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CONDUCTED BY

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THE AMERICAN
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OUR JOURNAL.

The reciprocities of Science and Art, their intimate and extensive interweavings, their indispensable, imperishable relations of mistress and handmaid, and the community of interests between the philosopher and the practical man, the man of science and the artisan, are considerations which seem fully to justify the comprehensive character of this work. The conductors will endeavor to render the work, in its various departments, popular, instructive, and reliable. It will contain the earliest record of discoveries in Physical and Chemical Science, original articles and communications from high authorities at home and abroad; and the science of Electricity, in its various divisions and connections, will receive special attention. The great, growing, and general interest in the subject of electricity—its rapid developments, and their high practical value—create a special demand for authentic information upon its progress and principles.

The division of Mechanic Arts will contain notices of valuable inventions, of patent laws, and legal questions and proceedings in connection therewith. Under this head, a list of patents granted in the United States will be given, together with the claims and explanations of the subject-matter of the invention and patent. In this respect, the "Journal" will differ from any other in the United States. It is well known that many of the claims under letters-patent, *as usually published*, convey no knowledge whatever of the character of the invention; and, whenever this may be the case, it will be the aim of this journal to explain the nature and purpose of the invention claimed. For such an undertaking, the conductors of the *Polytechnic Journal* are possessed of more than ordinary advantages, as they have all been connected officially with the Patent-office, and, transacting business in its immediate neighborhood, will have ready access to its records.

The division of Agriculture will embrace the whole subject, and be conducted by one who has made it a special study for years, both in this country and Europe. It will present notices of agricultural discoveries, inventions, and improvements, including domestic and foreign implements, gardening and farming economy, and original treatises on the manufacture of sugar, vine culture at home and abroad, wool growing, cotton and cane culture; and great efforts will be made to collect accurate information upon the management of the great staples of every section of the country.

The *Polytechnic Journal*, established at the seat of government, will derive great advantage from position alone. The assemblage here, during most of the year, of eminent men of all nations, and every section of our country, will afford to the conductors superior and ample opportunities for collating accurate and early information upon the various topics of the work.

CAREER OF SCIENCE.

There is a destination for every traveller, an end for every march, a goal for every racer, a climax for every aspirant, a summit for every mountain-steep; but where is the end of thought and its developments? "The faster run the quicker won," "The greater speed the earlier meed," may be mottoes for the encouragement of ephemeral labors; but there is no perch for genius, be her swift flight never so long—her pinions never so strong. No goal, no end, no summit, though with ever-accelerating pace it goes, forever waxing strong and great—no resting place, for there is no fatigue; but, with ceaseless efforts, it climbs, it soars, expands, invigorates under heavy burdens, takes fresh life and vigor from each new obstacle in its pathway, and, with perpetual grasp, its abiding glory and guerdon is to conquer. It has but to desire, to obtain, to "seek and to find." Such is the *career of science;* eternal with the Great Supreme, but by man hardly commenced; immortal, and to him eternal in the future. In Apostolic times, we read that even those miraculously gifted from on high were impressed with the belief, that the "end of all things was at hand," notwithstanding the precept of their great Teacher, that "of that day and hour no man knoweth." Reason has no better, surer foundation than the *Scriptures.* But we are not reading a homily now. We propose merely the inquiry, Was not such belief, on the part of those of old, to some extent founded upon their own restricted conceptions of the vastness of mental developments, as measured by their own standards? And is not this the secret belief—yes, the uttered thought—of many at the present day, and upon the self-same principle—of narrow perceptions and limited scope of mental vision, which looks to the present compared with the past only, and conceives no future which may bear similar comparison with the present—which regards mind as fully or sufficiently expanded, human wants as nearly supplied, the measure of earthly happiness as nearly full, resources mostly exhausted—in short, the full stature of the perfect man already attained? With the shallow thinker, enough has been done, and to do more is incomprehensible, and if not impossible, at least improbable; but to the deep thinker, the "*end is not by and by.*" Omniscience alone has set the bounds; and how near or how remote, not even angelic intelligences divine; but we, in the very poverty of our judgment, seem to discern clearly this truth, that if the achievements of mind are to terminate only with the exhaustion of its resources and capabilities, then the "*end is not by and by.*" Time was when a single capacious intellect could grasp and hold all of recorded and traditionary science, but the master spirits of this age tire under the burden of a single branch of the great circle of sciences. "The world is going ahead fast" has now become a familiar apothegm, and he that would win must work; he that lags must lose. Genius waits for no one; and the incessant, impetuous, ever-increasing whirl of thought confounds and intoxicates all save those who, avoiding the surface, plunge into the depths. "Drink deep or taste not of the *Pierian* spring" was once a wholesome admonition; but now no alternative, for from tasting follows, as almost an unavoidable necessity, the deep draught. It is, indeed, "going ahead fast;" but the faster it goes, the further it seems from the end. Wants and supplies increase; fountains of wealth and power unfold and are unfolded; gigantic enterprises are accomplished, and more and more undertaken; and there is a universal pressure, which bears every thing before it, and every one along with it. Space and time suffer violence, distance disappears, a day is as a year, and the blessing of threescore years and ten is the equivalent of patriarchal longevity. It is somewhat paradoxical to consider the destroying agent, steam, as contributing to the prolongation of human life; but this it does, and through its instrumentalities we live a day in an hour, a year in a day. But it is electricity that takes no note of time, and heeds no space; that brings leagues to inches, and time to nothing. Thus we live, and such is the *career of science*. But how shall we live, and how will it be hereafter? The insatiate cravings of thought, the restless yearnings of genius, even now, with all their rich earnings, betray impatience of delays.

> "At first, with vaporous wings, she flings the waves aside;
> And then, with fiery chariots, shakes the earth beneath her rapid strides;
> And last, with lightning's self, she rides both sea and land:
> And now she stops a while to ponder if aught quicker may be found to speed her way."

What is all this but the foreshadowing of new gains upon time and space? Mr. Calhoun* once remarked to us, while conversing upon the subject of electricity, that "the subjugation of electricity to the mechanical necessities of man would mark the last era in human civilization." The elements, air, water, and heat, had all been pressed into man's service, and electricity alone remained. But electricity has begun its work;† and if the convictions of the great statesman accord with destiny, then that era has commenced. If so, the signs of the times point to an era of length immeasurable, and the number of whose developments is legion. Such is the *career of science*, and its prospects. Part of man's duty and destiny is to comprehend and know all that the GREAT CREATOR has put under his dominion, and he is yet hardly aroused to the task. The learning of the past is to that to come only as the penumbra to that volume of light which will irradiate the escutcheon, and make effulgent the crown of *immortal genius*.

C. G. P., *Ed.*

ELECTRO-MECHANICS.

UNDER this head we shall describe and illustrate the various inventions in which mechanical operations are effected through the agency of electricity and magnetism, for the purpose of showing how far this subtile agent has already been made subservient to the mechanical necessities of man. We cannot undertake to introduce the details of the many modifications of each invention, but in most cases shall select some one, the most suitable as the type of its class. The first invention is that of the electro-magnetic engine, which will receive the largest share of our attention, as in the event of its complete success we anticipate the most momentous results. The electric telegraph stands next in point of importance; then follow the electric clock, the fire alarms, the electro-magnetic ore separators, the electro-

* The lamented *Calhoun* was excessively fond of discussion upon scientific subjects; and although more imaginative than practical, yet he completely fascinated you with his beautiful, extraordinary, and *bold conceptions*.

† In our next chapter, and in our future numbers, will be exhibited the progress of *Electro-Mechanics*.

magnetic and magnetic indicators for steam-boilers, the self-registering barometers and thermometers, electro-magnetic friction-brakes, etc.

Electro-magnetism as a moving power.—From the time of the discovery of the electro-magnet, it must have been regarded by many as possessed of mechanical value; and indeed prior to its discovery fruitless attempts were made to realize a motive power from Barlow's spur-wheel, and Sturgeon's disk, instruments designed for illustrating the action of magnets upon movable conductors, and, although tried upon an extensive scale, the amount of force developed was found to be barely sufficient to keep the apparatus in motion, with the most delicate provisions for the suspension of the revolving parts. From the discoveries of Prof. Henry, in relation to the modes of increasing the strength of electro-magnets, and his own invention of the first electro-magnetic engine, we date the foundation of electro-mechanics. The following is the brief communication of Prof. Henry through Silliman's Journal, vol. xx., 1831:

"Art. XVII.—On a Reciprocating Motion produced by Magnetic Attraction and Repulsion: by Prof. Joseph Henry.

"*To the Editor:*

"Sir,—I have lately succeeded in producing motion in a little machine by a power, which, I believe, has never before been applied in mechanics, by magnetic attraction and repulsion. Not much importance, however, is attached to the invention, since the article, in its present state, can only be considered a philosophical toy; although, in the progress of discovery and invention, it is not impossible that the same principle, or some modification of it on a more extended scale, may hereafter be applied to some useful purpose. But without reference to its practical utility, and only viewed as a new effect, produced by one of the most mysterious agents of nature, you will not, perhaps, think the following account unworthy of a place in the Journal of Science: the whole will be more readily understood by a reference to the annexed drawing.

Fig. 1.

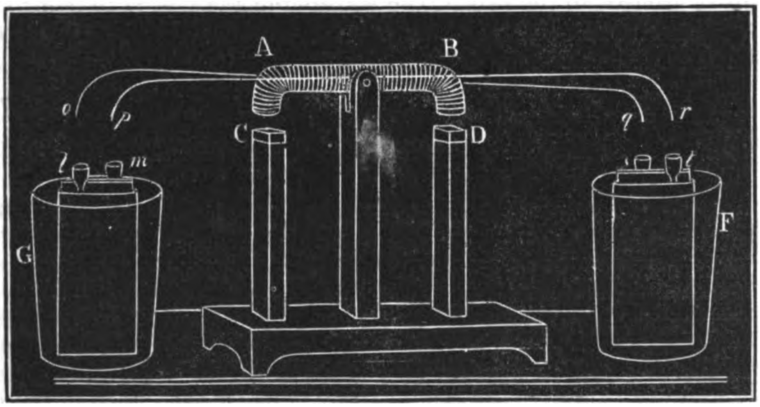


Fig. 1, AB is the horizontal magnet, about seven inches long, and movable on an axis at the centre: its two extremities, when placed in a horizontal line, are about one inch from the north poles of the upright magnets C and D. G and F are two large tumblers containing diluted acid; in each of which is immersed a plate of zinc surrounded with copper. l, m, s, t, are four brass thimbles soldered to the zinc and copper of the batteries, and filled with mercury.

"The galvanic magnet AB is wound in three strands of copper bell-wire, each about twenty-five feet long; the similar ends of these are twisted together so as to form two stiff wires, which project beyond the extremity B, and dip into the thimbles *s*, *t*.

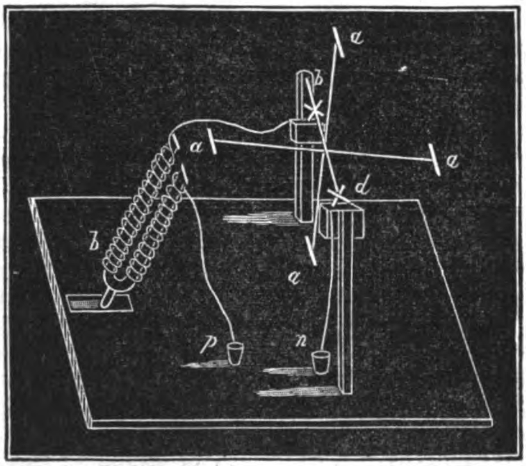
"To the wires *q*, *r*, two other wires are soldered so as to project in an opposite direction, and dip into the thimbles *l*, *m*. The wires of the galvanic magnet have thus, as it were, four projecting ends; and by inspecting the figure it will be seen that the extremity *m*, which dips into the cup attached to the copper of the battery in G, corresponds to the extremity *r* connecting with the zinc F. When the batteries are in action, if the end B is depressed until *q*, *r* dips into the cups *s*, *t*, AB instantly becomes a powerful magnet, having its north pole at B; this of course is repelled by the north pole D, while at the same time it is attracted by C; the position is consequently changed, and *o*, *p* comes in contact with the mercury in *l*, *m*; as soon as the communication is formed, the poles are reversed, and the position again changed. If the tumblers be filled with strong diluted acid, the motion is at first very rapid and powerful, but it soon almost entirely ceases. By partially filling the tumblers with weak acid, and occasionally adding a small quantity of fresh acid, a uniform motion, at the rate of seventy-five vibrations in a minute, has been kept up for more than an hour: with a large battery and very weak acid, the motion might be continued for an indefinite length of time.

"The motion, here described, is entirely distinct from that produced by the electro-magnetic combination of wires and magnets; it results directly from the mechanical action of ordinary magnetism: galvanism being only introduced for the purpose of changing the poles. My friend, Prof. Green, of Philadelphia, to whom I first exhibited this machine in motion, recommended the substitution of galvanie magnets for the two perpendicular steel ones. If an article of this kind was to be constructed on a large scale, this would undoubtedly be the better plan, as magnets of that kind can be made of any required power, but for a small apparatus, intended merely to exhibit the motion, the plan here described is perhaps the most convenient."

This simple machine is the basis of all the electro-magnetic engines, the forms of which have been very numerous. We have been particular to cite the whole communication, as it will serve our purpose for reference in the prosecution of our subject. Since this invention, the machines, or engines as we shall now call them, have all been found under the two classes of movements, viz., reciprocating and rotary. The first rotary engine was invented by Mr. Sturgeon, of England, and the first in this country was made by Dr. Edmondson, of Baltimore. There have been two principal varieties of engines as regards their magnetive arrangements, and there are, first, that kind, wherein a change of poles is introduced to bring into operation the attractive and repulsive forces, as in Henry's engine; and this change has been made either in the moving or stationary magnets, and the moving magnets have sometimes been permanent magnets of steel, while the stationary were of soft iron, and vice versa. The second variety of engine involves no change of poles to effect the motion, but gets its motion from the mere interception of the galvanic power by a mechanical contrivance called the *cut-off* or *electrotome*. In these engines stationary magnets are made to attract movable magnets, either rotary or reciprocating; the magnetic power of both is then suspended for an interval, during which the moving system passes through a certain space by the momentum acquired during the attraction, and then the magnetic power is again renewed, and so on throughout. The more simple form, however, of this class is where the stationary magnets are made to attract pieces of soft iron, the magnetic power being suspended in the manner just stated. This last-named variety of engine is found under numerous modifications of form. The principle common to all these forms, viz., the interception of the magnetic power at intervals, without a change of polarity, and their simple and economical construction, give them the preference over all other kinds of electro-magnetic engines. The first inventor of this form was Dr. Edmondson, of Baltimore, who published an account of it in Silliman's Journal, vol. xxvi., page 205, A. D. 1834. This is the first rotary engine of any kind in this country of which we have any record. The engraving is copied from his own illustration, and his description is here quoted.

"The Rotating Armatures, by T. Edmondson, Jr., Baltimore.—This instrument is intended to produce the rotation of a set of armatures, by causing a current of galvanism to pass, '*at certain times*,' through an electro-magnet, placed near the circle described by their revolution. The armatures are attracted by the induced magnetism as they approach the faces of the electro-magnet; and by the arrangement of the instrument, the current of galvanism is suspended, and of course the induced magnetism withheld, as the armatures recede from the electro-magnet. The armatures are nicely fixed upon an axis, and made to descend parallel to the faces of the magnet; and as they are attracted and suffered to pass, the momentum, which at the time of passage is only left, brings the others into action. Fig. 2, *a*, *a*, *a*, *a* are the armatures, *b* the electro-magnet, placed at an angle towards them, and wrapped with a single coil of coated copper wire; *d*, *d′* two small brass stars placed on each side of the armatures, and soldered to the axis. The points of the stars are made to descend into quicksilver troughs, placed underneath them, and to come into contact with the mercury at the time the armatures approach the electro-magnet, and to revolve out of the quicksilver as they recede from the electro-magnet; it is only at the time of their contact, that the current of galvano-magnetism, proceeding from *p*, where the positive pole of a galvanic element is placed, can pass through the coil to *d′*, and along the axis by the intervention of the small stars to *n*, where the corresponding negative wire of the element is placed. The instrument will revolve for several hours."

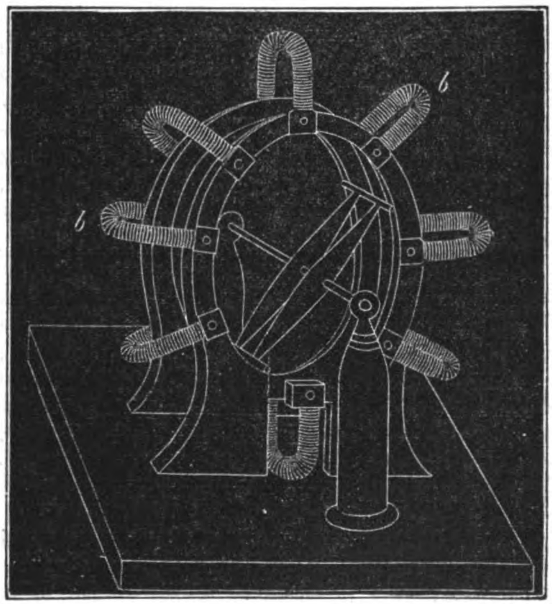
Fig. 2.



The plan here given is defective, inasmuch as the intervals of action are great, and it will be readily seen that each armature must pass beyond the poles of the electro-magnet to a distance greater than one half the distance between the armatures themselves, before the magnet can be recharged; for the magnet will attract this armature backward as much as it attracts forward the armature in its rear. A remedy for these difficulties will shortly be described. One principle involved in this engine is important, though in all other respects it is inoperative. It is clear that Dr.

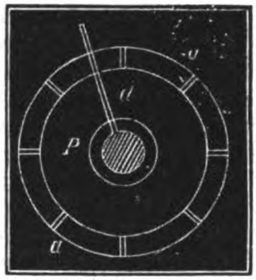
Edmondson is entitled to the credit of first introducing suspension of the magnetism as a substitute for the change of poles, and also revolving armatures with stationary magnets. The right of priority to this invention was warmly discussed in the English journals and papers in 1839, and it was claimed for Mr. Davidson, of Aberdeen, by Prof. Forbes, in a letter to Mr. Faraday. This discussion arose from the circumstance that Mr. Taylor, of this country, took out a patent for the invention in England, in 1839, and Mr. Davidson was proved to have invented it two years prior to this patent. So far as the suspension of magnetism is considered, Mr. Davidson was prior to Mr. Taylor, and also in the use of revolving armatures. The employment of revolving armatures and stationary magnets, was communicated to Mr. Taylor by Prof. Page, in 1838. Mr. Taylor obtained no patent in the United States, but found no difficulty in getting a patent in England, as their laws allow patents to the first *introducers* of inventions, as well as *inventors*. Mr. Taylor applied for a patent in this country, for an engine, in which there was a suspension of magnetic power, but his plan was radically defective in using stationary armatures and revolving magnets. The patent was refused. The engine patented and exhibited by Mr. Taylor, in England, and that invented by Mr. Davidson, have each the same defect as the original contrivance of Dr. Edmondson, and cannot be regarded as improvements upon the latter, except in mechanical detail. The remedy for the difficulty, which was pointed out on our first allusion to Dr. Edmondson's engine, was invented by Prof. Page, in the month of March, 1838, and published in Silliman's Journal, vol. xxxvi., No. 2, pages 350, 351, 352. The defect of *back action*, or attraction backward of the armatures, already explained, necessarily exists in any description of the engine, where the number of the armatures is equal to or exceeds the number of magnets, and the remedy consists in employing a fewer number of armatures than magnets. The reason is obvious. The spaces between the magnets should be as small as practicable to insure continuity or frequent repetition of the magnetic attraction; but the nearer the magnets are to each other, the greater the difficulty arising from back action where there is a multiplicity of armatures. The following illustration exhibits one of the three plans of Prof. Page, published in Silliman's Journal, vol. xxxvi., No. 2.

Fig. 3.



In this figure there are eight magnets shown, and only two armatures. Fig. 4 shows the cut-off detached, *a a* are metallic segments insulated from each other upon a cylinder of wood, and each connected with the helices upon the several magnets *b b*, Fig. 3; *p* is an entire cylinder or ferrule of copper upon the shaft of the engine, which communicates with one pole of the battery, and the current is conducted to the magnets in succession as the shaft revolves, through the spring conductor *d*. It will be seen by inspection of the figure, that the armatures are removed from each other as far as possible, and also as far as possible from retarding causes. As soon as one magnet ceases to act upon the armature, the next in advance is charged, and the only retarding causes are such as are unavoidable, and exist in every kind of engine where electro-magnets are employed. If the number of magnets is large, or the diameter of the engine will admit of it, there may be two sets of armatures at right angles to each other, or nearly so, but they must never be within any appreciable retarding influence from the magnets.

Fig. 4.

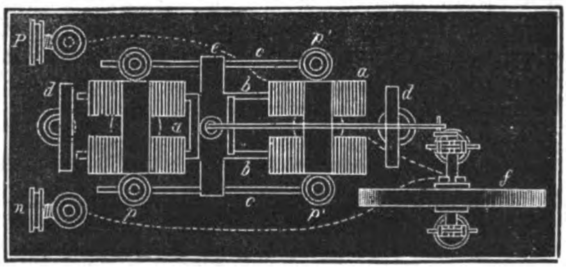


It is somewhat remarkable that the earliest and least successful attempts to obtain an electro-motive power were made upon the same general principle of action as the most recent and most successful. That principle was the direct action of the electric current, or the mutual action between magnets and conductors conveying currents of electricity. The* first trials were made with Barlow's† spur-wheel, the last trials were made with De La Rive's‡ ring, under some modifications, both of which instruments were originally contrived as distinct modes of exhibiting the mutual action of magnets and conductors. The ring of De La Rive is merely a helix of insulated wire floated upon water, or otherwise delicately suspended, and permanently attached to a miniature galvanic battery; and this helix or ring is made to exhibit a variety of motions, when a permanent magnet is presented to it. Although interesting, yet the motions are slow, and the forces thus exerted, trivial.

The first attempt to produce this peculiar action upon a large scale, and in such manner as to admit of an "increase to any desired extent of the magnet, helix, and batteries," was made by Prof. Page, in the early part of 1837 (Silliman's Jour., vol. xxxiii. page 192), and he has given the name of "*axial engines*" to those operating upon this principle.

By continued perseverance with this class of engines, Prof. Page has arrived at far greater power and results than have ever before been attained. The following illustration, Fig. 5, exhibits a simple form of this engine. *a a* are the helices, *b b* the axial bars or magnets, two sets of which are shown connected by the cross-head *e*. Attached to this cross-head is the connecting rod, which takes hold of the crank upon the shaft of the fly-wheel *f*. The rods or slides *c c*, attached to the cross-head, are guided in suitable bearings in the pillars P P. When the helices are connected with the galvanic battery, they force the axial bars in the direction of their *axes*,

Fig. 5.



* Sturgeon's Annals, vol. iii., page 429.
† See Roget's treatise on Electro-Magnetism, and Davis's Manual of Magnetism.
‡ Ibid. ibid.

and by alternating their connection with the battery it is evident that the two sets of helices and bars will give us a reciprocating motion; *d d* are fixed bars of soft iron which perform the part of electro-magnets. Their attractive force is added to the axial force, and in such a manner as not to involve the difficulties generally incident to the employment of electro-magnets. The poles of the axial bars are not allowed to approach very near to these armatures, and as their action is at the end of the stroke where the motion is slow and changes direction, the retarding operation from retained magnetism is not so great as in ordinary electro-magnetic engines. Prof. Page has invented a number of engines, instruments, and machines, all depending upon the axial motion for their operation, many of which will be hereafter described in this journal. One of the most important is the *rotary* axial engine. This engine, theoretically considered, is the most perfect of all electric engines, and a particular description and illustration of it will be given in a future number.

With the above brief historical outline of the three classes of electro-mechanical powers, we will proceed to examine respectively their peculiarities and merits.

First, of electro-magnetic engines where the attractive and repulsive forces of the magnets are employed.

It requires sensible time to charge and discharge a magnet, and the length of this time will depend upon the size of the magnet, the quality of the iron, and the intensity of the electric current. The larger the magnet the greater length of time required to develop its full power; the harder and more impure the iron, the less its magnetic capabilities, and also the slower in receiving its charge; and the more intense the electric current, the more speedily the magnet will attain its maximum of power, and *vice versa*, for each of these conditions. In some of Prof. Page's large electro-magnets, the time required, after the first contact of the battery, to raise the power to its maximum was from 1 to 2½ seconds. Time is such an important element in machinery, that this fact seems rather discouraging to the hope of obtaining great power from electro-magnetism. As we proceed, however, it will be shown that this *tardiness* of the electric force is not so formidable as it appears at first sight. In every description of motive engine, even in explosive engines, such as the gunpowder, gun-cotton, and gas engines, the exertion of force is gradual. But in the electric engine, the "*lightning engine*," many suppose that instantaneous action is its chief recommendation over steam and other powers; that as electricity moves with inconceivable velocity, there could be no "*getting ahead of it*," or, in other words, that it would follow up with full power the most rapid movements of machinery, and that whatever power was exerted by the electric current, directly or indirectly, in starting an engine, that same power would be constantly exerted, no matter how great the velocity of the engine. Such a result we shall probably never realize from any power. Electricity passes through good conductors in inappreciable time, it is true, although in every case it encounters resistances, owing to some physical character of the conductors, and to opposing currents. When an electric current moves in a conductor, it does not move all at once. It commences with a "wave," "vibration," "induction," "impulse," or whatever we may call it, which is transmitted with almost the rapidity of light; but the whole quantity of electricity which the conductor is capable of conveying from the battery does not so pass. The initial secondary current is always opposing itself to the primary current; and this initial secondary is stronger when the conductor is disposed in the form of a helix than when it is straight, and is greatly augmented by placing an iron bar within the helix. The full charge of the magnet, therefore, is to be effected by a struggle between the current from the battery and the opposing initial secondary, and not until this conflict ceases will the full magnetic power be developed. Let us suppose now that sufficient time has been allowed—one second, for instance—for the electric current to rise to its maximum, and the full magnetic power to have been developed, and that in this state of things the current from the battery be cut off. The consequence is a secondary current, called the terminal secondary, which tends to prolong the magnetism of the bar; but if this current is entirely intercepted, then the magnetism is left to itself; and if the iron be hard or the mass great, then the magnetism subsides slowly, and, as a general rule, *it requires about the same time to charge as to discharge a magnet.* It is principally owing to this retarding or reacting influence and the prolongation of the magnetism beyond the required time, that so many difficulties have been found in the engines where there is a change of polarity in the magnets, whenever attempts have been made to increase their powers by increasing the size of the magnets. There is, however, another source of loss in the use of large magnets. They retain a permanent amount of magnetism, and one cause of this retention is the impurity and want of homogeneity of the iron, which generally increase with the size of the wrought-iron bars. Again; with very large magnets, the inductive action from pole to pole is proportionally less, and with such obstacles in the way, the employment of large magnets seems to be almost "*contra-indicated.*" The preference has generally been given to a multiplication of small magnets; and theoretically there should be a considerable saving of power, but practically, the complication and nicety of construction, the difficulty of using to advantage conducting wires of sufficient capacity, the greater obliquity of the wires to the axis of the magnet, and the great force of the secondary currents, have left us in reality little to choose between large and small magnets. It has, however, been generally found that very small engines exhibited a greater proportion of power than the very large ones; but there is a practical difference between using a few small magnets in an engine designed for a small power, and a great number of small magnets in a large engine for a large power. It has been frequently suggested to combine a number of small engines to obtain a large power; but here arises a mechanical difficulty too obvious to need argument with an engineer. The plan reminds one of an invention not long since published, of an attempt in Scotland to get power from trained mice, for the purpose of spinning.

In changing the polarity of electro-magnets, the time of maximum development is increased, for the reason that one order of polarity has to be overcome before another can be established.

C. G. P., *Ed.*

(To be continued.)

ON THE VITAL PROPERTIES OF ELECTRICITY.

The following letter from Mr. Crosse, of England, will be read with interest, and we have introduced it principally as a text for the present and future commentaries upon the subject of animal electricity and its congeners.

MANCHESTER, *September* 17, 1852.

My Dear Sir: I forwarded the National Intelligencer, containing the remarks of Professor Hallowell, to Mr. Crosse, and two or three days since received from him a reply to my letter accompanying it. The following is an extract:

"The Professor's remarks upon my experiments on the acari are on the whole well made, with the exception of the *possibility* of my mistaking the motions of the animal for the undulations attending crystallization of a mineral. In your account you have given an excellent sketch of the apparatus I employed in my *most accurate* experiment on this subject, but I beg to observe that in this experiment *only one* acarus made its appearance, and this took place on the 140th day after its commencement. The apparatus was placed on a shelf in a subterranean cellar, which was quite dark. On the 140th day, as I was examining the bulb of the retort, by a lens with a lamp held behind it, I distinctly perceived a large well-formed acarus, *moving rapidly within the retort.* I at first fancied it might be on the outside of the bulb. I passed my finger repeatedly over its surface, but on removing it the acarus was *still visible*, and I watched it for a considerable time as it crawled around the *inside* of the retort above the fluid it contained. I never saw this acarus again, nor did I observe any other during this experiment. I have, however, seen many hundreds in other experiments, and most *attentively* watched their development from an incipient speck or hemisphere to its full formation. I perfectly agree with the gentleman who observed in your letter that those experiments should be received 'with more or less distrust;' and I can assure him and the public that *no one has felt more distrust in them than myself.* It is not my object to take the least credit to myself for these observations. I was an humble investigator of *truth*, and it is my wish to encourage others to an investigation of the same. It has long been my belief that the *electric influence* is the great principle by which the Almighty *puts together* and *separates;* and that it might be called, metaphorically speaking, *the right arm of God.* I trust ere long to give to the world a more detailed account of my observations and experiments on animal and vegetable life, as connected with electrical action. I am no judge whether this acarus be a distinct species or not. On this there are conflicting opinions. I have already observed that these acari are *always* produced upon a surface *kept constantly moist*, or *under a fluid.* I observed them two inches below the surface of fluo-silicic acid, forming upon a piece of negatively electrified quartz. When sufficiently advanced to throw out filaments, these filaments, on being approached by a sharp point, a pin or such like, collapsed and shrunk from the touch like the zoophites on rocks, and after a time expanded again. *This was the first symptom of animal life.* I earnestly wish these experiments were repeated and varied in every possible way. In a vast number of experiments I have produced various sorts of fungi, where I should never have expected to see them, and in some of them the fungi have preceded the acari. We know too little of these mysterious matters at present to confine them within the present laws of science.

"P. S. I used no soda in the above experiments. *Caustic potash*, *silex*, and *water* were the only ingredients. It is my intention, as soon as I can, to publish an account of my experiments relative to these animal and vegetable mysteries. In fact, I have begun to write my treatise.

"You are perfectly welcome, my dear sir, to publish any part or the whole of this letter, as you think fit."

The above from Mr. Crosse must satisfy the most incredulous that animal life was actually produced instead of mineral. There could be no mistake of the one for the other, unless the "*imperfect crystal*," the undulations of which the writer of the remarks thinks might have been mistaken for animal motion, could be imagined to have received fuller development, and, endowed with automatous power, have crawled round the glass. I think the Professor would be quite as much astonished at such a sight as at the other, especially if procreativeness was added, and little *perfect* crystals were the result. We know too little of the operations of Nature, and of the means by which the all-wise Creator may choose to carry out his works, to set up any infallible rule by which to judge or to limit them. The whole creation is a miracle, and to my mind the production of animal life is not more miraculous than that of vegetable. Man may accidentally, or by design, so bring together the necessary elements as by immutable laws must produce certain results, and who will be so presumptuous as to set a limit to them? Yours, truly,

FRAS. B. OGDEN.

HON. A. O. DAYTON, Washington.

Mr. Crosse is one of the most zealous and extraordinary experimenters now in the field of science; and yet, with all his enthusiasm, he has been discreet in his conclusions. We never could find any ground whatever for the charge of impiety against his experiments and accounts upon the subject of the development of his insect, *Acarus Crossii*, and he needs no self or extra defence on this point. He is in the noble pursuit of facts and truth, and his facts in connection with the acari and fungi have abundant collateral support, and his acari have been fully confirmed by high authority.

We cannot but infer that the atmosphere, the earth, and a great variety of solids, perhaps all of them, teem with organizations, vegetable or animal, either in the germ or perfect life; and that these find their developments and existences only under the circumstances designed for them by the Great Creator. Else how should we explain the existence of the entozoa, epizoa, the epiphytes, and the parasites of minute animals, whose only habitation is within the intestines, or eyes, or upon certain parts of other animals, or of plants; whose abiding places are particular plants, or parts thereof, or some special substance or surface; plants gloating in moisture, darkness, and rottenness, and extinguished by the first breath of pure air, or ray of sunlight? Where do their germs or ova lie concealed, or who has traced them out, and how do they survive the vicissitudes of cold and heat? Does one person more than another eat or drink of the ova or young of the great lumbricus or red worm found sometimes in such enormous masses in the human intestines? or of the tænia or tape-worm, with its ample folds and enormous length,* that exists only in this same, and seemingly, extraordinary domicile. Truly the "whole creation *is* a miracle," and its microcosms are as full of inscrutabilities as the mightier spheres they compose. From what peculiarity of composition or organization in an egg is it determined that the extreme tip of a certain fibre of a certain feather in the wing of a bird should always have just such a color and texture? How

* These worms have been reported of the great length of 600 feet.

can we comprehend that a man in walking for miles in the open air should leave in his trail traceable matter having properties peculiar to himself, and distinguishable from all other men and things? Yet we read of a bloodhound in England, who tracked a murderer over two leagues, having taken the scent from a shoe that was left behind. Yes, every breath we draw, every morsel we eat, every drop we sip, teems with eggs or germs, or swarms with life, and we would not have the veil lifted from our dim vision, or the obtuseness removed from our other senses, that we might be introduced into these microcosms, with all their sights and sounds, odors and tastes. In considering some of these extraordinary existences, such for instance as the *Acarus Crossii*, we must remember how great are the extremes under which we find life in *embryo* and *developed*, and that the food of one is another's poison. A certain kind of insect *thrives* in the most pungent ground red pepper, another riots upon henbane or tobacco, and although a little salt will kill a hog,* yet he swallows immense quantities of arsenic with impunity. Thus it is in the organic and inorganic worlds; life and properties display themselves only when they fall into their appropriate spheres of development or action. Mr. Crosse's great theme is *Electricity*, and he is soon to give us an account of his observations and experiments on animal and vegetable life as connected with electrical action. We shall look for the true philosopher in his deductions, but we confess a little fear lest he fall in with a certain sect of modern "Electro-Biologists" or "Reichenbackers," with their new principle of "OD." We hope we misinterpret him, but the following remark from one who has had such vast resources of observation and experiment, strikes us forcibly. We requote it. "It has long been my belief that the *electric influence* is the great principle by which the Almighty puts *together* and *separates*, and that it might be called, metaphorically speaking, the *right arm of God*." The metaphor is striking, but we confess that we are not yet converts to any doctrine or theory which identifies the mysterious principle of life with that of electricity. We want and require the *experimentum crucis*. Thus far the imaginary currents of *Mateucci* and others have not been made sensible by any *external tests*. No secondary current has been produced by the most violent muscular action, no external attraction, repulsion, or movement exhibited, nor deflection of the magnetic needle produced by internal currents of electricity in animals (unless they had special electrical organs), and to our knowledge no internal disturbance has ever been produced by *proximity* of the most powerful magnets, galvanic batteries, or electrified bodies. Some years ago we placed a celebrated somnambule within a great helix of insulated copper wire, and passed through this helix a strong current from a galvanic battery. No perceptible effects were produced either by a continuous current, or by one rapidly broken. We have thrust our hands, arms, and legs into the enormous helices used by Prof. Page, in his experiments upon *Electro-Magnetism* as a moving power, and without the slightest sensation, whether the current was broken rapidly or unbroken. These helices are the most powerful ever made. One of them raises up in its centre and suspends, without visible support, a bar of iron of 2000 pounds weight, and the secondary spark when the current is broken is from six to eight inches in length. The magnets are by far the most energetic ever produced, but we have never seen upon them the Reichenback "*fires*," nor have we ever experienced any novel sensations or functional disturbances while handling them, and working over them day after day, nor

* This has been tested by Prof. Gale of the Patent Office. Fish brine killed a hog that had swallowed several ounces of arsenic with impunity.

while we have been closely watching the movements of a three to five horse-electro-magnetic engine, in their powerful electric and magnetic disturbances, often at the rate of 1600 per minute. The dia-magnetic as well as the direct magnetic effects from these magnets were conspicuous, and although the animal tissues and fluids were doubtless susceptible of these influences, yet they all performed their respective offices as if without interference. We were once applied to for surgical aid by a young lady, who had broken a needle with the point deeply imbedded in the back of her hand. We placed her hand in a sling, and in contact with it a superior steel magnet, in such a position as to prevent the point from working up the arm. This she wore almost constantly for a week, but there was no change wrought in any function of the parts in contact with the magnet, and in the absence of *real*, *practical*, tangible, demonstrable, reciprocal, unsophisticated tests of the living functions of electricity and magnetism, we challenge all experimenters and theorists to the *external* test.

A trite saying, "that it is a poor rule that will not work both ways," applies here. "Action and reaction are equal," and if the magnet or electric currents can so strangely affect and assimilate with the functions of life without reciprocity of action, then philosophy has gained a new principle, and magnetism a new property.

C. G. P., *Ed.*

(To be continued.)

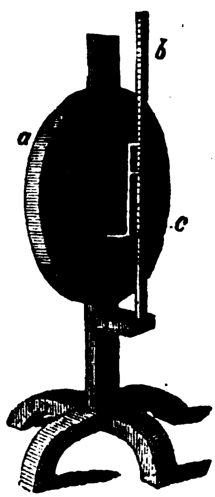
THE MAGNE-CRYSTALLIC THEORY.

Dr. Tyndall has exploded the magne-crystallic theory of Poisson, and has shown that a piece of wax between the poles of a powerful magnet comports itself like a crystal of calcareous spar, provided the wax be fashioned in the shape of the crystal. Proving, in fact, what was sufficiently established by Coulomb, that all bodies are magnetic, that is to say, magnetism may affect all matter to some extent. This is most conspicuously strengthened by Faraday's investigations.

C. G. P., *Ed.*

ON A NEW RHEOSTAT.

BY PROF. CHAS. G. PAGE, M. D., WASHINGTON CITY.



This instrument, now published for the first time, was invented some years since, and possesses advantages over any rheostat hitherto known. It consists of a spiral of thin ribbon of German silver, which metal is peculiarly well adapted to such purpose, as it possesses a very low conducting power, and at the same time a very clean surface, tarnishing with great difficulty. Its conducting power, as compared with pure copper or silver, is as 1 to 12. This spiral is fastened into a spiral groove in a disk of wood *a*, which revolves upon an axis running through the pillar *d*. The carrier *c* slides up and down the graduated pillar *b*, which is fixed upon a suitable support attached to the main pillar *d*. The carrier, which is a travelling index, is of metal, and has only a vertical motion, guided by a collar embracing the pillar *b*. There is a short arm projecting from the carrier in a line parallel with the axis of the spiral, the inner extremity of which arm is in contact with the German silver ribbon, and embraces it with a slight spring-clasp. The graduated pillar *b* is of suitable metal, of square form, and insulated from the main pillar *d*. The graduation is made to indicate, either in feet or inches, the length of the spiral traversed by the arm of the carrier. It will be readily understood, that when the spiral is revolved by hand or otherwise, it acts like a screw-thread to move the carrier up and down, according to the direction in which the spiral is turned, and brings more or less of the spiral into the circuit, as required. When the rheostat is included in an electric circuit, one wire of the circuit is connected with the pillar *d*, and the other with the top of the pillar *b*. The advantages of this rheostat are the facility of reading off the lengths of circuit included, simplicity of construction, and certainty of operation. The motion of the carrier being slow, the divisions upon the scale are minute: but they may be made larger, by causing the carrier to operate upon the short arm of an index-lever, or the ribbon of the spiral itself may be spaced off, before it is fixed upon the disk of wood.

C. G. P., *Ed.*

TECHNICAL CHEMISTRY.

[From the annual Report on the Progress of Chemistry, &c., by J. Liebig and Herman Kopp, for the year 1851. Translated for the American Polytechnic Journal.]

METALS AND ALLOYS.

Separation of Gold from the Dross of Arsenic.

LANGE* subjected the process of separating gold from the dross of the Reichenstein arsenic, mentioned by Plattner and Duflos,† to a further examination with reference to its practicability, which led to the following established results: A mixture of chloride of lime and muriatic acid in a large quantity of water, separates the gold from the dross more perfectly than chloriated water, and is not so injurious to the health of the workmen. By introducing chlorine gas, and afterwards lixiviating it, the gold will be completely extracted; and this is the best method as well as the most simple and economical. The simultaneous introduction of steam, or the conversion of the dross into powder, does not answer; on the other hand, heating the dross to 120° C. accelerates the operation upon the gold. Successive lixiviating has been found to increase the richness of a very weak solution of gold, in which case hot water is preferable to cold: washing of the dross with muriatic acid before using the chloric fluid, has proved a failure. The gold in solution is precipitated imperfectly by means of arsenic acid: it is better done with sulphuretted hydrogen or with lead. Less than 3 lbs. of chloride of lime (containing 13·5 per cent. of bleaching chlorine) for a hundred weight of dross, will not answer; and with this quantity, according to the average of experiments, the best dross yielded $\frac{1}{10}$; the middle quality $\frac{1}{11}$; and the poorer $\frac{1}{14}$ loth‡ of gold to a hundred weight.

SILVER.

Separation of Silver by means of Sulphate of Soda.

Patera§ feeling the inconveniences attending the use of a boiling concentrated solution of common salt for the extraction of silver, tried with

* Archir for Mineralogie von Karsten und Dechen, xxiv. 396.
† Jahrbsber. for 1849, 632; for 1850, 632.
‡ A loth is not quite a half ounce Troy weight.
§ Jahrb. der K. K. geologischen Reichsanstalt, 1851, iii. 52.

success the hyposulphite of soda proposed for this purpose. The possibility of preparing this salt cheap in large quantity, either by the introduction of sulphuric acid into sulphuret of soda, or by the introduction of air on a solution of the latter, as well as the far greater (30 times) solubility of chloride of silver, leave scarcely a doubt as to the practicability of this means, in the operations of metallurgy. He proposes for this purpose the extraction of the prepared ore with Real's press, under high pressure, and would not advise the precipitation of silver from the solution by metallic copper. If the silver be precipitated by means of sulphuret of soda in the form of silver glance, it has this advantage, that the lye in the case of hyposulphites is always renovated, and can be used again for the subsequent extractions. The deposit effected by the sulphuret of soda, contains on an average 60 per cent. of silver, which can be easily reduced by melting it with iron, and it gives more than 7½ ounces silver to a hundred weight.

Separation of Silver by means of common Salt.

Gurlt (see specification below)* has received a patent for a process of effecting the extraction of silver by the use of muriate of soda or common

* From the Repertory of Patented Inventions, 1851, 362.

Specification of the Patent granted to Adolf Frederic Gurlt, of Manchester, in the county of Lancaster, for an improved Method of Extracting Silver from Argentiferous Minerals.—Sealed Oct. 10, 1850.

These methods are—First, the eliquation process, in which the argentiferous substance is mixed with lead, or any suitable combination of lead; the silver combines with the lead owing to its great affinity for that metal, and is afterwards separated from it by the process of cupellation, which is well understood.

Secondly, the European method of amalgamation, in which a chloride of silver is formed by mixing common salt in a reverberatory furnace with the calcined ore or regulus; which chloride is then reduced to the metallic state by means of metallic iron, and dissolved by mercury, thereby forming an amalgam, which is separated from the ore or regulus by washing processes, and is then deprived of its mercury by distillation, leaving metallic silver behind.

Thirdly, the American amalgamation process, which consists in mixing calcined copper ore (magistral) and common salt with the ore from which the silver is to be extracted, and by the addition of such a quantity of water as to form a thick pasty mass, in which the chloride of silver thereby formed is reduced to the metallic state by iron, and is then dissolved by mercury, which amalgam is treated in the same way as that formed by the European method of amalgamation.

Fourthly, a method by which a chloride of silver is obtained in a similar way in a reverberatory furnace, as in the European amalgamation process, and is then dissolved by means of a hot concentrated solution of common salt, hyposulphite of soda, or any other suitable agent which will dissolve the chloride of silver, and separated by means of filtration from the insoluble portions of the material treated; the silver is then precipitated in the metallic state by means of any suitable metal.

Fifthly, a method by which all the sulphuret of silver contained in a mineral is converted by calcination into sulphate of silver, which is extracted by hot water, and then precipitated by cementation. My improved method consists in subjecting the argentiferous ore or regulus containing silver in the state of a sulphuret, directly to the action of a solution of common salt or its chemical substitutes, such as the chlorides of potassium, ammonium, &c., combined with the chloride of copper, iron, zinc, or other suitable metal, by which means the sulphuret of silver is converted into chloride of silver, and dissolved into its nascent state by this solution, so that it may be separated by means of filtration from the mineral with which it was previously combined; any natural chloride of silver (horn silver) contained in the ore is likewise dissolved. The argentiferous solution is then deprived of its silver by cementation, and may again be used for extracting silver from another portion of ore or regulus.

But, in order that my method may be more fully understood, I will now proceed to describe the best mode I am acquainted with of carrying the same into effect. I form the solution which I use for my process in the following way:—One hundred parts of the concentrated solution of the chloride of the alkali or earth, and ten or fifteen parts of a concentrated solution of the metallic chloride are well mixed, and heated to about 200 degrees of Fahrenheit previous to its being used. The mineral to be treated may be an ore of copper, iron, zinc, &c., or a regulus of these metals, and is in every case to be reduced to a fine powder, so as to facilitate the lixiviation; when I find that the gangue of the ore consists of a carbonate or oxide of lime, magnesium, barium, strontium, &c., which exercise an injurious influence on the solution by destroying the metallic chlorides, and reducing them to hydrates or oxides, I prefer to remove the injurious matters salt, directly on the ore, which contains silver in the form of a sulphuret. For this purpose he puts the pulverized material into a concentrated solution of common salt, heated to 94°, in vats resembling amalgamating vessels, mixed with 10 to 15 per cent. of a saturated solution of chloride of copper.

The sulphuret of silver is thus converted into chloride of silver, which may be at once, together with that which already exists there, precipitated from the solution by means of copper plates. The silver which is present in a metallic state cannot be extracted from the products of furnaces by this method.

Separation of Silver by means of Ammonia.

According to Swindell's* patent, the copper ore is oxidized as far as possible by roasting; the roasted mass is heated with a weak solution of caustic ammonia (specific gravity = 0·980), and the silver and copper are then separated from the solution so obtained by any mode desired.

IRON.

Effects of Sulphur on crude Iron.

Janoyer,† in consequence of the appearances observed in the furnace at Ormes, sought to determine more accurately by experiment the effect of sulphur on crude iron. At this smelting furnace, where a red iron ore of *Privas* was melted, together with a clayey iron ore, from the coal-formation,

by means of a smelting process, which converts them into a slag, and the ore into a regulus. Should it not be desirable, however, in other respects to smelt the ore, I wash the same with diluted sulphuric or muriatic acid previous to subjecting it to the desilverizing process, whereby in most cases the injurious matters are rendered harmless. I effect the lixiviation by means of revolving casks, such as are used in amalgamation works. These casks are charged according to their size with the mineral to be treated, and with the solution; the latter I recommend to be added in such proportion as to be equal to at least three times the volume of the mineral. Both mineral and solution should be heated to about 200 degrees Fahrenheit when put into the casks, unless means are used to heat the contents thereof during the process of lixiviation by steam or otherwise. After some hours' working, the solution is tapped out and renewed, which operation must be repeated until all the silver is extracted, the time and the number of changes of the solution being entirely dependent on the quantity of the mineral employed and of the silver to be extracted. The average time required for a charge of five hundred weight of ore or regulus, is about twelve hours, in which time three changes of solution are made. I finally wash the mineral with a concentrated solution of common salt, or other solvent of chloride of silver, in order to remove the remaining silver solution, which otherwise would be lost. The silver is precipitated from the solution in its metallic state by copper or any other suitable metal. I always prefer that metal, the chloride of which constitutes the solution, because a chloride of the same metal will then be found equivalent to the silver precipitated, and the solution may at once be used again for extricating silver from another portion of ore or regulus; in other words, a regenerative system of working is established: the silver after precipitation is then washed and refined in the usual way. In case the ore to be desilverized contains, with horn silver and sulphuret of silver, some metallic silver, but not in such quantity as may be advantageously extracted by mechanical processes, I prefer to smelt the ore, converting thereby the whole of the silver into sulphuret, which may then be acted on by the solution, as above described. The choice of the metallic chloride to be used in the solution depends to a great extent on the component parts of the ore or regulus. If the mineral to be treated be an ore or regulus of copper, I prefer a solution of the chloride of copper; if of zinc, I then make use of the chloride of zinc, as the agent to convert the sulphuret of silver into chloride; if it contain much iron, or other metal of no value for succeeding smelting operations, I use the chloride of iron, being the cheapest of those metallic chlorides. As regards the choice of the chloride of an alkali or earth in the solution, I generally prefer the chloride of sodium (common salt), as being the more powerful and cheaper agent; but the chlorides of potassium, ammonium, lime, &c., also answer the purpose.

He claims "The use of a combined solution of chloride of potassium, sodium, ammonium, &c., and of chloride of copper, zinc, iron, &c., for the purpose of extracting silver from argentiferous minerals."—Enrolled April 10, 1851.

* Chem. Gazette, 1851.

† Ann. Min. (4), xx. 359. Dingl. Pol. J. cxxiii. 441; im Austz. J. pr. Chem. lv. 287; Pharm Centr. 1852, 320.

containing 5·98 per cent. of sulphuret of iron, the gray crude iron immediately passed over into the white lacunar iron, the object being to render the great proportion of sulphur in the ore less injurious by an increased proportion of lime. Janoyer, for this purpose, tried the following experiments in succession:

1st. A good gray crude iron once melted with the addition of one per cent. marked (*a*), and the second time of two per cent. marked (*b*), of crystallized iron pyrites each time, afforded a regulus of white hard iron, which was clearer and harder in the second case than in the first. The analysis yielded in percentage of sulphur,

	(*a*)	(*b*)
Cast-iron before the experiment	0·09	0·09
" after the experiment	0·46	0·87
With the addition of the sulphuret of iron	0·53	1·06

Therefore the quantity of sulphur taken from the iron increases with the addition of the sulphuret of iron; but there is likewise each time a loss in sulphur, in $a = 0·16$, and $b = 0·28$ per cent.

2d. Filings of bright bar iron melted with 2 per cent. of sulphuret of iron (corresponding to 1·05 of sulphur), yielded a readily flowing, well-melted, soft iron, or regulus of iron, with 1·04 per cent. of sulphur. In these circumstances, as Berthier found to be the case, the sulphur becomes fully incorporated with the iron.

3d. Experiments (as in No. 1) where, in place of gray crude iron, specimens of red iron ore of *Privas* was melted (*a*) with 1 per cent. (*b*), 2 per cent. of iron pyrites yielded each time hard white crude lacunar iron filled with delicate crystals of sulphuret of iron. The analysis gave, in percentage of sulphur,

	(*a*)	(*b*)
Mixture before the experiment	0·53	1·06
Iron (regulus) obtained	0·41	0·96
Loss	0·12	0·10

Therefore a similar result as in No. 1.

4th. In experiments in melting (with 10 grains of the above-mentioned red iron ore, 5 grains of slag of the smelting furnace, and 0·2 grains of iron pyrites), with variable proportions of lime (in the first case 5 grains, in the second 10 grains), there was found in the crucible each time a white lacunar iron; the first time harder, with intermixture of crystals of sulphuret of iron and a proportion of sulphur = 0·1242 per cent.; the second time softer, without the crystals, and with 0·069 per cent. of sulphur. The slag of the first experiment in the upper layers was glassy, light, gray, well run together, and contained in the lower layers by analysis 0·5 per cent. of sulphur, a yellowish-white, rather hard, thick substance, that broke with a homogeneous fracture.

The slag in the second experiment appeared whitish-gray, somewhat uniformly mixed with the same substance mentioned in the first, and fell to pieces by moist air, producing much hydrate of lime, and being partially reduced to powder.

5th. When for the same purpose the proportion of lime in the furnace was gradually raised to a maximum, before ascertained, and yet allowable in practice, notwithstanding the regular operation, and the heating of the blast to 400°, only then good gray crude iron was obtained, when the richly pyritic clayey iron ore was diminished in proportion. From this experiment, as well as from the circumstances that there has been found in the dark gray crude iron 0·09 per cent. of sulphur (and thus more than in the lowest case in experiment 4), Janoyer drew the inference, that the whitening of crude iron is not owing to the mere combination of the sulphur, but is the result of the sulphur combining with the carbon of the iron; and while uniting thus, to form the sulphuret of carbon, at the same time it abstracts the latent heat which existed in it. In the smelting furnace the sulphuret of carbon is again decomposed in the upper parts of the furnace by means of the oxide of iron. The conversion, long since observed by Huëne,* of gray iron into specular iron, and vice versa, by means of sulphur, appears not to have been known to Janoyer.

Use of Caustic Lime in Fusing.

According to M. Levi and E. Schmidt,† the carbonic acid of lime, used as the flux in the smelting furnace on its passage to the mouth, is almost wholly converted into carbonic oxide, and thus occasions a needless waste of fuel. They therefore propose to use only burnt lime; and in an experiment on it, in a smelting furnace at Ougrée (Belgium), obtained a saving of almost 10 per cent. of coke for the production of the same amount of crude iron.

Livingston Gifford

Gases of Smelting Furnaces.

While Scheerer and Langberg, in their researches respecting the gases of the smelting furnace, have arrived at results which agree sufficiently with those of Bunsen, they differ essentially from those of Ebelmen's‡ experiments, as the latter mentions no pit-gas among the constituents. In Bunsen and Playfair's essays on the gases of the smelting furnace at Alfreton Iron Works,§ they ascribe the disagreement to a defect in the analysis employed by Ebelmen.‖ Hence Ebelmen has been led to make some observations in reply, and a new analysis of the gases of the smelting furnace. While, on the one hand, he admits that the method by weighing employed by him gave occasion to error, and that the imperfect expulsion of the oxygen from the tube, in which the combustion is carried on before its second weighing, diminished the proportion of the bihydroguret of carbon, or left it scarcely apparent, yet, on the other hand, he tries to prove that Bunsen's method by measure presents not less, and indeed more numerous sources of errors; such, for instance, as the uncertainty of the tension of the phosphoric acid, which is generated while determining the oxygen, the formation of the nitrous vapor in the detonation, the proportion of nitrogen of the oxygen employed for it, and the imperfect drying of the gaseous mixture before the absorption of the carbonic acid.

Many of these defects may show an apparent bihydroguret of carbon, or may increase to an actually visible one. An experiment as to the gases expelled by heat from charcoal (of oak) yields a proportion of free hydrogen to pit-gas nearly as 6·1. Ebelmen hence concludes, combining this result with that of his analysis of the gases of the smelting furnace at *Clerval*, that the proportion of the bihydroguret of carbon of these gases would not amount to 0·5 per cent., and therefore can hardly be determined. Moreover, he proceeds to say, he looked far less on the analytic method for the variation of his results from Bunsen's, than by the different processes, to collect the gases from the smelting furnace. The narrow tubes (gun barrels) which

* J. pr. Chem. xxvi. 308.
† Civil Eng. and Arch. Journ. Feb. 1851, 84. Dingl. Polytech. Journal, cxix. 353.
‡ Ann. Min. (3) xx. 359; (4) v. 3.
§ Rep. of the Brit. Assoc. for the Advancement of Sc. 1845, 142.
‖ Ann. Min. (4) xxix. 89; im Ausy. Compt. read. xxxii. 90; Inst. 1851, 27; J. pr. Chem. lii. 293; Dingl. Pol. J. cxix. 351.

Bunsen used, may have caused obstructions which modified the combination of the gases, and a different result may have been obtained than the medium one of the places referred to of the smelting furnace. In order to subject his earlier results to further examination, Ebelmen undertook two new series of analyses of the gases of the smelting furnace of Clerval (10 metres high, with a charge of charcoal) and a smelting furnace of *Seraing* (26 feet 8 inches, English, with a charge of coke), and this time not by combustion with oxide of copper and weighing, but by means of the eudiometer of Regnault and Reisent. The following results were obtained:

Smelting Furnace of Clerval.

Height below the mouth.*	1 metre.		3 metres.		6 metres.		8·55 m.	Form.
Carbonic acid	12·01	11·95	4·14	4·23	0·49	0·07	0·	0·93
Carbonic oxide	24·65	23·85	31·56	31·34	35·05	35·49	37·55	39·86
Hydrogen	5·19	4·31	3·04	2·77	1·06	1·09	1·13	0·79
Pit-gas	0·93	1·33	0·34	0·71	0·36	0·31	0·10	0·25
Nitrogen	57·22	58·56	60·92	60·89	63·04	63·06	61·22	58·17
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Of 100 in vol. of nitrogen { Oxygen	42·5	40·8	32·7	32·7	28·5	28·2	30·7	35·8
Of 100 in vol. of nitrogen { Carbonic vapo.	32·8	31·7	29·6	29·6	28·5	28·5	30·7	35·3
No.	1	2	3	4	5	6	7	8

Smelting Furnace of Seraing.

Height below the mouth.*	1 foot.		4 feet.	9 feet.	10 feet.	12 feet.	45 feet.	
Carbonic acid	11·39	11·39	9·85	1·45	1·08	1·13	0·10	
Carbonic oxide	28·61	28·93	28·06	33·88	35·20	35·35	36·30	45·05
Hydrogen	2·74	3·04	0·99	0·69	1·72	2·08	2·01	0·25
Pit-gas	0·20		1·48	1·43	0·33	0·29	0·25	0·07
Nitrogen	57·96	56·64	59·64	62·46	61·67	61·15	61·34	54·63
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Of 100 in vol. of nitrogen { Oxygen	45·0	45·6	40·0	29·6	30·2	30·6	29·9	41·2
Of 100 in vol. of nitrogen { Carbonic vapo.	35·2	35·7	33·0	29·4	29·6	30·0	29·9	41·2
No.	9	10	11	12	13	14	15	16

Ebelmen found that these and his earlier results agree, with the exception of the proportion of pit-gas. This, however, may apparently reach to 0·6 or 0·7 per cent., a fact that is to be ascribed to the formation of the nitrous vapor at detonation. In three of the cases (Nos. 4, 7, and 14) he particularly sought for cyanogen, but found none, though No. 14 was altered by smoke containing a white cyanite.

Ebelmen further asserts that the combination of the gases of the different regions of the smelting furnace, cannot be composed in percentage; but for this purpose the other constituents must be reduced to an equal quantity of nitrogen, that being the same constituent part which passes through the smelting furnace unchanged. (He appears here to forget the formation of cyanogen in the region of the base.) Bunsen's Analyses would furnish amounts not well harmonizing with these conclusions.

* From which the gas was taken.

Cementing of Steel.

W. Stein,* sustained by well-known experience, and especially the conversion of bar iron into steel, by means of ferro-cyanate of potash, believes that cyanogen must be regarded as the vehicle of the carbon in the preparation of cement of steel, and tries to support this view by experimental proof. Soft iron wire, of the thickness of a quill, heated in a stream of cyanogen gas for half an hour, showed an increase of weight of one-third per cent., only the middle of it fibrous, otherwise purely granular; after cooling showed hardness, and when corroded by nitric acid becomes black. Exactly similar results followed from heating the same iron with cyanide of potassium, except the formation of the steel was apparently more perfect. When the iron wire and cyanide of potassium (cyankalium) separated from each other, but inclosed in the same tube and heated, the result was the same, and the cyanide disappeared from its place. From this circumstance we may explain the superiority of cementing powder containing animal carbon and ashes. But merely powdered charcoal contains all that is requisite for the formation of cyanogen. The same heated with potash gives a clear Berlin blue; with fresh lime it gives appreciable quantities of sal-ammoniac; heated with carbonate of potash and lixiviated, and the solution mixed with chloride of iron, it yields a deposit, which washed and extracted by muriatic acid, leaves a residuum of a quantity of Berlin blue appreciable by weight. In the gas extricated by heating charcoal powder to a glow, there was found nine per cent. of a body, which appeared to him to be nitrogen; the presence of this latter also might be expected as a consequence of the admixture of atmospheric air that could scarcely be prevented.

Improvement of the Grain of Steel.

According to a patent by Riëpe,† steel should possess a uniformly beautiful grain after it has been exposed some four hours in a reverberating furnace to a glowing heat, but without melting it, and by such a management of the fire that the gas of the furnace may be as free as possible from oxygen.

Zinc obtained from Blende.

In order to obtain zinc from natural blende, Swindell‡ advises us to roast the blende with an equal weight of common salt, and to macerate it with water. After separating from the solution as much as possible (the glaubers salts) it must be precipitated with lime, and the oxide of zinc deposited (mixed with iron) must be heated as usual.

Hayes§ wanted to make some observations as to pure copper procured from Lake Superior, which had been wrought some time previous, and was brought into market in the form of rolled plates. According to many experiments tried on different plates, it uniformly contained two parts of silver in a thousand. By weighing the sheathing of three ships in repair after a long sea-voyage, he ascertained the amount corroded by the sea-water. This, reckoned at the average voyages of 27 months, amounted in the "*Chickora*" to 64·4 per cent., in the "*Hamilton*" to 70·4, in the "*Carthage*" to 38·0 per cent. of the original weight. According to Hayes, this metal thus corroded is a mixture of pure copper with a silver and copper alloy; instead of protecting the sheathing, as was expected, this latter hastened the corrosion.

* Polyt. Centr. 1851, 897; J. pr. Chem. liii. 491; Dingl. Pol. J. cxxi. 279.
† Chem. Gaz. 1851, 380. ‡ Ibid. 419.
§ Sill. Am. J. xi. 324; Chem. Gaz. 1851, 228; Dingl. Pol. J. cxxii. 59.

The greater corrosion in the case of the "Hamilton" resulted from the rolled plates of its sheathing having been heated after rolling; while for the two other ships only cold rolled plates were used.

Copper Products (Speise) from the Smelting of Copper Ore containing Silver.

At *Œblarn* in Upper Styria, where gray, black, and red copper ores containing copper pyrites are smelted, the separation of the silver from the crude ore, which occurs in working of copper, is carried on by the so-called "lead process." It is melted with the lead of *Villach*, and with other products containing lead, in a blast furnace, and thus contains three sorts of products, viz., lead ore (for refining) and dry stone, abdôrrsteine (the working of which affords tutty). In the latter of these Schenzl* found the percentage to be as follows:

Sulphur	1·88	Copper	48·10
Arsenic	0·78	Iron	1·20
Antimony	21·56	Nickel	0·32
Silver	trace	Bismuth	2·04
Lead	20·69	Insoluble in acids	0·93
	44·91		52·59

The mixed metal in the process described does not precipitate homogenoously, but in such a manner that in the upper strata the copper prevails, and in the lower the lead. The analysis was made on a specimen taken from the middle strata, and effected by means of separation with chlorine gas.

Corrosion of Copper.

Kobell† proposes as a liquid corrosive for copper, to operate on the metal without any unpleasant extrication of gas, a weak solution of chloride of iron in very diluted solution of muriatic acid, and believes that such a corrosive liquid is preferable to that given by Böhme and Schwartz.‡

Concentration of Nickel in Ore containing Nickel.

Bredberg reports as to the experiments tried at *Klefva*, in Sweden, 1849 to 1851, to extract nickel from magnetic pyrites (containing nickel and copper pyrites). From these communications, not yet completed, to which we shall refer again on some future occasion, we take the following:

The process at first pursued is nearly analogous to the *Fahlun* process in copper, and afforded the nickel with a great waste, in an alloy similar to the well-known floor iron (Eisen-sau), and which consisted of nickel (5 to 7 per cent.), copper, and iron, with some sulphur. This floor iron was melted down many times in succession, with an addition of quartz, in a sort of refining furnace, whereby the iron, in a great measure, passed into slag, and a richer alloy of 70 to 80 per cent. of nickel, 18 to 22 per cent. of copper, together with 1·5 to 2·5 per cent. of iron, was formed, which was partly granular and partly broken into small pieces (as crystallized nickel), and in this form was brought to market. As a preparation for further researches, the special object of this communication, a part of the ore was roasted in heaps, and the roasted products subjected to fusion in a blast furnace. More than threefold the amount was obtained, but the ore contained only 6 per cent. of nickel. Experiments for concentrating this ore, by means of the usual roasting, within open walls (or sheds), and the melting afterwards proved a

* Jahrb. der K. K. geolog. Reichsanstalt, 1850, 343.
† Instit. 1851, 325. Jahresb. 1847 and '48, 1027.
‡ J. pr. Chem. liii. 242; liv. 79.

failure; so that, alike in greater or less fires, the ore treated, in consequence of unequal roasting, always showed a great tendency to formation of floor iron (Eisen-sau) in the blast furnace. The evil was wholly removed afterwards by roasting the ore according to a method formerly given by Bredberg for copper ores, and copper-matt (matte de cuivre, Kupferstein). The ore was first accordingly reduced to powder, and then roasted on the red-hot cast-iron floor of a reverberatory furnace: in which case the roasting goes on so uniformly that the melting in the blast furnace is so perfect that no floor iron (Eisen-sau) is produced.

The concentrated ore can thus be brought to contain an average of 30 per cent. of nickel. By an enlargement of the blast furnace, before too small and ill adapted, in 24 hours 260 cwt., instead of 84 cwt., could be conveniently melted, and yielded 48 cwt., instead of 14 cwt., of matt (stein) in the same time: while the coal used for the production of an equal quantity of ore was lessened in the proportion of 22 to 10. A further and important advantage was obtained, namely, in the first melting, a matt (stein) of double richness, and consequently the shortening of the concentration process, so that the new method of roasting above mentioned, which has heretofore been used solely in metal, is also extended to ore.

Analysis of the Nickel of Commerce.

In the so-called Gersdorff cube-formed nickel, Pohl* found as the average of three analyses: 1·29 per cent. silicic acid, 7·98 antimony, and 0·17 arsenic; copper 68·32, nickel 21·21, iron 0·25, cobalt 0·78, carbon, sulphur, moisture, and waste.

(To be continued.)

THE PATENT OFFICE.

We propose, under this caption, to consider the Patent Office in all its relations; to furnish a full and particular account of the method of conducting business in the office, and to advert historically to whatever, in our judgment, will be interesting to our readers. We shall also have occasion to comment upon some of the defects of the existing laws; and upon one topic we shall be free to dilate, enabled as we are to speak *ex cathedra* from our long official experience in the Patent Office. This topic relates to the principles upon which the patent laws are administered in the Patent Office.

Our present patent law is a good law in the main, but is not without its defects. It is highly creditable to its framers, exhibiting learning, wisdom, and forecast; and for a number of years worked admirably well. Laws grow out of necessities, and all laws should be reformed, or made to conform to the necessities of the times. Undue veneration for law, because it is law, is a hindrance to progress; and a slavish adherence to dogmas, is a spirit unworthy the age. We would not "remove the ancient lankmarks," but we would change, whenever we can for the better, the face of *all things* within their boundaries. With proper respect for all existing laws, we must have respect unto existing and future necessities. The necessity must be clear, before the attempt to repeal, modify, or add, and great caution and deliberation exercised in the adoption of new laws. Especially in patent laws should our legislators look well to the quarter from which amendments emanate, lest *alleged individual or local wrongs* should out-

* Vienna Acad. Reports, vi. 594; J. pr. ch. lvi. 248

weigh the general weal. Patent laws were the offspring of odious monopolies, but are now, under various forms, recognized by all enlightened nations as expedient and equitable. Like all human codes, they oppress somewhere, but nevertheless are not injurious, since in granting a monopoly for a *limited time* to inventors, they give to others more than they take away. It was first satisfactorily established by Renouard, a distinguished writer on Patent Law, that an inventor has no "natural right" to the "exclusive use of his invention, independently of the positive law;" and as Mr. Phillips remarks, "there is no ground whatever on which to rest such a right, since the fact of one person being the first inventor or discoverer, affords no pretence for disfranchising others of the right in their turn of making and using the same discovery." Nevertheless, as before remarked, it has been found expedient and equitable to grant to the *first* inventor an exclusive privilege for a *limited time*. Lord Eldon said that the "patentee was a purchaser from the public, being bound to communicate his secret to the public at the expiration of his patent." But the most approved modern legislation does not so interpret the patent privilege, and a secret with the patentee is fatal to his patent and injurious to the public.

With these brief premises, we shall not deem it presumptive to advert to some of the obvious defects in our present code of patent laws; and first we notice a most serious defect in our system in not providing for the publication of patents. While connected with the Patent Office in the capacity of chief examiner, at the request of the commissioner of patents, we reported to him upon this subject as follows. The publication of the specifications and drawings of patented inventions has for many years been practised in England, France, and most of the European states, as a part of the general system, legalized for the encouragement of useful arts and the protection of inventors. In England the publication is conducted by private enterprise, and constitutes one of the most valuable records of science and art in our language, and a standard and constant work of reference in the United States Patent Office. From the etymology of the term, Letters-patent are letters which lie open; and in law, the grant of the same is equivalent to publication: but in effect it is hardly so, as the archives of public offices are difficult of access, and the parchment in the hands of its possessor is generally a sealed document to the world. The insertion, therefore, of suitable descriptions and illustrations, in some public journal, is necessary to apprise the public of the progress of inventions, to prevent infringements through ignorance or mistake, to avoid occasions for contests upon priority of invention, and to save the inventors the trouble of wasting their energies upon what has already been secured to another. It also stimulates improvement, and awakens commendable emulation.

Not anticipating in any manner our connection with a public journal, nor the publication of patents by ourselves, we also at that time—three years since—reported to the commissioner, as our opinion, that the publication could be best effected by private enterprise, and at a great saving to the government.

The necessity of some publication of patents has long been felt in this country, and has been urged upon Congress by Commissioners Ellsworth, Burke, and Ewbank, by the Secretary of the Interior, and by President Fillmore in his recent message. The editors of this journal, nearly five months in advance of the recommendation from the president, issued their *prospectus*, in which they promised to undertake this laborious, responsible, and expensive work, at their own risk. From their long experience and service in the Patent Office, and a wish to supply the public with the long-desired information, they felt themselves fully and peculiarly competent and prepared for the task; and a willingness to incur the expense with but little hope for the present of remuneration. The publication of patents by private enterprise in England is in favor with the government, and a great saving of public expense. There will be one manifest difference between our reports upon patents and the English. Their laws admit into a specification for one patent a number of distinct inventions, and frequently the most incongruous materials and devices are described, and claimed under one patent. Hence a digest of such patents cannot serve as a record without a notice of them all. Under our law and the regulations of the Patent Office, "*prolixity*" is not allowed in the specification, and the digest will be accordingly concise and to the purpose, and the explanation of the claim will generally be sufficient. The importance of such a work has too often been dwelt upon, and is too obvious for further comment, and we have but little doubt of its acceptability to inventors, patentees, and all interested in the progress of inventions.

THE UNWRITTEN RULES OF THE PATENT OFFICE,—

an evil, frequently as much felt within the Patent Office as by those without. The Patent Office prints a large number of "*Circulars of Information*," as they are called, for the benefit of patentees, inventors, and others, and these are distributed *gratis*. These circulars contain the rules and business regulations of the office—which are all presumed to be founded in law—and instructions, general and particular, to persons transacting business with the Patent Office. This is commendable in intention, but in many respects unfortunate. The mere fact of this publication warrants the conclusion that as a guide it is all-sufficient, that it contains at least all the important regulations or practice of the office; in fine, every thing of management not purely discretional. Trusting in such conclusion, persons are often mortified and disappointed upon meeting obstructions in the office which they could not have anticipated. Hardly a week passes in which questions of practice do not arise in the Patent Office among the examiners and others, which are settled according to the memories solely of the older *employées*. Technical and professional knowledge is of all kinds the most fugacious, and the Patent Office has been often awkwardly placed, in consequence of either uncertain memories, conflicting precedents, or the absence of its older officers. Every conclusion upon a mooted point is of importance as a precedent; and if some regular system of commitment to paper of these important points, as they occur, should be adopted, the office and the public would be mutually guarded against error and uncertainty. As it is, many and very important rules of the Patent Office are unwritten, although there are more written rules than are wholesome or necessary.

C. G. P., *Ed.*

(To be continued.)

DIGNITY OF PATENTS.

It is to be taken for granted that the various organizations adopted by the governments of enlightened nations for the encouragement of the useful arts by protection for limited times, are invested with enough of official and real dignity, to remove even from the most squeamish all scruples, hesitation, or delicacy in seeking that protection which the government wisely and generously proffers. Philosophers are among our greatest benefactors, but their gifts to the world are especially grateful, when they present to us some really useful application of their original discoveries. Sir Humphrey Davy is more remembered for his safety-lamp, than for all his splendid efforts and achievements in the field of discovery. Franklin's fame is so identified with the lightning-rod, that the mention of his name rarely fails to recall this wonderful invention and the discovery which led to it.

Discovery and invention are sometimes used as synonymous terms, but in their patentable relations they are distinct. The mere discovery of a fact, truth, or principle, independent of practical application or invention, is not the subject of letters-patent, for the reason that it involves nothing to protect by letters-patent. The discovery by Oersted of the connection between magnetism and electricity, affords a good illustration of this position. That signal discovery has brought in its train, a bright array of inventions and stupendous results, but of itself it presented nothing tangible as property or a source of pecuniary profit, being a discovery of a fact, truth, principle, or relation, for which we may say, metaphorically, he "took out a patent" for all time to come, and which none can evade or infringe. There are however some intangible *inventions*, the reward of which is honor alone. Newton's theory of gravitation is as purely an invention, as the printing-press or the steam-engine; and many others might be cited of a similar character. We must, in connection with this subject, advert to certain opinions recently advanced by some eminent men of science in this country, which if not properly explained or controverted, might exert an unfortunate influence upon a particular class of inventors, and operate to the prejudice of our patent system. In the suit of French *vs.* Rogers, for infringement upon Morse's telegraph, Prof. Henry in his testimony says as follows: "I left to others what I considered in a scientific point of view of subordinate importance, the application of my discoveries to useful purposes in the arts." "Besides this, I partook of the feeling common to men of science, which disinclines them to secure to themselves the advantage of their discoveries by a patent." Prof. Henry does not mean to discourage or throw discredit upon patents, and we wish merely for the sake of our own great cause, to show that he was in error in assuming that the feelings which actuated himself was "*common* to men of science." To dedicate to the world an invention of magnitude, or one fraught with promise of emolument immediate or remote, is truly a praiseworthy and self-sacrificing act, but such acts are, to the best of our knowledge, among the rarest of philosophers' doings, and in fact would in most cases defeat their own intentions, for experience has shown that the securing a valuable invention by letters-patent, is the surest guarantee of its early introduction and public benefit. In support of our views, we cite the distinguished Liebig, who has taken out a patent for a manure of his own invention,—Sir David Brewster, pre-eminent for his physical researches, multiplied discoveries, and inventive genius, whose name appears often upon the patent-roll,—Wheatstone, a prince among practical philosophers, abounding in patents,—Bramah, Watt, Barlow, Stephenson, Lardner, and many others of distinction, as bright examples among foreign patentees, and in our own country among the many patentees, we notice Prof. Hare, Prof. Locke, Prof. Maury, Prof. Horsford, Prof. Olmsted, Prof. Renwick, Prof. Johnson, Prof. Espy, &c., &c. With the countenance of such distinguished men, surely we need no reinforcement. The only case of open hostility to patents from the scientific profession in this country, that has come to our knowledge, is one which we cannot pass over in silence. We regret it extremely for the sake of the cause, and while we believe it will not be responded to by our scientific brethren, we trust that Dr. Jackson will not always be in such bad humor with patentees as exhibited in his address last year before the American Institute of New York. We entertain high personal and professional respect for Dr. Jackson, but should deem it recreant to our cause, if we passed his tirade upon patentees without comment. We are at a loss to account for his sallies on that occasion upon all who sought to protect themselves by letters-patent Dr. Jackson is himself a patentee, but we are to infer that he *ignores* his patent for the use of ether in surgical operations, as he contests priority of discovery with Dr. Morton, his partner in the patent. We cannot now stop to argue with him the propriety of patenting inventions and discoveries in science and art, nor need we, after the array of *scientific patentees* which we have cited in support of an institution held in such high estimation by the governments of all enlightened nations, nor need we at the present day, attempt to trace how far the prosperity of our country in all its great industrial relations, is due to the ingenuity of inventors, and the Patent Institution.

C. G. P. *Ed.*

THE PROGRESS OF LEGISLATION UPON EXCLUSIVE PRIVILEGES.

We propose to give in a series of articles a sketch of the progress of legislation upon exclusive privileges, so far as it relates to the protection of useful inventions, showing the source from which has sprung much of the prejudice of modern times against those rights; and most of the difficulties, as it seems to us, in the way of correct legislation upon the subject of protection to improvers and inventors of useful arts.

In the present article we shall trace the monopolies down to the time they were found in company with Patented *rights*, and the odious guilds which so long impeded the progress of the useful arts.

From the earliest recognition of the right to possess personal property, especially by the masses, monopolies have been watched with jealous eyes; and although much confusion has arisen in defining the limit where a just and equitable right terminated, and a monopoly, odious in its character, because unjust, commenced; a distinction between these two classes of property was discovered and admitted at a very early day.

The early Greeks, from whom we derive the term *monopolia*, applied it to those who purchased the whole of a commodity, so as to hold it at an exorbitant price, and thus extort from the consumer: a forestalling; it literally signifies a single or sole selling. It was used by Aristotle; and Zeno, in his constitutions, declares that no one shall exercise a monopoly of clothing, fish, or any other thing adapted to the uses of man; he also forbids all combinations among dealers to raise the price of any commodity, under penalty of perpetual exile to the offender, and confiscation of his goods.

The grant of monopolies has generally been considered the prerogative of sovereign power, and was exercised more or less without definite limit in England, down to the time of James I. There had been many early struggles against this infraction of common right; and in some cases an English parliament was found with sufficient temerity to annul the sovereign act; a notable instance of which occurred in the tenth year of the reign of Edward III., when one John Peach was arraigned at the bar of parliament, for having obtained of the king a monopoly of sweet wines. The patent was adjudged void, and was cancelled before his face in open parliament, for the reason that he exacted three shillings and four pence a tun on importations, and he was himself adjudged to prison until he made restitution of all he had thus received, and had paid a fine of £500 *to the King*. Whatever we may think of the reasons for cancelling this patent, or the fine to the king, the grantor, who generally contrived to take advantage of every act of his own, right or wrong, to extort money from his loving subjects, the lesson was a salutary one, and established a precedent never after forgotten: a triumph of right over prerogative.

During the reign of Elizabeth, that strong-willed woman contrived to control the sturdy Commons, and in spite of all the grumbling and threatened storm, the abusive grant of monopolies by the crown arose to its greatest height, and became intolerable: almost every species of trade was shackled with these unnatural restrictions; and at last the wily old Queen was forced to promise a reform, which promise, it is needless to say, she did not keep, and never intended to: it was done to stifle a troublesome investigation, and effected its object. The truth of the Queen, although it could not be questioned, was never believed. At almost every parliament the unsuccessful battle against monopoly patents was renewed; at the opening of the parliament of 1601, the Queen told the Speaker that it would be a short parliament, and she "willed that the members should not spend the time in frivolous, vain, and unnecessary motions and arguments;" but notwithstanding this gentle hint, a debate soon broke out upon the vain subject of suppressing monopolies; it was commenced by Mr. Lawrence Hyde, a bold reformer, who set forth the especial grievances under which his townsfolk suffered. To a remark of the Solicitor-General, that he had had orders from her majesty, last Hilary term, to take order for these patents, Sir R. Wroth replied, "I will but note, you were charged, in last Hilary term, why not before? there was time enough ever since last parliament [four years]. I speak it, and I speak it boldly, these patentees are worse than they ever were. There have been divers patents granted *since* last parliament. Those are now in being, to wit, the patents for currants, iron, powder, cards, ox-shin-bones, trayn oil, transportation of leather, lists of cloth, ashes, anniseeds, vinegar, sea-coals, steel, aquavitæ, brushes, pots, saltpetre, lead, accidences, oyle, calumin, stone, oyl of blubber, fumathoes, or dried pilchards in the smoke, and others." On naming which, Mr. Hackwell, of Lincoln's Inn, asked, "Is not bread there?" "Bread!" said one. "Bread!" said a second. "This voice seems strange," said a third. "No," said Mr. Hackwell, "if order be not taken for these now, bread *will* be there before the next parliament." This was indeed startling, and fear reached even the throne, producing a reaction which generated the gross, fulsome, and superlative thanks the Queen received on the occasion, which vividly shows the relative position of the Queen and her trusty Commons. The promise often before refused, and now made, fully granting their desires of reforming abuses which had grown so rank, that there was danger of an open rupture, was thus received by the House.

The Speaker, Croke, said, "My heart is not able to conceive, nor my tongue to utter the joy I conceived of her majesty's gracious and especial care for our good. Wherefore, as God himself said, '*gloriam meam alteri non dabo*,' so may her majesty say, in that she herself will be her only and speedy agent for performance of our humble and most wished for desires. Wherefore, let us not doubt, but as she hath been, so will she still be, our most gracious sovereign and natural nursing mother unto us, whose days the Almighty God prolong to all our comforts."

To this the House responded Amen.

On the following day, says the chronicler, the Speaker, Croke, accompanied by some seven score members of the parliament, proceeded to audience of her majesty, who received them in the council-chamber at Whitehall. After three low reverences, the Speaker said, "Most sacred and most gracious sovereign, your faithful, loyal, and obedient subjects and commons here present, vouchsafe of your especial goodness to our unspeakable comfort access to your sacred presence, do in all duty and humbleness come to present that which no words can express, most humble and thankful acknowledgement of your most gracious message, and most bounden and humble thanks for your Majesty's most abundant goodness extended and performed to us. * * * * That attribute which is most proper unto God, to perform all he promiseth, appertaineth also unto you, our most gracious sovereign, queen of all truth, of all constancy, of all goodness, never wearied in doing good unto us, the deeds themselves do speak, and even now your most gracious *published proclamation*, of your own only mere motion and special grace, for the good of all your people, doth witness unto us. In all duty and thankfulness, prostrate at your feet, we present our most loyal and thankful hearts, even the last drop of blood in our hearts, and the last spirit of breath in our nostrils to be poured out, to be breathed up for your safety." Much more of this fulsome adulation was breathed out by this most grave and dignified speaker. Who could expect, after thus giving up all the rights of a man, and prostituting the high office with which he was intrusted to such purposes, that either he or the abject parliament that sent him could discern or protect the rights of the poor artisan, or weed out the monopolies with which his rights were choked and caused to be doubted?

At the termination of this speech the sycophant made three low reverences, and then knelt down; and the members who formed his train imitated his posture, in which position they remained till the Queen had given them a somewhat lengthy specimen of self-laudation; when probably noticing some manifestations of uneasiness in her auditors, she said, "Mister Speaker, I would wish you and the rest to stand up, for I shall yet trouble you with a longer speech." At which these seven score and one English gentlemen ventured to stand up, as bid, while her majesty deigned to lecture them: thus ended this farce, in which it would be difficult to determine who was the greater hypocrite. It is quite evident, however, that the Commons had no true and just idea of what exact justice was in the grant of letters-patent; for on a proposition at this same parliament to pass a bill that every one who could invent any art or trade, which was good and profitable to the commonwealth, should monopolize the same, during his life; it was objected, not that the time was too long; but, as was remarked by the member from London, "Many arts had been devised in London to do that by one man, which would not heretofore be done with forty, which was unprofitable, because it did not set the poor in great numbers to work" —a fallacy that is not wholly out of fashion at the present day, but which we hope to expose in the course of these remarks, and which was then correctly rebutted by another member, who observed, "It is reason that he that hath invented any art or trade, should have some privilege, because it would be an encouragement to others, *nemo nascitur artifex*. It did not hold in arts that it is unprofitable that the work of many should be done by one, for it is profitable for the commonwealth that water should be brought to every man's house at ten shillings cost, as by the water-work device in London, when it could not be done formerly at 10*l*. cost." This would seem to be *argumentum ad hominum* to the London member; but owing to the lively and just fear of the House that the bad companions of these equitable rights would again spring up, the bill was rejected.

To show the heterogeneous character of patents granted at that time, we will name a few, beginning with 1575: Patent to Tallis and Bird, to print their musical Cantiones. 1588, Patent to R. Hexton, to make fl -kes, locke boxes, powder boxes, and bullet boxes for fifteen years; Patent to Sir Walter Raleigh, to grant licenses for keeping taverns; Patent to Sir Walter Raleigh, to dig for tin in Cornwall. 1589, Patent to John Ashley and Thomas Windebank, to have the benefit of forfeitures and fines for burning timber-trees, contrary to statute. This was one of a very curious class of patents: it enabled the iron-masters in the country about London to smelt iron, of which privilege they were deprived by a miserable statute of control, by compounding for the penalties of cutting wood imposed by said statute. 1591, Patent to receive fees for filing bills in Chancery. 1595, Patent to receive penalties for gashing of hydes and barking of trees. 1596, "Patent to trade to the Levant, for currants only, for which he was to pay 4000 pounds per annum," to W. Mercer. 1596, Patent to license gaming houses, to T. Cornwallis. 1598, Patent to import and make cards, to E. Darcy; this patent was subsequently litigated, and elicited from the counsel, Mr. Fuller, a bold and courageous speech, and a clear exposition of his ideas of the limit of the sovereign's right to grant patents; it is in strong contrast to Mr. Speaker Croke, before quoted. Fuller says: "Commonwealths were not made for kings, but kings for commonwealths; and the law, the inheritance of all, binds both the queen and subject. If law were not, there would neither be king nor inheritance, and to *outrun the law is to let in confusion*. The Queen, by her patent, cannot do wrong, and her prerogative is no warrant to injure the subject. Letters-patent were void if they tended to change the law, or hurt any man's inheritance, or granted any thing *contra commune jus*, or what tended to any general charge of the subject.

"By the law of God, every man should live by his labor, and therefore, were an act of parliament to prohibit any man from living by the labor to which he was brought up, it would be void by the law of God; and much more, letters-patent.

"Arts and skill of manual occupations, rise not from the Queen, but from the labor and industry of men, and by the gift of God to them, tending to the good of the commonwealth, and to the king; and it is a good part of a king, says Bracton, to reject no person, but to make every one profitable to the commonwealth.

"The Queen, by her prerogative, cannot take twelve pence from a subject, even to carry on her war, without an act, or grant any one's lands or goods; neither can she grant twelve pence gotten by any trade, and why, therefore, grant away the trade? If partial affection by private discretion do govern public affairs, then one man's will becometh every one's misery.

"Before this, if any person by his industry had obtained excellent skill in his trade, he might have reaped the fruits of it, and that hath been thought the surest thing, to obtain skill and knowledge, because thieves could not steal it; but Darcy hath devised a means to take a man's skill from him, which was never heard of before, and which, if others should do the like in other trades, it would discourage men to labor to be skilful in any useful art, and bring in barbarism and confusion. Before the grant, if any naughty and false cards were made, one might buy of others better cards; then there were many makers and many sellers; by Darcy's patent, be they good, cheap, or be they dear, you must buy all of him, or of his agents, in what manner it pleased him."

Fuller concluded by giving a description of the patent that he considered the crown might grant according to the law of the land. "I will show you how the judges have heretofore allowed of monopoly patents, which is, that where any man of his own charge and industry, and by his own cost and invention, doth bring any *new trade* into the realm, or any *engine tending to the furtherance of a trade*, that *never was used before*, and that for the *good* of the realm, that in that case the king may grant unto him a monopoly patent for some reasonable time, until the *subject may learn the same*, in consideration of the good that he doth bring by his invention to the commonwealth, otherwise not."

This last paragraph is a very fair exposition of objects that are the legitimate subjects for the grant of letters-patent. The powers claimed by Fuller for the judges, is much more questionable, but judicial opinions were then just entering their transition state with regard to patents. The just and equitable rights of inventors were confusedly commingled with grants of an absurd and most pernicious character. The improvement o the arts was a second matter with the government, while the filling of its coffers, regardless of justice, was a primary one; and in effecting this, it was rare to look beyond the present contingency, either for the good of the subject, or its own. What wonder, then, the very name of patent was odious; and even the most worthy in the race of improvement partook of the odium: but the curse of bad association was not all the inventor and improver of the useful arts had to contend with in struggling for his rights; the guilds and parliamentary enactments were enemies even more grievous in England, while in France and Germany the genius of improvement was absolutely prostrate under the tyranny of corporations: the history of these barriers to the expansion of man's creative intellect, served as armor for dull mediocrity to ride rough-shod over expiring genius; no man could exercise any handicraft without belonging to the corporation to which it pertained; and he was then bound by legislative acts, or corporation regulations, that were effectual bars to all improvement: and should an unlucky wight have conceived an improvement that involved the callings of two or more trades, as before conducted, woe be to him if he attempted to put it in practice. The masters and wardens, or other officers of the corporation, were much too worshipful to let the irreverence for their *mysteries* pass without peril and penalty to the offender.

In France penal statutes were enacted regulating the processes in every manufacture and trade. These regulations were sometimes dictated by wicked design, and sometimes by gross ignorance. Legislators or government officers fancied they could better and more understandingly direct and control the proper mode of smelting iron, working and compounding of metals; that they could better throw, twist, or spin silk, wool, and cotton; that their receipts for dying were infallible; their chemical compounds no quackery, and far above improvement. Perpigna says, "To insure a compliance with such absurd regulations, inquisitorial measures were resorted to; the residence of manufacturers entered by force; their establishments searched and explored, and their mode of working inquired into. Thus their most secret methods were often discovered and pirated by fraudulent competitors. The excesses committed under these tyrannical statutes were such, that one can scarcely conceive how any nation could so long submit to them."

The worthy Roland de la Platière, who was a minister during some part of the French revolution, and put an end to his life, in the reign of terror, gives a deplorable account of the numerous acts of oppression he had witnessed. "I have seen," says he, "eighty, ninety, even a hundred, pieces of cotton or woollen stuffs cut up and completely destroyed. I have witnessed similar scenes every week, for a great number of years; I have seen manufactured goods confiscated, heavy fines laid on manufacturers; some pieces of fabric were burnt in public places, and at the hours of market; others were fixed to the pillory, with the name of the manufacturer inscribed upon them, and he himself was threatened with the pillory, in case of a second offence. All this was done under my eyes, at Rouen, in conformity with existing regulations, or ministerial orders. What crime deserved so cruel a punishment? Some defect in the materials employed, or in the texture of the fabric, or even in some of the threads of the warp.

"I have frequently seen," continues Roland, "manufacturers visited by a band of satellites, who put all in confusion in their establishments, spread terror in their families, cut the stuffs from the frames, tore off the warp from the looms, and carried them away as proofs of infringements; the manufacturers were summoned, tried, condemned; their goods confiscated; copies of their judgment of condemnation posted up in every public place; fortune, reputation, and credit, all was lost and destroyed. And for what offence? Because they had made with worsted a kind of cloth called *shag*, such as the English used to manufacture, and even to sell in France, while the French regulations stated, that that kind of cloth should be made with mohair. I have seen other manufacturers treated in the same way, because they had made camlets of a particular width, used in England and Germany, for which there was a great demand from Spain, Portugal, and other countries, and from several parts of France, while the French regulations prescribed other widths for camlets.

"There was no free town where mechanical inventors could find a refuge against the tyranny of the monopolists. No trade but what was clearly and explicitly described by the statutes, could be exercised; none but what was included in the privileges of some corporation.

"No one could improve on a method, or deviate from the prescribed rules for manufacturing stuffs of cotton, worsted, or silk without running the risk of being heavily fined, having his frames destroyed, and his manufactured goods burnt in the public place, by the hands of the executioner. Many inventors were forbidden to reduce their inventions into practice, when their application for letters-patent was not supported by powerful recommendations, or when they were unable to bid a high price for the good-will of the clerks of office.

"A company of merchants, of Nantes and Rennes, wished to form on a new plan manufactories of woollen, silk, and cotton goods. They possessed new preparations for fixing the colors. As soon as the establishment was fitted up, the corporation of serge-makers contested their right of manufacturing woollen stuffs, and the corporation of dyers claimed the privilege of dyeing for them. Law proceedings, carried on for several years, absorbed the capital raised for the purpose of forming a useful establishment, and when at last a favorable decision was obtained, all the resources of the manufacturers were exhausted; thus the serge-makers and dyers succeeded in ruining dangerous competitors, by an oppressive united monopoly and combination.

"Lenoir, who carried to such high perfection the art of manufacturing mathematical and philosophical instruments, wanted a little furnace to prepare metals. He built one, but the wardens of the corporation of ironfounders came and demolished it themselves, because he was not a member of their community. After several vain attempts to re-establish it, he was obliged to solicit an authorization from the king, which was granted to him by special favor.

"When Argand had invented his lamps with a double current of atmospheric air, he had to sustain lawsuits brought against him by the community of tinmen, locksmiths, and blacksmiths, who opposed the recording of the privilege granted to him by the king, because the statutes reserved to the members of that community the exclusive right of making lamps; and Argand had not been received a member."

These tyrannies of themselves were sufficient causes to produce the bloody revolution which followed, in which all special privileges were abolished, that by their unnatural attempts to artificially shackle man in his spontaneous industrial efforts for his own well-being, created a vastly greater confusion, and more misery, although perhaps less apparent than the chaos which they preceded, that in one day swept off all the old monopolies. We could continue this dark picture through German trade-associations, and imperial enactments even more contracted and dogmatical, but the preceding sketch is sufficient to show through what perils and odium has advancing science in its application to the useful arts travelled: such is the dark picture of the progress of improvement, but a better day is dawning; the judges have aroused themselves to a sense of the importance of inventions, and in their desire to thoroughly protect, they may, in some instances, have exceeded the bounds of strict justice, in their construction of the law, for the benefit of the patentee. On this subject the law should be clear and well defined, or litigation will continue to increase, as it has done for many years past. Modern legislators should heed this, in reviewing the present patchwork of laws relating to the useful arts, generally misentitled, for their encouragement.

J. J. G., *Ed.*

THE NEW ENGLISH PATENT LAW.

During the past year the patent laws for invention, of Great Britain and Ireland, have undergone an entire revision, and a new system of granting letters-patent has been adopted.

The distinguishing characteristics of the new law are, briefly, first: the formation of a commission, consisting of the Lord Chancellor, Master of the Rolls, and the Attorneys General and Solicitors General of England, Scotland, and Ireland, who have power to make their own rules, subject to the approval of parliament. Second, the grant of a single patent for the three kingdoms of England, Scotland, and Ireland, including the Colonies, if desired; instead of the complicated and more expensive process of granting a patent for each. Third, a system of examination is provided for by certain law officers of the crown, who have the control of the grant, and hear all opposition to the grant, and summarily decide the case. Fourth, a material reduction of the cost of a patent, and a division of the payment into four instalments, the last and greatest of which (£100), is to be paid seven years after the sealing, in order to continue the grant for the balance of the term; which gives ample time to develop the utility of an invention, or its failure: the neglect to pay any one of the instalments cancels the patent.

The law provides for the filing of a "Provisional Specification," accompanying the petition and declaration,* the date of delivery of which is

* In England declarations are substituted, in extra-judicial cases, for oaths.

recorded: the provisional specification merely sets forth the nature of the invention, without detailing it; this is referred to the law officer for allowance, who may call in the services of a scientific person to aid him in his investigation; no other person is allowed to see the provisional specification, or to be informed of its contents. If it is satisfactory, a certificate is given of its allowance, which certificate is filed with the commissioners, under the provisions of the law; after which the law allows the invention to be used during the term of six months therefrom, or published without prejudice to any letters-patent to be granted for the same. Instead of filing a provisional specification, the inventor may file a complete specification of his invention, which confers like privileges, but this complete specification, unlike the provisional one, is published. We have here to advise applicants neither to use publicly, or publish their inventions, under the provisional specification, or to file a complete specification as allowed by law, before they obtain the letters-patent, as all such publications, or public use, afford, of course, a better opportunity to adverse parties to oppose the grant, in after proceedings.

The letters-patent must be applied for within the six months of protection given by the filing of the provisional specification.

All applications for letters-patent and complete specifications when filed, are advertised in the "London Gazette," and persons interested in opposing the grant, may leave their objections in writing within twenty-one days thereafter; when that time has expired, the case is referred to the law officer of the crown, who, after a hearing and decision, when in favor of the grant, causes a warrant to be made for the sealing of letters-patent. The patent must be applied for and issued within three months after the date of the warrant.

Patents for foreign inventions are not to continue in force, or be valid, after the expiration of the foreign patent, whether the expiration takes place before or after the grant of letters-patent.

Foreign ships cannot be prevented the legitimate use of patented inventions, in British ports, provided the country to which such ships belong reciprocate the privilege.

Extra copies of drawings are required, when drawings are referred to. All patent records are open to the inspection of the public, by law; which also provides for the publication of all specifications, disclaimers, &c., which can be procured at reasonable prices, as soon as convenient, after their filing; which copies, when printed by the Queen's printers, are to be taken as *primâ facie* evidence in the courts. A register of all patents is to be kept, and also of their proprietors. All limit to the number of proprietors is abolished.* A *scire facias* is provided for the repeal of fraudulent, or improper patents.

The rules of the Commission appointed to carry out the law, are very particular, determining the exact size of the paper and parchment on which the documents are to be written, together with the margin, &c., so that they can be readily bound; but as no one would attempt to go through the business of taking out an English patent, without an experienced attorney, we do not insert such details here. J. J. G., *Ed.*

THE FEES UNDER THE NEW LAW ARE:

	£	s.	d.
On leaving petition for grant of letters-patent	5	0	0
On notice of intention to proceed with the application . .	5	0	0
On sealing of letters-patent	5	0	0

* Formerly only twelve persons could, by law, own a patent.

	£	s.	d.
On filing specification	5	0	0
At or before the expiration of the third year	40	0	0
At or before the expiration of the seventh year	80	0	0
On leaving notice of objections	2	0	0
Every search and inspection	0	1	0
Entry of assignment or license	0	5	0
Certificate of assignment or license	0	5	0
Filing application for disclaimer	5	0	0
Caveat against disclaimer	2	0	0

STAMP DUTIES TO BE PAID.

On warrant of law officer for letters-patent	5	0	0
On certificate of payment of the fee payable at or before the expiration of the third year	10	0	0
On certificate of payment of the fee payable at or before the expiration of the seventh year	20	0	0

FEES ESTABLISHED BY THE ROYAL COMMISSIONERS.

By the Right Honorable Edward Burtenshaw, Lord St. Leonard's, Lord High Chancellor of Great Britain, and the Right Honorable Sir John Romilly, Master of the Rolls.

Ordered, that there shall be paid to the law officers and to their clerks the following fees:

By the Person opposing a Grant of Letters-Patent.

	£	s.	d.
To the law officer	2	12	6
To his clerk	0	12	6
To his clerk for summons	0	5	0

By the Petitioner on the Hearing of the Case of Opposition.

To the law officer	2	12	6
To his clerk	0	12	6
To his clerk for summons	0	5	0

By the Petitioner for the Hearing, previous to the Fiat of the Law Officer allowing a Disclaimer or Memorandum of Alteration in Letters-Patent and Specification.

To the law officer	2	12	6
To his clerk	0	12	6

By the Person opposing the Allowance of such Disclaimer or Memorandum of Alteration, on Hearing of the Case of Opposition.

To the law officer	2	12	6
To his clerk	0	12	6

By the Petitioner for the Fiat of the Law Officer allowiag a Disclaimer or Memorandum of Alteration in Letters-Patent and Specification.

To the law officer	3	3	0
To his clerk	0	12	6

THE NEW AUSTRIAN PATENT LAW.

[Translated and abridged for the American Polytechnic Journal.]

Emperor Francis the First of Austria, by the grace of God, King of Hungary and Bohemia; King of Lombardy and Venetia, of Dalmatia, Croatia, Slavonia, Galitzia, Lodomeria, and Illyria; King of Jerusalem, &c.; Archduke of Austria; Grand Duke of Tuscany and Krakow; Duke of Lothringen, Salzburg, Styria, Carinthia, Carniola, and Bukowina; Prince of Transylvania; Count of Moravia; Duke of Upper and Lower Silesia, of Modena, Parma, Piacenza, and Guastalla, of Auschwitz and Zator, of Teschen, Friaul, Ragusa, and Zara; Count of Habsburg, of Tirol, of Kyburg, Goerz, and Gradiska; Prince of Trient and Brixen; Count of Upper and Lower Lausitz and in Istria; Count of Hohenembs, Feldkirch, Bregenz, Sonnenberg, &c.; Lord of Trieste, of Cattaro, and the Windishmark; Grand Woiwod of the Woiwodship of Serbia, &c., &c., &c.*

Influenced by a desire to protect the inventive genius in all parts of his empire, and in consequence of the defects experienced in the patent laws of 1832, the Emperor has ordered the following to become the law of all and every part of his realms.

CHAPTER I.

EXCLUSIVE PRIVILEGES.

§ 1. *Exclusive privileges are granted for,—*

(*a*) Any new product of industry;
(*b*) Any new machine;
(*c*) Any new process.

The term *discovery* is defined to be the bringing to light some process that may have been known in former times, which has, however, been lost, or in bringing to light any industrial procedure unknown in the country.

By the term *invention* is understood the producing of a new object with new means, or producing a new article with known means, or the producing a known object with other means than such as had been hitherto in use.

By the term *improvement* is understood any addition of an arrangement, contrivance, or process, to an already known or patented object, by which a new result or greater economy is obtained.

Every discovery, invention, or improvement is considered new when it has not been in operation at the time the application for a patent is made, or when it has not been printed or published.

§ 2. Preparation of articles of food, of beverage, and of medicines, are not patentable.

§ 3. Patents of importation are only granted, when the petitioner has obtained a patent in a foreign country. Exclusive privileges are only granted to the inventor or his legal representative.

§ 4. Improvements on known or patented subjects are only patentable as far as the improvement is new, but in no way including the original subject.

§ 5. Scientific principles are not patentable; but when by applying such principles, new products, or new means of producing such, or a new process is introduced, a patent is granted.

* We have introduced the titles of the Emperor to show over what territory of his dominions the patent-right extends.

§ 6. The combination of two or more discoveries, inventions, or improvements of a different nature in one patent, is only admissible when those discoveries, inventions, or improvements form component parts, or as acting mediums for one and the same object.

CHAPTER II.

CONDITIONS UNDER WHICH PATENTS ARE GRANTED, AND THE MODE OF OBTAINING THEM.

§ 7. *The conditions are,*

(*a*) The application must be made before a competent authority, in a proper form, and with the necessary accompanying documents, models, &c.

(*b*) The payment of a certain tax.

(*c*) The description of the invention must be perfect and clear, and when it is necessary to make the application more explicit, drawings and models are required; so that when the patent has expired, any expert can imitate or build it.

§ 8. The applications for patents can be made at district governments, or designated courts.

§ 9. The application must be made, according to a formula, either by the inventor himself or by his agent:

(*a*) In the application the inventor must state his Christian and surname, profession, place of residence, when he lives in the empire; when he employs an agent, he is required to make the same detailed statement.

(*b*) The title or name of the invention, discovery, or improvement, must be clearly stated.

(*c*) The number of years which the inventor prays for a patent must be stated. The longest term is fifteen years; the emperor extends the term when sufficient reasons are shown. Patents of importation are dated from the date of the foreign patent.

(*d*) The inventor must also state if he wishes that his patent should be kept secret or not.

§ 10. To the application must be added,

(*a*) The tax or fee, or a certificate of deposit in some imperial bank. There is no further fee to be paid, even if the application should require examination as to its admission as regards public safety, &c.

(*b*) When an agent is employed, he must be provided with a power of attorney to transact all business in reference to the application.

(*c*) Foreign applications must have the original foreign patent annexed, or a certified copy of the same.

(*d*) The specification mentioned in § 7 must be sealed and provided with a cover, upon which the title of the discovery, invention, or improvement must be marked, corresponding exactly with the title set forth in the inclosed specification, as well as with the name, place of residence, &c., of the inventor.

§ 11. The amount of the fee for patents is regulated according to the number of years the patentee desires to obtain the exclusive privilege for his discovery, invention, or improvement. The fee amounts during the first five years of privilege to one hundred florins, for the next five years to two hundred florins, and the last five years to four hundred florins; of which for every single year the amount is divided as follows:

The first five years, every year 20 florins =	100	florins.
The sixth year	30	"
" seventh	35	"
" eighth	40	"
" ninth	45	"
" tenth	50	"
" eleventh	60	"
" twelfth	70	"
" thirteenth	80	"
" fourteenth	90	"
" fifteenth	100	"
For the whole patent term	700	florins.

The fee must be paid in advance. Should the government find it necessary to cancel the patent on account of being injurious to the public, or from some other reason, the patentee receives the amount of the unexpired term back.

§ 12. The specification must be in the *German* language, clear and precise; and when it is necessary to make the explanation more full, drawings or models must be added.

§ 13. The official authority, before whom the application has been made, examines the papers in presence of the applicant or his agent to see whether,

(*a*) The petition is properly drawn up and signed;
(*b*) If it has the necessary accompanying documents;
(*c*) If the fee is paid.

When the papers are found to be correct, the day and hour of the application is marked on the cover, and from that time the privilege of the right begins.

§ § 14 and 15—Refer to the proceedings of the lower and higher courts as to examination of the papers as to their proper form, seal, signature, &c.

§ 16. The ministry of commerce and trade alone is authorized to break the seal, and examine the specification, &c., to see whether,

(*a*) The specification is in German (§ 12), and properly signed;

(*b*) If the application does not contain more than one subject to be patented;

(*c*) If the title upon the cover corresponds with that in the specification; if the subject to be patented is properly described; if the necessary models and drawings are furnished;

(*d*) If the discovery, invention, or improvement is not injurious to the public, &c.

§ 17. An examination as to novelty or usefulness does not take place, the government, on the other hand, does not hold out any guarantee whatever; the patentee has to risk all the danger, damages, and expenses occurring from litigation or otherwise.

§ 18. When the papers have been found to be in conformity with the laws and regulations, a patent is granted in form of a proper document; in a case where objections are raised, a hearing is allowed within a given space of time.

§ 19. The government has a right to cancel a patent when found injurious to the health or safety of the public, or interfering with the interests of the State.

§ 20. The specification, drawings, models, and specimens are deposited in the Imperial Central Archives.

CHAPTER III.

ADVANTAGES AND RIGHTS OF AN EXCLUSIVE PRIVILEGE UNDER LETTERS-PATENT.

§ 21. An exclusive privilege secures to the inventor the exclusive right to use his invention or discovery for the number of years his patent has been granted.

§ 22. The patentee has a right to erect throughout the whole Austrian empire establishments to manufacture or sell his patented articles; he can give to others the right to use his discovery, invention, or improvement; he can dispose of his privilege as he pleases; he can will it away, sell or rent it as he chooses, and he can take out patents in foreign countries.

§ 23. If the patent granted comprehends only an improvement, the patentee has simply the right to the improvement; it does not give him the right to use the original invention on which he made his improvement.

CHAPTER IV.

THE EXTENT OF TERRITORY WHICH THE PATENT COVERS: ITS DURATION AND PUBLICATION.

§ 24. The patent covers all countries belonging to the Austrian Empire.

§ 25. The longest term for the duration of a patent is fifteen years. The Emperor alone can grant an extension.

§ 26. The patent has force from the day of its issue and the publication of the grant.

§ 27. Patents granted for a less number of years than fifteen can be extended to the remainder of that term.

§ 28. Patents extended, surrendered, or expired, are published.

§ 29. Patents lose their validity,

1. *Through the act of cancelling it.*

(*a*) Such a decision of invalidity can arise when it appears that the regulations and conditions required by law have not been complied with, as set forth in §§ 1, 3, and 12.

(*b*) When the condition upon which the right or privilege is granted, is not complied with.

(*c*) When contrary to the public interest (§ 19).

2. *In consequence of expiration:* which occurs,

(*a*) When the patentee does not execute his discovery, invention, or improvement, within a year from the date the patent has been issued.

(*b*) When the term of the patent has naturally expired.

(*c*) When the patent is voluntarily surrendered.

§ 30. When the patent has expired naturally, or by fault, or by surrender, it is considered public property.

CHAPTER V.

REGISTERING AND KEEPING OF PATENTS.

§ 31. Every patent granted has to be registered. The drawing and models are placed for safe-keeping in the Imperial Central Archives. Every change or transfer of the patent is promptly marked in the registers.

§ 32. Every person has a right to information at the archives about the patents, and to examine the register in person. Patents which are not to be kept secret, or those which have expired, can be copied in part or wholly by any person, or copies will be furnished by government.

§ 33. The keeper of the Archive of Patents is ordered to publish every month the titles of all patents granted, and at the end of every year a similar list of all the patents granted is to be published.

§ 34. The government publishes all those expired patents, which are considered useful to the public.

CHAPTER VI.

§ 35. Every exclusive privilege is transferable during the lifetime of the patentee, and after his death by his legal representatives.

§ 36. Every transfer must be legalized by the proper authorities.

§ 37. All transfers of patents are to be made immediately public. After the publication is made, nobody can plead ignorance of the fact.

CHAPTER VII.

INFRINGEMENTS OF PATENTS, AND PROCEEDINGS BEFORE THE COURTS.

§ 38. When a person or persons imitate a patented article, or process employed in manufacturing the same, without the consent of the patentee, it is considered an infringement. Patented articles imported from abroad, or kept for sale, for exhibition, or safe-keeping, are also considered infringements.

§ 39. When the specification of a patented invention has been transcribed in the official records open for public inspection, the first case of infringement of such patent subjects the infringer to a fine; if the infringement of a patented article took place under a sealed or secret patent, a repetition of the infringement makes it a case of fine of from 12 to 1000 florins, as the case may be, and in default of payment, as many hours' imprisonment as the fine contains five florins. If the infringer has obtained knowledge of the secret directly through the confidence of the inventor, or by having been in his employment, the case is to be considered a more aggravated one, and will be punished accordingly.

§ § 41, 42, 43, 44, 45, 46, 47, 48, 49, and 50 contain the legal proceedings in cases of infringements, in accordance with the laws of the land.

CHAPTER VIII.

SPECIAL REGULATIONS IN REGARD TO THE PATENTS GRANTED UNDER THE OLD LAW.

§ 51. The new law gives the patent granted under the old law of 31st of March, 1832, and which term having not expired yet, the same advantages as to a patent granted under the new law.

§ 52. The patentee of a patent granted under the old law must, however, make application at that district government where he desires to bring his patent in force.

§ 53. The extensions of exclusive privileges are gratuitous.

§ 54. Application for prolongation of patents granted under the old law of 31st March, 1832, are subject to the regulations of the present law.

(Signed) FRANCIS JOSEPH, M. P.

Done at Vienna, August 15th, A. D. 1852.

PATENT LAWS AND DECISIONS.

In European countries the executive power is deemed competent, without the aid of legislation, to grant patent privileges. Statutes, however, have been passed, restraining and contracting its exercise. After the separation from the mother country, in forming our national constitution, Congress was vested with the power, "to promote the progress of science and the useful arts, by securing for limited times, to authors and inventors, the exclusive right to their respective writings and discoveries." Under this provision, thirteen statutes have been passed concerning inventions; the principal ones in 1790, 1793, and 1836, the latter superseding the seven that preceded it. In 1837 and 1839, several important provisions were added to those contained in the act of 1836. Although the whole written law is contained in a few pages of statutes, yet owing to the uncertainty and inconsistent language employed, contests concerning its meaning are of daily occurrence. Trials, in patent causes, are peculiar. Often, several arts and sciences are involved. Perplexing questions of fact, and abstruse and difficult questions of law are encountered; frequently all these occur in one cause. The most learned and clear-headed judges, and the most intelligent juries, are often embarrassed with the questions raised for their consideration. To secure the proper judicial qualifications and uniformity of decisions, the trial of patent causes is confided exclusively to the Circuit Courts; and that of final review, is committed to the Supreme Court. A knowledge of the decisions of these courts is important to inventors, and to those using patented inventions. It is our purpose to place them within the reach of our readers. The decisions of Chief Justice Marshall, Justices Washington, McLean, Baldwin, and Woodbury, and a portion of those of Justices Thompson, Nelson, and Grier, have been reported and published. Many decisions of other judges, including several by district judges, sitting in Circuit Courts, have appeared in pamphlets and in the public papers of the day.

Of the numerous patent cases tried at the circuits in sixty-three years, only twenty-six appear to have been re-examined by the Supreme Court. For the first twenty-two years of the existence of that court, no patent cause is reported as having been brought there for revision. During the eleven years, while Mr. Dallas was reporter, and the first eleven Judge Cranch held that office, no patent case was passed upon, and but two, during the fifteen years the latter was reporter. Mr. Wheaton reported but four cases in twelve years, and Mr. Peters but five, in sixteen. Mr. Howard, the present reporter, has published fifteen patent cases in eight years.

At the present time, controversies concerning patents are becoming very numerous. These involve immense interests, and engage the attention of the best talent and acquirements in the legal profession. For the purpose of disseminating a knowledge of the patent law among those interested in understanding it correctly, the editors of this journal have set apart a portion of its pages for communications on that subject. These will be prepared by one who has collected all the decisions on this subject, for the purpose of publication, and who is devoting his leisure from the ordinary duties of his profession, to compiling a complete treatise on the subject. He will first give a digest of the decisions of the Supreme Court. These are authoritative in all courts. A similar synopsis of the decisions of the circuits will follow. At the end of each volume of the present work, an index of the decisions will be given. We now present the substance of the decisions of patent cases by the Supreme Court, for the first thirty-nine years of its existence.

Cranche's Supreme Court Reports.

1810. *Tyler and others* vs. *Suel*, 6 *Cranch*, 324.—Under the law of 1793, an assignee of a patent-right could not maintain an action for the violation of the patent.

1815. *Evans* vs. *Jordan and Morehead*, 9 *Cranch*, 199.—The act of 1808, for the relief of Oliver Evans, authorizing a new patent, provided "that no person who shall have used the said improvements, or have erected the same for use, before the issuing of the said patent, shall be liable for damages therefor." Held, that this does not authorize those who erected his machinery between the expiration of his old patent, and the issuing of the new one, to use it after issuing the latter.

Wheaton's Reports.

1818. *Evans* vs. *Eaton*, 3 *Wheaton*, 454.—Under the act of 1793, § 6, when the defendant gave notice that he would show that the patented invention had been previously in use, at specified places, and "at sundry other places in" &c. "and elsewhere;" the defendant was authorized to give evidence as to places not specified. The court will, however, protect the plaintiff against surprise.

Proof of payment for license, by those who had used the invention before plaintiff's patent, though admissible, is of little weight.

Quere. Whether Congress can decide who is the real inventor.

As the thing patented had been described in a public work, anterior to the supposed discovery, the patent, under the 6th section of the act of 1793, is void, whether the patentee had a knowledge of the previous use or description, or not.

A claim for an improvement on a machine, must show the extent of the improvement, so that a person understanding the subject, may comprehend distinctly in what it consists.

1822. *Evans* vs. *Eaton*, 7 *Wheaton*, 356.—Having an interest in the question, and not in the suit, is no cause for rejecting a witness. His liability to a like action, is no cause for rejection, though it may affect his credibility.

A patent for more than the patentee invented, is not valid; and where it is for a whole machine, it can only be sustained by showing that it is substantially different in its construction and mode of operation.

If the patented combination previously existed in machines up to a certain point, and the patented invention consists of the addition of some new machinery, or some improved mode of operation, the patent should be limited to such improvement. If it includes the whole machine, it covers more than the party invented, and it is void.

A patent for an improvement, must state its nature and extent, and it is not sufficient that it is made out by comparison, or other proof, on the trial.

1822. *Evans* vs. *Hettick*, 7 *Wheaton*, 453.—A person sued for a similar alleged infringement, may be a witness. The notice provided by the 6th section of the act of 1793, does not include all definers, which a defendant may make, but a witness may testify, whether the model presented, is like plaintiff's machine.

A deposition once read without opposition, cannot be objected to as irregularly taken.

Fits of derangement do not affect the competency or credibility of a witness.

1825. *Keplinger* vs. *D. Young*, 10 *Wheaton*, 358.—Knowingly purchasing the product of a machine, which was used in violation of a patentee's right, is no violation of the patent for the machine.

Upon sufficient evidence, a jury might infer, that the defendant owned the machine, or had an interest in it, or that it was rented to him with intent to evade the plaintiff's patent, which would authorize them to find he had violated the plaintiff's rights.

Conclusions of fact are to be left to the jury to draw.

Where a transaction is merely colorable, the jury may find that the plaintiff's patent right has been violated.

The next number will contain a digest of the important decisions in Peter's Reports. R. H. G.

PATENTS FOR IMPROVEMENTS IN MAKING SUGAR.

According to promise we intend to furnish explanatory notices, with illustrations when necessary, of all the patents as they may be granted, whenever the claims themselves fail to elucidate the invention. For this, our first number, we bring up to the present time the report of the Hon. Edmund Burke, former Commissioner of Patents, who undertook the important work of reporting fully upon the great staples of the country, and in 1848 commenced with reports upon wheat and sugar. (See Patent Office Report for 1848.) Mr. Fleischmann, who assisted Mr. Burke in the preparation of that report, being now connected with this journal, we have thought it of paramount importance that his labors in that subject should be continued; and it is our intention to keep careful watch upon the progress of this and other staples, and report them as often as expedient. Our regular reports upon patents will commence with the year 1853, in the next number, and the present report upon sugar will convey some idea of the mode in which they will hereafter be made.

No. of Patent 6219. John Spangenberg—*Clarification of Cane-Juice.* Patented March 27th, 1849.

The invention consists in a number of "juice-boxes," wherein the juice, as it comes from the mill, is allowed to settle all impurities. The "juice-boxes" are provided with steam-pipes, which are fed with the escape steam of the steam-engine working the mill. The pipes he makes of various shapes, but they are all perforated.

The juice is heated by means of the steam which passes through the juice, and heats it up to the boiling point: it also affects coloring and mucilaginous matter, which are much lessened by a continued passing of the steam into the juice.

The inventor claims, first: The direct application of steam by injection to the sugar-cane juice whilst in vats, and before being transferred to the "grand," for the purpose of speedily heating, clarifying, defecating, purifying, and freeing the juice of the feculent and other extraneous, injurious, and impure matter.

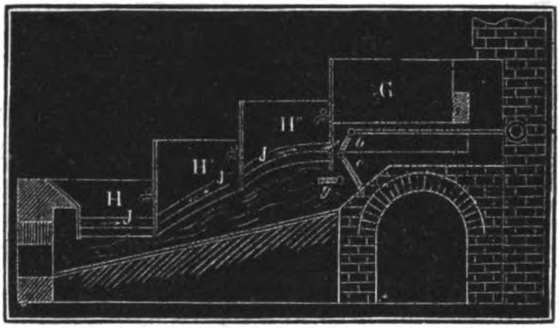
No. 6199. J. Spangenberg—*Improvement in Draining and Blanching Sugar.* Patented March 20th, 1849.

The inventor uses cold sirup for blanching and draining sugar, which is added to cold sugar, in such a manner that it saturates the whole mass, which is done either after or during the operation of potting.

He uses the common sugar plantation molasses, as it drains from the coolers, and adds it in proportion of 30 to 50 gallons of sirup to 1000 pounds of sugar. The molasses for the sirup is mixed with water or alcohol to 40 degrees Beaumé.

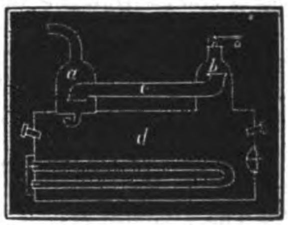
He claims, "Blanching the sugar by a solution of molasses and water, both being in a cold state, and the operation being performed in the hogshead destined for transportation of the sugar to market, thereby increasing the value of the sugar without a corresponding increase of expense."

No. 6395. KNIGHT REED—*Improvement in Sugar Pans.* Patented April 24, 1849.



The inventor says: "I am aware that pipes or tubes have been passed through the sirup for the purpose of heating the sirup with the steam, and that pipes or tubes are used in locomotive boilers as flues to pass the heated air, smoke, &c., through the water in the boiler for the purpose of economizing the heat, and that several boiling pans have been heated by one and the same fire; I therefore claim none of these, as such, as my invention; but what I do claim as my invention, and desire to secure by letters-patent, is the combination of the boiling pans HH'H'' of this construction, with the pipes or tubes JJJ, passing through the whole length of the series of boiling pans, and with the several dampers *gcb*, to direct, vary, and change the direction of the heat, and with the clarifying pans G so set as to be heated by the same fire which heats the boiling pans, and yet so that the heat may be entirely shut from the clarifying pans, or either of them, at pleasure; the whole constructed, arranged, combined, and for the purposes of heating the sugar pans."

No. 6617. ALFRED STILLMAN—*Improvement in Sugar Pans.* Patented August 28th, 1849.



The object of this invention is to prevent the foam from the boiling cane-juice from passing up into the pipe. The inventor connects therefore the two domes *a b* of his pan *d* by means of a pipe *c*, as seen in the annexed sketch. The inventor claims connecting the two domes of the evaporting pan by means of a pipe above the top of the pan, the end of which, in the second dome, is turned down.

No. 6519. ALFRED STILLMAN—*Improvement in Steam-Pipes for Sugar Boiling.* Patented June 12th, 1849.

The object of the improvement is to avoid the defects which other apparatus of that description possesses, and to obtain a larger amount of heating surface than can be attained by any of the known plans; and this the inventor says he attains by making the main steam-pipe *a* with a horizontal partition, which divides it into two compartments, connected by a series of siphon tubes *b*, which pass along horizontally from the upper one, and return in parallel lines to the lower one, the lower legs being placed below in the spaces between the upper legs, so as to leave a free passage for the circulation of the liquid to be evaporated. The steam from a boiler, or other source, enters one compartment of the main pipe, passes along the upper legs of the siphon tubes, and then along the other legs to the other compartment of the main pipe, and thence into the false bottom *c*. This arrangement, whilst it supplies an equal amount of steam to all the branch pipes of the series, presents an equal amount of heating surface in each branch, and greater in the aggregate than by any other method.

The inventor claims, "Connecting the two compartments of the main steam-pipe of the evaporating tubes of evaporating pans, by means of a series of siphon tubes, which receive the steam from one compartment and discharge it into the other compartment, whereby I am enabled to obtain a larger amount of heating surface than by any other known plan."

No. 6900. JOHN SCOFFERN—*Improvement in Purifying Sugar.* Patented Nov. 27th, 1849; in England, Dec. 8th, 1847.

This improvement consists in using sulphurous acid as a means of separating the lead which he employs in purifying or removing coloring matter from solutions of sugar. It is applicable for sugar refineries and sugar plantations. When it is employed for cane-juice, the juice must be somewhat alkaline; the lead material is mixed with it in proportion to 150 grains to every gallon of juice; the juice is then filtered, and the sulphurous acid gas forced through it to precipitate the lead, and afterwards lime is employed. The lead material is made in the following manner: 12 gallons of vinegar, of 5 per cent. strength, are placed in a copper boiler, and heated to 160° Fahr.; then 40 lbs. of finely-powdered litharge mixed with it, and boiled until of the consistency of paste.

"I would remark," says the inventor, "that I do not confine myself to the precise details, so long as the peculiar character of my invention be retained; but what I claim is the combined use of sulphurous acid with lead in the manufacture and refining of sugar, substantially as set forth."

LOUIS H. F. MELSENS, *in Belgium—Improvement in the Manufacture of Sugar.* Patented January 29, 1850.

Process for the extraction of the crystallizable sugar contained in the sugar-cane, in the beet-root, in the Indian corn, &c., &c., by which it can be obtained without loss by either cold or hot, or by slow or by rapid evaporation at will.

The properties of sulphurous acid have already been verified in relation to the "Mutisme" of wines and of liquors containing the sugar of the grape (by mutisme, I mean that condition in fermentable compounds induced by foreign bodies, by which the fermentation is checked, delayed, or prevented). The foreign body used becomes, under the conditions which I explain below, an agent for the complete extraction of the crystallizable sugar contained in the juice of different plants. But much as its employment has been extolled on various occasions, nevertheless all experiments made with it on a large scale for the purpose of extracting the sugar from the sugar-cane, or from the beet-root, have proved abortive, in consequence, no doubt, of the great chemical change which the crystallizable sugar undergoes by the influence of secondary products: the sulphites have been also employed for the same purpose, but their application has furnished no practical solution of the problem. I have attained no results very advantageous and uniform by the employment of the sulphite of lime dissolved in sulphurous acid, or generally by the employment of an acid sulphite of lime—the bisulphite is the combination that I prefer. The employment of this agent resists completely the change of the crystallizable sugar, pre-existing in the vegetable liquor, and admits of the extraction, by slow or rapid evaporation in the air or in vacuo, of nearly the entire sugar, in the form of crystals. This process renders the use of other defecators, either acids or alkalies, unnecessary; it renders useless, or nearly useless, animal black in the fabrication of sugar. In order that the method should succeed, it is necessary that the reagent indicated be intimately mixed with the pulp or with the juice, so soon as the crushed vegetable cells are exposed to the air. In this manner neither change nor coloration is possible, fermentation arising from the decomposition of the azotized matters cannot happen, and the formation of ammoniacal salts is thus directly avoided.

The liquid proceeding from the pressed pulp is submitted to evaporation, the same as it would be in concentrating any saline solution, unchangeable by the action of the air.

When the liquid procured from the pressed pulp, or from the crushing-mill, has been, during some moments, warmed up to 100° C, it should be left in repose, so as to draw off the limpid portion, or it can be filtered through pocket filters.

The filtrated liquid is then evaporated, either spontaneously cold or in vessels heated by plunging into boiling water, or heated by steam, or heated by the naked fire, or in any other way in vacuo or in air, to about 30° B; after another filtration, the whole of this sirup, left to itself in a place a little warm, crystallizes entirely. The sugar is thus obtained integrally, no coloring matter arising in the evaporation. I have never observed that it was absolutely necessary to introduce additional bases or salts to complete the defecation created by the bisulphite of lime; the proper employment of it, and simple filtration, have sufficed to obtain all the sugar at the first trial. The employment, however, of powdered animal black and of albuminous liquors, to clarify the sirup when about 30° B, improves the quality and the flavor of the sugar. When I make use of bases such as lime, magnesia, &c., &c., it is always upon sirup already at 25 C. 30° B. that I operate, and then it is entirely for the purpose of removing any taste of sulphurous acid, and to obtain a better clarification by the use of albuminous matters. These may be used to advantage, but all excess must be avoided.

I have investigated to ascertain if chalk, or other carbonates that favored the formation of deposits, added to the liquid in evaporation, would take away the taste—ordinarily their introduction has appeared to me useless. The bisulphite of lime, employed at the moment when the vegetable cells come in contact with the air, resists the action of the air upon the azotized matters, which it renders incapable of becoming ferments; the presence of the base or of the neutral salt, prevents the sulphurous acid transforming itself into a free sulphuric, that would destroy the sugar; the sulphuric acid which would be produced, would form immediately the sulphate of lime—a salt not only inoffensive, but useful; the effect of the heat upon the juice, treated with the soluble bisulphite, transforms a portion of this into neutral sulphite, which precipitates itself, coagulates the albuminous matters, and draws them down with it.

The quantity of sulphite required to treat the beet-root is very small—it is enough to employ two per cent. in weight of the beet-root of a solution of bisulphite, marking 10° B.; an excess beyond this is not pernicious. I have been able, with impunity, to employ it to the extent of ten per cent. for the sugar-cane; one per cent. suffices; and very probably, in working upon a large scale, these proportions may be diminished.

The employment of the bisulphite is directly applicable to those cases where, instead of operating by pressure, levigation or maceration are used, and by either of these modes of working, all the sugar can be secured, no matter what quantity of water may be employed. Not only does the use of the bisulphite of lime enable us to obtain, without any chemical change, the sugar that is in the cane or in the beet-root, but I have generalized its employment for the fabrication of all vegetable extracts, for anatomical preparations, vegetable or animal; for the preservation of animal matters, for their disinfection; in a word, for all the cases where it is important to arrest fermentation without introducing any dangerous or energetic chemical agent. Other sulphites may operate in the same manner, such as the sulphites of baryta, strontia, &c.; there are even some neutral salts that the sulphurous acid has the property of dissolving—as the phosphate of lime, &c.—provided that their liberated acid does not act upon the sugar; thus gelatine may be fabricated in preparing a defecator, and leave residuums very rich and useful as manures.

The preparation of the sulphite is very simple; it suffices to burn some sulphur or pyrites, and to send the products of the combustion, freed from impurity, by making them pass through dry chambers (debris cannes sèches); as for example, chambers filled with old stone-ware, &c., into the conduits of the dry chambers, in which is made to flow, from an opposite direction, a shower of milk of lime, or pure water, which dissolves the sulphurous acid.

That which I claim as my invention, and that which I desire to have secured to me by letters-patent, is the *Mutisme*, or process of treating saccharine solutions by means of a solution of acid sulphite of lime, baryta, or strontia, as hereinbefore described, applied to products containing sugar from the cane, or other vegetables, that the crystallizable sugar may undergo no chemical change, either by the formation of secondary products which destroy it, or by the generation of ferments which modify or transform it.

No. 7342. Robert De Massy.—*Improvement in Defecating Sugar.* Patented May 7th, 1850.

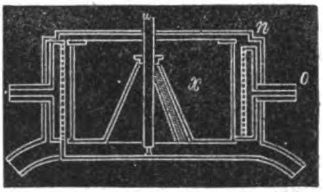
This invention consists in forming an insoluble saccharate or combination of the pure sugar with a basis, and then by drawing off the residue of the liquid which will take with it all the salts and all foreign matter, avoiding thereby the enormous expense of evaporation.

Secondly, in forming, by the aid of acids, insoluble combinations, which, in liberating the sugar, permits their separation by a second decantation. The basis is formed by means of caustic barytes in a slaked state, or by hydrate of barytes; the juice is first heated to 75° centigrade, and to every 26 gallons of juice about 13 lbs. of caustic barytes, or 27 lbs. of the hydrate of barytes added; the juice is then brought to ebullition, when a multitude of little crystals, the saccharate of barytes, are precipitated. This is used as "magma," or pressed into cakes.

The saccharate is decomposed by carbonic acid, evaporated to 30° Beaumé, filtered in order to separate the carbonate of barytes, and the pure saccharine liquid evaporated to the proper consistency.

De Massy claims the process described, for the immediate separation of the sugar from all foreign matter which injures the purification, by the manner above set forth, by forming a solid saccharate of baryta, pressing, decomposing, and separating the solid cakes, and finishing the process set forth, to the almost total suppression of heat necessary to evaporation.

No. 7616. Conrad Wm. Finzel.—*For an Improvement in Draining Sugar.* Patented Sept. 30th, 1850.



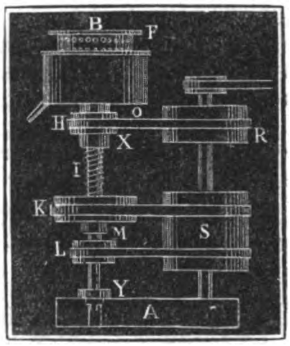
This consists in the application of steam to prevent the sugar from clogging in the periphery of the cylinder used in centrifugal machines.

By this contrivance also liquor can be forced, by means of a pump, against the revolving cylinder.

He claims "the mode of applying steam or liquids to machines used for separating sirups or fluids from sugar, by means of centrifugal force, for the purpose of clearing and keeping clear the meshes or apertures in the periphery of the revolving cylinders of such machines."

The annexed sketch represents a vertical section of the revolving cylinders with the outside casing, having at *n* a recess in which a steam-pipe *o* is placed. This pipe is perforated in such a manner as to throw the steam against the meshes of the revolving cylinder *x*.

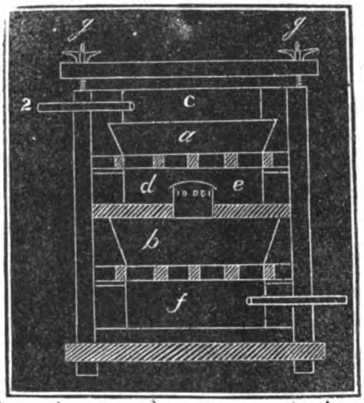
Van Anden's *Centrifugal Apparatus for Clarifying Sugar.* Patented June 10th, 1851



In this contrivance the pulley K, being larger in proportion to the wheel H than the driving-pulley S is to the driving-pulley R, the pulley K revolves slower than the wheel H, consequently the screw-shaft I revolves slower than the hollow shaft O, and the elevator slower than the strainer. The effect of this inequality between the velocity of the screw-shaft and that of the hollow shaft is equivalent to the former remaining stationary and the latter revolving around it, with a velocity equal to the difference between the two. But as the latter is fixed in its position, as the screw I enters the screw X, the former rises, carrying with it the pulley K L and the clutch M, the lower end of the screw-shaft sliding in the bearing Y at the bottom of the frame A. The elevator, being attached to the upper end of the shaft I, is also made to raise the strainer, the plough, following the spiral groove, dislodges its contents, which are thrown out over the rim of the strainer, the rim F of the central cup B having been carried up with the elevator. Thus the machine at the same time discharges itself and cleans the strainer, whilst it is kept in continual motion.

He claims as his invention the contrivance for discharging, and at the same time cleansing the strainer whilst in motion, by means of an elevator rising in a spiral groove substantially as described, or by an elevator rising in vertical or inclined grooves, which is essentially the same.

No. 8362. Smith Gardner.—*Apparatus for Depurating Sugar.* Patented Sept. 16th, 1851.



This invention consists in one or more series of pans, with perforated or wire-gauze bottoms. Below each straining-pan is placed a receiver to catch the molasses; over the first strainer *a* is placed a box *c* with a pipe 2, through which the air is forced into it. This box is open at the bottom, and when the air is forced into it, it passes through the sugar contained in the strainer *a*, carrying the molasses into the receiver *d*, and the air passing through the pipe *e* into the strainer *b*, and so on.

The whole apparatus must be air-tight, so that the air forced into the first strainer shall pass through the sugar into the second strainer, and so on, producing the desired effect.

The box or casing which contains the strainers and molasses receivers is provided with screws *g g*, to fasten the cover tight.

The inventor claims "combining two or more straining-pans with molasses or receiving vessels below each, the said pans being provided with a discharge-pipe or tube, so that the current of air shall pass from the lower part of the first to the upper part of the next, through the series, and so arranged as to retain the molasses or other liquid parts; and this combination he claims, whether the said succession of pans be used in one or more series, as described."

J. M. Miller.—*For Improvement in Sugar Vacuum Pans.* Oct. 21st, 1851.*

"Be it known that I, James M. Miller, of New York, in the county of New York and State of New York, have invented certain improvements in vacuum pans and other sugar manufacturing apparatus, &c., *parts of which are also applicable to other purposes;* and the following is a full, clear, and exact description of the principles or character which distinguishes them from all other things before known, and of the usual manner of making, modifying, and using the same, reference being had to the accompanying drawing, of which Fig. 1 is a plan of the heating pan," [and tubes Fig. 2, section showing the construction of the condenser tubes;]† "Fig. 3, a section through the boiler, vacuum pan, condenser, &c."

"My improvement consists in the mode of constructing steam-pipes for sugar-pans, and in their arrangement and combination with said pans, and with the boiler that supplies them with steam, by which arrangement the steam is conducted by the shortest possible course through the pipes to every part of the pan, and the condensed steam and water has a free and direct course back into the boiler. I am aware that large pipes have been employed for evaporation in pans, and also that the waste condensed steam has been made to run back through the same pipe into the boiler, consequently these abstract ideas are not designed to be covered by me in this

* We give the principal part of the specification of James M. Miller's sugar apparatus, the condenser to which has been applied with success to steam-engines—for which, in fact, it was originally designed: on that account we have been more particular to show the construction of the tubes of the condenser by an enlarged section.

† The part in brackets is changed from the original specification to conform to the selections we have made from the drawings, as the whole could not be introduced.

invention; but in all the attempts of this kind with which I am acquainted, a failure has ensued on account of the improper construction of the apparatus."

"The steam is admitted at the centre, and none of the pipes are attached to any non-yielding fixture by which they can be strained." "There are two other essential points necessary to be understood before my patent can be fully appreciated. First, the pipes must be made of as large diameter as is consistent with the maximum thickness of metal, to obtain the best circulation, which diameter I have found by careful experiment to be about 4 inches for the branch tubes, and about 6 inches for the main tube; the metal which I have found best adapted to this purpose being about sixty pound sheet copper.

"The second and the important point, is so to construct the pipes as to have them as short as possible, and at the same time cover as much space as convenient in the pan; and it was for this purpose I adopted the form shown in the drawing, Fig. 1. The pipes for heating and the pipes for the condensing portion of the apparatus, are somewhat different in their construction, although their arrangement is not unlike—that is, a series of short pipes branching from a main; the outer ends of the branch pipes are a little elevated, to insure the discharge of any condensed steam within them, into the main." The centre main of the boiling apparatus is connected by a short vertical pipe from the main C, Fig. 2, to the boiler A, placed beneath, passing directly down through the bottom of the boiler, and furnished with a stop-cock to shut off the steam or regulate its admission from the boiler A to the tubes. The vacuum or other pans may be made of any convenient form, either square or round, the length and position of the pipes being made to correspond.

Fig. 1.

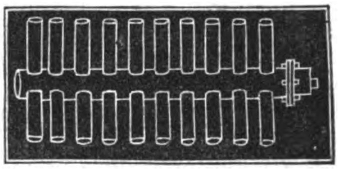
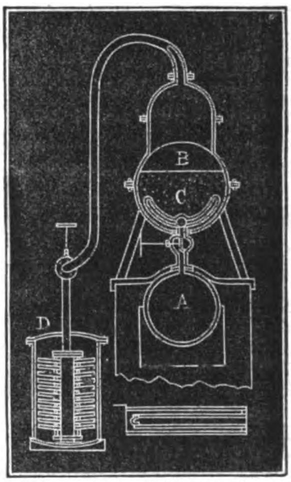


Fig. 2.



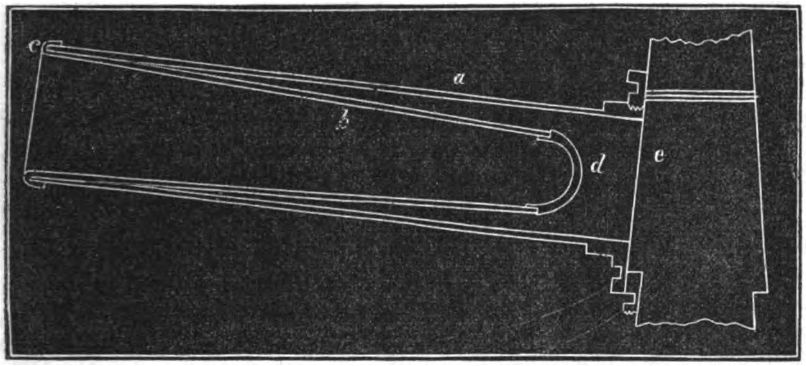
"D, Fig. 2, is a vertical section of the condenser, the details of the construction of the tubes of which are more clearly shown in the enlarged view, Fig. 3.

"The horizontal pipes *a*, extending from the main *e* nearly to the case, have within them smaller pipes that are attached all around to the edge of their outer ends, as clearly shown in the enlarged view at *c*, and being open at the outer ends, and having a piece *d* at their inner ends, form an annular chamber between the two pipes opening into the main *e*, with a body of cold water surrounding the outside of the part *a*, and with the part *b* to condense the steam within the chamber above named.

"It is obvious that the pipes may be used for various purposes as well as for sugar making, such as all of the evaporating processes, distilling, &c., and they may be employed in vacuo or otherwise, as is deemed advisable." "In the tubular condensers that have generally been used, the shell of the condenser necessarily had to sustain the pressure of the atmosphere caused by the vacuum; this on a large surface was very great, requiring the shell to be made very stout and well braced, and all contractions and expansions were necessarily straining all its joints. But in my condenser, the whole system works from a centre, as a base or fixture, allowing all its arms to expand and contract in any manner, without injury to their joints.

"The inventor claims, firstly, the evaporating and condensing tubes, constructed and arranged in the manner and for the purpose set forth; they being attached at one point only through which the steam enters, have freedom to expand or contract without injury; and the evaporating tubes being combined at the centre of the series as above specially set forth, with the boiler, the steam is conveyed from the boiler to the extremities of all the tubes in the most direct manner.

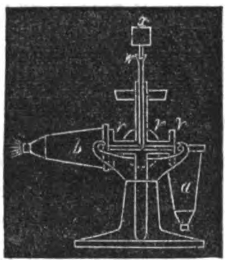
Fig. 3.



"I also claim connecting the filters with the vacuum pan, in the manner and for the purpose set forth, so that the vacuum pan shall perform the double office of making the vacuum in the filter and boiling in vacuo.

"I also claim the construction and arrangement of the condenser tubes above specified, the ends of said tubes being turned back inward nearly the whole length of the outer portion, as distinctly shown in the drawing."

No. 8545. Daniel King—*Centrifugal Apparatus for Clarifying Sugar.* Patented Nov. 25th, 1851.

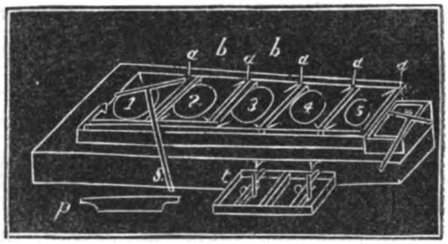


The moulds are first set vertically in rings *a*, then placed horizontally *b*, against the disks *v v v*. The disks have openings which communicate with a pipe *w*, which receives the clarifying sirup from a reservoir *x*. When the apparatus is set revolving, the sirup is forced through the contents of the moulds, and effects a speedy cleansing of the sugar.

The inventor claims centrifugal machines for separating fluid from other matter, constructed and operating as herein set forth, with detachable vessels containing the substance to be operated upon, irrespective of the exact mode of attachment, the number of vessels used, or their form.

No. 9086. Juan Ramos—*Improvement in Sugar Batteries.* Patented June 29th, 1852.

The inventor makes in the common battery used on sugar plantations, transverse canals or troughs *a a a a a*. These troughs are provided with lids *b b*, and communicate with a long one *i*, extending the whole length of the battery and empties into kettle 1. The object of the transverse canals is to receive the froth when the lids are raised. He uses rakes *s*, instead of skimmers, to rake the froth into the transverse and longitudinal channels *i*: the channels have stoppers to govern the scum or froth at pleasure. When the sirup is ready for strike, he places it into a box *m*, when all the froth is carefully separated and thus lets it into the coolers. His coolers *t* are provided with movable planks *o o*; they do not fill out the whole cooler, but are cut out in such a manner as to allow the sirup to flow around them (see fig. *p v*). When the sirup forms crystals, and has sufficient consistency, these planks *o o* are removed in order to allow the molasses to settle in the space formed by the planks; and when the plugs *v v* are drawn out, the molasses flows into the receiver below.



What he claims as his invention and discovery, is the construction of the transverse canal *a a a* in combination with the hinged cover *b b*, for the double purpose of returning the froth to the receiving pans and for preventing the sirup from falling into the canal, while being laded from one pan to the other.

"I also claim the construction of the lower longitudinal canal *i*, with its hinged board, for the purpose of more effectually removing the feculencies as described.

"I also claim the use of the movable plank *o*, in the coolers, which when removed, leaves a vacancy or channel for the molasses to flow away to the discharge aperture through the bottom of the cooler.

"In testimony whereof I have hereunto signed my name before two subscribing witnesses at Ponce, Porto Rico, the sixth day of May in the year one thousand eight hundred and fifty-two."

No. 9087. JUAN RAMOS—*Improvement in the manufacture of Sugar.* Patented, June 29th, 1852.

His improvement consists, in the first place, in removing the scum and froth by a rake, instead of the common skimmer as described in the former patent, No. 9086; in the collecting the scum in the transverse and longitudinal channels; the use of the box *m*, as already mentioned in the same patent. The double cooler which is represented above, marked *t*, is used for placing therein molasses, to which a strike is added, which is mixed with the molasses. After 48 hours, the planks *o o* are removed, and the molasses drawn off into the molasses tank. The inventor says that a great portion of the sugar contained in the molasses crystallizes when mixed in that way.

In defecating he uses the juice of the *plantain stalks* mixed with quicklime in certain proportions; as for instance, to 10 gallons of plantain-stalk juice he adds seven pounds of quick-lime; from this mixture he takes half a pint to defecate 300 gallons of cane-juice.

What he claims as his invention and discovery, is the use of the juice of the plantain stalk and quick-lime, combined substantially in the manner and for the purpose described for defecating the cane-juice.

"I also claim the application of a fresh strike of concentrated sirup from the battery to the molasses first drained off, for the purpose of crystallizing the sugar yet remaining in the molasses.

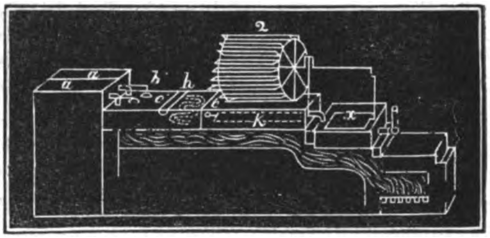
"In testimony whereof, I have hereunto signed my name before two subscribing witnesses at Ponce, Porto Rico, the sixth day of May, in the year one thousand eight hundred and fifty-two."

No. 9099. Robert and John Oxland—*Improvement in the Manufacture of Sugar.* Patented July 6th, 1852.

This improvement consists in combining acetate of alumina, aluminate of lime, and phosphoric acid, for defecating saccharine liquids; in the treatment of ordinary sugar, for instance, they use, in the water employed for blowing up in the usual manner, acetate of alumina in the proportion to a ton of sugar of 4 lbs. of alumina, dissolved in acetic acid, neutralized by means of aluminate of lime, saccharate of lime, or milk of lime; and as there remains always some alumina, superphosphate of lime, or phosphoric acid, is employed to remove it.

They claim the use of aluminate of lime in combination with the superphosphate of alumina, or of lime, or with the phosphoric acid, for clarifying cane-juice or sirups, as set forth, but disclaim the use of phosphoric acid, except in combination with the above-named bases.

No. 9315. Wm. H. Clement—*Sugar Apparatus.* Patented Oct. 12th, 1852.



The cane-juice coming from the mill is collected in the juice-boxes *a a*, which communicate with the long and shallow pan c^1c^2, by means of ball-cocks *b b*. The part of the shallow pan c^1 has in the centre a trough *h*, which receives the scum: at the bottom of the same pan, but at the further end from the ball-cocks, is a worm-pipe; by means of the ball-cocks and worm-pipe, a circulation of the fluid is produced through the difference of temperature in the juice, moving the scum into the trough *h*, and making thereby the apparatus self-scumming. The long pan c^1c^2 is divided by a partition; in the bottom of c^2 is placed an agitator *k*; above that part of the pan is a wheel *l*, the floats of which dip into the juice, and when in motion accelerate evaporation and scumming. The agitator *k* of pan c^2 and that of pan *x* is worked by geering connected with the scumming-wheel.

What he claims as his invention is, 1. The arrangement and combination of the simmering vessel c^1 with the ball-cock and the scumming-trough *h*, substantially as described in the first part of the foregoing specification, and he claims this arrangement and combination, whether alone or in further combination, with a partial covering of the bottom of the simmering vessel, or the introduction of the steam-worm, as there described.

2. The agitator *o*, arranged and operating in the manner and for the purposes substantially as described in the second and fourth part of the foregoing specification.

No. 9316. Wm. H. Clement—*Improvement in Sugar Apparatus.* Patented Oct. 12th, 1852.

This is a modification of the patent described under patent No. 9315. In this case he makes the pan c^1 and c^2, described above, very long, and places in c^2 a wheel like that described in the former patent, which has for its object the removal of froth or scum from the juice; the scum is pushed into a channel, running alongside of the pan c^2 and leading into a reservoir, from whence the juice which separates from the froth is pumped into pan c^1.

He employs a pump in the pan next to the wheel, which throws the boiling juice upon the top of the juice in the same pan, in order to keep it down, and prevent it from boiling over; the same pump is used to transfer the juice into the striking pan.

He claims the application in the manufacture of sugar of rotating paddles or leaves, for skimming or taking off the scum and gummous matters from the surface of the liquor.

Dr. Edward Stollé, of Berlin, has furnished us with several certificates from highly respectable planters of Jamaica, Ceylon, and Surinam, as to the efficacy of his innocuous and at the same time powerful clarifying agent for cane-juice. One pound of the Arcanum is added to every hundred gallons of the juice, immediately after it is expressed from the cane, to prevent its fermentation, by the antiseptic qualities of the Arcanum. It is not necessary to dissolve the Arcanum before mixing it with the juice. Heat is to be applied to the clarifier as soon as it is one-half or one-third full. The contents are to be stirred from time to time to facilitate its dissolution. As soon as the clarifier is filled, the temperature must be quickly raised to 155° Fahrenheit; at this moment the quantity of cream of lime, which is sufficient to neutralize the acidity of the juice is added. After boiling for five minutes the fire is put out, and the impurities are allowed to gather; after which, the juice, now of a very fine color, may be strained, if necessary, and concentrated in the usual way.

Dr. Stollé's Arcanum is sold in boxes of 200 lbs. each, at Hamburg, Germany., and in this country at New York, for $40.

Henry Bessemer's mode of manufacturing sugar—patented in England. Sealed March 20th, 1851:

The new processes are fourfold in their character, comprising, first, a new mode of obtaining the saccharine juice from the cane; secondly, a new mode of defecating and filtering the juice so obtained; thirdly, the boiling and concentrating of the juice; and fourthly, the crystallization and final curing of the sugar. By the first improvement, in the construction of the cane-press, a difference in the yield of the cane is obtained, as compared with the old rolling-mill, of about 20 per cent. In the new machine, the pressing tubes are reduced in length from 30 inches to 12, the first four of which are parallel, and three inches wide—the next four inches of their length being taper, and terminating with a width of but 1¼ inch, the smaller contracted point extending as far as the exit end of the tube. By this change of form, the entire removal of the elasticity in the "magas" occupying the tubes is removed, and after the cane has been collapsed by the severe pressure, and its breadth at the same time gradually lessened, every fibre and cell is made to assume new relative positions—not one remains unruptured, and an increased quantity of the juice is consequently expelled at the trough. In addition to this advantage, there is obviously a more equal distribution of power in each revolution of the machine; the deleterious chlorophyl, or coloring matter, of the outer portion of the cane is not expelled with the juice, as in the ordinary apparatus; the machine may be more easily fed, and weighs considerably less than rolling machines generally in use.

The juice, when expelled from the cane, is unavoidably mixed with numberless minute fragments of cellular tissues, albumen, and other extraneous matters, which, if not speedily removed, tend to produce the acidification of the liquid. At this stage comes in the second of the processes invented by Mr. Bessemer. The present mode of defecation and filtration consists in raising the temperature of the liquor to 150° Fahr., when a quantity of lime is thrown for the purpose of neutralizing the free acid, and assisting in the coagulation of the albumen; the temperature is increased to 180° Fahr., when, after allowing time for settling, the scum is removed, and the clear liquor drawn off into the "grand" copper, where it is subjected to boiling heat, when the feculent and other albuminous matters are kept constantly removed from its surface. The more completely these impurities are removed, the greater will be the brightness and value of the finished product. In the new process the juice passes through a wire strainer direct from the spout of the mill into the clarifiers, where it is raised to boiling heat by the application of steam, at which temperature it is kept for about three minutes, by which time the whole of its albuminous constituents and feculent matters will have been coagulated and chemically separated, but will, of course, still remain mechanically mixed, and in the form of light flock, pervade the entire bulk of the fluid. These substances are then effectually removed by a process similar to that employed in the manufacture of paper. A drum of about two feet in diameter and from four to five feet in length is made to revolve slowly in a small semicircular tray or vessel. This drum is covered with fine wire-cloth, through which the water forces its way, leaving a muddy coating of extraneous matters on the outer side, which, coming in contact as it revolves with a fixed scraper, similar in principle to the "doctor" employed in calico printing, is made to fall off in a state something like dry mud into a receptacle prepared for it. The process is self-acting. It takes in its own supply of foul liquor from an elevated cistern, delivers the clear juice into the evaporating pan, and discharges the refuse as we have already stated.

Up to this stage the advantages obtained must be evident to all who are acquainted with this interesting branch of manufacture. The liquor being received direct from the press, avoids the necessity of the use of liquor pumps; the clarifiers not being used as subsiding vessels, are not required to be so large; the loss of juice in the removal of the scum and in the sediment, is prevented; the use of the "mont-jus" is rendered unnecessary; the coagulation of the albuminous matter is more rapidly obtained; the evaporating process may follow immediately after the pressing of the canes; and finally, the self-cleansing filter performs its work much better than any continuous process of skimming, and renders unnecessary that watchful attendance which is now so imperatively necessary in order to obtain the required brightness and color of the sugar. The saving of manual labor by these improvements is self-evident.

On the various modes of boiling and concentrating the juice at present in use, whether by a series of semi-globular pans, the vacuum pan, Gadsden's pan, or the apparatus of Mr. Crossley or Mr. Schroeder, it is not necessary now to speak, the principle involved in one and all of them being the same—that of evaporating the fluid from the saccharine matter. The inventor of the process now under consideration contends that, in all the existing arrangements for the separation of the water from the sugar, boiling under any form, or the use of surfaces or pipes heated by steam, must be totally excluded, if the formation of molasses is to be prevented. It is a well-established fact, that a thermometer placed in a solution heated by steam or the direct action of fire, furnishes no indication of the temperature to which the liquid is exposed, as a vast amount of latent heat is absorbed by fluids in their formation into steam. To the forgetfulness of this simple fact are to be traced many of the fatal mistakes at present connected with the manufacture of sugar.

Thus, while the temperature of the sirup during ebullition in a vacuum pan indicates as low, perhaps, as 180° Fahr., the copper worm against which portions of the sugar are constantly brought into contact, is equal to and often above 226° Fahr.; the consequence of which is the destruction of the color, and an injury to the crystallizing powers of the sugar. By an arrangement, which Mr. Bessemer terms a hot-air evaporator, the concentration of saccharine fluids may now, however, be effected without the slightest injury to color or quality, and in an increased quantity.

This apparatus consists of a tank of thin plate-iron, of about 10 feet by 8 feet, and 2½ feet in depth, which has a false bottom, curved so as to form two parallel segments of a cylinder. Above these and coincident with them is a hollow drum of 18 inches in diameter, mounted on an axis, and on which is formed a broad spiral blade in the shape of a screw, or "creeper," the thread of which is about 15 inches in depth, and the convolutions three-quarters of an inch apart; and between each of the blades or threads of the screw, holes are formed spirally from one end of the drum to the other. At one end of the hollow drum, air, supplied by the blowing-fan, and heated to 150° by passing along a flue, is made to enter, which escapes through the holes in the drum in a radial direction, and sweeps like the hot breath of the simoom over the wet surfaces of the various revolving blades, absorbs the moisture thus exposed to its action, and passes off in an invisible vapor.

Upwards of six thousand square feet of evaporating surface is thus obtained in the small space of 10 feet by 8 feet. The screws make about eight revolutions per minute, and as they revolve, the more concentrated portions of the fluid are washed off as they descend into the fluid, and fresh portions are being constantly brought up on the surface of the screw, to be in like manner subjected to the hot-air blast. Finally, after three or four hours, the whole of the surplus liquor is carried off; the remaining fluid is sufficiently concentrated, and assumes a thick gelatinous appearance; and the screw, made to revolve in the opposite direction, expels the solution from the tank ready for the process of crystallization. By this process the sugar is not at any time exposed to a hotter surface than 140 degrees. No boiling, consequently, takes place, no slea is formed, and not one grain of crystallizable sugar is converted into molasses. The entire cost of fuel for evaporation is saved, the waste heat of the chimney and waste steam of the engine being alone employed, and the apparatus costs less than the ordinary vapor pans; it can be worked with a small amount of wind or water power. Three hogsheads of sugar, it is stated, can be obtained where two only are now produced, whilst the quality will be superior in color and taste, and will be perfectly free from molasses.

The separation of the crystals from the mother liquor, in which they are found, is effected in a most ingenious and efficient manner by the use of the air-pump. The transformation from the most repulsive and unwholesome-looking black sugar into a fine white sugar, is completed in one-seventh of a second by this process. The principle adopted is precisely that employed in "gassing" lace—an operation resorted to for the purpose of removing the minute filaments of cotton adhering to the surface of the fabric. In the case of the crystals of sugar, a thin film of fluid matter is required to be removed from the surface of the crystal, and this is effected by bringing it in contact with water—a material which would as quickly dissolve the crystal itself, as the flame of the gas would destroy the delicate and fragile web of the bobbinet. How can the water be thus brought into contact with the sugar for such a short period, and in such a manner as only to remove the outer coating of molasses, and leave the crystal uninjured? The process is a very simple one. A table of nine feet in circumference is made to revolve eight times per minute, having a coating of sugar spread over it to the depth of half an inch, and which consequently moves over a space of 72 feet per minute. At one part of its revolution the table is made to pass under a pipe of two inches in diameter, from which a shower of water is falling, and as the pipe is but one-sixth of a foot in diameter, and the table passes it at the rate of 72 feet per minute, it follows that each portion which comes under the falling water will be retained only $\frac{1}{432}$ of a minute in each revolution. This table, being covered with thin brass-wire gauze, has placed immediately under it a vacuum chamber, into which the falling water, carrying with it the semi-fluid coating of molasses, is drawn as the table revolves; the crystallized sugar remains on the surface pure and white, and is delivered by a scraper into the hogshead placed for its reception.

AGRICULTURE.

INTRODUCTION.

In presenting these pages on agriculture to the public, and especially to those persons who are interested in agriculture, it seems but proper to sketch for our readers some outlines of the plan we have in view in conducting this part of our journal. We embrace in our design the whole subject of agriculture, both in *theory* and *practice*. We do not intend to confine ourselves merely to the discussion of its topics in the limited sense in which it is sometimes used, as merely implying the proper cultivation of the soil; but in its broader generalizations, as covering the whole ground of land husbandry, the management of the farm, and the various collateral branches which serve to illustrate this great subject.

It is not necessary to detain our readers on so trite a topic as the importance of agriculture. This is too universally acknowledged to require any formal statement. The means for promoting its advancement will properly furnish a field for a variety of remarks. Though scarcely yet having attained to the precision of a science, still it has, too, its scientific relations, and these may be fairly regarded as in the purview of our undertaking.

Much has been said of the chemical developments that have startled the practical farmer by their proclaimed wonders. We yield to no one in the high value which we place on this science as the handmaid of the various arts, and the service she has and may still render to agriculture. But at the same time we cannot but feel that with what is true and practical, not a little, too, that is visionary and impracticable often finds a place in our agricultural journals, under the name of agricultural chemistry; and we hope to be able so to hold a balance of discrimination which will enable us to reject the latter, while we gather in the former into our pages. We hope to interest our readers somewhat in the progress of agriculture and methods adopted on the continent of Europe, and to supply a defect which has long existed in this country. We are well acquainted with the transactions of the improvements of agriculture of England, but little has been made known in this country of the labors of other portions of the old world.

We shall endeavor to give greater precision and definiteness to the data from which conclusions are drawn as to the bearing relations of the various parts of agriculture to each other. Frequent reports are made of large crops, large animals, and striking developments of the soil or its products; but while these may excite wonder, and perhaps prompt to emulation, they are wanting in that clear statement of details of management, proportions, &c., which may render them practically useful. Some vague idea may possibly be formed as to the general character of the experiment, but the evidence is wanting that the amount of material, its cost, its actual effect has been accurately ascertained; and subjected to a thorough analysis of this kind, it might be found that the wonder ceases, or rather is changed to pity for so useless expenditure, which proves but a losing experiment at last. The peculiar branch of agricultural proportions, if well understood, might correct, in a great degree, this evil; and one object we hope to keep in view, is to present this topic both directly and incidentally to our readers.

In connection with this, too, is the doctrine of manures, or fertilizers; and we hope here to point out to our agriculturists the true relation it should bear in their practice, and show what is visionary and what can be realized.

The culture of various great staples of our country, the management of fruits, the introduction and acclimation of products, from all parts of the world, which may deserve attention; the care of the dairy, and the breeding and improving all the domestic animals; the right course to be pursued in securing such breeds of sheep, cattle, and horses, as are adapted to our various climatic circumstances; these are topics to which we shall also direct the attention of our readers.

The literature of agriculture is becoming daily of greater importance; and though it can never supersede practical knowledge, yet a proper acquaintance with good works and treatises on these subjects, are of no little advantage to the well-trained agriculturist.

Facts are the basis on which all practice can legitimately proceed, and it certainly can be no objection to any candid inquiry for the truth, that these facts are recorded in the pages of a book rather than transmitted by traditions from father to son.

O. L. F., *Ed.*

ABD-EL-KADER ON THE ARABIAN HORSE.

With a pastoral people of wandering habits like the Arabs, who roam with their families and herds over vast plains, the horse became necessarily, as it were, a second part of man. The horse is the inseparable companion of the Arab in his travels and expeditions: with his horse he distinguishes himself in battle, at weddings, and at religious festivals; he makes love and war with it; and distances are of no consideration to him, whilst in possession of a noble steed. The Saharian, like all Arabs, manages his horse with great care, values pure blood, and takes great interest in improving his breed. The love for horses has passed into the very heart-blood of the Arab: he is the companion of the warrior and the friend of the chief; in fact, he is a member of the family. He is the universal subject of poetry and song, the inexhaustible theme of conversation at their religious, warlike, and social meetings. It is there, where the young are initiated in the secret of managing the horse; it is there, where the most common Arab of the desert becomes familiar with the superior points of horses, and the innumerable sayings, legends, and Scriptural quotations, in regard to this noble animal. "The prophet said," they will exclaim, "the paradise of this world is upon the back of the horse." All actions and thoughts tend to develop their love for the horse. Their religion makes it a duty, their restless life, incessant feuds, and the great distances over which they have to roam, make the horse a necessity.

Mohammed, like Moses, understood fully the mission of his people: he was well aware that the ultimate success of Mohammedans depended upon the daring and courage of the horseman, and he saw the necessity of cherishing among his people love for the horse, in order to strengthen and promulgate the faith of Islamism.

In the course of time, proverbs, traditions, and legends have been gradually diffused and accredited among the Mohammedans as the sayings and laws of the prophet, as articles of faith. The Arabs say, "When God intended to create the horse, he spake unto the wind, 'I will that thou shouldst give birth to a being which can carry my worshippers—a creature which is to be cherished by all my slaves, and which will be the cause of unhappiness and despair among all those who do not follow my laws.' Thus God created the horse, exclaiming, 'Thou shalt be unequalled. The treasures of this world are placed between thy eyes. Thou shalt destroy my enemies. I shall make thee happy, and give thee the preference over all other animals. Every man shall feel kindly towards thee. To the charge, as well as in the retreat, thou shalt fly without wings. I shall place upon thy back only such men as will know me, address their prayers to me—men of kind hearts, men who worship me.'"

The companion of the prophet, Sidi-Amour, said: "Love the horse; take good care of it; it merits your affections; treat it like your children, nourish it like the friends of your family, cheer it with your caress. For the love of God, do not neglect him, because you will repent it in this world, as well as in the next."

When Abd-el-Kader was taken prisoner by the French, General Daumas took the opportunity of making inquiries of him respecting the Arabian horse. The following letter, in reply, contains many interesting particulars on this subject, most of which, we presume, will be new and of interest to our readers.

ABD-EL-KADER'S LETTER TO GENERAL DAUMAS,

In answer to several inquiries about the Arabian horse.

You asked me, "How many days can an Arabian horse travel without rest and without suffering much by it?"

A horse, sound in limbs, and receiving as much barley as his stomach needs, can render as much service as his rider requires of him. The Arabs say, "Give barley and abuse." A horse can make 16 parasangs every day without over-fatiguing him. Sixteen parasangs is the distance from Mascara to Koudiat-Aghelezan on Oued-Mina, which has been measured.* A horse which eats as much barley as it requires can travel that distance and continue it for three and even four months in succession, without allowing it a single day's rest.

You asked, "What distance a horse can run during a day?"

This question I am not able to answer with much accuracy; but I think it should reach 50 parasangs—the distance, for instance, from Tlemcen to Mascara. We have seen a great many of our horses making that distance in one day. But a horse going that distance in one heat, should never be allowed to travel the next day. More of our horses went in one day from D'Oran to Mascara, but it took them two or three days to return.

You asked for examples, "As to the power of endurance of hunger and thirst of our horses."

When we were at the embouchure of the Melouïa, we made excursions into Djebel-Amour, following the route of the Sahara. Every morning when starting, we set our horses in gallop, and kept them for 5 or 6 hours in full speed, without allowing them to draw breath; and we accomplished our excursions, going or coming, in 20 or 25 days at the most. During that time our horses got only as much barley as each man could carry along with him—averaging about 8 meals; they got no straw, but alfa and chiehh, and in the spring, some grass. Nevertheless, the very day when we returned to our people, we took part in the games, and used the same horses. Whilst on those expeditions, our horses were one or two days without water; once they had not seen water for three days in succession. The horses of the Sahara can endure still more than this. They are sometimes three months without tasting a single kernel of barley; even the taste of straw is often not known to them, except on the day when their masters buy grain in the Tell. They live mostly on alfa, chiehh, and sometimes guetof. The chiehh is better than alfa, and the guetof better than the chiehh. The Arabs say:

> "Alfa makes him go,
> Chiehh makes him fight,
> And guetof is even better than barley."

Some years, when the tribes are not admitted into the Tell, the horses of the Sahara do not see a single kernel of barley for a whole year. They are then fed on dates, on which they get fat; and with such food they can be used for long expeditions, and even in battles.

You asked, "Why the Arabs back their horses at such an early age, whilst the French do not use their horses for the saddle till after they have passed the fourth year?"

The Arabs say the horse is like man, best qualified to be taught whilst young; and the proverb goes:—"The lessons of childhood engrave themselves on stone; those of maturer age disappear like the nests of birds."

* A parasang is about 3·11 English miles.

You asked me, "If the Arabs of the Sahara keep records to establish the pedigrees of their horses?"

Whether the people of the Sahara or of the Tell keep written records, the fame of a horse is sufficient; because the genealogy of their good horses is known to every one, like that of their masters. I have heard that some families keep such genealogical accounts in writing; but I am not able to state their names. These kind of records are customary among the people in the East, as I mentioned in the small treatise addressed to you.

You wish to know "The names of the tribes of Algiers most renowned for their horses."

The best horses of the Sahara, without exception, are the horses of Hamyan; their horses are all of the best kind, because they employ their horses neither in hard work nor for carrying heavy burdens: they are exclusively employed for the use of the saddle in expeditions and battle. They endure hunger, thirst, and fatigue better than any other breed. After the horses of Hamyan, come those of Harar, of Arboa, and of Oulad Nayl. The best horses in the Tell, as to blood and beauty of form, are those of the Chelif's, principally those of Oulad-Sidi-Ben-Abd-Allah, near the Mina, and those of Oulad-Sidi-Hassan, a part of Oulad-Sidi-Dahhor, who inhabit the mountain Mascara. The fastest upon the race-course or hippodrome—also beautiful as to form—are the horses of the Flilas tribe. The best for travelling upon rocky ground, and not requiring shoeing, are the horses of the Assassena tribe, in the Yakoubia. It is said that the celebrated Sultan of Morocco, Moulaye-Ismael, observed: "My horse has been raised in the Maz, and watered in the Biaz." The Maz is a place in the country of the Assassenas, and Biaz is the stream, known by the name Taufet, which runs through the territory of that tribe. The horses of Oulad-Khaled are also renowned for the same qualities. Sidi-Ahmed-Ben-Youssef, whilst speaking in praise of the wives and horses of that tribe, said: "The long *braids*, and the long *djelals*, will be seen among you until the day of resurrection."

You state, "It was asserted that the horses of Algiers are not of Arabian origin, but Barbes."

That is an opinion which I thrust home upon its authors. The Barbes are originally Arabs. A celebrated author says: "The Barbes inhabit the Mogheb; they are all sons of Kais-Ben-Ghilan, and originate from the two great tribes, Hemiarites, of the Senahdja, and of the Kettama, who came to the country during the invasion of Ifrikech-el-Malik."

According to this statement, the Barbes are *bona fide* Arabs. The Arabian horses have gradually increased, and spread in the Mogheb in the same ratio as the Arabs settled that country. In the time of Ifrikech-Ben-Kaïf, the empire of the Arabs was great and powerful: it extended in the West, to the limits of Mogheb, as in the times of Chamar L'Hemiarite; and it extended, according to the book of Ben-Kouteïba, entitled "El Marif," to the East, as far as China.

There is not the least doubt as to the Arabian origin of the horses of Algiers: many may have degenerated, because they are often employed in hard labor in the harness, for carrying burdens, and other hard work; many mares have been degraded by raising mules from them. Nothing of that kind was ever done among the Arabs of former days. They believed that it was sufficient to ruin forever the merits of a horse by allowing it to walk upon a ploughed field. The following tale may illustrate what I have stated:

An Arab, riding upon his noble horse, met his enemy, equally well mounted. Immediately the chase began—the one who was pursuing was soon distanced by the other. Seeing himself losing ground, he hallooed to the other in despair, and asked:

"In the name of God, say, has your horse ever done any work?"

"He has worked, but only four days," was the reply.

"Well, mine has never done any work whatever, and now, by the head of our prophet, I am sure to catch you!"

He continued the chase with the utmost confidence. At the close of the day, the fugitive began to lose ground, and the other gained rapidly upon him. At last he reached him, and unhorsed him.

The vanquished exclaimed: "My old father—God have mercy upon him!—was accustomed to say that there is no more blessing upon our land, since we subjected our noble steeds to work like beasts of burden. God made the horse for the saddle, the ox for work, the camel for carrying burdens. He has gained nothing by changing the ways of God."

You asked me again, "About our modes of treating and feeding horses."

The owner of a horse feeds him in the beginning in small quantities, gradually increases the rations, until he has ascertained how much barley he requires; he begins then to diminish those rations a little to a certain allowance, which he feeds out to him regularly.

The best time to feed barley is in the evening, except on the road, and then it is not in the least advantageous to feed it in the morning; it is said: "Barley fed in the morning is found in the dung; barley fed in the evening goes in the croup." The best manner to feed barley is when the horse is saddled and girthed. The best way to water a horse is when it has the bridle on. The Arabs say: "Water with the bridle, and feed barley with the saddle on." The Arabs give preference to a horse which eats little, provided that it is not done at the expense of its strength. They say such a horse is an invaluable treasure. To water horses at sunrise makes them thin; to give them drink in the middle of the day keeps them in good order.

During the great heat, which lasts generally forty days, the Arabs water their horses only every second day, which is considered the best practice. In summer, autumn, and winter, they feed out some straw; but the principal food is barley. The Arabs say: "Had we not seen that the horse comes from the horse, we would say it is barley which produces him."

They say: "Of all the prohibited meat, select the lightest." That means, select a light horse; because Mohammedans are not allowed to eat horse-flesh.

"A man becomes an expert horseman after having been several times thrown from his horse."

"The blood-horse is not malicious."

"The horse is a bird without wings."

"Nothing is too far for a good horse."

"The man who forgets the beauty of horses for that of women, will never prosper."

"The horse knows its rider."

Our saint, Ben-el-Abbas, said: "Love the horse, and take good care of him. Do not spare any pains with him; because through him you obtain honor, through him you get beauty."

He said further: "When the horses are abandoned by man, I take them into my family; I divide with them the bread of my children; my wives clothe them with their veils and provide them with covering. I lead them every day upon the field of adventure. Carried onward by their impetuous speed, I conquer the most valiant.'"

I have finished this letter, that our brother and companion, friend of all the commanders, Sid-Ben-Senna, may hand it to you, and I salute you,

ABD-EL-KADER.

ON VINE CULTURE IN THIS COUNTRY.

In the autumn of the year of 1846, business having called me to Louisiana, I proceeded through the Ohio valley to the Father of rivers.

Of all the gigantic improvements which attracted my notice along the shore of *la belle rivière*, none surprised me so much as the numerous and extensive vineyards which, within a few years, have spread over the hillsides near Cincinnati, adding a new charm to the vicinity of the queen city of the West.

On my return, in the following spring, I spent a day in Reading, Pennsylvania, where I visited the vineyards and the cellars of one of our most successful vine-dressers, Mr. Fehr. I tasted his wine from the vintage of the previous year, and I must confess it surpassed my most sanguine expectations; the flavor was delicate, the bouquet peculiar but pleasant, and it had much strength, although only a few months old.

This fine product grown upon the hills of Reading, and the success of vine culture in the West, convinced me that the time is not very far removed, when the United States will produce its own wines on the sloping shores of its numerous rivers.

These hills may not grow a Chateau-Lafitte, a Burgundy, Hochheimer, Johannisberger, or Tokay, but they will produce a growth of a peculiar nature and virtue, differing from the European, yet it may be as valuable, if not more so, than the renowned wines of the Old World.

It is generally supposed that the European grape-vines do not succeed in this country, and that only the native vines can be cultivated to advantage. This conlusion always seemed to me rather premature, because it has been proved, in other parts of the world, that European vines can be transplanted into other regions of a different climate, although the experiments for their culture and general management may have been unsuccessful for a series of years.

I know the accounts which have been given of the failure of the vineyards of Vevay, Indiana, and of those in Gallatin county, Kentucky. Many an unsuccessful trial made by others, as well as those by the father of the Ohio vine-culture, the indefatigable and liberal Nicholas Longworth, Esq., of Cincinnati, will be held up to me as proofs that the European vines do not succeed in this country.

But are these few experiments, made within a narrow compass in comparison to the vast extent of our country, sufficient to justify the broad assertion, that European grape-vines cannot be raised in the whole United States, embracing at least 23 degrees of latitude and 50 degrees longitude? Certainly not: for some of the newly-acquired territories prove the contrary; and if we examine into the condition of the atmosphere of the eastern parts of the United States, we shall find that its hygrometric state, in many parts, is not so very different from that of the old world where good vines grow, as to prevent the hope of ultimate success.

The difficulty of acclimating the European grape-vine in some parts of the United States, must be attributed to the high degree of moisture suspended in the atmosphere. Now on this subject we seem authorized to suggest the following remarks: We have sounded the ocean along the shores of our extensive coast; we know its depths; we are investigating the nature of storms; we are making numerous experiments, embracing a wide range of territory, in regard to the variation of the magnetic needle, in order to facilitate navigation and promote commerce. Millions of dollars have been spent on those important objects; while experiments and researches on a large scale, in regard to agriculture, have been comparatively neglected.

A series of meteorological observations, in various parts of the Union, with the view of ascertaining the saturation by moisture of the atmosphere, would, no doubt, have indicated portions of our vast territory, corresponding to many geographical points in the most famous vine-growing countries of the Old World, and where experiments in the culture of the grape-vine would have proved completely successful.

The Smithsonian Institute possesses a record of a series of meteorological observations, establishing, almost conclusively, the fact that the Ohio valley, from the high state of saturation by moisture of its atmosphere, is the least adapted to foreign vines, and that the eastern portions of Virginia, North and South Carolina, Tennessee, Alabama, Georgia, Texas, are much better suited to the introduction of European vines. New Mexico and California produce even now good wines, made from grapes, the vines of which have been originally introduced from Spain.

The investigation of the precise condition of the atmosphere as to its saturation by moisture, would be of incalculable benefit to our farmers; and the Congress of the United States might authorize the Smithsonian Institute to employ the necessary assistants to investigate this matter during a number of years, so as to ascertain, with some degree of certainty, what portion of the Union is best suited, not only for the cultivation of the grape-vine, but also for other fruits, and agricultural products.

Another reason why we have not yet succeeded in raising European grape-vines with advantage, is that we have principally intrusted the management of our vineyards to German or French vine-dressers: for the most part people of little or no education or judgment. They bring with them, in many instances, only the knowledge of the culture of the grape-vine of their native country—a country vastly different from ours. We require unquestionably another mode of culture, and we cannot expect that ignorant vine-dressers will discover the mode best suited to our peculiar climate and different soil. These vine-dressers have their strong predilections for the vines raised in their fatherland. The Germans want their Riesling, the basis of the Rhine wines; the French the Pinot, Chasselas, or Gamet; the Hungarians their Tokay or Kadarke. Each one of them regards the kind raised in his country as the best, and distrusts any others, simply because he has never even heard their names, and is unacquainted with the different culture which the vines require, and the different treatment to which the wine from another species of grapes must be subjected.

These persons, however, are considered as the men best qualified to introduce into this country the proper culture of vines, and the best mode of making wine. It is from them we are told that we must learn. Those who have visited the vine-growing districts of Europe, and especially noticed the vineyards of France and Italy, must have observed how little is known by the producers about the rationale of their own proceedings. How many of them, in fine, even in their own country, and in good locations, produce vinegar instead of wine!

This consideration leads us to the conclusion that the vine-growers of this country, if they desire to obtain more satisfactory results, must take the matter into their own hands.

But it requires time, perseverance, and knowledge to effect it. Cuttings from the vineyards of the Old World, which were set with vines before the time of Columella, cannot be expected to thrive at once properly in our country, from the fact that we take them from an old exhausted soil, from old degenerated stocks, and transplant them to the virgin state of our own soils, where they are invigorated, and produce an abundance of shoots, leaves, and tendrils. This uncongenial growth is often retarded, or suddenly again stimulated, through the influence of our peculiar climate; and the few grapes produced rot in consequence of the superabundance of moisture in the atmosphere, so very obnoxious to some kinds of grapes. The foreign vine-dresser is at loss how to manage such luxuriant growth, or to prevent the effect of a scorching sun: he becomes confused, not having the necessary judgment to adopt another mode of treatment, sees his hopes blighted, and then raises the cry, that "the foreign vines will not grow in this country."

It is very essential that the land for the culture of the grape-vine should be properly selected and prepared; that some time should be allowed to the vine to become acclimated, and that the treatment should be in conformity with the existing circumstances. Do we not find that nearly every country in Europe has its peculiar mode of managing its vines? Have not the most able writers on vine culture shown the necessity of adapting the training of every species of vines to the various prevailing climatic influences and to the nature of the soil?

The Dutch at the Cape of Good Hope, it is said, sowed the first cuttings and ploughed them in, like grain, and of course they did not succeed. A better mode was introduced by the French settlers; but even under their management, the wines produced upon that new soil had a bad flavor. Thus, the first settlers at the Cape believed for many years that the European vines beyond the equator produced no good wines; but the people of the Cape found at last the right location and soil: the right kind of vines were introduced, from which resulted the famous *Constantia*. Similar difficulties were experienced at Madeira and other countries.

The famous Ximenes of Spain, it is said, is produced from vines introduced by a German of the name of Simon, who brought the cuttings from the Rhine, probably from Riesling; and so it will be in this country: we shall yet find the right kind of vines and localities, and by persevering in our efforts to ascertain the proper mode of cultivating them, and the necessary management of the must and the wines in the cellar, we shall produce wines of superior quality. To accomplish this, however, we must collect and introduce all kinds of vines, not only those from France, Spain, or Germany, but we must bring them from the Caucasus, from Persia, Syria, &c., from Africa, and especially from latitudes and climates which are more similar to our own, and we must pay particular attention to those *species which ripen in the latter part of August, or early in the autumn.* We must train them in various ways—*low*, *middle*, and *high*. We must prune them to spurs, heads, limbs, bows, &c., till we find the mode answering to the kind and the climate. Many such experiments have undoubtedly already been made, but I question whether they have been carried far enough to produce the desired results. I question if we are possessed of the extensive information this subject requires; and it is with a view of aiding in the future development of this subject, that I have taken pains to collect, whilst stationed as U. S. Consul at Stuttgart, in Wirtemberg, a mass of information and facts in regard to the various modes of vine culture practised in Germany, Hungary, Italy, France, Spain, Portugal, the Greek Archipelago, the Caucasus, Persia, Arabia, Algiers, Cape of Good Hope, &c., &c., with reference to the climate, nature of the soil, and other peculiarities affecting their growth.

The capital of Wirtemberg, being the centre of a great vine-growing country, affords, through its public institutions, a rare opportunity for such an undertaking.

The King of Wirtemberg, to his praise may it be said, always had the interest of the farmers at heart. He established at an early period of his reign, an agricultural bureau, agricultural and horticultural societies, wine improving associations; a professorship of agriculture at the university of the state; agricultural schools; stud, sheep, and model farms in various parts of the kingdom; national fairs; and besides the publication of agricultural and horticultural journals, the royal library is supplied with all works in the different languages treating on the subject of agriculture and the kindred branches of this all-important pursuit.

The beneficial influence of these wise measures, are to be perceived in every part of that kingdom; the roads are lined with choice fruit-trees, the hills are covered with vines, the luxuriant meadows enjoy a regular system of irrigation, the highly cultivated fields produce all kinds of crops, and even the forests are subject to a proper culture, in order to secure the necessary supply of fuel and timber. By means of the royal studs, the Arabian blood has been introduced and improved to great advantage, the breed of horned cattle is an excellent one, and the royal model-farms distribute annually a certain number of young bulls of great beauty and excellence among the farmers of the country; the improved plough is nowhere so extensively adopted as in Wirtemberg. Large flocks of fine sheep too are frequently met, pasturing upon some small strip of uncultivated ground, which has not been considered worth occupying by the plough or hoe.

What a difference exists between that country and the adjacent one of Bavaria! Look at the comparatively barren districts of the latter, and then at the charming and highly cultivated valley of the Neckar, and its picturesque tributaries; nothing can more forcibly illustrate what a wise government can effect, or show that public institutions for the promotion of agriculture and its kindred branches, are not only beneficial to the individual farmer, but indispensable to a high degree of agricultural prosperity.

I have also visited many vine-growing districts, and I made drawings of the principal grapes, either from nature or copied them from reliable sources, described their mode of cultivation, the peculiar treatment of their juice, and prepared a work which I have reason to believe is the only one of its kind now extant in any country.

Among my collections of drawings are specimens of grapes, many of which would answer for our climate, and which, with a proper mode of culture, would undoubtedly fulfil all the demands of the intelligent vine-grower and of the consumer of wines.

As we are just beginning to have some literature on this great subject, it is highly important to establish a *nomenclature* intelligible to all: for the furtherance of this object, I have made a series of illustrations representing the grape-vine and its parts, various modes of pruning and training, and have also drawn the tools used in the field, press-house, and cellar, and have given them the proper terms and names.

These illustrations, with the various information, might be published by Congress, and distributed among the farmers of the Union, because a work of that kind is too costly for us to hope that its publication will be undertaken by private individuals. Without such aid from the government, or from public institutions, we shall have as much confusion about the names of the grapes, parts of the vine, and terms of operation, as exist in the Old World, where one district does not understand the technical terms of another, thereby caûsing great obstacles to the promotion of this branch of agriculture and to the diffusion of knowledge through the medium of the press.

Now is evidently the time to lay the foundation for such a literature, and if the task be properly commenced, and vigorously prosecuted, it cannot fail to call forth the energy and intelligence of our farmers, and to enrich our country with another great staple article.

We shall endeavor to bring before our readers the improvements and experiments made in vine culture and vinification abroad, as well as at home, and we hope that we may succeed in assisting in the development of this important branch of agriculture in our country, through the medium of this journal. Before I close these remarks, I would suggest yet another plan, by which the introduction of foreign vines and the quality of our own could be best tested. It is the same plan which M. Chaptal, one of Napoleon's ministers, adopted in the year 1802. Chaptal ordered that a nursery of vines be established in France, in which all the vines of the world should be placed, and properly cultivated. M. Bosc was appointed to describe them, and artists were employed to draw the vines and grapes. The sum of 180,000 francs ($36,000), was appropriated for that object.

On my way home to the United States, I visited this nursery, which is in the garden of Luxembourg, at Paris. There are upwards of 2,000 different grape-vines, labelled, numbered, and properly registered; but on inquiry about the work of M. Bosc, I was informed by the director of the garden, that it was never finished, and the drawings, executed on parchment, were lost.

I hoped to have had an opportunity of comparing my work with the great work of M. Bosc, but that was now impossible, and I had to content myself with the inspection of the vine nursery, where I found also our Catawba and Isabella, as the representatives of the grape-vines of the United States.

This nursery has added many a good and useful vine to the great number already cultivated in France, and the table has thereby obtained many a fine specimen of nature's handicraft.

Why could not three or four acres of the Mall, in this place, be set aside for a similar national enterprise? And why could not our consuls, and our naval officers, spread over the whole globe, be directed to send and bring home cuttings of wild and cultivated grape-vines from the respective districts and countries they visit, to be here planted and trained in various ways? Let an intelligent vine-dresser attend to it; let him keep a regular journal of all their peculiarities; of their time of blossoming, setting, ripening, &c., and I am sure we shall soon ascertain that there are many vines which will answer our purpose; and we shall have laid the foundation of a new and useful branch of agriculture, which will prove an important addition to that great department of industry, the main source of our national wealth, and the best promoter of liberal institutions.

C. L. F., *Ed.*

WASHINGTON, Dec. 1st, 1852.

MERINO SHEEP.

In tracing the history of the Merinos in the United States, from its earliest date to the present time, we find that the number of fine-wooled sheep can be but limited, and that the wool of the flocks bred from Merinos imported from various countries of Europe, cannot be possessed of an uniform and decided character.

This highly important branch of husbandry, has had to contend with many difficulties ever since the first importation of Merinos, which fact must however be principally ascribed to a want of correct knowledge of the Merino sheep, and its proper treatment.

Our wool-growers bought their experience dearly, and they have come at last to the conclusion, that the thin-fleeced short-stapled Saxon Merino or Electoral sheep, with a light skin and poor carcass, are not the kind of sheep which will repay food, labor, and the interest on the capital invested in such flocks; they have found that in order to succeed and to make sheep-breeding a profitable business, they must introduce the heavy-fleeced Infantado breed, with a large carcass, heavy folded skin, producing a wool which will answer the demands of the manufacturers, and will satisfy the consumer of the fabrics made therefrom.

Much has been done of late to introduce that description of sheep; some of our intelligent wool-growers have visited Spain, to procure specimens of that once so celebrated stock, but to their great disappointment, they found them entirely run out. The Spaniards, misled by the success of the Saxons, and for fear of losing the reputation of their wool, have, like them, aimed at fineness, but being destitute of the intelligence and perseverance of their northern rivals, have destroyed not only the distinct character of their most famous flocks, but have produced, like the Saxons, small animals with a thin fleece and short staple, without having obtained that high degree of fineness and evenness of wool, for which the Saxon Merinos are so remarkable.

There exist only a few flocks of the Infantado breed on the Continent; these are the flocks at Rambouillet in France; the descendants of the sheep presented by the King of Spain to Maria Theresa of Austria, and those raised from the Spanish Merinos presented to Frederic the Great.

The Rambouillets have been kept pure and intact from foreign intermixture. Those of Austria and Prussia, are also of pure Spanish origin, but have been improved as to their wool, through careful breeding. The demands on the flocks of the Rambouillets, since the worth of the old original Infantado, and breeds of similar qualities, has been revived again, is very great, and the eager purchase from the continent of Europe, from Australia, and the United States, cannot be supplied with the number required.

The size of the Rambouillets is much increased from their rich and abundant food, and it has been found that they are raised more to please the eye of the purchaser, than to render the service required from them, and thus proving generally of little use to sheep-breeders. The Rambouillets seem to be possessed of a deformity which is not only unpleasant to the eye, but which may have also an injurious effect upon their health. The *Journal d'agriculture pratique, &c. Paris*, 1852, remarks, that at the last public auction, which came off at Rambouillet on the 18th of April, 1852, there were offered for sale 49 young rams about 18 months old; and it goes on to say, "That lot, when seen together, was not pleasing to the eye: almost all were *saddle-backed*, some slightly, but others again to such a degree, that many a wool-grower would not use them for his flocks. This evil, it is said, has been caused by a single ram, and the whole flock of Rambouillets is now infected with that deformity to such a degree, that it will require years to eradicate it."

In Saxony, there are some establishments where sheep of renowned good blood are raised for sale; and they also feed high in order to develop the young animals rapidly, and to give their fleeces that heavy, healthy appearance and abundance of yolk, which makes the wool feel soft to the touch; but they prove, like the fattened Rambouillet, of a delicate constitution, and are of not much service to breed from.

The Infantado flocks of Austria and Silesia, have not yet been made the object of speculation; the wool-growers of those countries aim still at the greatest perfection of the short-stapled Merinos, and it is only of late that the rich heavy-folded animals, with a long combing wool, are again sought after. The Infantados of the above-named countries, are not prepared for show; they are perhaps less striking as to size, when compared with the Rambouillet, but there is no doubt they are much more hardy and much more serviceable to breed from, and possess also a rare evenness of wool, a beautiful staple, besides a heavy fleece.

It affords me great pleasure that I can say, that I have been instrumental in assisting two enterprising wool-growers of Vermont, to procure for them a select number of the last-mentioned Infantados. The same wool-growers visited Spain and France, and not having been very successful in those countries, they also came to Germany in search of good sheep. At that time I was resident at Stuttgart as U. S. Consul, when the gentlemen called on me for assistance to carry out their object, to which I cheerfully responded. We went together into Saxony and Silesia, examined many flocks, and we were at last recompensed for our trouble; we found the very description of sheep my fellow-travellers were looking for.

From letters I have received since, I learn to my pleasure, that they are very much pleased with their purchase, and it is hoped that their enterprise will be followed up, so that more of that fine breed will be brought to this country, in order to lay the foundation of a pure and improved Infantado breed.

I am aware that of late many Merinos have been imported, and it is expected that they will answer the present demands of our wool-growers, and that they may succeed in establishing all over the Union, Merino flocks from which animals of pure blood and great perfection, to breed from, can be obtained.

We must be careful, however, not to produce *too many famous crosses* or *breeds;* we have unfortunately already *too large a number* of *celebrated flocks* in this country, each and every one possessing, according to the account of the owners, all the superior qualities which nature even is not able to produce: we read of the exquisite fineness of a single woolhair, without mentioning, however, the difference which exists between that hair and the woolhair from other parts of the fleece; neither are we told how the staple looks, &c.

We hear of enormous weights of fleece, without being informed of the fineness of the woolhair, the state of the wash, and the quantity of food consumed.

Besides these extraordinary qualities, these sheep are of enormous weight, but the breeder of these prodigies does not state how many pounds of hay, oats, or corn, they have consumed; neither how much the pound of meat costs produced in that way.

The speculation of some wool-growers to produce *these extraordinary breeds*, who make "unanswerable demands on nature," may injure our wool-growing interest again; it may lead to results similar to those in New South Wales. The results of Australian wool-growing should serve us as a warning. Thinking it might interest our wool-growers to become acquainted with the difficulties which exist in that highly-favored country for the sheep, I have copied an article, on sheep, from a paper published in New South Wales, which seems to have been written by some one who is well acquainted with the subject, and candid enough to state the errors which they have committed, and confessing openly to the world, that they have legions of breeds, but none of any consequence.

On the Management and Diseases of Australian Sheep: from the "Peoples' Advocate and New South Wales Vindicator." November 8, 1851, vol. iii., No. 159.

It has been said, and perhaps not without some cause, that the Saxon sheep are more subject to disease than any others. Many go further, and maintain that catarrh and some other maladies, are hereditary in the race. This must be an error of judgment; there is no such inherent disposition. But when any disease breaks out in a mixed flock, the Saxon affinities become first affected, from their less hardy nature; and the opinion hence may have been adopted. This explanation, it is to be hoped, will be so far satisfactory to the admirers of this valuable variety of the genus ovis. The introduction of the *Leicester breed* may be denounced as a curse to the colony. Instead of breeding for the attainment of fine wool, and maintaining the superiority which our soil and climate promised us to expect, the rough-wooled, large-bodied Leicester must be introduced to retract back to the old original stock. In fact, Australia is not the land for the Leicester. Our frequent dry seasons, the occasional scarcity of food, operate unfortunately for the thriving of the large-sized animals; and nature appears, in many instances, to take the matter summarily into her own hands, limiting the growth by the means of supply.

The *South Down.* The chief recommendation of this breed is for fat. Their delicacy of constitution and greater size, do not recommend them to Australian pasture.

Crosses: that name is legion, and large enough, in all conscience. The Cape, Indian, South Downs, Leicester, Saxon, Spanish Merino, Anglo Merino, Lord Westerns, French Merino, Cheviots; and these jumbled, blended, mixed, re-re-crossed, in neither arithmetical nor geometrical ratio or progression, according to no law, judgment, or reason, but guess-work, hap-hazard, chance, luck, or blundering, make up the bulk of our stock. The upshot of all such patchwork leaves us in the awkward botched situation of having no definite breed,—speaking generally, either for carcass or wool—a sort of mongrel stock-nondescripts; having lost the good qualities—bulk of body and fineness of wool.

This indiscriminate mixture, from unskilful management and the voracious appetite for numbers, now bring the reward usually awarded by the lady president, Nature, when her laws and authority are outraged—bare pastures, burrs, and thistles!—liens on wool, liens on stock! If we would confess our errors then, there may be some hope of amendment. A stock quite Australian (and the Merino blood could still be found or selected), reared by skilful breeders, is just now a desideratum of high importance.

We sadly want a Captain Macarthur to lead the way and direct operations. The spirit of improvement has yet to visit Australia. We are scattered, isolated, disunited. Few owners will admit that their stock degenerated. They are paragons of perfection; and yet—tell it not in Leeds, publish it not in London—how many may be found who cannot, although managing their own stations, tell the distinctive marks of a Saxon or of a Merino ram.

Fine-wooled sheep have been kept unimpaired, without decrease of carcass or declining qualities of wool, when prudent and intelligent breeders have applied their skill and abilities with perseverance. We never stood in greater want of scientific knowledge and its dissemination, than at the present time. We require principles, established on the foundation of experience and judicious selection; and the man who would come forward and volunteer the forlorn hope, would entitle himself to public gratitude, and to the highest honors the country could bestow. . . . . .

To what purpose are we breeding just now, between Saxon and Merino types? Tell me, babbling echo! To render confusion more confused; to graft in the Merino blood the defects and imperfections of the Saxon race, without obtaining one single advantage either in body or wool; but which might be got from the cultivated Merino alone, if any care was bestowed on its improvement.

The agriculturist, the gardener, and the florist, never expect to rear good crops, rare or useful fruits, or beautiful flowers, without much care, skill, and pains; nor need the Australian flock-owners flatter themselves that the country and climate, much as it may have done, much as it may yet do, will always continue to produce paying productions, whether animal or vegetable, without incurring a little outlay of skill, and of capital also, for improving the breed, and raising of food sufficient for their necessary support and healthy condition."

The subject of sheep-breeding and wool will occupy a prominent place in our future pages. We intend to give full accounts of the numerous experiments and improvements, which are in progress in Europe and at home, in relation to this important branch of husbandry.

C. L. F., *Ed.*

MISCELLANEOUS.

THE UNITED STATES PATENT-OFFICE REPORTS CONSIDERED ABROAD.

The journal "Le Génie Industriel," published in Paris, gives for the benefit of those interested in the production of sugar, the article on the sugar-cane, with all the illustrations of the various kinds of cane, &c., and those of Mr. N. Rillieux's apparatus, as furnished by Mr. Ch. L. Fleischmann, for the Patent Office report for the year 1848. The same journal for the month of March, 1852, vol. iii., p. 162, mentions that Mr. Rillieux's apparatus has been introduced in France by Messrs. Cail & Co., under the name *appareil d'évaporation à triple effet.* These gentlemen built a Rillieux apparatus for the beet-sugar manufactory of Messrs. Clovis, Godin & Co., at Cuincy, near Douai, where it has been in operation since the 27th of September, 1851, without interruption, and they believe that it will finish the entire crop without requiring cleaning or repairing.

F. J. Cail & Co. say, "We have the satisfaction of knowing that the enlightened beet-sugar manufacturers are in favor of Rillieux's apparatus, which is a new step towards the economy of beet-sugar manufacture; it requires less fuel, less animal charcoal, less labor, and it furnishes a sugar of the best quality." We are very much gratified to see this ingenious American invention on the continent of Europe.

WORKING OF THE NEW ENGLISH PATENT LAW.

The new patent law, which came into operation on the 1st of October, furnishes a pertinent illustration of the invigorating influence of practical reform. Under the old *regime* the average number of English patents taken out during the year was five hundred, or about ten each week. In the first three weeks of October, 1851, there were only twenty patents sealed. During this year the number of provisional registrations and completed specifications amounted to no less than four hundred and sixty-one. It may perhaps be supposed that out of so large a number a great proportion of the application for patents must be of trivial importance, and for very trifling inventions. So far, however, as an opinion can be formed from the titles, the inventions are full as large in scope and of as great value as the average of patents under the old law; for example, the improvements relating to the spinning and weaving of textile fabrics are 38; inventions relating to shipbuilding, 19; in agricultural implements, 15; in steam-engines, 15; relating to motive powers, 10; in railway locomotives, 10. There are improvements in lighting and ventillation, in refining sugar, in dyeing, in mining operations, in printing, in galvanic batteries, and voltaic engines, &c. The alteration in this law also affords an additional proof of the important fact that the reduction of restrictive taxes not only tends to increase production, but to augment revenue. The cost of an English patent, independent of fees to agents, was formerly £100. The annual revenue derived by the Government from that source was therefore, on the five hundred annual patents, £50,000. The new patent law will yield more than a quadruple increase to the revenue, upon the supposition that three-quarters of the provisionally registered inventions are protected for three years only.

London Correspondent of the National Intelligencer, Dec. 6, 1852.

OKRA HEMP.

We are indebted to Major Scott for a specimen of hemp which was made from the okra plant. It has been ascertained that ropes can be made from the fibres of the okra, as strong and durable as those made from hemp, and it is not improbable that the culture of this plant may soon be as extensive in the Southern States as that of hemp in the Middle States. It is said that upwards of three tons of okra hemp can be raised on a single acre of land. The seeds of okra are said to be a good substitute for coffee, and if they can be allowed to ripen before the plant is cut for hemp, the land may be made to yield a double product to the planter.—*Nat. Int.*

The okra requires a rich soil, but if it can be substituted for hemp, we predict its early extensive culture in this country. It is raised with the utmost facility in the vicinity of Washington, where in good soil it grows to the height of six and eight feet. This we have on the statement of Prof. Page, who has cultivated it largely this season for the market, merely on account of the seed-vessels, for soups, etc., and for drying them for use out of season, which has now become a large business. It cannot be too strongly recommended.

NEW STEAM AND GAS ENGINE.

Mons. Galy-Cazalat invented, according to the *Comptes Rendus* of September last, a new oscillating steam and gas engine without piston or valve. It is put in motion by the combined forces of steam and the gases arising from the furnace, or by means of steam and diluted air, heated up to a high temperature. The inventor, in comparing his invention with the ordinary steam-engines, says that an engine of 1000 horse-power constructed after his plan would cost only one-half the price; it would take only half the amount of fuel to work it, and require one-half of the space of an ordinary steam-engine now used on the steamers.—[We have *our doubts*, but are willing to wait. *Eds.*]

FOR HORTICULTURISTS AND AMATEURS.

Mons. Troccon in France has obtained a patent for a new kind of flower-pots. Troccon's pots are made of wire-gauze, of perforated tin, or galvanized sheet-iron. These pots are placed within another pot made of china or glazed ware: the space between the outer and inner pot is filled with earth. Should the plants be set out in open ground, the gauze pot is taken from the ornamental vase and placed in the soil; the roots communicate through the openings of the perforated pot with outer soil, and derive nourishment from it. When winter approaches the pots are taken up and again placed in ornamental or other pots.—*Génie Industrielle*, No. 19, 1852.

MANUFACTURE OF GLUE FROM SHEEP'S FEET.

When the skin is removed from the feet, the thick bones are taken out, and the foot split in two, without separating it entirely. They are then put into slaked lime for 60 days; after that they are placed in a vat with lime-water, made of fresh quicklime, where they remain for eight days. They are then washed, cleaned, and put for three days in fresh water, and afterwards dried. This kind of glue is worth from 30 to 34 francs 100 kilogrammes. Sheepskins prepared in the above-described manner give a glue worth 60 fr., hogs'-skins 90 fr. per 100 kilogrammes.—*Ib.*

HATTERS.—NEW MODE OF SEPARATING THE FUR FROM RABBIT-SKINS.

Two pounds of quicklime are made into lime-water: to this is added a solution of 5 ounces of potash and 4 ounces of common salt, dissolved in a gallon of water. The whole mixture is boiled, and when cold it is put on the rabbit-skins with a brush, at a temperature of about 18° Reaumur or 73° Fahr. In a short time after the fur can be separated from the skin without difficulty. It is stated that the fur obtained in this way is much easier worked in felting and fulling than that obtained by the common mode, and the whole operation is much easier: one man can perform in the same space of time what ten are scarcely able to accomplish in the old way.

Jahrb. and Wien. Polyt. Inst. Bd. 15, p. 268.

GUTTA-PERCHA.

Fonorbert and Pruckner, in Berlin, treat gutta-percha in the following manner: the crude gutta-percha is first rasped, and then soaked in water, by which means the impurities, sand, &c., separate. The soaked mass is brought between rollers, when it is still more divided. These small particles are then passed through hot rollers, and rolled into thin sheets; the sheets are afterwards passed through other rollers, heated to a higher temperature until the gutta-percha acquires a dark-chestnut color. During the operation of rolling, from 3 to 5 per cent. of flowers of sulphur are thrown uniformly upon the mass. The impregnated mass is placed in a steam-boiler, where it is exposed to a temperature arising from steam under a pressure of eight atmospheres. The sulphur here unites thoroughly with the gutta-percha, and at that stage the color changes to a dark gray. The moisture is entirely expelled by the high temperature, and the escape-steam carries the sulphurous acid with it.

Dr. L. Elsner (Chem. Tech. Mitthl. 1810–1852, p. 82) found in analyzing a knife-handle made of gutta-percha, stone-coal tar, rosin, and saw-dust; he thinks that the saw-dust was mixed with the melted gutta-percha and stone-coal tar, and the mass pressed in moulds.

VARNISHES.

Amber Varnish.—The amber is carefully melted in a covered vessel, in order to remain yellow, and prevent ignition. Eight ounces of this amber are put in an iron pan, with from 7 to 8 ounces of linseed-oil varnish, and melted together; when cold it is mixed with 1½ to 2 lbs. of spirits of turpentine. The linseed-oil varnish is prepared by mixing half a gallon of linseed-oil with 3 ounces of pulverized umber and 4½ ounces of pulverized litharge.—*Polyt. Notizbl.* 1852, p. 26.

Varnish for Iron.—Varnish made after the following mode, makes a very durable and handsome protection for iron: 2 parts wood-tar oil, 250 parts asphalt, and 250 parts of rosin are melted together in an iron kettle: the mixture is diluted with oil of turpentine.—*Polyt. Centralbl.* 1851, p. 1083.

TO PRESERVE THE WHITE AND YOLK OF EGGS FOR VARIOUS PURPOSES.

Augier and Robert prepare the white and yolk of eggs to preserve them for considerable time without spoiling, in the following manner:

To prepare the Yolk of Eggs for tanning Glove-Leather.—500 grammes of the yolk of eggs are mixed in a mortar with 8 grammes of common salt and 24 grammes of starch, and dried in a warm current of air.

To prepare the Yolk for Toilette-Soap.—The oil of eggs, which has been obtained through pressure from carefully dried yolk of eggs, is saponified with potash. To 16 parts dried yolk of eggs one part of saponified yolk of the egg is added to a small portion of starch, and perfumed. This soap makes the skin exceedingly soft. Both preparations have a beautiful yellow color.

Preservation of the White of Eggs for Clarifying Purposes.—The white of eggs is mixed with the eighth part of its volume of water, and beat into foam. When the foam has settled, it is filtered through a woollen bag, and the filtrated portion dried upon plates of glazed earthenware (Fayence) in a current of air of about 86° Fahr.—*Moniteur Industr.* 1851, No. 1509.

TO MAKE CLOTH AND OTHER WOVEN ARTICLES IMPENETRABLE, ACCORDING TO EICHTHAL.

Ten lbs. of alum and ten lbs. of sugar of lead, each article dissolved separately in warm water, and the solutions mixed; the *clear* liquor, consisting then in a solution of acetate of alumina, is drawn off from the sediment and mixed with 125 gls. of water, in which one pound of isinglass is dissolved. The cloth to be prepared is placed in the liquor for twelve hours, then dried and calendered. Articles prepared after this mode are impenetrable to water, and are not attacked by insects. It does not prevent the perspiration of the body from passing off when worn for garments.

Bayer, Kunst, and Gewerbebl. 1850, p. 534; Polyt. Centralbl. 1851, p. 126.

IVORY PAPER

Is made of a quarter of a pound of parchment cuttings, which have been boiled with three pints of water for four or five hours—that portion of the water lost by evaporation must be replaced. The decoction is strained through linen. This glue is marked No. 1. The portion left in the linen is again boiled, which makes a weaker kind of glue, and is marked No. 2. Three sheets of good drawing-paper are first moistened with a sponge, and with glue No. 2 glued upon each other. Upon the paper is placed a slate; upon the back of which the edges of the paper are turned over and glued, and left to dry. Three other sheets of drawing-paper are managed in the same way, and glued upon the first three. After it is well dried, the surface of the paper is polished with sand-paper. To five-sixteenths of a quart of warmed glue, No. 1, three tablespoonfuls fine-sifted plaster of Paris are added, and this mixture is put on to the paper with a sponge, and when dry polished off with fine paper, and again covered with a coat of glue No. 1, dissolved in three parts of water. Oxide of zinc mixed with the gypsum will give the paper a yellowish tint like ivory. This paper is exceedingly well suited for miniature painting, and it has qualities which give it even a preference over ivory: the colors adhere better to it, and are much easier washed off, &c., &c.—*Leipz. Polyt. Centralbl.* No. 15, p. 238.

SWEDISH PAINT.

The following mixture is very extensively employed in Sweden as paint:
(*a*) 3 lbs. of rosin are melted in 20 lbs. of sperm-oil.
(*b*) 10 lbs. of rye flour are mixed with 30 lbs. of cold water to a paste.
(*c*) 4 lbs. of white vitriol dissolved in 90 lbs. of hot water.
The paste is first mixed with the white vitriol, and then with the mixture of rosin and sperm-oil, and the whole well mixed together. This paint is colored with ochre, venetian red, umber, &c., and applied to wood-works, especially to that kind of wood which suffers from the worm.

FIGURED PICTURE-FRAMES MADE WITH SILK RAGS.

The composition consists in—4 parts of rosin, 1 part of wax, 6 parts of glue, 4 parts of alum, and 12 parts of plaster of Paris. Rosin and wax are first melted together: to this is added the concentrated solution of the glue and alum, with the plaster of Paris. In this mixture small pieces of silk stuffs are thrown, and well stirred up with the composition. The mass is then colored and poured into moulds: the rags settle upon the face of the mould, and give the article a striped and figured appearance like marble. With this composition beautiful articles for ladies' dressing and writing tables can be made.—*Dr. L. Elsner*, *Chem. Tech. Mitth.* 1850–1852.

TO DYE WALNUT, POPLAR, AND OTHER WOODS MAHOGANY COLOR.

Mix sawdust or shavings of mahogany with rain or other soft water (hard water will not answer), and boil the mixture. The liquor makes an excellent dye, which is very durable: it does not bleach; on the contrary, it increases in depth.—*Ibid.*

CIDER.

Mode of making Cider by Du Tays.—The ripe apples are ground between rollers, and the pulp is placed in a tub, where it is left for 24 hours. The pulp is then pressed, and the juice strained and put in barrels; the barrel is well bunged. Next to the bung a hole is made, into which a small stopper of straw is put: this stopper is moved about every three or four days, in order to allow the carbonic acid gas to escape, and to prevent the barrel from bursting. After two months, when the cider is clear, it is drawn off into another barrel and bunged. If intended for sparkling cider, it is put in bottles about the latter part of February. The cider prepared in this way, and put in barrels, keeps sweet for 18 months.

Moniteur Industr. 1851, No. 1607.

WOOLLEN RAGS FOR MANURE.

The use of woollen rags for manure is well known. When once decomposed they act very powerfully, but the decomposition is slow, and they are not easily spread uniformly on land. Mons. Goubin therefore treats the rags with a weak caustic soda lye, and dries them. They are afterwards pulverized, passed through sieves, and in that condition put on the land. Four hundred pounds of such powder are sufficient for three acres of land. This manure is especially well suited for turnips, beets, and all such plants as require a short time for their development.

Agriculteur Practicien, Nov. 1850.

BURNT SUGAR FOR COLORING WHISKEY, ETC.

Lipowitz adds to each pound of sugar whilst being burnt, a half an ounce of crystallized carbonate of soda. This caramel, or burnt sugar, is much easier dissolved in alcohol of any strength, and gives it an intense brown color. Sugar prepared in this manner does not form any sediment, which is often the case with common burnt sugar.—*Arch. du Phar.* vol. 77, p. 284.

PERAS, AN ARTIFICIAL FUEL, ALSO CALLED PARISIAN STONE-COAL.

Nut-coal is washed, dried, and mixed with 7 to 8 per cent. concentrated stone-coal tar. The warm mixture is put in cubical forms, and submitted to a pressure of about 2000 kilogrammes (a kilogramme = 2 lbs. 3 oz. 5 dr.). Well-made peras have more consistency than most of the stone-coals, and they can be much better stowed in steamers. Doctor Elsner (Chem. Tech. Mittheil. 1850–1852, p. 15) remarks that a similar artificial combustible, consisting of nut-coal, brown-coal dust, turf, and stone-coal tar, has been often mentioned under the name of "Carbolein" in public print.

CEMENTS FOR STEAM-ENGINES.

Sixteen parts fine iron-filings, two parts salmiak, one part flowers of sulphur, are mixed together, and placed in a close vessel. When used for cement, to one part of this mixture 20 parts of fine iron-filings are added, and the whole moistened with seven-eighths of water and one-eighth of vinegar: the cement is then ready for use.

For Oil Cement are recommended: (1) 1 part of minium, 2½ parts of white-lead, 2 parts of clay, well mixed with linseed-oil varnish.

(2.) *Fast-dyeing Oil Cement.*—2 parts pulverized litharge, 1 part finely-ground sand, 2 parts lime in powder, and boiled linseed-oil.

(3.) A cheap and steam-tight cement is produced by a mixture of rye flour and linseed-oil with an equal portion of chalk.

Organ f. d. Fortschritte d. Eisenbahnwesens, 1849, p. 128.

STONE CEMENT.

According to Dr. Heller the following composition makes an excellent stone cement: Glue is soaked in cold water, afterwards heated, and fresh slaked lime added, until the mixture attains the proper consistency—the cement must be applied whilst warm. This cement acquires great hardness, equal to stone, and it is not influenced by water or moisture. When used for porcelain, glass, or metal, a small quantity of flowers of sulphur must be added. This cement never yields, and articles repaired with it break sooner in other parts than those where it has been cemented.

Polyt. Notizbl. 1851, No. 1.

CEMENT TO FASTEN LEATHER UPON METAL.

Fuchs (Gewerbebl. Koenigs. Wirtemberg, 1851, p. 196) soaks the leather in a hot solution of nut-galls, and applies it to the metal upon which it is to be fastened—the latter must be provided with a coat of glue. When dry, the leather will adhere so tight that it sooner tears than separates from the metal.

EXHIBITION AT THE METROPOLITAN MECHANICS' INSTITUTE, IN WASHINGTON CITY.

The first exhibition of the Metropolitan Mechanics' Institute, for the promotion and encouragement of manufactures, commerce, and the mechanic and useful arts, will be opened at the city of Washington on Thursday, the 24th day of February, 1853, in the new and splendid hall of the east wing of the Patent Office, the hall being 275 feet long by 70 feet wide.

To this exhibition the manufacturers, mechanics, artists, inventors, and all others desiring to display the results of their labor, skill, ingenuity, and taste, from all portions of the Union, are cordially invited to contribute. Every effort will be made by the proper authorities of the Institute to display whatever goods may be received to the very best advantage. Judges will be carefully selected to examine them, and suitable awards will be made to articles of superior merit in the several classes.

It will be the aim of this Institute to make this, and its future exhibitions, fairly represent, so far as possible, the industrial position of our country; whether regard is had to the raw materials which nature has so bountifully bestowed upon us, to the machinery by which these materials are prepared for the use of man, or to the finished manufactured product, replete with utility or beauty. Contributions are therefore earnestly solicited in all of these departments.

The Committee believe that the City of Washington possesses certain advantages for holding such an exhibition, which are worthy of the consideration of exhibiters throughout the country. Its *metropolitan* character secures a population composed of elements drawn from every quarter of the Union. It owes its present rapid growth and rising prosperity to the whole country, and neither shares nor is the object of those jealousies which commercial rivalry sometimes tends to produce. As the seat of government, the leading men of all parties, of all pursuits, and from every portion of our vast continent, congregate here. As the spot where all legislation upon the great industrial interests of the country is carried on, it stands most in need of practical illustrations of the condition of those interests. No-where in the country could an exhibition be more likely to contribute to the permanent and wide-spread reputation of works of superior merit, or to render greater service to the cause of American labor.

The only attempt at an exhibition that has ever been made in this city was eminently successful. We have now the advantage of bringing the measure forward under the auspices of a regularly-organized Mechanics' Institute, which, for the first time, appeals to the country for aid in carrying out its important and beneficent aims. The period of holding the exhibition has been selected with a view to avoid all interference with the exhibitions of other associations; and the Committee hope, on that account, to secure the hearty co-operation of all. Materials, machinery, and manufactures, which have elicited commendation at similar displays elsewhere, may find, among the crowds who will be gathered in our city at the interesting period of the inauguration, new admirers, and a new market.

The following rules will, in all cases, be strictly adhered to and enforced:

1st. The Hall will be opened for the reception of goods on Monday, the 14th day of February; and on the evening of Thursday, 24th February, at 7 o'clock, the exhibition will be formally opened for the reception of visitors. The exhibition will positively close on or before Thursday night, March 17th.

2d. No article deposited after Saturday night, 19th of February, can be entered upon the judges' lists for competition or premium, except such as the Committee shall be satisfied were dispatched from a distance in time to have reached the Hall by that day, but failed to arrive from unavoidable detention.

3d. Articles designed for exhibition only, will be received free of charge, until Tuesday night, 22d of February, at 10 o'clock, after which time depositors will be subject to a charge of from 50 cents to $1 for each article deposited.

4th. Apprentices and minors, who contribute articles of their own make or invention, shall specify their age, and the time they may have served at their business.

5th. All articles deposited for competition and premium must be of American manufacture, conspicuously labelled with appropriate names; the name of the maker and inventor (if known) and the name of the depositor; a copy of which label must be furnished the clerk at the time of bringing the goods for entry on the record. Prices may be affixed or not at the option of the exhibiter.

N. B.—Goods should be addressed as follows: "Exhibition of the Metropolitan Mechanics' Institute, Washington City," and should have the nature of the articles, and the name of the party sending them, distinctly marked on the package. They should also be accompanied by a detailed invoice.

Any further information will be given by applying (post-paid) to the Corresponding Secretary, to whom all communications on the business of the Institute should be addressed.

CHARLES F. STANSBURY, *Corresponding Secretary.*

THE AMERICAN

POLYTECHNIC JOURNAL.

ELECTRO-MECHANICS.—No. 2.

In case of the employment of small electro-magnets, or a great excess of battery power, the plan of changing poles works admirably well, for the changes are rapid, and the attractive and repulsive forces together keep up a continual action. There are, however, several objections to this plan of operation.

First. The repulsive forces are very feeble compared with the attractive forces, and the disparity between these forces is greater in electro-magnets than in permanent magnets.

Second. It is very important in using the repulsive forces, that the stationary and revolving magnets should be charged to the same extent, otherwise attraction would occur instead of repulsion. If two similar poles of electro-magnets are brought together, they will attract each other when one pole is much more highly charged than the other. The equalization of the charge in the revolving and stationary magnets is very difficult to obtain, and appears to be utterly impracticable where the engine is of any size. Besides various accidental causes, there is one prominent and principal cause. It has been before noticed that the charging of a magnet required time, and this generally in proportion to the size of the magnet. Now if we bear in mind that the cut-off or pole-changer of an engine must always work contemporaneously with the engine, then we shall see that if the engine revolves fast, the magnets which are to have their poles changed have not time to acquire their full charge. If the engine revolves slowly, then the magnets have more time to acquire their charge; but another difficulty follows if the magnets are of any size, viz., the retarding forces increase; and from several electro-magnetic engines of large size, which we have made and tested, we have not been able to fix upon any *working velocity.* They ought to have more power when working at a low velocity, and in fact they do; but the rate at which the greatest power is manifested, when the magnets and engines are large, is so very slow as to be unfavorable in most mechanical operations. This was not expected of the "*Lightning engine,*" but thus it is.

As said before, electricity is quick enough in its movements, but when it has to operate through the medium of electro-magnetism, it seems quite too slow for our purposes. In fact, the nature and effects of the retarding forces have been less studied in connection with electro-mechanics than other points of less importance. We are led here to notice a very common error upon the subject of electro-magnetic engines. We often hear the remark that it would be very easy to increase the power of a rotary electro-magnetic engine by increasing its diameter, and thus increasing the leverage. So we might, to a certain extent, if it were not for the very difficulty we have just mentioned. The further the magnets are from the centre of motion, the more rapidly they have to move, and in addition to the extra weight we shall find that the magnets have less and less time to receive their charge, as they are placed remote from the centre, with a view to the increase of leverage. Thus there seems to be no reason for making an electro-magnetic engine of large diameter, except for the sake of room for magnets of a large size. Referring to Fig. 1 we shall understand readily the nature of this difficulty in charging magnets in an engine, and equalizing the intensity of charge in the revolving and stationary systems. The revolving system of magnets is represented in the magnetic poles *a d*; the stationary system by *b c*; the cut-off or pole-changer is represented by the cylinder of insulated segments *e*, and the conducting-arm *h*. We must suppose that there are as many segments in the pole-changer as magnets in one of the systems. In the present plan, the conductor *h* is supposed to be moving in the direction of the arrow, and the magnetic pole *a* has been attracted up to that point where its change of poles must commence, and repulsion to ensue between *a* and *b*, and attraction between *a* and *c*. Before change of polarity can take place, the whole charge of magnetism must be neutralized, and a reverse polarity established. It takes time to neutralize the charge and time to establish the charge of the opposite character. The pole *a* is moving in the direction of the arrow, and as the arm *h* passes from one segment to the next the change in the magnet commences. During therefore the whole time of the subsidence of the magnetism, the pole *a* is moving away from pole *b*, which retains its permanent charge, and they attract each other, and the motion may be such that *a* will arrive opposite to *c* before it has lost its charge, and the reverse polarity commenced, and therefore instead of being attracted by *c* it may be to some extent repelled by it. Hence it may be pushed back by *c* and pulled back by *b*. If the reverse polarity commences before *a* has passed beyond the reach of *b*, then it will be somewhat attracted by it, instead of repelled, unless the charge should rise at once in *a* to near the intensity of *b*. These retarding forces therefore operate to some extent whether the motion is slow or quick, and we perceive how the magnet may fail to receive its full charge when it is moving rapidly. Indeed, the machine or engine not carrying any load may revolve so fast as that the magnet intended to be changed shall not experience any change of polarity, the *back action* being overcome by the momentum of the moving magnet. This element of time required for the maximum development and subsidence of magnetic force, exists, whatever the texture, quality, and size of the magnets. It is influenced and perhaps arises from the action of secondary currents, which we shall explain in our next.

Fig. 1.

C. G. P., *Ed.*

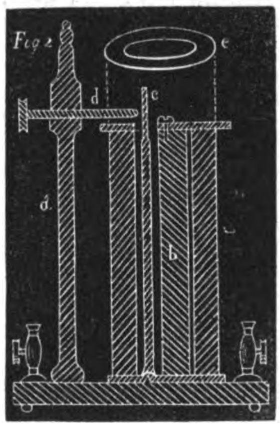
(To be continued.)

ON A NEW ELECTRO-MAGNETIC APPARATUS FOR EQUALIZING MOTION FOR TELEGRAPHIC AND OTHER PURPOSES.

BY PROF. CHARLES G. PAGE, M. D.

This is believed to be the first contrivance in which the varying force of magnetism has been compensated in one and the same electro-magnet. When an armature is presented to an electro-magnet, it is attracted with a force varying inversely as the square of the distance, or, most probably, as the cube of the distance. If this armature is to be connected with machinery, it is necessary to regulate or equalize its force by means of a spring, which of course interferes with the attraction of the armature to the extent of the tension of the spring.

Fig. 2 is a vertical section of the apparatus, which we shall call the *Compensated Armature; a a′* is the helix, which is of an ovoid form in its cross-section, as shown by the extended outline sketch *e*. The opening in the helix is quite oblong, and almost rectangular in shape. When a bar of iron is suspended within a circular opening in a charged helix, the bar tends *towards* the sides or walls of this opening, though this tendency is very feeble. If two iron bars are put into the circular opening, they repel each other, and tend to take positions against the walls of the opening opposite to each other. If the opening in the helix be oblong, then a bar of iron will move with considerable force towards either end of this opening, and if two bars be placed in the opening they will each be impelled from each other by repulsion and also by the peculiar action of the helix, and they will occupy the ends of the oblong opening.



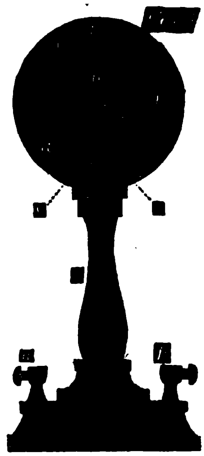
These combined actions are taken advantage of in the *Compensated Armature. b* is a bar of soft iron fixed within the oblong opening, and occupying about two-thirds or more of the opening. *c* is another small bar of soft iron, having a small rod of brass inserted in its top, and supported below upon a knife-edge or pivot. *d* is a screw-stem passing through a pillar, and has upon its tapered end a bit of platinum. Opposed to this tip, there is a piece of platinum upon the brass rod *c*. When the electric circuit is completed in the helix, the bar *c* is repelled by the bar *b*, and is also impelled by the helix towards the side *a′*. It is probable that the repulsive action of the magnet and the impelling action of the helix, both obey the same law, and thus give nearly an equal action throughout the motion of the rod *c*. If *c* and *d* are included in an extra or local circuit, as in telegraphing, each time the circuit is made and closed with the helix, *c d* will come together and close the extra circuit. If necessary, a very light spring may be attached so as to bring the armature *c* back against the magnet. The action between *b* and *c* being repulsive, there is no tendency to adhesion between them. This instrument has been tried upon a short telegraphic route and works well. In the instrument used there was no spring used, the bar *c* merely falling back by its own weight, from a slight inclination of the instrument. Prof. Page has made arrangements to apply for letters-patent for this invention, and also for one for the same purpose, and involving the same principle, to be described in our next number.

C. G. P., *Ed.*

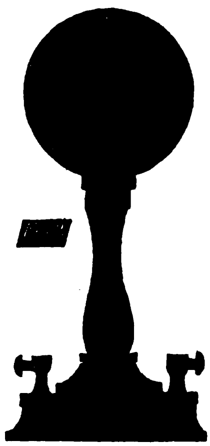
ON A NEW THERMO-GALVANOMETER.

BY PROF. CHAS. G. PAGE, M. D.

This instrument, contrived by me some years ago, and made about three years since by Mr. Ari Davis, is designed to measure the quantities of galvanic currents by their heating powers. It is founded upon the principle of Regnier's metalline thermometer, in which the expansion of metallic rods by heat is indicated by means of the curvature of the rods in their middle, both ends being fixed to a frame.



In Fig. 1, *a a*' are two plates of hammered German silver, which metal is selected on account of its low conducting property, and other very suitable qualities. These plates in the instrument are about three inches long, one-twentieth of an inch thick, and one-tenth of an inch wide. For delicate operations they should be made of smaller dimensions every way. The upper ends of these plates enter slight depressions in the cross-bar of brass *b*, which is fastened firmly to a dial plate of brass *d*. The lower ends of the plates *a a*' are fastened to pieces of brass *c c*, which pieces are insulated from each other, and also from the metallic stand *e*. This stand is hollow and the wires represented by dotted lines; within the stand are connected each respectively with the plates *a a*' and the binding screw-cups *p n*. One end of a cord is attached to plate *a*, thence it passes over a little pulley on the plate *a*', thence over a pulley on the top of the pillar *h*, and to the other dependent end of the cord is attached a small weight. The cord is wrapped twice around the pulley *h*. The axis of this pulley passes through the dial plate *d*, and has attached to it the index hand *m*, as seen in Fig. 2. When the poles of the galvanic battery are connected with the cups *p n* the current passes up the wires within the hollow stand, and through the German-silver plates. As they expand they bend outwardly, raising the cord over the pulleys, and thus move the index. The plates *a a*' should be nearly parallel when not conveying the current, and as they expand they form an arc, the versed sine of which is many times greater than the longitudinal expansion, that is, for a slight increase in the length of the plates there is a very considerable lateral motion at the middle of the plates, which makes it a very sensitive instrument for the purpose.



C. G. P., *Ed.*

TECHNICAL CHEMISTRY.

[Translated for the American Polytechnic Journal.]

ANCIENT ALLOYS.

An extended work has been published by J. A. Phillips respecting the different coins and armor of antiquity, in which he compares their composition with their historical relations, so far as these can be ascertained. It is divided (omitting the historical introduction, which is not pertinent here) into, one part, which treats of the method of analysis, another part respecting the results obtained, and the conclusions drawn.

As to the method, Phillips* previously convinced himself, by means of a common solution, prepared for the purpose, of a quantity by weight of pure silver, tin, silver, lead, and copper, that neither the method given by Pelouze or Levol of determining the copper is sufficiently accurate, because in both cases the influence of atmospheric oxygen, which misleads, is not prevented. He therefore prefers, after the precipitation of the lead by sulphuric acid, and the silver as chloride of silver, to precipitate the copper, with a solution of caustic potash. Instead of weighing the chloride of silver exactly, which appears uncertain, in so small quantities as are proposed on the average for the investigation, he collected it on a filter, and after washing and drying, calcined it, yet without the chloride of silver being melted. The filtrated ashes obtained were immediately wrapped up in a piece of sheet lead with some carbonate of soda, and tartrate of potash, and melted down in a crucible prepared with borax and carbonate of soda, and the pure lead (Bleikornig), containing silver so procured, refined upon the cupel. The quantity of lead must always be large in proportion to the chloride of silver, and of course free from silver, or consist of a definitely known proportion of silver. The proving of this process, with the artificial mixture mentioned, gave for the metals employed, sufficiently accurate results: they were therefore with some modification retained for the cases following. Small quantities of iron, cobalt, and nickel, rendered it frequently necessary first to precipitate the copper, as copper glance (protosulphide of copper), in order then to separate the iron in the filtrated solution by means of benzoate of ammonia, from nickel and cobalt, and these with the hydrocyanite of potash from each other. If there was sulphur present, this precipitated in the developments of the alloy, as sulphate of lead, with the oxide of tin. By digesting the precipitate with carbonate of soda, the sulphuric acid in this can then be carried over, and after the requisite operations with chloride of barium, may be determined. In the absence of lead, the determination of the sulphur is effected directly by an addition of chloride of barium to the filtrated fluid of the oxide of tin. The table B contains the results estimated in 100 parts, and No. 1 to 19 the mean value of the two analyses. Of a number of other coins the proportion of silver only is determined directly by means of cupellation.

* Chem. Soc. Qu. J. N. 252; Edin. Phil. J. lii. 75; Ann. Ch. Pharm. lxxxi. 206; Pharm. Centr. 1852, 101, 115.

TABLE B.

		Obverse.	Reverse.	Color and state	Age.	Weight in grains.	Spec. Weight.	Copper.	Tin.	Lead.	Iron.	Zinc.	Silver.
1	Roman As	head of Janus	a ship	Iron gray at the fracture; blistered	500	4150	8·59	69·69	7·16	21·82	0·47		
2	Half As or Semis	head of Jupiter	S	brittle	500	1997	8·64	62·04	7·66	29·82	0·18		
3	Quadrans	head of Hercules	The sign: OOO	do.	500	970	8.58	72·22	7·19	19·56	0·40		
4	Hiero I.			yellow, shining, compact; very hard.	478	?	8·72	94·15	5·49		0·82		
5	Alexander the Great				335	108	8·69	86·77	12·99				
6	Philip III. Macedon				323	83·3	8·71	90·27	9·43				
7	Philip V.				200	164	8·59	85·15	11·12	2·35	0·42		
8	Athenian Coin	head of Minerva	a naked figure with a thunderbolt	very hard	?	89·5	8·61	88·84	9·95	0·63	0·26		
9	Egyptian do., Ptol. IX.	head with beard	an eagle with a thunderbolt		70	387	8·81	84·25	15·64		trace		
10	Pompejus	head of Janus	bow of a vessel	hard, brittle; cast.	58	809	8·70	74·17	8·47	16·15	0·28		
11	Family of the Atilians.	do	bow of a vessel, under it Roma	hard, brittle; coined	45	466	9·02	68·69	4·86	25·43	0·11		
12	Julius and Augustus				42	842	8·64	79·18	8·00	12·80	trace		
13	Augustus and Agrippa	2 heads	Crocodile and "COL: NEM"	very hard and brittle; yellow	30	288	8·65	78·45	12·96	8·62	trace		
14	Family of the Cassii			softer than all above named	20	365	8·52	82·26			0·35	17·31	
15	Nero		a sitting Roma	yellowish	60	435	8·59	81·07	1·05			17·81	
16	Titus			yellow, soft	79	178	8·50	83·04			0·50	15·84	
17	Hadrian	Fortunæ reduci.		yellow, covered with patina	120	365	8·80	85·67	1·14	1·78	0·74	10·83	
18	Faustina, jr.	Pietas		whitish, brittle, without patina	165	362	8·83	79·15	4·97	9·18	0·23	6·27	
19	City of Samosata		sitting figure of the city	grayish, coarse, brittle, without patina.	212	274	8·58	70·91	6·75	21·96	trace		
20	Victorinus. sen. *a*	Provitentia Aug		tolerably hard, without patina	260	87·7	8·77	95·37	0·99	trace	trace		1·60
21	" " *b*	Salus Aug.		without patina	260	87·6	8.78	97·18	0·10	trace	1·01		1·76
22	Tetrius, sen., *a*				267	37·8		98·50	0·37	trace	0·46		0·76
23	" " *b*				268	45·25		98·00	0·50		0·05		1·15
24	Claudius gothicus, *a*	Spes publica		tolerably hard	268	52·2	8·81	81·60	7·41	8·11			1·86
25	" " *b*	Juna regina			268	58·3	8·71	84·70	8·01	2·67	0·31	trace	7·98
26	Tacitus, *a*	LibertasAugusti			275	66·3	8·72	86·08	8·63	4·87			4·40
27	" *b*	Pax publica			275	49·5	8·70	91·46			2·31		5·92
28	Probus, *a*	Clementia Temp			275	52·2	8·72	90·68	2·00	2·33	0·61	1·39	2·24
29	" *b*	Mars Victor			275	49·0	8·74	94·65	0·45	0·44	0·80		3·22
30	Sword blade, broken	Found in the Thames, under the Chertsey bridge, 17 inches long			Probably they are all from the times before Christ.	1 lb.		89·69	9·58		0·33		
31	" "	Found in Ireland, 8 inches long				4 oz.		85·62	10·02		0·44		
32	" "	do. do. 8½ " "				6 "		91·79	8·17		trace		
33	Lance head, "					11½"		99·71					
34	Battle-axe (Celt)					10 "		90·68	7·43	1·28			
35	" "					1 lb.		90·18	9·81				
36	" "					4 oz.		89.38	9·19		0·33		
37	" "					5½ "	8·09	88·61	10·79	3·20	0·58		

Remarks.—No. 2 was defective; No. 1, 0·57; No. 2, 0·23; No. 3, 0·28; No. 9 contained traces; No. 33, 0·34 cobalt; also No. 1 traces; No. 2, 0·19; No. 3, 0·20; No. 33, traces of nickel; No. 3, 0·65 cobalt and nickel; Nos. 1, 2, 3, 7, 9, 12, 13, 14, 30, 32, 34, traces; No. 5, 0·6; No. 33, 0·23; No. 36, 0·24, sulphur. The copper in No. 1 has been determined from the difference.

		Inscription.	Weight of the coin in grains.	Contents of silver in per cent.
1	Aurelia	..Restituti Orbis	57·2	2·90
2	"	..Fortuna redux	50·5	2·96
3	Severina	..Providentia Deorum	54·5	4·37
4	"	..Concordia militum ..	54·0	5·80
5	Tacitus.......	..Libertas Aug.......	61·4	4·90
6	Victorius, sen..	..Pax Aug...........	38·0	2·20
7	" "	..Providentia Aug....	35·7	1·10
8	Tetrius, jun...	..Pietas Aug.........	31·5	0·38
9	" " ...	" "	44·0	0·41
10	Quintillus	..Fides militum......	52·4	2·32
11	"	" "	33·8	2·25
12	Marius	" "	43·7	5·15

According to the results of this analysis and the tables, the older coins are essentially alloys of copper, tin, and lead; but the latter ingredient, with few exceptions, only comes in any considerable amount in the coins before the time of Christ, and often is wholly wanting. Zinc appears as a part of the coin first shortly before the Christian era, and disappears again almost wholly about the time of the thirty tyrants, when its place is supplied by a certain percentage of silver. Of the latter Phillips believes that it was purposely added in order to raise the value, which certainly was not the case with the iron, cobalt, nickel, sulphur, as pure mixtures. The proportion of lead, of the older coins probably, was designed to make the melting easier, as these were cast. As to the later alloys abounding in tin, stamped and yet so hard and brittle, Phillips believes that they were wrought while yet warm under the die or stamp. In no case do the coins consist of unalloyed copper. Even in the pieces of armor examined, there was found only one (No. 33) pure copper; they otherwise consist of copper and tin, nearly in the proportion of 10 to 1, with an addition of lead, which probably served to remedy the too great brittleness of the metal.

R. Hunt analyzed a fragment of a vessel found in an ancient furnace of bronze, probably of Phœnician origin, and which was rusted over the surface, and found—72 per cent. of copper; 9·0 tin; 4·0 iron; 3·0 earthy matters; 12·0 carbonic acid, oxygen, and waste.

ALLOYS OF SILVER COINS.

The proportion of silver in French coins (legally = 0·900) differed in particular pieces about 3·14 thousandth part, as Levol found, and on this account, because the alloy is a mixture of silver, will be in the combination $Ag^3 Cu^4$, which precipitates very easily in an unequal manner. He proposes this combination as the legal alloy (which would thus contain 0·719 silver).

SILVER-PLATING BY MEANS OF COMBINATIONS OF CYANOGEN (CARBURET OF NITROGEN).

By decomposing the ferrocyanate and ferridcyanide of potash with a salt of silver, we obtain, it is well known, solutions which are as well adapted to galvanic plating with silver as the double salt of cyanate of potash with cyanide of silver. Bouilhet undertook the solution of the question, as to what takes place in the mixture of those salts, and whence the property of this mixture for galvanic silver-plating is to be traced.

As to the yellow ferrocyanate of potash, according to the usual prescription for a silvering fluid, dissolve it in six parts of water, and add somewhat more than one-tenth of its weight of chloride of silver. Since the ferrocyanate of potash exists in it in such excess that the pure exhibition of the combination of silver formed could not be obtained, Bouilhet substituted a more simple recipe by boiling for an hour a solution of one part of ferrocyanate of potash with 8 parts of cyanide of silver. This formed a dirty blue sediment; the fluid filtrated from it was colorless, now was an alkaline reagent (which before was not the case) produced under the influence of the galvanic currents a plating of silver, showed itself free from iron, and by crystallization yielded a salt consisting of cyanogen, silver, and potash. For the purpose of quantitative analysis, Bouilhet converted a quantity by weight of it into sulphates, and determined the weight of the same in a red-hot state (a particular experiment had taught that there would be no loss in it), as well as the proportion of silver and sulphuric acid. The value thus obtained, as well as the determination of the cyanogen, by burning another portion of the salt with chromate of lead, produced the proportion in equivalents of 2 Cy + Ag + K. In order to examine the sediment more closely, the exhibition of the silvering fluid was repeated in a particular apparatus with the exclusion of the air. The sediment now appeared gray, and on exposure to the air or by means of chlorine, took a blue color, and became a cyanuret of iron. Bouilhet therefore concludes that the adaptedness of the fluid in question to plating with silver, is owing not to the iron being fully eliminated from the solution, but absolutely to the formation of the double combination Cy Ag, Cy K, which he thus explains: in the bringing together of the ferrocyanite of potash with the cyanide of silver, the cyanite of potash is immediately found (hence the introduction of the alkaline reaction), and also ferrocyanide of silver, which in boiling decomposes into one equal part of cyanuret of iron and two equal parts of cyanide of silver; the latter combines with cyanide of potash formed at the beginning into a double salt = Cy Ag, Cy K. If any one chooses to employ, instead of the cyanide of silver, as in the original recipe, some other salt of silver, as for example chloride of silver, then (in place of cyanate of potash) there is formed chlorate of potash and cyanide of silver, which reacts on the residuum of the ferrocyanate of potash as before. Synthetic experiments, which were instituted for the confirmation of this explanation, gave for a definite weight of materials the amount of double salts nearly, which is shown by the theory, provided that the boiling is carried on at least three hours, by which the sediment gradually takes a red color.

If a solution of ferridcyanide of potash be decomposed with cyanide of silver in the same proportions as in the ferrocyanate of potash, there is immediately formed a blue deposit which at last by continued boiling becomes red, while the fluid itself is perfectly colorless. When filtered it shows the same properties as those exhibited in the case of the ferrocyanate of potash; it plates in the galvanic apparatus, is free from iron, and contains a salt which, analyzed according to the method described, appears as Cy Ag, Cy K. When the process was made with the exclusion of the air, the deposite was not blue but brown, but gradually passed into red, with the extrication of the cyanuretted hydrogen, and then exhibited the properties of an oxide of iron. It is also properly a cyanide of iron, which is decomposed afterwards under the influence of the boiling heat and the water. From the products formed (cyanide of silver, cyanide potassium, hydrocyanic acid, and cyanide of iron), Bouilhet draws the conclusion, that the connection of the process is wholly analogous to that of the decomposition of the ferrocyanate of potash by means of cyanide of silver; there is therefore first formed from the ferridcyanide of potash and cyanide of silver, ferridcyanide of silver and cyanide of potassium; the first is decomposed into cyanide of iron and cyanide of silver, which then combine with the cyanate of potash. By the use of another salt of silver (for instance, chloride of silver), there is formed ferridcyanide of silver and a corresponding salt of potash (chloride of potash), whereupon the same reaction as before takes place. In this case also the synthetic confirmatory experiments gave nearly the quantity of double salt estimated by theory, and the same of the latter with the simultaneously formed deposit (when this is taken into the account as cyanide of iron, after an analysis made at the close), very nearly the weight of the ingredients used.

Pure cyanide of silver (exhibited by means of the introduction of hydrocyanic acid in a weak solution of nitrate of silver), boiled with cyanide of potash, yielded a salt, which in the analysis proves to be double salt Cy Ag, Cy K. In similar circumstances, in the galvanic apparatus, it yields nearly as much silver as the other two fluids for silver plating. Bouilhet concludes his investigation by stating that whichever of them may be used, the double salt named is the only true agent in the silver-plating.

COATING OF ZINC WITH OTHER METALS.

Lüdersdorff engaged in the investigation of the ways and means of discovering a mode of coloring articles of zinc with other metals, and particularly the chemical method by simple immersion or rubbing on. As a steep for the restoration of the pure metallic surface, he finds for small articles, which can be dipped in, that a mixture of two parts of concentrated nitric acid and one part of sulphuric acid is the most suitable; for larger articles, as for instance statues, they are to be washed with a solution of potash and ammonia. For coating with the metals under consideration, he proposes it be done by means in part of tartrates (for zinc, copper, bronze), partly by cyanide of potash (for gold and silver). In reference to the recipes for the various solutions, and the necessary manipulation, we refer to the treatise itself.

METALLIC COATINGS GENERALLY.

Prescriptions for the galvanic coating of metals with brass, are given by Heeren; and Steele, those for fluids for galvanic bronzing, tinning, copper-plating, plating with silver and gilding with the well-known agents; while Grissel and Redwood give those for other metals in the usual way.

COATINGS OF IRIDESCENT COLORS.

According to Bergeat thin coatings of iridescent colors may be obtained on bronze and brass in the galvanic method, if the article be brought into connection with the carbon end of a Bunsen's battery, and it be dipped into a lye of 500 grammes of caustic potash with one quart of water, which has first been boiled with litharge. On closing the circuit the color takes place, and runs through gold-yellow, orange, red, into blue and green. According to Geubel, one might obtain such coatings on sheet-copper, if sulphuretted hydrogen is applied to its surface, when it has been moistened with muriatic acid.

SALTS: POTASH.

Bley finds, in the Illyrian potash lately again brought into market, after it has been unknown there for some years; in two specimens, for the 100 parts:

Carbonate of potash	78·75	82·85
Carbonate and sulphate of soda	12·50	12·50
Silicious earth and gypsum	8·75	4·65

Gatty has obtained a patent for combining the manufacture of tartaric acid with carbonate of potash. He uses for this the neutral tartrate of potash, which continues in solution after the saturation of the tartaric acid with chalk. According to the specification of the patent, this solution must be mixed with the requisite quantity of milk of lime, and after the transposition has taken place carbonic acid gas be conducted through it. The fluid, which at the end of the process contains carbonate of potash, must be drawn off clear from the tartrate of lime, evaporated, and the residuum calcined.

VAREC OR KELP.

Golfier-Besseyre has investigated a variety of kelps obtained on the French coast. He made use with a few modifications of the methods given by Gay-Lussac, by lixiviation, as well as the thermometrical analysis for determining the proportion of salts of potassa to the salts of soda. Thirty-four sorts collectively in the treatment with water left an insoluble residuum or very difficult to dissolve in it, consisting of sand and earthy salts. The proportion of the soluble salts to this residuum varied between the two extremes 20·5 : 79·5, and 72·5 : 27·5, it was therefore between $\frac{1}{5}$ and $\frac{8}{11}$ of the whole. The dissolved part, which alone was closely examined, consisted of salts of potash and of salts of soda, in very fluctuating proportions, and according to the classification of bases and acids chosen by Golfier-Besseyre within the following limits: the sulphate of potash varied from 44 to 11 per cent. (the sum of the soluble salts), and sank even in one case to 2 per cent.; the chloride of potash from 35 to 12 per cent. even to 0·36; the iodide of potash reached only to the hundredth of a per cent.; the chloride of soda varied from 70 to 9 per cent.; the carbonate of soda, which in such products stands in the background, from 17 to 9 per cent., and sometimes was altogether wanting; the sulphate of soda was mostly wholly wanting, yet once reached to the height of from 18 even to 35 per cent.; and likewise the hyposulphite of soda as an exception reached to 20 per cent., but mostly was wholly wanting.

MARINE SALT.

Schrotter and Pohl analyzed two kinds of sea salt found in commerce, one of which was from the salt-yard of St. Felice, in Venice (*a*), the other from that of Trapani, in Sicily (*b*). Both kinds dissolved in water left a residuum consisting of lime, alumina, oxide of iron, magnesia, phosphoric acid, carbonic acid, and quartz sand; the filtered solution proved to be free from carbonates, from combinations with fluorine, phosphates, bromine, and iodine. The analysis gave in 100 parts of the salt mixture contained in the solution:

	(*a*)	(*b*)
Chloride of soda	95·91	96·35
Chloride of magnesia	0·46	0·50
Sulphate of soda	0·40	0·51
Sulphate of lime	0·49	0·45
Insoluble residuum	0·16	0·07
Water	2·58	2·12

SALTPETRE.

According to Gentele, for the purposes of manufacturing nitrate of potash from nitrate of soda, a person must pour a solution of the latter into a boiling solution of as much potash. There is deposited a carbonate of soda, which must be drained out. The remainder of the soda may then be separated from the saltpetre by reducing it to powder.

As to the presence and profit of saltpetre in Hungary, Szabo and J. Moser have made communications. On the examination of crude saltpetre, see the report for this year, page 627.

SOAP.

In reference to the preparation of soap, with an addition of starch, which is regarded as necessary in many soaps for the toilet, but in the common soap in bars is considered an adulteration, Pohl states that a soap of this kind for some time has been found in trade at Vienna, and which may be prepared in the so-called cold method by stirring in it from 6 to 10 pounds of starch, 40 to 50 pounds of tallow, and 100 pounds of soda (made with 110 pounds of lime, to a caustic lye of 18° Beaume). The product feels elastic, is quite white when cut, entirely homogeneous, and is wood-brown when dried. The starch in it may be indicated by iodine. One specimen gave, 53·82 per cent. of fatty acids, 6·31 of not perfectly pure starch, 36·41 of water, and 3·60 of soda and waste.

MORTAR AND HYDRAULIC LIME.

Schafhäutl, in a contribution to the history of cements or hydraulic mortars in England, gives a series of historical and technical notices, especially respecting Roman Cement, Portland Cement, and the so-called Concrete, as to which we refer to the treatise.

In an appendix respecting the shining stucco of the ancients, Schafhäutl seeks to supply the chasms in the theory of the stiffness of the mortar, by hints in which he intimates that there is between fluidity and solidity a third or middle condition, which is available in the phenomena mentioned, as well as in the geological, but is yet much too little noticed. The chemistry for this middle state, the "*Straitochemie*" as opposed to "*Hygrochemie*," the doctrine of combinations of soft bodies, must first be established.

Schafhäutl incidentally mentions, in the treatise referred to, an analysis conducted by him of the Sheppey Stones, *i. e.* nodules of lime (*a*) found in the Isle of Sheppey, which serve for the Roman (Parker's) cement. Pohl analyzed an hydraulic lime (*b*) of Sievering, near Vienna. The analyses gave for 100 parts, especially for that with muriatic acid,

SOLUBLE PARTS.	(*a*)	(*b*)
Carbonate of lime	67·12	48·36
Carbonate of magnesia	1·33	2·50
Protocarbonate of iron	5·50	3·50
Protocarbonate of manganese	1·35	trace
Alumina	0·41	10·31
Sulphate of lime		trace
Phosphate of lime		trace
	75·91	64·67

INSOLUBLE PARTS.	(*a*)	(*b*)
Silicious earth	16·51	30·98
Alumina	4·20	1·72
Oxide of iron	1·03	trace
Oxide of manganese	0·61	trace
Lime		0·80
Magnesia	0·41	
Sulphate of lime		trace
Potash with traces of Soda	0·88	
Bitumen		1·47
	23·64	34·97

La Roche found in an hydraulic lime belonging to the lias formation, and quarried at Wiesloch, used among others for the building the harbor in Manheim, by two analyses the results (*a*) and (*b*). Adler, in a powder bought as Portland cement, the result (*c*):

	(a)	(b)	(c)
Lime	42	44·0	48·16
Oxide of iron	3	3·0	12·00
Alumina	12	10·5	3·12
Silex	4	4·3	27·00
Carbonic Acid	35	36·0	7·66
Moisture and Waste	4	2·2	
Sulphuric Acid			2·06
	100	100·0	100·00

Marignac examined two specimens of hydraulic lime from the Drance:

Carbonate of lime	50·25	50·36
Carbonate of magnesia	40·95	41·99
Clay	8·17	7·05
Water	0·92	0·37
	100·29	99·77

WHITE LEAD.

The kinds of white lead analyzed by J. A. Phillips, as already mentioned in p. 357 of this Report, according to the Dutch method, did not always exhibit the same condition. The usually good and successful product was hard and firm (*a*), yet here the white lead was obtained in some pots, soft and spongy, and easily crumbled between the fingers (*b*). As the subsequent analyses of Phillips proved, this is not owing to the difference of composition, yet there were among them certain kinds (as *c*) which varied from the usual compound.

Name of the White Lead.	Carbonic Acid.	Oxide of Lead.	Water.	
W. Blackett's	11·26	86·51	2·23	(*a*)
Darlington's	11·62	86·36	2·05	
W. Blackett's	11·58	86·11	2·34	(*b*)
Darlington's	11·53	86·27	2·21	
W. Blackett's	12·58	85·52	1·58	(*c*)

All the five sorts were wholly free from acetate of lead. If these products agree with Mulder's, yet on the other hand they differ from those of Richardson. Phillips supposes the reason to be in the too great degree of heat in which the latter dried the white lead, for by means of the experiments instituted, it lost at 150° all the water in combination, and at 170° the carbonic acid.

CHROMATES.

According to Swindell, the extrication of chromates from chromate ores by heating red-hot the pulverized ore with common salt, chloride of potash, or hydrate of lime (according as the manufacture is of salts of soda, potash, or lime), must be undertaken in the commencing glow of white heat, in a reverbatory furnace, while a stream of very hot vapor is conducted over the mixture, which must be often stirred up.

LIME BLUE.

Gentele examined a blue calcareous oxide of copper (containing lime), which is to be found in commerce under the name of Lime Blue. A less beautiful species of lime blue is obtained from the precipitation of sulphate of copper in a very thin milk of lime in excess, and set in the cold. The more beautiful kind examined in preference by Gentele is obtained by the precipitation of a solution of 100 parts of sulphate of copper and 12½ parts of sal-ammoniac, by means of milk of lime, of 30 parts of burnt lime, in the cold. The fluid after some days becomes perfectly colorless. A solution of blue vitriol, mixed with an excess of ammonia and dropped into lime water, gives the same precipitate (*a*), which decomposes in washing, and becomes soluble in ammonia. If we drop lime water, or milk of lime, into an ammoniacal solution of copper, there also appears a blue precipitation, which in the beginning again dissolves; if milk of lime be added to it, until it begins to be permanent, and then it is immediately filtered, the fluid yields elegant blue needle-shaped crystals (*b*). With a sufficient addition of lime the fluid is likewise wholly colorless. The analyses gave:

	(*a*)	(*b*)	
Water	18·76	26·01	27·00
Sulphuric acid	11·20	23·83	
Oxide of copper	46·85	33·56	33·44
Lime	16·19	16·19	
Waste (Carbonic acid)	7·00		
	100·00	99·59	

Gentele estimates from (*b*) the formula, $5(CaO, SO^3. 2HO) + 7(CuO, 2HO)$; the analyses likewise agree as well with the more simple proportion 2 : 3 of the two members, and hence he constructs a recipe for its preparation. When sulphate of ammoniacal oxide of copper is digested with sulphate of lime there is no such deposit. Potash and soda used in place of lime produced deposits of another kind as might be expected. The presence of ammonia makes the hydrated oxide of copper far more certain, and renders the exhibition easier.

COLORS IN OLD PAINTINGS.

Dumas and Persoz have investigated the chemical nature of the substances used in old paintings of the 13th century, on the wall of the Sainte Chapelle at Paris. The painting is on a gold ground, the gold ground being laid on a coating resembling varnish (this consists of 81 per cent. of oxide of lead, and 19 of fatty acids), the upper layer of which is colored red with red lead. The white of the painting proved to be a preparation of lead soluble in acetic acid (probably white lead), a kind of blue was recognized as a phosphate of iron, another blue as ultramarine, a deep red as cinnabar, brown as well as yellow as ochre. The rose in some flowers appeared at first to be lake of madder, but probably was identical with the color which is obtained by pulverizing a rose-red muscle (*Tellina fragilis*) that abounds on the coasts of France; a violet similarly circumstanced resembled also the powder of the violet portions of the shells of the *Neritina fluviatilis*. These colors, the Report concludes, were not oil colors ground with varnish, but appear the rather to have been put on dry by dusting over the surface smeared with varnish, just as certain earthenware is glazed.

PREPARATION OF GLASS—CLOUDING OF GLASS.

Splitzgerber makes the observation that many kinds of glass by moderate heating in the spirit flame become clouded, cracked, and rough, but only on the surface. It is evident that this is a sign of poor glass, melted with too much alkali or too little lime, which on this account becomes more or less affected by a drop of melted chloride of lime smeared over it. This clouding and becoming cracked is caused by the expulsion of the moisture combined with the upper surface of the glass, and depends on a yet invisible decay from the influence of the atmosphere. One piece of such glass yielded him $\frac{1}{6}$ per cent., another 1 per cent. of water by heating. When the clouded surface of a glass is polished off, the new surface no longer exhibits the appearance.

ON THE WORKING OF WOOD.

A historical sketch of the devices employed in working in wood, including sawing, planing, turning, boring, mortising, carving, and other ornamental work.

It has been said that the history of the progress of civilization would be recorded, if the history of the invention of some early and useful tool could be written: fanciful as this may seem, there is undoubtedly a near association between the progress of the mental development and culture of man, and that of the mechanic arts; this was noticed and commented on by very early writers, and has often been repeated in modern times: no such history has, or can be written; in fact, a written language is itself an indication of so high an advance in art, that all the earlier epochs are buried in the clouds of dim tradition, and the seal of uncertainty and oblivion has been placed upon them.

No material has so much or so long engaged the thought and skill of man as the working and fashioning of wood for his wants and purposes; it was his earliest aid probably in the first stages of his progress, and has maintained its predominant position in supplying his wants, comforts, and luxuries up to the present moment, and in the highest stages of civilization. To enumerate the purposes to which it is, or has been applied, would require volumes; and a detail of the machinery devised for working it would fill a library. In bringing to the notice of our readers some of the prominent manufactures of wood, and the machines employed therefor, we shall confine ourselves principally to the improvements of the last two or three centuries, and to those lines of manufacture which have been, or may be, usefully introduced into this country.

The first important use of wood by man was the formation of habitations, either in part or whole of that material, the gradual advance from the tent-pole of the nomadic tribes to the more permanent habitations formed wholly of wood, solid and durable, form a continuous series in the progress of man, from rudest barbarism to civilization: the hut of logs is the rudiment of the coming town, the collection of a family under one roof the nucleus of future society. The log hut of the pioneer on the outskirts of civilization requires but few tools; the woodman's axe will do all for its construction in its rudest form; if doors of thin material be wanted, the addition of a saw is an aid; if any part is framed, chisels or their equivalent are required; by placing these chisels in a stock planes are formed, with which the surface of the finer parts can be smoothed. With the aid of these tools and some others, devised by the advancing refinement and increasing wants of cultivated man, more seemly works are accomplished—by saws, hammers, nails, and the like, beautiful edifices arise, tasteful and comfortable; the wainscot of the walls becomes highly elaborated; carvings and ornaments adorn the balustrades and hand-rails; mouldings are made to give a finish and beauty to the structure, showing the progress of taste and wealth, and wondrous skill and labor. This does not wholly satisfy; the labor required for the production cannot be requited; easier modes must be devised, and labor-saving machinery is suggested, and implements for making elaborate ornaments more regular and more speedily than could be done by hand are constructed—these we shall try to trace, not from their inception, but from the earlier and ruder forms to the present more perfect organization.

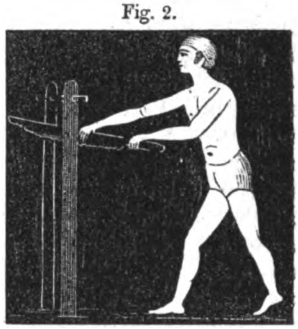
The most difficult and laborious operation is to reduce a log to one or more large flat surfaces, such as squared timber, or slabs in the form of planks and boards; this was first done by splitting and hewing—next by sawing. And this implement, the saw, shall first engage our attention, as one of the most primitive as well as useful tools to which other than manual labor was applied, or of which an organized machine was formed for the working of wood.

Saws were known to the ancients. One has been discovered in a private tomb at Thebes, together with some other carpenters' tools, and is now preserved in the British Museum; the blade is ten inches and a half long, and one inch and a quarter broad at the widest part; the teeth are irregular, and seem to have been formed by a cutting instrument struck against the edge of the plate, thus raising a sort of tooth or burr. The following is a representation of this curious old relic.

Fig. 1.

In Rosellini's work on the antiquities of Egypt are several representations of the saw and its uses; the one which we have given a copy of is taken from an Egyptian painting: a man is represented in the act of sawing; the teeth of the saw are tolerably well formed, and altogether it is a creditable implement, not unlike the handsaw, except the handle, which in this instance is straight, like a modern key-hole saw. The Egyptian saw seems to have been made of brass, like many other tools of that wonderful people.

Fig. 2.



Among the ruins of Herculaneum a curious picture has been discovered, representing the interior of a carpenter's shop, in which are two figures engaged in cutting a piece of wood with a frame-saw. In the bench on which the wood is laid there are a number of holes, into which the cramps that hold the wood are put; these also are similar to those of modern times. This is the earliest representation within our knowledge of a frame-saw for two persons. A frame-saw is shown upon an altar in the *Musé Capitolin* at Rome, with the frame and twisted cord for tightening the saw quite like a modern implement of the same kind.

The commonest saws now sold in the market are, according to Hebert, made of plate-iron, hammer-hardened, and planished upon an anvil, to give them a degree of stiffness and elasticity: such instruments are, however, nearly worthless. The better kinds of saws are made of shear or cast-steel. In the English manufactories, after the steel is rolled out into plates and cut into form by shears the edges are filed, and then, by a clumsy and unmechanical process of manual labor of the most disagreeable and fatiguing character, these flat surfaces are slowly ground level on a grindstone; some skill, and great physical power are required in this operation. Next, the teeth are cut in a fly-press, or more expeditiously by a die-cutter moved by steam. After the teeth are cut and trimmed the plates are hardened and tempered; the saws are then planished and submitted to a grinding process, as before spoken of, upon a large grindstone. The plate is held against the circular face of the stone by an interposing board, against which the grinder presses with all his force. In order to grind it as evenly as possible the workman stands on tiptoes, stretching over the stone, which revolves with great rapidity; his hands, arms, breast, and knees, being all brought into action to produce the desired effect, while he becomes wet and covered with the debris formed by the operation. This primitive manipulation is superseded in this country by a grinding machine, which does the work better and much more expeditiously. The process of grinding impairs the flatness and elasticity of the saw-plates, and they are consequently hammered again. A substitute for this last process has been invented in the United States, and recently patented, by which the saw-plate, when properly heated, is struck by a very heavy iron casting or hammer, covering the whole surface, and bringing the plate down upon an anvil of equal size, thus finishing the operation at a single blow. We are not aware that sufficient experience has yet been had to determine the value of this device, but it certainly shortens the time required to manufacture the saw. The hammer marks made by small hammers are taken out by passing the plate lightly over a grindstone, and then polishing on a buff-wheel with emery.

To make the surfaces of saws truer than by grinding, Gen. Bentham, in his patent of 1793, proposes to stretch them upon a proper bed or support, and by a reciprocating motion their whole surface is brought under a cutting tool. This would seem to be the first iron-planing machine described.

Returning from this digression upon the manufacture of the plate, we are next to notice the teeth, and the varieties in their forms which have been from time to time adopted, according to the skill and knowledge of the mechanic, and the purpose for which the saw was intended, the fancy of the constructor, or inventor; often without any true understanding of the requirements of the tool, or power of adapting it to the work to be performed. The following are among the most prominent varieties of forms of modern saw-teeth. A is a hand-saw tooth; in this, as in most of the others, the teeth are set, or bent alternately to opposite sides, beyond the face of the plate, as shown in the plan. In filing these teeth to sharpen them their outer edges are left the longest, so as to form an obtuse cutter, as shown at *a*; the front side of the tooth is perpendicular, and the rear side inclined more or less: this seems to be the oldest form of tooth, and is commonly called the hand-saw tooth. It is filed so that the face *b* of every other tooth shall be in a line parallel with the line *a*; the others are at an opposite angle, parallel with the line *h*. The purpose of this saw is generally to rip or split planks lengthwise of their fibres, and it is required to cut very little on either side; but it will be perceived that the greatest amount of cutting edge is at the side, and very little if any true cutting surface is left at the upper edge or point of the tooth; the consequence is, the operation is one of abrasion, and not, properly speaking, cutting, and so far the tool is ill adapted to the service. A saw so formed is rarely ever perfectly set; and if it is not, the work done by the teeth will be very unequal. Those teeth that are set the widest perform an undue share of the work, are soonest dulled, and cause the rough, uneven surface upon the face of the kerf, so well known to workmen: these irregularities of course increase the labor. When critically examined, the ordinary saw will be found the most incorrectly constructed tool of modern times. For cross cutting, the side edge is useful; but as the only part that cuts is the extreme point, which is set outward, the operation may be termed scratching rather than cutting. Many difficulties present themselves in changing the character of this tool, and so far it seems to have defied the ingenuity of man to radically improve it. B in the diagram is the *peg*, or *fleam*-tooth, and is used in cutting both ways; it is a very stout and durable tooth, but is subject to most of the objections of that first named. The *cross-cut tooth* C is like the peg-tooth,

Fig. 3.

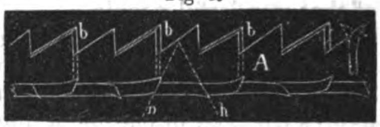


Fig. 4.

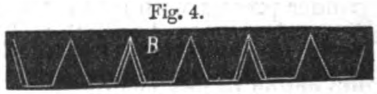


Fig. 5.

but there is no straight space between the teeth. These last are generally used with two men, one at either end of the saw, as in pit-sawing. D represents gullet or brier-teeth, in which, in addition to the two inclined lines that form the point of the tooth, there is a deep rounded notch cut out at the base in front of the tooth, forming what is technically termed a gullet; this enlargement is for the purpose of holding a greater quantity of shavings or sawdust than the obtuse angle of the tooth would admit; and also to allow the tooth to be sharpened with a flat or half-round file;—this tooth is generally set in the same way as those before named, its only advantage is, that the tooth is stouter. Sometimes saws are made materially thicker on the toothed edge than on the back, as in pruning saws for green wood, shown in diagram E. And it has been attempted to spread the points of saw teeth for cutting wood as at F, in the same manner as saws used by smiths in sawing metal, but they were found to anchor in the wood, and on the whole were unserviceable.

Fig. 6.

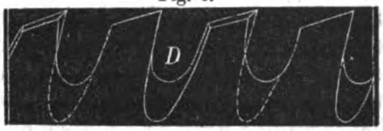


Fig. 7.

A recently patented improvement in ripping saws, whether for cutting plank, resawing or slitting, seems to promise a valuable advance in the improvement of saws, and may lead to many others, we therefore describe it more particularly. The newly invented tooth, Fig. G, is in its general characteristics like the gullet-tooth; but instead of the back of the tooth *a* being formed at an angle, as all the gullet-teeth heretofore made have been, the back inclines a little distance from the edge *b* of the tooth, and then extends back in a line parallel with the cutting edges;—the cutting edges themselves are spread, as shown at diagram F; the teeth are filed sharp, and then finished by passing a file lightly over the face of the whole to straighten them, and turn their cutting edges into an exact line with the course of the saw in cutting. Saws made on this plan for hand or mill purposes, have been found to perform nearly double the work, with a given force employed, to what could be effected by saws of ordinary shape. It is obvious that these saws are not adapted to cross cutting; but they seem to leave but little to be desired in ripping or similar work, where the cut is to be made lengthwise of the fibre. The advantage of the straight breast *a* on this tooth is to prevent the tooth from anchoring in the wood. It can only enter as far as the breast, and is then made to cut like a plane, bearing upon the straight portion of the tooth; the action is like that of a series of narrow planes, it cuts instead of scraping or abrading the fibres, which renders the work easier, and causes the saw to last longer.* There are many other intermediate forms of teeth besides those figured, but we do not propose to go into minute details. It has been attempted to use plane-cutters on the sides of saws, to plane the material as it is cut, and curved teeth have been made in very early times, hooking alternately in opposite directions, so as to cut either way; but these devices have proved more fanciful than useful: and when originally discovered, were soon abandoned and

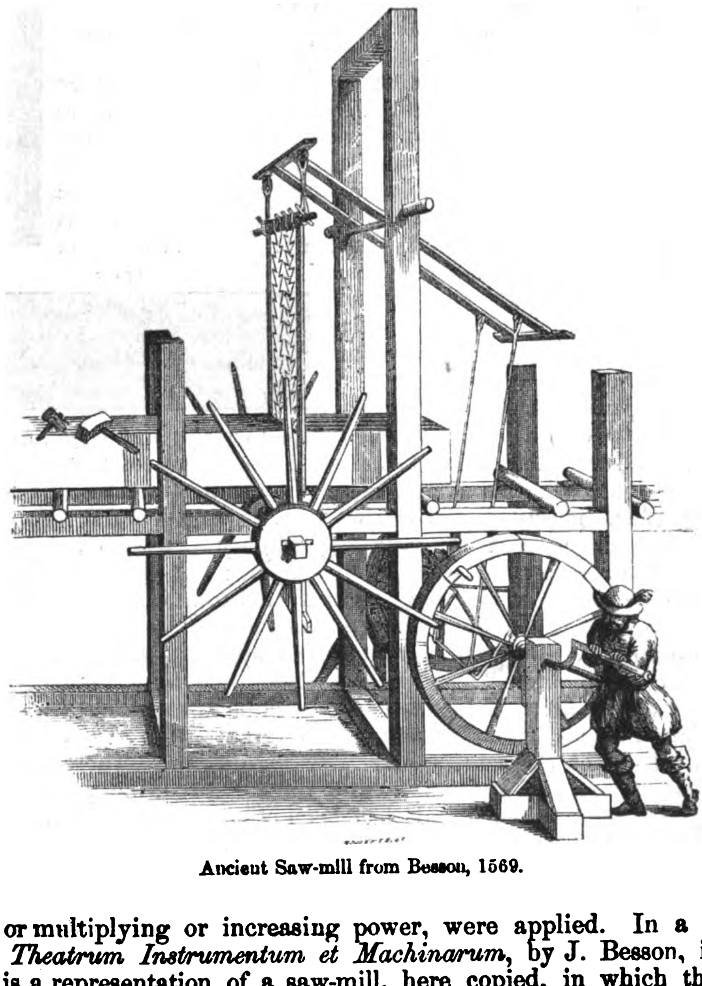
Fig. 8.

* This ingenious and simple invention is patented by H. Knowles, Esq., late machinist of the Patent Office.

forgotten till resuscitated by some subsequent inventor, to be again consigned to oblivion.

Saw-mills are of great antiquity. In the fourth century a saw-mill was erected on the river Roeur, in Germany: this was probably but a rude and primitive effort, for at a much later date they were considered as new and uncommon. Upon the discovery of Madeira, in 1420, mills were there erected for sawing the excellent timber of that island into planks, showing that saw-mills were well known at that date. About the same time the cities of Breslaw and Erfurt had saw-mills; but a knowledge of them was not universally diffused, for the Bishop of Ely, ambassador of Queen Mary to Rome about 1555, particularly describes a saw-mill he then saw for the first time. They were not introduced into England till the eighteenth century.

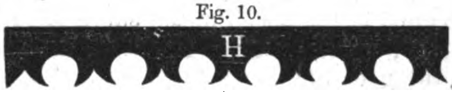
Saw-mills were in early times devised to work by manual labor as well as by water, and to this machine many of the crude devices for saving



Ancient Saw-mill from Besson, 1569.

labor, or multiplying or increasing power, were applied. In a rare old work, *Theatrum Instrumentum et Machinarum*, by J. Besson, in 1569, there is a representation of a saw-mill, here copied, in which there is a gang of saws, one half of which saws have their teeth formed to cut on the downward stroke, while the intermediate ones are formed to cut on the upward stroke. The device for hanging and vibrating the saw is ingenious for the employment of manual power: and the log is fed forward by means of a windlass and cord on rollers, the windlass having arms extending out from it which are struck by a pin on the fly-wheel upon the crank shaft, that turns the windlass at intervals, by which the log is moved a given distance at every revolution of the crank. In the next engraving of the same volume there is another saw-mill, with a singular form given to the teeth, as more clearly represented in the separate diagram H, in which it will be seen that every alternate tooth hooks one way, while the intermediate ones hook in the opposite direction; or rather, there are two hooked cutters on each tooth, whose points turn in opposite directions, for the purpose of cutting as well on the upward as the downward stroke of the saw. It will thus be seen, that at this early period gangs of saws were known and used;—and in fact, all the elements were known for feeding in the log and sawing by power as early as 1588, as shown in Ramelli *Le Diverse et Artificiose Machine*, published in that year.

Fig. 10.

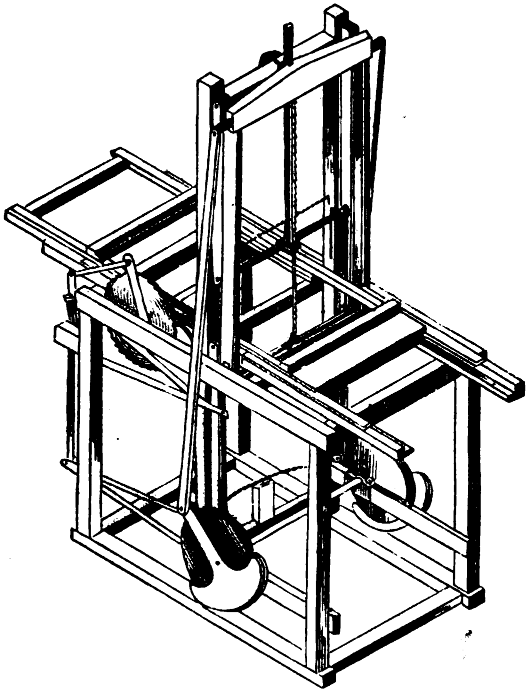


In modern times most of the improvements in saw-mills have been confined to setting the log, guiding and supporting it, and guiding the saw and straining it in the gate, or dispensing with the gate, or guiding the same; for many of which patents have been taken.

When one saw only is used in sawing a log up into planks, each time the saw runs through the log, the log itself must move sideways far enough to permit the saw to cut the next plank, or else the saw must be moved; the latter has been suggested, but never to our knowledge successfully put in practice. The log lays upon a carriage, moving lengthwise on proper rails or other fixtures, supported by head and tail blocks, one at each end; and sometimes, when the log is very long, intermediate supports are temporarily applied; and generally a roller or other fixture is situated near the saw, to resist the force of the cut. To set the log, the parts of the head and tail blocks to which the log is dogged or fastened, have a lateral motion given them either by hand, or by some contrivance by which they are rendered self-acting; the object is to throw the log quickly and accurately to one side, without passing the proper point. The devices for this purpose have been screws, racks, and pinions or pawls, put in motion by stationary projections, against which the part to be moved strikes just before the carriage is quite run back to the point from which it commences its next forward movement.

For guiding balks of timber, Bentham, in his patent of 1793, says: "If the piece in sawing is liable to be bent laterally out of its direction, this effect may be counteracted by rollers stationed just before the teeth of the saw, so as by a spring or weight to press against the side of the piece, and keep it to its direction." He further says: "To confine the saw the better to its direction, and prevent its being twisted by any cause, I sometimes employ a pair of guides, consisting of pieces of hard wood, or metal, having each of them a slit, in which the saw itself is moved, and by the sides of which the whole breadth of the saw, the teeth only excepted, is embraced. One of these guides is fixed as near as possible above the upper surface of the piece, the other as near as possible below the under surface. To cut a curve you need only to make the piece advance [to the saw] in a direction adapted to such curve. In cutting circularwise (in cutting felloes of wheels for example) the business of directing the course of the piece may be performed by a pair of calipers lying flat on the bench or floor, and moving about a centre; which calipers are, at their extremities, furnished with teeth proper for laying hold of the ends of the piece: the arms of these calipers must be of a length equal at least to the radius of the circle to be cut. The operation of advancing may, in this case, be performed in the same manner as that of rectilineal sawing, except the rack, instead of being straight, must be bent to the segment of a circle, and fixed concentrically to the calipers. Pieces may be cut to an elliptical form by substituting an oval trammel instead of calipers." A piece may be cut to any irregular curve by forming a channel in the bench to the curve required, over which the piece to be cut slides; then by inserting pins in the piece (or its carriage), it is moved according to the curve to be cut. To saw beveling and winding surfaces Bentham proposed the following apparatus:—Let the frame or bench on which the piece moves be made to tilt or turn on a pin or gudgeon at each end, so placed that if joined they would form an axis passing lengthwise through the middle of the bench, at the height of the upper surface of whatever is used to support the piece, and through the saw. On one side of this axis let the bench be loaded, in such a manner that it would drop on that side if it had no support. From the under part of this side project a support downwards, then place below a waved-mould or director, by which the bench is canted according to the winding surface required.

It has been attempted to move the saw along the length of the log, instead of moving the log up to the saw, but this has not been found to work well in practice: great steadiness and accuracy of motion is required in the saw to produce the best effect, which has been found incompatible with carrying it along the log. In hanging the saw in its frame it has been common to project its upper end forward of the line of motion, so that as the saw descended its edge advanced along the log as fast as it cut; but sometimes the ways or guides on the fender posts upon which the log slides have been set inclined, so that while the saw itself was straight in the gate, the gate and saw both advanced while descending. There were objections to both of these devices. In hanging the saw over it was generally badly strained, and it often required adjusting; while with that, as well as the inclined ways, a cut of a determined distance must always be maintained, unless the parts were readjusted; the objections to this are, that in sawing large or small logs different feeds should be given; a log of two feet in diameter could not be cut so fast as one of one foot in diameter; and if, instead of feeding up the log just the distance of the rake of the saw, it is fed slower, the saw only cuts during a portion of its descent, and with a pecking action striking the log and straining the saw; this difficulty has long been felt by the practical sawyer, as well as the other defect, of cutting too slow in small timber. Recently a remedy has been devised for both these defects by Knowles, the ingenious inventor before named, who has hung his guides *a* for the saw-frame, as shown in the diagram below, by one end, the other being allowed a motion forward and back, regulated by a screw *b*; there are four of these guides, composed of straight bars of iron or steel planed true, upon which the boxes of the saw-frame slide; there are two of them on each fender post *c*, one above and the other below, each moved, as above stated, by a screw; all the screws being of the same pitch, and connected by an endless chain *d* passing over pulleys on their projecting ends behind the fender posts, they all turn together, and move the guides to exactly the same inclination, so as to throw the saw forward more or less on

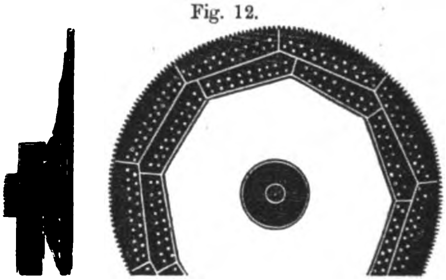


its downward stroke, according to the size of the log or its quality, relieving the saw readily in knots or other bad places, and keeping it always up to the greatest amount of work it is capable of; and as the feed exactly corresponds with the forward motion of the saw, it cuts its whole length, and wears equally instead of striking on its upper part only, and thus unduly bringing an improper strain upon the saw. Saws were steadied as early as the last century by guide pieces, embracing the sides of the saw just above and below the log; and this device has recently been employed, as well as rollers, between which the stuff is held while sawing.

Circular saws have been repeatedly brought into use for the supposed advantage of making a regular cut instead of the intermitted one of the upright saw, by which means the log could be moved regularly along. It was found in practice that a saw of large diameter, when it became heated, expanded so as to run irregular, or, in technical phrase, buckle: to remedy this, saws of smaller diameter have been used; and to cut through a log one saw was placed below the log, cutting up into it a little above the centre, and above the log was another saw cutting in the same plane, and a little behind the first, thus finishing the operation. But little practical utility was attained by this method: the mechanical difficulties of keeping the two saws in the same plane, the double geering to drive them, and in preventing either from a lateral inclination, has prevented their general introduction. A device to obviate the defect of expansion in large circular saws was made in this country some years since by giving an end-chase or lateral movement to the shaft, while the periphery of the saw was guided by two small rollers between which the saw runs. Thus any tendency of the saw to run sideways was transferred from the outer circumference to the shaft. A modification and improvement of this has since been patented, by hanging the saw in a frame that is so jointed as to move easily sideways without causing the journal to slide.

In the early manufacture of circular saws a difficulty was found in constructing one of large diameter. A remedy for this was described in a patent granted to Brigadier-General Samuel Bentham,* in 1793, which is probably the most wonderful patent ever granted, and more fruitful of practical devices, that have since been frequently repeated with entire success. The title of the patent is for "*various new and improved methods, and means of working wood, metal, and other materials.*" Bentham proposed making the cutting portion of the saw in annular segments fastened upon the face of a large flanch affixed to the shaft: this is shown in the accompanying figure.† It was afterwards patented in 1806 by Brunel, who gained great fame and a title by this and other beautiful devices for the working of wood, every one of which may be traced in the patent of his predecessor, Bentham, whose name was strangely overlooked, while Brunel reaped both the fame and reward of his original devices.‡ This saw was often used for veneer cutting, and we believe is still employed for that purpose.

Fig. 12.



A patent was granted many years ago, in the United States, for forming a circular saw on a new plan; the saw consisted of a circular disk or plate,

* As the name of Samuel Bentham has often, within the last few years, been before the public, we here present a short sketch of his career. He was a brother of the celebrated Jeremy Bentham, and possessed a talent quite equal to his illustrious relation. He very early displayed a fondness for machinery and invention. A writer in the London Mechanics' Journal says: "After having received classical instruction at Westminster-school, his decided predilection for naval affairs induced the binding him to the master-shipwright of Woolwich Dockyard, with whom he served a regular apprenticeship of seven years, receiving at the same time with experience in manipulation, all the scientific instruction which could be obtained from the best professors of the day. He afterwards spent a year and a half in studying the practice of the several other Royal dockyards, and some time as a volunteer and captain's guest on board a first-rate ship in Keppel's fleet. His subsequent extensive travels in Europe and Siberia gave him great knowledge in a vast variety of manufacturing concerns. In Russia he was appointed a lieutenant-colonel, and given the superintendence of Prince Polemkins' manufactories at Dubrovna, near Pricheft. It may well be asked in what way so young a man had become competent to this vast undertaking? It was from a combination of scientific with practical education. Having obtained leave of absence, he came to England early in 1791: his turn for mechanical works led him, in 1791, to visit most of the great manufactories in England. He found much machinery in use for the spinning of cotton, but for the working in wood none, save some turning lathes, some circular and reciprocating saws, and some boring tools used by the Messrs. Taylors for making blocks. Shortly afterwards it happened that his brother, Jeremy Bentham, was engaged by government to undertake the introduction of industrial prisons: Samuel Bentham, with a view to render convict labor profitable, perfected a variety of machines of his invention for working stone, metals, cork, etc., and more particularly those for working wood, for which he obtained patents in 1791 and 1793."

† A recent writer remarks he saw one of Bentham's saws for cutting veneer, in which neither the saw, the kerf, or the veneer was thicker than writing-paper.

‡ Since writing the above, we have seen our views corroborated by a writer in the London Mechanics' Magazine, who adduces positive proof to sustain his position from government records.

of iron or steel, having recesses cut in its edge at certain intervals, into which were fitted teeth of the hawk-bill kind. There were only four pairs of these teeth—placed equidistant from each other, around the periphery. The recesses into which they were fitted were chamfered on the edge, and a V groove on the edge of the tooth slipped on to and embraced the chamfered edges. A small brass pin, riveted through a hole drilled at their juncture, held the parts firm in place.

Other forms of saws have also been brought into use; some of the most prominent of which are—the cylinder saw: this is a cylindrical tube of plate steel, with teeth cut on its edge; it has been employed for cutting round rods, the size of the interior of the saw, for button-making, and for surgical purposes;—the ring saw, which is the cylinder saw enlarged, and supported by its outer or inner circumference on pulleys, from the friction of which it is driven;—and lastly, the belt saw, which is an endless belt of steel, having teeth cut on one edge, and running over two pulleys, with a portion of its length kept straight for cutting. This saw seems wholly impracticable, has never been successfully brought into use, and probably never will be.

A recent saw, if the tool can be properly called a saw, has been devised for cutting out mortises. It consists of a compound flat endless chain, two, three, or more links broad, with a cutting-tooth on each link of the chain. This chain runs over two pulleys, like the belt saw; one of the pulleys is less in breadth than the saw, and when a piece of wood is brought in contact with that portion of the chain of cutters which is over the pulley the mortise is made; the pulley itself enters the mortise as the wood is removed by the cutters.

After the logs have been sawed into planks, the next operation in order is to smooth them for wainscots, floors, and other purposes. No labor of the carpenter has been more arduous than planing boards; and as early as 1791 a patent was taken out by Sir Samuel Bentham, the engineer before mentioned. This is the earliest positive date we have of a machine to be worked by other than manual power in the planing of boards. The plan is one which, after years of experience, has been found best adapted to the purpose, and which is now, with some modern improvements, coming into general use. A short sketch of this invention of Bentham's may here be interesting. His patent is for "a new method of planing wood;" it is dated 26th of November, 1791. The description is confined to such parts of the apparatus as the patentee deems to be new, leaving all details of construction to the skill and knowledge of the intelligent mechanic, who, to use his own language, "cannot now be much at a loss for means of executing the details of any of the species of work mentioned." The intention of Bentham was to supersede the hand-plane, and substitute unskilled labor, or some inanimate propelling force, for the artisan; he says, "The invention is, properly speaking, the invention not of a mode but of a principle; the modes in which that principle may be employed, and the species of work to the performance of which it may be applied, are innumerable;" and he says further, "The only course I can pursue is to give such a general and in a manner exhaustive view of the extent of the principle, of the manner of applying it, and of the sorts of work to which it may be applied, as to enable the public at large, upon the expiration of my term, to reap the benefit of my invention in its fullest extent." * * "Drawings are not given, as they would tend rather to confine the direction to a particular mode; whereas words may serve to convey the instructions in the most general way, and with a latitude that will adapt itself to whatever variety of circumstances may present themselves, and the better enable the artist to pursue the invention through all its branches." It will be seen by this that Bentham does not intend to describe a perfectly organized machine. The frame he leaves for the mechanician to fashion; the device for moving the cutters or board are to be any of the common and well-known mechanisms. The usual devices known to all workers in wood are not dwelt upon, or the kind of power, or its mode of application. His description is confined to the novel elements of machinery required to effect a variety of purposes. For instance, to plane planks and boards to a uniform thickness; to plane the board or stuff with one edge thicker than the other; to plane tapering, so as to make a wedge-shaped piece, and to combine any of these devices; to make wavy or irregular cuts, either vertical or horizontal, which, together with moulding cutters, will make a great variety of figures: all these effects are clearly indicated in this patent. The elements for producing them are given throughout the patent, not in connection, for the reasons already quoted, but in every case designating the purpose of each device. There is no ambiguity in this, as the same course of classification is often adopted by eminent modern writers on mechanics. We will give the devices described in this patent in their natural order, beginning with the function of holding the board, while it is operated on by the plane. He says, "The accuracy of planing depends, even in the present mode, in some measure, upon the bench; in this new mode, an attention to the construction of that implement is particularly essential. For the case when the board winds so as to afford no surface on which it would lie firm on an ordinary bench, a compound bench may be employed, consisting of a middle part and two sides; the middle part serves for the support of the board to be planed, and is capable of being raised or lowered at pleasure; the sides are made to separate and close horizontally, so as to receive between them and keep steady a piece of any breadth. For this purpose they are furnished with one or more rows of flat teeth, which, without being long enough to damage the board, are numerous enough (in conjunction with a common stop or bench-hook) to keep it to its position." This, says the inventor, *may* be used to hold down the board; but his invention is not here exhausted, for he says this device is adapted to thick boards, and he adds further on, "But here it is necessary to observe, that in planing of boards not very thick, the board may at one part spring up to the iron [cutter], and the iron, having thus got hold of it, may not part with it until it has reduced it below the intended thickness, and in case of very thin boards, when though you keep down the edges in manner above mentioned, the middle may notwithstanding be apt to rise, there may be heavy rollers, or rollers loaded with weights, let through the sides of the plane as near the iron as may be, and on one or both sides of it" [that is, before and behind the cutting edge]. "In this manner, without any great additional consumption of moving force, the board, however thin, may be effectually kept down flat upon the bench." The compound bench, before described, affords an easy method of tapering a piece to any degree, either lengthways or crossways: this is done by raising one end of the middle portion of the bench, or one of its sides, as the case may be, and the piece laid upon this inclined surface will be cut to a taper by a plane passing over its upper surface.

So much for straight planing; but other effects are provided for. By a proper configuration of the guides upon the bench, the surface of the work may be made to receive curved forms, and those of a very complex nature; to curve the work in a longitudinal direction, a corresponding curve is given to the sides of the bench or plane guides, and by moving the plane laterally also as it progresses, almost any variety of curvature may be produced, which, together with moulding plane-irons in combination, will produce very complex figures. A mode of moving the bench up to the plane may be adopted for the plan of moving the plane to the work.

"Where," says the inventor, "your board is of substance enough to admit of your confining it in such manner as to come at more than one surface" [that is, where it need not be fastened down along its edges], "you may easily connect planes together, or compound your plane so as for it to apply itself to either or both edges at the same time, as to one side. In case of a single edge, one means of confining to its work, the plane belonging to that edge is, by giving to the plane-iron of the plane belonging to the side a diagonal direction, as is sometimes done in rabbet-planes; or you may confine the plane at the edge, or a plane at each edge, by springs or guides. In this manner, edges of boards may receive any moulding, or be rabbeted, or tongued and grooved, at the same time that the side is planed."

The mechanical elements for cutting may be thus described from this patent. To begin with the simplest case, viz., when the board is already of the form required, it may be reduced and smoothed by drawing a plane over the board repeatedly; the board being laid upon a bench in the usual way, that is, as carpenters commonly do; "but the plane for this purpose must be made, in the first place, as broad, at least, as the board, and must be capable of cutting the whole breadth of the board at once. Secondly, the sides of the plane" [extending beyond the sides of the board] "may extend below the sole sufficiently to serve as guides to the plane. For making the stroke, the plane may be kept down by its own weight, or by being loaded," according to the force required. Specific directions are given how this gigantic plane should be constructed to come upon, and quit the board properly; its projecting cheeks determine the thickness to which the stuff shall be planed, and a mode of shifting the weight that presses the plane down from one end to the other as required. "If the board is finished at one stroke, the plane can be drawn back without injury, but if it requires repeated strokes," a contrivance is necessary to save the cutting edge in dragging the plane back on the board; a device for lifting the plane in such cases is then described.

Instead of taking but one shaving at a time the whole breadth of the board, several may at the same time be taken by disposing irons in the plane one behind and lower than another, so as to take off as many shavings in thickness as you please. "In this manner, so you apply force enough, you may perform almost any planing work at one stroke"—which may be either a flat surface or any moulding. "You may dispose irons enough, one after the other, to cut the piece through; and if you make them narrow enough, slitting or ploughing may in this manner take the place of sawing." As to the exact construction of the tools, the inventor says: "Minute instructions and dimensions cannot here be given, since these must be adapted to the nature of the wood." To obviate the necessity of cutting deep with its attendant disadvantages, it is proposed to apply "slitting planes" to the two opposite sides of the board, and each cut but half way. The ingenious inventor is aware that a many ironed plane is difficult to construct and work, as if any one of the irons is damaged or choked the operation fails; he says, "A better way may be to employ a number of separate planes following each other, each separately pressed down to the work by its own weight or otherwise," by which device the bad effect of one plane not working may be avoided. "As to the mode of connection between the links of such a chain of planes, as simple a one as any may be an oblong frame, the sides of it furnished with perpendicular slits to receive pins projecting from the sides of each of the planes." "In the thickness of the shaving which these different planes are set to take off, there may be some difference; the foremost ones being set the rankest for the sake of riddance, the hinder ones the less rank for the sake of smoothness." How perfectly does all this accord with modern experience!

A toothed iron, to plane the board into channels for the purpose of speed and convenience, especially in cross-grained wood, instead of using double irons, is named by this fruitful inventor; after which the pieces between the channels are cut away. This device has since been patented in this country some fourteen years ago. It is suggested either to move the plane over the wood or moving the piece, the plane remaining fixed, or moving both. "The expedient of making the piece move, while the plane is fixed, may be particularly useful where the plane is so constructed as to *embrace the piece on all sides, whether it have cutters on all sides or not.*" This is the mode now used in all planing machines whether with stationary or rotary cutters. A description is given of planing tenons and mortises, but the arrangement is simple, and on the plan of the other operations, merely changing the form of the plane and its position to serve the purpose. In the closing remarks the patentee says, "With respect to the choice of the moving power and the manner of applying it, nothing need here be said. The choice between wind, water, steam, &c., is a consideration of economy."

The devices found in this patent may be thus summed up. For holding the board—first, it may lay on the bench as in ordinary planing, that is, by being simply held by a bench-hook at one end; secondly, a compound bench may be used having a bed for the piece to lie on, and two movable side-pieces to embrace the edges and clamp the piece on its sides the whole length; this is used in the case of thick winding pieces, which are not sufficiently straight to lay flat on the bench; thirdly, thin stuff that would be liable to be drawn up from the bed by the cutters, may be held down by heavy rollers, or rollers weighted, placed on either or both sides of the plane-iron, as near the edge as possible; and fourthly, the piece may be held by being embraced by the plane, that is, the part which holds the cutters, whether there are cutters on all sides or not. These devices are not described as being each used entirely separate, but may be used in combination or otherwise, as needed; their purpose is designated and their employment left to the discretion of the artisan as his wants require.

For planing or cutting the surface, we find the following devices: first, a cutter set in a stock, and only differing from a common plane by being wide enough to have the cutter reach entirely across the board; to this is added ribs along the two edges beyond the breadth of the board to bring the board down to a given thickness; and these ribs or guides may be put to any of the moving planes in one form or another. Secondly, a number of cutters may be put in one stock, one being placed lower than another, from front to rear, in proportion to the shaving each is to take off. Thirdly, a series of planes may be connected in an oblong frame, each of which planes can move up and down separately a limited distance, and will reduce the board to a given and equal thickness, the first planes of the series being set the rankest, and of course following any inequalities of the board, and taking off a shaving the whole length, unless the board was thinner than the gage. Fourthly, setting planes not only to plane the upper or under surface of the board, or both, but also at the same time placing other planes so as to cut mouldings on the edge of the board, or tongues and grooves—the whole being done at one operation. This leaves nothing more to invent in stationary or reciprocating planing machines, except some nicer details, which modern skill has recently supplied, as we shall show in describing the latest and most perfect machines, in which stationary knives are used. We shall have more to say of the inventions of Bentham when we come to treat of rotary cutter planing-machines.

J. J. G., *Ed.*

THE IRON BRIDGE AT HARPER'S FERRY.

DESIGNED BY WENDEL BOLLMAN, AND PATENTED IN 1852.

This bridge is in many particulars new in principle. It is sustained upon four granite columns or abutments, some twelve feet in height above the piers, and only four feet square at the base, and two feet nine inches at the top. Upon these the bridge rests, entirely without thrust or contraction to affect the stability of such slender supports, all the strains being brought within the structure of the truss and suspension-frame. Its appearance is so novel and striking, that we have given it a place on the title-page of our cover. The particulars of the construction we shall give in the words of the ingenious inventor, together with the experiments of the superintendent of the Baltimore and Ohio Railroad (for which Company the bridge was built), whose name will be a sufficient guarantee for the correctness of the report. The experiments were fully confirmed by tests we ourselves witnessed at this bridge.

J. J. G., *Ed.*

DESCRIPTION OF THE BRIDGE AS BUILT AT HARPER'S FERRY.

The span of the iron suspension and trussed bridge erected at Harper's Ferry is 124 feet between abutments. The length of cast-iron in the stretcher is 128 feet. The weight of cast-iron in the R. R. truss is 65,137 lbs.; of wrought-iron, 33,527 lbs.; making a total weight of cast and wrought iron equal to 98,664 lbs.

From an examination of the engraving it will be found that the wrought-iron requires but little workmanship; the rods from the centre to the abutments having simply an eye at one end, and a screw at the other, with a weld or two between, according to the length. The long counter-rods have two knuckles and one swivel for adjusting the strain and for convenience in welding, as well as in raising the whole to its place.

The cast-iron stretcher is a hollow bar, octagonal without and circular within; it averages one inch of metal in thickness. It is cast in lengths according to the length of the panels, and is joined in the simplest manner. At one end of each length is a tenon, at the other, a socket; the latter is bored out, and the tenon and its shoulder turned off in a lathe to fit the socket, so that when the sections are thoroughly joined, they form one continuous pipe between the abutments. The ends of the sections of the cylinders inserted into those contiguous are slightly rounded, to allow a small angular movement without risk of fracturing the joint.

A cast-iron plate, or washer, A, sets on a bracket cast with each abutment-end of the stretcher, and at right angles to the centre acting-rods B. The

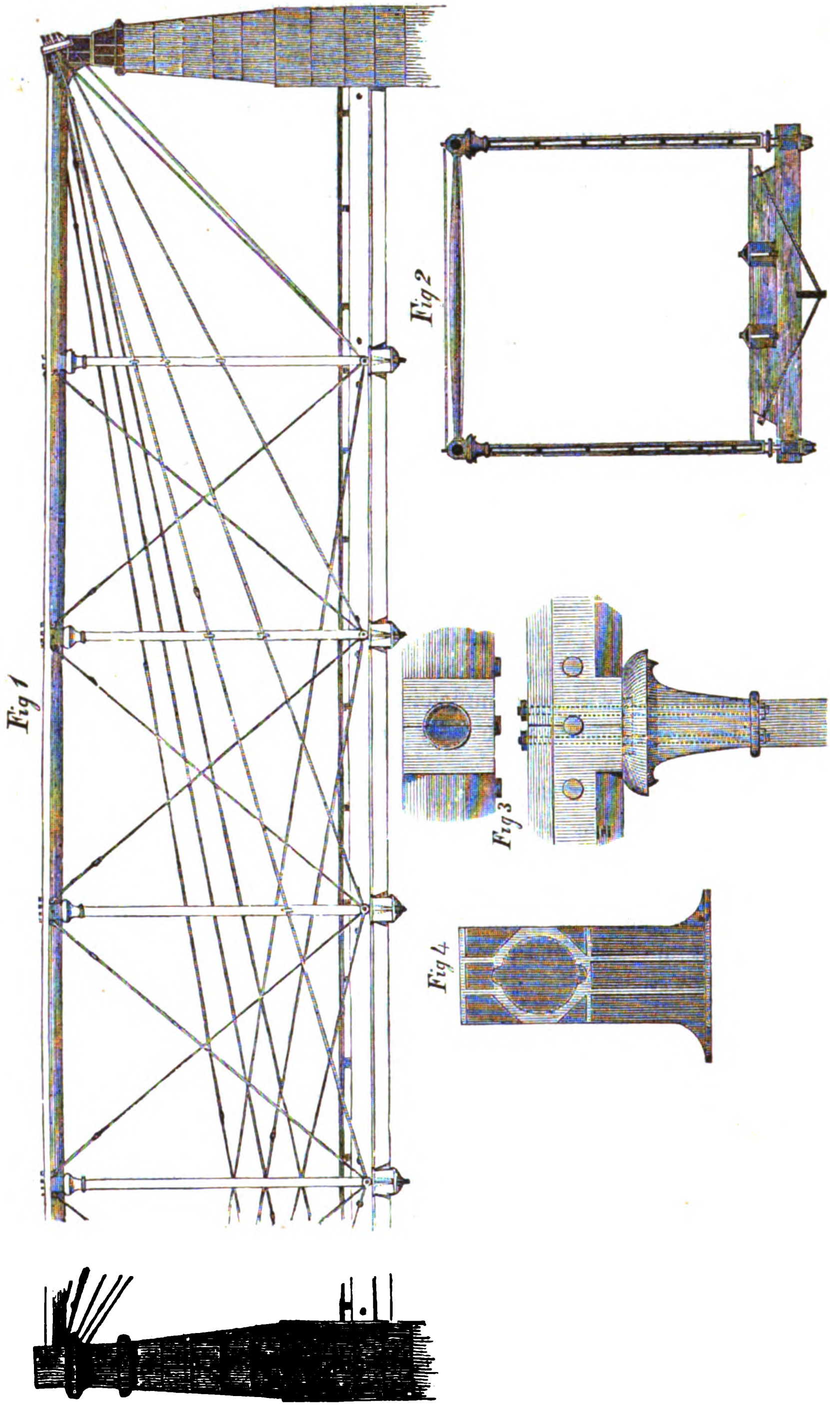


Fig 1
Fig 2
Fig 3
Fig 4

tension-bars are passed through this washer to receive a screw-nut for fastening the bars and adjusting the system.

Each post is cast with a seat in the abacus to receive a ring-tenon cast upon the under side of the stretcher, and bolted through, as in Fig. 3. The slots or openings in the post, as seen in the cross-section of the bridge, give a free passage to the suspension-rods. Through the floor end of each post there is an eye-bolt which receives the eye-ends of the tension, diagonal, and suspender rods; the latter, being bolted through a cast-iron plate, sustain the floor cross-beams, and their seat, the suspender-washer. Sufficient play is here given by a slot in the plate and in the cross-beams for strain and expansion.

The stretcher or straining-beam, the vertical posts, and the suspension-bars compose the essential features of the bridge; each post being hung by two bars from both ends of the stretcher independently of all the others, and each post and pair of tension-bars forming with the stretcher a separate truss.

This system, perfect in itself, is additionally connected by diagonal rods in each panel; also, by light, hollow castings, acting as struts—(see Fig. 2.) The diagonal side-rods might be safely dispensed with, for the peculiar merit of the truss is its perfect independence of such provision; they are used as a safeguard only in case of the fracture of any of the principal suspension-rods.

By this combination of cast and wrought iron the former is in a state of compression, the latter in a state of tension—the proper condition for obtaining the best effect from the two metals. The principles of the suspension and of the truss bridges are here united. *Each* bar performs its own part in supporting the load in proportion to its distance from the abutment; so that the entire series of suspending-rods transmits the same tension to the points of support as would be equally transmitted from thence to the centre of bridge. Each bar or rod is straight and of a uniform figure, and therefore the elements of calculation are as simple as those of the lever, "when the fulcrum is at one extremity, the power at the other, and the weight to be supported at some intermediate point." This first principle of the lever is here exemplified in its most naked simplicity, it being sustained in equilibrium by a force applied at a given point and acting in a given direction. Consequently, by the property of the lever, the power multiplied by its distance from the fulcrum, is equal to the weight multiplied by its distance from the fulcrum. The power and weight are reciprocally as the distances. Pressure upon the fulcrum is the difference of the weight and the power.

Now to proceed, as in the annexed diagram, for the proportion of one rib —that is,

One-half the Weight of Bridge and Load.

Weight of iron, ...	24,000 lbs.	
" " timber, ...	15,000 "	
" " load, ...	184,000 "	
" " momentum, ...	25,000 "	
	248,000 "	The total weight to be sustained by one rib.

This, when distributed, is carried at eight different points—at the centre by two equal, and on either side by two unequal forces. Therefore, $\frac{248,000}{8}$ = 31,000 lbs. on each post; or, in other words, there is a concentration of 31,000 lbs. on each floor-beam at the points of suspension.

The distance from the centre of the abutment to the centre of the bridge

$= 64$ ft.; so that $\frac{31{,}000 \times 64}{128} = 15{,}500$ lbs. weight on the acting-rods at the centre, the forces being equal.

The distance from the centre of the abutment, or the point of support, to the centre of the post or internal line of the first or abutment panel $= 17{\cdot}5$; therefore, applying the principles of the lever, as before mentioned, we have transferred to the furthest point of support $\frac{31{,}000 \times 17{\cdot}5}{128} = 4238$ lbs. as the weight, which, deducted from 31,000 lbs., leaves 26,761·8 lbs., as the weight transferred to the nearest point of support.

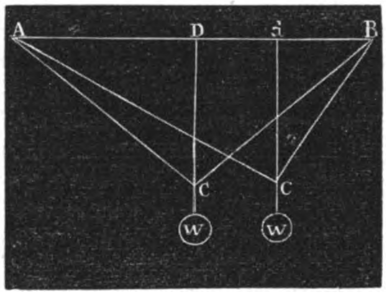
To use further plainness in the application of first principles, let us take the following diagram.

$A\ D = \frac{1}{2}\ A\ B = 6$

$A\ d = \frac{3}{4}\ A\ B = 9$

$B\ d = \frac{1}{4}\ A\ B = 3$

$W = 144$



In the triangle A C B, A C = C B. Then, the weight being between the fulcrum and power, A B : A D or D B : : W : A C or B C, or 12 : 6 : : 144 : 72 lbs., or $\frac{144 \times 6}{12} = 72$ lbs. weight on A C or B C—the forces being equal.

B d = 3. Then A B : B d : : W : A c′, or 12 : 3 : : 144 : 36 lbs., or $\frac{144 \times 3}{12} = 36$—144=108 lbs. on B c′, or by proportion, A B : A d : : W : B c′, or 12 : 9 : : 144 : 108 lbs. on B c′—the forces being unequal.

With this simple key to the calculation by first principles of mechanics, within the compass of every practical man, we shall consider the harmony of this system.

This bridge, it will be seen, is composed of seven independent trusses, which transfer the weight concentrated on each floor-beam directly to the abutments without aid from any other connection, and not from panel to panel as in general use.

The strain on both the cast and wrought iron is wholly in a direct line; and the result is, the minimum quantity of metal required to carry a given weight. Its security and economy are evident; the weight of the bridge and load rests on the piers, towers, &c., the only horizontal thrust being from the expansion of iron, which is accommodated by rollers and the sliding of the abutment-bracket over its pedestal, or by any other means: the necessary dimensions of the masonry may therefore be extremely moderate.

It is evident, from an inspection of the engraving, that no chord is requisite at the bottom of the truss to resist tension; the only advantage of that employed is to regulate the movement produced by expansion, in the performance of which agency it acts as a resistant to compression.

Although the abutment-bracket-casting and its pedestal in the Harper's Ferry Bridge were so constructed as to admit of accommodation to expansion by rollers, yet this contrivance was omitted with the view of fully testing the effect of the greatest expansion throughout the system.

The pedestal is seated on and embraces the top of the granite column. This pedestal and bracket were carefully planed off to true surfaces for the purpose of reducing the amount of friction between them.

It is now more than a year since this bridge was erected at Harper's Ferry, during which time it has been exposed to extremes of cold and heat, and to an average run of twenty trains daily.

From the closest inspection we find that the extreme expansion measures, as near as possible, 5-16 of an inch on each tower, or 5-8 in the entire length, 128 feet of stretcher, and without the slightest perceptible derangement of masonry; the dimensions of which are 4 feet square at the base, 12 feet high, and 2 feet 9 inches square at the top.

While on the subject of expansion, it may be well to notice the effect from difference in the expansion of the rods of different lengths. At the first point of suspension, or where the longest and shortest rods meet, the counter-rod is about four and a half times longer than the acting-rod, and the expansion of the counter is four and a half times that of the acting-rod. But there is also a proportionate difference in the lengths of the parts of the stretcher from the point directly over the centre of connection to the extremities of these rods. This has been practically proved in this bridge.

The suspender-bolt, when the expansion is extreme, or 5-8 of an inch in the length of the stretcher, exhibits a difference of 3-16 towards the short or acting-rod, which difference is provided for, as seen by slot dotted in Elevation, Fig. 1, where the vertical suspender-bolt moves to accommodate any such difference, and to give that proportion of weight to each rod according to the angle.

This bridge affords easy access for repairs—for instance, should a new floor-beam be required, it is but needed to slacken the horizontal-rod and the keys in the longitudinal strut, remove the washer from under the point of suspension, and let down the beam to be replaced, which can be done without trustling up any part of the bridge.

In case of fire, the floor may be entirely consumed without any injury to the side truss.

"Particulars of a trial made under my supervision on the 1st day of June, 1852, to prove the stiffness of an iron bridge erected by Wendel Bollman, at Harper's Ferry, and known as the Winchester Span of the R. R. Viaduct at that place.

"Three first-class tonnage engines, with three tenders, were first carefully weighed, and then run upon the bridge, at the same time nearly covering its whole length, and weighing, in the aggregate, 273,550 lbs., or 136,775 tons net, being over a ton for each foot in length of the bridge.

"This burden was tried at about eight miles per hour, and the deflections, according to gages properly set and reliable in their action, were at centre post, $1\frac{3}{8}''$, and at the first post from abutment, 9-16 of an inch.

"It may be satisfactory to give also the tests applied to an iron bridge, of similar principle, of 76 feet span, on the Washington Branch R. R., erected by Wendel Bollman, and their results.

"A passenger-train passing quickly caused a deflection of 9-16 of an inch at the centre. An engine and tender weighing forty tons of 2240 lbs. caused a deflection of 5-8 of an inch. Two engines and tenders at rest—back to back—an aggregate of $77\frac{1}{2}$ tons, caused 11-16ths deflection; the same, at ten miles per hour, 13-16ths; the same, head to head, under motion gave, at 4 miles per hour, ... 13-16ths.

8 " " . . . . a *little* more.

20 " " . . . . 14-16ths.

"W. PARKER, *Sup't. B. & O. R. R.*"

From the test at Harper's Ferry it is found that the load did not cover the entire length of bridge by about thirteen feet, yet the excess of weight in the middle, and at a speed of about eight miles per hour, produced no greater deflection than $1\frac{3}{8}$ of an inch at the centre post, and 9-16 of an inch at the first point from abutment.

It may be well to add, for general explanation of the last trial on the Washington Branch R. R., that when two first-class engines and tenders stand *head to head*, they nearly concentrate a weight of 48 tons in 36 feet; yet at twenty miles per hour the deflection at centre was but 14-16ths.

DECISIONS OF THE SUPREME COURT OF THE UNITED STATES IN PATENT CASES.

1829. Pennock & Sellers *vs.* Dialogue.—1 *Peters' R.* p. 1, Act 1793.

It is no ground of error, that the court below omitted directions to the jury upon points of law, when neither party requested it at the trial. The party desiring instruction upon a particular question of law, should request such instruction.

An inventor may abandon his invention, and surrender or dedicate it to the public. This inchoate right, thus once gone, cannot afterwards be resumed at his pleasure; for where gifts are once made to the public in this way, they become absolute. It is generally a question of fact for the jury to determine, whether the acts or acquiescence of the party furnish satisfactory evidence of abandonment or dedication. But when all the facts are given, the court may state the legal conclusion deducible from them.

The patent act of 1793 prescribes the terms and conditions, and manner of obtaining patents, and proof of a strict compliance with them lies on the foundation of the title acquired by the patentee.

Many of the provisions of our patent act are derived from the principles and practice which prevailed in England; but the language of the English statute of monopolies is not identical with our patent act; English decisions, however, may serve to illustrate some of the provisions of our statute.

The words "not known or used before the application" must mean, not known or used by the public before the application.

If an inventor should retain the monopoly, and make and sell his invention publicly for years, and only apply for a patent when he feared competition, it would materially retard the progress of science and the useful arts, and give a premium to those who should be least prompt to communicate their discoveries.

The English statute of monopolies provides "that letters-patent and grants of privileges for fourteen years or under, for the sole working or making of any manner of new manufactures within this realm to the true and first inventor and inventors of such manufactures, which others, at the time of making such letters-patent and grants, shall not use." The use referred to here is a public and not a private or surreptitious use, in fraud of the inventor.

Under the English statute, if the inventor suffered the thing invented to be sold and go into public use for four months, the grant was void. "To entitle a man to a patent, the invention must be new to the world. The public sale of that which is afterwards made the subject of a patent, though sold by the inventor only, makes the patent void."

No other interpretation can be fairly put upon our statute. If an invention is used by the public, with the consent of the inventor, at the time of his application for a patent, such patent, if granted, will be invalid.

Where the suggestions of the patentee are not true, and the conditions on which alone the grant was authorized to be made do not exist, a patent is not good.

A fraudulent or piratical use by a third person might not defeat a patent.

The legislature did not intend to grant an exclusive right to any one to monopolize that which was already in common use.

The sixth section certainly does not enumerate all the defences which may be interposed to suits on patents. It gives the right to a patent to the first and true inventor, and to him only; if known or used before his supposed discovery, he is not the first, though he may be a true inventor. But if he put it into public use, or sell it for public use, before he applies for a patent this would furnish another bar to his claim. This would be an abandonment, creating a disability to comply with the terms and conditions on which alone a patent can be granted.

1832. GRANT AND OTHERS *vs.* RAYMOND.—6 *Peters*, p. 218, Act of 1793.

The Secretary of State in issuing patents is a mere ministerial officer, and can exercise no power which is not expressly given. If the forms of law are complied with, he can exercise no judgment whether the patent shall be issued or not.

A new patent issued where the old one has been surrendered, can only be sustained on the general spirit and object of the law, and not upon its letter.

Inadvertency or mistake is a judicial question which cannot be decided by the Secretary of State.

Neither can he decide those judicial questions on which the validity of the first patent depends; yet he issues it without inquiring into them. The correct performance of all those preliminaries on which the validity of the original patent depends, are always examinable in the court in which a suit for its violation shall be brought.

The rightfulness of issuing the new patent is declared to depend on the fact that "the defect in the specification arose from inadvertence or mistake, and without any fraud or misconduct on the part of the patentee." This is a question for the jury.

A party may plead his defence specially, or plead the general issue, and give notice of special matter under the sixth section. If he shows that the patentee failed in any of those prerequisites on which authority to issue a patent is made to depend, his defence is complete. He is entitled to the verdict of the jury and the judgment of the court.

If he wishes to annul the patent, he must follow the statute strictly. Evidence "tending to prove that the specification filed by the plaintiff does not contain the whole truth relative to his discovery, or that it contains more than is necessary to produce the described effect," will protect the defendant. But in order to authorize a judgment declaring the patent void, he must go further, and show such "concealment or addition" to have been made "for the purpose of deceiving the public." The evidence of fraudulent intent is only required where it is sought to annul the patent.

A defective specification is a good defence, although it did not originate from design.

In consequence of the ministerial character, in which the Secretary of State acts, the performance of the prerequisites, on which a patent can issue, must be examinable in any suit brought upon it.

The English books are full of cases in which it has been held that a defective specification is a good bar when pleaded to, and a sufficient defence when given in evidence on the general issue, in an action brought for the infringement of a patent right.

Whether an inventor has abandoned his invention, or dedicated it to public use, is not a question of intention, "but of legal inference, resulting from the conduct of the inventor, and affecting the interests of the public."

The case of *Pennock* vs. *Dialogue*, 1 Pet. 1, affirms the principle that a failure on the part of the patentee, in those prerequisites of the act which authorize a patent, is a bar to a recovery to an action for its infringement; and that the validity of this defence does not depend on the intention of the inventor, but is a legal inference upon his conduct.

1833. Shaw *vs.* Cooper—7 *Peters' R.* p. 292, Acts of 1793 and 1800.

The decision in the case of *Grant* vs. *Raymond*, 6 Peters, 220, referred to and confirmed. When a patent is surrendered and a new one issued, it is a continuation of the first patent, and runs from the date of the first year.

The application for the new patent may be considered as appended to the original application.

The second patent being a continuation of the first, the rights of the patentee must be ascertained by the law under which the original application was made.

The first patent in this case was issued under the law of 1800, which required the applicant to make oath that to the best of his knowledge and belief that the invention had not been known or used in this, or any foreign country; and it provided if it had been the patent should be void.

The act of 1793 provided that every person in his application for a patent shall state that the invention was *not known or used* before such application.

The sixth section of this act provides that if the thing patented had not been originally discovered by the patentee, but had been in use before the discovery of the patentee, the patent should be void.

It seems that citizens and aliens are placed substantially upon the same ground. "In either case, if the invention was known or used by the public before it was patented, the patent is void. In both cases the right must be tested by the same rule."

By the act of 1793, if a thing was known or used by the public before the application, a patent will not be sustained.

The knowledge spoken of in the act of 1793 is public knowledge. If surreptitiously obtained, it will not affect the right of the inventor, though acquiescence on his part will lay the foundation of a presumption against him.

In England it was held in one case that suffering the invention to be sold and used for four months would render the patent invalid. In a later case it was held, that allowing it for any period would render the patent utterly void.

Vigilance is necessary to entitle a party to privileges secured under the patent law.

If the invention is fraudulently made known to the public, the inventor should assert his right immediately, and take the necessary steps to legalize it.

An inventor's right does not depend alone upon his discovery, but also upon the legal sanctions which have been given to it, and the forms of law with which it has been clothed.

No matter by what means an invention may be communicated to the public before a patent is obtained, any acquiescence in the public use, by the inventor, will be an abandonment of his right.

His right would be secured by giving public notice that he was the inventor of the thing used, and that he should apply for a patent.

An acquiescence cannot be presumed when the inventor has no knowledge of such use. Knowledge may be presumed from circumstances. This will generally be a question for the jury.

After a patent is granted, no subsequent use can affect the patentee's right.

The same evidence which would defeat an application for a patent would, at any subsequent period, be fatal to the patentee's rights.

The evidence he presents to obtain a patent is not only *ex parte* but interested; and the questions of fact are left open to be controverted by any one who contests his right under the patent.

A strict construction, as it regards the public use of an invention, before it is patented, is required by the letter and policy of the law.

A presumed acquiescence when the public use is known, or might be known to the inventor, is the only safe rule which can be adopted.

In some of the cases at the circuits, the question of abandonment was made to depend upon the intention of the inventor. But these cases were overruled in *Pennock* vs. *Dialogue*.

Whatever may be the intention of the inventor, if he suffers his invention to go into public use, through any means whatsoever, without an immediate assertion of his right, he is not entitled to a patent, nor will a patent obtained under such circumstances protect his right. R. H. G.

NOTE.—The reader will bear in mind that the decisions which we now give, are under the act of 1793 and the amendment of 1800. In several important particulars, these acts differ from that of 1836, and those subsequent to it. These differences will appear when we give the adjudications under the latter acts. The decisions under the act of 1793 led to several changes found in the statute of 1836. The early decisions are necessary to a proper understanding of the more recent statutes, and the adjudications under them.

REVIEW OF THE OPINION OF THE HON. J. K. KANE,

In the Circuit Court of the Eastern District of Pennsylvania, in the cases: Sloat vs. *Patton; Sloat* vs. *Winslow; Wilson* vs. *Snowden; Wilson* vs. *Ashton.—Motions for special injunctions.*

IT becomes our duty as faithful journalists, devoted to the interests of inventors and mechanics, to notice the opinion of his Honor Judge Kane, in the above cases, as published and copied recently in several periodicals devoted to mechanics.

The courts have had an increasing demand made upon their time of late years to such an extent, that it may come to be a grave question whether or not some special tribunal shall be constituted to try the questions involving the validity of, and interferences with, Letters-Patent for inventions in the useful arts, leaving to the Circuit Courts the other issues only. It cannot be expected that the District or Circuit Judges will understand the questions of abstract mechanics, and their nicer adaptation and application to the trades and callings that constitute most of the inventions upon which patents are based. To remedy the want of knowledge in the judges, a system of introducing "experts" has been adopted; persons with more or less knowledge, who come before the court and deliver their opinions under oath, explanatory of the inventions at issue, and also to what degree the mechanical equivalents extend, and upon questions of identity or otherwise, of any two or more devices. These "experts" rarely have any great amount of knowledge of the history of the arts, and are often found to be strongly prejudiced in favor of the side for which they are testifying: they frequently mislead the court by an ignorance of science, or a misapplication of it in a truly deplorable way. In illustration of this we have but to refer to the antagonistic opinions of "experts" in almost every important patent case. An "expert" should, no doubt, be a man thoroughly versed in all the questions of abstract science involved in the case: he should also be well acquainted with the practical working of the improvement upon which he is called to testify. If a chemist is called in to testify as to chemical equivalents, it is not enough that he should know that certain ingredients are considered isometric to determine them to be equivalents, but he must have seen them compounded, and be able to prove whether or not the same identical effect is produced by both. So with the mechanical "expert," he should be well informed upon the history of the art about which he is to testify; he should be thorough in his mechanics, and have witnessed the operation of the machines or the things about which he is to give an opinion. In this, as in most other cases, "a little learning is a dangerous thing" to rely on. Unless he masters the reasons for the results he is to testify about, he is even more unsafe than the most common witness who has no theory to defend, or nice points of difficulty to avoid; but above all, "experts" should, if possible, be appointed by the court, and not be in the employ of either party litigating; they should have ample time and opportunity to investigate and receive explanations, and then, as now, give in their deposition based upon the facts.

We have been led into these remarks from the character of the opinion of the learned judge; for he could only be led into the grave historical and mechanical errors therein contained by the testimony upon which he relied. But we must first notice the position of the court in declining to entertain the question of the validity of the patents in controversy, assuming the ground, if we correctly understand him from the imperfect report—that if A, B, and C, and so on down to Y, have unsuccessfully contested the validity of a patent, then Z, if he is overflowing with proof, shall not use it to defend himself against an unjust attack because of a decision in which he had no part—we trust there is some error in this. Another point of importance is the order of the judge, giving a person employed by the complainants power to inspect, and cause to be worked, the defendants' machines, *in any way he might request.* We question the propriety of such a license being given to either party in a suit. We know nothing of the individual, or what his testimony was, or how far it affected the issue, but we believe the principle involved to be unsound.

The learned judge is reported to say, in his opinion, that from the time of Bramah, half a century ago, until now, planing with knives set upon a disk, and made to revolve in the plane of the intended surface, *has never been successful.* Where the judge's authority comes from for this assertion, we know not, but it is a notorious fact, that the Bramah machine has been successfully used from the time of its invention to the present day in England, and is, and has been used to plane surfaces in various parts of this country. Can the judge assume that an invention is worthless which is so carefully figured and described in works of the highest authority, unless he is assured of it by the most positive testimony? If there was any such testimony before the court, perjury must have been committed by the witness who so testified.

We pass over the philosophical reasoning of the judge upon the assumption of a fact that has no existence, simply remarking that, if on the first experiment with a disk machine it was found to mark the planed surface by what the judge is pleased to call the "*back-lash*," we cannot believe that even he would contend there was any invention in simply bending the finished part of the board out of the way; at all events, the originator of this device never thought it worth while to claim any credit for it.

The next statement in this opinion of the learned judge strikes us with more astonishment than any other. It is in the following words: "Woodworth *was the first* to propose a remedy for this, by placing his cutters on the periphery of a rotating cylinder, while he presented the face of the board in the tangent plane of their revolution *** and *gave the dip and lift cut* which has been so *often recognized as the characteristic of his patented machine*." In the face of the disclaimer in the original patent of Woodworth we do not perceive how it is possible for the judge to assume, that Woodworth first proposed the dip and lift cut, or in other, and less fanciful language, the revolving cylinder of knives. Woodworth absolutely disclaimed this in his original patent, frankly avowing they had long been in use; but if he had not, it is well known patents had been repeatedly taken for it long prior to Woodworth's day, and his reissued patent of 1845 claims this simply in combination with another device.

The judge goes on to say, numerous witnesses all swore to the fact, that the machine in controversy was a *disk* [or wheel flat on its face], and that its cutters moved in the same plane, and parallel with the lower face of the boards. "But," the judge gravely adds, "*it is as certain as any truth in the philosophy of mechanics, that in this they are mistaken.*" And why? because it interferes with a theory the learned judge has adopted, probably, either from some of the "*experts*," or the ingenious counsel in the case, aided, perhaps, by the gentleman's ingenuity who passed boards through the machines by the court's order, which were thus *made* to show a dip and lift cut.

This hocus pocus in mechanics, of turning one machine into another totally dissimilar, is not novel to us, and has been quite too common in our courts within the last few years, displaying very much the same kind of talent as the juggler possesses who turns a fan into "my grandmother's rocking-chair." We profess no supernatural power, or very great dexterity, but we could easily show the learned judge how to plane boards with a revolving disk and leave *no* "*back-lash*," or, as we should say, scoring, upon the planed surface; to be sure, we should be forced to do it just as it has always before been done, and without any different effect from that of Bramah's—but still, efficiently. We suspect his honor was somewhat misled in his philosophy of mechanics by the defendants themselves, but knowing nothing of the defendants or their machines, we are unable to say. We are dealing simply with the broad questions of fact involved in the opinion.

The judge again goes on to say, "It is true, that upon *tramming* the disk with the bed-plate, to test their parallelism [by which we suppose he means measuring], the defendant's witnesses observed no deviation from the disk form [a plane-faced wheel]. But though this were so, yet in just such a disk the cutters might be arranged in such a manner as to describe a cone when revolving." If we understand the judge's mechanical elements here, we confess we should be at a loss to know how a cone-cutter could be made out of them, even of the most infinitesimal character.

From the context we presume the judge has been led to suppose that a wheel or disk whose face is flat, having its shaft or axis perpendicular to its plane face, and its cutters on the same, or a parallel plane, can by inclining its shaft be made to cut conically; for he says that the machine, while at rest, can be modified so as to give proof for the time of the parallelism of its parts, and while in motion it may be set to cut slightly conical. Our *mechanical philosophy* teaches us this is a physical impossibility; and we have no doubt we should have a majority of all mechanicians, and every mathematician with us on this point. The paradox of which the judge complains is all founded in preconceived error: the fact that boards are, and for many years have been, planed by a plane-faced wheel, stands out as stubbornly as the man's foot did in the stocks, while his learned counsel argued that it could not be there.

In speaking of the tongueing and grooving apparatus, the judge tells us that "it consists of a revolving saw-plane of *lozenge shape*, set at such an oblique angle as to make all the teeth on its *periphery* equidistant from its axis of motion. In revolving it describes, *of course*, a cylinder." Most assuredly this is a paradox requiring more ingenuity to construct than was ever yet the gift of man: but, assuming for the judge some meaning in this sentence, there is still wide latitude for a play of talent to make out of this device a *duck-bill cutter*. From the opinion of the court, it would seem that the defendants' case was lost from a want of knowledge of common-place facts, and a misconception by the court of all the devices involved in the issues tried.

While we regret that Judge Kane should, in the last paragraph, seem to imply that *all* machines to plane boards *must* necessarily be an infringement of the Woodworth Patent, we quote his closing remarks with great satisfaction, and heartily respond to the truth they convey.

"It is a truth of large acceptation, both in policy and morals, that it is better in the long run to strive patiently for a legal property of one's own, than to persist in trespassing on the property of others. The invention which is set forth in letters-patent *belongs* to the inventor—as rightfully as the house he has built or the coat he wears. It cannot detract from the dignity of his title, that the subject of it is of his own creation, his thought, conceived and developed and matured in the recesses of his mind; that it has cost no man else any thing, and asks nothing in return for the contribution it makes to the general wealth and happiness, but that security of enjoyment, during a limited period, which the laws engage for all other property without limitation of time, and without stipulating a price. It would be a reproach to the judicial system, if an ownership of this sort could be violated profitably or with impunity."

J. J. G. *Ed.*

SOME OF THE WRITTEN RULES OF THE PATENT OFFICE.

[Continued from page 27.]

THE rules of the Patent Office relating to patent agents are covert personalities, entirely unbecoming the dignity of public office. If a patent agent should defraud or "impose upon an inventor," the Patent Office is not the mediator or apologist, though its published circular places it in this attitude. In such cases redress is at law or between the parties. The office has undoubtedly the right to adopt rules for the transactions of business with all persons, and to enforce such rules to the exclusion of any one who seeks to annoy, evade, or refuses compliance. The fact is too well established to be advocated or denied that competent patent agents are useful and important to inventors and the Patent Office, and they are an indispensable part of the patent system in every country where patent laws are granted. There may be dishonest men among them, but it is unjust on that account to malign them as a body. Formerly there were patent agents in Washington who kept "*stool pigeons*" about the porch and vestibule of the Patent Office, but this system was broken up by the energy of Commissioner Burke. The parade of integrity, impartiality, and incorruptibility of the Patent Office, which accompanies the written rules for patent agents, is in bad taste, to say the least. We cite two passages: "Patents are granted or rejected upon the merits of the cases presented, and there are no circumstances which can, with the knowledge of the undersigned, be brought to bear, to turn the office from the strictest impartiality."

Again: "It is hardly necessary to state that no fees are received in this office, except those provided by law, and that no offers of sums of money, or payment of the same to third parties, can influence the decision upon a case, or hasten the period of its examination." From an experience of ten years in the Patent Office, we can testify to the general probity and ability of its officers, but while there, we were constantly mortified at the above and other seeming attempts to foreclose doubts and forestall public opinion by such ostentation of the moral purity of the Patent Office.

It is very remarkable that the same circular of information which so attempts to disparage patent agents, and dissuade inventors from seeking their assistance, contains also some remarks recommending inventors to employ patent agents. Thus in one place it holds the following language, viz.:

"To relieve applicants from the expense of employing agents, the examiners will decide questions of novelty and patentability upon papers imperfectly prepared, if sufficiently perspicuous to be understood, *when such papers are prepared by the inventor himself*. But if an agent be employed, it is presumed that he is qualified for the business he has undertaken without calling on the office for instructions.

"Inventors desirous of examining models before making application, should apply to the Commissioner or chief clerk, who will direct the machinist to aid them in all necessary inquiries. This caution is given to save applicants from impositions to which they are exposed. If the services of patent agents are desired, able and faithful ones can be found *at their offices* in this and other cities."

And then again: "The Patent Office does not make original drawings to accompany applications for patent. It furnishes copies of the same only after the patent is completed. Draughtsmen in the city of Washington are always ready to make drawings at the expense of the patentees."

And again: "The personal attendance of an applicant at the Patent Office is unnecessary. The business cae be done by correspondence or by attorney. All explanations and suggestions in relation to pending, and to all other cases, should be in writing, addressed to the Commissioner; correspondence with the examiners or other subordinates is strictly prohibited. When an application has been *finally decided*, the office will retain the original papers, allowing the applicant to obtain copies thereof."

And lastly, in a spirit of partiality and unwarrantable discrimination, it declares: "An examination, as to originality of invention, may be made on a single drawing, when no agent is employed; but in all cases presented by agents or attorneys, duplicate drawings must be filed before any examination can be had. They must be signed by the patentee, and attested by two witnesses, except when the specification describes the sections or figures, and refers to the parts by letters; in which case they are neither required to be signed, nor accompanied by written references, the whole making one instrument. Drawings are absolutely necessary when the case admits of them. They must be on separate sheets, distinct from the specification, and one at least must be made on stiff drawing-paper."

This last order of Commissioner Ewbank is in direct violation of law and justice. The law requires (see sec. 6, act of March 3, 1837) positively the "applicant for a patent to furnish duplicate drawings in all cases admitting drawings." The Patent Office formerly, by way of indulgence, allowed applications to be entered with one drawing, and required two in case of granting the patent. This practice was not only loose, but as time has and will more plainly show, unfortunate. The drawings of the records in the Patent Office are much mutilated, and will not last many years; and it would have been far better for the office, patentees, and inventors generally, if the law had required *triplicate* drawings. We remember once recommending the grant of a patent for an improvement in spectacles, when a patented drawing was *out of the portfolio*, which represented the identical invention. This drawing had been taken out by some person to examine, or it was in the hands of some person to make a duplicate of it. The patent was issued, and thus there were two patents for the identical invention. But to return to the law and rules. Without assigning any reason whatever, the Patent Office enforces the law upon one class of men, patent agents, and discards it for another, viz., inventors who choose to put in their applications in an imperfect condition. In the absence of a reason we have a right to the inference that such a rule was made to serve some personal ends.

We are glad to find that the present Commissioner is fully alive to many of the peculiarities of this circular of information, and also of the defects in the patent laws. It is worthy of note that during the whole of the administration of the Patent Office by Mr. Ewbank, nothing whatever was done for the reform of patent law, or in any way to aid the cause of the *inventors*, for whom he proclaimed so much sympathy in his reports, *passim*. The Hon. D. K. Cartter, the present able Chairman of the Committee of Patents in the House, has taken a very lively interest in the subject of patent law, and possessed as he is of enlarged and liberal views upon this subject, we are sure that he would have been very ready to have cooperated with the Patent Office in bringing about those reforms so very desirable, and which have been urged upon Congress by inventors, without any disposition on the part of the former Commissioner of Patents to respond to their wishes, or even give the subject merited attention.

C. G. P., *Ed.*

NOTE.—Since the above was in type, we have received a copy of a new set of rules by the present Commissioner that seems to correct most if not all of the objections to the former pamphlet.

ON ARABIAN HORSES.

[Translated for the American Polytechnic Journal from the work of General Daumas, entitled "Les Chevaux du Sahara."]

GENERAL PRINCIPLES OF THE ARABIAN HORSEMAN.

A TRUE horseman should be temperate in eating and drinking. If he cannot support thirst he never will make a warrior; he is like a frog in a swamp.

Buy a good horse, because when you pursue you will catch the fugitive, and when you are pursued the eye will not be able to say where you are gone.

Give preference to the horse of the mountain over the horse from the plain, and prefer the latter to that of the marshy land, which is only good for carrying burdens.

When you have bought a horse, study it with care, feed it gradually with barley until you have ascertained the exact quantity which its appetite demands. A good horseman should know the exact quantity of food which is most convenient for his horse, as well as he must know the exact charge of powder for his gun.

Never allow your dogs or your asses to lay down upon the straw or barley which is to be used as food for your horse.

The prophet said, "Every kernel of barley given to your horse is worth an indulgence in the other world."

Give the last kernel of barley to your horse, even if you have to deprive yourself of it; because Sidi Hamed-ben-Yousseuf has said, "If I had not seen horses produce horses, I would say it is barley;" he said further, "Barley is more powerful than spurs."

Do not water your horses but once a day, one or two hours after mid-day, and feed them with barley at sunset; that is a good practice in war, and besides it is the best way to make the flesh of the horse firm and hard.

To make a fat horse undergo and stand the fatigues of war, ride it until it loses flesh; never attempt to make him thin by reducing his rations. Never place your horse near others that are feeding on barley without giving it barley also. Never give it water after feeding barley—that would kill your horse.

Never water your horse after racing, you hazard his life. After a race or hard ride, when you wish to water your horse do it with the bridle on, feed it with a tight girth, and you will find that your horse will do well by it.

Keep yourself clean, and make your ablutions before you mount the horse. The prophet will love you.

He who commits a sin upon the back of his horse, is not worth the possession of it; he will be wounded, and finally punished.

When you run your horse, keep it back, so that you can use his fire when it is most required. You must use it like a skin filled with water; open it gradually, and keep the opening tight, you can easily then preserve the water, but if you open it briskly the water escapes at once, and nothing is left to quench your thirst with.

A good horseman should never run his horse up or down hill, except when he is obliged to do so. On the contrary he should always slacken his gait. When you ask a horse which he loves best, to go up or down hill, he will answer, "May God curse the point where they meet."

When you have a long course before you, manage your horse in such a way that it can now and then take breath, keep up the change of gait until it has perspired and got dry again, allow it to urinate, draw your girth tighter, and you can then do as you please, your horse will never leave you in any difficulty.

When you are on the road and the wind blows heavily against you, change your line of march, if it is possible, in order to avoid the wind and prevent your horse from getting sick.

When your horse is going at full gallop and some other rider follows you, keep your horse quiet and do not excite it, because it will get excited without your urging it.

When you pursue an enemy, and you observe that he forces his horse, keep yours back, and you will be sure to overtake him.

After you have been a long time among narrow passes of a mountainous country and having emerged upon the plains, you will do well to gallop your horse.

In starting, the horseman should always allow his horse to play and gambol for a few minutes in order to free it from stiffness, and the horse will be easy for the whole day. After a hard and fatiguing ride, when you approach the tents of your people, let your horse dance and gambol a little. The women of the tents will applaud and will say, "Here is such a one, son of such a one," and you will learn the exact value of your horse.

The man who does not give a good gait to his horse, is not a horseman, and ought to be pitied.

The rider who can but does not allow his horse to urinate, commits a sin. His companions should stop him, it is a meritorious act.

In war or chase, should it happen that you have to swim your horse across a stream, be not frightened when he swallows seven or eight mouthfuls of water; that will not injure him in the least, he will continue his course with all safety. After a long course, you must either unsaddle him at once and throw cold water upon his back, or you must leave him saddled until he is perfectly dry and has eaten some barley, but always use the precaution to walk it all the time. There should be no mean between these two modes of practice.

After a long journey on a rainy or cold winter day, cover your horse immediately after you have reached your tent, give it roasted barley, warm milk, and do not allow it to have any water for that day. Never let your horse run on a hot summer day. Remember what their sires said, "Do not let me run in summer if you wish that I should save your life on a day of battle."

In case of life or death, should you observe that your horse is tired, let him have the bridle, and give him with the spurs a very vigorous thrust, so that it will bleed; the horse will urinate, and may save you yet.

When you rest your horse after a hard race, you can run it again when the mucus has ceased to flow from its nose.

Do you desire to ascertain the strength of your horse, after a day of fatigue, dismount and pull it by its tail towards you; does it resist without being moved from its stand, you can depend upon it. In expeditions, after great fatigue, when you have only a few moments to rest, take for your pillow the bridles of your brothers, you will never be left behind or forgotten.

A horseman should study the habits of his horse and try to understand him thoroughly; he must know when he puts the foot upon the ground that he can rely upon his horse, that he will be quiet among the mares, or that he is obliged to fasten and watch him. These details are of importance in the presence of an enemy.

TRAINING THE ARABIAN HORSE.

The Arabs are in the habit of sending the colts with the mares to the pasture soon after they have been weaned; this is considered for colts as indispensable to the proper development of all their powers. In the evening when they return home, they lay themselves near the tents of their masters; women and children play with them; all kind of attention is paid to them; they are fed with bread, flour, milk, and dates. Being continually in company with the members of the family, the colt becomes very gentle, and forms that attachment to man which is so much admired and commented upon by travellers in the East. It happens very often that colts cut their tushes at the age of twelve months; they grow poor in consequence of it, eat little, and would perish if their tushes were not removed; after they are pulled out, they soon gain their strength and health again.

When colts of the age of fifteen or eighteen months do not show the proper freedom in their shoulders, the Arab never hesitates to apply fire (or the actual cautery) to the scapulo-humeral articulation. A cross is marked upon that point with tar or chalk, according to the colors of the horse; a circle is described around in a manner, that the extreme points of the cross are confined within it: to this figure the fire is applied.

In cases where the knees of the colts are badly turned, when there is a disposition for tumors or swellings, fire is applied upon three parallel lines near or at the place of disease.

If there is an indication that the colt is going to be straight in the hind or fore part, fire is applied to the large pastern, but only upon the anterior parts, proving that the Arabs are well acquainted with the seat of the tendons, and they are careful not to injure them. The fire is ordinarily applied with a *faucille*. The operation is generally performed during cool weather, in the latter part of autumn or in the beginning of spring, when flies are few and heat not oppressive. The proper time for commencing the training of colts is in their eighteenth month.

The Arabs begin thus early, because they know from experience that it is the only way to make a horse gentle; and it is particularly favorable to the development of the spleen, which the Arabs consider very important for the subsequent value of a good horse. The Arabs know full well that colts taken in training at a later period, will grow larger and stronger to the eye, but in reality they are less able to stand fatigue, and are less fit for long heats. "A hardened horse brings good luck, and God knows if the Arabian horse is hardened." The Arabian horse is kept in a continual motion, he accompanies his master everywhere, has to seek his own food, and has to walk great distances to obtain water, and this incessant activity makes him bear so much fatigue, and able to render at all times the services required of him. At eighteen or twenty months the colt is first backed by a child, who rides him to the water and pasture. A line or light bit is used, so as not to injure his mouth. That exercise is advantageous to both; the child practises riding, and the colt gets accustomed to carry a weight corresponding to his strength; it learns to walk properly and to see various objects that pass or approach him. The Arabians make their horses very gentle in that way, to be easily managed and not in the least restless. At that age the colt is accustomed to the fetters. In the commencement the fetters are made short, because without that precaution the young animal would lose its equilibrium, and hurt its chest or shoulders, or it may receive injury in lying down or getting up. The Arabian mode of fettering is without doubt the best and safest. The horse fettered thus is forced to bend forward whilst feeding, and it would seem as if the horse could not keep from falling, yet it never happens, from the fact that the Arabian horses are exceedingly well balanced, and of a firm foothold, having fine lines along the back and loins. With the Arabian fetters the horse is obliged to stretch its head and neck, making those parts more supple and free, and when it wants to lie down it has to place itself in the position of a dog stretched out to enjoy the sun. The colts are fettered around the tents, they are generally watched by a young negro, who has a long slender rod with which he chastises the colts every time they kick or bite. This is continued until the horse is perfectly gentle. When the colt is sent to the pasture it is always fettered. The fetters are placed either on the right or left side, a fore and hind foot is always fastened together, the ropes are kept rather short, to force it to keep its vertebral column straight, so that it grows more convex than concave. The advantages are lost when the rope is too long, because it allows the colt too much freedom. At the age of twenty-four to twenty-seven months the bridle and saddle exercises begin. Great precaution is used; the bridle is put on first and the curb generally enveloped with sheep's wool, the saline taste of which makes the colt to like it, which is indicated as soon as it begins to chew it. This exercise is practised for several days, always in the morning and in the evening; and when it is fairly accustomed to take the bridle, it is finally backed.

The autumn is the best time to back it—the flies are less troublesome, and the heat not so great. At the tents of some distinguished chiefs the colts are first practised with a basket filled with sand; they are used for a fortnight or more, until the horse learns to carry a heavier weight; at last a man backs him. About that time the colt has reached the thirtieth month. The vertebral column has acquired strength; the young horse has become familiar with the fetters, saddle, and bridle, and it is now given into the hands of an experienced horseman, who treats it with the greatest care and kindness: he uses no spurs—a small rod is sufficient to correct its faults; he rides it gently short distances, and gradually takes it to the next tent to see his friends, or look after his herds. His whole object is to make it obedient: should it show opposition, he talks to it in a quiet undertone; never gets excited—knowing that any resistance or harsh treatment will ruin the horse, and that it will lose that great virtue of an Arabian horse, "*the most perfect obedience.*" Poor people are obliged to use their colts earlier, before they reach their thirtieth month, but they are aware of the injury done to their horses; but necessity knows no laws or rules.

At the age of thirty months, the colts are practised in standing quiet when the rider has left the saddle. He teaches this by drawing the reins over its head, and letting them fall on the ground. A slave is placed near by, who watches the horse carefully, and in the moment it intends to start, he puts the foot upon the rein, which gives it a sudden shock, and after several days' practice, the horse begins to stand like a rock, and awaits its master for days. This is a very important part of the Arabian horsemanship, and is much practised in the Sahara, where, for instance, a horseman has killed his antagonist, and he wants to secure the horse, he has only to throw the rein of the horse of his enemy upon the ground, and the horse is immovable like a statue; without this precaution, the horse would run away and join the tribe of his master. The colt is kept in regular practice in these lessons, until it has reached the third year, when it is taught to stand perfectly still; when the horseman wants to mount, the safety of his life depends on this kind of training. The lessons must be short, but continued until the horse stands firm and quiet. In these lessons the horseman is assisted by two men; one holding the reins, the other the stirrup. With gentle treatment and patience, the colt will soon learn to obey his master. The Arabs say that only such horses are restless under that lesson who are ailing and suffering from some cause, or are badly built.

From the third to the fourth year the horse is much used, but well fed. It is mounted with spurs; it is practised in its former lessons, and made more expert in them; it becomes more courageous, and is already free from fear; neither the noise from the various animals about the tents, nor that of the ferocious beasts which roam about in the night, or the report of the guns alarm it; and it is soon fit for the chase or war. Should there be a horse, which in spite of all careful management remains obstinate, either from laziness or malice, rears, bites, kicks, and is not willing to quit the tent or the company of other horses, and gets easily frightened,—such a horse must be brought to obedience by the force of spurs. They must be applied with energy and experience; long furrows must be drawn over the belly and flanks to inspire it with a perfect terror. It is only in a very few cases that such energetic punishment does not produce the desired effect; often after the first lesson the horse becomes gentle and obedient like a lamb, and follows his master like a dog. Horses which receive one such lesson, never require a second one. To sharpen the pain, salt or gunpowder is rubbed into the bleeding furrows. The Arabs are so much impressed with the efficacy of such a lesson, that they believe a horse is not regularly trained without having passed through this cruel ordeal. They consider such lessons with spurs, to be to a horse what the training collar is to a pointer or setter. Yet the expert Arabian horseman only uses the spurs to horses of a decided obstinate character. Generally a stick is used to chastise the horse, and it is applied pretty smartly upon the neck, behind the head piece of the bridle. Some put iron rings in the ears of obstinate horses, and especially such as are known to rear; every time the horse shows an inclination to rear, a blow upon the ring soon teaches him to leave off. The Arabs say spurs add one-fourth to the good horsemanship of a rider, and one-third to the vigor of the horse. They give the following fable as a proof of that saying: "When beasts were created they had a talk among themselves. The horse and camel swore never to fall out with each other; but, on the contrary, to keep always on good terms. One day it happened that an Arabian engaged in a feud, saw his camel take to its heels, and with it went all his fortune. He called at once for his horse—jumped on it, and forced him to start, but all efforts were without avail; the horse did not stir, remembering the promise he had made to his friend the camel. The Arab at last applied his terrible spurs: the horse, enraged with pain, reared, plunged, and soon reached the fugitive. 'Oh, thou traitor!' called out the camel, as the horse approached; 'thou hast perjured thyself: thou hast sworn never to harm me, and now you force me back again in the power of that tyrant.' 'Do not accuse my heart, for such a crime,' replied the horse; 'I did not want to injure you; but the thorns of misery made me to follow your steps.'" It is not easy to use the Arabian spurs with the proper effect. The horsemen who possess that talent are noted: some of them know how to push the horse on, by tickling it continually with the spurs on the sides without wounding it; others again know only how to make a constant noise by striking against the stirrups, and exciting the animal in that way. Only those are considered the most expert in the use of spurs who understand how to make those bleeding furrows, which we mentioned above. When it is said that a horseman can take the sides of a horse from the navel to the vertebral column, it means that he understands the art to the highest degree of perfection. How often have I heard the Arabs exclaim, in praise of their Emir, "Abd-el-Kader crosses his spurs upon the loins of his horse!"

The spurs are very dangerous with an inexperienced horseman, because he may strike a horse in a joint, and lame it forever. Should the horse fall, the spurs could injure it very dangerously. The Arabs keep therefore the straps of their spurs always loose, so that they can move somewhat in case they are brought awkwardly against some parts of the horse. In case a horse is killed under his rider, the spurs are also much more easily slipped off when kept loose upon his foot, and allow the horseman to fly on foot and save his head. This is the reason why the Arabs use slippers in preference to boots.

The Arabs consider European spurs as entirely insufficient and useless. They say, "What effect can you produce with your spurs in case of life or death, when your horse is already worn out with fatigue? Your spurs are only good for tickling—to make him restless; but to get the last spark of fire from him, to save your head in case of emergency, our spurs are the thing."

The Arabian horseman manages himself the entire education of his horse. In the Sahara, horsemanship is taught by practice, tradition, and example. The name of a good horseman is only acquired by many and repeated proofs of great skill. To reach that reputation, it is not sufficient to know how to lead a horse over even ground, but he must be able to use his gun with great address; also in timbered, broken, and rough ground. Such an expert rider is called a rifle horseman, in distinction from that of the spur horseman. Should a horseman unite both qualifications, he is considered the beau ideal of a rider. They make even a difference between a horseman who knows how to get well over dry ground, and one who leads his horse courageously over slippery ground; the one is called the horseman of summer and the other of winter.

The Arabs, when they begin first to try their colts in racing, ride them on even ground; they use the stick and spurs to bring it into full speed; the heats are always short. Afterwards he tries it with an older horse of some repute, which animates the colt to keep up with the older horse. These trials are not without danger; but they believe that the guardian angel watches over the horseman, saying, "The angels have two special missions upon the world: one to preside at the races of horses, and the other at the union of man and wife. It is their calling to protect the horseman and his horse from evil, and to watch over the conception of the latter for a happy result."

To teach the horse in stopping suddenly, he rides against a wall, tree, man, or other objects, in full speed, and stops short when near it. When it has acquired some perfection in this exercise, he rides it at full speed to the brink of a precipice, or on the shore of a river. This is a very important part in breaking horses for warfare, chase, &c. When the young horse is not yet entirely at the command of the rider, when it hesitates or refuses to separate itself from other horses, it is at once subjected to the following lesson: Some friends assist and place themselves in two ranges opposite each other, at two or three paces distant—the horse is forced to pass between the two ranges of horsemen. As soon as it stops, the horseman next to it strikes it with a rod, and at the same time the rider applies the spurs with vigor. In a fortnight's time, the most stubborn horse is perfectly broken and obedient as a lamb. The exercise of turning consists in turning the head of the horse quietly and briskly either to the right or left, but generally to the left. After the horseman has discharged his gun, he strikes with his hand the neck of his horse, and it turns to the left. After some practice it turns at the inclination of the body of the rider. Another important exercise is to start the horse from perfect rest into a full gallop. Distinguished Arabian horsemen are not content with the various exercises mentioned above. Some of them teach their horses extraordinary feats to shine at festivals, or other public exhibitions. For instance, he teaches the horse to jump at the horse of his enemy and bite it. Horses broken in that way have very often unhorsed the enemy. The horses are also taught to accelerate the gait of camels by biting their legs, as the shepherd dogs pinch the sheep. He teaches him also to walk on its hind legs like a dog. A great feat is to make the horse jump from the ground with its four feet at once—the rider generally throws at the same moment his rifle in the air and catches it very skilfully. Some break their horses to kneel down: this lesson is commenced whilst the horses are young. The attendants of the colts teach them to bend the knee by tickling it at the crown of the hoof and pinching it at the same time in the joint, and force it gradually to kneel. The horseman effects the same by touching it gently with the sides of the spurs above the knee. This is considered the ne plus ultra of horsemanship, and is the great delight of the women, who applaud and cheer the skilful performer. Besides this lesson, the horse is also broken for the games, which are practised at all religious and social festivals. The game of the girdle is very popular: the horse is started in full gallop, and the expert horseman lifts from the ground a girdle or scarf. Some more expert ones take two or more of them in one race placed at different points.

In the rifle game the Saharians are very expert: they use a large stone, or the shoulder-plate of a sheep, as target. The horse is started at some distance to get into a full gallop, and when it is at fifty or sixty paces the horseman fires at the mark. They are well practised in that exercise, and kill a gazelle or ostrich with much certainty.

The Arabs know only two kinds of gaits—the gallop and the pace: the trot they consider as useless and injurious to the horse. The great care and kindness with which the Arabs treat their horses, is not only from interest, but from religious feeling.

The Prophet said unto them: "The true believer who has broken his horse in such a manner as to distinguish himself in the holy wars—the sweat, the hair, the dung, and urine of such a horse will go into the balance of good, for the benefit of its master at the day of the last judgment." Notwithstanding all those ties which unite the Arab to the horse, notwithstanding the attachment formed between him and his horse, be it from habit, interest, or religion, the Mohammedan never gives his horse the name of a *human being*. He would consider it a sin to call a horse by the name of a saint. Horses of merit are called, for instance, "Happiness," "My fortune," "Gazelle," "Ostrich," "Coral," "Future," &c., &c. Similar names are given to the slaves.

It is a common practice among the Arabs to cut the hair of the foretop, of the tail, and mane. They have certain rules and objects for doing so. They cut, for instance, all the hair off a colt twelve months old, having only a small bunch on the top of his head, and the withers, and at the root of the tail. At the second and third year all the hair is cut and shaved off. From the third and fourth year they let the hair grow, until the colt has reached its fifth year, when they cut and shave them again. This is the last time that the hair is cut: it is left to grow now, and it would be considered a crime to touch it any more, because it could only be done with the view to make the horse appear younger, and cheat the purchaser. Every time the hair is cut, the place shorn or shaved is rubbed with an ointment made of sheep's dung and milk, or of Prussian blue and hot butter. These ointments soften the skin, and it makes the hair grow thicker. This singular custom of cutting and shaving the hair off has two objects. Firstly, to make the age of the horse known at the first glance up to the eighth year, because it requires three years before the hair has obtained its full growth again. Secondly, to harden it to the sting of flies; and, finally, to make the hair thicker, longer, and more silky in appearance and to the touch. The Arabs ridicule exceedingly the English fashion of mutilating the horse by cutting off half of its tail, and not without reason.

NOTE.—What a contrast between the Arab and the Christian horse trader! Instead of proclaiming their age, the Christian resorts to every kind of trick, even to the filling of teeth, dyeing of hair, and insertion of tails, to make horses appear young, and deceive the purchaser.

THE CONSTANTIA VINEYARDS AT THE CAPE OF GOOD HOPE.

IN the year 1650, when the Dutch first took possession of the Cape of Good Hope,* that country, now so fertile, was an entire wilderness, here and there covered with shrubs and a few scattered trees. The greatest portion of the land near the coast was an unproductive barren sand plain. The Dutch found, however, the climate very favorable to all kinds of plants, and in course of time introduced a great number of European agricultural plants and fruits, among which the grape-vine was not forgotten, and which seemed to flourish beyond all expectation. The grapes were abundant, and exceedingly rich in juice, but the wine produced from them had an unpleasant earthy taste, which increased when manure was applied to the vines. This was very discouraging to the vine-dressers of the Cape, and its culture was almost abandoned, until the settlements advanced in the valleys of the mountain region, when not only the earthy taste of the wine disappeared, but a wine was produced which is unrivalled even by the most celebrated productions of the old vine-growing regions of Europe.

Professor Ferdinand Krauss, of the Royal Museum of Wirtemberg, with whom I became acquainted during my stay at Stuttgart, lived for several ears at the Cape, collecting specimens for the Royal Cabinet of Natural History; he was an intimate friend of the present proprietor of the Groot and Kleen Constantia vineyards, which the Professor visited very often, taking much interest in the management of those celebrated spots, coming, as he did, from a vine-growing district himself. He examined the soil, and collected many interesting facts, which he brought to the notice of the

* The Cape of Good Hope lies under the 35° Lat. S., and 16° 8′ Lon. E.

agriculturists of Germany, at the convention held at Stuttgart in the year 1842, from which the following account is mostly taken:

Professor Krauss brought with him from the Cape the principal grapes raised there, and had them preserved in jars, which he had the kindness to show to me, and I had the pleasure to find that the preserved Pontac, from which the best Cape wine is made, corresponded with the drawings of that grape in my collection of grapes, which came originally from France.

Upon the eastern side of the mountain range which crosses the Peninsula from the Table mountain to the proper Cape of Good Hope, there rises the Constantia mountain, at the foot of which the celebrated vineyards and settlements of *Groot* and *Kleen Constantia* are situated.

William Adrian Van der Stell, who was the Dutch governor from the year 1699 until 1707, planted the first vines at Groot Constantia, named after his daughter. He was the first who introduced white Muscatel and Pontac cuttings from the south of Europe, of which, at the present time, many a healthy vine can still be seen. In the year 1778, Henry Cloete, the grandfather of the present proprietor of these famous vineyards, purchased them for £1500; he enlarged and improved them considerably. In the year 1784 he imported from the south of France the first Frontignac vines, and cultivated them with such success, that in the third year after planting he produced good wine from their grapes. His heirs continued to improve the land; and Jacob Cloete, the present owner, takes good care to preserve the reputation and celebrity of the Constantia growth. Mr. Cloete ascribes the fine aroma and extraordinary qualities of his wines, not to the peculiar or better kind of vines, or to a secret in the management of the vine, but mostly to the peculiar nature of the soil, which is forcibly illustrated by the adjacent vineyards, where the same kind of vines are cultivated, and treated in the same manner as those in the vineyards of Mr. Cloete, yet his neighbors are not able to produce a wine like the Constantia. They endeavored, through a judicious mixture of soil and manure, to improve their vineyards, but nevertheless the results were not satisfactory. Experiments of the same kind have been made in other districts of the Cape, as, for instance, on the Tiger mountain, Drackenstein, and on the eastern shore of the Olifant river, with the view of growing Constantia vines. The wines from those districts are sweet and pleasant, and are sold in Europe for Constantia, but they cannot stand comparison with the genuine growth of the Constantia vineyards.

The Constantia mountain rises 2000 feet above the level of the sea; the foot of the mountain consists of a coarse-grained granite, mixed with large crystals of feldspar; upon the strata of the granite lies a colored sandstone rich in quartz, through which pass several veins of manganese ore.

The eastern acclivity of the mountain has many deep chasms, which are covered with trees and shrubs. The Constantia vineyards lie upon a granite hill, which is bordered on two sides by deep ravines. The soil of the vineyards consists not alone of decomposed granite, but it is mixed with fragments of colored sandstone, which, from various causes, have been carried down to lower portions of the mountain. From the proper mixture of these two principal geological formations the peculiarity of the composition must be ascribed. The best soil of the Constantia vineyards is of a yellowish color, and contains a great deal of the coarse grains of quartz. The large grains of quartz allow the rain (which falls abundantly during the rainy season) to penetrate easily into the subsoil, as in summer they assist in binding the soil firmly together, so as to form an impenetrable crust against the hot rays of the sun.

On examination it is proved that the soil contains, in some parts, more or less clay or sand, that gives the soil a more or less whitish color. The Professor ascribes it to a strata of granite different in composition from the coarse-grained ore. In the adjacent vineyards he could trace the veins of decomposed *dolomite*, which pass through the granite in a similar manner as in the vicinity of Cape Town. In those places the soil is of a reddish brown color, fine like powder, but very unfavorable to the culture of the vine.

In the Constantia vineyards three different kinds of vines are cultivated, viz.:

1st. The red and white Muscatel with small elliptical bunches, but compact; the grape round, and very rich and juicy.

2d. The Frontignac, with elliptical bunches as big as a man's fist; the grape round, and of a light red color and very juicy.

3d. The Pontac, the bunches are compact, but only half the size of the others; the grapes are of a dark blue color, small, oval, and the juice is dark red. The veins of the vines are red, and the leaves are very downy.

Besides these there is also a vine cultivated called the Steen grape, its bunches are not very compact, the grapes are white, round, and small; it is not suited for the sweet wines, but is used for *champagne*, probably the Riesling from the Rhine. Of the first three vines mentioned above, the red and white Muscatel are more extensively cultivated than the other kinds.

The vineyards are laid out in a very simple manner. The land is spaded over to about two feet deep, and in the spring (September and October) the cuttings (18 inches in length) are planted in rows, four feet apart. In the second year, during the rainy season, the land is a little manured. The young vines bear, generally, in the second year after planting; and in the fourth year they are perfect in their development, and the grapes are now suitable for sweet wines.

Mr. Cloete assured the Professor that much attention and precision are required in the management of vineyards. According to the accounts of our reporter these vineyards are managed with great judgment, and the land is kept perfectly free from weeds: the work is performed not only in the right season and time, but with care. The vineyards are generally manured in the months of June and July. Those on poor soil are manured every second or third year; in good land, every eight or ten years. The manure is always applied in small quantities. In some portions, where the soil is of the very best quality, it is applied only every 18 years. Mr. Cloete observed that the grapes take the taste of the manure. He found that vines manured with fresh cow-dung yield grapes with a taste like the fertilizer: to prevent it, he uses only manure which has been previously mixed with leaves, and allowed to decompose before it is carried into the vineyards. The vines are trained low, and about the middle of July pruned down to three buds.

The vineyards with a poor soil, containing but little clay, are worked in the month of August; those with good soil, and a right proportion of clay, are worked about the beginning of the month of October. Some vinedressers pretend, that when the lands are worked in the month of July the insects are more effectually destroyed. The insects are very numerous and injurious to the vines at the Cape, and during the months of September, October, and November, the children are regularly employed in cleaning the vines; every vine is carefully examined, and every insect removed. A kind of caterpillar, called Brochmannetje, destroys the buds; and another caterpillar, as well as a bug (*Phlyctinus Callosus*, *Colander*), bore into the young shoots and cut them entirely off; the latter are considered the most dangerous to vineyards.

In the beginning of November the vines blossom; the grapes ripen about the latter part of January, or in the beginning of February. To make sweet wine the grapes are left to get very ripe, until they are nearly half dry, upon the vine. To accelerate the ripening the leaves are removed, to allow the sun more access. About the latter part of March, or in the beginning of April, the vintage commences. The grapes are gathered only during fine weather, and about mid-day, when the dew has entirely disappeared. Each bunch is separately examined, and all rotten or spoiled grapes removed from it.

The operation of expressing the juice is carried on with much care and speed, because the must and the husks are liable to be influenced by the high temperature of that climate, which causes the loss of the pure and fine flavor. The grapes are placed in a vat and slightly trodden, to separate the stems from the grapes; the stems and mashed grapes are then put into a sieve made of the Spanish cane, and the grapes are forced through the meshes by hand, and the stems removed. They are next gathered into a vat, the bottom of which is perforated, and placed over another vat or vessel, which receives the must as it flows from the grapes; in this vat they are now thoroughly trodden. This is a very tiresome and fatiguing operation, because the grapes are already much dried up, and require greater power to mash them properly. The juice which is collected in the lower vat is again mixed with the husks, and the whole placed in a large cask, when the mass is well mixed and stirred up until the fermentation commences.

The fermentation begins sooner or later, according to the temperature of the atmosphere, sometimes on the second, sometimes about the eighth or tenth day. After the fermentation has set in, the mass must be kept quiet and undisturbed; and when it has lasted for about two days, the must is drawn off from the husks and placed in dry, well-sulphured casks: after eight or ten days, when the fermentation has ceased, the must is again drawn off, and placed in another thoroughly-sulphured cask.

In the manufacture of sweet wines, the principal object is to stop the fermentation as quick and as perfectly as possible. Mr. Cloete accomplishes this in the following manner. He puts into each cask of 152 gallons six or eight buckets full of wine; the cask is then sulphured, well bunged down, and rolled and moved about until the smell of sulphur has entirely disappeared; this is generally accomplished in about two or four hours' time, and the cask is ready to receive the charge. The cask must be examined every day, and if the fermentation has again commenced, the wine is drawn off at once into another cask, which has been well sulphured and managed as stated above. But in all instances the wine must be drawn off every six weeks after the first sulphuring, in order to keep it always clear and fine. During the first year the wine requires at least every month a change of casks. Wine managed in this way can be brought into market after the second year, but it is much better to use it in the third or sixth year. The Constantia wine is not for long keeping, it gets ropy and oily. These wines are kept best in airy, clean cellars, above ground. This is the management of the wine from the Groot Constantia, the oldest vineyard, which yields the best product. Kleen Constantia is of more modern date, and is in possession of the brother of Mr. Cloete. There are two other vineyards joining Groot Constantia; one of them is called High Constantia, belonging to Mr. Van Reeken.

The prices of the sweet Constantia wines have much increased in the course of time. The grandfather of the present proprietors sold, in the year 1780, half an Aam = 19 gallons of the white and red wine, at £2 18*s*. 6*d*., of the Frontignac and Pontac, £3 10*s*.; the same quantity costs, since 1838, of the first sort, £15; of the latter sort, £18 10*s*.; the Pontac brought, in the year 1840, the enormous price of £22 10*s*. for the half an Aam.

During the months of November, December, and January, the roads in the vicinity of Capetown are crowded with teams and oxen bringing in wagon loads of wine, even from a distance of 200 or 300 miles.

The different wines made at the Cape are red and white Constantia, Frontignac, Pontac, Hock, sweet Muscatel, Steen Constantia, and Cape Madeira. Also a large quantity of raisins are made in the colony, and the dried fruits of the Cape are very celebrated.

The inhabitants of the Cape divide the year into two periods—the good and the bad monsoon. The first commences in September, and answers to our summer: during its continuance the S. E. winds prevail. These winds are of a dry and blasting sort, and destroy the foliage and blossoms of such fruit trees as are not sufficiently sheltered. The mornings, during this season, are in general hot and sultry; but the breeze springs up about mid-day, dying away towards evening, leaving the atmosphere cool and refreshing. The thermometer, in the hottest months, varies from 70° to 90°, but often remains for days at 83° or 84°, and has sometimes risen to 105° in the shade.

On the approach of winter the S. E. wind becomes less frequent and violent, and is at length succeeded by the N. W. wind, which is generally attended with thick fogs and heavy rains. The rain descends in torrents, sometimes for many days without the least interruption, particularly during the months of June and July.

It is not unusual for the thermometer to rise 30° in the course of five or six hours. The mean temperature of the winter months is 58°, of the summer months, 77°.

C. L. F., *Ed.*

SHEEPFOLD OF THE AGRICULTURAL SCHOOL AT HOHENHEIM, IN WIRTEMBERG.

The object of keeping sheep at the Agricultural School at Hohenheim. in Wirtemberg, is twofold: first, to supply the sheep-breeders of Wirtemberg with fine rams and ewes to breed from; and second, for the instruction of the pupils.

The flock is not very large, and numbers about eight hundred and fifty in all. It consists in—

1. *Electoral-sheep*, which were originally procured from Saxony. In the year 1846, two rams and four ewes were added from the Lichnowski Hennersdorf flock.

2. *Electoral-Justinger*, a cross with original Merino rams, obtained from Spain in the year 1780, and the common country sheep, which, since 1824, has been exclusively crossed with Electoral rams.

3. *Merino Comb-wool sheep*. This breed was commenced in the year 1830 with a select number of heavy-woolled Electoral-Justinger, and since 1843 it has been crossed with rams of the comb-wool flock of Count Schwerinat, Wolfshagen, in Uckermark.

4. *The English Merino Cross* was commenced in the year 1850. Merino ewes of a coarse wool were crossed with long-woolled Leicester, in order to

obtain sheep of a larger size, possessing greater fattening properties, and a long comb wool. The offspring of the first cross have been kept pure and without intermixture. Some have been crossed with fresh English blood, but as the wool did not answer the expectation, a rich and heavy-woolled *Merino Comb-wool ram* has been employed.

The principal aim in breeding at Hohenheim is to increase the quantity of wool and the size of the animals.

I had often occasion to examine these flocks, and found the *Electoral*, like their kindred, of a small size, with a tight skin and light fleece, but the wool fine and well stapled.

The *English Merinos* have a wool of about three inches and more in length: it is soft to the touch, very little curled, the staple open. I have raised many a sheep from crosses between common ewes and Merino rams, and their wool was as long, and even of a finer quality, than the above-named English Merinos.

The ewes are numbered by means of marks in the ear. The rams have the number burnt upon the horns. A regular register is kept, in which the character of the wool is inscribed, and the class marked to which the sheep belongs. The following is a copy of that register:

No.	Parents.			Character of the Wool.										Form and Size of Body.	Classification.	Remarks.
	Mother.		Father.	Exterior of the Staple.	Interior of the Staple.			Length.	Density of the Fleece.	Fineness.	Softness.	Evenness.	Weight of Fleece.			
	Number.	Descended from, and Quality.	Number.		Regularity and Evenness.	Bows.	Growth and Character.									

To facilitate the keeping of the above register, and to control the coupling register, a separate lamb register is kept, which is divided into the following columns: 1, The number of the ewe which is expected to produce a lamb; 2, the number of the ram with which the ewe has been coupled; 3, day of crossing; 4, day of birth of the lamb; 5, sex of the lamb; 6, number which has been given to the lamb. The lamb is numbered immediately after the birth, or in the first days whilst it is kept in a separate stall with the mother. After the first year, the yearlings are registered according to their sex. The columns of the character of the wool and classification are filled up at the yearly principal examination of the flock. It is preferable to describe the character of the wool of the ewes and to classify them at the time when they have their first lamb. Ewes and rams are used for breeding when two and a half years old. A ram generally serves for fifty to seventy-five ewes. Some years since the time for coupling was about the latter part of July, and lasted up to the last days of August, so that the time for lambing fell principally in the month of January. Of late, summer lambs have been found to be more advantageous. The experiments made at Hohenheim have shown that ewes are not so apt to take the ram in the winter as in summer; but the results proved so very favorably that the experiments were continued. The winter coupling-time is generally in January, and lasts until the middle of February. The ewes must be kept warm during that time, and must be fed for two or three weeks previously with potatoes and oats, to make them more eager for the ram. Whilst the ewes are lambing during the winter they lose their wool, or get wool of a weak kind. Those with summer lambs remain vigorous, and do not lose a single wool hair.

The washing of the pregnant ewes never affected a single one of them injuriously. Soon after the clip, they have the lambs in the fields and pastures, or at home during mid-day or in the night. In about ten days or a fortnight, the lambs go with their mothers upon the pastures. The milk of the ewe is very nourishing, and the lambs grow vigorously, and in the following spring they are as large as the winter lambs, five months older. The yield of wool is nearly as great as from yearlings, and can be made up in bundles and sold with the regular fleece wool.

The quantity of wool gained from summer lambs compared with that from winter lambs is as 74 to 64. Besides the greater gain on wool, the summer lambs develop themselves sooner and better, and are less liable to disease. During the transition from winter to summer lambing, a great many ewes remain unimpregnated; but after two or three years there is no greater number of such ewes than we find usually among ewes which have their lambs in winter. The time for pasturing commences about the 15th of April, and lasts till late in November—in all seven months. Five sheep are calculated to one morgen (about three quarters of our acre) of meadow. One sheep to one morgen of meadow, upon which the sheep are pastured early in the spring, and after the second crop of hay is taken. For fields under cultivation, one sheep to four morgen.

The time for wintering the sheep lasts five months. The sheep are fed with hay, sliced raw potatoes, sometimes beets and straw. Potatoes are not injurious to sheep which have been accustomed to them at an early age, provided that only half of the equivalent of hay is given in potatoes, and that the ewes are uniformly fed with them before and after lambing. The mode of feeding is the following:

A ewe before lambing receives 1¼ lb. of hay, 2 lbs. of potatoes, and 1 lb. of straw. A ewe with a lamb, 1¾ lbs. of hay, 2 lbs. of potatoes, and 1 lb. of straw. Yearlings, 1¼ lbs. of hay, 2 lbs. of potatoes, and ¾ lb. of straw. For a ram, 1¾ lbs. of hay, 2 lbs. of potatoes, and ¾ lb. of straw. The rules of feeding are: In the morning the sheep are fed with hay; they are then watered; at ten o'clock A. M., with potatoes; at noon with hay, and watered; in the afternoon, at three o'clock, with potatoes; and in the evening, with straw.

Once a week they get salt, in the evening; 2 lbs. a year are calculated per head.

The lambs are kept in the beginning, every one in a separate stall with its mother, till the mother knows the lamb and the lamb the mother, and till she allows the lamb to suckle freely; they are then brought into larger divisions; after four weeks, the lambs are separated for two or three hours during the day from their mothers, and continually somewhat longer until they are only allowed to be with them during mid-day and night. The lambs are then fed with hay and oats; after four months, they are entirely separated from their mothers. When the lambs are about four weeks old, the surplus ram-lambs are castrated. The washing and shearing are done in the beginning of June; they are washed under a shower-bath. The evening before the washing commences, the sheep are driven into a pond to be soaked, and are kept overnight in the stable. The next morning they are driven into the pond again, and in two or three hours afterwards washed as clean as possible under the shower-bath. The sheep, when dry, are examined and classified before they are shorn.

The fleece of every sheep is exactly weighed, and the weight registered. The separation of the inferior portion of the fleeces and putting them up in bundles is intrusted to experienced persons. According to the Shearing List of 1850 before us:

1. The ewes of the Electoral breed were 322 in number; each received $2\frac{1}{2}$ lbs. of hay, or its equivalent, per day, and yielded in wool $2\frac{1}{3}$ lbs.; worth $1.40.

2. The ewes of the Merino Comb-wool breed, 226 in number; each received 2·75 lbs. of hay, or its equivalent; yielded in wool 2·75 lbs.; worth $1.42.

3. The ewes of the English Merino breed, 31 in number; each received 2·75 lbs. of hay, or its equivalent, per day; yielded in wool $3\frac{1}{2}$ lbs.; worth $1.14.

The rams of the same breed as the ewes No. 1, 36 in number, each received daily 3 lbs. of hay, or its equivalent; yielded in wool 3 lbs.; worth $1.80.

The rams of breed No. 2, 46 in number, each received daily 3 lbs. of hay, or its equivalent; yielded 3·33 lbs. of wool; worth $1.75.

The rams of breed No. 3, 6 in number, each received daily 3·25 lbs. of hay; yielded in wool $3\frac{1}{2}$ lbs.; worth $1.30.

The wethers of the Electoral breed, 459 in number, each received daily $2\frac{1}{2}$ lbs. of hay, or its equivalent; yielded in wool 2·32 lbs.; worth $1.40.

The wethers of breed No. 2, 319 in number, each consumed $2\frac{3}{4}$ lbs. of hay, or its equivalent, and yielded in wool 2·75 lbs.; worth $1.46.

The English Merino wethers, 45 in number, each consumed daily 2·75 lbs. of hay; yielded in wool $3\frac{1}{3}$ lbs.; worth $1.32.

From the above we will observe that a Merino consumed, on an average, 2·75 lbs. of hay; yielded $2\frac{1}{3}$ lbs. of wool; worth, on an average, $1.50.

A Merino Comb-wool consumed, on an average, 2·83 lbs. of hay; yielded 2·94 lbs. of wool; worth $1.54.

An English Merino consumed, on an average, 2·92 lbs. of hay per day; yielded 3·45 lbs. of wool; worth, on an average, $1.25. And it shows further, that the Merinos consumed less hay, produced less wool, but of a superior quality, which brought a higher price, and repaid much better the food consumed than the sheep of the two other breeds.

C. L. F., *Ed.*

GUANO.

[From Professor Stockhardt's "Chemical Field Lectures," translated for the American Polytechnic Journal.]

LOCALITY AND CONSTITUENTS OF GUANO.

GUANO consists of the dung of sea-fowls, which has been heaped up in the course of time in larger or smaller layers on uninhabited islands and cliffs.

Good guano is only to be found in those parts of the world in which it never or scarcely ever rains, and on those islands which are high enough not to be washed by the sea, for in the opposite case, the best and most efficacious portions of the guano become dissolved and carried off by the water. If a dunghill be left to lie in the open air for some years, so that the sun may shine on it, the air penetrate it, and the rain wash it out, what will remain of it at the end? not much more than some earthy mineral substances which cannot be dissolved or evaporated. Such kinds of poor guano that have been lixiviated by rain or other means, are often met with in commerce, and the farmer should be on his guard against them. These belong to the cargoes which come from Chili and Patagonia, as rains are very frequent in those countries. The kinds which we meet with now under the name of "African Guano" are likewise of this description, while the guano which for a couple of years has been brought from Africa, which bears the name of Schabo or Ichaboe, cannot be regarded as a good kind of guano.

The best guano comes from the part of Peru where it rains very rarely, and which lies between 5° to 20° of south latitude. It here covers the rocky surface of the cliffs and islands in layers of very different thickness. The thickness of these layers varies from one or several yards to twenty or thirty yards or more. In the first years when a layer of guano has been deposited, it has a white color and is called White Guano (*guano blanco*); this is regarded as the best, and is estimated by the Peruvians, who particularly value it, higher than the brown. It has about the same constituents and the same efficacy as our doves' dung, only it acts more energetically, because it is richer in substances containing nitrogen than the latter. The reason of this difference is in the difference of the food of the birds. The sea-fowl, the excrements of which furnish the guano, live on fishes, while the pigeons or doves live on vegetable food; but flesh is always richer in nitrogen, and on this account furnishes a dung richer in nitrogen than vegetable food. The layers which succeed to the white guano, have a clear brown color, still deeper down it becomes darker, and at the bottom rust color; the lower layers too are always more compact than the upper. It is evident that the lowest layers are the oldest; in them the putrefying decomposition has gone the furthest, and therefore in the lowest layers there are not to be found any feathers, egg-shells, and other remains, while in the upper layers they are very frequent.

But may not these layers of good guano be soon exhausted in the increasing need of it? This apprehension has been expressed by many farmers; but they need not be anxious on this point. According to the estimates lately made by the Peruvian government, the layers of guano found in Southern and Central Peru will furnish a supply of more than 500 millions cwt. This supply must therefore last for some time.

But this apprehension, that there may be an end to guano, should have the effect to spur up the farmers to share in the advantages which rational husbandry may derive from it before it is too late. For it is incontestable that those countries which first lay hold of it will reap the greatest advantage, as they will the sooner increase the value of their lands than those which come into its use later, and the former will thus reach sooner the point at which they can dispense with guano. This point will be reached, when by the use of guano such an amount of fodder and straw is attained as will enable the farmer to produce as much stable manure as is required for the enriching the whole extent of his lands. In Saxony and Upper Lausitz there are already many such farms, which employ guano with the view of producing hereafter the necessary amount of manure from their domestic cattle, by means of an increased product.

The kinds of guano at present found in commerce are brought from South America and Africa. The South American under the names of Guano of Peru, Bolivia, Chili, Sea Island, and Patagonia; the African under the same names, or of the Cape and Saldanha Bay Guano. Of these varieties, only the *Peruvian Guano* is regarded as *good* guano; all the other kinds are less rich, and more or less washed out.

Till within a few years, as already mentioned, a tolerably good kind was brought from Africa, which bore the name of Schabo or Ichaboe, and was distinguished by a very dark brownish black color. This sort has ceased, as according to certain statements the layers have been wholly exhausted since two years; it may therefore be omitted here.

The names are patent, they can at pleasure be fixed on this or that article: therefore there is no reliance as to the name given in commerce. In order to obtain a sure standard for judging of the goodness of different sorts of guano, we must know of *what constituents* they are composed, and in *what quantity* the more important elements are to be found. What a remarkable difference there is in this respect will be evident from the following analyses of those kinds of guano which have been brought into Saxony for the last few years. The quantity analyzed is 100 lbs.

Constituent Parts.	No. 1. Guano of Peru. 1850.	No. 2. Guano of Peru. 1851.	No. 3. Guano of Saldanha. 1847.	No. 4. Guano of Chili. 1848.	No. 5. Guano of Patagonia. 1850.	No. 6. New Guano of Africa. 1850.
Moisture	10	8	8	20	6	15
Combustible or volatile substances containing nitrogen	59	65	22	11	15	13
Phosphate of lime	25	22	64	51	77	53
Alkaline salts	3	4	..	..	..	..
Salts of soda	1	..	1	13	..	..
Gypsum	..	..	..	2	..	13
Silicious earth, sand, stones, &c.	2	1	5	3	2	6
Total Quantity	100	100	100	100	100	100
Nitrogen in 100 lbs.	12 3-4	13 1-2	1 3-4	3-4	1 1-4	9-10
Value per 100 lbs., reckoned according to the constituent parts.	$2.42	2.52	0.96	0.80	1.00	0.72
Present price in trade of 100 lbs.	2.75	2.75	1.80–2	1.80–2	1.80–2	1.80–2

Likewise the *white lumps* are differently compounded, which are often found in good as well as in bad kinds of guano, as the following table of their principal parts shows, that 100 lbs. of lumps contain:

Constituent Parts.	Guano of Peru, No. 1.	Patagonian Guano, No. 5.	Guano of Africa, No. 6.
Combustible substances	74	13	14
Nitrogen	15 1-4	7-8	1
Phosphate of lime	16	68	30
Gypsum	..	3	41

A kind of *adulterated guano*, which two years since came hither from England, contains only 7 per cent. of combustible substances, with $\frac{2}{5}$ nitrogen, and 89 per cent. of ash (of yellowish red color), in which were contained 72 per cent. of silicious earth, sand, clay, and stones. One part of Peruvian guano has been mixed with six or seven times as much clay and sand. Another cargo which first reached Hamburg this spring from England, to be sold as good guano to the good-natured Germans, consisted of one-third of good Peruvian guano and two-thirds of fine sand; it also yielded on being burned brownish red ashes.

Of the given constituents of guano, *nitrogen* is regarded as by far the most valuable one, for this it is which imparts to it its wondrously *strong exciting* power, for which it is so highly prized and paid for. In the fresh excrements of fowls, nitrogen is principally to be found in the form of uric acid, just as in the urine of cattle, sheep, &c.; in putrefied fowl-dung, on the contrary, such as we have in guano, the uric acid such as exists in putrefied or stale urine has already been converted into *ammonia*, or more correctly ammoniacal salts, which are easily soluble and digestible by plants. We must regard guano therefore as a perfectly fomented manure, as a *decomposed liquid dung in a more solid form*, and to this circumstance is to be ascribed that it is so *rapid* in its effects whenever it is applied to moist soil.

In good guano nearly half consists of ammoniacal salts, while the bad kinds often only give traces of them. At present, notwithstanding the high price, guano is the *cheapest source of ammonia* for the farmer, for the pound is only 15 cents, or one pound of nitrogen at 18 cents, while the ammoniacal salts of commerce cannot be procured at the cheapest rate at less than from 30 to 33 cents. As long therefore as the field can by ammonia attain to a higher degree of fruitfulness, and so long as we possess no cheaper source of ammonia, so long also must guano be used with advantage as a mighty aid to agriculture.

In the common temperature the ammoniacal salts contained in guano are not volatile, because the acids which it contains, which are likewise generated by the rotting of the bird dung (humic and oxalic acids, &c.), operate to fix the ammonia as well as the sulphuric acid. We need not then fear that guano will sensibly lose its power by being kept. On being heated, on the contrary, it loses much of its fertilizing power.

Next to nitrogen or ammonia, the *phosphoric acid* is considered the most valuable constituent of guano. It is always found in guano combined with lime, and therefore in analyzing it is generally set down as *phosphate of lime*. This lime remains, when guano is heated, in the form of ashes, as it is not thus burned or dissipated. The more phosphate of lime (ashes) and the less ammoniacal salts (combustible substances) guano contains, so much the lower must its value be put down. Good Peruvian guano contains about one-fourth to one-third of phosphate of lime; the poor lixiviated (African, Patagonian, &c.), on the contrary, three-fourths to four-fifths. We find the opinion frequently asserted, that the excellent effect of guano is principally to be ascribed to the phosphate of lime contained in it; but the guano itself contradicts this opinion in the most decisive manner, for if it were correct, then must the bad guano effect much more than the good, as it contains two or three times as much more phosphate of lime. But it does not so prove, as hundreds of experiments made by farmers in Saxony show, who in order to spare a few cents in buying a good article, used the Patagonian or African kinds of guano.

The other constituents of guano, Alkaline Salts, Salts of Soda (Glauber Salts, Common Salt, &c.), and Gypsum, existing in guano, are only to be found in such small quantities, that they may be passed over in the analysis of guano for agricultural practice. The two last only deserve a closer consideration when they are found in large quantities, for in this case, because of their lower price, they must be regarded as a *means of deterioration* of guano. The kind under No. 4 must be regarded as such a guano, adulterated by salts of soda; and as one adulterated by gypsum, the kind under No. 6.

EFFECT AND USE OF GUANO.

On account of its great proportion of nitrogen, *i. e.* ammonia, the good guano is to be regarded as the most *exciting* and *rapidly effective* manure which is at the command of the farmer. For this reason, it is above all others the best for *auxiliary manuring*. The farmer has in it an admirable means of *improving the usual stable dung* and raising its fertilizing power. Stable dung is poor in nitrogen, for one cart-load contains hardly more of it than half a hundred weight of guano. But this nitrogen is not yet in a state to be taken up by plants, for it is not, or but a small portion of it, in a proper state for nourishing plants; it will be so after it lies in the earth. A small addition of guano can here effect wonders, for young plants derive their nutriment from it till that from the stable manure is ready to be taken up by them; they can therefore grow more strongly and rapidly at the outset, and the farmer may in this way obtain *vigorous* young plants.

Another advantage, which goes hand in hand with this, is, that unfavorable circumstances of the weather and climatic influences operate less injuriously on such crops, for it is natural that a powerful plant will be less harmed in such circumstances than a weak one. Saxon farmers as well as English have often made the observation, that the crops manured with guano, are less exposed to attacks of insects than others. Potatoes manured with guano are rarely attacked by the maggot, and likewise rape fields manured the previous autumn with guano were less injured by snails, while other fields were greatly ravaged by them.

Whether this mode of applying the guano with the stable dung be carried on at the same time, or put in with the seed, or strewed over the seed already sprung up, is immaterial, if it be only used in time, so that the plants can make full use of it.

The farmer must use guano as the physician does Peruvian bark or quinine, as a tonic or means of giving strength, so to aid crops of all kinds which have suffered by the winter, or have been kept back in their growth from want of strength in the soil or any other cause. Such crops are to be strewed over in the spring, or before they shoot up, according to their condition, with one and a half to two hundred weight of guano for an acre, and may in all cases depend on excellent success, especially in winter wheat, because its vegetation in the spring is slow. The excess of growth which is obtained thus by guano, after deducting its cost, must of course be regarded as the *increased net product;* for the cost of planting, the interest of the land, industrial capital, taxes, &c., are to be put to the account of the produce which we might have obtained without manuring with guano, and would be the same even if the increased product had not existed. By such an aid with guano, we are also in a condition so to strengthen some poor spots of the crop, that the whole field will be converted into a very uniform beautiful crop.

Used in this way, even a farmer who possesses sufficient stable manure may yet derive advantage from guano, for among his usual manures he has none which operates with equal quickness and can be applied so conveniently as guano. Old compost heaps, often times drenched with urine, come nearest to the effect of guano.

As good guano consists of rotted excrements, in which the manuring ingredients, the combustible or organic ones, as well as the incombustible or mineral ones, are all existing, it can therefore be as well employed as *solely dung* material, like rotted stable manure, and indeed in all cases has a decided preference over the latter, where the aim is to secure a quick and powerful effect. Guano affords the greatest advantage for the oil fruits of every kind—rape, &c., likewise for potatoes; it is especially well suited for wheat and rye, and next barley, vetches, and peas, and finally to oats. The diminished profit when applied to the latter is by no means, however, so great that guano cannot be used with advantage. But particularly guano is extremely useful and profitable for vegetables, beets, grats, and garden plants of all kinds; for example, as celery, carrots, cabbages, artichokes, &c.

In its application to oil crops, guano shows itself the more profitable, because these, as first crops, do not lay down, even when manured to excess, and leave the soil in such a state of fertility, that wheat or rye succeed excellently after them. The remarkable extension these crops have had the last ten years in Saxony, is mainly to be ascribed to this manure. Their culture has been made possible on the Erz mountains to the height of above 2000 feet above the level of the sea. With the aid of guano, summer oil-crops are cultivated in a far more extensive manner in the most mountainous regions, than was formerly the case. As this crop needs only a short time to ripen, and is easily sold immediately after the gathering, the money used in manuring is repaid with the profits in about three months, and the field is likewise fully prepared for the reception of the winter crops, which, without any additional manuring, yields an excellent crop. In the mountainous regions of Saxony, guano yields a yet more special advantage in planting winter rye upon grass land, newly turned, after it has been mown for one or more years in grass, which when the soil is not too heavy and binding, gives an uncommonly good yield, and proves very advantageous. Formerly the extent of a winter crop after grass depended on the quantity of dung that could be brought together; with the help, however, of guano, one may now give it any extent.

It would occupy too much space for this essay to state the various experiments made in Saxony, where guano has proved to be profitable *for all kinds of crops*, and in *all sorts of soils*. It is sufficient to say that according to them one hundred weight of guano in the *first* year caused a product of 540 pounds of rye, 600 to 800 pounds of barley, or 320 to 330 pounds of potatoes. If we calculate the effects as fertilizers afterwards, it may be assumed that one hundred weight of guano in the circumstances produced at least 800 pounds of rye with the corresponding amount of straw, of at least 1800 pounds, of which some 60 per cent. may be reckoned for the first, 25 per cent. for the second, and 15 per cent. for the third year.

The quantity of 30,000 cwt. of guano, which is yearly used in Saxon husbandry, therefore yields an increased crop of 240,000 cwt. of grain, and half a million cwt. in straw, or a corresponding amount of other crops.

For comparison of the strength of manure of the guano, with cow-dung, as the average of the experiments made in Saxony, it may be taken that one hundred weight of guano may be substituted for 65 to 70 cwt. of stable dung, or three large wagon loads; two to two and a half hundred weight of bone-powder gives the same result. But guano has the advantage before bone-powder, that it acts at once, and suits all kinds of soil; on the other hand, bone-powder remains longer in its effect. The reflective agriculturist will hence easily understand, that it must be *very advantageous to add some guano to bone-powder*, in order that it may also act powerful the first year. The same is likewise good practice in the oil-cake.

For full manuring an average of four hundred weight for a Saxon acre, or two hundred weight for a Prussian morgen,* is the estimate, but we must be governed by the climate and soil; and in mountainous regions this amount is often exceeded, while in situations where the climate and soil are peculiarly favorable, it is lessened. As respects the *mode of using*, the following particulars may be mentioned:

1. The guano must be *prepared* before used on the field. This preparation is very simple, and consists in converting it into a uniformly powdered mass, and mixing it with earth. The former is effected on a threshing or barn floor, by sifting and threshing. First the fine portions are sifted out; then the lumps and pieces which remain are beaten fine, and again sifted, until all is reduced to powder. The last portion remaining is often so soft and sticky, that it spreads out flat in threshing, and cannot be passed through the sieve. This can again be beaten together with some brickdust, by which it easily acquires a pulverized condition, or it may be added to the compost heap, which should not be wanting on any good farm. The sifted guano is now mixed with two to three times as much earth, or a mixture of ashes and earth, and all is shovelled together till the most thorough and uniform mixture is effected. This earth must have the usual condition of moisture, without balling up, or forming clods. It is well to make the mixture at least four to six days before it is strewed on the ground. It is still better if this preparation is made beforehand, at some time chosen, when the work of the farm is not pressing, for it may easily be the case that at the seed-time the work may accumulate, and the mixing of guano with earth be done hastily, and not so well, which is attended by bad results. But if the mixture is in store these disadvantages are avoided. To put it on the field, is best done by means of a tray or trough, and scattering it with a ladle, as we do lime, or by sowing from the seed-cloth. It is well to effect the strewing two or three days before sowing the seed; then lightly harrow in the guano upon a light soil—rolling in will answer; and then harrow in the seed at the proper time. Moist weather has a very favorable influence on the efficacy of the guano, especially in the summer crop.

The addition of earth to the guano has manifold advantages. Pure, good guano is so rich in ammoniacal salts, that it easily operates like a steep on the tender roots of plants, especially in dry weather. By means of the earth it is so covered and divided, that this injurious effect is no more to be feared. When mixed with earth the gaseous substances from the guano are prevented, as the porous earth has the peculiarity of absorbing and retaining these substances. Finally, by the addition of earth a uniform distribution of the mass of manure of the field may be effected, and the dust prevented, which otherwise might occasion inflammations, and other injuries to the laborer.

With potatoes, vegetables, beets, &c., we can to every plant give a handful of the mixture of the earth with guano, in laying or planting them. One-third of an ounce of guano, which costs about one-fourth of a cent, is sufficient for one plant. As auxiliary manuring, the third and fourth part is efficacious; therefore a quantity of from $\frac{1}{48}$ to $\frac{1}{64}$ of a cent produces a very considerable increase of growth. Equally certain results

* 100 American acres are equal to 150 Prussian morgen.

are also obtained in the case of these crops, when the mixture of earth and guano is strewed as uniformly as possible in the furrows in which potatoes are laid; or when, in case guano is not immediately at command, it is applied at the surface of the field, after the potatoes have already come up, harrowed over, which is very advantageous, even when the potatoes have already reached the height of about four inches. One or the other mode is used for *garden plants*, for which, as well as for *grass* or *meadow land*, liquid guano is to be recommended. For this purpose take one part of guano, and at least 80 or 100 parts of water, since the guano with more strength acts corrosively on the plants. For manuring on the top, which, according to circumstances, is to be done in the autumn or in the early spring, guano mixed with earth may likewise be most appropriately used.

TESTING GUANO.

The above analyses of guano show that one kind may be *perfectly genuine*, but at the same time *really very bad;* how great must then be the danger of deception, if there be *purposed counterfeits* introduced which make a good kind bad, and a bad yet worse! In these circumstances it cannot be urgently enough recommended to farmers, that *he who would not run any risk of throwing away his money, let him not buy guano of any but a well-known authority, or after a previous chemical analysis.* If a farmer is not afraid of a little time and trouble, he can make this examination with ease for himself. There are tests now of such simplicity that they scarcely require greater skill and attention than the burning or boiling of coffee, and yet are accurate enough to serve as certain guides in doubtful cases.

1. *Testing by drying and washing.*—If the guano is in a state of uniform powder, as is the case with most of the kinds which come from Peru and Chili, weigh out two ounces of it, and let it lie spread out on paper for two days in a moderately warm spot; in winter in a warm room, and in summer in a dry airy place, in order that it may be air-dried. What it loses in weight for the time must be accounted as excess of water. Many kinds of guano are so moist that in this slight drying they lose from 20 to 24 per cent. of their weight.

If the guano, as in the case of the Patagonian and African, is of dissimilar condition, we must try to break up the lumps, which often have another composition than the powdery parts, and to reduce it to a mixture as uniformly as possible, before the portion set apart for drying is weighed. Any stones, feathers, pieces of leather, which are present, must be distributed equally through the whole mass. As the stones are often so firmly stuck over with guano that they can only be freed from it by scraping, it is well to pour over a separate portion of that guano hot water, and let it soak for a night, and the stones and sand remain behind.

2. *Testing by burning.*—Pour half an ounce of the guano to be proved in a large spoon, and place it over red-hot coals, till nothing but white or grayish ashes remain, which is to be weighed when it is cooled. *The less ashes remain the better is the guano.* The best kinds of Peruvian guano give from 30 to 33 per cent. of ashes, while the poor kinds, which are now so much offered for sale, as, for instance, the Patagonian, African, Saldanha bay, and Chili guano, leave from 60 to 80 per cent. of ashes, and that which is purposely fraudulent still more. The ashes of the genuine guano, the bad as well as the good, are always *white* or *gray;* a yellow or reddish color indicates adulteration with clay, sand, earth, &c. *This test is very simple, and also very certain;* it is founded on the fact that the nitrogenous com-

binations of guano, which, as mentioned in the foregoing pages, constitute its principal value, are dissipated and burnt out by the heat. The difference of smell during burning is also characteristic: the vapor of the good sorts has a suffocating smell, like spirits of hartshorn, and peculiarly pungent, like old cheese; that of the bad kind, on the other hand, like singed horn-cuttings or hair.

The burning may be done on a hearth, or in any stove. Thrust a brick far into the fire, and lay the spoon on it, so that the handle may rest on the stone, and the hollow part with the guano reach clear into the fire. On the outer part of the handle stick a cork, in order not to burn the hands while holding it.

3. *Testing with lime.*—Pour of the kind of guano to be proved, a coffee-spoonful into a wineglass, and add to it a spoonful of slaked lime; then pour in some spoonfuls of water, and stir it all briskly together. The lime extricates the ammoniacal salts contained in the guano, exactly as from decomposed dung, and stale liquid of dung: the ammonia is set free and escapes. *The more excellent the guano is, the stronger will be the suffocating ammoniacal smell which rises from the liquid guano.* This test has not the accuracy of the former one, but still it is very convenient in many cases to form a very approximative and general judgment respecting different kinds of guano. In present circumstances, it appears to be the more useful, as the middle sorts are now very rarely to be met with, and therefore in most cases we find in commerce only that which is of excellent quality or very poor, in the examination of which the lime test above given may be applied, as the difference of strength of the smell is indeed so remarkable that it cannot wholly escape the most inexperienced nostrils.

In order to try this test at any time, it is proper to keep ready a quantity of slaked lime. But that it may not lose its strength, it must be carefully excluded from the air; keep it therefore in a dry bottle, which is well closed with a cork stopper.

4. *Testing by washing out.*—Put half an ounce of air-dried guano into a filter made of press or blotting-paper, which is to be placed either in a tin funnel, or some other contrivance, to hold it; pour on it hot, or better, boiling water, as long as it runs through it of a yellow color. Lay the paper with the wet guano, when no more fluid drops from it, in a warm place, and weigh the part that remains after it has been thoroughly dried; and thus we may learn by the loss in the half ounce, the weight of those substances which have been dissolved by the water. The rule therefore is, *the more that is dissolved from any kind of guano in water, the more ammoniacal salts it contains, and better it is.* As in the test by burning, those kinds of guano are to be preferred, which leave behind them the least quantity of residuum after washing out. In the best sorts, and so in the Peruvian, the insoluble residuum of half an ounce is the proportion of about 50 to 55 per cent.; in the inferior kinds, on the contrary, 80 to 90 per cent.

But there may be exceptions to this rule when a guano contains much soluble mineral salts. We meet with kinds of guano in commerce which consist of one-half to one-third of sea salt and Glauber's salts, and kinds also which in being washed out by water would leave behind only one-eighth to two-eighths of an ounce of insoluble substances, without their, however, being good articles. In such cases we may protect ourselves against false conclusions, in the fullest manner, if resort be had to the test mentioned under 2, for then we should find that a guano of the kind just alluded to gives three-eighths of an ounce and more of ashes, and therefore must be reckoned as a poor sort.

5. *Testing by vinegar.*—Pour on the guano to be examined strong vinegar, or better, some muriatic acid; and if it effervesces strongly, we can conclude therefrom there is a designed adulteration of the guano with *lime*, which may also be ascertained by the second test, as the lime in burning remains behind, and increases the quantity of ashes.

The good Peruvian guano reaches Europe only by means of a trading-house (Gibbs, Bright & Co., London), which has concluded a contract with the Peruvian government, by which they have the exclusive trade in this guano.

PHYTANETIC RECORDS.*

We intend to furnish monthly records of the seasons founded upon the times of seeding, setting, blooming, and fruiting of such plants as have their regular seasons, the times for budding and grafting of various plants, and such other observations as may serve the purposes of farmers and gardeners in reference to seasons. It is well known that most of the published directions for *phytanetic* operations are made for special latitudes, and most of the seed packages, coming as they do from the more northerly States, contain directions for those States alone. For the States south of Virginia, or even Pennsylvania, we have but little that is reliable on this subject for a guide for farmers and gardeners.

For the present number we have but one locality represented, and that only in a partial manner, but which will serve as a good record of the mildness of the past autumn and present winter.

County of Washington, D. C., near Washington City, 150 *feet above the level of the Potomac. By Prof.* Page, *Ed.*

Nov. 8, 1852.—The first hard frost of the season on the night of the 7th November, 1852. Up to that time tender plants, such as egg-plants and tomatoes, not injured in exposed situations, and dahlias in full bloom, but somewhat exhausted from the great length of the season. All of them frost-bitten this night, and growth checked. In 1851, these tender plants were cut off in October. On 25th Dec. 1852, Christmas morning, a bouquet was gathered from the open grounds, as follows: chrysanthemums, drummond-flox, dwarf-flox, rocket-flox, heartsease, verbenas, fresh rose-buds, coral honeysuckles, petunias, green foliage of southern-wood, and flowers of creeping-myrtle.

Jan. 19, 1853.—On the night of Jan. 16, 1853, the thermometer fell to 18° Fahr. Up to this time the foliage upon most of the rose-bushes was fresh, and the plants were in many places in a growing condition. The foliage of the petunias also was in many spots entirely fresh. This night and the following, when the thermometer fell to 17° Fahr., entirely cut off the foliage of these and all the deciduous plants.

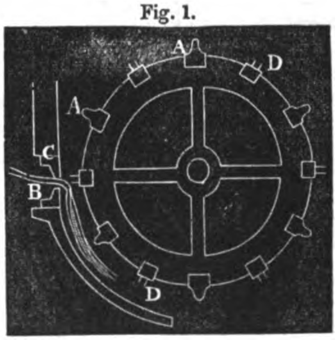
* Phytanetic is from a Greek word, which signifies time of planting.

REPORT OF PATENTS GRANTED FROM THE FIRST OF JANUARY.

Illustrated: with the Claims officially reported annexed.

No. 9512. JAMES P. ARNOLD, of Louisville, Ky.—*Machine for Hackling Hemp.* Patented Jan. 4th, 1853.

Fig. 1.



THIS machine consists of a cylinder, upon which alternately a number of beaters A and hackling teeth D are fixed, as seen in sections, Fig. 1. The hemp is introduced between the rests B and C, against which the beaters and teeth work.

"I do not confine myself to any particular form or arrangement of the parts, so long as the machine is so constructed that it will operate substantially in the manner herein set forth. The form I have described and represented is the one I have essayed with success, and therefore deem it sufficient to show how my invention may be practically carried into effect. What I claim as my invention, and desire to secure by letters-patent, is the method of hackling hemp, by subjecting it to the action of a series of mixed beaters and combs, the teeth of the latter being of varying length, some of them not projecting so far, and others beyond the beaters, and the whole operating substantially in the manner herein set forth.

"I also claim a rest B C, having a narrow slot open at one end, in combination with a concave E, projecting beyond the end of the cylinder, at the open end of the rest, substantially in the manner herein set forth."

No. 9513. J. P. BRUEN & J. J. WILSON, Hastings, N. Y.—*Improvement in Sawing Stone.* Patented Jan. 4th, 1853.

The nature of this invention consists in lifting the saw-frame sufficiently near the middle of its range of motion, in order to effect during the operation of sawing the proper supply with sand and water.

The inventors state that they have discovered that a much better effect is produced if the sand be introduced under the saw, at the middle of the stroke, than when introduced at the end, for the reason that the grains of sand are carried in one direction half the length of the stroke, and then back again in the opposite direction, presenting on the return motion opposite angles to act on the stone, whilst on the old plan the grains of sand act the whole length of the stroke in the same direction, and are then discharged, and in their improvement the fresh grains of sand with their sharp angles are made to act on the stone, when the saw is at its maximum velocity, whilst on the old plan, this takes place when the saw has its minimum motion.

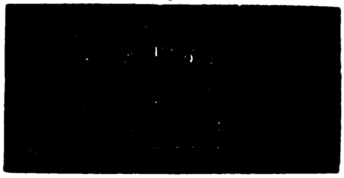
The frame is also provided with india-rubber cushions or their equivalents, between the ways and inclined projections, in order to absorb or reduce the concussions, which would otherwise take place when the wheels strike the said inclined projections.

"What we claim as our invention, and desire to secure by letters-patent, in the sawing of marble and other stone, is lifting the saws at or sufficiently near the middle of the stroke to effect the herein-specified purpose substantially in the manner specified.

"We also claim interposing india-rubber, or its equivalent, between the ways and the inclined projections which lift the saw-frame, substantially in the manner and for the purpose specified."

No. 9514. James J. Clark—*Improvement in Self-winding Telegraphic Registers.* Patented Jan. 4th, 1853.

Fig. 2.

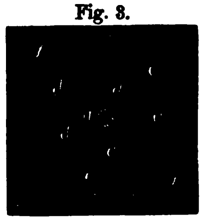


This improvement consists in an arrangement, by which, when the spring is wound up to a certain point, the current through the winding magnet is cut off by establishing a cross connection by the points P and Q, shown in Fig. 2, coming into contact, until the instrument has run down a little, when the points P and Q separate, and the current through the winding magnet is re-established, and the winding operation renewed.

"I do not desire to claim the application of the click and ratchet-wheel, operated by an electro-magnet, vibrating a lever, to cause rotation and obtain power; but what I do desire to claim, and secure by letters-patent, is regulating the current through the coil of the electro-magnet, of the self-winding apparatus, by means of the relative motion of the spring shaft and spring box, so that when the spring has been wound up to a certain point, that current shall be cut off, and the self-winding apparatus cease to act."

No. 9515. John D. Dale, of Philadelphia—*Machinery for Planing Mouldings.* Patented Jan. 4th, 1853.

Fig. 3.

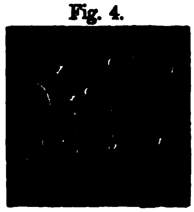


The object of the invention is to plane a plank into a series of mouldings, and separate them from each other at one operation; for that purpose the inventor arranges a series of moulding-cutters or plane-irons, side by side, fastened between disks *e d*, secured by screws, as seen in Fig. 3, representing a vertical section of the machine; the disks *d* with the planes *c c* are placed upon an axis *a*, with circular saws *f f*, or equivalents, for separating the mouldings at one and the same operation: the disks are held together by screw-bolts and nuts *d d d d*.

"What I claim as my invention, and desire to secure by letters-patent, is arranging a series of sets of moulding-cutters, or plane-irons, side by side, along the length of a rotating stock, substantially as specified, when this is combined with rotating saws, or their equivalents, interposed and projecting beyond the periphery of the cutter for separating the several mouldings, and separating them, are performed at one and the same operation, and accuracy of work secured, as set forth."

No. 9516. John D. Dale, of Philadelphia—*Machine for Planing Mouldings.* Patented Jan. 4th, 1853.

Fig. 4.



This improvement consists in a planing-iron, which can be moved so as to produce the moulding by successive operations. In Fig. 4, *b* represents the bed-plate upon which the lumber *f* is placed to be planed; the plane-iron operates on the under surface of the board; the hinged plane-stock *v* is secured to the plane-iron *w*; *x* are pressure blocks; *z* a spring to receive the end of the set-screw

c', tapped in a bracket c' jointed to the side of a sliding-plate t, that holds the plane-stock; $i\ i$ are rollers.

"I do not wish to limit myself to the number of knives or rollers to be used; nor to the manner of operating the rollers, as these may be varied at pleasure. And I wish it to be understood that I do not wish to limit myself to the use of all my improvements in one machine, although the best results will be produced by the employment of all of them.

"What I claim as my invention, and desire to secure by letters-patent, is attaching the planing-iron to a plane-stock, which is hinged to an adjustable sliding-plate, substantially as specified, by means of which combination the plane-iron can be readily thrown up to be sharpened, without the necessity of taking it out of the machine, as set forth.

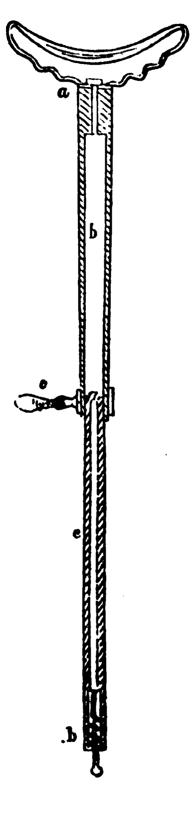
"I also claim the adjustable sliding-plane, substantially such as described, when combined with the separate movable mouth-piece, by the means substantially such as herein described, so that in setting the plane-iron, a differential motion is given to the mouth-piece, in order to vary, to any desired thickness, the shaving, that when the plane is set to cut a thick or thin shaving, the mouth-piece shall receive a corresponding set, as described."

No. 9517. Geo. & Geo. W. Feaga, of Frederick, Maryland—*Improvement in Grain Washers.* Patented Jan. 4th, 1853.

The nature of this invention consists first, in washing the grain in water, by which means the smut is loosened, garlic and other light impurities will rise and pass off with the water; the grain is brought by means of elevators or otherwise, into chambers heated by steam or hot air, where it is thoroughly dried, and thence carried to the stones for grinding.

"Having thus fully set forth the nature of our invention, and the means of putting it into practical use, what we claim as new, and desire to secure by letters-patent, is the method herein described, of separating grain from smut, garlic, and other impurities, by first washing it in a trough or reservoir of water, where the separation takes place, and then conveying the washed grain to a drying apparatus, where it is thoroughly dried—the whole operation being performed substantially in the manner herein set forth and described."

Fig. 5.



No. 9518. John S. Gallaher, Jr., of Washington, D. C.—*Improvement in Crutches.* Patented Jan. 4th, 1853.

This improvement consists in crutches made of an elliptical spring, corrugated or otherwise, and an air-cushion. The crutch is made to revolve upon the staff, as shown at a, in Fig. 5; the upper part of the staff b is hollow or tubular, and wide enough to admit the lower part e; the hand-rest c is movable, revolving, and adjustable; and the ferule d is provided with a spring and a bulb end.

"Having described the construction and operation of my improved crutch, what I claim, and desire to secure by letters-patent is, First, the *revolving, plain, or corrugated* spring top in *combination* with an *air*-cushion, substantially as above described.

"Second, I claim, in *combination* with the revolving spring top, the *sliding* joint applied to the *staff* of a crutch, in the manner and for the purposes described.

"Third, I claim, in *combination* with the *sliding* staff, the *revolving* handle, *extension* ferule, and *elastic* bulb, as above described and set forth in the accompanying drawing."

No. 9519. SAMUEL HALL, of Pittsburg—*Improvement in Hillside Plough.* Patented Jan. 4th, 1853.

Figs. 6 and 7.

The improvement of this plough consists in the greater strength and durability which the mould-board obtains, by resting on the landside, first by the hinges E E′ and *n n′*, seen in Fig. 6, and the edges of the mould-board at *s s*, further against the projections *m m*, placed as far as practicable from the mould-board, to prevent too much strain upon the hinges, which would occur otherwise constructed, having the whole pressure of the furrow-slice upon that point.

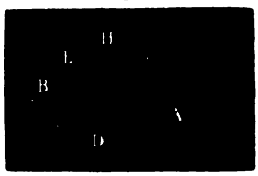
Fig. 6 is a side elevation with the mould-board spread to show the mode of hinging.

Fig. 7 is a side elevation of the plough, with the mould-board set properly.

"What we claim, as the invention of Samuel Hall, and desire to secure by letters-patent, is the manner of arranging the mould-boards upon the landside, to wit: placing their hinges at such a distance from each other on each side of the centre of the landside, that each mould-board may be supported by the edges *s s* and projection *m*, as far as practicable, from the hinges, and rest upon the grooves near the middle of the landside, substantially for the purposes herein set forth."

No. 9520. RICHARD HOLLINGS, of Boston—*Regulating the Spread of Water when Discharged from Hose.* Patented Jan. 4th, 1853.

Fig. 8.



The water is spread by means of a flat, fan-shaped piece A, see Fig. 8, which is attached at the mouth of the hose pipe B by means of pins, which pass through the collar O; the spread A has a handle H, which rests against the upper part of the frame E, and is regulated by a thumbscrew D.

"What I claim as my invention, and desire to secure by letters-patent, is hanging the spread A to the hose pipe by means of pins passing through the collar O (which allow it to vibrate), in combination with adjusting apparatus for varying the position of the spread in the manner specified."

No. 9521. B. F. JENKINS & L. L. KNIGHT, of Barre, Worcester County, Mass.—*Machine for Turning irregular forms.* Patented Jan. 4th, 1853.

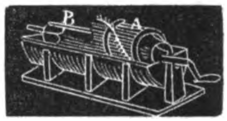
This invention belongs to that description of lathe in which the work and cutters both revolve, and the irregularity of form is produced by the vibration of the axis of the work, and of the whole or part of the cutters. The improvements consist in controlling the vibration of the said axes.

"We do not claim the vibrating cutting cylinder and vibrating work carriage;

"But what we claim, and desire to secure by letters-patent, is giving the necessary relative vibrations to the cutter, cylinder, and work carriage, by crank pins or eccentrices upon the axis of a pair of toothed wheels, of which one is toothed all round its periphery, and the other upon any suitable portion of its periphery, the latter wheel having a constant rotary motion applied, which gives an intermittent rotary motion to the former wheel, whereby the said cutter, cylinder, and work carriage receive, the one a constant vibratory motion, and the other, an intermittent vibratory motion, substantially as described."

No. 9522. Meritt Peckham & Lucius O. Palmer, of Utica, N. Y.—*Improvements in Ore Washers.* Patented Jan. 4th, 1853.

Fig. 9.



This ore washer consists of an outer hollow cylinder A, composed of several wings or segments, between which rods are inserted to allow the finer particles to pass through, and a solid cylinder B in the centre, the ends of which are at one end indented.

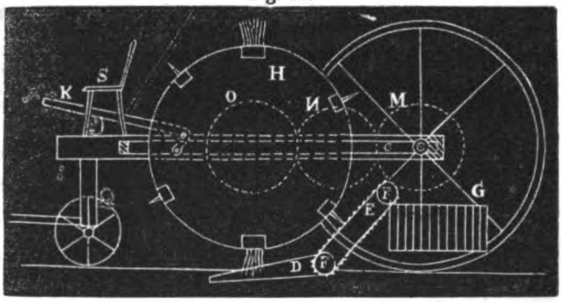
To operate this machine, the trough is filled with water, and a small stream of it kept constantly running in at the upper end of the trough. The cylinder is made to revolve in the water in the direction of the arrow and the earth thrown into the hopper, falling to the lowest part of the same at M, Fig. 9, which is inclined at an angle of about 22½ degrees towards the cylinder; and as all parts of it are the same, the earth and whatever may be mingled with it, slides through the apertures in the head into the cylinder, when more is thrown into the hopper. The cylinder, being divided by the wings into different sections, the earth within it is made to revolve at the same time with the cylinder, and as this end is the highest, at each successive revolution of the cylinder the mass must come nearer the lower end of the machine.

When the stones (having by their movements in the water become divested of all loose particles), have reached the lower end of the cylinder, they fall from the wings upon the inclined concave surfaces and are thrown out, while the small bodies which have passed between the rods of the cylinder, and cannot be removed by the water, settle to the bottom of the trough, where they are constantly stirred by the teeth *f* on the outside of the cylinder A. The first tooth in the bar enters the contents of the trough first, and the others follow in succession, each nearer the upper end of the trough than the preceding one, and in this manner they effectually counteract the tendency of the contents towards the lower end of the trough. When the operator desires to draw off the contents of the trough, he draws upwards the slide and reverses the motion of the cylinder, when the teeth, by entering the trough first at the upper end, together with the inclination of the trough and the current of water, will effectually empty the trough of its contents. The machine can be elevated or depressed so as to give the contents a greater or less amount of friction, as the nature of the earth in which gold is found may require.

"We claim as our invention, and desire to secure by letters-patent, the interior cylinder with indented ends, and wings attached, as described, to operate as a discharging apparatus attached to the interior of an inclined revolving screen, in the manner and for the purpose specified."

No. 9523. Francis C. Schaeffer, Brooklyn—*Implement for Digging Potatoes.* Patented Jan. 4th, 1853.

Fig. 10.



The potatoes are scooped from the hills by means of the scoop D (see Fig. 10); the cylinder H is provided with teeth and brushes, to throw the potatoes upon the endless apron E, running over rollers FF; this endless apron carries the potatoes into the receptacle G; the dirt and mould passes through the bottom of the scoop, and through the endless apron, made of iron rods. The driver, who may be seated at S, can elevate or depress the scoop by means of the lever K, whereby the frame is operated upon, in which the scoop and cylinder rest. The driving geering is attached to the hind wheel, and operates by means of toothed wheels M N O, upon the cylinder H.

"I am aware that machines have been previously used for digging potatoes; but in those machines the potatoes are dug or scraped from the hills by means of a concave or scoop, formed of a single piece, the brush cylinder carrying the potatoes up the concave and into the receptacle. I therefore do not claim the above arrangement; but what I do claim, and desire to secure by letters-patent, is the arrangement and combination of the scoop D and endless apron E, by which the potatoes are dug or scooped from the hills, and the dirt thoroughly separated therefrom, as they pass up the endless apron into the receptacle."

No. 9524. William Watson, of Chicago, Illinois—*For Improvement in Tongueing and Grooving.* Patented Jan. 4th, 1853.

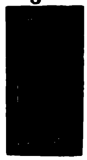
The inventor states that the operation of tongueing and grooving, by means of his improvement, may be effected with very little labor, by reason of the gradual nature of the cut, which is in proportion, as the length of the knives and number of gouges are increased, will be rendered still easier, while the tongue formed is clear and perfect. The board is forced along between the tongueing and grooving stocks by any well-known feeding apparatus. The stocks are stationary, and each knife set therein projects a little more than the preceding one, in order to make the cut somewhat deeper.

"Having thus described my improvements in tongueing and grooving machines, what I claim therein as new, and desire to secure by letters-patent, is the method substantially as herein described, of tongueing and grooving boards, by means of knives, arranged in the plane of the sides of the tongues or grooves, with their cutting edges inclined towards their rear extremities, so as to cut gradually deeper and deeper, as the board passes them, when in combination with cutting instruments, arranged between these side knives, to reduce or remove the surplus wood, which is severed by them, substantially as herein specified."

No. 9525. Jeptha Avery Wilkinson, Fire-Place, N. Y.—*Improvements in Printing.* Patented Jan. 4th, 1853.

This improvement consists in the combination of the proper machinery

Fig. 11.



for folding and cutting the sheets, in cylinders to secure the types upon; the shaft of each type being formed of a taper or radial line, corresponding with a line drawn from the centre of the cylinder to its periphery, each type shaft having a notch on one side and a projection on the other (see Fig. 11), by which the type not only lock into each other, but also fit into beads or grooves on the inside of the cylinder.

"I am not aware that type have ever been formed with two parallel sides, and two sides tapering on the radii of a circle, with a groove on one side and a projection on the other, so that on setting the parallel sides together and the tapering sides together, and placing the projecting beads into the corresponding grooves, a cylinder is formed of firmly secured type, with their faces equidistant from the centre, by which means the printing is effected the same as though the whole was solid in a perfect cylindrical form; this constitutes the essence of my invention, and the other parts claimed are the means to use, to form, regulate, and work this main invention, and for parts growing out of or connected with the same.

"1st. The application of notches or grooves, and beads or projections, on the shafts of type tapered to the radii of a circle for the purpose of locking said type together, and securing it in place on a cylinder, substantially as described and shown.

"2d. The mode described and shown of forming column lines, rules, rings, and blocking, so that they are adapted to the cylinder and to the type, with notches and projections to lock into the type and cylinder, substantially as described and shown.

"3d. The mode described and shown, of constructing the type cylinder with heads; the one head having a bead or projection, the other with a notch or groove around in its face, near the edge, for the purpose of receiving and securing the type or other parts composed, on the surface of said cylinder; such heads being fitted with means to compress and hold the type and parts in cylindrical form, for the purpose of printing, by a rotary movement, substantially as described and shown.

"4th. The mode of constructing the compositor's stick in the form of a part of a cylinder, with flanches, having beads or grooves, so as to hold the type in segments of a circle, while composing or setting up, preparatory to the placing of the same in the galley or proof cylinder, substantially as described and shown.

"5th. The mode of constructing and applying the galley or proof cylinder so that it shall receive and hold the type in circular form from the composing-stick, and retain the type and the needful parts in place for correction and proof, and for transferring the same to the type cylinder, the parts being constructed and operating substantially as described and shown.

"6th. The mode of forming and constructing the type-holder or grab, to inclose, take hold of, and securely lift a mass of type from the galley or proof cylinder, and transfer the mass either to the type cylinder, or to a stack, for further use, or to reverse or vary either of these operations, as may be needed, the instrument being constructed and operating in the manner and with the effects described and shown.

"7th. The application and arrangement of the pulleys, bands, and guide-plates, so placed and moving, as to carry the sheet of paper from the press, in lines diverging vertically and conveying horizontally, under, between, and over the guide-plates, thereby presenting the paper in a folded form to the compressing rollers, substantially in the manner and with the effects described and shown.

"8th. The application of the press-rollers, to compress the folded paper, and lead that out of the folding apparatus, and the combination of the standing-roller, revolving-shear, standing-shear, valve, and cam, to effect the cutting of the folded paper, as it issues from the rollers, and guide the fresh cut edge clear of the standing-shear, the whole of the parts being constructed, arranged, combined, and operating substantially as de scribed and shown."

No. 9526. Rudolph Kreter, of New York—*Machine for Covering Hammers for Pianos*. Patented Jan. 4th, 1853.

Figs. 12 and 13.

This invention has for its object to make coverings of hammers for pianos in a connected set. The inventor uses three coverings for the hammers. The several coverings are placed in a clamp, and placed into the machine, when the sliding-frame descends, and carrying the covering with it, held between the clamps, whereby the layers of the hammer covers are properly turned up, as seen in Figs. 12 and 13.

The degree of pressure is regulated by weights or springs, and it produces a good and regular fit on the end of the hammers, and gives it the proper shape. To increase the pressure at the side of the hammers, the vise is provided with screws and bolts, which can be tightened at pleasure. When the hammers are properly fixed, the bar K is lowered to remove the pressuré against the heads of the hammers.

"What I claim as of my invention, and desire to secure by letters-patent of the U. States, is—1st. The application of the felt or other covering material to the whole set of hammer-heads at one operation, in the manner described.

"2d. I claim the clamp A, bar *k*, levers, pulleys, and block B, with the sliding-frame *p* in combination, substantially as described; but without limiting myself to the precise shapes and proportions or positions of the said parts, provided the arrangement embrace the means of holding the set of hammer-heads, and of bringing them to bear upon a table containing the strips of felt described; and also the holding and moving the whole together, either horizontally or vertically, to and from the jaws of the vise, as set forth.

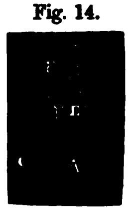
"3d. I claim the vise in combination with and inclosing the bar *k* and block B, as described.

"4th. I claim the lip-pieces, in combination with said vise, for the purpose described.

"5th. I claim the levers and springs, in combination with the vise, for producing the pressure upon the sides of the felt, during the passage of the hammer-heads between the jaws of the vise, as described.

"6th. I claim the method of increasing or diminishing the pressure ot the levers upon the vise, by means of the movable bridge *x*, in combination with the press *x'* and *y*, as described."

Fig. 14.



No. 9527. Walter Hunt—*Improvement in Bottle and Decanter Stopper Swivel Caps*. Patented Jan. 4th, 1853.

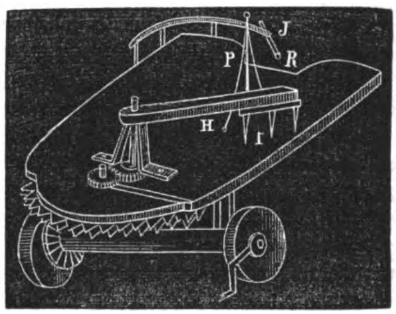
The annexed drawing, represented in Fig. 14, and the following claim, explain this improvement in bottle and decanter stoppers fully.

"I am aware that there have been other plans of self-acting stoppers recently introduced. I allude to the bivalves, hinged at the top, which, in short, is nothing more than the valve of the treacle cup duplicated, and its application to rum instead of molasses. There are also other plans of recent date, which have sprung up since mine were commenced, constructed upon the principle of puppet valves—all of which have the same objection of producing an uncertain scattering or over-discharge, and are constructed upon principles widely different from my above-described plan, and to which I make no claim in this application.

"*But what I do claim*, and desire to secure by letters-patent, in my above-described invention, is the combination of the circular cap F′ and the central shaft E, upon which said cap is suspended, so as to allow of its having three principal motions, viz., the swivel, pendulous, and sliding motions, by means of which, without regard to which side of the stopper is upward (when it is placed horizontally, or nearly so), the under portion of the cap swings off from the *flange* C, thereby producing a downward opening between the two, for the requisite discharge of the liquids contained."

No. 9528. Thomas Baylis & Daniel Williams, Tecumseh, Mich.—*Improvement in Rakes to Harvesters.* Patented Jan. 11th, 1853.

Fig. 15.



The inventor places upon a platform of a grain-cutting machine, as shown in illustration, Fig. 15, a revolving rake-arm H, which carries a rake I and describes a circle upon the platform, gathering the cut wheat into a sheaf, which is discharged at R; the movable joint J is a break attached to the side railing, designed to change the direction of the rake-head at R, and to aid in discharging the sheaf.

To the rake-arm is fixed a post P with a small pulley, over which a small cord passes with a weight at K, the other end being attached at the head of the rake.

"What we claim as our invention and improvement, and desire to secure by letters-patent, is

"The construction and method of operating the rake, together with the use of the jointed brake, in facilitating the discharge of the sheaf at the rear of the machine, as set forth."

No. 9529. Nathan Chapin, of New York—*Duplicate Turning.* Patented Jan. 11th, 1853.

The inventor, in setting forth the advantages of his improvement in turning of profile work, says: "They are, great accuracy, as all the pieces must necessarily be alike, and obviates the necessity of removing them until finished, not only on the outside, but also on the inside edges or profile, while the sliding clamps admit securing the pieces, irrespectively of accurate length, and permit the forming of tenons and plinths on the ends, which is important in forming baluster stuff; the open slots give great facility of entering endwise the material.

"What I claim as my invention, and desire to secure by letters-patent, is constructing the clamping heads with a projection on the interior face, in combination with the orifices cut through said clamps and projection, for the purpose of introducing key slats, in order to retain the pieces firmly in position during the operation of turning the interior and exterior surfaces.

"Second. I claim giving to the sliding and vibrating interior cutter suspended on the stationary mandrel, motion corresponding to the pattern to be turned, by a rod passing through the stationary mandrel, in the manner and for the purpose herein described."

No. 9530. Moses G. Farmers, of Salem, Mass.—*Improvement in Porous Cells for Galvanic Batteries.* Patented Jan. 10th, 1853.

In order to prevent evaporation of the acid in the porous cell, the inventor makes the cover of earthenware of the same material as the cell, and while it is in the plastic state he inserts strips of platina, and glazes and bakes it afterwards. Instead of making the whole vessel porous, he glazes the greater part of it, inside and out, leaving only a small portion unglazed, for the electricity to pass through the porous portion of the unglazed earthenware.

"I claim as my invention, the improved cell, as made substantially as described, viz., with a part only of it porous, or so as to permit the electricity to pass from the nitric acid or liquid within it through such part and into the liquid surrounding the cell, the remainder of the cell being made by glazing or other means, impervious to the passage of electricity and acid or liquid through it, as specified."

No. 9531. Pinkney Frost, of Springfield, Vermont—*Fastening Scythes to Snath.* Patented Jan. 11th, 1853.

Fig. 16.

This invention consists in a loop A and the set-ring B, constructed as shown in Fig. 16; the set-ring has a groove, as shown at *b* in the dotted lines, which corresponds with the groove in the loop. The loop is fastened by means of a screw.

"What I claim as my invention, and desire to secure by letters-patent, is the peculiar construction of the loop and the set-ring, with the grooves *b*, in the manner and for the purpose set forth."

No. 9532. Ammi M. George, of Nashua, N. H.—*Improved Method of Hanging Circular Saws.* Patented Jan. 11th, 1853.

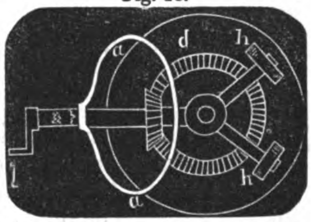
Fig. 17.

The nature of this invention consists in supporting and guiding a circular saw L, shown in Fig. 17, which is driven by the friction-wheels H and K applied near the periphery of the saw, by means of a guard-plate M, in which the arbor of the saw-plate works, which enables the inventor to saw boards or veneers by means of circular saws at a width almost equal to the diameter of the saw. The guard-plate has an opening at each end, through which the friction-wheels H H′ K K′ pass. These friction-wheels are set in motion by pulleys and bands.

"Having thus fully described my invention, what I claim therein as new, and desire to secure by letters-patent, is, in combination with a circular saw driven by friction near its periphery, the guard-plate, with its arbor, around which the saw runs, and by which it is held into the wood, and on which the board or veneer being sawed may rest, and relieve the saw from all friction therefrom, and by which means I am enabled to cut boards or veneers of nearly equal width with the diameter of the saw, substantially as described."

No. 9533. John L. Gilliland, Brooklyn, N. Y.—*Improvement in Punty Iron for Fire-Polishing Glass.* Patented Jan. 11th, 1853.

Fig. 18.

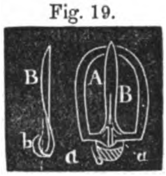


Articles made of glass, which require a high polish, that cannot be attached by means of a piece of glass to the ordinary punty iron, without destroying their surface, as, for instance, lenses, object and image glasses, the inventor uses a horizontal rotating table *d*, on the end of a hollow handle *a*, through which a shaft passes, which, by turning the crank *g* and the geering under the table, as shown in the illustration, sets the table revolving. The articles of glass placed upon said table can be rotated in the furnace or glory-hole, so as to receive the heat equally on all parts.

"What I claim as my invention, and desire to secure by letters-patent, is the method, substantially as described, of fire-polishing glass, by means of a rotating table, provided with a hollow handle, or its equivalent, and geer, by which said table can be rotated as described."

No. 9534. Peter P. R. Hayden, of New York—*Improvement in Buckles.* Patented Jan. 11th, 1853.

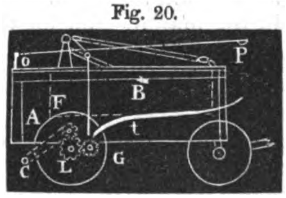
Fig. 19.



The annexed illustration, shown in Fig. 19, explains the improvement fully. The inventor claims, "constructing the buckle in the manner substantially as herein shown and described, viz.: by uniting or connecting the two ends of the body A of the buckle, by means of a boss *a*, formed at each of the two ends of the body; said bosses being in contact with each other, and forming a bulb around which one end *b* of the tongue B, is clasped. The end *b* of the tongue which surrounds the bulb, having a recess or groove in its inner surface, which conforms to the convexity of the bulb, and keeps or binds the bosses firmly together, and also keeps the tongue in its proper place."

No. 9535. Silas A. Hedges, of Lancaster, Ohio—*Improvement in Carts for Distributing Manure.* Patented Jan. 11th, 1853.

Fig. 20.



This invention consists in two cart bodies; one to hold the manure, which is suspended within the frame of the other large cart body; at the lower part of the rear end of the cart body A is a revolving endless belt C, which distributes the manure. This belt is moved by a cog-wheel geering into wheel L. The manure contained in the cart body B falls upon the endless belt C, when it is lifted by means of a rope, which works around an axle G. This axle is turned by means of a cog-wheel, which can be geered by means of the lever J into the driving geer connected to the hind wheel; the tail-board O is lifted by the lever P.

"Having thus fully described my invention, what I claim therein as new, and desire to secure by letters-patent, is constructing a manure cart with two bodies; the front one of which is raised or tilted, for the discharge of manure into the rear one by the action of the hind axle, by means of the axle G and tackle I, when thrown into geer by the hand-lever J, arranged and operating in the manner and for the purpose set forth.

"I also particularly claim the combination of the endless apron, the tilting-bed, and raising the tail-board, simultaneously with throwing the endless slotted apron, in the manner and for the purposes fully set forth."

No. 9536. William Mann, of Philadelphia—*Improvement in the Manufacture of Copying Paper.* Patented Jan. 11th, 1853.

In order to make a copying paper, which absorbs the copying properly, and furnishes a perfect impression from the original, the inventor combines manilla hemp fibres and cotton in equal parts. The inventor says in his specification, "The peculiarities of both these substances are, when damped, that they absorb or receive a portion of the ink from every part of the writing and the contractive property of the manilla in drying, serving to give a sharp outline to the impression thus made by absorption, and preventing the ink from running, spreading, and blurring, whilst the flexible nature of the cotton neutralizes the manilla fibre in its action.

"What I claim as my invention, and desire to secure by letters-patent, is the copying paper herein described, composed of manilla fibre, or the equivalent thereof, tempered with cotton or its equivalents, substantially as herein set forth."

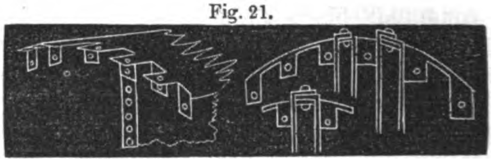
No. 9537. A. Aayres—*Improvement in Screwing Apparatus.* Patented Jan. 11th, 1853.

The nature of this invention consists in fitting and securing solid dies between the two side plates of a stock in such a manner that their turning and motion endwise, or in the direction of the axis of the screw, is prevented, but that a certain amount of movement, laterally or transversely to the axis, is allowed. The reason for allowing this movement is to enable the dies to accommodate themselves, as the pipe or other articles are turned to fit it to any bends or irregularities which may occur in it, and which, if the dies are fixed, cause it to jam, and render it more difficult to turn and prevent the screws being truly cut.

"What I claim as my invention, and desire to secure by letters-patent, is arranging solid dies between the side plates, or their equivalents, of a stock, in such a manner that they are free to play, to a limited distance, in a plane perpendicular to the axis of the bolt or pipe to be screwed, while they are, at the same time, incapable of revolution in the same plane, substantially in the manner and for the purposes described."

No. 9538. Richard Montgomery, of New York—*Improved Method of Connecting Sheets of Sheet-Flue and Water-Space Steam-Boilers.* Patented Jan. 11th, 1853.

Fig. 21.



The inventor makes his boiler of corrugated iron with flat margins, and overlaps the edges of the water-spaces, whereby he dispenses with the usual flue-sheet, and claims to be enabled to build his boiler much cheaper in consequence of a reduction of material and labor in putting the joints together, or lessening the number of joints between the water-space and the flues. The illustration shown in Fig. 21

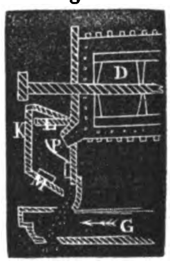
shows the arch of the fire-box and the mode of fastening the water-spaces B, and the formation of the flues C, by means of tongues cut out from the cross-sheet, to which alternately the water-spaces are secured.

"Having thus described my improvements in steam-boilers, what I claim as new, and desire to secure by letters-patent, is riveting together the overlapping flanges of the opposite sides of sheet-flues in steam-boilers, in the manner described, whereby the flues are firmly attached, each to each, and the usual flue-sheet is dispensed with; and also certain advantages in construction attained in other parts of the boiler, as described.

"I also claim the method of connecting a series of flues and water-spaces with the roof or arch of the fire-box, by means of tongues, which project from the latter, and are secured alternately to the faces of the water-spaces and to the tops of the flues."

No. 9539. Dan. Pease, Jr., of Floyd, N. Y.—*Improvement in Smut Machines.*

Fig. 22.



The inventor uses a perforated metallic scouring cylinder A, in which the beaters D revolve, driven by a pulley; on the same shaft at the other end of the annexed illustration, Fig. 22, is a fan-blower, which drives the air through the channel G in the direction of the arrow, to blow the dust from the grain. The grain passes from the cylinder at O into the box K, when they are forced against the deflector P with great force, and are scattered upon the inclined plane M, which is provided with ribs *s s*, to divide the grain as evenly as possible, and expose it to the current of wind.

"What I claim as my invention, and desire to secure by letters-patent, is the employment of the adjustable deflector P, set at an angle to throw the grain in different directions, in combination with the receiver K L M, the top of said receiver being adjustable to any height desired, and the front-piece K of the same being set in such a position in relation to the deflector P, that it will, when the grain strikes the deflector, be thrown against the said plane surface K, which, from its peculiar position, will throw the grain in a partially spread state, up against the adjustable top L, which causes it to spread still more, and then to fall down on the ribbed bottom M, and pass off through the wind pipe.

"I also claim causing the grain to spread to a greater or less degree, by making the top of the receiver adjustable to different heights, in the manner and for the purposes herein described."

PUBLICATION OF PATENTS.

We express the general, if not the universal sentiment of inventors, in our thanks to the Hon. Mr. Cartter, Chairman of the Committee on Patents, for his promptness, energy, and fidelity to the cause of inventors, in bringing forward and procuring the passage of the annexed bill in the House of Representatives on Monday, the 24th ult. The publication of the digest of patents has been long and most earnestly desired; and we were on this occasion specially gratified to see with what confidence and cheerfulness the House met Mr. Cartter's propositions, and we readily account for it in the fact that Mr. Cartter has, from the commencement of his duties as Chairman, identified himself with the true interests of inventors, and the elevation of our patent institution. The following is a copy of the bill as it passed the House.—*Editors Amer. Pol. Jour.*

PATENT-OFFICE REPORTS.

Mr. Cartter—I ask the unanimous consent of the House to report a bill which I sent to the Clerk's desk. The bill will explain itself, and I hope the House will give their attention.

The bill was then read, as follows:

An Act to regulate the report of the Patent Office, and providing for additional officers therein.

SEC. 1. *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That the Commissioner of the Patent Office shall cause to be prepared a general analytical and descriptive index or digest of all such discoveries, patented under act or acts of Congress, as he shall deem important to be made known and published, and of all such discoveries and inventions made in this country as tend to illustrate those so patented as aforesaid; to be accompanied with such proper drawings as are requisite for understanding the same; shall from time to time publish such portions thereof as are sufficiently prepared for that purpose, and distribute and sell the same as in his judgment will be best for the public interests; and shall report the whole, when completed, to Congress. And the net proceeds of the sales hereby authorized shall be accounted for by him and credited to the patent fund.

SEC. 2. *And be it further enacted*, That in lieu of the list of inventions and claims heretofore contained in the annual report of the Commissioner of Patents, he shall cause to be prepared and embrace in his annual report, short, intelligible descriptions of the several inventions and discoveries patented during the year, accompanied with such drawings as are necessary for understanding the same, and an analytical and alphabetical index of the same, according to the subjects.

SEC. 3. *And be it further enacted*, That one compiler, with an annual salary of twenty-five hundred dollars; one assistant compiler, with an annual salary of fifteen hundred dollars; and one engraver, with an annual salary of twelve hundred and fifty dollars; and one additional examiner and assistant examiner, to be paid like those now employed in the Patent Office, shall be appointed in the manner provided in the second section of the act approved July 4th, 1836, entitled "An act to promote the progress of the useful arts, and to repeal all acts and parts of acts heretofore made for that purpose."

SEC. 4. *And be it further enacted*, That the Commissioner of Patents is hereby authorized to draw upon the patent fund from time to time for such sums as shall be necessary to carry into effect the provisions of this act, and they are hereby appropriated for that purpose.

ERICSSON'S CALORIC ENGINE.

....e publication of our first number, there has been an experiment for once more testing the capabilities of heated air as a motive-power, which, for its stupendous magnitude, deserves more than a passing notice. Although we regret to say that no reliable information has yet been published by the inventor, by which a correct judgment could be formed by the engineer and man of science of the exact practical utility of the device.

The public has been somewhat excited and astonished by the current reports in the papers of the day, which do not, however, so far as we have seen, throw any real light upon the subject. Air as a motive-power is an old acquaintance of ours, and numerous have been the bright expectations blasted by a failure to make it useful: like its compeers carbonic acid gas and alcohol, there seems to be an inherent defect preventing its successful introduction, which we regret our want of space to clearly show at this time.

This invention, as put forth by Capt. Ericsson in a pamphlet some twenty years ago, was clearly refuted by a writer in the London "Repertory of Patent Inventions," in January, 1834. A similar one, patented by Sterling in 1827, had long before proved worthless; and until it can be shown that this has some radically new feature, which does not appear from the patent, we fear it will share the same fate as its predecessors.

The great feature of this engine, we are informed in one of the daily papers, from which we quote, is the "regenerator," consisting of "a series of wire nettings placed side by side to the thickness of twelve inches, presenting a metallic surface of 15,000 square feet, in which are contained upward of 100,000,000 of meshes—minute cells, through which the air is forced, and in which it imbibes or parts with caloric to the amount of 450°." The same paper goes on to say, and we understand it to be reporting Capt. Ericsson's words: "The maximum temperature, which is requisite for doubling the volume of atmospheric air, is 480° F., of which 30° are afforded by the furnace, and the residue by the regenerator." "This action is instantaneous." Taking for granted the correctness of these numbers, which we by no means admit, we regret that among the questions asked Captain Ericsson, there were none that elicit the facts upon the following points, which would have thrown some light probably upon the subject: What is the velocity of the air through the regenerator for any given velocity of piston? Is its course straight or otherwise? What force is required to drive the air through the regenerator, or in other words what is the difference between the pressures on the two sides of the regenerator, when making nine or any fixed number of revolutions? Would it or not require four times as much power to force it through at double that velocity, and if not, what increase of power would be required? What is the greatest number of revolutions obtained with these engines, with the working-cylinder 168 inches and supply-cylinder 137 inches diameter? Is any auxiliary power required to supply air, other than the supply-cylinders?

We cannot close our brief remarks upon this subject without paying a tribute of respect to the gentlemen who have been induced to freely advance the money to carry forward a project having ostensibly for its object the saving of human life. The motive was philanthropic, and if its object fails it will not be their fault, for they could not be expected to have a knowledge of so difficult a subject; their motive was equally honorable whether their effort should be crowned with success or disappointed by a failure.

J. J. G., *Ed.*

NOTICE.

PHYTANETIC RECORDS.

The Editors of the American Polytechnic Journal are desirous of procuring the services of some skilful observer of plants to furnish monthly an account of the seasons for seeding, planting, and gathering the important vegetables, fruits, and flowers, of various localities; times of budding and grafting, of blooming and fruiting; and also the times at which the various annuals are cut off by autumnal frosts; and what cultivated plants survive the winter; and, in fine, any thing remarkable in the season connected with *cultivated* plants. As we propose to collect these records from all parts of the United States, that part of the Journal will be specially valuable and interesting to gardeners and farmers: in return for this service we will send monthly, free of postage, a number of the Journal. The Journal, it will be seen, has a considerable space devoted to agriculture in all its branches. It is desirable that the records should be full, but in condensed form; and in case they should prove satisfactory, the Editors will be ready to give an adequate remuneration.

MISCELLANEOUS.

TANNING LINEN, HEMP, AND COTTON GOODS.

Wimmer made a decoction of half a pound of good oak bark with 12 lbs. of water boiled down to 8 lbs. In this hot decoction he placed, for forty-eight hours the articles to be tanned, and dried them in the air. The articles were placed for eight months in a very damp cellar, where they remained perfect, without the least alteration; whilst untanned articles of the same description, and under the same circumstances, were entirely destroyed.

Bayer, Kunst, & Gewerbebl, 1851, p. 449.

ARTIFICIAL MODE OF COLORING MARBLE AND OTHER STONES.

Green.—A solution of verdigris colors marble light-green, but it does not penetrate into the marble deeper than one line.

Gamboge colors the marble yellow, when dissolved in hot alcohol, and applied warm.

A dark red color is produced with a solution of nitrate of silver in distilled water. This color penetrates deep into the marble.

A handsome red is made by a solution of dragon's blood in alcohol.

Chloride of gold stains the marble *purple-violet.*

Scarlet red is produced by a solution of cochineal in alcohol.

Smaraged-green color can be produced by a coat of a mixture of wax and distilled verdigris laid on in a warm state. When the mixture is coated, it is taken off. The color sinks in the marble four to five lines deep.

Sandal, *Pernambuco*, and like dye-woods, when treated with alcohol, make colors which give the marble beautiful tints.

Böttger, Polyt. Notizbl. 1850, p. 282.

THE AMERICAN POLYTECHNIC JOURNAL.

ELECTRO-MECHANICS.—No. 3.

When a battery current is sent along a conductor—for instance, a metallic wire—it encounters two resistances, one arising from some peculiar physical property of the metal impeding its passage; the other, from the action of adverse currents. The first is called resistance to *conduction;* the second, the effect of *induction*. The conducting powers of the metals vary; and, as a general rule, the precious metals conduct the best. To this rule, platinum offers a remarkable exception. The properties of metals in conducting electricity are somewhat in the order of their conducting powers for heat. The metals usually employed for conductors in the construction and working of electro-magnetic machinery are copper and iron. Their relative powers are variously estimated by different authors; but the average rule, as deduced from the most careful observers, gives to copper six times the conducting power of iron. For each metal, its conducting power *generally* increases with its purity, and so far as we have been able to learn by experiment, hard-drawn wires, and rolled or hammered plates of metal, conduct better than annealed forms of the same metals. In experiments upon the conduction of alloys, Pouillet found that pure gold was equal to 84·41, and 18 carat gold = 14·77; while silver, when pure, gave by itself a greater conducting power than the gold.

There are, however, some remarkable exceptions to this rule. Copper is generally conceded the highest rank as a conductor; but it has been observed by some experimenters, that copper and silver in certain proportions make a better conductor than pure copper. The silver coin of the United States is said to be the best. Mr. Harris (Phil. Trans. 1827, p. 18) gives the following results with metals and alloys:

	Conducting Power.
Copper,	12
Copper 1 part, Silver 1 part,	12
Copper 1, Silver 3.	12
Copper 3, Silver 1,	12
Gold,	8
Gold 1, Copper 3,	4·8
Gold 1, Silver 2,	4·8
Zinc,	4
Brass,	4
Platinum,	2·4
Iron,	2·4
Tin,	2
Lead,	1

We give below the results of experiments by several distinguished men upon the conducting powers of metals. We do not find among them the estimate for German silver. It takes a very low rank, being about *one-twelfth* the conducting power of copper; and this property, in connection with its difficulty of oxidation, its hardness, elasticity, ductility, and low price, compared with platinum, renders it a very valuable metal in some experiments, as we have already shown in the construction of the rheostat, described in our first number, and in the thermo-galvanometer, in our number for last month.

The conducting power of liquids is exceedingly small compared with that of metals. Platinum, which is a poor conductor, conducts ten hundred million times better than pure water, and two and a half million times better than a solution of sulphate of copper. We have collected with some pains eight tables of conducting powers, for the purpose of exhibiting the results of experiments by men of the highest eminence and authority in this branch of science, and we cannot fail to be struck with some remarkable discrepancies in these results.

LENZ.
At 32° Fahr.

Silver,	136·25
Copper,	100
Gold,	79·79
Tin,	30·84
Brass,	29·28
Iron,	17·74
Lead,	14·62
Platinum,	14·16

REISS.

Silver,	148·74
Copper,	100
Gold,	88·87
Cadmium	38·35
Brass,	27·70
Palladium,	18·18
Iron,	17·66
Platinum,	15·52
Tin,	14.70
Nickel,	13·15
Lead,	10.35

POUILLET.

Gold,	10[illegible]·5
Copper,	100
Platinum.	22·5
Brass,	15·2 / 23·4
Cast-steel,	13·0 / 20·8
Iron,	15·6 / 18·2
Mercury,	2·6

BECQUEREL.

Copper,	100
Gold,	93·6
Silver,	73·6
Zinc,	28·5
Platinum,	16·4
Iron,	15·8
Tin,	15·5
Lead,	8·3
Mercury,	3·45
Potassium,	1·33

OHM.

Copper,	100
Gold,	57·4
Silver,	35·6
Zinc,	33·3
Brass,	28·0
Iron,	17·4
Platinum,	17·1
Tin,	16·8
Lead,	9·7

DAVY.

Silver,	109·1
Copper,	100
Gold,	72·7
Lead,	69·1
Platinum,	18·2
Palladium,	16·4
Iron,	14·6

FARADAY.

Copper,	6·33
Gold,	6·00
Silver,	4·66
Zinc,	1·80
Platinum,	1·04
Tin,	1·00
Iron,	1·00
Lead,	0·52

MULLER.

Gold,	1·36
Silver,	1·03
Copper,	1·00
Zinc,	·28
Platinum,	·22
Iron,	·17
Mercury,	0·26

We may account for some of these irregularities upon the supposition that the conducting powers were not all taken at the same temperature, and that the condition of the metal as to compactness or hardness, was not noticed, and that sufficient pains were not taken to insure entire purity of the metals. We also suspect that with different metals there are not the same proportional changes in their conducting powers for corresponding changes of temperature; and hence, if one series of experiments is conducted at 32° Fahr. and another at 60°, there might be a considerable disagreement in the results. The most remarkable result in the whole series is the high position assigned to lead by Davy, making it nearly equal to gold.

The conducting power of metals diminishes with an increase of temperature, while that of liquids increases with their temperature. With any of the above conductors, and also with all conductors, solid or liquid, the law of conduction is as follows:

Bodies conduct electricity in the inverse ratio of their lengths, and the direct ratio of their cross-sections. Or it may be expressed as follows:

The resistance by bodies to the conduction of electricity is directly as their lengths, and inversely as the areas of their cross-sections. By lengths, we understand the distance through which the current of electricity has to travel, whether it be a liquid or a solid mass, and whatever be its form. This law was proved many years since by Davy, Pouillet, Becquerel, Christie, Ohm, Fechner, and others; but Barlow and Cumming, from their own experiments, came to quite a different conclusion. They considered that the *conductibility was inversely proportionate to the square of the lengths, and directly as the diameters of the wires (or as the square roots of their sections).* This latter law has been fully disproved.

The resistance from *induction* is a more complicated study. We will content ourselves with a plain statement of the effects and general action of induced currents. The various conditions under which induced currents are produced, are as follows, viz.:

1st. When a current is being developed in a conductor—a wire, for instance—it induces a current in an opposite direction in contiguous conductors, and also in its own wire; that is to say, the electricity belonging to the wire itself moves in the opposite direction or against this the primary current. This induced current is termed the *initial secondary.*

When a current is subsiding in a conductor, it induces in contiguous and also its own conductor, a current which moves in the same direction, or in conjunction with the primary current. This induced current is called the *terminal secondary.*

Any change in the condition of the primary current, however caused, is accompanied with the production of induced currents, in accordance with the principles just stated.

C. G. P., *Ed.*

(To be continued.)

TECHNICAL CHEMISTRY.

[Translated for the American Polytechnic Journal.]

AGRICULTURAL CHEMISTRY—ANALYSIS OF SOILS.

The Chalk Formation as a Sub-soil.

THOMAS WAY* has made an examination of the composition of the chalk formation usually to be found in England, and which there exerts an influence as a sub-soil in agriculture. As to its more important constituents in this respect, these contain (not including the strata furnishing coprolites, and which are not taken into the investigation) mostly only traces of phosphoric acid; but in a species of marl, called *green* marl, it reaches as high as 3·76 per cent. This same marl contains 3·66 potash, and 1·51 soda. In the other descriptions, with the exception of the chalk formation proper, which contains only fractions of a per cent., the proportion of alkali varies from 3 to 4 per cent., in which sometimes potash and sometimes the soda predominates.

* Journ. of the Royal Agric. Soc. of England. xii. 545.

Titanium in Soil.

Salm-Horstmar* makes the observation that titanium is a very prevalent constituent in soil, although wholly disregarded in analysis, and which he found in most kinds of soil, especially in the sand, on the shore of the North Sea, and in clay of Grossalmerode;† in the latter case the proportion of titanic acid being about 1 per cent.

Slime of the Nile.

M. W. Johnson‡ found in a specimen of the slime of the Nile, from the vicinity of Cairo, the composition of Nos. 72 and 73 of table C, which agrees quite nearly with that previously ascertained by Payen and Poinsot.§ Water abstracted from this slime of the Nile 1·06 per cent. of inorganic, and 0·24 of organic parts, in all 1·30 per cent., and left behind 93·84 per cent. of inorganic, and 4·85 of organic matters, together 98·69 per cent. In an air-dried state, it contains 7·78 per cent. of water. In a specimen of the water of the Nile, which Johnson investigated at the same time, he found oxide of iron, lime, magnesia, soda, silex, carbonic acid, sulphuric acid, chlorine, and organic substances, but on account of the small quantity to be analyzed, could not distinctly indicate the constituents, which were in still less quantities.

Burning of Clay-soil.

A. Völcker‖ made an investigation into the causes why so valuable an improvement is effected in heavy clay-soils by burning, in British agriculture. He regards the benefit as resulting both from mechanical and chemical changes. By means of the former, the stiff, heavy soil is changed into a loose, porous one, which is far more accessible to the atmospheric agencies and instruments of culture. He finds also that unburnt clay yields more ammonia than burnt clay, after it has been exposed for some months to the air. The quantity of ammonia (0·0002 by weight) absorbed by the latter, appears to him too small to have any effect ascribed to it. In order to ascertain the chemical changes, Völcker undertook the analysis of specimens of clay, before and after burning, at different degrees of heat, and from the comparison of the same, he draws the following conclusions, which are of general interest: Natural clay contains, together with its principal elements, phosphoric acid, potash, and soda, in very observable quantities (the alkalies up to above 2 per cent.); and further, a constituent soluble in a weakened solution of muriatic acid, in which likewise there were found alkalies and phosphoric acid: the quantity of the portion so dissolved, as well as the proportion of this latter in alkali (but not in phosphoric acid), increased by burning at the first, but in a stronger heat it diminished again. To the efficacy of the burning is essentially to be ascribed the increased proportion of the clay in disposable alkali, and hence is explained the reason why this result is especially evident in the turnip crops: by burning, particularly when caustic lime is used at the same time, the same end is reached at once and quickly, which is attained at a greater expense of time in fallowing. It is sufficient to burn the clay at a heat in which its organic constituents will only carbonize, for at a higher tempera-

* J. Pr. Chem. liv. 129.

† Comp. L. Goncliris Handbuch, d. Chem. 4, Aufl. ii. 450.

‡ Chem. Soc. Qu. J. iv. 143; Pharm. Centr. 1852, 152.

§ Jahresber. f. 1850, 646.

‖ Journ. of the Royal Agric. Soc. of England, xii. 496; Chem. Gaz. 1852, 121; Journ. Prac. Chem. lvi. 159.

ture we destroy the right degree of porosity, and at the same time lessen the disposable alkali; and hence the frequent ill-success of the operation in practice, together with the striking results. These observations, as is evident, and as Völcker himself admits, are not all new.

Girardin* examined a number of concentrated manures (engrais concentrés), *i. e.*, artificial preparations, which represent, in a small compass, great fertilizing power, such as Bicke's, Huguin's, Dusseau's, and others. They are, more or less, mixtures of phosphated earths, soluble salts, and organic substances. For the figures and details, we refer to the essay itself.

Sussex,† in order to reduce the fluid contents of privies to a dry form, more suitable and easy for transportation, advises to mix it with some acid, and with 5 to 6 per cent. of silicate of soda, so that the whole may be rendered stiff by the formation of gelatinous silicates.

In dried blood, as at present obtained for the purpose of manufacture, and used as manure, Thomas Way found in 7 specimens the following results :‡

No.	Water.	Nitrogen.	Equivalent of Nitrogen in Ammonia.
1	8·78	13·24	16·07
2	7·91	13·58	16·49
3	6·19	13 93	16·91
4	21·81	11·44	13 89
5	29·46	10·45	12·69
6	22·11	11·38	13·82
7	35·43	8·74	10·59
Mean,	18 81	11·82	14·35

Th. J. Herapath§ analyzed various fossils (bones, coprolites, and pseudo coprolites) from the crag formation in England, with reference to their value as manures; and also has made communications‖ respecting the preparation, use, and composition of the manure sold in England by the name of *super-phosphate of lime*. On account of the local interest of this subject, we refer to the essays themselves.

As to the ashes which are sold in North Germany under the name of "Post" (*Chara fœtida*), see article on Ashes of Plants.

Lawes and Gilbert¶ have carried on a series of experiments, on a great scale, respecting the mineral manuring, especially in reference to the views propounded by Liebig. They deduce the conclusion that the chemical analyses of plants, cultivated either as to organic or inorganic constituents, will in nowise furnish any standard for the artificial composition of manures, so far as these constituents are abstracted from the field by means of the crops.

Chevandier,** who has been engaged since 1847 with extended experiments respecting the applicability of manures in the forest culture, in a preliminary publication has given a survey of the results obtained, omitting the details, from which we derive the following:

He chose as the forest to be the subject of experiment, that of Vogesen-

* J. Pharm. (3) xix. 131; Dingl. Pol. J. cxx. 454; Jacquelain (Compt. Rend. xxxiii. 398, Instit. 1851, 330) gives a guide to the investigation of such manures.

† J. Pharm. (3) xx. 266; Dingl. Pol. J. cxxiii. 176.

‡ Journ. of the Royal Agric. Soc. of England, xii. 584.

§ Journal of Royal Agric. Soc. of England, xii. 91.

‖ Ibid. 204.

¶ Ibid. xii. 1; Ausz. Chem. Gaz. 1851, 298; Instit. 1851, 310; Comp. Pusey, view of the influence of chemistry on agriculture, in the Journ. of the Royal Agric. Soc. of England, xi. 381, and Liebig's reply to the same, Chem. Buefe, 3d. Aufl. 1, Abdr. 641; Ann. Ch. Pharm. lxxix. 116.

** Compt. Rend. xxxiii. 633; Instit. 1851, 393; J. Pr. Chem. lv. 179; Dingl. Pol. J. cxxiii. 461.

sandstein, the district belonging to the parti-colored sandstone and shell-lime, variously wooded, partly pines and partly of other descriptions; but which, in respect to situation, closeness of forest growth, and similar circumstances, allowed as certain a comparison as might be. They were generally young trees, which were still rooted in the upper portions of the soil, to which the manure was immediately applied. To every experiment a particular parcel was assigned, with two divisions. One division served to indicate the permanence of the manure, and was only manured in the first year; the other division was also manured the following years. In each district a parcel was reserved, *i. e.* without artificial improvement of the soil, for comparison of its product in wood with that obtained in the division under the operation of the manure. The determination of the yearly growth was made, by continued measurements of the trunks chosen for this purpose in each parcel (in all 5530 trees). By combining the average so obtained, an average of a higher order was derived, which was the basis for Chevandier's succeeding results. The manures applied in the experiments may be arranged in four classes: 1. Those operating decidedly favorable on the growth of wood (sulphuret of lime, sal-ammoniac, gypsum, wood-ashes, sulphate of ammonia, poudrette, lime, unburned bones). 2. Of very feeble or doubtful benefit (carbonate of potash, coagulated blood, bone-ashes, mixture of equal parts of Chili saltpetre, unburned bones, sulphate of iron, and carbonate of lime, as well as equal parts of nitrate of potash, with unburnt bones). 3. Without any influence (carbonate of soda, nitrate of potash, common salt). 4. Of injurious effect (sulphate of iron, by itself and in equal parts, with burnt or unburnt lime; in some cases indifferent). The increased product of wood in manures of the first class, and with once manuring, varied from 4 to 23 per cent.; with permanent manuring, in which the trees together received the fourfold dose, 24 to 40 per cent. of the correspondent growth without manuring. On account of the cheapness of most of these manures, Chevandier believes that the favorable results may be applied for use in large quantities.

Manuring with Sulphates.

J. Pierre* took occasion to repeat his experiments, mentioned in the previous report, p. 659, respecting the effect of the different salts on the production of sainfoin the next year, but only so far as refers to the sulphates, in order to see how far the external conditions of the growth, especially the weather and the age of the plant cultivated, operate. The experimental field, the process of observation, in short, the other circumstances remained the same, up to the natural changes of the weather, and the circumstance that the sainfoin sometimes was of the third year's growth, and only the first cutting of this year of the observation for other reasons could be taken into the account. With these things supposed, Pierre found his earlier experiments confirmed in the whole, and hence makes the following conclusions: Unburnt gypsum, all other things being equal, acts more powerfully than burnt gypsum, so long as no other salt is added to it; on the contrary, it appears exactly the reverse when the gypsum is mixed with common salt. Sulphate of soda and sulphate of ammonia are favorable for increasing the crop, and the more so, the greater the addition made, at least within the limits of the experiments (250 to 100 kilogs. on the hectare). If additions of these two sulphates be made on the field in succession, which represent the same amount of sulphuric acid, the best result to all appearance is on the

* Compt. Rend. xxxii. 337; Instit. 1851, 74; Dingl. Pol. J. cxx. 229.

side of ammoniacal salt; this, under these conditions, even exceeds gypsum mixed with common salt. An active operation, therefore, must be ascribed to the basis, combined with sulphuric acid.

Applications of Gypsum.

Fellenberg* has again taken up the often-discussed question of the effect of gypsum on clover, in order to furnish an experimental solution, in opposition to the views which have hitherto been promulgated respecting it, and especially of those authors who ascribe that effect simply to an increased addition of lime. Assuming this as correct in the same circumstances, the proportion of lime must be greater in the clover which has received gypsum, than in that which has not.

For the purpose of a comparative analysis of the ashes, Fellenberg provided himself with specimens, selected from clover and sainfoin, of the crop of 1850; this he carefully freed from dust and earth, and dried at first in the sun at 100°, and finally at 110°, in a hot-air bath. The analysis of the material reduced to ashes, according to Rose's method (by carbonizing, extracting the carbon successively with distilled water and muriatic acid, then the combustion of the residuum of carbon)—the process is not described more in detail—gave the following result:

	SAINFOIN.		CLOVER.	
	With Gypsum.	Without Gypsum.	With Gypsum.	Without Gypsum.
Per centage of ashes of the dried substance	4·83	4·58	9·39	9·47
Silica	6.79	4·68	0·21	....
Carbonate of magnesia	16·79	15.72	7·05	7·79
" lime	29·11	27·67	25·13	26·99
Phosphate of lime	18·57	19·04	15·82	13·67
" potash	0·07	0·29	0·18	....
Sulphate of potash	3·00	10·87	1·16	4·92
Silicate of potash	6·60	7·84	3·23	2·83
Carbonate of potash	17·49	11·78	45·07	42·81
Chloride of potassium	1·57	2·10	2·14	0·96
	99·99	99·99	99·99	99·97

Traces of soda and oxide of iron remained in the phosphate of lime, which were not regarded. These results do not sustain, as Fellenberg concludes, the view which is based on the increased addition of lime; for the proportion of lime hardly appears to be increased by means of the gypsum in the clover, and even is lessened in the sainfoin; on the other hand, in both cases there is a decided increase of sulphuric acid, even amounting to three or four fold in the plants which received the gypsum. A comparative determination of the sulphur of plants, with and without gypsum—which in this connection has particular interest—was wholly unsuccessful, according to many methods tried. If, Fellenberg further adds, the gypsum mainly operates by its sulphuric acid, this, in the small quantity which is added thereby to the plants, must not be so understood as though its sulphuric acid acted directly as a manure; much more the gypsum is to be regarded absolutely as a means of fixing the ammonia in the soil. Sprinkling, with very weak sulphuric acid, instead of gypsum, likewise effects a powerful and luxuriant growth.

* Mittheil der Bemer. Naturforschenden Gesellschaft, 1851, 74.

RULES AND FORMULÆ FOR CONSTRUCTING MACHINES AND PARTS OF MACHINES.

[Translated and prepared for the American Polytechnic Journal, by M. C. Gritzner, Civil Engineer, and C. L. Fleischmann.]

The rapid progress in all branches of industry and internal improvements throughout the civilized world, has elicited from learned men attempts to popularize scientific principles and to make science a valuable auxiliary to the efforts of the empirical man. Even the learned of theoretical Germany have descended from the higher regions of speculation, and reduced science to the comprehension of the masses. Within the last ten years several important works on mechanics from high sources have appeared in Germany, which bear the marks of usefulness and practicability. Among these works, those of F. Redtenbacher, Professor of the Polytechnical School of Carlsruhe, Grand Duchy of Baden, have been generally acknowledged as works of the highest merit. Professor Redtenbacher, having spent a great portion of his life in the investigation and study of machinery, has taken the dimensions of various machines of England, France, and Germany, and in comparing their mode of construction, and the strength of the various parts, has combined these facts with the results of his scientific investigation, published the rules and formulæ, with the view to enable the student, as well as the practical mechanic, to construct perfect machines. This work he has published under the title of "Results for Constructing Machinery," and we take great pleasure in making our readers acquainted with that portion of the work which relates to the rules and formulæ of constructing parts of machinery.

Professor Redtenbacher, in the preface to his work, says:

"A collection of results for the construction of machines is not only an indispensable reference for the experienced engineer, but also for the beginner who intends to prepare himself for his future practical career. When the engineer or machine-builder has once entered upon the field of practical operation, there is neither time nor desire to seek in elementary school-books, encyclopedias, or voluminous libraries, after facts or scientific results; but he will search and prefer books which contain the desired data in a shape and form which require little study and tiresome perusal. The third chapter contains the rules of construction of the active and passive parts of machinery. The modes of construction, according to the proportional relative numbers, have been carried out with the utmost carefulness. The dimensions relate mostly to axes and journals; and when the latter are once determined, the other dimensions are easily found by means of the relative proportional numbers, which are furnished by the given rules. When these rules are once understood, they will be found too useful and practical ever to be abandoned; because they are, 1st, applicable to all kinds of measure systems; 2d, the relative proportional numbers are either entirely constant, or only a little variable, and consequently they can be retained in mind very easily; so that any question of construction can be solved without reference to the tables.

"These rules have, however, their weak points, which do not originate in the application of the relative proportional numbers, but from the fact that they are based upon statical principles, and that neither the influence of the effects of masses, nor the wear upon the parts of machines, has been taken into consideration, which always takes place in machinery of rapid motion. These defects can be easily remedied. Should it be necessary to take the effect of masses into consideration, it is only required to make the journals and axes at once strong enough; for instance, one-quarter or one-half stronger than they are usually made; and when the mode of calculating with relative proportional numbers is used, the other dimensions will be in due proportion. When there are heavy strokes to be taken into account, the counteracting parts must be provided with sufficient mass to absorb a considerable quantity of power, without causing too great vibration of the molecules."

The application of statics and dynamics to the construction of machines and their separate parts, furnishes certain results which are correct as to theory, but to make them applicable for practical purposes, they require modifications; because there are many material influences which cannot be brought under a strict mathematical investigation.

The numerical value of such modifications can only be found by experience, which Professor Redtenbacher obtained in the following manner: he measured and procured the measurements of machines of the best constructors of England, Germany, and France, and by comparing the later with each other, and with the dimensions obtained by theory, he found the most suitable dimensions, and at the same time the numerical values serving as coefficients for the formulæ.

This comparison furnished also certain numbers expressing relative proportions of the various parts of machines.

The fact that parts of well-constructed machines are very nearly proportional among themselves, is well known to machine builders; but it has never been brought under a general system. Professor Redtenbacher takes, for instance, for the calculation of parts of machines for the transmission of power, the journal of an axis, and expresses all the dimensions of the other parts belonging to it, as, for example, axes, wheels, &c., in relative proportional numbers to the diameter of the journal.

The practical advantage of this method is, that only one part of a machine, as, for instance, the diameter of a journal, is necessary to be calculated; so, for instance, in the following chapter, No. 3, on screw-bolts, d expressing the diameter of the screw-bolt (see d in Fig. 3), is obtained by the formula

$$d = 0{\cdot}029 \sqrt{D}$$

The number 0·029 is the numerical value or co-efficient, above-mentioned. $d_1 . h . D_1$ and n, are expressed in relative numbers to d.

M. C. Gritzner, civil engineer, and graduate of the Polytechnical School of Carlsruhe, and pupil of Professor Redtenbacher, now in Washington city, with C. L. Fleischmann, have translated that portion of the work which relates to the construction of parts of machines, and have reduced the weights and measures into American pounds (avoirdupois) and inches, and calculated the formulæ accordingly.

1. ROPES.

In determining the diameter of ropes for the support of a certain amount of weight, not more than the fifth part of their absolute strength should be brought into actual use. Accordingly, the diameter of a rope d expressed in inches, which supports with safety a weight D (pounds avoirdupois) is found by the following formula:

$$d = 0{\cdot}03 \sqrt{D}$$

For example, a rope is required to support a weight of 1759 pounds, the formula stands thus:

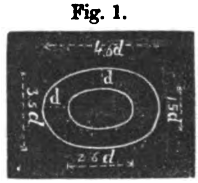
$$d = 0{\cdot}03 \sqrt{1759}$$
$$\sqrt{1759} = 41{\cdot}9$$
$$41{\cdot}9 \times 0{\cdot}03 = 1{\cdot}26 \text{ inches, the value of } d.$$

The following table contains the results of the formula:

D Pounds.	d Inches.	D Pounds.	d Inches.
62	0·24	1547	1·18
110	0·32	1759	1·26
172	0·39	1988	1·34
247	0·47	2226	1·42
337	0·55	2480	1·50
441	0·63	2750	1·57
555	0·71	3033	1·65
688	0·79	3326	1·73
831	0·87	3636	1·81
990	0·94	3961	1·89
1162	1·02	4298	1·97
1344	1·10	4648	2·05

2. CHAINS.

Fig. 1.



When chains are carefully used, one-third of their absolute strength can be brought into actual use, and the diameter d of the chain iron, which can support a weight D with safety, is found by the following formula:

$$d = 0{\cdot}0074 \sqrt{D}$$

For example, a chain is required to support a weight of 1378 pounds, the diameter of the chain-links is found by substituting for D the amount of pounds given:

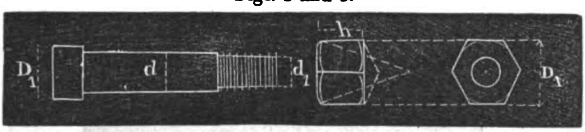
$$d = 0{\cdot}0074 \sqrt{1378}$$
$$\sqrt{1378} = 37{\cdot}12$$
$$37{\cdot}12 \times 0{\cdot}0074 = 0{\cdot}28 \text{ inches} = d.$$

The following table gives the corresponding values of d and D, as well as all other dimensions of the chain-links.*

D Pounds.	d Inches.	$1·5\,d$ Inches.	$2·6\,d$ Inches.	$3·5\,d$ Inches.	$4·6\,d$ Inches.
703	0·20	0·30	0·51	0·69	0·91
1,012	0·24	0·35	0·62	0·83	1·09
1,378	0·28	0·41	0·72	0·96	1·27
1,798	0·32	0·47	0·82	1·10	1·45
2,277	0·35	0·53	0·92	1·24	1·63
2,810	0·39	0·59	1·02	1·38	1·81
3,401	0·43	0·65	1·13	1·52	1·99
4,047	0·47	0·71	1·23	1·65	2·17
4,747	0·51	0·77	1·33	1·79	2·35
5,508	0·55	0·83	1·43	1·93	2·54
6,323	0·59	0·89	1·53	2·07	2·72
7,194	0·63	0·94	1·64	2·21	2·90
8,122	0·67	1·00	1·74	2·34	3·09
9,105	0·71	1·06	1·84	2·48	3·27
10,145	0·75	1·12	1·94	2·62	3·44
11,240	0·79	1·18	2·05	2·76	3·62
12,398	0·83	1·24	2·15	2·89	3·80
13,581	0·86	1·30	2·25	3·03	3·98

3. SCREW-BOLTS AND NUTS.

Figs. 2 and 3.



By comparing the dimensions of the screws as they are generally used in machinery, the following rules have been established:

a. For Screws with Triangular Thread.

$$d = 0·029\ \sqrt{D}$$
$$n = \sqrt[3]{481 \times d - 62·5}$$
$$d_1 = \frac{n-2}{n}\, d$$
$$h = 0·09 \times 1·193\, d$$
$$D_1 = 0·2 \times 1·415\, d.$$

b. For Screw-bolts with Square Thread.

$$d = 0·029\ \sqrt{D}$$
$$n = \tfrac{1}{2}\ \sqrt[3]{481 . d - 62·5}$$
$$d_1 = \frac{n-2}{n}\, d$$
$$h = 0·094 \times 1·634\, d$$
$$D_1 = 0·2 \times 1·415\, d.$$

* For a chain supporting the weight of 703 lbs., the corresponding dimensions are 0·20, 0·30, 0·51, 0·69, 0·91.

$d \,.\, d_1 \,.\, h \,.\, D_1$, express the dimensions of Figs. 2 and 3. D is the pull expressed in pounds, to which a screw-bolt is exposed, n the number of turns of the thread upon the length d.

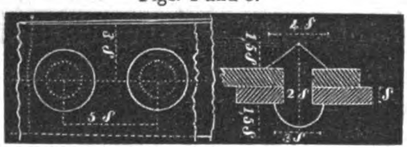
The results of the formula are given in the following table:

D Pounds.	d Inches.	n Triangular Thread.	n Square Thread.	d_1 Inches.	D_1 Inches.	h Inches. Triangular Thread.	h Inches. Square Thread.
179	0·39	5	2·5	0·24	0·75	0·55	0·73
242	0·47	6·3	3·1	0·32	0·86	0·64	0·85
346	0·55	6·6	3·3	0·38	0·97	0·73	0·98
463	0·63	6·8	3·4	0·44	1·08	0·82	1·10
573	0·71	7·0	3·5	0·51	1·19	0·91	1·23
716	0·79	7·3	3·6	0·57	1·30	1·00	1·35
1025	0·94	7·7	3·8	0·70	1·52	1·18	1·62
1389	1·10	8·0	4·0	0·83	1·72	1·37	1·87
1829	1·26	8·4	4·2	0·96	1·95	1·55	2·13
2292	1·42	8·7	4·4	1·09	2·17	1·75	2·38
2865	1·57	9·0	4·5	1·22	2·39	1·91	2·63
3438	1·73	9·2	4·6	1·35	2·61	2·10	2·88
4099	1·89	9·5	4·7	1·49	2·83	2·32	3·13
4805	2·05	9·7	4·8	1·62	3·05	2·50	3·39
5598	2·21	10·0	5·0	1·76	3·27	2·68	3·64
6427	2·32	10·2	5·1	1·90	3·49	2·86	3·89

4. RIVETS.

For Riveting Sheet-Iron.

Figs. 4 and 5.



If we call s the thickness of the sheet-iron to be riveted, the dimensions will be as follows:

Diameter of the rivets,	2 s
Distance of the rivets,	5 s
" of the edge of the sheet-iron from the centre of the rivet	3 s
Diameter of the semi-spherical head,	3 s
" of the conical head,	4 s
Heights of both these heads,	1·5 s

THE PROGRESS OF LEGISLATION UPON EXCLUSIVE PRIVILEGES. No. 2.

In our former number we endeavored hastily to sketch the utter confusion in which the rights of inventors were involved; first, by the abusive prerogative of the sovereign; secondly, by misdirected legislation; and lastly, by the shackles put upon trade by the guilds. These last were probably more instrumental in stopping all progress than any other cause, and the effects of their tyranny is still visible in the rules governing the mechanical trades; especially on the continent of Europe, where all power to change one's vocation is sufficiently guarded against, and where the absurd rule still prevails of making the young craftsman just out of his apprenticeship become a "*journeyman*," or in other words requiring him to spend a certain portion of his time in journeying into other countries to work his way in different places, before he is allowed to settle down quietly at his business at home as a master worker, by which course the habits of the greater number are too surely vagabondized for the selfish masters to ever after fear their rivalry—we believe this custom has generally prevailed in Germany to this time. Not only were men prevented by vexatious regulations from amending their own arts and callings; but, as was previously shown, they were absolutely prohibited from working at any trade to which they were not attached by rule of law,—regardless of their talents or desires: how under such circumstances, could it be expected that improvements would flourish? and as nothing in this world long remains permanent, the arts frequently followed the natural law, and retrograded: "a lost art," is a common expression, and it is too true that many a valuable art was for a long time lost to the world, because of the want of knowledge of the true interests of mankind by their legislators. We hope the time is now past when an art can be lost, and it certainly is, if exact justice is done to the inventor and improver, and his property is respected: no man would deprive the world of his discoveries, while his property in them was absolutely secure; but, on the other hand, the instances are rare, where a man is found willing to spend his time and substance to improve an art or machine, and reap no reward therefrom.

Experience has proved that most of the brilliant inventions that have astonished the world, were made by men whose attention was called to the subject from some different pursuit. Savery's invention for raising water by steam, he describes to have been an accident. Watt was a mathematical and optical instrument maker, attracted to the subject by repairing a model of a primitive steam-engine. Arkwright was a barber. Whitney was accidentally set to devising some better mode of getting out cotton, from first seeing the awkward hand process after he became a man. Fulton had little knowledge of vessels, and less of steam-engines, when he devised his steamboat; and if it be not invidious to name the living, we may add Faraday was a book-binder, Henry a watchmaker, and Morse a painter; how much would the world have lost if they had been shackled by trade rights. Who, after such a display of the advantage of the largest liberty of choice of calling, would be willing to check it by unwise legislation? Fortunately for Arkwright and Watt, the cotton manufacture and steam-machine construction had not been erected into guilds, or drawing-frames, spindles, and condensers would have languished alike; but still, what could be, was done. The Lancashire manufacturers would combine to prevent the use of machine-made yarn, although better than they before had, and every subterfuge and evasion was brought to bear upon Watt's right to his engine.

While each trade was controlled by specific rules, yielding to no advance; curbing the aspiring operator within the trade, and absolutely prohibiting all without from entering into competition, it is obvious that improvements must have crept forward at a snail pace.

A recent English writer remarks, "legislation to control industry for the supposed advantage of the public, in the quality or price of the article produced, or in the employment afforded to a number of citizens engaged in its production, has long been known to us in our apprenticeship laws, excise and protective duties. These have however, in recent times, rapidly declined in public estimation, and appear to be in course of expulsion from our statute books, under a conviction that so far from conferring material benefits, they inflict positive injury, not the less serious because spread over a wide surface."

Corporations and guilds had no doubt an important part to play in emerging from the dark ages: the weak were thereby protected from the strong, and thus was the first step taken towards the emancipation of the masses; presently they grew stronger, and in turn became the tyrant; stemming the onflow of the current of liberty: to neutralize these in some degree was the purpose of grants of privilege to individuals, by the sovereign power, which became a ready source of profit to the king as the guilds grew weaker; to individuals and the community, however, they soon became an intolerable grievance; for men could scarcely follow the trade they had learned, or turn to any other, by reason of these monopolies.

The first step towards a just legislation on the subject of inventors' rights, is due to England. After many a sharp contest with the sovereign, as before related, the statute of 21 Jas. I. c. 3. was enacted in 1623. This famous statute abolished all monopolies, but has a proviso, excepting "Letters-patent granted for twenty-one years or under, *heretofore* made, of the sole working or making of any manner of new manufacture within this realm to the first and true inventor or inventors of such manufactures, which others at the time of making such letters-patent and grants did not use," &c. The same proviso also extends to any letters-patent and grants of privilege for the term of fourteen years or under, hereafter to be made. Thus was limited the grant of exclusive privilege by the crown in industrial matters, and this law was in force down to the time of William the Fourth without amendment. The state of the law in France down to the era of the revolution, and of Germany much later, was more like the law in England prior to James I.

In our next and succeeding numbers, we shall endeavor to explain the views of the best modern writers on the subject, and the present state of the laws of various countries.

J. J. G., *Ed.*

RULES OF THE PATENT OFFICE.

The "Circular of Information" upon which we have passed some very temperate strictures, has been entirely remodelled by the present commissioner Mr. Hodges, and replaced by a code of regulations which will undoubtedly prove acceptable to most persons having business to transact with the Patent Office. Mr. Hodges very *courteously* and *sagaciously* has submitted his code to persons outside, having experience in business with the Patent Office, for suggestions, objections, or amendments; and so wisely has it been drawn up, that he has probably committed most of those whom he has consulted, to the approval of his measures. We read at once in this circular, the propriety of appointing some one of the legal profession to the office of Commissioner of Patents. One of the first acts of Mr. Ewbank was to revise and alter the circular, prepared by Mr. Burke his predecessor, and as we have said above, our comments upon Mr. Ewbank's circular were temperate, when we pronounced it undignified and entirely unbecoming a public office. In a conversation with Mr. Webster nearly two years since, he remarked, that "if he had it in his power he would put a good *lawyer* at the head of the Patent Office." We replied that a good lawyer could not be had for the salary, except for a brief term. Mr. Webster replied with emphasis, "*Then give him five thousand a year and I wouldn't care if he never saw a cog-wheel in his life. Your examiners have, or should have science enough, let them report to the commissioner for his decision.*" Mr. Webster, in addition to that broad glance of his, that took knowledge of all the affairs of government, had special opportunities of judging of the necessities of the Patent Office, when this bureau was under the department of State, and his supervision. We are inclined to go even beyond the commissionership with our legal preferences. There are other offices in this bureau in which legal attainments are of high value, perhaps necessary; and in the examinerships, we have always regarded legal attainments as highly important to the successful discharge of the duties. We speak from long experience. For many years, while we were in the Patent Office in the capacity of examiner, there was but one lawyer among the subordinates His legal knowledge and advice was common stock in the office, of daily use to himself and his brother examiners, and on many occasions saved the Patent Office from exposure to public derision. Of late, so much of the business with the Patent Office is transacted through gentlemen of the legal profession, that a deficiency of legal knowledge, if not embarrassing to an examiner, is so to the attorney, who is not slow to discover it. It is a mistake to suppose that the business of an examiner is purely *scientific* or *mechanical*. It is SCIENTIFIC, MECHANICAL, LEGAL, and JUDICIAL; and we assert it with an assurance of a full response from influential sources, that the most extensive and profound knowledge of science or mechanics can never make an EXAMINER if he have not a judicial mind. The Commissioner of Patents by law is alone recognized as the judge of claims for patents, but the Commissioner of Patents can hardly find time to decide upon the difficult and contested questions arising before the examiners, and hence it has always been the practice for the examiners to decide for themselves. Under such circumstances, the importance of legal knowledge should not be overlooked. We would not be understood as preferring lawyers for examiners, for an adequate scientific or mechanical knowledge is indispensable. The greatest evil now imminent, in connection with our patent system, is the enlargement of the examining corps. When there were but four principal examiners and four assistants, we were fully impressed with the difficulties which would grow out of an increase in the number of examiners, and originated and urged a plan for an increase in the corps without increasing the number of examiners. We proposed to make two grades of assistant examiners, viz., a first and second assistant. The duties of the first assistant to be similar to the duties of the examiners, so far as relates to investigations of facts bearing upon claims for patents, and to report the results to the examiner. The examiner also to conduct investigations so far as time would permit. The second assistant to perform the clerical duties of the assistant examiner as at present, in the preliminary examination of papers, &c. We regret exceedingly that the experiment of this system has not been tried.

It has met with extensive approbation, and we have never heard either in or out of the Patent Office, the first reasonable objection to it. Why it has not been tried, perhaps the late Commissioner Ewbank can now tell us, as it was brought fully to his attention. The evil we have just alluded to, is one which will increase with the number of principal examiners. The decision of questions of patentability, is confessedly one of the most difficult undertakings within the whole range of jurisprudence. In the words of an eminent jurist, patent law is the "*very metaphysics of law.*" There are now seven examinerships, and we must have seven incumbents, each possessed of different qualifications, of differently constituted minds and temperaments, and each a judge within his own precincts. One must be a chemist, another a mathematician and physical philosopher, another a mechanical philosopher, another an engineer, another an agriculturist, another a physician; in fact, the whole range of science and art, must be to some extent represented, and all must be men of more than ordinary talent and education. Now it is reasonable to presume that with a board so constituted, there might arise much contrariety of action in the respective departments, and that there would be positive need of daily conference. It so happens, whether rightfully or not, we leave to others, that at the Patent Office the examiners have always been in the habit of applying certain principles of Patent Law with more stringency to one class of inventions than to another.

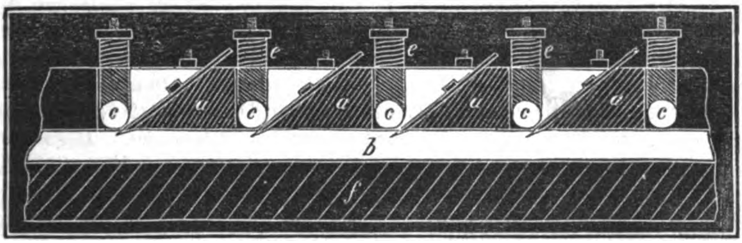
(To be continued.)

ON THE WORKING OF WOOD.—No. 2.

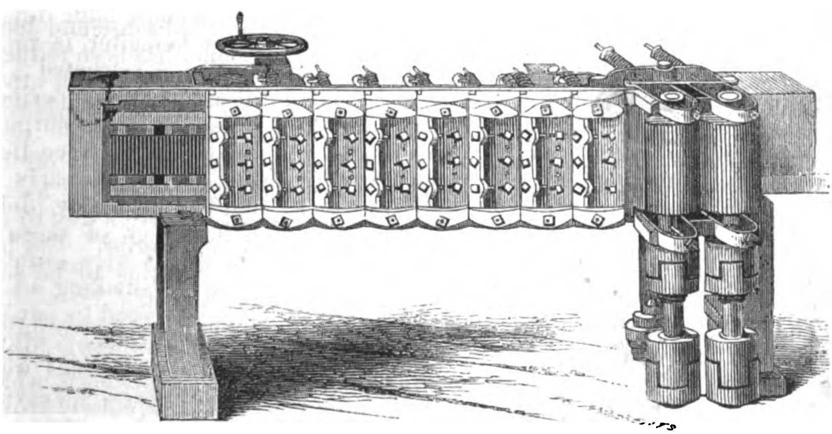
A historical sketch of the devices employed in working in wood, including sawing, planing, turning, boring, mortising, carving, and other ornamental work.

In our previous article we fully detailed the first planing machine of which we have any knowledge; it was an imitation by an automatic device of the manual operation of planing, and, as we shall see hereafter, is probably the best mode of planing surfaces when properly constructed: its advantages, however, have not been appreciated till a very recent period; so slowly does man arrive at a correct knowledge of some of the simplest elements of machinery. Several machines have been essayed since Bentham's with stationary cutters, particularly in this country; as early as 1805, there were two, one by John Bennock, and the other by John Hinman. We are not aware that the description of either of these is now extant. From that time up to 1813 five other patents were granted for planing machines, besides another in the latter year for making scaleboards, as well as planing, a purpose to which Bentham proposed to put his machines, as appears from his patent of 1793, in which he speaks of cutting steamed timber. From 1813 to 1829 six other planing machines were patented, all but three of which, we believe, were with stationary knives; but owing to bad execution, and a want of knowledge of the operation of the tool, but little progress was made. Since that time, numerous other machines have been made and patented of this character, but of these we shall name only two as having received any extended trial prior to 1848, when the first successful machine of this kind with which we are acquainted was put into operation. One of the machines above spoken of was patented in 1833, by B. Kugler. It consisted of a series of plane irons set in a solid stock, the stock itself having a slight range of motion, and in front of the first knife was a light guiding spring. This machine clogged in working, and was of no practical use, having the defects which Bentham pointed out as inherent to such a construction. The second machine was patented by B. Langdon, in 1838; it was only used for planing shingles, but it was found to require stuff of the best quality, as crooked, cross-grained material would be spoilt by it; consequently it never came generally into use. This total want of success in the application of stationary cutters made their introduction and operation exceedingly problematical, till Woodbury brought out his machine, in 1848. This machine consists of a series of separate stocks or beds *a*, as shown in the Fig. 1, each separately screwed to

Fig. 1.



a frame *b* with rollers *c* just in front of the cutters, of small diameter, held down by stout springs *d*; *f* is the bed on which the plank lies. The rollers were not abstractly new, nor were the series of cutters, but the nice capabilities and adjustment of the machine overcame the difficulties, and, at last, planing was successfully done with stationary cutters; much, however, was wanting to perfect the machine: great power was required to drive it, the parts required better proportion for strength, and, in fact, a new trade had to be learned by the operatives; still the success of this



effort was a stimulant that caused the ingenuity of many to be directed to the subject. Allen's machine next succeeded Woodbury's, and was deemed by the first inventor to be a direct infringement on his right. This question is still, we believe, an open one, no legal decision having conclusively settled the point.

The machine which now seems most largely coming into favor, and which appears likely to supersede all its predecessors, is one patented to G. W.

Beardslee in 1851. Whether it is to be beaten by some new rival remains to be seen. The characteristics of Beardslee's machine are, the permanent and certainly fixed position of the edges of the knives, with an elastic motion of the heel of the stock, in all the cutters, except the front one, which rises and falls with the inequalities of the board, cutting a shaving of a given thickness (unless the board proves thinner than the gage the first knife is set to), and thus removing all the grit and dirt tending to dull the edge of any succeeding knife that is scraped over it, and thereby saving the edges of the planes that follow. The irons are all capped, and there is ample provision for driving the board through. This machine is said to plane more than six thousand feet an hour. We take pleasure in being able to present our readers with an engraving of its exterior as now used.

PATENT OFFICE REPORT FOR 1851.

JUST PUBLISHED.

SINCE the new year, the report of the Commissioner of Patents for 1851 has been issued. It is hardly necessary to remark upon the worthlessness of a public report of this kind, published a year after its time; but as it will, no doubt, be circulated to some extent, we shall make a few remarks on the mechanical portion of it, although we need not so critically point out its many errors, as the author has been removed, and his place supplied by another appointment.

We like the suggestion of the late Commissioner, to make the bureau independent of the control of the Department of the Interior; the exercise of a strict supervision of the Patent Office, by the head of the Department, to which it is attached, is a modern innovation, principally introduced under the very lax management of the last Commissioner. When the bureau was under the State Department, the business regulations of the Office, and the appointment of its officers, was principally left to the good sense and judgment of the Commissioner; but recently, the Commissioner has been reduced to the condition of an upper clerk. This is wrong. No one who will attentively read the statute, can doubt but the design was to render the bureau as independent as possible, without erecting it into a Department.

We are sorry to see a disposition in the Commissioner to shuffle off the responsibility of asking for more room—so absolutely necessary to the bureau—on to his subordinates. This, however, seems to give a key to the assumption of power which we see in the Secretary of the Interior. The last Commissioner has done inventors an injury, and it remains to be seen whether the present incumbent will be fully able to rectify it.

The report says, "dissatisfaction on the part of applicants is unavoidable, because of the number of old devices presented for patents." We protest against this traducing of inventors altogether. Our own experience, which is by many years greater than that of Commissioner Ewbank, clearly proves that inventors are never dissatisfied, or certainly very rarely so, when shown that their inventions have been anticipated: but the dissatisfaction has arisen from the hypercritical manner in which their cases have been treated in the office. When a man is referred to a "door-plate" as a reason why he cannot have a patent upon a "fire-place;" and another is told his mode of "manufacturing an iron fence" is refused on account of a "glass door-knob;" and a third gets for answer, that one of the most cogent reasons why his patent cannot be granted is, that "*a space* connects two objects" which he connects tangibly; when a chemical compound is refused because the office says, without giving a reason, that the advantages said by the inventor to be gained by it, "*cannot be*;" when a *railroad-car* is rejected upon a "*horse power*" and a "*ship combined*," neither one being sufficient *alone*; when weeks and months of delay take place, under some frivolous and vexatious rule, and many an applicant is refused a patent with the satisfactory remark that the "thing is old, and no reference is necessary;" when all this takes place, *as it all actually has within the last few years in the Patent Office*, we think there are other reasons for dissatisfaction besides the refusal of a patent. We frequently advise others that their inventions are not new, but we never tell them so without being able to show them the same thing done by others before. We used frequently, as an examining clerk in the Patent Office, to do the same thing,—seldom to the dissatisfaction, although frequently to the disappointment, of the applicant. We have never known any agent of respectability to urge a claim for a patent after he had been shown the same thing done before. But so long as the custom is, to travel out of the record, referring to ever-pointed pencils for cooking-stoves, grain-threshers for mowing-machines, the public will be apt to believe "the wind is south-south-west" in that quarter, or that "there is something rotten in Denmark." The fault, we are led to believe, is in the system, as well as in the management of it; but the two wrongs have sometimes been unbearable.

The great number of rejected applications, in proportion to those patented, is startling; and we venture to affirm, that within the year embraced by the report, there were many things rejected, more novel and valuable, than a great many that were patented.

The Commissioner complains of attempts made to overawe him. Of this we know nothing; but it tells badly for the firmness or integrity of the Commissioner, to fear being swayed from his duty by clamorous wrong. If he means, he should be above inspection and animadversion, he must get a revival of the old alien and sedition law to put himself at his desired altitude. His comparison between a ministerial and a judicial officer, we cannot see the force of; they have no analogies.

We have so many years advocated the publication of the patents by government, that we are glad to see the head of the Patent Office echo our views. If it had been done before the burning of the Patent Office in 1836, invaluable information now lost would have been preserved to the country, as well as hundreds of thousands of dollars spent in litigation. The publication of the past inventions cannot be too soon commenced; for the future, we mean to have a care.

The great annoyance of the accumulation of models in the Office is mentioned by the Commissioner; but the most obvious, as well as just remedy, he has not named, which is, to return to inventors all rejected models. If a patent is refused, it is, or should be, because the invention is like something already known to the Office; therefore a duplicate model of a known thing is an incumbrance, and had better be out of the way. We have reason to know these rejected models are an absolute nuisance, and must be abated before many years; the sooner they are restored to their respective owners, or burnt up, the better will it be for all concerned. It has been said the models should be retained to prevent any future grant of the same thing, but this is a greater satire on the judgment of the Office than we should care to utter.

The suggestion for the increase of the salaries of certain officers, is judicious, but a chemical laboratory we have no desire to see in the Patent Office, as at present constituted; the examiner having charge of the chemical department has already too much to do, without the addition of a laboratory: unless a chemist was appointed to take charge of it solely, it would be worse than useless.

On the addenda report by Mr. Riddle, upon the London Fair, we have little to say. Its authorship is too apparent, and its English origin is labelled on nearly every page. To Americans it gives no comparative view of the manufactures of their own and foreign countries. It is a pity that Mr. Riddle had not obtained an American instead of an English reporter to write it, for then we should have had something besides a string of English advertisements. Of course it can hardly be expected that a person wholly unacquainted with most of the arts, or their history in this country, should write very profoundly upon such a heterogeneous exhibition as that of the London World's Fair. The lamentable part of it is, that the report of a government bureau should have been prostituted to advertising English products, without at all informing American mechanics of the comparative state of the arts of a like character at home.

J. J. G., *Ed.*

ON VINE CULTURE.

PARTS OF THE GRAPE-VINE, AND THEIR NOMENCLATURE.

In the European literature on vine culture, there exists much confusion as to the proper designation of the different parts of the vine, of the names of grapes, of the terms employed in the culture, as well as in the mode of making wine. This arises from a want of a general nomenclature intelligible to all. Every vine-growing district in France or Germany has its own terms, so that the vine-grower of one place is not able to understand the technical phraseology of another, thus causing great difficulty in the dissemination of correct knowledge, and in the introduction of better modes of culture and adaptation of new kinds of vines and treatment of wines.

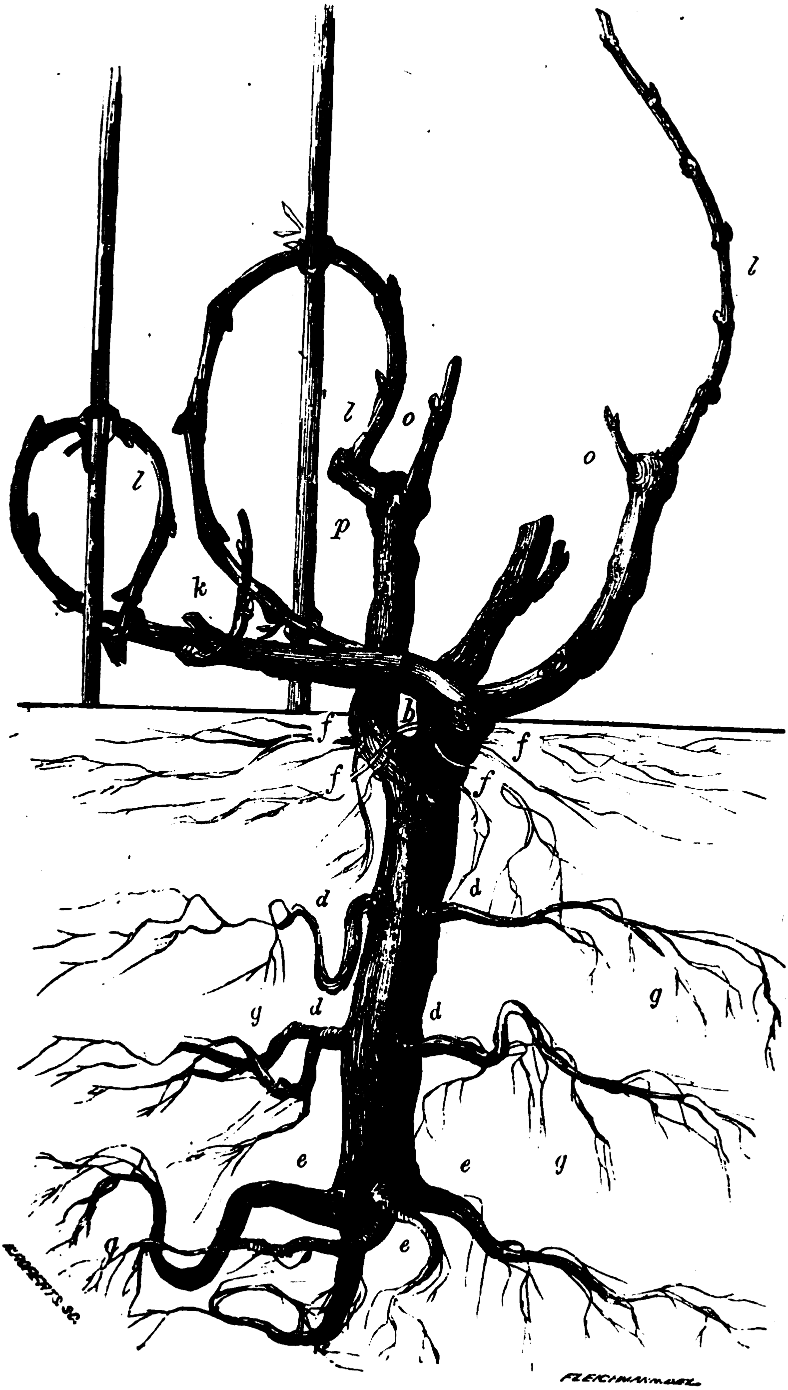
This we must avoid on the outset, and it is easy, as we are just beginning to have a literature on this subject. Now is the very time to establish a proper nomenclature which, when disseminated over the Union, and once understood, will become general, and we will be enabled to comprehend the description of the operations of the vine-dressers on the Pacific, as well as those on the Atlantic, on the Gulf of Mexico, or in the valley of the Mississippi, in all portions of this vast continent where the English language is spoken.

To accomplish this, it is necessary to represent the grape-vine with all its parts above and below ground, and name them properly; to describe the operations in field, in the cellar; and establish correct terms for the *modus operandi*, and the tools adapted thereto.

Such representations we have made. They are exact, having been made from nature in the vineyards or the respective places; they have been named either by the terms already used in English, or we adapted them from the works of Columella, from those of the French, Germans, or Italians.

We consider this part of our treatise as the most important, as it will enable the novice in the culture of the grape-vine, when reading works on this subject, to understand the precise meaning without being led into mistakes or doubts. This will aid him to undertake any mode of culture described with the entire assurance of success.

C. L. F., *Ed.*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THE GRAPE-VINE.

The term *grape-vine* comprises the whole plants, roots, limbs, shoots, leaves, tendrils, &c., &c.

The parts of the grape-vine under ground are:

The *root-shaft;* French, collet; German, wurzelstamm. (See Fig. 1, *a.*) The shaft is formed of the cutting, from the lowest knot of which, or from the place where the cutting is united with the two-years' old wood, as by the mallet cuttings, grow the *foot-roots* e e e.

From the sides of the *root-shaft* at the knots, grow the *side-roots* d d d d.

Near the *head* b of the root-shaft, grow the *dew-roots* f f f f.

From the *foot*, *side*, and *dew roots*, grow the *fibrous roots* g g g g g.

On the upper part of the root-shaft, and above ground, grow:

The *head* b, which—according to various modes of pruning—is small, as in low or limb pruning; or large, as, for instance, in the Hungarian mode.

From the *head* b, grow the *limbs* h h h. The limbs are old enlarged shoots, from which grow the young *bearing* or *fruit shoots* l, l l l.

Sometimes from heads with limbs grow short limbs, called *ground-wood*, i, which in course of time can be used as new limbs when the old ones are getting too long, injured, or of feeble growth.

From the knots of the limbs grow sometimes shoots, which, if pruned to two or three buds in their second year of growth, serve to replace old limbs. These shoots are called *limb-spurs* k.

On the upper part of the *limb* grow the *bearing* or *fruit shoots* l l l. When they are trained in a circular shape, they are called *bows;* when the *shoots* are pruned low, so that only one or two buds are left on them, these shoots are called *spurs*, o o.

From the *buds* of the *shoot* again grow young shoots (see Fig. 2, n n n) which, in their first stage of development, are delicate and of herbaceous nature. In the autumn their wood acquires, gradually, compactness, the green bark turns brown or whitish, and at that state they are then fit for cuttings.

Upon the shoots grow:

The leaves (see Fig. 2, s s s). Opposite to the leaves, on the same knot, grow either *grapes* c, or *tendrils* d d d.

From the corner of the leaves grow the *water-shoots* e.

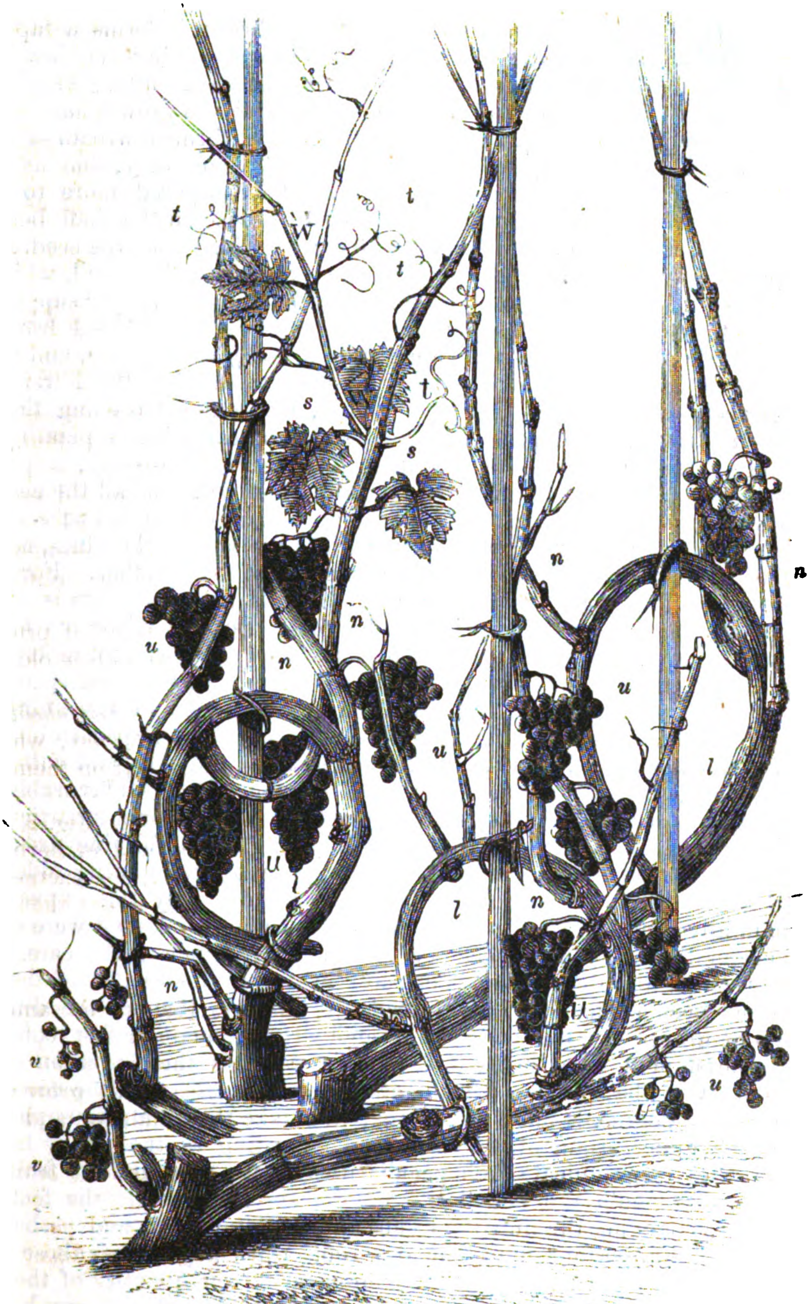
A *bunch* of *grapes* consists of a number of *grapes*, which grow upon a *stem* called *bunch-stem.* From the *bunch-stem* grow branches, and on the branches the small, short *grape-stem.*

The bunches are either *compact*, *loose*, *scattered*, *shouldered or winged*, *cylindrical*, *wedgeform.*

The grapes are either *round*, *roundish*, or *oval.*

The grape is covered with a *skin;* under the *skin* lies the *flesh;* and in the centre of the *flesh* are placed the *seeds.*

Fig. 2.



FLEICHMANN. DEL ROBERTS. SC

THE ROOTS OF THE VINE, AND THEIR MANAGEMENT.*

If we plant a vine from the seed, like other shrubs it forms a tap-root, which divides in different branches, and forms also side-roots, dew-roots. It is different with vines raised from cuttings. Here a cutting is planted which must form roots instead of a green shoot. If its growth succeeds, it has not a single tap-root in its lower portion, but it forms a wreath of roots, which (see Fig. 1) occupy its place, with this difference only, that as none of the roots have the superiority, it must be compared more to root-branches. Side and dew roots are produced likewise on the shaft beneath the ground, as well as on grape-vines which are derived from the seed. But by planting cuttings there is the advantage that in a deep soil, which is not moist in the lower strata, those roots which, from the proper support of the plant, get so deep in the ground that they are not affected from the atmospheric influence of excessive moisture or too great dryness, and hence the care of the vine-dresser is always directed to develop the lower roots as perfectly as possible. For this reason, he prefers loosening the soil below the trenches, and puts in manure and good earth before planting the cuttings. If the development of the roots succeed properly, a perfect growth of the vine can be expected, and the vines will bear all the changes of the weather better than any other kind. If it does not succeed, the plants will be sickly, which will cause various diseases of the vines, as well as falling off of the grapes in the least change of the weather. For vines with strong foot-roots, the influence of the side and dew roots is of less importance for the proper support of the vine. But the dew-roots always exert greater effects on the vegetation of the vine the less foot-roots there are, and in case the latter are dying off, the former are most indispensable, as in this case they must fully perform their function of sustaining the vine. In situations with a wet sub-soil, and tenacious impenetrable clay soil, such cases often happen, but in loose sub-soil, gravelly, and with loose rocks, clefts, &c., they are very rarely to be met with. Unfavorable circumstances occur in the sub-soil, which yet exerts not at once a particularly bad influence; its foot-roots resist them in young, powerful vineyards for a longer time without being injured. But if the vines are getting older, the roots are gradually dying away from below, and only the upper roots remain alive and sustain the vine. Then such vines stick as it were on the surface of the earth, and need for their support much more care. The effects which the different sorts of roots exert on the quality of the vine have not been sufficiently investigated. It appears that as the different kinds of grapes love more one soil or another, their main or foot roots take the nourishment from each, and on this depends the formation of the peculiarity of the species. On the other hand, the effect of the dew-roots, in a certain degree, is more accidental; they take their nutritious particles from the upper strata of the earth, and according as these may be prepared, they communicate their peculiarities to the vine and its fruit, and thus modify again the peculiarity of the species. While the foot-roots serve for conveying the nutritious substances lying deeper, and perhaps for the more unimportant fluid, the dew-roots especially convey those nutritious particles, which exert a greater influence on the quantity of the fruit. When, therefore, by the nutriment received from the sub-soil, any kind of grape retains in its fruit the peculiarity of its species, yet this again may be influenced, and may cause innumerable variations, according to the

* Translated from Babo "der Weinbau."

proportion of the mixture and state of the manure of the upper strata of the soil, according to the season itself, and therefore it is, that under tolerable similar circumstances, the principal taste of a wine is affected and modified by the situation, the soil, &c., &c.

From the above, we see how defective it is to observe one and the same rule in the management of roots. This must be judged of,

1st. According to the situation and kind of soil, especially according to the nature of the sub-soil.

2d. According to the growth and age of the vines. That the tendency of the vine-dresser generally should be directed to the formation of the root, and to keep the main roots deep as possible in the soil, will be regarded as proper and natural by every intelligent cultivator of the vine. The care for this purpose begins with planting the cutting. For this, only cuttings must be taken which have already formed the right beginning of foot-roots. In order that they grow stronger, and spread out as much as possible, the ground must be properly prepared, and a proper hole made to receive the plant, which attentive vine-dressers fill up with good loose and rich earth. In planting the root-cuttings, the upper roots are taken from the same. The poorest ground is purposely chosen for the upper strata of the ground, in order that the foot-roots may grow vigorously and that the side-roots are prevented to develop their roots in a poor unproductive soil. In manuring vineyards, we must see that the manure is put deep enough so as to bring out and increase as much as possible the foot-roots, and not the upper roots. Every year, in the spring, the earth round the vine must be removed, and the dew-roots cut away. In many wine countries the opening of the vines forms a special business, which is done with a particular small kind of hoe. Where this is not usual, the vine-dresser practises "making banks." In the spring the earth is drawn away from the vine, and is laid in the midst of the rows on the so-called banks (ridges). The object of this procedure is, that the vines may be laid bare at a tolerable depth, and that all the roots may perish that sit too high on the surface. During the summer, new dew-roots are always formed, which are taken away again in the following spring. This method of managing the roots is usual in the best wine regions, and is, indeed, the only procedure suitable on dry percolated soils. In this way, the foot-roots grow deep enough, and do not need the side-roots for the nourishment of the vine. By this management of the side-roots, the foot-roots will always grow deeper in the ground; the success of the vine is less dependent on sudden changes of weather. In sandy soils, this management of the roots is the only possible way to keep vineyards in a healthy, vigorous state; for if a greater development of the higher side-roots is allowed, the foot-roots die off, and the vine, depending on the roots near the surface, must dry up at the first spell of continued hot weather. The manuring in deep holes, which is practised in sandy regions, is very suitable to promote the growth of the root downward. A deeper culture, in the spring, finally destroys the formation of all the upper roots, and when the same is repeated every year, it is not possible that any surface-roots should remain for any length of time.

This is different in wet and impenetrable sub-soil. If we have vineyards with a sub-soil of a wet nature, but we wish nevertheless to set grape-vines there, we must first try to draw off the water. But if this is not possible, we can do nothing else than to proceed in the management of the roots according to the circumstances. The cuttings must not be so long, and they must be planted more shallow. Its roots must not be allowed to grow too deep, but must be allowed to spread out near the surface, and the roots which otherwise are to be cast away, as, for instance, the dew-roots, they must be spared as much as possible, and taken care of, because they now contribute essentially to the growth of the stock. Hence the removal of the dew-roots in the spring is wholly relinquished. The manuring, and all the preparation of the soil, must be as much on the surface, in order that none of the roots may be injured. It is not even deemed advisable in hot weather to undertake hoeing, and if it is done, it must not be deep, and very much on the surface. It is also much better to pull out the weeds than to open the soil with the hoe, and give access to the air and sun. Probably the observance of this rule would prevent, in many cases, the diseases called yellows of the vine, and the falling off of the grapes, although it cannot be denied that in such vineyards cold weather is more injurious than in any other.

In vineyards on impenetrable clay strata and rocks, the upper roots especially must be carefully spared and attended to. When on flat rocks, nothing else can be done than to favor the formation of the upper roots at the surface. In firm clay strata, the roots often can be made to grow down deep, by digging the ground up, and by loosening the bottom of the prepared soil, and to cover it with gravel and thorn branches. Without such a precaution, the soil, after a year, is again as firmly settled down as before, and the few roots which have penetrated into the sub-soil soon die off again. The vineyards also must be managed wholly on the surface when the foot-roots of the vines, on account of their age, have perished. If the penetration of the foot-roots into the sub-soil has ceased, they gradually decay, and, in this case, the roots at the surface take their place; the latter must not be touched, but, on the contrary, we should rejoice if they will properly grow. Likewise in vineyards with an unfruitful sub-soil, as in very old vineyards, the periodical operation of laying down vines, as it is customary in Champagne and Burgundy, is the best means, not for the purpose of making young wood, but for the purpose of creating around the vine a greater space for the roots to project their roots, in which the property of wood of one year's growth, to make roots, is admirably employed. Such layers, however, keep only so long as the roots thereby formed retain their activity. After some years, this ceases, and the vine must again be laid down, in order to replace the old roots by new ones, which grow again on the fresh shoots, to be made into layers.

In Weinheim, for instance, a Tramin vineyard was taken up, in which the vines were, in the outset, forced to grow their foot-roots deep into the wet soil, and after they had rotted, they could not put forth any side-roots higher up on the shaft, because they also were killed. Here the use of a continued method of making layers would have been probably very useful.

Columella would have the roots of the vines cut off one and a half feet below the surface, in order that they might not grow towards the surface. He knew and states the bad results. He says, "The so-called '*day-roots*,' near the head of the vine, should not be cut off close to the shaft, but about an inch from it, in order that they may not immediately put forth, and that the vine may not receive too severe wounds where the moisture of the winter comes easiest in contact with it." According to him, the opening and cutting of the roots is to be done in the latter part of the year. For Italy this prescription is certainly more proper than in northern wine countries. Here, on account of the prevailing moisture, such a procedure would be most difficult. It is more natural and proper to protect the vine from the frost by covering it up than by exposing the roots. But Columella's opening the vines corresponds to the already mentioned mode of "making banks," still customary in many places, only that the latter takes place in the spring, and not at such depth as his prescription demands. The manuring in holes, usual in many parts of the upper Rhine, has also the same effects of shortening the roots described by our Roman, for the holes are made a foot deep, and all the roots which lie higher are thereby thrust off, and thus here again may be found the traces of a very old, but intelligent and suitable management of the vines.

A method of cultivating the roots may be effected by manuring in holes, provided it is not done at the same time on both sides of the vines, but alternately, every other year, in another row. Hence the formation of the root is always to be drawn more to the manured side. If the other side is to be manured by means of such holes, fewer important roots are destroyed, and the fresh manure here likewise again excites a renewed root-vegetation, while the opposite one gradually grows old, and thus there ever takes place a fresh formation of roots. If the roots lie very near the surface, and must have a certain cover against the scorching rays of the sun, then grass paths appear to be very advantageous in vineyards. In such vineyards the vines remain green and fresh looking, whilst the vines in other vineyards, differently managed, have become yellow. These grass borders have also always more grapes than the other rows. The *must* derived from the path borders was weighed, and compared with must of other rows, and the result did show that the must of the luxuriantly thriving vines standing on the paths weighs two to three degrees less than those of the grapes which stand in land subject to a continual cultivation. When the quality of the wine is the object, paths should only be used where the heat penetrates too much into the soil, and when hardly any grapes are obtained in the wet localities. But in culture for quantity, grass banks are advisable on wet places, where the heat prevents vines from producing grapes, and, indeed, such cases occur in which, for the proper care of the roots, the whole vineyard must be sown in grass. It may be objected that paths are manured by the decay of the grass roots, and that this manure is injurious to the luxuriant vegetation. Although an influence of this kind cannot be denied, there must, however, come yet another effect into play, because weeds, and even a top dressing with green manure, show similar results. It is a pity that grass paths in vineyards bring with them many inconveniences, as, for example, more severe summer frosts, increased quantity of snails, deficiency of the reflection of the sun's rays, otherwise they would be advisable for the better growth and more judicious management of the roots. But in the cultivation of the vine, there is hardly any object which may not somewhere be introduced with profit, if its use is attended with consideration, knowledge, and experience; and so the addition of grass paths are not to be so unconditionally neglected as is often done. While we advise every vine-dresser at least to force the roots of his vineyards as deep as possible, we must yet also counsel him always to have regard to the nature of the soil, for by a wrong application of this prescription, otherwise so proper, he may, in a few years, destroy the finest vineyards.

AGRICULTURAL ESTIMATES.

"LEARN to calculate and study the proportional relations which one branch of agriculture has to another, as well as the probable results of all the farming operations when combined, and you will be able to ascertain, with some degree of certainty (so far as such business can be calculated, subject as it is to various influences beyond your control), the profit upon the capital, labor, and intelligence employed."

This true, and most salutary advice was often repeated by our own professor, in his lectures upon the organization of farms, in explaining the mode of forming plans according to which a farm should be conducted; how to calculate the number of working cattle needed, the necessary quantity of manure, the number and kind of domestic animals for the production of such a quantity of manure, the amount of food consumed by them, the amount of manual labor required for certain works, at various periods, and the relations and management of all the collateral branches which constitute the whole of a large farm.

"Learn to calculate," were his parting words, when we set out to apply his rules to practice. During my practical career, I found that above all knowledge in agriculture, the practical experience, and well-established results of centuries, were most important; and had it not been for the valuable data which I collected while at the agricultural school, I should have not met with so much success in my various undertakings in farming. I am so fully impressed with the importance of this subject that I feel it my duty to re-echo the words of the worthy professor, "Learn to calculate."

We intend, as we have mentioned in our introductory remarks, to lay before our readers interested in agriculture the experience of practical and scientific agriculturists of Germany; and if these data do not correspond with the experience of our farmers, and should they not be exactly adapted for all the latitudes of our extensive country, they may serve as a guide how to collect and arrange the practical results of the various operations, and it is hoped it will induce some of our farmers to bring reliable and well-proved facts to the notice of the public, which will enable us to establish, in the course of time, a record of the proportional relations of farming operations which may serve young farmers to apply the experience of their fathers to great advantage. Our pages are always open to any valuable remarks of such a nature, and we hope to prove that the usual complaints of the small and uncertain profits arising from farming must be mostly ascribed to the want of knowledge *how to calculate properly*, and to carry out the estimates in practical results.

C. L. F., *Ed.*

SHEEP.

HOW MANY SHEEP SHOULD BE KEPT IN A STABLE.

To three ewes, with their lambs, should be allowed 36 square feet, as long as they suckle the lambs. Four full-grown rams, wethers, or two years' old sheep, require 36 square feet. Six lambs, or yearlings, require the same space.

Ten square feet for a ewe and its lambs; eight square feet for a grown sheep, and six square feet for a yearling.

(1.) *Necessary quantity of Food.*

(*a.*) *Pasture Food.* According to many accurate experiments, and long experience, 6 to 12 head of fine sheep can be kept for seven months upon an acre of sheep pasture. On an average, 9 head.

Where the pasture land has been ineluded in the regular rotation of crops, such lands is best sown in with white clover (Trifolium repens). Three or four pounds for the acre are sown upon a winter crop, early in the spring, and harrowed in. Upon each acre of such a pasture, 12 head of sheep can be kept well, during the whole summer.

(*b.*) *Stable Food.* It is a common calculation that the food of 1 cow is sufficient for 10 sheep. The necessary amount of green fodder for sheep fed in the stable is easy to be determined. A grown sheep requires 8 lbs. of green clover. A tolerable good clover field yields yearly, in two cuts, 36 lbs. of clover on 36 square feet. One acre to 43,560 square feet can support 36 head of sheep for 150 summer days. What a difference between this and the above stated proportion on pasture lands.

(*c.*) *Winter Stable Feeding.* A grown sheep requires daily, when expected that it should remain in full vigor, and to yield the general amount of wool, &c., 1½ lbs. of hay, and 1 lb. of barley, oat, pea, or vetch straw during 5 winter months, and those who are prudent will provide for 6 and 6½ months, in case of a wet and late spring, and early frosts in the fall of the year. The amount of 1½ lbs. of hay, and 1 lb. of barley straw, or oat straw, is equal to 2¼ lbs. of hay, or its equivalent. The rams should receive during coupling time 1 bushel of oats; the ewes, during the lambing season, 2 bushels of potatoes, or 2½ bushels of turnips, and the water for drink should be mixed with oat-meal. Those who drive sheep, on rainy days, upon the pasture lands, with the view to economize fodder, cheat themselves, because they do not understand their own true interest. Pulmonary complaints, foot-rot, and other contagious diseases, will, sooner or later, diminish the flock, and they will loose a hundred-fold of what they ex-expected to economize. It is just as unwise to stint the sheep on food, and to starve them through the winter. There is an inevitable loss in manure, wool, in quality and quantity, and diminution in the value of ewe and the lambs, which is many times larger than the saving of food. Many lambs die in consequence of weak constitutions, and the mothers follow them. A sheep consumes daily in ground salt, where it has a free use of it, ⅙ oz., or about 4 lbs. in a year.

Hay can be substituted by pea, oat, and vetch straw, in proper proportions, reckoning according to their power for nutrition. Calculating 5 winter months, a ram requires yearly, ⅛ of an acre of pasture land, 2½ cwt. of hay, 180 lbs. of straw, 180 lbs. of straw for litter, 2½ bushels of oats, and 4 lbs. of salt, and yields 5 to 8 lbs. of washed wool, and 1½ loads of manure at 10 cwt. a load.

A ewe requires on pasture land, in hay and straw, salt the same quantity as the ram, besides 2 bushels of potatoes, and yields from 2 to 6 lbs. of washed wool, 1 lamb, and 1½ loads of manure, provided the sheep are housed during the summer nights.

A wether requires, on pasture land, in hay, straw, and salt, the same quantity as the ram or ewe (oats and similar food are not fed to wethers), and yields 4 to 8 lbs. of washed wool, and 1½ loads of manure.

The board and wages of the shepherd, cost of shearing, must also be brought into the account, in making estimates for a sheep farm.

THE SWISS DAIRYMAN—HIS CATTLE, AND MODE OF MAKING CHEESE, &c.

MANY Swiss farmers, like other cattle-breeders in the Old and New World, very often winter more cattle than they have food for, trusting to Providence for an early spring to save their cattle from starving. When the winter is long, and the snow does not leave the valleys in season, pine-leaves and moss must take the place of hay. It is only in the stable of the large farmers and in the rich cantons, where the fine colossal cattle, peculiar to Switzerland, can be seen. The Swiss are generally very much attached to their cattle—they live under the same roof with them, and have their comfort at heart. The stables are airy and warm; cleanliness is one of the greatest virtues of the Swiss, and it is not withheld from their cattle. Like all mountaineers, they are of a superstitious nature; they believe in *hobgoblins*, and the like; trust in goats and bucks to keep the witches from the stable; and what they are not able to accomplish, in keeping all supernatural evil-doers at bay, they hope to effect by nailing the portrait of some saint to the stable-door. The saints without, and good fodder within, thus make his cattle safe and good-looking.

The Swiss dairyman is very particular about the fodder—it must be sound, fresh, and free from impurities; the hay is fed out with salt, and salt is also used in stacking hay. Cleanliness, he says, is half the fodder. The dung is always removed from under the cattle; the urine is never allowed to accumulate in the stable; the water for watering the cattle is kept pure and fresh; the cows are regularly curry-combed, brushed, and rubbed down with woollen rags, till their coats shine bright. He talks with his cattle as he would to his children; and his bovine family listens with pleasure to his remarks, and seems to understand the meaning of his words. In cases of sickness he knows a number of remedies; and should the disease take a dangerous character, he calls at once for the aid of the learned veterinary—perhaps quicker than he would send for a physician in case of sickness in his own family.

The work about the stable is altogether performed by men. The Swiss say if a woman milks a cow, the milk will spoil; others object to women on account of their delicate fingers being not strong enough to milk a cow perfectly dry, which causes a gradual diminution of the milk; they pretend also that women tickle the cows, which makes them restless and mischievous.

The great delight and pride of a Swiss dairyman, is a fine herd of cattle, ornamented with bells and bands embroidered with all kinds of figures. This singular taste he enjoys as much as the rich man does an array of gold-laced livery servants. The vanity of having a better set of bells, and the desire to outdo his neighbor, very often leads to extravagance. They generally have a set of two or three bells, which are in perfect tune and harmony with the note of the *Ranz des Vaches*.* The largest bells, nearly a foot

* The celebrated *Ranz des Vaches* consists of a series of inarticulate sounds, which are mostly produced through the larynx, and it sounds more like the notes of wind instruments than the human voice. There is nothing regular in the melody; it varies in every other canton, and is generally in keeping with the character of the singer, sometimes slow, lamenting, again quick and lively. It is sung by some for half an hour in succession, with a series of changes and modulations. In the Canton Apenzell, two or three persons sing it together; one or two sing one note, whilst another *ruguses* (as that style of singing is called there), in proper harmony with the other two. It is a kind of call for the cattle, when they are scattered over a large space and among rocks, and difficult places to get at; but accustomed to this call, they return invariably to

in diameter, cost from $16 to $20 a piece; and a whole set, with rich bands, from $50 to $60; whilst the whole dress of the owner amounts to not more than about $8. The largest bell is always allotted to the largest and finest cow. The bells are used when the cows go to and come from the mountains, or when they are driven to another pasture or farm. When the dairyman of the canton Apenzell, for instance, moves his cows to another quarter, he is very particular in his appearance. He wears a fine white shirt, with the sleeves turned up over his arms; large, red embroidered suspenders, holding the yellow-colored linen inexpressibles; and a small leathern skull-cap, or large hat, finishes the toilet. Then, with a bright-scrubbed milk-bucket thrown over his left shoulder, he walks at the head of his herd, singing the *Ranz des Vaches* in his best style; at his heels closely follow three or four goats; then comes the cow with the large bell, followed by the others in regular file, with the bull in the rear, carrying the milk-stool upon his horns. The whole is followed up by a sledge, with his furniture and dairy fixtures.

It is really suprising with what pride and importance the bell-cows are inspired. They are full of vanity and jealousy; and should it happen that one of them is deprived of her distinction, she at once shows her grief; she bellows, refuses food, and loses flesh; if she has a chance, she will attack her rival with a perfect rage, and continues a deadly warfare until she regains her bell, or until it is taken from her rival. Singular as this fact may seem, the experience of centuries places it beyond doubt.

When the time has come to drive to the mountains, which is generally about the latter part of May and the beginning of June, there is much bustle throughout the farm-yards—all and every thing is in motion; the chime of the bells intermingled with the *Ranz des Vaches*, the bellowing of the bulls, the sound of the cow-horn enliven the quiet village, till at last the signal is given, and the herds start to their respective pastures. The dairyman takes leave of young and old for the coming season, as he seldom returns to the valley again before winter. A few weeks on the mountain restores the winter-starved cattle; and in proportion as the snow recedes from the higher parts of the mountain, the cattle gradually make their way upward to the rich, aromatic pastures, where they remain until bleak winds and snow forces them to return to the lower pastures, to a warmer temperature, and to a more abundant vegetation; and there they continue till winter sets in, and compels them to take shelter in the stables.

The Alps are the delight of the Swiss; he feels there far more happy and free than in the valley. He enjoys there the rich milk, cream, cheese, and butter of his cattle, and he is full of hopes that the surplus of his dairy products will be sufficient to procure all the necessaries of life for the coming winter. Who ought not to feel happy among those towering peaks, inaccessible to the bustle and vice of civilization below? Who ought not to feel inspired with a love of nature, surrounded as he is with its most gigantic, unaltered specimen—in an atmosphere so pure and elastic, perfumed with the scent and the ambrosial odor of the mountain flora, which embellishes those luxuriant pastures, spreading over every spot where the roots of the delicate plants can take footing. In those elevated regions reigns that heavenly quiet, which is only now and then interrupted by the hum of an

the hut. The call for pigs and sheep is different from that for cows, which is the regular *Ranz des Vaches*. The *Ranz des Vaches* no doubt was the invention of the first herdsmen who pastured their cattle among the wilds of the Swiss mountains. This song has a peculiar effect upon the Swiss when heard in foreign lands; it produces that soul-destroying malady, "*home sickness*;" and it is said that even the cows are affected in the same way by it.

insect, by the cry of a soaring eagle, the bells of the herds, or by a thundering noise caused by a stone rolling from its former place of rest into the abyss below, filling the air with long-repeated echoes.

The visitor from the plains witnesses there sometimes that great and curious spectacle of a thunder-storm below, and the bright sunshine and pure sky above him; black clouds roll then in heavy, frightful masses along the valleys, lightning crosses the moving vapor, and thunder peals with awful sounds among the rugged, rocky mountain-sides. There is another and still more sublime spectacle to be enjoyed in that lofty region—a sunset: when he sinks gradually behind those eternal snow and ice-fields, sky and mountains seem to melt into masses of gold and purple, ever changing in intensity and beauty; and when the golden rays strike the untrodden fields of ice at a more acute angle, the valley begins to be gradually wrapped in night, and darkness rises in the same proportion towards the sun-dressed mountain-tops as he approaches the horizon. At that moment the all-absorbed spectator of this grand and sublime scene, is roused from his contemplations by a singular strain of notes—it is the *Ranz des Vaches*, with which the industrious dairyman calls his cattle to the hut; and scarcely have the first notes of this call re-echoed from the many walls of rocks, than the mountain-sides begin to be alive with cattle returning home, to yield the gathered treasures to their master.

When the sun has fairly set, and night begins to spread its sable wings over the world, the dairyman steps under the door of his humble dwelling, and sings through a wooden funnel a choral melody, simple as his instrument, yet a prayer to his Maker. These melancholy sounds serve also as a guide to the belated herdsman, hunter, or traveller, as an invitation to the poor but hospitable hut of the mountaineer; and at that signal every one in hearing bends his knees, like the inhabitants of the villages below at the sound of the chapel bell, saying their evening prayer.

The dairyman has finished his day's work—made the cheese from the evening milk, and cleaned the vessels of the dairy—and retires to the hay-loft, wraps himself in his blanket, and snores in harmony with the pigs, which take shelter near the hut on the outside.

Scarcely have the first rays of the sun again illuminated the highest points of earth's rugged crust, the mountain lark sings its morning hymn, and the dairyman leaves his nest, swarming with fleas, attends to his cows, makes cheese from the morning milk, sends the cattle to the pasture, brings the cheese made the day before to the cheese-lofts, cleans his dairy fixtures, and after a frugal breakfast, he looks about what he can do to keep his pastures clean and safe, removes stones, distributes the dung, and builds walls or fences near precipices to protect his cattle from danger. Such is the occupation of the dairyman of the Alps, which goes on regularly every day, never interrupted by any cares whatever, except by sickness of some of his assistants or his cattle, or from the loss of a cow by falling over the sides of a dangerous spot. He remains a stranger to the doings and undoings of the masses below, and truly he may thank his Creator that civilization never will reach so high up, to leave a place where man can be free and live retired from the misery of the onward progress of time.

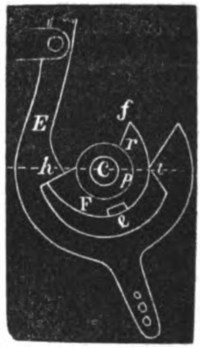
C. L. F., *Ed.*

(To be continued.)

CLAIMS OF PATENTS

Granted on the 18*th and* 25*th of January, and* 1*st of February,* 1853, *furnished with explanations and diagrams by Ch. L. Fleischmann.*

No. 9540. Robert W. Andrews, Hartford, Conn.—*For Improvement in Power Looms.* Patented January 18th, 1853.

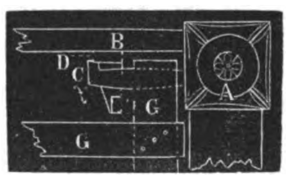


The nature of this invention consists in operating each treadle E (see figure), by means of a mover F, having two outwardly-acting cam-surfaces *i r*, of unequal length, combined in one piece in such a manner that the position of the said mover F upon its arbor can be removed for the purpose of doubling its capacity for producing different movements and retentions of the treadle. The treadles will be moved positively, smoothly, uniformly, and gradually in both directions; the permutations in the figure of the fabric woven, may be doubled without additional machinery, and the cams and treadles may occupy much less space than would be possible by any other means.

What I claim as my invention, and desire to secure by letters-patent, is operating each treadle by means of a mover having two outwardly-acting cam-surfaces, of unequal lengths, combined in one piece, and producing the movements and retentions substantially as herein set forth.

I also claim such a form and arrangement respectively of the treadles and their movers, that the treadles can be reversed in their positions upon their fulcrums, and thereby cause a reversal of the movements and retentions of the said treadles, substantially as herein set forth.

No. 9541. C. L. Bauders, Cleveland, Ohio—*For Improvement in Bedstead Fastening.* Patented Jan. 18th, 1853.



This invention consists in connecting the side rail and posts of bedsteads by fastenings composed of metal-bars, with projections on each end, the inner faces of which are sections of screws; these faces work against metal-inclined planes, one of which is fastened in the post A (see figure), the other near the end of the rail B. The joint being kept tight by the weight of the bed, which rests on a frame G, so connected with the fastening that the pressure upon it keeps the joint close, and the bedstead perfectly firm.

He claims "the fastening of bedsteads by the use of a metal-bar, having upon its extremities arms with their inner faces formed of sections of screws, which arms work against the faces of castings secured in the bed-posts, and to the ends of the rails, thus drawing the ends of the rails against the posts; the faces of these castings against which the arms of the bar work, being likewise constructed of sections of screws. The joint being kept close and the bedstead firm, by the pressure of the slat-frame, caused by the weight of the bed and its occupants, upon arms attached to the metal bar, thus forming a self-tightening fastening, the whole being constructed and arranged as herein fully set forth."

No. 9542. Dexter H. Chamberlain, Boston, Mass.—*For Improved Machinery for Reducing Metallic Bars.* Patented Jan. 18th, 1853.

Fig. 1.

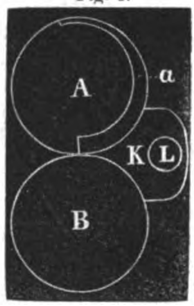


Fig. 2.

This invention consists in machinery for reducing metallic bars, in the shape of nails, &c. One of the rollers A (see section in Fig. 1) has a grooved cavity *a* on its periphery, the cavity being made wider at one end than it is at the other. Against the cavity and ends of the two rollers, a third roller in a vertical position (Fig. 2) is arranged. The bolster K is fixed upon an end of a slide L. The object of the bolster is to prevent the metal-rod, during its elongation, from being spread out and drawn so as to form a fin in the side of the rod, which would be likely to occur were the sliding-bolster not used.

The reduction of a rod on its opposite sides is effected by running it in the cavity *a*, and between the rollers during their revolutions, the movable or sliding bolster operating to prevent the splaying out, or squeezing of the metal between the rollers, so as to form a fin.

What I claim as my improvement, is the combination of the bolster K with the three rollers A B F, as arranged and made to operate together substantially in manner, and for the purpose as specified; the object of the said bolster being to prevent the over-riding, or squeezing out of the metal, so as to form a fin between the rollers as stated.

No. 9543. Joseph Contner, Milray, Penn.—*Improvement in Saddle Trees.* Patented Jan. 18th, 1853.

The annexed figure and the claim explain this improvement in saddle-trees fully.

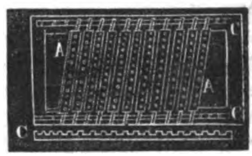
What I claim as my invention is, connecting the bridge-spring seat D to the pommel of the saddle A, by hooking or fastening the hook or curvature, on the front end of the longitudinal centre spring C, of the bridge-spring seat, to the semi-oval or semi-circular steel or iron plate or strap J, fastened underneath the pommel by screws, or otherwise through its legs to the legs of the pommel, to give additional spring or play by its motion on its pivots *m m* to the seat, and to allow the bridge-spring seat to be disconnected from the frame of the saddle when necessary, and to strengthen the pommel by rendering the hole through it near the horn (which weakens it) for connecting with the seat unnecessary.

No. 9544. George Cook and David Cook, New Haven, Conn.—*Improvement in Driving Circular Saws.* Patented Jan. 18th, 1853.

This improvement in circular saws, consists in making the pinion (see figure) on the shaft, hollowing or curved on the side opposite to the direction in which it revolves, so that the elastic covering of india-rubber, upon the surface of the driving wheel E, shall fill said hollow of the pinion *b*, so that it cannot slip or spring out of contact, and drives the circular saw A with great uniformity

What we claim, and desire to secure by letters-patent, is the curved or hooked tooth pinion, acting in the manner and for the purposes hereinbefore set forth.

No. 9545. SAMUEL T. THOMAS AND EDWARD EVERETT, Lawrence, Mass.—*For Improvement in Hole Boards for Jacquard Looms.* Patented Jan. 18th, 1853.



This invention is designed to facilitate attaching or detaching the mail-cords or heddles in a jacquard loom, when the number of threads in a given breadth of the cloth is to be increased or diminished; the improvement is confined to the hole-board, by which the necessity to unfasten every mail-cord from its lifting-wire is avoided. By this improvement, the inventor says he can make the changes in one or two hours, without removing the mail from the lifting-wire cords. The hole-board A A, in the figure, extends across the frame; they are placed in the grooves of the bar C C. The bars are in pairs, and can be changed when another set of bars, with a greater number of notches, is required to alter the breadth; the mail-cords are allowed to remain in their respective holes in the cross-bars, and hang from the lifting-wires in their working position. If we use a pair of bars having eleven cross-bars, with each cross-bar having twenty holes, we have 220 mail-cords in a breadth of six inches. If we substitute for these a pair of bars of twenty-two cross-bars in contiguous notches, we have the same number of mail-cords in a breadth of three inches; when the side-bars are inserted, they are so placed with reference to each other, as to bring the back hole of the cross-bar nearly in a line with the front hole of the adjacent cross-bar. Any required number of threads to the inch can thus be obtained by simply using side-bars having more or less cross-bars to an inch.

What we claim is the sectional harness-board, in combination with the movable supporting bars placed on each side of the frame, for the purpose of adjusting and retaining said harness-board in the position required; the whole constructed, combined, and arranged in the manner and for the purpose specified.

No. 9546. JAMES S. HOGELAND, Lafayette, Ind.—*Improvement in Wool Condensers.* Patented Jan. 18th, 1853.

In wool condensers of the reciprocating variety, the slubbing ropeing is compressed tightly upon the surface of the rub-roller by the reciprocating rollers above, so that it often happens that the ropeing adheres to the rub-roller with sufficient force to be drawn round by it until it breaks from the spool, which causes delay, &c. The object of this invention is to remedy this defect by employing relieves and guide-rollers, which are situated and rotated on the delivery-side of the ordinary rub-rollers, to relieve the slubbing which adheres to the latter, and is carried out of a direct line to the spools.

To obviate this evil, I have furnished the condenser with a small relief-roller, and nearly in contact therewith on its relieving-side revolving in the same direction.

What I claim as new therein, and desire to secure by letters-patent, is the method herein described of detaching the ropeings from the rub-roller, and guiding them on their passage to the spool in such a manner as to prevent them from being unequally deflected, and thereby unequally stretched, by means of a relief and guide-roller, arranged and operating as set forth.

No. 9547. JOHN GRIFFITH, Philadelphia—*Improvement in Screw-Cutting Dies.* Patented 18th Jan., 1853.

The inventor claims as his invention, "The circular die with an offset, which makes a cutting edge, which is held in position by a bolt and screw-nut, the threads which are cut in its periphery being parallel instead of having a running pitch, substantially in the manner and for the purposes as herein before described."

No. 9548. JOHN L. KINGSLEY, of New York—*For Improvement in Metallic Gum Composition for Stereotype Plates.* Patented 18th Jan., 1853.

This invention consists in preparing and using composition made by grinding metals, earths, and such like materials with the raw or uncured gums of gutta percha and india-rubber.

The inventor melts, the two gums above-named, passes them through steam-heated rollers; at this state he introduces an impalpable powder of a metallic substance to make it hard. He gives various compositions, of which we select the following two:

a. Composition. 4 parts gutta percha, 1 part india-rubber, 1 of peroxide of antimony, 1 part of peroxide of zinc, 3 parts of peroxide of iron (very hard).

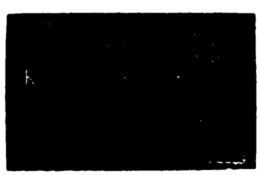
b. Composition. More plastic, 4 parts gutta percha, 1 part of caoutchouc, 3 parts of peroxide of zinc, 2 parts of peroxide of iron.

He uses also franklinite in some compositions. The inventor considers the use of unprepared and uncured gum as highly important.

"Having thus stated clearly the nature, and described the process of preparing my gum, found specially adapted to the stereotype plates and moulds, I wish it to be distinctly understood that I do not claim the mixture of the gums, gutta percha, india-rubber, &c., with other non-elastic gums, resins, &c., as shellac, resin, sulphur, &c.; nor do I claim vulcanizing; nor do I use vulcanized compounds; nor do I claim mixing the elastic gums with the alkaline earths, or earths proper, nor with the carbonates, nor the sulphates of these bases, as pulverized marble, plaster of Paris, Epsom salts, &c.; all these things having been done before by Nelson Goodyear and others, for hardening and otherwise modifying the elastic gums, but

"What I do claim as my invention, and desire to secure by letters-patent, is the making of stereotype moulds and plates of the raw or uncured gum, combined with the pulverized oxides of iron and antimony, or their equivalents, in manner and for the purposes herein set forth."

No. 9549. JEREMIAH P. SMITH, Hummelstown, Penn.—*For Improvement in Corn Shellers.* Patented 18th Jan., 1853.



The inventor makes the shelling-bars in separate pieces e e e (see the figure). The first is plain on the face; the second and third are bevelled on the feeding end, to facilitate the discharge of the cobs more freely. The straps *h h h* are to prevent the feeding-bars *e e e* from coming in contact with the cylinder *d*; there are also springs, which press the bars in such a manner as to shell either thick or thin ears. The screws are to regulate the spring.

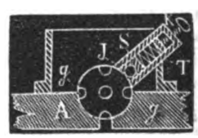
"What I claim as new, and desire to secure by letters-patent, are the bevelled spring-blocks or shelling-bars at *i i* in separate pieces, in the manner and for the purpose set forth in the preamble and specification; but I do not claim to be the inventor of spring-blocks or shelling-bars."

No. 9550. Jos. W. Webb, Aurora, N. Y.—*Improvement in Rotary Engines.* Patented 18th Jan., 1853.

This invention consists principally in so constructing the steam chest-valves, exhaust-chambers, and slides, that steam may be made to act expansively in the cylinder. To accomplish this, the inventor constructs a double engine, having two annular cylinders firmly connected to each other and stationary, but not communicating with each other. Each has its parts, stop, and piston, &c., but so arranged that when the steam is exhausting from one cylinder, it shall be operating with its greatest power upon the piston of the other, and vice versa, the piston being firmly connected to the same shaft by means of appropriate disks. Both cylinders receive steam from the same exhaust-chamber, and through its own valve, and through an aperture in the top of the steam-chamber governed by slides, which are stationary when the engine is in operation, but shifted for reversing at the pleasure of the engineer.

"What I claim as my invention, and desire to secure by letters-patent, is making two exhaust-openings, such as described, separate and distinct from each other, through each steam and cut-off valve, said valves having seats on the upper as well as lower side of the steam-chamber, each of said exhaust-openings communicating with the exhaust-chamber through apertures in the upper side of the steam-chamber, which are opened and closed at pleasure, by slides used in connection with the valves for governing or reversing the engine—the whole being constructed, arranged, and operating substantially as described and represented."

No. 9551. Samuel H. Witherow, Gettysburg, Penn.—*For Improvement in a Corn Planter.* Patented 18th Jan., 1853.



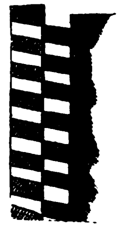
The inventor says, "The great practical difficulty in the drills heretofore constructed and in use, has been that the shape of the grains of corn is such, that two grains will get edgewise or endwise in the seed-cells which will take in but one grain on its side, and where the fore end of the hopper is rigid and immovable, the grain thus situated must be cut or broken to pieces, and thus rendered worthless for planting. The holes or cells must be limited in size, &c., and the brush, in removing the seed which projects from the cells, removes also the seed which is desired to be planted, and makes thus false planting."

The inventor remedies this by making a box *g* (see the figure) in the fore part of the seed-box at suitable angles reaching down to the cylinder A; at the end of the tube is a roller J, the bearing of which rests on the block S, the spring T, which presses upon the block S, and consequently upon the roller, and that upon the grain. When the roller comes in contact with the grain, the spring allows the roller to rise, and the grain passes down into the furrow; the roller closes down again without injury to the grain.

"What we claim therein as new, and desire to secure by letters-patent, is the arranging of the spring T, slide S, and roller J, within a box or tube forming one end of the hopper, in such a manner as to prevent any more seed from leaving the hopper than is required for planting—the whole being arranged in the manner and for the purpose specially set forth.

"We also claim the arrangement of the drag-bar, under the plough-beam and passing through the adjustable hanger M, and a slot in the neck of the mould-board, for the purpose of giving additional lateral support to it, and protecting it from the earth which runs up on the mould-board in turning the furrows—the whole being arranged and combined in the manner and for the purpose herein set forth and described."

No. 9552. John Bell, Harlem, N. Y.—*Joining Corners of Boxes.* Patented 25th Jan., 1853.



The inventor states in his specification: "The nature of this invention consists in forming a joint compound of a double oblique tenon, and corresponding mortises at the corners of boxes, drawers, &c., &c., as seen in the figure, which are prevented from coming apart when the lid or bottom is fastened on, thereby being secured in a manner superior to dove-tailing or other modes heretofore known. The lines of the tenons being parallel to each other, but drawn from both sides of a vertical line at the corner of the box at an angle otherwise than a right angle thereto, yet joining on said vertical line, these lines may be drawn reversed (or herring-bone); that is, the lines drawn on the side and end of the box descending and forming an obtuse angle with the vertical line above the vertex of the angle; or may be varied by drawing the lines on the descending and forming obtuse angles, while those on the other end ascend, forming acute angles with the vertical line.

"What I claim as my invention, and desire to secure by letters-patent, is the joining the corners of boxes, &c., by means of double oblique parallel mortises and tenons, so that neither the sides nor ends can be separated or displaced without previous removal of the top and bottom of the box, as set forth substantially in the foregoing specification and accompanying drawing."

No. 9553. James Black and Orson Beecher of Philadelphia, Pa.—*Improvement in Steam Diaphragm Pump.* Patented Jan. 25, 1853.

This invention consists, firstly, in connecting the condenser with the valve box, between the eduction and induction valves, by a pipe with a check-valve so arranged as to draw the air, &c., from the condenser; when the water is drawn down in said pipe by the diaphragm, the vessel is filled with water, and the air is driven out of said pipe through another check-valve into the discharge pipe or elsewhere, by the water when it is forced up in said pipe as it is expelled from the vessel by the steam above the diaphragm, and thus the air is drawn from the condenser by a column of water working the equivalent of an air-pump.

2. In the arrangement of a pipe with a valve in it, leading from the bottom of the condenser to the chamber of the pump, so constructed and arranged as to draw the water from the condenser into the chamber of the pump by the action of the diaphragm or its equivalent; thus causing the water-pump to work an exhaust-pump or *its* equivalent to the condenser at the same time that it does its ordinary work. The inventor states "that such a pump can raise a given quantity of water in a stated time for one-fourth of a common piston-pump and steam-engine, and raise it to a stated height with half the steam or other power required to operate a piston-pump and steam-engine to raise the same quantity of water."

We claim, 1st. The pipes E^3; valves d^2 and d^3, or their equivalents, so constructed and arranged as to draw the air, &c., from the condenser, and drive it into the discharge pipe or elsewhere, by the column of water in said pipe operating by the working of the diaphragm which causes said column of water to work the equivalent of an air-pump to the condenser.

2d. The pipe D^5 and valve *d*, or their equivalents, so constructed and arranged as to draw the water from the condenser by the raising of the diaphragm, thus causing the water-pump to work an exhaust-pump or its equivalent to the condenser, at the same time that it does its ordinary work substantially as described.

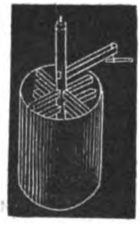
No. 9554. CHARLES BOURGARD, New York—*Machine for manufacturing Wigs.* Patented Jan. 25, 1853.

The machine which constitutes this invention, consists of a work-frame, its carriage, and one or more needles; and the mechanism through which the said work-table, carriage, needle, or needles, receive such motions in relation to each other as are necessary for the proper performance of the operation. The carriage is mounted on wheels which run on a suitable railway, and the work-frame is placed upon a double slide-frame, which rests on the carriage and is adjustable longitudinally and transversely. The work-frame is provided with means of securing the silk or other material into which the hair is to be inserted, and of confining a suitable quantity of hair which is laid on the face of the said material. The needle is barbed, and receives a reciprocating motion in a line perpendicular to the face of the silk or material, and passes through it from its back side, catching one or more hairs as may be required, and drawing the root ends through the back of the silk or material.

The carriage receives an intermittent rectilinear motion which takes place between every two passages of the needle through the silk or material, so as to bring the silk or material to a proper position for the drawing through of the succeeding hair; by this motion the hair is inserted in rows. The relative position of the hairs of each row to those of the next rows, is regulated by the double slide of the frame.

I claim (for the purpose of making the partings or those parts of wigs and all articles of a similar nature, where the artificial scalp or skin is visible, and the surrounding parts), the employment of two or more adjustable slide-frames, for carrying the silk or other material into which the hair is to be inserted, and the hair to be inserted therein, in combination substantially as described, with a reciprocating hooked or barbed needle, either the said frames or needle having such a movement as is necessary to insert the hairs at a proper distance apart.

No. 9555. HENRY BRITNEY, Springfield, Ohio—*Improvement in Tanning Leather.* Patented Jan. 25, 1853.

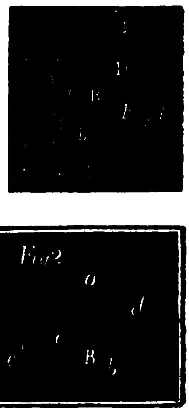


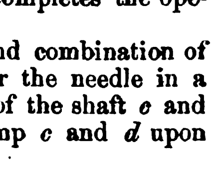
The inventor says in his specification, "It is desirable that all the hides in a vat of tan liquor, should have their entire surfaces so exposed to the liquor, that they will be equally and simultaneously impregnated by it throughout. To accomplish this more perfectly, the inventor devised a process whereby the hides are spread out, floated, and towed horizontally in parallel layers.

He places within a tin vat a shaft (see figure), which is turned by a horse or other power: in the shaft are placed or fixed a series of arms, one above another, four inches apart. The hides are secured by one edge to the horizontal arms, each arm having one or more hides attached to it, as there may be room; when the hides are attached the vat is filled with liquor. The shaft is put in motion, when the hides arrange themselves horizontally and parallel to each other, the liquor can circulate freely among them, and they are uniformly tanned. There is no injurious stretch put upon them. The constant motion of the apparatus keeps the liquor so thoroughly agitated, that the tanning matter is equally distributed throughout, so that the hides at the top of the vat are tanned as rapidly as those near the bottom or the middle.

Having thus described my improved process of tanning hides, What I claim as new therein and desire to secure by letters-patent, is continuously towing the hides, in separated layers, through the tanning liquor, in such manner that each hide made fast only at one edge or end to the towing mechanism, will be gently stretched and kept spread out by the resistance of the liquor which is caused freely to circulate in contact with both sides or surfaces of the hides, whereby every hide of a quantity, however large, is equally and constantly exposed to the action of the tanning liquor, and the stretching action upon the hides is adjusted substantially as specified.

No. 9556. Freeman Palmer, Conneaut, Ohio—*Improvement in Sewing Machine.* Patented Jan. 25th, 1813.





The inventor's improvement is in the feeding apparatus for shuttle sewing machines. We have given two figures to explain it. Fig. 1 is a side-view showing the feeding wheel B with a flange *b* upon its disk, and the cramp *d*, which grasps the flange *b*, but sliding freely along the same until acted on by the lever *c*, when it instantly binds firmly upon the flange, so that the feed-wheel shall be carried forward by the arm *e*; the cramp *d* is kept in its place by a spring; Fig. 2 is a front view showing these parts in their proper position. The forward motion of the feed-wheel which gives the length of the stitch, is regulated at pleasure by a screw-regulator which allows the arm a longer or shorter range. In the returning motion of the shuttle, one of the friction-rollers strikes the arm, and placed on the other end of the shaft *c*, opposite to the wheel B acting upon that wheel, carrying the material to be sewed far enough forward for another stitch, which completes the operation.

"What I claim as my invention, is the arrangement and combination of parts, by which the material to be sewed is carried under the needle in a way to secure any required length of stitch, consisting of the shaft *c* and the screw-regulator Y together with the lever and cramp *c* and *d* upon the feed-wheel B, substantially as herein described."

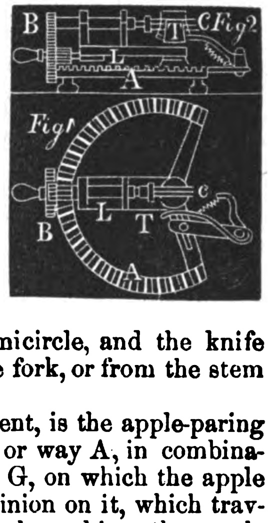
No. 9557. Samuel M. Perkins, Springfield, Penn.—*Improvement in Manufacturing Coats.* Patented Jan. 25th, 1853.

This invention consists in manufacturing coats, vests, pantaloons, &c., directly from wool or other fibres, coming as batting from carding machines, without spinning, weaving, and dressing the same into cloth, or the cutting and sewing operations of the tailor. The bat, as it comes from the machine, is shaped or formed into a coat, or other wearing articles, by tearing out portions of it for the arm-holes; the arm-pieces are torn diagonally across the middle of the bat, to have the natural downward inclination of the fibre like cloth. The arm-pieces, collar, &c., are "*tacked*" to the body by few stitches. The coat is now ready for the next operation, that is, to be "*shrunk*" by a kind of felting process; the last operation is to shape the coat, &c., over a coat-block, dry it, and finish it with lining, buttons, &c.

What I claim, and desire to secure by letters-patent, is the art or method, as described, of making seamless felt articles of use and wearing apparel, by giving the batting of wool or fur the desired shape, and uniting its edges where required, with silk, or any other non-shrinking equivalent, or by such shrinking threads or fibre as will resume their original state when dry, substantially as hereinbefore set forth.

I do not claim the mode of carding or preparing the batting, as that was well known long before my invention; nor do I claim the shrinking or felting process, as that has also been well known.

No. 9558. Wm. H. Lazelle, New York—*For Improvement in Apple-Paring Machine.* Patented Jan. 25th, 1853.



This invention consists of a revolving fork with prongs, which sustains the apple against a stationary, yet yielding or spring knife T (shown in Figs. 1 and 2), fastened to arm M, by which, when the traversing lever L is pushed horizontally backward and forward, a rotary motion is given to the fork on which the apple is secured, thus making the apple rotate against the knife T, which acts upon it to pare or remove the skin in a perfect manner. When the apple is placed on the prongs of the fork, and the handle of the lever is drawn to the end U of the rack A, by pushing the lever forward in a horizontal direction, the prongs of the fork will traverse a semicircle, and the knife will act longitudinally from the heel to the toe of the fork, or from the stem to the blossom-end of the apple.

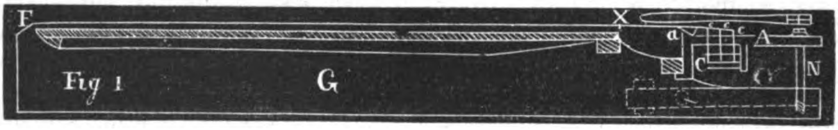
What I claim, and desire to secure by letters-patent, is the apple-paring machine, constructed with a stationary circular rack or way A, in combination with a traversing lever L, for operating the fork G, on which the apple or other article is placed, the said handle having a pinion on it, which traverses the said rack, and gives rotary motion to the fork, making the apple to revolve against the swinging spring-knife T, while the handle is pushed backward and forward in a horizontal direction by the operator, in the manner substantially as described and for the purpose set forth.

No. 9559. J. Piffaut, New Orleans, La.—*Improvement in Pianofortes.* Patented Jan. 25th, 1853.

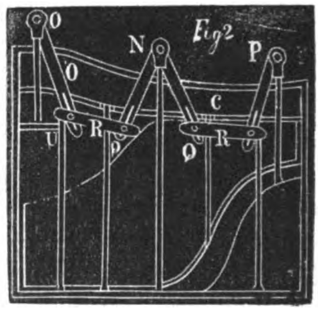
The nature of this invention consists in constructing the metallic frames of pianofortes, so as that the inside frame, or that which supports the long bridge of the piano, may be raised or lowered at pleasure, and thus raise or lower the tone of the instrument, and at the same time keep up the general accord of the piano.

The inventor makes the frame entirely of iron or other metal.

The movable or adjustable part is shown in Fig. 1, at A, which supports what is termed the "straight or long bridge." By turning the screw N, the rear end of part A will be drawn down, whilst the front part, which carries the bridge *a*, will rise, whereby the tone of the piano is raised, or lowered by a reversed operation.



To raise or lower the tone of an instrument, and still preserve its accord, it is well known that the coarser strings will require more straining than the finer ones, so that as this operation is a constantly-varying one, which no rigid or non-adjustable apparatus could provide for, some allowance must be made for it. For this purpose I arrange besides the centre screw N (see Fig. 2), one on each side of it and near the ends of the frame O P, which are similarly connected to the main frame, in all respects as that at N. These screws are provided respectively with curved levers N′ O′ P′, to which they are permanently fixed, so that by the turning of one, the other will move with it. These levers are connected together by connecting-bars R R, which are attached by screw-bolts passing through slots in the levers, in which they are made adjustable, so as to make the coarser strings, when the tone of the instrument is to be raised, undergo a greater degree of tension than the finer ones, which may be done by increasing the length of the lever by means of its slot (and *vice versa*), and thus preserve the accord. By turning the screw N, motion is given through the levers and contracting-bars to the screws O P, and consequently all three act simultaneously, and with that degree for which they may be set. There is a dial or indicator, upon which a hand on the screw P marks the degree to which the instrument is raised or lowered. C represents pieces of wood, with which the metallic movable part A may be filled, so as to better hold the pins C C C which extend into them. F (Fig. 1) represents the crooked bridge which is fixed to the frame, in the ordinary well-known manner. The number of ribs may be increased or diminished, or so arranged as best to support or counteract the strain upon the wires.



The movable part A has two motions independent of the frame; viz.: one horizontal, or so that, whilst the bridges cannot approach each other nearer than a given point, they may be moved or recede one from the other; the other motion is in the arc of a circle upward, for straining up the wires.

What I claim therein as new, and desire to secure by letters-patent, is in combination with the metallic frame of a pianoforte; the movable part which supports the bridge, and which is raised or lowered at pleasure by means of a key operating through the screws and levers, or their equivalents, for the purpose of raising or lowering the tone of the instrument, and at the same time preserving its accord, substantially as described.

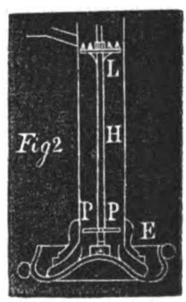
No. 9560. Josiah W. Archibald, Porto Rico—*Improvement in Draining Machine for Sugar.* Patented January 25th, 1813.

The inventor fills bags, made of any kind of material, with sugar, to be purified, and places them into centrifugal depurating machines now in use in sugar manufactories, or on plantations. When the sugar is freed from molasses, the bag is removed, and another bag immediately takes its place, There is no doubt that a great deal of labor is saved by this improvement, because the removal of the sugar from the centrifugal apparatus is a slow and tedious operation. The apparatus must be stopped, the sugar dug out, which causes delay and labor.

The claim is, to the employment of a fibrous or flexible bag, made of cotton, linen, hair-cloth, or any other substance, placed loosely, or secured by loops, as described, in a centrifugal depurating sugar machine, inside of the wire-gauze cylinder, and containing the sugar, said bag not being permanently attached to the machine by any screw or clamp, et cetera, but to be freely placed in and then lifted out of the machine entirely, when the sugar is depurated, for the purposes set forth.

No. 7561. Abiathar T. Potter, of Boston, Mass.—*For improvement in Gold Washer.* Patented January 25th, 1853.

The nature of this invention consists in a water-wheel L, placed in the tube H, (see figure 2), which conducts the water containing the metal into the apparatus, the wheel L being operated by water as it enters or descends the tube, so as to agitate the water by the motion of the wheel, and the arms P P, fixed to the shaft I. This wheel may work an additional apparatus to wash the ore or metals before they come in contact with the mercury. The outlets of the tube H, conducting the water containing the ore into the bath open at or near the bottom, in oblique direction at E, shown in Fig. 2, so that the water coming from the tube H acts in combination with the water which issues from the oblique and spiral apparatus O, in a pipe which surrounds the bath, so as to give the mercury in the bath a rotary motion, and thereby brings all the water containing the ores more effectually in contact with the mercury.



Claim.—1st. A wheel, or its equivalent, arranged in the tube above mentioned, so as to be operated by the water containing the metals, etc., as it issues into or descends in the tube, so as to agitate the water by the motion of the wheel, whether it is made to operate some other agitating apparatus or otherwise.

2d. I also claim the openings E F, or their equivalents, in combination with the openings T T, or their equivalents, substantially as described, for giving such direction to the water as will move the mercury in the manner and for the purposes set forth, substantially, as described.

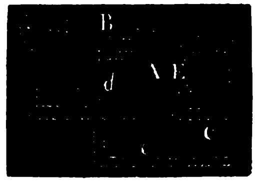
No. 9562. Thomas Prosser, New York—*Improvement in Expansion Drill.* Patented Jan. 25, 1852.

This invention consists in the combination of mechanism for producing a continuous expansion in the cutting part of a chambering drill, when in motion, thereby enabling the operator to enlarge a hole previously made, in metallic substances, within the thickness thereof, technically called chambering, changing the centre, or stopping the drill.

The inventor shows, in his specification, various methods of accomplishing his mode of drilling. In the annexed figure, the cutter *b* is oblique to the axis of the drill, which appears to be the best to make good and clear work. The cutter is set in motion by the bevel-wheels *a* and *c*, which wheels can be worked by hand or otherwise.

What I claim, and desire to secure by letters-patent, is the combination of the inclined cutter *b*, with a screw cut thereon, bevel screw pinion, or its equivalent, and collar *c*, arranged in the manner described, so that by holding said collar, during the rotation of the drill, a continuous feed motion is communicated to the cutter.

No. 9563. PETER TATTAVAL, Washington, D. C.—*Register for Omnibus Passengers, &c.* Patented Jan. 25, 1853.



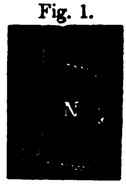
The inventor places a shallow oblong box where the upper step of an omnibus is generally put, and provides it with a cover B, hinged to it, and made to vibrate up and down. In the central part of the box is a small compartment, in which the device for operating the machine is arranged.

When a person steps upon the step B (see figure) it depresses; the shank of the shaft is raised sufficiently to allow the lower ball in the tube to escape, whereupon it falls through the aperture *m* into a drawer *c*, placed under the box A, of which the key is kept by the owner of the omnibus. At the same time the shank is raised far enough to prevent any balls passing below it till it is again depressed. Hence each time that the step B is depressed, in entering or leaving the omnibus, a single ball is allowed to escape. Thus for each passenger two balls are dropped, one in entering, one in leaving.

What I claim therein as new, and desire to secure by letters-patent, is the springs, operated and arranged in combination with the inclined planes and escapement tube, in the manner and for the purpose substantially as herein described.

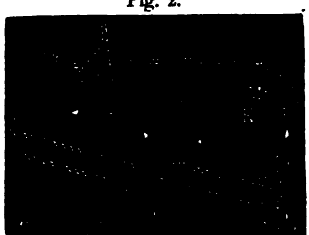
No. 9564. AUGUSTUS B. CHILDS, Rochester, N. Y.—*Improvement in Winnowing Machines.* Patented Jan. 25, 1853.

Fig. 1.



This invention consists in a method of regulating the blast for the second winnowing of the grain, by combining with the revolving fan, which generates the blast for both the first and second winnowing, by a compensating supply valve M (see Fig. 2), situated at some point intermediate between the fan and the place at which the grain is winnowed the second time, the operation of this valve being such that it can be opened to admit an increased quantity of air to supply the fan, whenever the latter demands more than could be drawn through the grain without increasing the strength of the blast to such a degree as would enlarge the carrying away of the sound grain along with the impurities. It consists, further, of a self-regulating delivering valve, which prevents the admission of air while it opens to discharge grain, or impurities separated from the grain, and collected in any receptacle within the machine. The valve-box N is attached to the casing at the lowest line of the inclined bottom of chamber K. The upper part of the box communicates, by an aperture, with the chamber K, and the seeds which fall upon the bottom of the chamber run into the valve-box, where, as a sufficient quantity of the impurities have accumulated in the box, it opens by the weight of contents, without admitting air.

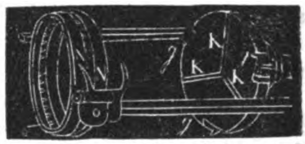
Fig. 2.



I claim the regulating of the blast for the second winnowing of grain, by combining with the revolving fan, which generates both the first and second blast, a compensating supply valve, as herein set forth; but I make no claim to a spring valve, in itself, as such a contrivance is well known for various purposes.

I also claim the self-regulating valve, which prevents the admission of air into the machine while it opens to discharge the impurities separated from the grain, and thus prevents an undue accumulation of them at the bottom of the air-chamber.

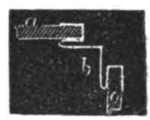
No. 9565. CHARLES B. HUTCHINSON, Waterloo, N. Y.—*Improvement in Machinery for Cutting Barrel Heads.* Patented Feb. 1, 1853.



The wood for the barrel-head is placed in the clamp-rings N N to hold it and to present it to be cut and dressed by rotating cutters *g g g* and K K K, said cutters being arranged upon a rotating disk, as seen in the figure.

Claim.—The use of clamp-rings N N to hold the pieces of heading, and hung in bearings on opposite sides, or in any equivalent way, so as to be reversible, in combination with the adjustable rotating cutters *g g g* to cut and bevel the edge of the head, and with the face cutters K K K, arranged upon the disk *j*, substantially as described, whereby the opposite sides of the head may be successively presented to the action of the cutting tools, and the head cut out, chamfered, and face dressed, or cut out and chamfered only, at one operation."

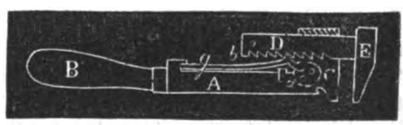
No. 9566. ELIJAH F. PARKER, Proctersville, Vermont—*Construction in Frames for Lanterns.* Patented Feb. 1, 1853.



The inventor makes the corner pieces of lantern frames, or those which unite the top and bottom, in one piece, in the manner shown in the figure, whereby he says that he avoids the necessity of soldering these parts, and makes a more substantial frame at less cost; *b* representing the corners, and *a a* the glass.

"What I do claim as my invention and desire to secure by letters-patent, is the turning of grooved or sunken flanges upon the frames of lanterns, so that when the top and bottom are united, the flanges for holding the glass, mica, or their equivalents, shall be already in place to receive them, without any further soldering, substantially as herein described."

No. 9567. LEO. B. READ, of New York City—*Screw Wrench.* Patented Feb. 1, 1853.

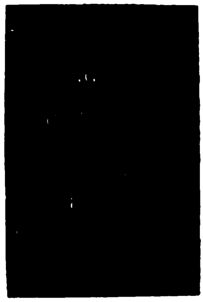


The nature of this invention consists in having the shank D of the adjustable jaw E, pass through a recess in the stationary jaw C, which is attached by a pivot to the end of the wrench-stock. The shank D of the adjustable jaw is provided with a rack into which a pawl, attached to the end of the wrench-stock, catches.

"I do not claim the jaw E attached to a shank, and the shank passing through a recess in the jaw C, independent of the mode of operating the jaws; for the above device differently modified, is employed in various wrenches now in use; but

"What I claim as new, and desire to secure by letters-patent, is the arrangement of the several parts, as herein shown and described, viz.: the jaw C, being attached by a pivot *a* to the stock A, and said jaw C, having a recess through it, through which recess, the shank D, of the adjustable jaw E, passes—the shank D, being provided with a rack b into which a pawl F, attached to the end of the stock, catches, said pawl being kept into the rack b by the spring g—by which arrangement the two jaws E C are forced against the sides of the nut, as the handle of the wrench is turned, and the jaws made to bear or bind harder upon or near the corners 5 and 6 of the nut, thus preventing the jaws from slipping around it."

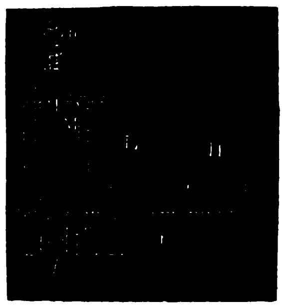
No. 9568. W. & M. STRATTON, Philadelphia, Penn.—*Portable Gas Apparatus.* Patented Feb. 1, 1853.



The nature of this improvement consists in constructing a stove, retort, and cooler, all arranged so as to be portable in the strict sense of the term, which may be used for the manufacture of gas.

"What I claim as my invention and desire to secure by letters-patent, is in the construction of the stove, of removable gates C C in the ends B, for the introduction of the retort, and the movable section G, under the rosin holder, in the manner as set forth and shown."

No. 9569. BENJAMIN SHIVERICK, South Sandwich, Mass.—*Improvement in the mode of Feeding Rosin to the fires of Glass Furnaces.* Patented Feb. 1, 1853.



This improvement relates to furnaces, wherein rosin is employed as fuel, and is melted in a vessel or pot by the heat of the fire, and suffered to pass into the fire-place or chamber.

In front of the flame-chamber, and directly over the fire-place, is the pot or vessel H, for melting rosin; under the bottom of the pot there is to be one or two sliding plates or doors, or dampers K, to regulate the amount of surface of the bottom of the pot against which the fire of the fire-place may be suffered to act.

The interior of the pot H is divided by means of a strainer L; the rosin is to be placed in the rear chamber f, and pass through the strainer into chamber e; from there it passes through vertical strainer g into chamber M; in this chamber is a discharge tube h which opens in the fire-place; this tube may or may not be surrounded by a strainer; in the upper part of tube h, there is inserted a long conical plug J attached to a rod; this rod has a spring on the top which can be regulated by a nut n. The inventor says, "In order to have a clear, constant, and uniform flow of the rosin down the tube, it becomes desirable not only to provide some means of regulating the flow, but of freeing the tube from glutinous matter that may be in it; this is effected by the spring and nut m n; by pressing down the rod of the valve J, the opening may be sufficiently cleared; by removing the hand from the rod, the spring brings the rod back to its former position, and the flow may be easily regulated and kept clear. The volatile spirits arising from the rosin may be carried off into the chimney."

"I claim the combining the long conical valve and the discharge tube, by means of a set screw and nut, and supporting spring, whereby the flow of the melted rosin may not only be regulated, but when any interruption takes place, the attendant can readily remove the same, either by lifting the valve, or pressing on it, such valve being subsequently moved back to its exact or former position by the spring; this improvement being a very important one, in the operation of the apparatus."

No. 9570. RICHARD SOLIS, New Brunswick, New Jersey—*Improvement in manufacture of India-Rubber.* Patented Feb. 1, 1853.

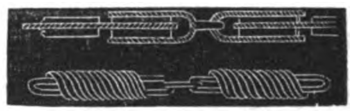
The nature of this invention consists in the art of remanufacturing what is commonly known and called Metallic Vulcanized or Insoluble Rubber.

The inventor takes vulcanized rubber, cuts it into small pieces, and subjects them to mastication by any suitable machinery; when ground and reduced to powder, this powder is mixed with a paste made of ordinary india-rubber and spirits of turpentine—equal proportions of both answer best. He found also that from a mixture of vulcanized india with native rubber, a good fabric can be made.

"I claim as my invention the manufacture of india-rubber fabrics, by the mixture of ground or powdered vulcanized rubber, with the ordinary india-rubber of commerce."

No. 9571. J. L. PULVERMACHER, Preslau, Prussia—*Improvement in Voltaic Batteries and Apparatus for Medical and other purposes.* Patented 1st Feb., 1853.

The nature of this invention is stated by the inventor to consist in forming galvanic *a* elements of a positive and negative metal separated from each other, and combined *b* and in contact with porous, non-conducting



substances, which porous substance will absorb and retain the existing fluid, and impart it to the metals to excite the electric action.

He makes various shaped chains. Fig. *a* is a chain composed of a series of elements linked together, each one of which is an electric pole; *a* is a positive metal, with a flat plate of negative metal inside, and with a porous, non-conducting substance, such as linen, cloth, leather, &c., around interposed. The links are formed by placing the negative metal outside and the positive inside; the links thus arranged form a chain. This arrangement (says the inventor), however, presents certain difficulties; the zinc plate corrodes soon; it does not present sufficient surface for producing electric currents; when brought in contact with the human body, it does not produce electric currents, &c. He makes other combinations which avoid the above difficulties; for instance, he makes a hydro-electric chain, which becomes electric when brought in contact with the human body; when moistened with any diluted acid, it makes a powerful portable plate on a small scale (see Fig. *b*). The element is composed of zinc and copper-wire coiled, as a helix, and around a cone formed of small pieces of wood and copper-wire, or other conducting wire, inverted in a hole inside.

"I do not claim simply making galvanic elements of negative and positive metals, with porous, non-conducting substances interposed, as in the well-known voltaic pile.

"What I do claim as my invention, and desire to secure by letters-patent, is constructing galvanic elements of positive and negative metals, separated from each other by a porous, non-conducting substance, when the said porous, non-conducting substance is surrounded and held by one or both the said metals, substantially as specified and for the purpose specified.

"I also claim forming the galvanic elements by coiling, in the form of helices, the positive and negative wires in grooves previously made in the surface of an inner core of wood or other porous substance, substantially as specified, so that when the wires are wrapped around in the said grooves, they shall both be in contact with the porous substance within and separate from each other, as specified.

"I also claim forming a chain of a series of elements, substantially such as herein described, by means of ties or links, substantially as and for the purpose specified.

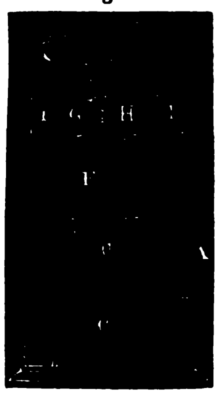
"And, finally, I claim the method of interrupting the current of electricity, by means of the spring-vibrating conductor interposed, substantially as herein described, for the purpose of breaking and closing the circuit, by the movement of the human body or other like motion, as set forth."

No. 9572. Jean Baptist Moineir and Pierre Trippolite Bontegny, of Paris, France—*Improvement in Purifying Fatty Materials.* Patented 8th Feb., 1853.

"This improvement," says the inventor, "applies especially to the treatment of fatty matters with alkalies." He passes through such a mixture of fatty matters and alkalies a current of sulphurous acid gas, which frees the mixture from impurities and hardens it, so that a superior kind of candles can be made therefrom. The residue is treated in like manner, and successively so till the matter is completely exhausted.

"What I claim as my invention and discovery, is the introduction and mingling of a current or currents of sulphurous acid gas with mixtures of fatty acids and alkalies preparatory to the process of being converted into candles, tapers, and articles for burning, thereby rendering such mixtures of a superior quality, and causing them to burn with a stronger, clearer, and brighter light."

Fig. 1.



No. 9573. Nath. A. Boynton, of Boston, Mass.—*Improvement in Hot-Air Furnaces.* Patented 8th Feb., 1853.

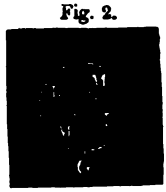
Fig. 1 represents a vertical section of the hot-air furnace.

Fig. 2 a top view of the hollow "wheel radiator."

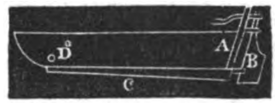
The claim of the inventor refers to the hollow rim G, shown in the vertical section at I I, which is provided with hollow spokes M M′ L L′, and hollow hub H; S is the smoke-pipe, and A the outer casing of the radiator.

"What I do claim is the above-described hollow 'wheel radiator,' made with a hollow rim, hollow spikes, a hollow hub (open at top and bottom), and a valve and valve-seat, so made and applied to the hub, that when the valve is closed, it shall cause the heat and volatile products of combustion to pass through one or more of the arms and into and through the hollow rim, and thence out of the said rim through the other arm or arms and into the hub and over the valve, and so that when the said valve is opened, the heat and volatile products of combustion may pass directly up through the hub without first circulating through the hollow arms and rim, substantially as specified."

Fig. 2.



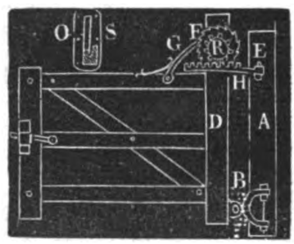
No. 9574. George Chase, of Prudence Island, R. I.—*Improved Arrangement of Centre-Board and Rudder for Shoal-water Vessels.* Patented 8th Feb., 1853.



The nature of this invention consists in providing a vessel with a stern-post A which may slide up and down in guides or ways, and in attaching thereto the rudder B, as also the rear end of the centre-board C, the front end being hinged by a pin D or otherwise near the bow, so that when the centre-board strikes in shallow water, or when it is raised or lowered for any purpose whatever, the rudder shall also rise or fall with it.

"What I do claim herein as new, and desire to secure by letters-patent, is attaching the rear end of the movable centre-board and the rudder to the sliding stern-post, so that the said centre-board, stern-post, and rudder may be raised or lowered together, substantially as described, and by which means I only use a single rudder, whose position can always be known by the height of the stern-post to which it is hung, as also that of the centre-board, the sliding stern-post serving as an indicator to the positions of both."

No. 9575. John Filson, of Milroy, Penn.—*Improvement in hanging Farm Gates.* Patented 8th Feb., 1853.



The figure represents a front view of the gate. A the hinge-post, B double-jointed hinge, D back post of gate, E elongated rack-hinge, F ratchet-wheel, G pawl, R the cog-wheel working in the rack-hinge.

This improvement consists in providing a contrivance by which a gate may be raised or lowered and retained at any desired height, when obstructed in shutting, either by coming in contact with the ground, on account of the hinge-post yielding to the weight of the gate, or in case of an accumulation of snow or ice, or other obstruction beneath it, and in a contrivance by which the catch of the latch may be raised or lowered to suit the height of the gate, which is accomplished by means of the cog-wheel R and rack-hinge, the cog-wheel R being attached to the ratchet F, viz.: when the gate is lifted up, the rack forces the cog-wheel to turn with the ratchet, the pawl G preventing the turning back, keeps the gate at the point desired. The catch F works up and down in a slot O in a metal plate S, and can be set at the necessary point to suit the height of the gate and of the latch.

"What I claim as my invention, and desire to secure by letters-patent, is the lower double-jointed hinge in combination with the apparatus attached to and constituting the upper hinge as described, for the purpose of holding the gate at any inclination required, for the purposes set forth."

No. 9576. George Peacock, of Albany, N. Y.—*Improvement in Core-bars for forming Cores for Casting Pipes.* Patented 8th Feb., 1853.

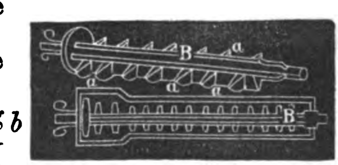


Fig. *a* represents a perspective view of the core-bar.

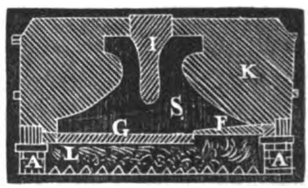
Fig. *b* a top view of the core-bar in the flask.

The inventor claims "the core-bar B having transverse wings or projections *a* of semicircular or other shape, corresponding to the shape of the article to be cast; said wings or projections permitting the sand to be rammed for forming the lower half of the core, and holding or binding the sand to the lower part of the bar, and allowing the upper half of the core to be made by the sweep, as herein set forth.

"I also claim the manner of anchoring the core-bar as herein described, viz., by means of the metal strips or bridges fitting in recesses in the upper surface of the core-bar, said bridges resting upon wooden supports *d d*, and having anchor-rods bearing upon their upper surfaces, the liquid metal burning out the wooden supports, and allowing the core to be withdrawn, by which means the core is prevented from being raised or forced upward by the liquid metal as it is poured into the mould, and thus enabling pipes to be cast of any desired length.

"I also claim the manner, substantially as herein described, of connecting or jointing the core-bars for forming cores for elbows or branch pipes, viz., by means of wooden wedges *g g*, which are the means of holding the bars together while the core is being formed, said wedges being burnt out by the liquid metal when poured into the mould, and allowing the cores to be withdrawn."

No. 9577. Charles Peters, of Trenton, N. J.—*Improvement in Moulds for uniting Steel to Cast-Iron.* Patented 8th Feb., 1853.



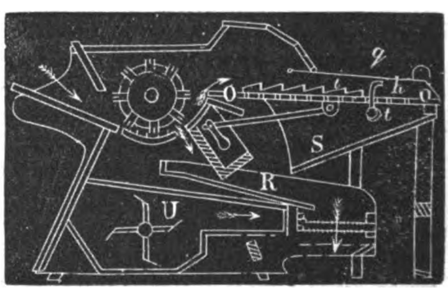
The nature of this invention consists in forming a solid basis of iron, brick, or other hard material, to the mould, with an aperture therein of the shape of the steel or wrought-iron sought to be welded, and thus, by means of the said aperture, subjecting the steel or wrought-iron, while in the mould, to the fire, until the same is heated to welding heat.

In the figure, F represents the wrought-iron face of the anvil S; G the steel face; K sand in the flask, while on the furnace for heating the steel to the welding heat; I, core in the mould, represents the cavity as patented May 4th, 1852; A the base of iron and fire-brick.

The mould is placed over a furnace level with the ground; and nothing but the steel or wrought-iron face shall be exposed through said aperture to the fire; when it has obtained a welding heat, the mould is taken off the fire on to a bed of sand, to prevent the steel or wrought-iron from burning; the molten iron is then poured into the mould.

"What I claim as my invention, and desire to secure by letters-patent, is the use of a solid base to moulds in which steel or wrought-iron is to be welded to cast-iron, with an aperture in the same, so that by means thereof the said steel or wrought-iron can be subjected to the heat of the furnace while in the mould."

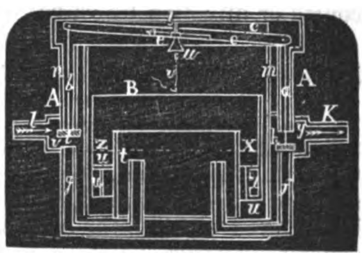
No. 9578. J. F. Zimmerman, of Charlestown, Virginia—*Threshing and Clearing Grain.* Patented 8th Feb., 1853.



The inventor says: "A most essential advantage in my improved thresher, is the straw deliverer or vibrating-table. I have side-pieces *h h h*, to which a table or straw platform *o o* is attached, having several saw-like parallel running strips *i* attached thereto at proper distances. The platform or straw-table *o* has a number of perforations or holes acting as a riddle or screen. To this table is attached a sloping bottom *s*; the table and scoop hang in straps to allow it to move; the vibration is produced by a rod and crank in the ordinary manner; through several of the holes of the vibrating-table *o* pass prongs *q* attached to a horizontal axle *t*, working underneath the platform. The saw-like teeth *i i i i* are used for the purpose of pushing the straw forward in its passage from between the concave thresher *b*; and the curved prongs *q* are used to beat the straw and shake out what grain or kernels are not separated by the thresher, and fall through the hole in the table upon the scoop *s*, and from there upon the inclined-plane R on to the screen or riddle, where it is acted upon by the current of the fan-blower U.

"I claim the invention, use, and application of the perforated vibrating-table *h h h o o* arranged to a sloping bottom or platform *s s s*, and the parallel saw-like strips or straw-pushers *i i i i*, combined with an oscillating rake *y y z*, and straw-beaters or curved prongs *q q q*—the whole combined and working with the oscillating hinged standard and suspending-straps, as shown in the figure, and substantially as set forth."

No. 9579. E. R. Hallam & T. B. Barnard, of New Haven, Conn.—*Improvement in Gas Meters.* Patented 8th Feb., 1853.



The figure is a vertical section of the machine.

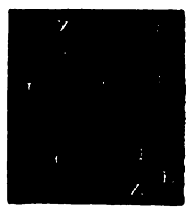
A is the external cylinder, to the bottom of which is fastened an inner cylinder *t*, thereby forming an annular space *u*; B is a cylinder with a hollow ring *w* at the bottom which serves as a float to counterbalance the weight of the cylinder B, the annular space *u* being filled with water or other liquid up to the line *x z*; *l* is the receiving-pipe through which the gas passes into the valve-box, and thence into the cylinder B, through the pipe *g* or into the space above the cylinder B, through the pipe *n*; *k* is the delivering-pipe through which the gas passes from the space within the cylinder B through the pipe *f*, or from the space above the cylinder B through the pipe *m* to the valve-box *y* and thence to the burners; *h* and *i* are the valves by which the gas is directed in its course through the pipes *g n f m*; *c* is the beam that works the valves *h* and *i* by means of the rods *a* and *b*; *e* is a hollow tube attached to the beam *c* by a centre on which it can vibrate; *l′* is a bent wire for the tube *e* to strike against when it is raised or lowered by the cylinder B, by means of the button *w′* and cord *v′*; *c′* is a stationary bearer fixed to the cylinder A, and carries the beam *c*, &c.; B′ is the centre or pivot of the beam *c*; E is a bracket carrying the end of the pivot B′.

Operation—The gas, being received through the pipe *l* into the valve-box *v*, flows through the pipe *g* into the space within the cylinder B, but is prevented from passing into the pipe *n* by the valve *i*, and prevented from flowing out of the cylinder B by the valve *h* until the cylinder B is full, when it raises the hollow tube *e*, and then the mercury or other fluid that is in the tube runs down to the other end, causes the tube to turn on its centre *o* and to strike the bent wire *l′* and turn the beam *c*, forcing down the valve *i* and raising the valve *h*; then the gas within the cylinder B is allowed to flow out through the pipe *f*, and thence through the pipe *k* to the burners, and the gas, flowing through the receiving-pipe *l*, is allowed to pass up the pipe *n* into the space above the cylinder B, but is prevented from passing out of this space by the valve *h* till the cylinder B has descended to its required distance, when the cord *v'* pulls down the tube *e* and allows the fluid within it to run back to its former position, when it turns upon the centre *o*, and, striking the lower part of the bent wire *l*, turns the beam *c* back to its first or former position, and changes the valves so as to allow the gas to flow into the cylinder B and out of the space above it, and so on.

The quantity of gas passed through this machine is measured by the cylinder B, which may be made to work an index on the top of the machine by means of a wire or rod working through a stuffing-box on the top of the cylinder A, one end of which wire is attached to the index, the other end projects below the stuffing-box and into the cylinder A sufficiently for the cylinder B to strike it and raise it, when the said cylinder B gets to its full height, and thereby moving the index; the index is not shown in the drawing, presuming it unnecessary, as any ordinary index can be attached.

"What we claim as our invention, and desire to secure by letters-patent, is the within described method of constructing meters with one cylinder working within another, so that the gas passes alternately into the inner cylinder and out of the space above it, and then out of the inner cylinder while the supply enters the space above it, the gas being changed in its course or direction by valves, as herein described."

No. 9580. H. Le Riemondie, of New Orleans, La.—*Improvement in Surgical Instruments for examining the Ear, &c.* Patented 8th Feb., 1853.



The figure represents a section of the instrument. In using this instrument, the lenses G must be adjusted, and also the reflectors I made of silvered plate; the lamp C is lighted and put into the case A; the light is reflected by the concave reflector I to the oblique plane reflector D, and from that to the reflector E, thence to the object examined at the end of tube X, and then through the tube F and lens G to the eye O of the operator. When the ear, nose, or other part should be examined, the tube E is inserted.

"What I claim as my invention, and desire to secure by letters-patent, is the construction of an instrument for examining the interior of the ear, nose, eye, or other part of the human system, by the combination of the reflectors I D E, the lens F, case A, tubes B H D', and lamp C, substantially in the manner herein specified."

DESIGNS.

No. 540. *Design for a Cooking-Stove.*

What we claim as new therein, and desire to secure by letters-patent, is the device "Prairie Flower" on the front plate, the arrangement and configuration of the floral device ornamenting the side-door C consisting of a full-blown central flower *e*, stems, foliage, and pendant flowers *g*, and the ornamental configuration of the smaller door D, as herein represented and described.

No. 541. *Design for a Wood-Stove.*

What we claim as new therein, and desire to secure by letters-patent, is the configuration and arrangement of the ornamental device on the side-plates of the stove, as represented and described.

We also claim the ornamental design of the fire-door, as represented and described.

We likewise claim the ornamental configuration of the bottom-plate F, as described.

No. 542. *Design for a Cooking-Stove.*

Having thus described our ornamental design for elevated oven-stoves, what we claim as new therein, and desire to secure by letters-patent, is the configuration and arrangement of the ornamental design of the plate E, as shown and described.

No. 543. *Design for a Cooking-Stove.*

What I claim as new and my invention, is the arrangement and combination of the herein represented ornaments, moulding, panellings, and shapes, into the above-specified design for cooking-stoves, substantially as above shown.

No. 544. *Design for a Cooking-Stove.*

I claim the ornamental configuration or design, substantially as represented in the drawings, and as above described.

Design, No. 545.

I do not claim the peculiar form of this stove, or any of the ornaments separately; but

What I do claim, and desire to secure by letters-patent, is the combination and arrangement of the ornamental forms and figures represented in the accompanying drawings, and forming, together, an ornamental design for a parlor-stove.

RECENT DECISIONS IN PATENT CASES BY THE SUPREME COURT OF THE UNITED STATES.

Sibley and others *v.* Foot. January, 1853.

A juror was taken ill, discharged, and another drawn from the panel, while the plaintiff's counsel was opening his cause, and before any evidence was given; to which the defendant objects. Held, that this was a matter within the discretion of the court, and not ground of error. The plaintiff below offered in evidence a disclaimer endorsed upon his letters-patent. The defendant objected, because it did not state "the extent of his interest in said patent," and the court excluded the evidence. Afterwards, the defendants offered in evidence a certified copy of the disclaimer, not as a disclaimer, but as a confession that the patentee was not the original and first inventor of a part of the thing patented. The plaintiff objected, because the endorsement was not in his hand-writing, nor signed by him, and the defendants had already caused a certified copy to be rejected. The court below rejected the evidence. Held, that the rejection of the disclaimer, when offered by the plaintiff, was erroneous, because, the plaintiff being patentee of the whole interest, it was fair to infer that he still owned the whole, and it was unnecessary for him to state that he had not parted with any of it. Its rejection, when offered by the defendants as a confession, was right. If it had been received as a disclosure, as it ought to have been, the defendant could not have offered it in a manner to prejudice the plaintiff. When subsequently offered, with the object of injuring him, it was rightfully rejected. An erroneous reason given for rejecting evidence is no ground of error.

It has been repeatedly decided that the courts of the United States have no power to order a peremptory nonsuit, against the will of the plaintiff.

On the trial, the defendants offered in evidence two articles in Ure's Dictionary of Arts, "Thermostad," and "Heat regulator." The plaintiff objected, because he had not received a notice which authorized its admission, and it was excluded, on the ground that the defendants should have directed the plaintiff's attention to the particular articles in the book, instead of referring to the whole work, containing 1300 pages. Held, that this evidence was properly rejected. Also held, when offered to show that Ure, the author, had a prior knowledge of the thing used, the rejection was proper, because the notice did not state "where the same was used" by Ure. Besides, inasmuch as the same section of the statute provides that a prior invention, in a foreign country, shall not avoid a patent, otherwise valid, unless the foreign invention had been described in a printed publication, the defendants are thrown back upon that clause of the act which provides for that defence, arising from a printed publication, which has already been considered.

Where a patent is for a combination of elements, the plaintiff cannot recover without showing that the defendant has used all parts of such combination. Where the judge instructed the jury that the claim, in the specification, on which the plaintiff must recover if at all, was for a combination of such parts of the described mechanism, as were necessary to regulate the heat of a stove, and that the defendants had not infringed the patent unless they had used all the parts embraced in the plaintiff's combination, and left it to the jury to find what those parts were, and whether the defendants had used them; held, that this instruction was correct. In such instruction, the judge did not submit to the jury a matter of law, but one of fact. The construction of claim is a matter for the court. The court construed the claim to be for a combination of such of the described parts as were combined and arranged to produce a particular effect, to wit: to regulate the heat of a stove.

The defendants requested the judge to instruct the jury, that the index, or detaching process, and the pendulum, were constituent parts of this combination, which he refused. The claim is, "I also claim the combination above described, by which the regulation of the heat of the stove, or other structure, in which it may be used, is effected." This calls for all such elements of the combination as are actually employed in regulating the heat, by the plan in the specification. Consequently, it was a question of fact for the jury, upon the evidence of experts, or an inspection of the machines, or both, to say what parts were essential to constitute this combination. When the claim does not point out the particular elements composing the combination, but only declares, as it properly may, that it is made up of so much of the machinery as produces a particular result, it is a question of fact which of the parts are essential to produce that result. This is not construing, but applying a claim, and is proper for the jury. It is not proper for the court, on bills of exceptions, to express an opinion on a matter of fact; but it is pertinent to say, that an examination of the models, exhibited here in court, has satisfied us that a jury might fairly come to the conclusion that the defendants did use a detaching process not substantially different from the plaintiff's, and occupying, in their combination, the same place, and answering substantially the same purpose as the plaintiff's process does in his combination.

Leroy *v.* Latham. Decided January, 1853.

Error from the Circuit Court, Southern District of New York.

Case for the infringement of letters-patent for an improvement in machinery for making lead pipe. The claim was, "We do not claim as our invention and improvement any of the parts of the above-described machinery, independently of its arrangement and combination above set forth. What we do claim as our invention, and desire to secure, is the combination of the following parts above described, to wit: the core and bridge, or guide-piece, with the cylinder, the piston, the chamber and die, when used to form pipes of metal, under heat and pressure, in the manner set forth, or in any other manner substantially the same."

On the trial, the defendant gave evidence tending to show that the machine patented by the plaintiff (below) was not novel, but had been previously invented, used, patented, and described in printed publications. On the trial, the court, charging the jury, said, "The plaintiffs also state that they do not claim any parts of the machinery, the cylinder, core, die, or bridge, but that they claimed the combination when used to form pipes of metal, under heat and pressure, in the way they have described. There can be no doubt, if this combination is new, and produces a new and useful result, it is the proper subject of a patent. The result is a new manufacture. And, even if the mere combination of machinery, in the abstract, is not new, still, if used and applied in connection with the practical development of a principle newly discovered, producing a new and useful result, the subject is patentable. In this view, the improvement of the plaintiff is the application of a combination of machinery to a new end, to the development and application of a new principle, resulting in a new and useful manufacture. That the discovery of a new principle is not patentable, but that it must be embodied and brought into operation by machinery, so as to produce a new and useful result. Upon this view of the patent, it is an important question for the jury to determine, from the evidence, whether the fact is established on which the alleged improvement is founded; that lead in a set, or semi-solid state, can thus be reunited, or welded, after separation." The defendants (below) excepted.

The court further charged, "That, in the view taken by the court, in the construction of the patent, it was not material whether the mere combinations of machinery referred to were similar to the combinations used by the Hansons (the inventors), because the originality did not consist in the novelty of the machinery, but in bringing a newly discovered principle into practical application, by which a useful article of manufacture is produced, and wrought pipe made as distinguished from cast pipe." Excepted to.

The word principle is used by elementary writers on patent subjects, and sometimes in the adjudications of courts, with such accent and precision as to mislead. A principle is not patentable. In the abstract, it is a fundamental truth, an original cause, a motive, and these cannot be patented, as no one can claim in either of them an exclusive right. Nor can an exclusive right exist to a new power, should one be discovered. Through the agency of machinery, a new steam-power may be said to be generated, but, under the patent laws, no one can appropriate this power exclusively to himself. The same may be said of electricity, and of any other power in nature, which is alike open to all. In all such cases, the processes used to extract, modify, and concentrate natural agencies constitute the invention. The elements of the power exist; the invention is not discovering them, but in applying them to useful objects. Whether the machinery used be novel, or consists of a new combination of parts known, the right of the inventor is secured against all who use the same mechanical power, or one that shall be substantially the same.

A patent is not good for an effect, or the result of a certain process, as that would prohibit all other persons from making the same thing by any means whatsoever. This, by creating monopolies, would discourage arts and manufactures, against the avowed policy of the patent laws.

A new property discovered in matter, when practically applied in the construction of a useful article of commerce or manufacture, is patentable; but the process through which the new property is developed and applied must be stated, with such precision as to enable an ordinary mechanic to construct and apply the necessary process. A patent will be good though the subject of it consists in the discovery of a great general and most comprehensive principle in the science or law of nature, if that principle is, by the specification, applied to any special purpose, so as thereby to effectuate a practical result and benefit not previously attained. In Housebill v. Neilson, in his charge to the jury, Mr. Justice Clerk said, "the specification does not claim any thing as to the form, nature, shape, materials, numbers, or mathematical character of the vessel, or vessels, in which the air is to be heated, or as to the mode of heating such vessels." The patent was for "the improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required."

In that case, although the machinery was not claimed as a part of the invention, the jury were instructed to inquire, "whether the specification was not such as to enable workmen of ordinary skill to make machinery or apparatus capable of producing the effect set forth in said letters-patent and specification."

It would seem, that where a patent is obtained, without a claim to the invention of the machinery through which the valuable result is produced, a precise specification is required, and the test of infringement is, whether the defendants have used substantially the same process to produce the same results.

A patent for leaden pipes would not be good, as it would be for an effect, and would, consequently, prohibit all other persons from using the same article, however manufactured. The new property in the metal, claimed to have been discovered by the patentees, belongs to the process of manufacture, and not to the thing made. In the present case, the patentees found their claim on the specification above quoted, and they can neither modify nor abandon it, in whole or in part. The combination of the machinery is claimed, through which the new property of the lead is developed, as a part of the process in the structure of the pipes. But the jury were instructed, "that the originality of the invention did not consist in the novelty of the machinery, but in bringing a newly discovered principle into practical application." The patentees claimed the combination of the machinery as their invention, in part, and no such claim can be sustained without establishing its novelty, not as to the parts of which it is composed, but as to the combination. The question whether the newly developed property of lead used in the former pipes, might have been patented, if claimed, as developed without the invention of machinery, was not in the case. There was error in the instruction, that the novelty of the combination of the machinery, specifically claimed by the patentees as their invention, was not a material fact for the jury, and on that ground the judgment below is reversed.

The case of Bearn *v.* Smallwood, cited from 2 Story R., 408, and approved, in which Judge Story said, "He (the patentee) says that the same apparatus, stated in this last claim, has been long in use, and applied, if not to chairs, at least in other machines, to purposes of a similar nature. If this be so, then the invention is not new, but, at most, is an old invention, or apparatus, or machinery, applied to a new purpose. Now, I take it to be clear, that a machine, or apparatus, or other mechanical contrivance, in order to give the party a claim to a patent therefor, must, in itself, be substantially new. If it is old, and well known, and applied only to a new purpose, that does not make it patentable."

R. H. G.

DECISIONS OF THE U. S. SUPREME COURT IN PATENT CASES.

1840. The Philadelphia and Trenton Railroad Co. *v.* James Stimson. 14 Peter's R., 448.

This was a writ of error to the Circuit Court for the Eastern District of Pennsylvania. The action was brought for a violation of the patent of the plaintiff (below) for turning short curves on railroads. The original patent was issued August 23, 1831, and surrendered and reissued September 26, 1835, "on account of defective specification." The plaintiff offered the re-issued patent in evidence; the defendant objected, because it was not stated that the prerequisites of the act of 1832 had been complied with, viz., that the error in the former patent had arisen by inadvertency, accident, or mistake, and without any fraudulent or deceptive intention; and without such recitals, as it was the case of a special authority, the patent was a mere nullity, and inoperative. The patent was admitted in evidence; held, that the objection was not a valid one.

It is a presumption of law, that all public officers, and especially such high functionaries as the Secretary of State and President, perform their proper official duties, until the contrary is proved. Where an act is to be done (like granting a patent) upon evidence and proofs to be laid before a public officer, upon which he is to decide, the fact that he has done the act (granted the patent) is *prima facie* evidence that the proofs have been regularly made, and were satisfactory. No other tribunal is at liberty to re-examine or controvert the sufficiency of such proofs, if laid before him, where the law has made such officer the proper judge of their sufficiency and competency.

It is not necessary for the patent to contain any recitals that the prerequisites to the grant of it have been complied with, because the law makes the presumption.

But for this presumption, the recitals would not help the case without auxiliary proof that those prerequisites had in fact been complied with. Patents for useful inventions, equally with patents for land, have been deemed *prima facie* evidence of the regularity of the grant.

In patents for useful inventions, the courts have gone further, and held, that inasmuch as the patentee makes oath that he is the true inventor, that the patent was *prima facie* evidence that he made the invention.

The act of 1836 requires that the defendant, when he relies in his defence on the fact of a previous invention, knowledge, or use of the thing patented, shall state in his notice of special matter, the names and places of residence of those whom he intends to prove to have possessed a prior knowledge of the thing, and where the same had been used.

This is intended to prevent a patentee's being taken by surprise at the trial. Unless such notice was given, an examination of a witness could not be rightfully had on this point. The *onus probandi* is on the defendant to show the notice, otherwise the objection, that the evidence was improperly excluded, must fail.

It is incumbent on those who insist upon the right to put particular questions to a witness, to establish that right beyond a reasonable doubt for the very purpose stated by them, and they are not afterwards at liberty to desert that purpose and to show the pertinency or relevancy of the evidence, for any other purpose not then suggested to the court.

A compromise between the plaintiff and other defendants or parties would not be evidence to aid in sustaining a patent.

A party has no right to cross-examine any witness, except as to facts and circumstances connected with the matters stated in his direct examination. If he wishes to examine him as to other matters, he must do so by making the witness his own, and calling him as such in the subsequent progress of the cause.

If, upon the cross-examination, the answer is unfavorable to the party upon the collateral matters thus asked, which were not founded in the issue, he would be bound by it and not permitted to introduce evidence to contradict it.

Parol evidence, bearing upon written contracts or papers, ought not to be admitted without their production, so as to enable the court and jury to see whether or not the admission of the parol evidence will trench upon the rule, that parol evidence is not admissible to vary or contradict written contracts or papers.

It is a general rule, that the declarations of a party are not evidence in his own favor. But in cases of assault and battery and wounding, the party's declarations to his physician, as to his pains and injuries, may be given in evidence. In case of inventions, which is an intellectual process or operation, the exact origin can scarcely ever be known, except by speech. The invention may be consummated and perfect, and may be susceptible of complete description, a month, or even a year, before it can be embodied in any visible form, machine, or composition of matter. The declarations of a party that at a former period he invented a particular thing, may be objected to.

But declarations, stating that he had made an invention, which he describes and explains, are properly deemed an assertion of his right at that time, as an inventor, to the extent of the facts and details which he then makes known, although not evidence of their existence at an antecedent time. It is evidence that the thing described was known to him at that time and that he claimed it. It establishes the origin to be as early as the date of the conversation.

After a party informs the court that he has no further evidence to offer, and the opposite party discharges his witnesses, and they leave court, it is a matter of discretion by the court whether they will permit further evi dence. The exercise of such discretion is necessary to protect the rights of parties. It being matter of discretion, error will not lie.

1842. PROUTY ET AL v. RUGGLES ET AL. 16 Peter's, 336.

Error to the Circuit Court for Massachusetts.

The Ruggles (plaintiffs below) sued Prouty and Mears to recover damages for infringing their patent for an improvement in the construction of the plough. On the trial, judgment was for defendants. The plaintiffs (below) took exceptions to the charge of the court. The claim in the patent was for "the construction of such ploughs as aforesaid, and the several parts thereof, not separately, but in combination, for the purposes aforesaid, viz.: 1. The inclining the standard and land-side, so as to form an acute angle with the plane of the share. 2. The placing the beam on a line parallel to the land-side within the body of the plough and its centre, nearly in the perpendicular of the centre of resistance. 3. The forming the top of the standard for brace and draft. We do not intend to confine our claim to any particular form or construction, except such form as may be necessary to place the beam in the perpendicular of the centre of resistance, and parallel to the land-side, and also to such form of the top of the standard as shall serve for brace and draft, but have given such form as we deem most convenient, which may be varied, as is obvious."

On the trial, the plaintiffs asked the court to instruct the jury, that if the defendants had used a standard in combination with the other two parts that served for brace and draft, it was an infringement, although not jogged into the beam as described in the specification. Also, that to use any two of the three parts described as composing the combination claimed, was an infringement, although the third was not used. The court refused these instructions.

Held, that the extension of the standard, and the jogging it into the beam, were material parts of the improvements claimed by the plaintiffs. They state in their specification that the standard "extends back from the bolt to such a distance as to form a brace to the beam;" also, "that being jogged into the beam, it relieves the bolt in a heavy draft." In the summing up, they claim "the forming the top of the standard for brace and draft." The extension of the standard back from the bolt, and jogging into the beam, are material parts of the improvement claimed.

This patent is for a combination, and the improvement consists in arranging the different portions of the plough, and combining them in the manner stated in the specification, for the purpose of producing a certain effect.

None of the parts referred to are new, nor is any portion of the combination less than the whole, claimed as new, or stated to produce any given result. The end in view is proposed to be accomplished by a union of all, arranged and combined together in the manner described. This combination, composed of all the parts mentioned in the specification, and arranged with reference to each other, and to the other parts of the plough, in the manner therein described, is stated to be the improvement, and is the thing patented.

The use of any two of these parts only, or of two combined with a third, which is substantially different in form or in the manner of its arrangement and connection with the others, is therefore not the thing patented.

It is not the same combination, if it substantially differs from it in any of its parts. The jogging the standard into the beam, and its extension backward from the bolt, are both treated by the plaintiffs as substantial parts of their combination for the purpose of brace and draft. Consequently the use of either alone, by the defendants, would not be the same improvement, nor infringe the patent of the plaintiffs. Judgment affirmed.

R. H. G.

MISCELLANEOUS.

IMPORTANT DISCOVERY IN GRAFTING THE PEACH-TREE.

By Prof. Chas. G. Page, M. D., Washington, D. C.

It is almost a universal practice with gardeners to bud the peach-tree, and in nearly all treatises upon peach culture, budding is recommended in place of grafting, and grafting is spoken of as impracticable. In the year 1839 my attention was first turned to this subject. An old farmer of Fairfax county, Virginia, who boasted of his skill in grafting, informed me that he once grafted one hundred peach-trees and failed in every one. Upon trying the experiment upon a single tree and with the utmost care, I failed also, and saw what appeared to me to be the true cause. My mind at that time being familiar with surgical subjects, I remembered that after a wound or incision was made, adhesion would not take place as long as the blood flowed or a discharge was kept up; that *coagulum* must be formed before union could be effected; that where the circulating vessels were too active or forcible, ligatures or mechanical means were employed to diminish the force of circulation. There appeared to me to be a close parallel between the conditions and practice in the surgical case and that of the peach tree.

The peach-tree is one of very rapid growth and active circulation. When an incision is made, or the tree headed down in the grafting season, there is at once an *overflow* of sap; when the scion is inserted in any of the usual ways and the grafting composition applied, the excessive flow of the sap prevents the formation of *coagulum* or *callus*, and thus interferes with the adhesion or union between the stock and the scion or graft. This flowing of the sap was to be stopped, and several ways suggested themselves readily. The first was to cut the tap-root. This was done by passing down a long and sharp knife and severing the root at a depth varying according to the size of the tree—for large stocks going deeper than for small ones. The second was to head the stocks down, lift them from the ground, cut the tap-root and replant the stocks, inserting the grafts either before or after the planting. Under both these modes of checking the circulation, the grafts inserted—after the common mode of cleft grafting—took perfectly well. The proportion of grafts succeeding with this treatment was as great as with apple-trees. I have even succeeded in grafting in this way in the month of August; and there is now upon my father's farm at Pageville, Fairfax county, Virginia, a large and vigorous peach-tree in the full prime of bearing, which was grafted in the summer of 1839. There are also at the same place a number of peach-trees grafted in the spring of 1839, which are in a flourishing and healthy condition, and which are, of course, now nearly fourteen years old from the graft, and fifteen years from the seed. They look rather better than trees budded in the same year; but this difference is perhaps owing to better treatment. A remark may not be amiss here concerning the age of the peach-tree. It is not naturally a very short-lived tree, as is generally represented and believed. The early failure of this tree in New Jersey has probably given rise to this opinion, although i is true that elsewhere the tree shares a similar fate under unfavorable circumstances. We have seen peach-trees here *two feet* in diameter at the base of the trunk, and *fifty years* old.

We will enlarge upon this subject in a future number of the Journal, as we have much yet to communicate upon the culture of this important fruit. The philosophy of the grafting operation is clear. The cutting of the tap-root, or a general shortening of the roots, checks at once the circulation of the sap; and if the tree be still kept in a growing condition, the *callus* will readily form and the graft take kindly. There is some advantage in being able to graft this tree, although it buds so easily and during so long a season (frequently in this region from the middle of June to the last of September). The grafted tree is earlier in fruit, and, in case budding fails, the stocks may answer for grafts in the spring.

HERMBSTADT'S RECIPE TO CURE DISEASED TREES.*

If the tree has only a few roots, and indeed almost only a top root, without the small dew or secondary roots, let it be rinsed first in water, and the root, as far as possible, be cleansed from the earth, wrapped round once with an old woollen rag, and made pretty fast with thread or twine. Old frieze, or old woollen stocking, is the most convenient for this purpose. Then let the tree be planted, moistened, and secured by a stake and bands against the motion of the winds, and let it be left to nature.

SIMPLE AND EASY METHOD OF RETAINING FOR A LONG TIME THE GERMINATING POWER, AND THE TENDENCY TO GROWTH, IN SEEDS OF ALL KINDS.

Hermbstadt says, "Chance led me to the discovery of as simple as useful means of keeping seed for a long time, and sending them to the remotest regions, without their losing their tendency to growth. I received, many years since, from a very great distance, certain grain, which are usually hard to procure in England, if they are imported in the common way. These grains were mixed with dried grapes, or raisins, and appeared to me to be in a very good state. I sowed them in pots, which I covered with frames, and they all came up. Rejoicing in the object obtained, I gave to my children, who were then in foreign countries, the commission to collect all seed which they could procure, and pack them for me in blotting paper, and to send them, partly wrapped up with raisins, and partly with moist coarse sugar. This commission was founded on the conviction which I had that my first grain owed the retention of their moisture to the raisins. We see a great part of the most common seed lie a very long time in the ground without being changed, and their germ develops itself in a moment when the share of the plough brings it up to the surface, and they are thus brought in contact with the atmosphere. I concluded, from this observation, that the foreign seeds likewise might be kept, at least, for many months, if they are suitably covered, and if they are exposed to a gentle moisture, such as there is in raisins or sugar. Experiment justified my conclusion. Of twenty sorts which I sowed, not one failed; on the contrary, those that were sent packed, according to my wish, in the common method, did not come up, though they were similar to the former. I examined both before sowing them. Those which were surrounded with raisins or sugar had

* Translated for the American Polytechnic Journal by E. Goodrich Smith, Esq., late Agricultural Clerk of the U. S. Patent Office.

kept fresh and sound; but the others, on the contrary, were dry, and bitten by insects."

We have often made the experiment, but without success, to send seeds, in well-stopped bottles, which are difficult of growth, out of their native land. They need, without doubt, a certain quantity of air and moisture, of which they are deprived.

THE BEST METHOD OF PREPARATION FOR ORCHARD FRUIT-STONES.

For sowing nurseries, the stones of fruit-trees from frozen and then decayed fruits is best. They germinate much earlier, and put forth stronger trunks than other stones. Those apple-tree trunks grow the strongest, and most powerful, which are sprung from one kernel, which is put into the ground with the apple. This is, at least, according to nature, and is the best method. To take whole apples is the best, for probably the fermenting portions of the same give the best nutriment to the germ in its beginning existence, as the mother's milk does to the child.

CARE NEEDED IN ALL PREPARATIONS OF SEED.

In all preparations of seed, the greatest care is needed, lest the germinating power be injured by means of the germinating power. The urine must not be fresh or caustic, but be properly stale. The seed must not be soaked in urine, but merely moistened by it, so that its capacity for germinating may not be destroyed. The lime water ameliorates the caustic power of the urine, therefore it must not be omitted. A sure sign that the seed has been injured is, when it has taken a reddish color in place of its natural one. This occurs especially when it is *heated* in heaps. It ought, also, not to be left to be too dry, because otherwise the urine burns too strongly. Rain-water is the best preventive of this. If the treatment is rightly understood, a person will proceed the surest if he soaks the seed first in drainings of the dunghill, which is diluted with rain-water, for 12 hours, and then moisten it with urine.*

The latest experiments have taught me that the germinating power is not destroyed by urine, but that this happens only,

1st. When caustic lime is used for powdering the seed.

2d. When wood ashes is used in too large quantities, which too suddenly dries up the seed that is swollen.

3d. When the swollen seed does not find sufficient moisture in the soil.

Among all these means, the lime is that which requires the most care, but which, when rightly used, operates the most powerfully. *Every thing* here depends on the *too little* or *too much* used. Besides, science now has reached such a point, that every farmer can easily acquire for himself sufficient practice. The experiments communicated afford truly valuable hints, especially the address of the proprietor Rang, at Lorenziberg, who has indeed only taken simply impregnations, not preparations, in his collected recipes. Whoever has reason to fear the lodging of fruit, I recommend to him silicious earth, described before.† The lodging of fruit is

* I might also recommend an addition to every preparation for seed, a little of the common flower of sulphur, because hardly any plant can dispense with sulphur, and besides it is not found in all kinds of soils, therefore the vitriol of iron, by which wheat is attempted to be protected against the brand, often has done wonders.

† Melt 4½ ounces of carbonate of potash, 3½ ounces of dry carbonate of soda, and 9½ ounces of finely pulverized silica, together; pour the fluid mass, as soon as the foam has subsided, on

found only on the most productive fields, and hence the injury is so much the greater. To the farmer this means must be a most invaluable secret, which, under given circumstances, will insure thrice as great a harvest. The preparation of the above-mentioned substance is not difficult or costly. Whoever will try the experiments will thank God for this invention. In place of silica, ground or finely powdered glass, which, as is well known, is made of silica, may be taken, and thus some potash saved.

The following are among the simplest and cheapest, and also the most effective, methods of impregnating seeds for sowing.

1. Finely sifted, and if possible, fresh wood ashes, stirred in boiling water, so as to form a thin paste, and allowed to stand for some days in a warm place. After cooling, put in the seed kernels, and let the mass be stirred about frequently during 12 to 18 hours. The seed kernels have immediately a coating, like roasted chestnuts, and if they should not be sufficiently dry for sowing, they may be mixed with finely-sifted wood ashes. The quantity of the ley of ashes cannot be accurately determined to a quantity of seed. We must take so much that the kernels may not become too greatly smeared.

2. Strong drainings of the dunghill, which have more of the urine of horses and cattle than of rain-water, flown in, and mixed with the urine of men, or better the urine merely. Let the seed, as much as it is wished to prepare at once, be cast up into a heap, moistened once with this fluid, and shovelled up until it is thoroughly wet through.

COLORED DAGUERREOTYPES.

[From Liebig and Kapp's Annual Report of the Progress of Chemistry. Translated for the American Polytechnic Journal.]

NIEPCE de St Victor (Anm. ch. phys. (3) xxxii. 373), in pursuing the discoveries of E. Bequerel (Jahrest, 1849, 146), to produce colored daguerreotypes, examined a great number of chlorides of metals. He believes that he can assert, with certainty, that the combinations of chlorine which give the flame of alcohol a certain color, make silver plates, when dipped in the solutions of such combinations, especially suited for the photographic reception of the same color. Niepce remarks that only perfectly pure silver gives lively and fine colors, but they get cloudy when the alloy consists of 0,718 contents of silver. He uses combinations of chlorine with water, in the proportion of 1 : 3. In using nitric acid with a copper salt, he diluted it with $\frac{1}{10}$ of water. Mixtures of several substances, which have been rendered as clear as possible, by filtering and decanting, should only be used in such quantities as to be sufficient to prepare only two plates with it, because the solutions lose rapidly in power. The silver plates, when perfectly clean, are put a few minutes in the solution, until a sufficiently thick film has been deposited upon them. They are rinsed in water, dried and heated over a spirit flame; the color turns then red, brown, cherry-red, light red, reddish white, and, at last, entirely white. It is best to stop at the change into cherry-red. The pictures require, nevertheless, in the camera obscura, from two to three hours to be perfected.

To the photographic perfection of a single color, the following combinations of chlorine proved the most preferable: for *red*, chloride of strontium; for *orange*, chloride of lime, chloride of uranium; for *yellow*, sub-chlorate

lead plate, and let it cool; this is the substance which gives the palm so much firmness that even the heaviest winds never bend it, and the lodging of the fruit cannot take place. This is to be added to the preparations of the seed before described.

of soda, chloride of sodium, chloride of potassium, pure chlorinated water, muriatic acid, with a copper salt; for *green*, boracic acid, chloride of nickel, some copper salt; for *blue* and *indigo*, double salts of chloride of copper and chloride of ammonium; for *violet*, chloride of strontium and sulphate of copper. Muriatic acid gives the alcohol flame a yellow, blue, and green color, and a silver plate prepared with this acid takes all colors.

Chloride of antimony, chlorate of lead, and chloride of zinc, which color the flame white, it is said, when mixed with other salts, which make the silver plate disposed to a color, give the picture a whitish ground. Such bodies as do not color the flame do not dispose the silver plate to receive any kind of color.

Niepce divides the combinations of chlorine, in regard to their disposition for photographic action upon silver, in four classes.

1. Combinations which dispose the silver plate to the reception of one or more colors. All these combinations make the flame colored; the chloride of iron, potassium, copper, nickel, the sub-chlorate of soda and lime, and chlorated water.

2. Combinations which give no color to the flame of alcohol, but tend to make the silver plate, however, photographic, not photochromatic. Chlorine, with arsenic, antimony, bromine, iodine, sulphur, bismuth, gold, or platina.

3. Combinations which give neither colored flames, nor do they make the plate easily sensitive, but when mixed with copper salts, forming chloride of copper, they make the silver plate photochromatic. Chlorine with aluminum, barium, calcium, cadmium, cobalt, manganese, magnesium, sodium, phosphorus, silver, strontium, zinc, and tin. Muriatic acid, mixed with $\frac{1}{10}$ of water and nitrate of copper, disposes the silver plate for all colors.

4. Combinations which, together with a copper salt, make the silver plate only photographic, but not photochromatic, which alone by themselves do not produce colored flames, but, with copper salts, color the flame green, are chloride of mercury and chlorate of lead.

Niepce has not examined the combinations of chlorine with cerium, chromium, iridium, carbon, molybdenum, palladium, silicum, rhodium, titanium, wolfram, trinconium.

E. Becquerel claims for some points in the above experiments as his discovery. The Athenæum of August 16th, 1851, No. 1242, p. 881, says that Niepce de St. Victor has succeeded in producing photographic pictures with all the natural colors, but that the *modus operandi* differs from that of his former labors on colored flames and colored daguerreotypes.

Letillois (Compt. renduis xxxiii. 71) has given notice that he has discovered a colorless liquor, with which he has succeeded to fix all the colors of the spectrum upon white paper.

EXHIBITION OF THE METROPOLITAN MECHANICS' INSTITUTE.

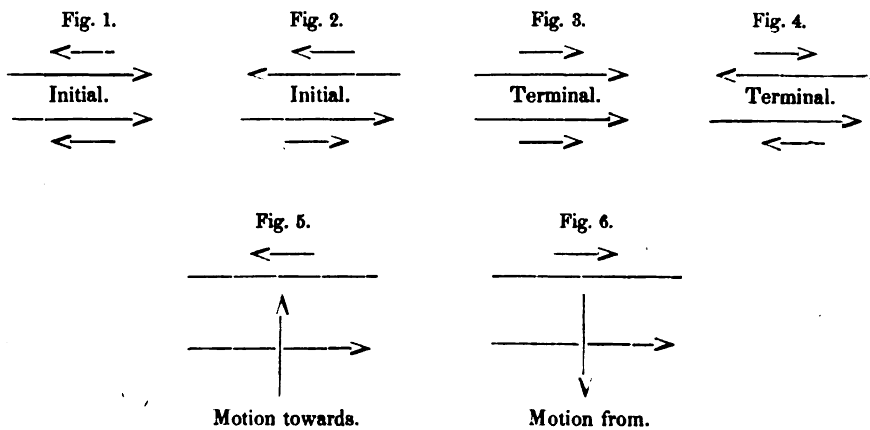
The Fair of this Institute commenced on the 24th Feb., and is now in full tide of interest and success. In some particulars, it rivals any of the mechanics' fairs of our larger cities, and is highly creditable to its projectors. The extraordinary length and symmetry of the hall, and the tasteful decorations, and arrangements of specimens and models, present a *coup d'œil* of the most imposing character.

THE AMERICAN
POLYTECHNIC JOURNAL.

ELECTRO-MECHANICS.—No. 4.

The *Initial Secondary* is sometimes termed the result of the induction of a current on itself, and is considered as the development of the neutral resident electricity of the conductor which conveys the *primitive* current, or of conductors within its influence. Within the *primary* conductor, it acts as an opposing or retarding force, and in the contiguous or extraneous conductors, or circuits, it reacts upon, and in opposition to, the primary current. When a primary current is sent through a helix surrounding a bar of soft iron, the initial secondary is not only felt in the helix, but is active within the body of the iron bar or magnet, and resists the development of magnetism. The elimination and exhibition of this current within the magnet was first shown by Prof. Page, in a magnet of peculiar form, for a description of which see Silliman's Journal, Vol. 35, No. 2, page 255. The motion of helices, in which primary currents are already established, and also of magnets, is attended with the production of initial secondary currents in all conductors *towards which* the motion is made. The motion of two charged helices or magnets towards each other produces the same effect. Therefore, if two charged electro-magnets approach each other, initial secondary currents are produced in the helices of each; or if one electro-magnet be charged, and the other not, the same action takes place. We are thus particular in this description for the reason that this initial secondary current plays an important part in electro-mechanical operations.

Another result of induction is the production of a secondary current called the *terminal* secondary. It is so called because it is a sequel, or consequence of the *termination* of the primary current. When the primary current is arrested, a secondary begins to flow in the same direction with the primary. This secondary, like the initial, is due to the disturbance of the *resident* electricity of the conductor which conveys the primary current of contiguous conductors, or of the bar of iron or magnet inclosed within the helix. The direction of the terminal secondary is the same as that of the primary current. Motion of the charged conductor, or of contiguous conductors, develops the terminal secondary, when the motion is that of recession from each other. When two charged electro-magnets, or one charged and one not charged, recede from each other, the *terminal secondary* is induced in the helices conveying the *primary*, and also within the body of the magnet. From its concurrence with the primary, there is, at this time, an increase of electric action, and a rise in the strength of the magnet. It may be well to observe here, that if two oppositely charged electro-magnets are in contiguity, it requires a mechanical force to separate them, and the very exertion of this force is attended with the resistance due to the exaltation of magnetic power by the action of the *terminal secondary*. *Vice versa*, if two oppositely charged electro-magnets approach each other, which they will do by their mutual attraction, their powers are respectively diminished by the action of the *initial secondary*. If two similarly charged electro-magnets be made to approach each other, by mechanical force, the exertion of this force begets a resistance, and the magnets have their powers exalted by the action of the initial secondary, thus developed, in the respective helices. *Vice versa*, when two similarly charged electro-magnets recede from each other, which they will do by their mutual repulsion, their powers are respectively diminished by the action of the *terminal secondary* thus developed. From these conditions we derive the following conclusion: That the mutual exercise of the powers of electro-magnets in producing motion for the purpose of *motive powers*, occasions a resistance to the primary, or battery, current, and a weakening of the magnets, whether the forces operating are repulsive or attractive; and that the exertion of mechanical force to move magnets in a direction contrary to that which would yield us their motive power, is attended with a development of electricity in favor of the primary, or battery, current, and a strengthening of the magnets. We have often thought—but never tried it—that the value of the secondary current could be directly tested, for different velocities, by estimating the force required, at different velocities, to turn an electro-magnetic engine *against itself*. In order to illustrate plainly these somewhat complicated currents, we have constructed the following diagram.



Figs. 1 and 2 exhibit the initial action of the two primary currents upon each other. In Fig. 1, they have the same direction, and in Fig. 2, different directions. The large arrows denote the primary currents, and the small ones the initial secondaries. The initial secondary is produced from the commencement of the primary, and during the rise to its maximum. Figs. 3 and 4 exhibit the terminal actions of two primary currents upon each other. In Fig. 3, they have the same direction; in Fig. 4, different directions. The terminal secondary is produced by the subsidence of the primary from its maximum to its minimum. Figs. 5 and 6 exhibit the action of a primary when in motion to and from a contiguous conductor. The large arrows represent the primaries; the arrows crossing them, the direction of motion; the plain lines, the contiguous conductors, and the small arrows, parallel to these lines, the secondaries. Motion *towards* is analogous in effect to the rise of the primary current, and motion *from*, to the subsidence of a primary. The arrows for the secondary currents, in all the figures, have no reference to the effect of a current upon or within its own conductor, and are intended merely to show the inductive effects upon contiguous conductors, whether conveying currents or not. The straight lines, of course, represent only portions of a circuit, and we must understand that where there is not a circle, or circuit, of conductors for the electricity to return upon itself, there is no current. With this remark, we are brought directly to the subject of *closed circuits*. Closed circuits are such as exist in the body of the electro-magnet, while it is being charged or discharged, and in every metallic circuit surrounding such magnet, or a line in the prolongation of its axis. Their influence in electro-mechanical movements is detrimental. Closed circuits, conveying initial secondaries, retard the development of magnetism, and closed circuits conveying terminal secondaries prolong the duration of magnetism. In Vol. 34, No. 2, of Silliman's Journal, Prof. Page has described and represented an instrument by which the closed circuit may be made to retard or accelerate the motion of an electro-magnetic engine. We see, from these preliminaries, what difficulties we have to encounter from magnetic and electric resistances in the attempts to apply electricity as a motive power. They may be recapitulated briefly as follows:

1st. The retentive power of iron for magnetism.

2d. The difficulty of using large magnets for large powers, from the time required to charge and discharge them, and their disproportionate retentive power, owing to the difficulty of obtaining pure and homogeneous textures in large masses.

3d. The resistance to conduction by the metallic and liquid portions of the electric circuit.

4th. The resistances from induced currents and closed circuits, caused by the action of currents upon each other, and contiguous conductors, and by the motion of the charged conductors, or magnets, or those parts concerned in the electro-magnetic movements.

These, however, are not all of the important difficulties to be encountered. There are others of equal, or, perhaps, greater moment. We fear, however, that our readers will be discouraged, unless we interpose here, by way of anticipation, a few remarks upon the probability of success in the application of electricity as a motive power. And we announce to them our firm belief that the electro-magnetic power *will* and *must* come into use as a motive power, and that for some special purposes, to which it will be applied, it will be found to be economical, and that we expect to be able, before our discussion of this subject is finished, to satisfy even the most skeptical upon this point. But we must take an impartial stand, and hold up to view every difficulty and objection, and vanquish them if possible, and if not, weigh them with the advantages when we come to sum up the whole case.

C. G. P., *Ed.*

(To be continued.)

TECHNICAL CHEMISTRY.

(Agricultural Chemistry Continued.)

NURTURE OF THE OAT PLANT.

Salm Horstmar* has brought out a continuation of his earlier work (mentioned in the Jahresber for 1849, p. 661) on the nutrition of the oat plant, in order to correct and further extend the latter. The progress and the method of carrying out the experiments are as essentially retained, but with this difference, that for artificial nutrition he used a soil of quartz sand, powder of quartz, and mountain crystal, pounded porcelain, artificially prepared silex, and also the carbonate of lime instead of charcoal, as these last are nearer alike the condition of the natural soil. In the experiments two sorts of nutrition were conveyed to the plants by these means; substances containing nitrogen and inorganic ones, as they form the most important constituents of the ashes of plants (such as silica, potash, lime, magnesia, oxide of iron, phosphoric acid, and sulphuric acid). Next to the principal result derived from the earlier experiments, the fact is confirmed, that these two classes must exist at the same time in the soil for a normal growth of the plants. The absence of one or other of the seven inorganic substances, Salm Hortsmar further concludes, causes the entire or partial disturbance in the development of the organs, even with the presence of additions containing nitrogen. If these seven inorganic substances are united and applied in proper manner (with additions containing nitrogen), this answers for a powerful and regular growth of the plant, even to the development of the blossom inclusive, but not further; the normal formation of the fruit, and the end of the vegetation appropriate to nature, is not thereby attainable: it depends rather on a condition which is yet by no means fulfilled. This condition, according to his further experiments, he designates as the existence of soda, together with the above-named constituents. The clay plays therein a very moderate part; as to the proportion of manganese and chlorine, further experiments must decide. As an important indication for the entire or partial absence of the substances necessary to the formation of fruit, the appearance of the auxiliary haulms, at or after the ripening of the fruit, deserve notice, so far as we may thereby ascertain that the condition of the formation of fruit may be previously exhausted, as well as the conditions of vegetation in the nucleus. In respect to numerous details, we refer to the essays, especially to the synoptical tables which are there given.

INFLUENCE OF MAGNESIA ON VEGETATION.

A. Vogel† has tried experiments as to the influence of magnesia on vegetation, having a double reference to the germination and the continued development of plants. In the first respect, he finds that carbonate of magnesia does not hinder the germination of cresses, but it acts mechanically, as it bakes the whole together in a compact mass, and thus is unfavorable to the development of germs. In respect also to the growth of the plant, the magnesian salts have a bearing, and are not as injurious as other earthy and alkaline salts. On this occasion, Vogel mentions, as preliminary, a course of experiments in the laboratory at Munich, yet in progress, which have for their object to establish the relation of the most diverse mineral

* J. pr. Chem. lii. 1, liv. 129; in Auz. Pharm. Centr. 1851, 203, 209: Ann. Ch. Phys. 3 xxxii. 461, xxxv. 54. † Ann. Chem. Pharm. lxviii. 196; Instit. 1851, 29¹

ANALYSIS OF ASHES, &c. TABLE C, 1.

Numbers,	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
Names of chemists,	MERZ.	ZEDELER.			WILDENSTEIN.		E. WOLFF.																	
Substances.	Tobacco leaves.	Cacao beans.	Sweet almonds.	Rice kernels.	Poppy. Seed.	Poppy. Plant.	Spurry.							Summer Rye Straw.			Barley Straw.							
1. Potash,	26·96	37·14	27·95	20·21	9·10	36·37	26·12	24·32	25·56	25·44	28·28	25·58	[illegible]	18·95	21·30	20·49	20·36	23·70	34·76	20·60	30·34	26·45	23·09	24·50
2. Soda,	2·76	1·28	0·23	2·49	..	..	1·14	1·23	0·64	..	1·01	1·11	1·1[illegible]	..	..	..	3·51	6·88	2·82	5·04	2·93	2·37	4·08	0·95
3. Lime,	39·53	2·88	8·81	7·18	35·36	30·24	14·4[illegible]	14·32	14·53	14·06	13·09	13·8[illegible]	15·0[illegible]	6·93	8·77	7·31	5·79	5·20	7·39	5·57	5·94	5·10	5·30	6·89
4. Magnesia,	9·61	15.97	17·66	4·25	9·49	6·47	8·88	9·20	9·62	9·62	7·93	9·7[illegible]	[illegible]·62	2·18	2·62	2·33	1·58	1·35	1·53	1·47	1·41	1·78	1·41	2·19
5. Alumina,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6. Oxide of Iron,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7. Oxide of Manganese,	..	..	..	..	Spur.	Spur.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8. Sulphuric acid,	2·78	1·53	0·37	..	1·92	5·09	1·79	1·90	2·58	2·10	3·00	2·66	3·92	1·68	2·61	2·18	3·22	2·40	3·39	3·71	3·28	6·92	6·70	3·28
9. Hydrochloric acid,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10. Chlorine,	..	1·67	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
11. Silex,	4·51	..	..	1·37	8·24	11·40	1·14	1·12	1·04	1·17	0·96	1·20	0·9[illegible]	52·28	43·48	49.01	47·42	39·22	25·10	45·04	34·86	40·49	42·43	42·98
12. Carbonic acid,	..	0·17	..	..	..	..	27·38	27·04	25·95	25·86	24·20	26·86	21·4[illegible]	12·85	14·92	13·1[illegible]	14·26	15·61	21·82	15·15	17·96	13·65	13·86	16·06
13. Phosphoric acid,	..	39·55	43·14	60·23	30·98	1·28	10·20	10·50	11·56	10·68	11·66	10·58	11·2[illegible]	5·13	6·39	5·28	3·86	2·64	3·19	3·42	3·28	3·24	3·18	3·82
14. Phosphate of iron.	4·20	0·17	1·04	4·12	0·81	4·14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15. do. of lime; magnesia & oxide of iron,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16. Chloride of potassium,	..	..	..	..	7·15	2·50	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17. Chloride of Sodium,	9·65	..	.	.	1·94	2·51	8·90	10·37	8·52	11·12	9·99	8·47	9·41	..	..	..	..	..	..	..	..	..	..	..
18. Coal,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19. Sand,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sum,	100·00	100·81	99·20	99·85	99·99	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Per cent. of ashes of the dry substances,	23·38	..	4·90	0·875	6·12*	7·96*	8·98	8·48	9·45	9·45	9·81	8·75	8·98	7·20	5·81	5·91	..	..	..	..	..	..	..	..
Do. do. of fresh substances,	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

* Air-dried substance.

ANALYSIS OF ASHES, &c.

TABLE C, 2.

	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.
	E. WOLFF.						WITTING.				
	Buckwheat Straw.						Birch. Corresponding with			Beech. Corresponding with	
							No. 76.	No. 74.	No. 75.		No. 74.
1.	81·72	21·64	39·59	40·49	28·22	23·93	12·81	5·67	14·78	10·91	6·94
2.	. .	. .	. .	. .	. .	. .	1·60	1·25	2·77	1·23	0·34
3.	15·71	14·01	12·78	11·57	14·08	18·57	26·72	46·89	. .	13·55	43·59
4.	1·66	1·87	3·26	1·89	4·72	4·21	2·22	1·69	11·78	12·03	5·39
5.	. .	. .	. .	. .	. .	. .	1·38	0·42	. .	0·05	. .
6.	. .	. .	. .	. .	. .	. .	0·78	0·47	. .	.	0·62
7.	. .	. .	. .	. .	. .	. .	Trace*	1·67	3·81	3·47	Trace
8.	4·67	2·81	2·71	4·32	7·08	8·51	0·02	. .	2·77	1·04	0·62
9.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
10.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
11.	3·57	4·15	4·16	4·22	4·79	5·22	2·88	1·51	4·00	6·36	2·13
12.	20·37	16·07	27·08	22·21	19·98	23·16	18·88	24·67	12·92	26·24	28·29
13.	10·34	9·51	6·46	8·92	10·90	10·01	8·13	4·22	16·65	5·64	7·54
14.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
15.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
16.	7·41	26·93	0·77	8·13	6·85	9·70	. .	. .	. .	. .	. .
17.	4·55	3·01	8·19	8·75	3·38	1·69	7·17†	7·17	9·84	6·68	0·62
18.	. .	. .	. .	. .	. .	. .	0·62	0·46	0·49	2·08	. .
19.	. .	. .	. .	. .	. .	. .	19·84‡	2·40	4·67	10·71	3·66
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .

	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.
	W. BAER.						SCHULZ-FLEETH.									
	Rape Seed.				Rape Straw.		Nymphea lutea.	Nymphea lutea.	Nymphea alba.	Stratiotes aloides.	Scirpus lacustris.	Typha angustifolia.	Arundo phragmites.	Chara fœtida.		Hottonia palustris.
	First kind.			Sec'nd kind.	First	Sec'nd	Young leaves and stem.	Old leaves and stems.		Whole plants.				Two localities.		
	Selec'd.	Washed.		Rub'd off.	Kind.											
1.	15·12	16·33	17·42	16·06	16·63	16·54	22·92	17·91	14·41	30·82	9·69	14·81	8·63	0·49	0·23	8·34
2.	. .	0·34	0·37	1·14	10·57	1·32	. .	. .	4·48	1·21	4·99	. .	. .	0·18	0·12	3·18
3.	8·49	8·30	10·10	11·32	21·51	25·37	25·24	39·00	18·89	10·73	6·98	21·94	5·88	54·73	54·84	21·29
4.	7·51	8·80	9·10	10·45	2·92	11·07	5·09	3·61	2·67	14·35	2·38	1·56	1·21	0·57	0·79	8·94
5.	0·56	1·02	0·60	0·49	0·63	0·22	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
6.	1·46	1·79	1·92	0·99	1·30	1·19	0·24	0·16	0·25	0·38	0·24	0·16	0·21	0·04	0·16	1·82
7.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	1·75
8.	3·79	5·88	2·04	7·93	3·90	5·46	1·86	1·39	1·21	3·48	5·55	2·56	2·77	0·24	0·28	6·97
9.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
10.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
11.	32·06	19·98	18·52	9·23	11·80	3·42	0·81	1·16	0·49	1·81	46·56	0·62	71·51	0·70	0·33	18·64
12.	3·57	5·24	4·93	6·91	23·04	27·59	22·23	28·26	22·16	30·37	7·93	21·01	6·57	42·60	42·86	21·29
13.	27·67	31·90	33·86	34·00	4·68	4·08	7·18	4·65	2·58	2·87	4·84	3·88	1·99	0·31	0·16	2·88
14.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
15.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
16.	. .	. .	. .	. .	. .	. .	7·88	4·88	. .	. .	. .	16·82	. .	. .	. .	. .
17.	0·76	0·96	0·55	0·85	2·53	3·26	2·78	7·33	29·66	2·72	10·08	10·28	0·35	0·14	0·08	8·94
18.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
19.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
	100·99	99·77	99·41	99·37	99·51	99·47	96·23	99·35	86·80	98·72	98·44	99·64	99·12	100·00	99·75	99·04
	6·98§	5·97§	5·93§	4·58§	4·47‖	4·41‖	7·96	10·15	12·99	17·19	8·07	9·58	4·69	54·58	68·89	16·69
	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .

* In No. 31 to 35 protoxide of manganese. § In No. 36 to 39 air-dried substances.
† " " residuum insoluble in acid. ‖ Air-dried substances.
‡ " " in water.

ANALYSIS OF ASHES, &c. TABLE C, 3.

	52.	53.	54.	55.	56.	57.	58.	59.	60.
	SPOONER.		TEVIS.	HAGUE.	HOMER.	LEHMANN.		KROOKER.	
	Kinds of Tea of Trade.					Extract of		Molasses in Water.	
	Souchong. First Kind.	Souchong. Sec'nd Kind.	Oolong.	Young Hyson.	Ninyong.	Souchong Tea.	Java Coffee.	Soluble parts of Ashes.	Insoluble parts of Ashes.
1.	8·70	44·96	12·38	33·95	28·38	47·45	51·45	47·88	1·70
2.	25·46	1·70	40·00	9·26	12·88	5·03	. .	2·34	0·17
3.	11·86	8·77	7·68	8·17	8·39	1·24	3·58	. .	5·29
4.	9.59	8·41	6·17	6·79	. .	6·84	8·67	. .	. .
5.	. .	. .	. .	. .	. .	. .	. .	. .	. .
6.	8·42	6·80	7·18	4·75	19·81	8·29	0·25	. .	. .
7.	. .	. .	. .	. .	. .	0·71	. .	. .	. .
8.	10·14	6·96	8·27	4·89	4·76	8·72	4·01	1·53	. .
9.	. .	. .	. .	. .	. .	. .	. .	. .	. .
10.	. .	. .	. .	. .	. .	. .	. .	. .	. .
11.	16·04	8·79	7·81	10·89	5·59	2·31	0·73	0·85	0·22
12.	. .	. .	. .	. .	. .	10·09	20·50	22·39	3·79
13.	12·62	11·46	8·26	16·64	17·44	9·88	10·02	. .	0·29
14.	. .	. .	. .	. .	. .	. .	. .	. .	. .
15.	. .	. .	. .	. .	. .	. .	. .	. .	0·63
16.	. .	. .	. .	. .	. .	. .	1·98	. .	. .
17.	2·40	2·15	2·25	4·66	8·25	8·62	. .	12·92	. .
18.	. .	. .	. .	. .	. .			. .	. .
19.	. .	. .	. .	. .	. .	1·09	0.49	. .	. .
	100·00	100·00	100·00	100·65	100·88	100·27	100·68	87·91	12·09
	5·48	6·11	5·14	5·94	4·78	8·06	8·41	. .	. .
	.		. .			.			

	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.
	C. JOHNSON.		WALZ.			KREMERS.					
	Hand Cheese.	Swiss Cheese.	Peat. First Kinds.	Peat. Sec'nd Kinds.	Peat. Third Kinds.	Coal Ashes. Stone.	Coal Ashes. Stone.	Coal Ashes. Stone.	Coal Ashes. Stone.	Coal Ashes. Stone.	Coal Ashes. Brown.
1.	4·85	2·46	2·31	0·69	0·81	0·53	0·60	0·11	0·07	0·35	0·99
2.	7·33	3·67	2·45	0·78	3·03	. .	0·28	. .	0·29	0·08	1·72
3.	2·55	17·82	9.78	10·19	17·26	2·26	2.80	1·08	3·44	19·22	20·56
4.	. .	0·81	Trace	Trace	. .	0·26	0·52	0·35	1·60	5·03	2·16
5.	. .	. .	4·50	2·53	1·80	5·28	22·47	31·63	8·31	2·12	29·50
6.	0·11	0·17	37·50	20·25	14·00	74·02	25·83	6·36	54·47	60·79	82·78
7.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
8.	. .	. .	8·71	5·64	2·40	2·17	2·37	0·24	0·52	10·71	9·17
9.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
10.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
11.	0·03	0·08	4·15	5·69	16·00	15·48*	45·18	60·23	81·30	1·70	3·12
12.	. .	. .	2·50	2·53	3·50	. .	. .	. .	. .	. .	. .
13.	13·68	20·45	Trace	. .	. .	. .	. .	. .	. .	. .	. .
14.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
15.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
16.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
17.	72·47	55·37	8·17	2·67	2·00	. .	. .	. .	. .	. .	. .
18.	. .	. .			. .	. .	. .	. .	. .	. .	. .
19.	. .	. .	82·40	49·08	89·20	. .	. .	. .	. .	. .	. .
	101·02	100·88	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
	18·15	11·36	. .	. .	. .	1·99	1·89	1·74	11·18	8·06	1·16
	.			.	. .	. .	. .	. .	. .	. .	

	72.	73.	74.	75.	76.	77.	78.
	SCHULZ-FLEETH.		WITTING.			M. W. JOHNSON.	
	In 100 parts. No. 42 to 51 inclusive.	Soil to No. 42, 43, 44, 46, 47, and 49. Hydrochloric acid takes out 100 parts.	Soils of Morschen. Elect. Hesse.	Soils of Marburg. Elect. Hesse.	Soils of Akureyri. America.	Nile Slime. In Hydrochloric Acid. Soluble.	Nile Slime. In Hydrochloric Acid. Insoluble.
1.	0·0054	0·017	0·03	0·06	0·81	1·26	. .
2.	. .	0·010	0·03	0·05	0·77	0·89	. .
3.	0·0533	0·468	50·95	0·49	4·21	8·89	1·54
4.	0·0112	0·017	2·11	0·49	2·77	2·26	0·47
5.	. .	0·020	0·78	. .	11·46	6·75	5·87
6.	Trace	0·029	6·02	0·49	15·15	11·22	1·97
7.	. .	0·005	. .	0·02§	. .	. .	. .
8.	0·0072	0·024	. .	. .	0·01	0·22	. .
9.	. .	. .	. .	. .	. .	. .	. .
10.	. .	Trace	. .	Trace	0·03	0·27	. .
11.	Trace	0·024	7·07	3·24	12·49	0·76	56·10
12.	0·0506	0·390	10·20	. .	1.82	1·87	. .
13.	0·0006	0·034	Trace	0·03	. .	. .	. .
14.	. .	. .	. .	. .	. .	. .	. .
15.	. .	. .	. .	. .	. .	. .	. .
16.	. .	. .	. .	. .	. .	. .	. .
17.	0·0885	. .	. .	. .	. .	. .	. .
18.	. .	. .	3·99†	1·52	11·10	. .	. .
19.	. .	. .	18·81‡	94·49	89·88	3·54‖	1·99‖
	0·1618	1·088	100·00	100·00	100·00	82·48	67·44
	. .	. .	. .	. .	. .	. .	.
	. .	. .	. .	. .	. .	. .	.

* Besides sand in No. 66 to 71 incl.

† In No. 74 to 76 water.
‡ " " insoluble part in acids.
§ " " protoxide of manganese.
‖ " " organic matter.

substances to the process of germination. We shall return to these experiments as soon as they are known to be connected.

INFLUENCE OF THE CONSTITUENTS OF THE SOIL ON THE DEVELOPMENT OF PLANTS.

A continuation has since appeared of the extended investigation (mentioned in the Jahresber for 1850, p. 657, by E. Wolff, "Contributions to the estimate of the fluctuations to which the quantative composition of the ashes of one and the same plants are subjected"),* which treats of the composition of the ashes of a part of the crop obtained on the experimental beds of 2¼ square feet, viz.:

A. The ashes of the spurry-hay (without seed) in which the experimental field was manured: In No. 7, with 1 lb. of wood ashes and 32 grammes of carbonate of potash; in No. 8, with ¼ lb. of ashes and 8 grammes of carbonate of potash; in No. 9, with ½ lb. of ashes and 80 grammes of carbonate of soda; in No. 10, with ½ lb. of ashes and 32 grammes of carbonate of magnesia; in No. 11, with nothing; in No. 12, with ½ lb. of ashes and 96 grammes of common salt; in No. 13, with ½ lb. of ashes saturated with sulphuric acid and muriatic acid, together with 10 grammes of common salt, 10 grammes of carbonate of potash, and 10 grammes of sal-ammoniac. The spurry ashes gave in parts soluble in water (*a*), and in those insoluble in water (*b*), in 100 parts:

	In No. 7.	In No. 8.	In No. 9.	In No. 10.	In No. 11.	In No. 12.	In No. 13
a	49·97	49·02	48·29	49·41	54·00	49·13	51·47
b	50·03	50·98	51·71	50·59	46·00	50·87	48·53

B. The ashes of rye straw in which the experimental field was manured: In No. 14, with 1 lb. of wood ashes and 32 grammes of carbonate of potash; in No. 15, with ½ lb. of ashes and 32 grammes of carbonate of magnesia; in No. 16, with ½ lb. of ashes, previously saturated with sulphuric acid and muriatic acid.

C. The ashes of buckwheat straw, in which No. 25 was not manured; No. 26, manured with common salt; No. 27, with saltpetre; No. 28, with potashes; No. 29, with sulphate of magnesia; and No. 30, with lime.

D. The ashes of barley straw, in which No. 17 was not manured; No. 18, manured with common salt; No. 19, with saltpetre; No. 20, with soda; No. 21, with potashes; No. 22, with sulphate of magnesia; No. 23, with glauber salts; No. 24, with lime.

The composition of these ashes is presented in Table C., with the corresponding numbers. As Wolff's communications respecting this subject are not yet closed, and, besides, a continuation as well as review and discussion of the whole results is to be expected, it is not the proper time now to enter upon the results of the part lying before us. We shall confine ourselves, therefore, to the remark, that a positive rule respecting the relations of the constituent parts in the soil, and their assimilation by which the facts standing separate are connected, and the numerous apparent contradictions and actual fluctuations in the ash state of the plants may be solved, has not yet been given. The results, also, in general contain nothing in favor of the representation of bases in plants, although in particular cases (as in the spurry-hay, between lime and magnesia) the numbers point to it with great harmony.

* J. pr. Chem. lii. 65, in Ausz. Pharm. Centr. 1851, 316, 321, 346.

(To be continued.)

A COMPARISON OF THE T AND I RAILS, AND GENERAL REMARKS ON THE FORM OF RAILS.

[*Prepared for the American Polytechnic Journal by M. C. Gritzner, Civil Engineer.*]

We have before us a treatise containing the results of experiments on the strength of support of rails of different forms. These experiments have been made by order of the Prussian Ministry of Public Works, and under the supervision of a railroad engineer of high standing.

We omit the description of the apparatus used in these experiments, and merely state, that it has been constructed with great care and ingenuity.

One hundred and thirty-two experiments were instituted with T, I, and Λ rails, of twenty different forms, and with a *number* of rails of *each* form manufactured at various establishments. Each rail was cut in three pieces, and each piece tested separately. The bottom flanches of the I rails were gradually cut away, in order to transform them, by degrees, into the form of T rails; and when brought to that shape, various experiments were tried with them.*

As a matter of course, these experiments demonstrated that the strength of rails of the *same* form differs according to the peculiar nature of the iron, which originates in the mode of manufacture, as well as in the quality of the pig iron.

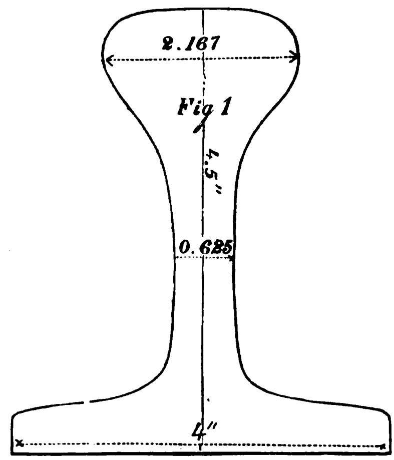
The experiments uniformly proved, that the strength of support of the I rail, when gradually transformed into a T rail, diminished in a greater ratio than its weight. This was the case within the limits of perfect elasticity, as well as over these limits, up to the moment of breaking; and that ratio became more unfavorable the more the bottom flanches were cut down. If the flanches are so diminished, that only the thickness of the vertical body of the rail remains, then the decrease in the strength of support amounts to more than double the decrease of the weight, which is in perfect keeping with theoretical demonstration. Consequently, in determining a new form of I as well as T rails, it must be laid down as a rule, to use all the iron which can be possibly spared from the vertical body for the bottom flanches and head of the rail. This stands in direct opposition to the view entertained by some engineers, that the flanches in the T rail could be dispensed with altogether, and after the head has been formed all the iron should serve to heighten as much as possible the vertical body. Such rails are in use on two of the oldest Prussian railroads. But this form has not been imitated; on the contrary, the foot of the T rail has been made either entirely of equal size with the head or the vertical body has been made somewhat thicker at the bottom part.

In all the experiments, the rails broke invariably from the bottom upwards. They broke evidently not from the compression of the fibres of the head, but in consequence of the rupture of the expanded fibres of the bottom part. Rails with a smaller base proved more liable to break: for instance, a T rail broke with 31,900 pounds, and at a deflection of 5.46 inches; another piece of the same rail, with the head downwards, did *not* break with 40,000 pounds, and at 5 inches deflection. Even I rails broke sooner in a reversed than in their normal position, because the number of fibres is greater in the broad bottom plate than in the surface of the head. The form of the head depends not merely on the required strength of support,

* The weights and measures referred to in this article are expressed in Prussian pounds and feet. One Prussian foot, 12.3585 English inches; one Prussian inch, 1.0299 English inches; one Prussian pound, 1.0308 English pounds.

but also for the object of presenting a sufficient surface to the wheel. Experience has established, that a well-shaped rail head ought to be only a little rounded at the top, and very much so at the sides; further, that in order to secure the sides of the head from breaking off, they should not project much, and the under part of the head, where it joins the vertical body, should make an acute angle, to strengthen it.

The pear-shaped head of the "Ostbahn" rail (see Fig. 1) seems to be in conformity with all these conditions; its breadth, however, being 0.017 inches less than that of the standard rail adopted by the Convention of Railroad Engineers at Berlin in 1850. To curve the top of the head with a greater radius than from 5 to 6 inches, seems not to be advisable, because too heavy a pressure would then be concentrated upon a very small surface and the rail would wear out too quickly.

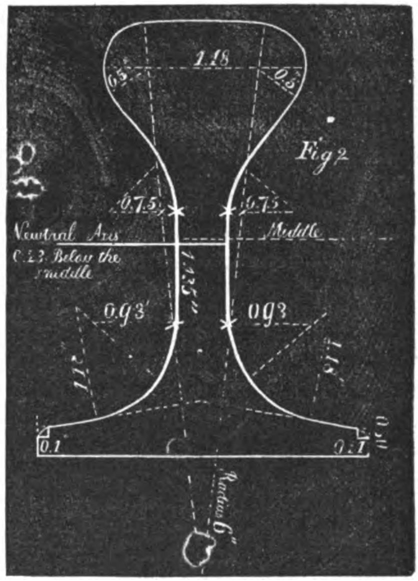


In forming the bottom part, or foot, we are more at liberty. There would be advantages in making the foot very flat, especially when the rails are fastened with spikes. The rapid cooling of thin flanches renders the manufacture of such rails, however, very difficult. To produce the flanches of the "Ostbahn" rail without defects, has been, as we know, a matter of considerable trouble to the manufacturers. Moreover, taking into consideration, that the outer ends of the flanches of the "Ostbahn" rails have proved, by experiment, to be unable to follow the deflection of the vertical body, we have, on this account, to restrict the breadth of the foot. The strength of support will not diminish much more than the weight, if that breadth is not reduced to less than 3½ inches. The resistance of such a foot will be stronger also against lateral vibrations than the foot of the T rail, which is either smaller, or in the best form, equally as large as the head. This resistance is decidedly sufficient, if we consider another series of experiments which prove the "Ostbahn" rail to suffer a lateral pressure of 60,000 pounds before the first sign of permanent curvature becomes apparent.

In regard to the quantity of iron which shall go into the foot, we have, as a general rule, that the sums of the momenta of curvature for the part above and the part below the neutral axis, shall be equal. This rule supposes the resistance of iron against compression to be the same as against expansion. And in fact, this is very nearly the case, as has been proved against Eaton Hodkinson, who asserted that they are in proportion as 11 to 9. Further, it is desirable, that the centre of gravity should not fall in the upper half of the rail.

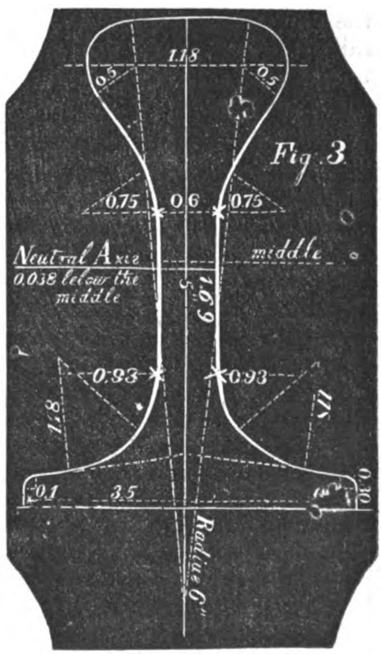
The vertical body of the "Ostbahn" rail is very strong as to lateral pressure, the body and foot strictly following the deflections of the head during the whole of the experiments *with lateral pressure.*

If the rail track is rationally constructed, the rail will never be exposed to such an extreme lateral pressure as during the experiments. Moreover, the resistance against lateral motion mainly depending upon the horizontal dimension of head and foot, half an inch thickness of the vertical body will be decidedly sufficient for a rail of four and a half inches height; of course,



this thickness has to be increased with the height of the rail. It is not probable, that the tendency to upset the rails is as great as is frequently asserted. If such were the case, how could the usual fastening with spikes be sufficient? There is no instance known on any German railroad, that a rail has been upset by a train; but wherever the spikes have been raised, it was caused, in all probability, by vertical, and not by horizontal vibrations. Heavy locomotives, however, short curves, and a substructure of soft-fibred wood, may cause lateral displacements. To avoid these lateral displacements, it is necessary to concentrate the whole pressure within the vertical body of the rail. For this purpose, we round the top surface of the rail, and give the rail an inclined *position*, which corresponds to the conical form of the wheel ring; and where there are curves, we give a proper elevation to the outer rail of the track.

In compliance with the above deductions, based upon said experiments, as well as upon theoretical speculation, the rail forms Fig. 2 and Fig. 3 have been determined.



In these forms of rail, Fig. 2 and Fig. 3, the lesser breadth of the foot, and the stronger brace connecting the flanch and body, enables both these parts to follow closely the bending of the head,* and facilitate the manufacture considerably in comparison with the "Ostbahn" rail.

The rail (Fig. 2) $4\frac{1}{2}$ inches high weighs $20\frac{1}{4}$, and the 5 inch rail (Fig. 3) $22\frac{1}{4}$ pounds per foot, assuming the weight of a cubic inch of wrought-iron to be 4.74 oz. The weight of that part of the rail below the neutral axis,† compared with that above, is in the $4\frac{1}{2}$ inch rail (Fig. 2) as 1 : 1·12, and in the 5 inch rail (Fig. 3) as 1 : 1·08.

The centre of gravity in both forms, falls a little below the middle of the height, and the sums of the momenta of curvature above and below the neutral axis are very nearly the same,—a little more *below*, in consideration that the centre of gravity will descend with the wear and tear of the rails.

The breadth of the foot has been assumed for the 5 inch rail (Fig. 3), and—

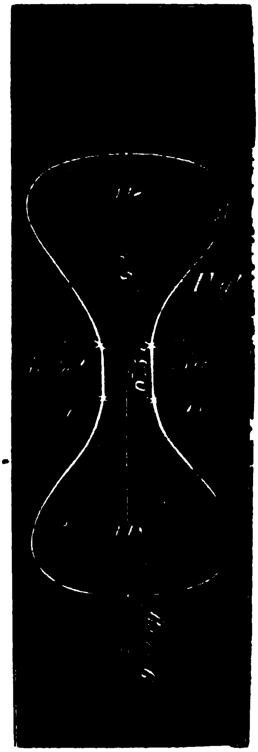
* This, as we see from the experiments, is not entirely the case with the "Ostbahn" rail.

† The neutral axis passes very nearly through the centre of gravity of the rail.

although it might be somewhat smaller for the lower rail—yet it has been retained for the $4\frac{1}{2}$ inch rail (Fig. 2), in order to obtain also for this form the equation of the momenta of curvature.

The T rails corresponding to the I rails of Figs. 2 and 3, are represented in Figs. 4 and 5, their weights being $21\frac{7}{16}$ and $22\frac{9}{10}$ Prussian pounds respectively per foot. Although containing a little more iron than the I rails, still their strength of support is less, the respective momenta of curvature being but 0.915 and 0.924 of the I rails.

Sundry experiments with rails of various roads, and from different manufacturers, showed a great difference in the strength of support of rails of the same form, and even of pieces of the same rail,—especially within the limits of perfect elasticity.



However, the average deflection, corresponding to the unity of weight,* varies but very slightly *within* those limits; and therefore, this average deflection is the proper standard to go by in comparing the strength of support of differently-formed rails, within the limits of perfect elasticity. And certainly, the principal condition of a good rail will always be its strength of support *within the limits of perfect elasticity;* because, as a matter of course, rails could not be approved of which assume a permanent curvature under the pressure of a usual train.

We compared the experiments made with fourteen differently-formed rails, from eleven different roads, in regard to their resistance against permanent curvature, as well as to their resistance until they broke. This comparison places four of the I rails in the first rank, amongst which is the "Ostbahn" rail; the fifth in rank is a T rail; the sixth and seventh are I rails; the eighth, ninth, tenth, and eleventh are T rails; the twelfth is a I rail; and the thirteenth and fourteenth are ⋀ rails.

The T rails rank tolerably high in regard to resistance against permanent curvature; still they are far inferior to the I rails in resistance against breaking. So, for instance, the rail the fifth in rank is a T rail from the "Berlin, Potsdam, Magdeburg" road. In consequence of its excellent material, and its larger basis, although defective in its manufacture, it ranks higher than the other T rails of nearly the same weight, and ranks even higher than some of the I rails of heavier weight. Still in respect to breaking, it is considerably inferior to the I rail; their iron, however, not being near as good as that of the T rail.

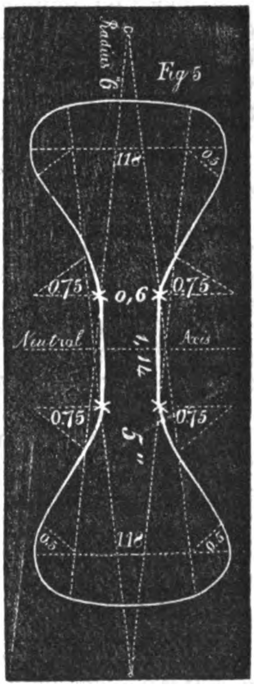
This is an important consideration in the choice of a new form of rails,

* This average has been obtained in the following manner: two columns of the table of experiments contain the number of hundred-weights which pressed successively upon the rail, and its corresponding deflection, till the point where the limit of perfect elasticity was reached. To each two numbers of said columns a third number has been computed, expressing the average deflection per hundred-weight—or, calling that the unity of weight—per unity of weight. From a number of experiments with rails of the same form, from different manufacturers, and pieces of the same rail, of that form, the average of those third numbers has been taken to get the average deflection corresponding to the unity of weight for a certain form of rail; for instance, thirty-one experiments with the "Ostbahn" rail, gives their average deflection, per hundred-weight, 0.00038 inches.

liable to heavy shocks, great cold, and other extraordinary accidents, by which the limits of perfect elasticity are easily overcome.

We see from the tables, that—supposing the two points of rest of the rail to be three feet apart—the limit of perfect elasticity is overcome with a curvature of about 0.067 of an inch. There is no rail track in the world without such curvatures of the rails.

Fortunately, perfect elasticity far above the limits of the first permanent curvature exists, as proved by these experiments. The permanent curvature corresponds to the greatest pressure which is ever brought to bear upon the rails, caused by the driving wheels of the locomotive. After each passage of that weight, the rail returns to its first assumed curvature. Nevertheless, the use of curved rails can never be approved of, because the influences of temperature on the texture of the iron, and the gradual displacement of the wooden part of the road, &c., will cause greater deflections of the rail, which may finally lead to breaking it.



The experiments prove that the foot of the ⌶ rail offers more resistance against breaking than its head. This was also the result with two rails the foot of which contained even less iron than the head. The iron resists more intensely in broad planes than in any other form. The T rails, the feet of which were less voluminous than the heads, resisted a considerably greater pressure in a reversed position (⊥).

The foot of the T rail must obviously be made either entirely or at least very nearly equal to its head in size.

Another result which we gather from these experiments is, that the ⌶ rail, if of equal height with the T rail, resists a much greater lateral pressure than the latter; and if the ⌶ rail is enlarged, the ratio of its resistance against lateral pressure is increased in a greater ratio than its weight.

Further, we see, that in all the experiments with lateral pressure, the foot and body of the rail followed strictly the curvature of the head, within as well as over the limits of perfect elasticity; whereupon we draw the conclusion, that the vertical bodies are stronger than necessary, the rails never being exposed to such enormous pressures as have been applied during the experiments.

According to this conclusion, the horizontal dimensions of the vertical body has been fixed, as seen in Figs. 2, 3, 4, and 5.

Wrought-iron in general should be tough, fine-fibred, and dense, because iron of such qualities possesses a great strength of support, and presents the utmost security against sudden fracture.

It may not be out of place here, to state what has been proved of late, that the *specific heaviest* iron fulfils these conditions best. The very best riveting iron is the specific heaviest, and the *crystallic*, *coarsely-grained* iron weighs the least (specifically).

But rail iron should possess *hardness* besides the above-mentioned qualities. A *stiff rail of steel nature* would certainly be superior to any other. But as long as a steel-hard iron cannot be produced below the present price, we must be satisfied with iron that possesses *excellent welding* qualities, and at the same time produces a rail of *homogeneous*, *fine-grained*, texture.

We see from the above experiments, that rails of these qualities resisted best against permanent curvature; that they, even in regard to breaking, compared very well with rails of the toughest iron; and that rails of coarsely-grained, crystalline texture, are less reliable.

THE COTTON-GIN, AND ITS PATENTED IMPROVEMENTS:

CHRONOLOGICALLY DESCRIBED AND ILLUSTRATED BY CHARLES L. FLEISCHMANN.

In our first number, we gave the improvements in apparatus for the manufacture of sugar, patented in the United States. We now intend to lay before our readers the improvements upon a mechanical contrivance which has been so signally the means of our great success in the introduction of cotton.

According to the last census, in the year 1850, the cotton crop of the United States amounted to 987,449,600 pounds; an increase of about 970,000,000 pounds more than the crop of the year 1800.

"The earliest record of sending cotton from this country," says the Census Report, "is in the table of exports from Charleston, in 1747–48, when seven bags were shipped. The next parcel, consisting of 2000 pounds, was shipped in 1770; and a third shipment, of seventy-one bags, was made in 1784, which were seized, in England, on the ground that America could not produce so great a quantity. The amount exported from the United States in 1791 was 189,316 pounds; in 1793, 487,600 pounds; 1794, 1,601,760 pounds; in 1795, 6,276,300; in 1800, 17,789,803 pounds; in 1810, 93,261,462 pounds; in 1820–21, 124,893.405 pounds; in 1830–31, 276,979,784 pounds; in 1840–41, 530,204,100 pounds; in 1850–51, 927,237,089 pounds."

This astonishing result has been obtained by means of a simple mechanism which enabled the planter to separate the fibres from the cotton-seed speedily, and in the most perfect manner, without any aid of manual labor, except that of feeding the machine, and putting the ginned cotton into bags.

The labor thus saved, the planter employed in the extension of his crops, and it gave, not only a distinctive direction to the agriculture of the south, but it furnished us at once with a new and profitable staple. It not only aided in enriching the planter, but it increased commerce and shipping; it created innumerable cotton-mills in this country, as well as in Europe; it gave increased impulse to our enterprising citizens of the south, as well as the north, and furnished means for the development of the inexhaustible resources of our great Union.

There is no mechanical invention which has influenced so materially the wealth of a nation, and none which has aided to increase the comforts of man, so much as Whitney's saw-gin.

It is only to be regretted, that the original model of Whitney's invention, deposited in the U. S. Patent Office, as well as all the improvements made upon it, up to the year 1836, have been destroyed in the burning of the Patent Office. However, the specification of Whitney's cotton-gin has been restored again, and the inventor himself furnished a model which was deposited in the collection of models in the new Patent Office, from which the following representation has been made.

The patents granted for cotton-gins from 1794 up to 1836 have not been restored, and we are not able to give any further account of it than the names of the patentees, and date of the patents, which we record chronologically as they were granted.

ELI WHITNEY'S PATENT, GRANTED ON THE 14TH OF MARCH, 1794.

THE UNITED STATES OF AMERICA:

To all to whom these letters-patent shall come:

WHEREAS, Eli Whitney, a citizen of the State of Massachusetts, in the United States, hath alleged that he has invented a new and useful improvement in the mode of ginning cotton, which improvement has not been known or used before his application, has made oath, that he does verily believe that he is the true inventor, or discoverer, of the said improvement, has paid into the treasury of the United States the sum of thirty dollars, delivered a receipt for the same, and presented a petition to the Secretary of State, signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose.

These are, therefore, to grant, according to law, to the said Eli Whitney, his heirs, administrators, or assigns, for the term of fourteen years, from the sixth day of November last, the full and exclusive right, and liberty, of making, constructing, using, and vending to others, to be used, the said improvement, a description whereof is given in the words of the said Eli Whitney himself, in the schedule hereto annexed, and is made a part of these presents.

In testimony wherèof, I have caused these letters to be made patent, and the seal of the United States to be hereunto affixed. Given under my hand, at the city of Philadelphia, this fourteenth day of March, in the year of our Lord, one thousand seven hundred and ninety-four, and of the independence of the United States of America, the eighteenth.

{ L. S. }

GEO. WASHINGTON.

By the President. EDM. RANDOLPH.

City of Philadelphia, to wit:

I do hereby certify that the foregoing letters-patent were delivered to me on the fourteenth day of March, in the year of our Lord one thousand seven hundred and ninety-four, to be examined; that I have examined the same, and find them conformable to law. And I do hereby return the same to the Secretary of State, within fifteen days from the date aforesaid, to wit: on this same fourteenth day of March, in the year aforesaid.

WM. BRADFORD, Attorney-General, U. S.

The schedule referred to in these letters-patent, and making part of the same, containing a description, in the words of the said Eli Whitney himself, of an improvement in the mode of ginning cotton.

A short description of the machine invented by the subscriber for ginning cotton.

The principal parts of this machine are: 1st, the frame; 2d, the cylinder; 3d, the breastwork; 4th, the clearer; and 5th, the hopper.

1st. The frame, by which the whole work is supported and kept together, is of a square or parallel ogramic form, and proportionable to the other parts as may be most convenient.

2d., The cylinder is of wood. Its form is perfectly described by its name, and its dimensions may be from six to nine inches diameter, and from two to five feet in length. This cylinder is placed horizontally across the frame, leaving room for the cleaver on one side, and the hopper on the other. In the cylinder, is fixed an iron axis, which may pass quite through, or consist only of gudgeons driven into each end.

There are shoulders on this axis, to prevent any horizontal variation, and it extends so far without the frame as to admit a winch at one end, by which it is put in motion, and so far at the other end, as to receive the whirl by which the clearer is turned. The surface of the cylinder is filled with teeth, set in annular rows, which are at such a distance from each other as to admit a cotton-seed to play freely in the space between them. The space between each tooth, in the same row, is so small as not to admit a seed, nor a half seed, to enter it. These teeth are made of stiff iron wire, driven into the wood of the cylinder. The teeth are all inclined the same way, and in such a manner that the angle included between the tooth and a tangent drawn from the point into which the tooth is driven will be about 55 or 60 degrees. The gudgeons of the cylinder run in brass boxes, each of which is in two parts, one of which is fixed in the wood of the frame, and the other is confined down upon the axis with screws.

3d. The breastwork is fixed above the cylinder, parallel and contiguous to the same. It has transverse grooves, or openings, through which the rows of teeth pass as the cylinder revolves, and its use is to obstruct the seeds while the cotton is carried forward through the grooves by the teeth. The thickness of the breastwork is two and a half or three inches, and the under side of it is made of iron or brass.

4th. The clearer is placed horizontally with, and parallel to, the cylinder. Its length is the same as that of the cylinder, and its diameter is proportioned by convenience. They are two, four, or more, brushes, or rows of bristles, fixed in the surface of the clearer, in such a manner that the ends of the bristles will sweep the surface of the cylinder.

Its axis and boxes are similar to those of the cylinder. It is turned by means of a band and wheels, moves in a contrary direction from the cylinder, by which it is put in motion, and so far outruns it as to sweep the cotton from the teeth as fast as it is carried through the breastwork. The periphery of the whirls is spherical, and the band a broad strap of leather.

5th. One side of the hopper is formed by the breastwork, the two ends by the frame, and the other side is movable from and towards the breastwork, so as to make the hopper more or less capacious.

The cotton is put into the hopper, carried through the breastwork by the teeth, brushed off from the teeth by the clearer, and flies off from the clearer, with the assistance of the air, by its own centrifugal force. The machine is turned by water, horses, or in any other way, as is most convenient.

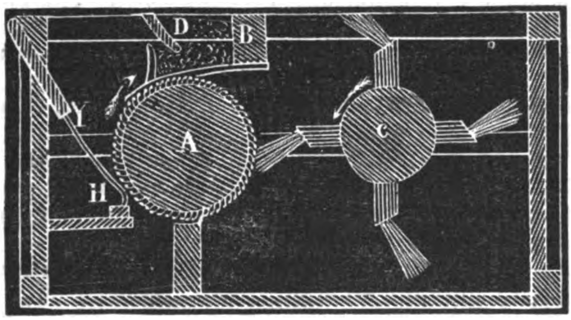
There are several modes of making the various parts of this machine, which, together with their particular shape and formation, are pointed out and explained in a description, with drawing, attested as the act directs, and lodged in the office of the Secretary of State.

Signed, in presence of ELI WHITNEY.

CHAUNCEY GOODRICH, Counsellor at law, Hartford,
JOHN ALLEN, Counsellor at Law, Litchfield.

Fig. 1 represents a section of Whitney's cotton-gin, as set forth in the above specification. A, the cylinder with teeth; B, breastwork; C, clearer; D, hopper; Y and H, grate.

Fig. 1



The patents of the following patentees have been lost in the fire of the Patent Office, and have not been restored:

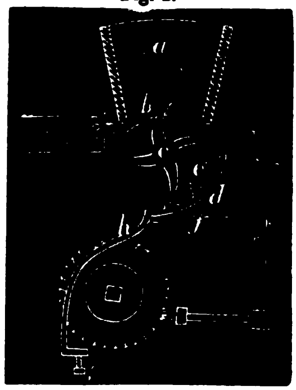
Hodgen Holmes, Georgia, May 12, 1796.
Robert Watkins, Georgia, Dec. 23, 1796.
John Murray, Georgia, Dec. 23, 1796.
Eben Whiting, Mass., Jan. 22, 1801.
Wm. Bell and L. S. D. Montmollen, Georgia, March 7, 1802.
C. T. Saltonstall, N. Carolina, Jan. 4, 1803.
William Bell, Pennsylvania, Nov. 24, 1803.
John McBride, Nashville, Tenn., Aug. 3, 1807.
Obed Crawford, U. S., June 22, 1807.
Robert Hancock, Sen., and Ed. W. Carr, Philadelphia, Pa., Feb. 6th, 1811.
Isaiah Jenkins, New York, Dec. 27, 1815.
Engelhart Cruse, Charleston, S. C., Nov. 18, 1816.
G. F. Saltonstall, Fayetteville, N. C., Dec. 31, 1817.
Isaiah Jennings, New York, Jan. 17, 1817.
William Gould, Georgia, Feb. 28, 1821.
Samuel Pennoyer, Cross River, N. Y., July 24, 1822.
Eleazer Carver, Jr., Bridgewater, Mass., June 12, 1823.
J. and T. Leavitt, Comfort Lane, Conn., March 24, 1825.
Isaac B. Barnes, Beaufort, S. C., Nov. 6, 1826.
Peter Nox, Augusta, Geo., Dec. 7, 1826.
Joseph Ewbank, Jr., Glasgow, Ky., July 29, 1828.
David Phillips, Jefferson Co., Miss., April 3, 1829.
S. T. Conn, New York, June 11, 1829.
Phineas Gardner, Woodville, Mass., April 22, 1830.
Eben A. Lester, Boston, Mass., Jan. 8, 1831.
Wm. Whittemore and Wm. Whittemore, Jr., West Cambridge, March 21, 1833.
Samuel Sawyer, Boston, Mass., March 30, 1833.
James Lynch, Tuscaloosa, Ala., July 22, 1833.
Wm. Whittemore, Jr., West Cambridge, Mass., March 7, 1834.
Jacob Perkins, Bridgewater, Mass., Jan. 13, 1834.
William S. Cooler, Norwich, Conn., Jan. 7, 1835.
Wm. Whittemore, Jr., West Cambridge, Mass., May 29, 1835.
Henry Clark, New London, Conn., Feb. 25, 1836.

Edwin Keith, Bridgewater, Mass., March 4, 1836.
Pierson Reading, Trenton, N. J., April 13, 1836.
James McCreight, Winsborough, S. C., July 2, 1836.

William McCreight and James McCreight, of Winsborohug, S. C., made improvements in the cotton-gin, which were patented Feb 5th, 1836. The drawing was lost in the fire, and has not been restored; the specification, however, is recorded. The inventors claim, therein, three distinct improvements, viz:

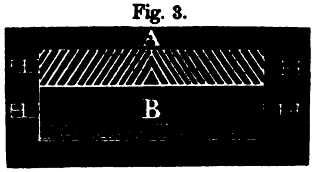
1. A movable breastwork, instead of a stationary one, as were generally in use at that time.
2. Sliding ribs, arranged in such a manner that when they become worn at one place, they can be set or shifted, in order to bring such part of the ribs into play, which would not allow the cotton-seed to pass through the ribs.
3. The mode of regulating the pivots of the brush cylinder, by means of set screws.

Fig. 2.



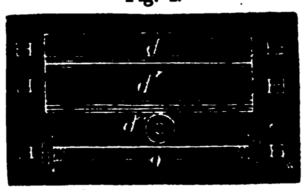
The next improvement in the cotton-gin, on record, is that of Alexander Jones, of New Orleans, La., patented April 25th, 1837. The improvement consists in the supply of seed-cotton, through movable hoppers, placed above the gin saw, as shown in Fig. 2. At the bottom of the hopper *a*, are ribs *b*, between which a number of pickers *c* work, and take the cotton placed upon the grate *b*, and pull it down, in proportion as it is required by the saws. The cotton falls upon another grate *d*, with projections *e*, again, and by which it is thrown, and thereby freed from dust, and the coarse kind of impurities, which are collected upon the platform *f*. The cotton falls, finally, upon the ribs *h*, and is ginned.

Fig. 3.



John Stevens, of Poughkeepsie, N. Y., obtained a patent, dated Nov. 25, 1837, for improvement in roller cotton-gins. He uses two rollers; the upper roller A, in Fig. 3, is of metal, provided with a series of spiral grooves, diverging from the centre towards the extremities; the lower roller B is of a larger diameter, formed of a series of rings, made of cork, which are placed upon an axis, and pressed firmly together by means of a screw. Each roller is provided with a pulley. The inventor claims spiral grooves, and the cork roller.

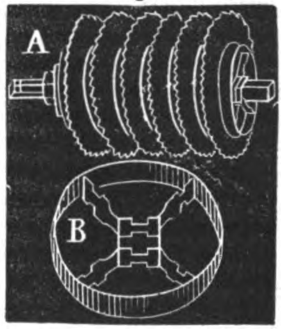
Fig. 4.



Lucilius H. Mosely of Poughkeepsie, N. Y., obtained a patent, dated Nov. 25, 1837, for a roller cotton-gin. The inventor makes the smaller and upper roller *d* of paper (see Fig. 4), and the lower and larger one *d'* of stone, or burnt clay. The inventor makes the paper roller by placing a number of paper disks *d''* upon an axis, which is provided, at each end, with a screw and nut, as seen in *o*, by means of which he compresses the disks so tight that the roller forms a solid surface, which can be neatly turned by means of a lathe. The lower roller he makes of stone, or burnt clay. He claims the paper and stone, or clay rollers, which are worked by pulleys, or otherwise, set in boxes regulated by springs and set screws.

Jacob Idler, of Philadelphia, Penn., obtained a patent, on the 1st of December, 1837, for improvement in saw cylinders for cotton-gins. The improvement consists in a series of metal wheels, between which the saws are secured. These wheels are placed upon a shaft, and fastened together by means of a screw and nut, as shown in Fig. 5, A. B is a perspective view of one of the wheels.

Fig. 5.



(To be continued.)

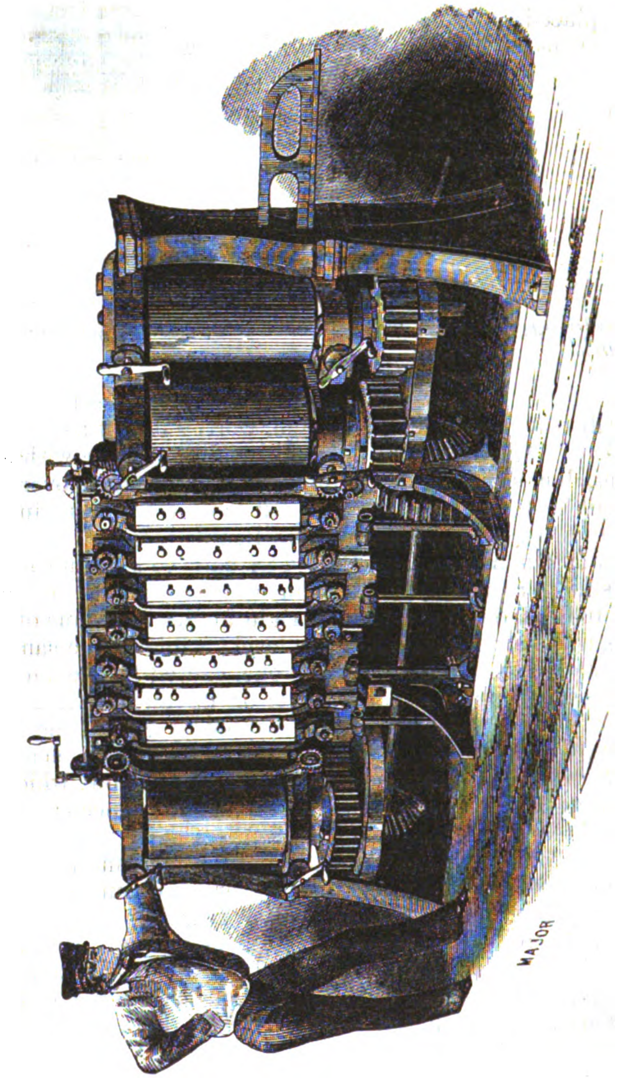
ON THE WORKING OF WOOD.—No. 3.

A historical sketch of the devices employed in working in wood, including sawing, planing, turning, boring, mortising, carving, and other ornamental work.

Since writing our last number of this series on the working of wood, we have seen still another planing machine, worthy of notice for its many ingenious devices. It can hardly be considered a machine with a stationary set of knives, but seems to have important advantages over such. We here represent a general view of the exterior of the machine, which, in its external appearance, is somewhat like Beardsley's.

The knives in this machine are united in pairs to separate stocks, which stocks have slides or ways in the permanent frame, in which they slide laterally across the board to be planed, at right angles to its line of motion, but in one plane, so as to plane the surface level; while at the same time they make what may be termed a drawing-stroke, caused by the united motions of the progressing board, and the latter or up and down motions of the knives. This motion of the knives is caused by connecting each of the sliding stocks, by means of a connecting-rod or pitman, clearly shown in the engraving, with eccentrics on a horizontal shaft below, which eccentrics are so placed as to cause the stocks to be equally balanced; one portion of them sliding in one direction, while the others move in an opposite direction. The inventor claims for this feature of the machine important advantages, such as cutting with much less power, and smoother, as well as keeping the edges of the knives free from clogging. Another feature is, jointing the first pair of vibrating knives, so as to cause them to divide the thickness of the wood to be removed between them, each taking a proportionate shaving. The first knife in the machine is what is called a "floating knife," and follows the inequalities of the surface, taking a shaving from it, and removing the grit to save the edges of the other knives that follow. There is a series of rollers opposite the knives (not shown in the engraving), between which and the knives the boards pass to be planed. These rollers are supported in a frame jointed or hinged at one end, and fastened by bolts at its other end to the frame. If there is any obstruction to the working of the machine, this frame with its rollers may be swung open like a door, and the obstruction removed; it also gives access to this part of the machine. The boards are fed in by two pairs of feed-rollers, that are clearly represented. There are other novel features of minor consequence, not here enumerated, but the foregoing shows the character of the machine. The ingenious inventor of this machine is Barlow.

In continuing the subject of machine planes, we shall come to the class known as rotary planes; these are of two kinds. The first, and historically the oldest, are the cylinder planes, which have been used for planing metal as well as wood, and a modification of them has been employed for inlaying,



BARLOW'S PLANING MACHINE.

carving, and other purposes, of which we shall hereafter have occasion to speak. They consist of a series of cutting-edges, more or less in number, which revolve around a common axis, placed either horizontally or vertically, and generally driven with a rapid rotation. The form of the cutters and mode of construction differs with the purpose to which they are applied; with these, as well as with the stationary-knife planes, any form of moulding can be produced, either wavy or straight.

The next form of rotary cutters are those which are placed so as to describe a plane perpendicular to the axis of rotation; these are placed either radially or at an angle to the radii, upon the face of a wheel of proper form and proportions to sustain them. The cutters used in this kind of plane are of various forms, straight or gouge formed; but with planes of this description, nothing but a plane surface can be made; mouldings cannot be cut with them.

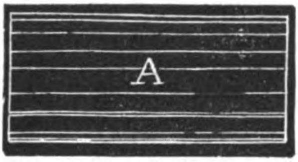
Besides the two principal kinds of rotary planes, there is a third between the two, partaking more or less of the nature of one or the other, as it more nearly approaches the form of either: this is called the *conical plane;* and, as the name indicates, the cutters are upon, and in their revolutions, describe a cone more or less obtuse—sometimes so flat as to become almost a plane, and again acute as to approximate a cylinder. It will be seen that the cylinder cannot be said to plane a flat surface, but instead thereof, it cuts a series of cycloidal curves as the material passes it, which, owing to the slow progress of the material compared with the rapid revolution of the cylinder, are so small that the approximation to a level surface is sufficient for many practical purposes. Unlike the stationary knives, the limit of the quantity the revolving cutters can plane in a given time is soon attained; while on the other hand, a much less degree of skill and knowledge is required in their invention, proper construction, and operation. They were much earlier put in successful operation in this country, where their use has extended in a most wonderful manner, and amassing enormous wealth to their owners. Much time, ingenuity, and money has been expended in litigating the right of property in these devices, but, happily, it does not come within our province here to discuss the merits of the question. We merely intend to follow out and record the historical facts as they occurred, leaving the task of ascertaining their consequences to others.

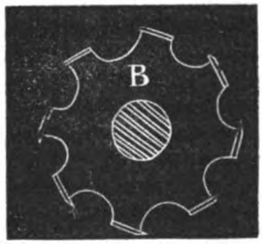
In the patent granted on the 23d of April, 1795, to Gen. Samuel Bentham,* of which we have heretofore spoken, are numerous devices for working wood and other material, as the title already quoted designates. Our present purpose embraces those portions only which relate to the working of wood. In a former number we described the large circular saw of Bentham, and a planing machine that he had previously patented, in which he used planes analogous to the hand-plane. We now propose to give his revolving cutter, or cylinder plane, as described in this patent, for the planing of wood, in the working of which material he had so much practical experience. He says, circular saws, cutters for the teeth of wheels, &c., have been used, "but the idea of adopting the rotative motion of a tool with more or less advantage, to giving all sorts of substances any shape that can be required, is my own, and as I believe, entirely new."

For the formation of the rotating saws, and other cutting tools revolving around a centre, and describing a cylinder, he gives the following directions: "The most obvious mode is, the making the cutter of one piece, consisting of steel, or iron with steel welded on to it, as far as is necessary for strength and sharpness." This kind of cutter when made thin, is the ordinary circular saw; if it is made thick, it becomes a burr-cutter, which is represented in the cut below. Such a cutter is used to reduce and shape wood and metals also. A is a plane burr-cutter, B is a moulding cutter. "In some instances, however," says Bentham, "there may be some advantage in making it in pieces; for instance, in annular segments, fastened to an included cylinder, the larger it is the greater will be the advantage in

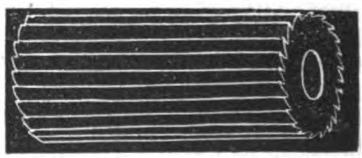
* For a sketch of Bentham's life, see our first article on wood, published in our February number page 102.

thus composing it." This device is shown in that part of our article describing saws, where a veneer saw of this description is delineated. "Another mode of composition is," says our author, "to make the teeth distinct from each other, as well as from the cylinder from which they are to project; they will thus be bedded in the cylinder, taking on and off as occasion may require." And he adds: "This mode *I have practised* with particular advantage in the case of the moulding cutter and planing roller above spoken of." In the passage here referred to, on turning back we find the following definition of what he means by a planing roller and its teeth.





"*Teeth* of such cutters may be considered as so many *plane irons*." "To cut a groove or channel, you have only to make a circular saw, or (to use the name I call the tool by, whenever its effect depends upon a degree of thickness greater than necessary to give it strength) the *circular cutter*, of the thickness requisite to form the breadth of the groove." "If a plane cutter, such as that spoken of for cutting a groove in the breadth of a piece, be made so thick, or, as we might be apt now to say, so broad, or so long as to cover the whole breadth of the piece, it will present the idea of a *roller*; I accordingly call it in this case a *cutting roller*. It may be employed with great advantage to perform the office of a plane." It will thus be seen that the perfect cutting cylinder of Bentham, the one which he used, was a cylinder, with separate knives bedded upon it, so as to be removable. If we are at a loss to know how the space between the knives projecting beyond the periphery of the cylinder is to be formed, we may learn by turning to that part of his description which speaks of a remedy for a difficulty that may arise by the clogging of his rotary cutting tools. He says: "Whether any expedient for this purpose will be worth applying, will depend upon the *shape and magnitude* of the space between the teeth." Accurate experiment has clearly proved that the centrifugal force generated in a rapidly-revolving cutting cylinder, is sufficient to clear the cutters with ever so small a space; yet Bentham here indicates, and custom has sanctioned, a considerable space hollowed out in front of each cutter. Therefore with these minute particulars of description, we do not hesitate to represent by a drawing in the cut, a cylinder that exactily carries out his description, merely premising, that he does not name the number of cutters to be used; and we have therefore taken a convenient number, more than is now generally used, and less than those on the ordinary burr-cutter.



"If a roller of this sort," says Bentham, "be placed with its axis horizontal, and the bench underneath it be made to rise and lower, the bench may be very readily adjusted, so as to determine the thickness to which a piece will be reduced by being passed under the roller. The influence of the rotation on the advancement of the piece is the reverse of what it is when the track of the piece is above the roller; therefore, if you choose, the advancement of the piece should, instead of being performed in a direction the same with that of rotation [cutting from the unplaned to the planed surface], be performed in the opposite direction [from the planed to the unplaned surface], the direction of the rotation must be reversed." Many have supposed this to be a modern improvement, but the clearness of this description must dispel the delusion. "Whether the axis of the roller be horizontal, perpendicular, or oblique, the piece, being passed against it so as to receive its figure, may be made, not only to receive a *flat* and *even surface*, but any longitudinal curvature or waving, by a compound motion;" which is explained in the part relating to the sawing apparatus. "To gain time, cutters may be applied on different sides of a piece at once; and such of them as make parallel cuts may be mounted on the same axis." For instance, the upper surface of a board or plank may be planed level, and at the same time its two edges tongued and grooved by the different cutters.

To advance the material to the cutters, the following is a description: "When their motion is of the rotative kind" [that is, circular saws, cutting cylinders, moulding planes, tongueing and grooving tools, and such like], "though the advancement may be performed by hand, yet regularity may be more effectually insured by the aid of mechanism. For this purpose, one expedient is the connecting, for instance, by cogged wheels, the advancing motion of the piece with the rotative motion of the tool." Another expedient he mentions is by the use of a rack and pinion; or, perhaps, this rack and pinion may be considered to be described as the apparatus, connected by the "cogged wheels" with the *rotative motion* of the tool; an arrangement of that kind would be easily made, and was common at that day. A weight is also named, and this is a very old device for moving forward a carriage. And he further adds, for very small distances, a spring may be employed. The only modes described in this patent for holding the piece, are by movable stops, consisting of a screw or wedge, to close against the piece with force sufficient to hold the piece; this is like the mode employed in the most ancient saw-mills. In those cases where the cutter comes up through the bench, the bench itself prevents the piece from being cut too deep or drawn into the cylinder. No yielding device is described in this patent either to hold down the board of unequal thickness, or to plane such pieces to an equal thickness, as devices of this kind had been clearly and fully set forth in his previous patent, as well as the mode of operation without a carriage, where the plane-stock surrounded the board, or, as we should now say, the stationary part of the frame, consisting of a bed-piece, stock, &c. We presume the author deemed it unimportant again to name the rising or falling of the plane, or the weighted rollers, to keep down the board, as used in modern times; for it was well known he had previously patented holding down the board by the plane-stock, or by heavy or weighted rollers. Whether he ever used these—to him well-known devices—or not, must forever, probably, remain unknown; but that he successfully planed with the revolving cutters, we have his own distinct and positive avowal to prove, and his high character and standing are a guarantee for his truthfulness.

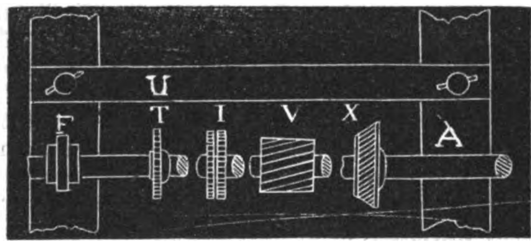
We have been thus particular in giving a full statement of this first rotary plane, partly on account of the wonderful perfection to which it was at once brought, and partly because it has so often been brought into our courts within the last few years, and so misrepresented that even the learned judges have repudiated it. More ingenuity has been expended to prove it was not what the description plainly indicates it was, than has ever been exercised since Bentham's day, in the formation of planing machines. In fact, the only novelty that distinctly appears in modern planing machines is, advancing the board between feed-rollers to the cutters; which, perhaps, may be considered to be indicated in the mode of connecting the advancing motion with the rotary motion of the cutters by *cogged wheels;* but this device never was claimed by any one: our first knowledge of its employment comes from the patent of U. Emmons, granted in 1829; the term of which has now expired, and become public property.

Numerous devices for planing or cutting wood, as described by Bentham, were brought into use, such as the block machinery of Brunel, hereafter to be described; and planing machines, of various descriptions, for planing flat surfaces. Some of these were essayed in this country: but the next cylinder machine we shall notice, is one patented to Roguin, of Paris, by the French Government, on the 6th of March, 1817.

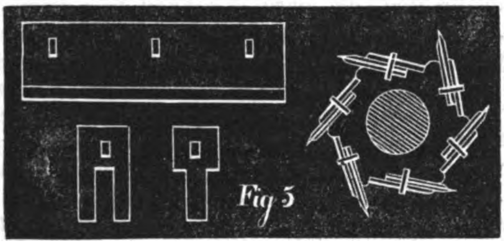
The purposes to which Roguin proposed to apply his machine were various. First, planing; second, tongueing and grooving; third, cutting ornamental mouldings. To illustrate these various devices and purposes, he employs but a single drawing, putting all his various cutters on one shaft. Of course, these were never intended by him to be so worked, but by grouping the varieties together, he sufficiently illustrated his invention.

His machine consisted of a frame of proper dimensions, upon the upper part of which a carriage, supported on rollers, moved over proper ways; upon this carriage the material to be worked was affixed, by means not shown, but which could be done in various ways without invention.

This carriage was moved by a cord wound upon a windlass, and the thickness of the piece, which was fastened to it to be cut, was determined

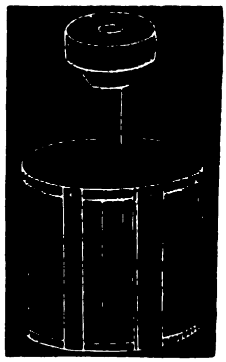


by set-screws, that raised or lowered the bottom of the carriage. Above the carriage, a cutting cylinder was supported by its journals, in pedestals affixed to the stationary frame, upon which the carriage moved, and to the cutting cylinder a very rapid motion was given, so as to cut the surface of the wood presented to it by the movement of the carriage, on which the wood was affixed, in a horizontal line below. The cutting cylinder was what is known as a burr-cutter, which, even to the present time, is largely employed for cutting wood in various ways, as we shall have occasion to show. For plane surfaces, this cutter was straight on the edge of its knives, as shown at V in the assemblage of cutters above, taken from Roguin's drawing in the patent above-named. For a moulding, the edges of the cutters were made to assume an outline the counterpart of the moulding to be cut, as represented at X. For a groove, a single cutter, the breadth of the groove, was used, as shown at T. For a tongue, two small, thick cutters were employed, sufficient to cut out the two rabbets by which the tongue is formed, as seen at I; each of these tools, if placed upon a separate shaft, would be ready for use. To guide and hold down the wood while being cut, Roguin puts a bar of wood or iron U across the machine, just in front of the knives, bearing upon the unplaned surface, and holding it down. This bar is attached to the frame A, apparently by set-screws, by which its height can be adjusted. We show the relative position of this guide and the cutters in the engraving, copied from Roguin's patent, on the 27th of March, 1818. Roguin applied for, and received a patent for an additional improvement to the last-named patent; one feature of which was to make the cutter travel over the board instead of moving the board under the cutter. The second was to construct the cutters in a more perfect manner, by making each cutter or knife separate, and bolting it on to the cylinder; this is represented in Fig. 5, which is an end view, together with a representation of some of the cutters for planing, tongueing, grooving, and moulding. These, it will be



seen, are in the best form of modern cylinder cutters; for which some credit has recently been given to Mr. Paxton, and the builders of the Crystal Palace, in London, as a new device for sash-making, although for many years used in this country for the same purpose. This, however, seems to be precisely the same thing as Bentham describes in his patent of 1793; and we do not recognize in Roguin's machine any new feature, unless it may be the distinct representation of the guide-bar L, for holding down the wood to be cut, combined with the cutting cylinder, in which there was certainly little or no invention. Similar cutters, in most particulars, were used in this country by several persons for different purposes, such as cutting hoops, tongueing and grooving piles, planing, and other work, as appears by the patent record and elsewhere. There were nine planing machines patented in the United States prior to 1820; two more up to 1828; and in all, up to 1853, one hundred and two patents have been granted for planing wood in this country. Sashes were "*stuck*" here as early as 1825, or earlier, by rotary cutters; and in 1828, boards were planed by J. Hill with a rotary cutter, and a spring to hold the boards down, which was, in 1826, superseded by rollers.

In December 1828, a patent was granted to W. Woodworth, for "an improvement in planing, tongueing, grooving, and cutting into mouldings, either plank, board, or any other material, and for reducing the same to an equal thickness, and also for facing and dressing brick, and cutting mouldings on, or facing, metallic, mineral, or other substances." Under this very comprehensive title, are obscurely indicated several devices. The material, according to the description, is first reduced to an equal width by circular saws, which the patentee seemed then to suppose to be new, for he claimed it; but he afterwards disclaimed the device, finding it was old. The next thing he describes is a "rotary cutting-wheel," thus constructed: "Heads or circular plates, fixed to an axis, may have one of the heads movable, to accommodate any length of knife required." "The knife [is] fitted to the heads with screws or bolts" [that is, knives for plane surfaces]; "the knives or cutters for moulding, [are] fitted by screws or bolts to *logs*,* connecting the heads of the cylinder, and forming, with the edges of the knives or cutters, a cylinder. The knives may be placed in a line with the axis of the cylinder, or diagonally." This description, if followed, would form a cylinder of knives, which it would be very difficult, if not wholly impracticable, to work, and which could never be made to work in practice properly. They were very soon abandoned by the inventor, who substituted the cylinder described by Bentham, and figured by Roguin many years before. The patent further goes on to say: "The plank or other material resting on the carriage, may be set so as to reduce it to any thickness required; and the carriage, moving by a rack and pinion, or rollers, or any lateral motion, to the edge of the knives or cutters, on the periphery of the cylinder or wheel, reduces it to any given thickness." This language is extremely obscure, but it indicates that the board is affixed to a carriage; and it is evidently adjusted, as to thickness, by the raising or lowering of the carriage, or something upon it, as in Roguin's machine. The rude drawing said to have originally accompanied the patent, throws no light upon the subject, but shows a crude, ill-digested device, incapable of efficient action, and vastly inferior to its predecessor. The following is a copy of the cutter shown in the drawing. His tongueing and grooving "wheels" he describes as follows: "The grooving-wheel is a circular plate, fixed on an axis, with a number of cutters attached to it, to project beyond the periphery of the plate, so that, when in motion, it will perform a deep cut or groove, parallel with the face of the plank or other material. The rabbeting-wheel, also of similar form, having a number of cutters on each side of the plate, projecting like those on the grooving-wheel, cuts the rabbet on each side of the edge of the plank, and leaves the tongue or match for the groove." These cutters are infinitely inferior to those of Roguin, of 1818, ten years anterior. But we learn from the claim, that what is supposed to be the improvement and application of these tools, is the real invention of Woodworth. He disclaims the cutter wheels, "knowing they have long been in use," but claims their *improvement;* in other words, the manner in which he constructs them, and their application to planing boards and other material. It is difficult here to understand what is meant by "application;" if it means applying his newly-constructed wheel, it was no doubt new, as no one at that day, much versed in mechanics, would ever have used such a device. If it means applying a cylinder cutter to the planing of boards, &c., we have clearly shown it had been anticipated. In this description, like that of Bentham's, no frame is described, or driving geering; and those parts that are described, so as to be made out, show a want of knowledge of mechanics and judgment in the patentee.



This patent has been noted for being constantly before the courts in this country for some years past, in which it has received numerous and contradictory interpretations, and many dogmatical explanations from learned judges, none of whom have agreed as to what it was. It has been extended for a length of time, greater than any other patent ever was; and was reis-

* Probably this word should be either *lugs*, that is, ears, or *lags*—strips put upon the heads of a drum or pulley, to form it into a cylinder.

sued after it had run more than fourteen years; and long after the patentee was dead—which reissue describes—not only the original and all it contains, but things that the original patent and drawing clearly show could not have been invented by the patentee before his patent was granted, unless he wilfully concealed them. This patent has probably brought more money to its owners than any other ever did, and consequently, has been a greater tax on the country; with what justice, each reader must decide for himself.

The next cylinder machine patented in this country was that of Uri Emmons, in April, 1829. The description shows the machine to have been perfectly organized before the patent was applied for. He describes his cutting or planing apparatus to be "a cylinder of wood or metal, on which knives are placed, straight or spiral, with the edges exactly corresponding with each other," and numbering from two to twelve; the cylinder is from six to ten inches diameter. For tongueing and grooving, he describes the tools to be burr-cutters, similar to those used for cutting brass-wheels. This is exactly the device patented by Roguin, in 1817, twelve years before, who also showed in his drawings the spiral knives for planing. The cylinder is hung in sliding boxes in this machine, so as to be set up or down, to determine the thickness of the stuff to be planed, instead of setting up the carriage, as in Woodworth's, and others preceding. To feed the board or plank through the machine, he named two devices, and claimed both, although one was certainly not new, and the other doubtful. The first is a carriage, like Bentham's, Roguin's, and Woodworth's plans; the second carries the plank forward by feed-rollers, without a carriage, the piece being guided by a straight edge or bar on one side; this differs from the mode distinctly described in any rotary-cutter patent preceding it; but the plan of feeding plank, to be planed by reciprocating planes, was clearly described in a patent granted by the French Government, in 1825, to Thomas de Manneville, of which we shall have occasion to speak. Some minor modifications and improvements have been since added to the varieties of cylinder machines used, one of which is of considerable importance—a cutter head for tongueing and grooving, by Hazard Knowles, which we may at some future day figure, when treating of mouldings. Placing the cylinder obliquely across the board, has been thought an improvement, and used; and a ready way for moving the bench out or in, has been devised and patented, by hinging it at one end, and affixing a toggle joint to the other; but it does not seem essential to particularly describe or figure any of them in the present article. In our next we shall describe the disk and cone machines, beginning with that of Bramah.

J. J. G., *Ed.*

(To be continued.)

PROPAGATION OF THE GRAPE-VINE.

The grape-vine is propagated:

1. By *seed:* French, *pepins;* German, *Sammen.*
2. By *cuttings:* Fr. *chapons*, *boutures*, those with old wood, *crosette;* Germ. *Blindreben*, *Knothoelzer*, *Schnitt* or *Stecklinge.*
3. By *root cuttings:* Fr. *chevelus;* Germ. *Wurzelreben*, *Wurzlinge*, *Landstoecke*, *Reiflinge.*
4. By *buds*, *eyes:* Fr. *bourgeons* or *boutons;* Germ. *Augen.*

5. By *layers:* Fr. *marcotte;* Germ. *Senker*, *Einleger*.
6. By *graftings:* Fr. *greffe;* Germ. *Pfropfen*.

1. *By seed.* It is most improbable that nature should have produced originally so great a variety of grape-vines as are found existing; no species of plants has such a great number of varieties, and we are therefore led to conclude, that the greater portion of all the known varieties described by the writers on the grape (ampelographes) have been produced from a few original stocks by seeds.

That new varieties can thus be obtained is proved every day by the experiments on various species of plants. The new variety generally retains the principal features and properties of the mother plant, yet it differs in many other respects, as to color and shape of the flower, or in the form, size, and flavor of the fruit.

For centuries the Dutch have successfully operated in effecting a diversity of changes in tulips, hyacinths, and other bulbous plants, as well as in roses, &c.; and the Germans, French, and Belgians have imitated them, and produced likewise new varieties peculiar to their treatment, climate, and soil. The grape-vine, too, has been subjected by them to similar experiments. Van Mons, of Belgium, celebrated for his investigations on plants, found by observation that the climate has great influence in effecting changes in plants raised from seeds, which have belonged originally to another zone. He sowed the seeds of many exotics, and the plants raised in the higher northern latitudes, in general, differed from the original stocks of a warmer clime, and the plant thus transferred to a colder region was often superior to what it had been in its original locality.

Puvis remarks "our fruits (France) have been introduced into North America, where they were remarkably successful, but their seeds produced again a number of new varieties of such an excellent quality, that they have been again brought back to Europe, and raised for their superior excellence."

There is sufficient proof that new varieties of plants, in general, can be produced by seeds, as is demonstrated daily in greenhouses, fruit-gardens, and the facts, too, in evidence as to the grape-vines are numerous in Germany, Belgium, England, Crimea, France, and America; in each of these countries some excellent new varieties have been produced, which not only ripen sooner, but bear a better grape, than the fruits from the original stock. But notwithstanding all these proofs, there is still much controversy among the practical as well as among the theoretical vine-growers.

Roziers states that grapes raised from seedlings are of a bad flavor and altogether detestable. Sinety, author of the "*Agriculteur du Midi*," says, "vines raised from seeds are of a wild nature, the grapes are sour and do not ripen, require a long time before they bear, and the shoots are only useful for grafting.

On the other hand, Van Mons has produced excellent grapes from seed, which ripened in the cold and damp climate of Belgium. In France, Vibert, too, produced many superior kinds of grapes from vines raised by seed. Dr. Morelat, "*Oenologue bourguigon*," assures us that the seeds have always given him identically the same kind of grape-vines and fruit as the vines from which the seeds were derived. Mons. Vibert, horticulturist at Angers, says fourteen plants out of twenty-six raised from seeds have produced grapes which were in every respect the same as those from the mother plants. Metzger states that the inspector of the gardens of the Grand Duke of Baden, at Carlsruhe, obtained from seeds of the black Trollinger, a variety of grapes of a light reddish color, differing only in the color of the grape, while the other characteristics were the same as the grapes from the original plant (the drawing of that new variety of red Trollinger is contained in Fleischmann's Collection of European Grapes).

It seems that this subject is now beginning to receive that attention which it deserves. The German vine-growers look upon the production of vines from the seed as the only way of regenerating some varieties, which, through continued and unchanged practice of propagation by cuttings, are losing much of their vigor, growth, and original good qualities of the grapes. Von Goess, president of the Agricultural Society of Austria, in addressing the president of the convention of vine-growers at Marseilles, says: "One of the counsellors of administration of the empire occupies himself diligently with the production of new varieties of grape-vines by means of seeds or hybrids;" * * * "there are already a great number of remarkable varieties, the origin of which is reliable as well as instructive."

At the convention of the vine-growers at Angers, raising of grape-vines by seeds was considered the only mode of improving the products of the vineyards of France, and thus renovate again the plants which have degenerated by the old and long practice of propagating them by means of cuttings or layers. Puvis,* who is a great advocate of the propagation of the grape-vine by seeds, says that "many of our better varieties of vines have become quite short-lived, and in order to keep them vigorous and productive they must be renovated by layers after a certain number of years. The *Pineau*, of the *Côte d'Or*, for instance, has become delicate, its roots are enfeebled before they reach the age of fifteen years, and the only way to keep them productive is by making layers; the shoots produce new roots, and are able to nourish and support the plant properly. The roots of the Sirah grape-vine, of the *Hermitage*, is still more delicate; these vines must be regularly propagated by layers every ten years, and after all the vineyards will not last more than forty years, when they must be entirely renewed. No doubt many experiments have also been made in this country, with the view of producing new varieties by seeds and hybrids. Mr. Longworth is indefatigable in his efforts to obtain some new kind to answer better the climatic circumstances of Ohio, and, doubtless, some varieties will yet be produced, and thus acclimated for the use of our vine-growers.

In Europe the regular vine-growers do not practise this mode of propagating vines, because the operation is a slow and tedious one; the seedlings do not bear till the sixth or the tenth year; and the Germans will have observed, that they seldom produce the same kind of grapes. They however acknowledge that new and superior varieties have thus been obtained, of a more vigorous growth, better answering to the climate, their wood being of a more compact, healthy nature than that of the mother plant. But from the greater difficulty in raising seedlings, and the long time it takes before they become useful, the practice is not general, and it is left to the amateur and to the man of inquiry to continue the experiments.

Lenoir gives the following directions for raising grape-vine seedlings: The seeds must be taken from well-developed grapes, the grapes must be kept until spring; when they begin to rot, the seeds are then in the most perfect state for sowing. They are sown in pots, filled with a rich loam mixed with decomposed manure, and are covered half an inch thick with a similar soil. The pots are placed in hot-beds, or put into the ground, up to the rim, alongside a wall well exposed to the sun, and protected from cold winds.

* *M. A. Puvis*, De la Culture de la Vigne et de la Fabrication du Vin. Paris, 1848.

The first year the plants are yet too small and delicate to be transplanted, they are therefore left in the pots, but care must be taken that they are not injured during the winter by frost or by too much moisture. The next spring they are transplanted into open ground in some warm protected location. During the summer they must be kept clear of weeds, and during the winter well covered with brush-wood, leaves, or a light kind of earth. The third spring, when they show some vigor, they are trimmed, and during the summer kept clear of weeds, and should be watered with a mixture of liquid manure and rain-water; when the winter approaches they should be again protected from the frost. The following, or fourth spring after sowing, they are treated like cuttings. Should there be some very vigorous plants among them they should be taken up and planted near a wall.

The first grapes will indicate of what nature and quality they will be in course of time. Sometimes they taste sour and astringent, but the astringency may disappear, and the grapes may become suitable for wine, provided they are sweet; but should they taste insipid, or only sweetish, there is not much to be expected from them.

If the seedlings resemble the kind from which they are derived, then it is important to examine and see if there are not some plants among the lot which produce ripe grapes much earlier than the others; this is of great moment, especially in such as belong to a good variety, but which are of a late maturity.

To bring the seedlings to bear sooner layers must be made. The shoots are laid down, for that purpose, in a manner that four buds are placed under ground, the shoot is trimmed off above the fifth bud, which is kept above ground. Should they not bear the second year after they have been set out in the vineyards, new layers must be placed, or the shoots must be grafted upon the root-shaft, or upon another shoot of the same plant, or upon other vines that already bear.

Bohi recommends, in raising grape-vines from seeds, to take the seeds from the press, but they must be of one and the same kind of grapes, and to sow them the same autumn after the vintage. The soil should be of a sandy, light nature, but rich, and the locality not much affected by frost. The first spring, when the plants come up, they must be carefully weeded; the second spring he advises to cut off the shoots near the ground, to loosen the soil around each plant with care, so as not to injure the roots. The third spring the plants are treated in the same way as in the second, except that small stakes are driven into the ground, to which the young plants are fastened. In the spring of the next, or fourth year, when the shoots grow two feet long, or more, they are then placed as layers. He says, "in that way I planted seeds in rather poor stiff clay soil; in the third year I made layers of eight plants, and in the next, or fourth year, they were so vigorous and had such fine wood that I could prune them to bows. From two of them I got very fine grapes. In the spring of the fourth year the rest of the plants I placed as layers, and the fifth year I obtained very vigorous, healthy vines. *The form of the leaves varies from that of the original plants from which the seed was derived;* however, the character of the grapes is the same, and, from all appearance, they will produce the finest kind of grapes."

2. *Propagation by Cuttings.*—Cuttings are made from shoots of one year's growth. Those grown upon two-years' old wood are the most preferable. They must have acquired the proper maturity, viz., the wood must have obtained the proper consistency, the bark must have lost that greenish, herb-like appearance, and turned brownish or whitish, according to the na-

ture of the vine. When the cuttings are made in the fall, the shoots have only attained their seven or eight months of growth; but generally they are collected the following spring, during pruning-time, and are then of ten or eleven months of age. They are severed from the vines by means of pruning-knives or shears. Some vine-dressers prefer cuttings with a portion of two-years' old wood attached to it (see Fig. 1), and are called mallet-cuttings, from the appearance of a mallet; some consider cuttings without it just as good.

Fig. 1.

Puvis, in his last work on vine culture, page 87, in answer to the question: "Should cuttings be used with or without old wood?" says, that shoots provided with a piece of older wood, what the French call *en bon bois*, fruit-wood, insure a good, productive cutting; and, moreover, as the roots grow principally from the place where the shoot is connected with the older wood, such cuttings are sure to produce better roots and succeed better, so that *crosetts* or mallet-cuttings can be relied on to produce more productive vines. Miller, in his Garden Dictionary, says, under the article on Vine Cuttings: "You should always make choice of such shoots as are strong and well ripened, of the last year's growth. Those should be cut from the old vine just below the place where they were produced, taking a knot or piece of the two-years' wood to each, which should be pruned smooth, then you should cut off the upper part of the shoots so as to leave the cutting about sixteen inches long. When the piece or knot of old wood is cut at both ends, near the young shoot, the cutting will resemble a little mallet, from whence Columella gave it the title of *malleolus*." We have called this kind of cutting, mallet-cuttings, in distinction from a plain cutting, without the additional old wood.

The best time for the selection of the vines from which the cuttings are to be taken, is when the grapes begin to ripen; the vine-grower should then select and mark the plants which are vigorous and good bearers, and according to the kind of grapes which they produce. If the vineyard is liable to heavy frost, it is advisable to take the cuttings before the winter sets in; generally they are cut in February or March at the time of pruning. The vines from which the cuttings are taken should be healthy, but neither of too luxuriant nor of stinted growth, neither too young nor too old. Vines in the first period of bearing, seven or twelve years old, are the best. If it is possible, it should be avoided to take cuttings in a year in which the vines have not borne well, or when, in consequence of cold damp weather, the young shoots have not ripened properly.

The cuttings should have short joints and large thick knots, those with large pith must be thrown aside. In Champagne the shoots with two or three large and perfect buds above the place where the young shoot is grown on the two-years' wood, are considered the best. In Wurtemburg the cuttings from vines of three or four years bearing are preferred to others. The shoots are generally longer than necessary for cuttings; the best part of a shoot is that next to the two-years' wood, and the upper part of them should not be used for cuttings. In purchasing it is therefore advisable to take entire shoots, which can be shortened by the purchaser according to his fancy. The cuttings vary in length, some make them one and a half, some two and two and a half feet long, according to the depth at which they have to be planted. When the length has been determined, the shoots are then cut one and a half to two inches above the last bud, in order that the last bud may remain fresh.

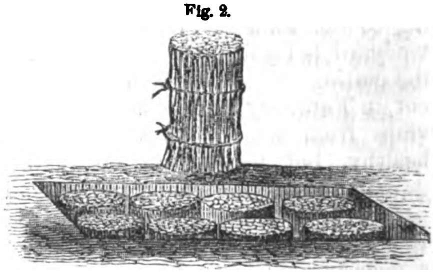
The next operation is to cleanse them from the hardened tendrils and side shoots; the mallet, or old wood, must be evenly and nicely trimmed with a sharp knife, and thus they are ready for planting, either in the vineyard or nursery.

In southern countries cuttings may be collected immediately after the leaves have dropped, and when the wood has obtained the necessary degree of ripeness. In northern climates pruning may also be done before winter; the cuttings are then gathered before the cold sets in, and they can be placed in a cellar, or some other suitable place, where they are protected from frost. The cuttings are made up in bundles, from fifty to two hundred in a bundle. When they are placed in cellars they must be covered with moist sand to about three buds, which are allowed to project; or they are buried in a ditch, where they are covered up to the uppermost bud, which is left out of the ground.

Where pruning is performed in the spring of the year, as, for instance, in the Rhinegau, in the Neckar valley, &c., the cuttings must be secured from the influence of the sun or air, so that they may remain fresh until planting time. This is accomplished by putting them in holes made in a cool place and covered with earth about six inches deep (see Fig. 2). Some vine-dressers place the cuttings in water. The water should cover them about two feet. The water must be renewed every other day. In running water, which is much better, they must be placed upon sandy or a muddy bottom, where they remain until the buds begin to swell, and have reached to the size of a bean.

In some vine-growing districts the germinating power of the cuttings is artificially accelerated. The bundles for that object are assorted and neatly done up, and placed in water for a few days, then they are put with their buds downwards into a hole dug in the ground. The hole must be made in a warm and dry place, large enough to hold a good number of bundles; at the bottom of the hole a layer of dry moss is to be placed, and the sides must also be lined with dry moss, in order that the cuttings should not come in contact with the earth. The bundles are placed and arranged in such a way, that their lower ends being uppermost, form an even plane, upon which moist moss is thrown from one and a half to two inches in thickness; the moss must be every day twice sprinkled over with water. In a short time the buds on the thick ends of the cuttings begin to swell, and a little later the roots show themselves. After three or four weeks the cut-

Fig. 2.



tings must be now and then examined; the moss cover has to be carefully lifted, to see in what state they are, and ascertain if they continue to develop themselves properly. It requires usually six or eight weeks before the *cheese* begins to form. When the roots have acquired the length of one-fourth of an inch, then it is time to remove them from the pit and plant them. It is not advisable to let the roots grow longer, because they are easily damaged. This artificial mode of forming roots on cuttings has the advantage that it accelerates their growth, that those cuttings which show no vitality can at once be removed from the rest, and save much labor for replanting. But on the other hand, it requires a great deal of attention, and should the weather set in and continue warm and dry just after planting, they are then liable to great injury. Watering, however, might prevent this, which is not so very laborious even when the water has to be carried some distance. The necessary quantity required can be easily calculated, allowing, for instance, a quart per cutting.

Ch. L. F. *Ed.*

ON PRUNING AND TRAINING GRAPE-VINES.*

The pruning, as well as the method of training the vine, belongs to the most important parts of vine culture, which have the greatest influence both on the quality and quantity of the wine. On the choice among a variety of well-known methods, depends the success of a vineyard, as well as its fruitfulness, and the quality of the wine.

Although the pruning of the vine is closely connected with the mode of training, yet this connection is never so close that the one exclusively depends on that of the other. In one and the same mode of training, many methods of pruning may be used; and one and the same method of pruning can again bear different modes of training.

The close connection of these two subjects makes it very difficult to represent it properly. We are at a loss with which first to begin; and hence it is that some treat first of the pruning, while others commence with the mode of training.

I have preferred to speak first of the method of pruning, because, when this is faulty, the best mode of training does not succeed in securing a good and well-conditioned grape-vine. But in both, the flexibility of the vine is shown in all possible forms and magnitudes. It may appear as a plant of some feet in height, and also as a tree, according to its management in respect to the soil. In every form, it is fruitful, and rewards the diligence of the vine-dresser, if it is only treated properly with reference to its locality.

As to the difference in the importance of pruning and training, the first, if it is properly carried out, is most effective for the preservation of the vine, because it prevents it from producing too many grapes, and the early enfeebling arising therefrom; and it also operates as well in strengthening and improving the grapes, for, if the shoots are shortened, a larger quantity of sap goes to the remaining wood, which enlarges the sap vessels, and this expansion seems to promote the better development and improvement of the fruit itself.

The attention, in a good method of training, is more directed to keeping the vine upright, and protecting the shoots from growing irregularly into each other, thus giving a proper place for the fruit, and effecting a perfect

* Translated from Babo's work, der Weinbau.

maturity, and, above all, exposing the soil to the influence of the sun and the air, so that the vegetation of the vine may be developed as rapidly as the climate and situation will permit.

Both objects must so far correspond, that in cases of powerful growth, they must furnish longer shoots, as well as an opportunity to fasten them, while in weaker vegetation, the pruning and mode of training are so managed that they require almost no support, because the vines are in a state to sustain themselves. A longer pruning requires an additional artificial support; by a shorter one, stakes may be wholly dispensed with.

By pruning the vine, as already alluded to, a certain preponderance is sought to be effected in the supply of the nutritious substance by means of the roots, in addition to that which the plant receives from the air. If we observe the process of vegetation of a pruned grape-vine, and the treatment founded on it, in the course of a summer, we immediately see what powerful shoots it produces in the spring, in order partly to use the sap supplied from the soil in a greater quantity, and partly also to form the organs, by means of which they can appropriate to themselves the necessary substance from the air. The vine-dresser lets either the shoot develop itself undisturbed, or shortens it again. In the latter case, if the equilibrium of the action of the root with the capacity of the limbs and shoots to take up the sap is not sufficient, the water shoots grow, which, however, the vine-dresser must not remove when the shoots are shortened in the spring. Thus the vine grows on till towards September. By means of the leaves (which, in consequence of the excess of sap caused by the pruning, becomes more strongly and perfectly developed, and so that their functions act more quickly and perfectly), the communication with the air is soon again restored. This proceeds in its regular course, and the plant again acquires the equilibrium in reference to its sources of nutrition. Nothing stands in the way of the constant development and increase of all the various parts of the vine; at the end of the summer the growth is completed, and the vine has all the shoots again replaced which were taken away from it by pruning. As at this period of the year the sap recedes, there is no further reason for allowing all the green shoots to remain, therefore the vine-dresser's care is now directed to the grape, and when the leaf or the shoot prove a hindrance in maturing the fruit, they may be taken away without injury to the development of the vine for the next year.

If no disturbance takes place by the weather, or bad and improper treatment, the proper wood is formed for the next year. In the buds lie the future fruitfulness, but not as in an orchard tree, in which certain fruit-buds exist that are never in a condition to put forth branches; but the fruitfulness of the future shoot depends upon the manner in which the vessels in the buds have been perfected, so as to form a shoot that is strong for bearing; but this should not be of a growth too powerful, for, in that case, the formation of leaves preponderates and the setting of the grape is thwarted, the sap being, in this case, in the formation of leaves.

By means of the vegetation of the previous summer the vine is prepared for the future pruning, but by pruning, the equilibrium which has been established at the end of the summer, between the flow of the sap upward from the roots and the shoots, is again destroyed, and the process of a more perfect development of all parts of the vine begins anew, in consequence of this preponderance of sap.

If we look at wild vines, and their circumstances of vegetation, we may recognize the correctness of what has been now said. Not being checked and restrained, in the first pressure of the sap, the equilibrium between the nutrition from the soil and the air, as well as between the nutrition from the soil and the number of roots corresponding thereto, is not established; the vessels do not become enlarged, the tendency to form new shoots is frustrated, and therefore these are very seldom stout and strong, and the leaves, as well as the grapes, remain small and inconsiderable. If such stocks suffer any injury on the root, so that the nutrition flows upward from them more scanty, the vine falls back, and gradually dies.

When the pruned vine, in the course of vegetation, tries every year anew to recover its equilibrium, in respect to the nutriment from its root and the number and length of the shoots formed, then the object of the pruning is to destroy the equilibrium every spring, and by this equalizing being continually again disturbed, a more powerful growth is produced, which improves the fruit, as we observe in comparing the pruned with the unpruned vines, without causing any retardation of the vines, because the summer vegetation always again establishes the equilibrium.

The preponderance of the nutriment from the roots is sought to be obtained by the cuttings. Hence the young vines are pruned to their small heads in the first year. It might be supposed that thus the nutriment from the air would be checked, but this is not the case, for so long as no leaves generally exist (as in the early spring), they do not appear necessary, but as the leaves appear, they replace and make up, by a greater vital activity, the necessary number.

But salutary as a certain excess of nutrition from the soil is to the growth and fruitfulness of the vine, it must not exist in too great measure. If this is the case, the whole process of formation exceeds its proper bounds, the swelling of the vessels appears to become too powerful, and then only operate in the formation of leaves and shoots, grapes do not set, and those that already exist are transformed into tendrils. This may be observed when very vigorous vines are cut off too short, or when, by any particular circumstances of the season, the growth of the vine is unusually excited, in which case, the grapes, according to the expression of the peasants, grow over, or change into tendrils.

If the reverse is the case, and there is either hardly none, or only a slight excess of sap, then the growth approaches nearer to the nature of wild unpruned vine. The leaves and the grapes remain small, and if the root is too feeble to furnish a greater quantity of nutritious sap, or if perhaps the soil, by its meagerness, contributes to this result, the vine becomes at first unfruitful, and in the end wholly perishes.

To keep the vine in the right state, the length of the pruning should be proportioned to the quantity of sap. This is the greatest art of an experienced vine-dresser, whereby he has not only the fruitfulness, but also its permanence and the quality of the wine, in his power. In pruning, he must have a particular care that he not only always prunes somewhat less wood than the vine might apparently bear, but he must also avoid pruning too little, in order that the growth of the vine may not be too much excited. He must judge of the degree of these relations, and especially how the vine is conditioned as to its roots; the less there are, the less must be cut off. It has been supposed that, according to the kind of vine, the pruning must be longer or shorter, but this is wholly incorrect. We must judge only according to the power of growth of the vine, and if the dwarf kind of vines, as, for instance, the Riesling, in certain localities, grow rankly, they must be pruned like kinds of more powerful growth. But if the rank-growing vine, on a meager soil, grows too weakly, they need not be pruned any longer than the dwarf kinds. It may therefore be laid down as a rule, that the condition of the soil, as to its power of growth and richness in manure, must furnish the standard for the mode of pruning, whether it be long or short; only on a soil of equal condition, regard is to be had to the kind of vine itself, and among these, that sort must be pruned longest which is the most active in growth; *i. e.*, which by the power of its roots draws from the soil the greatest quantity of nutritious substance, and which is in the best condition to use it.

Young vineyards, planted with vines of the dwarf kinds, must often be pruned longer in the first year than in the succeeding ones, because they will otherwise bear nothing. These form, on the whole, no exception, but belong to those cases in which the particular circumstances of the soil call forth a stronger activity of growth.

The answer to the question, where the longer or shorter pruning must be used, is therefore simple, and in theory easily established. But that acumen in judging of the power of active growth belongs to practice, which is only possessed by the experienced vine-dresser who has carried on the business for a long time, combined with gifts of observation and good understanding, and not merely mechanically. But if, owing to the power of growth in the soil, and, as a consequence of this, the strong or feeble growth of the vine is cited as the standard, according to which the vine-dresser should prune long or short, another rule follows, which is often disregarded, but when omitted, causes destruction in many a vineyard. Long or short pruning must not be decided upon empirically according to an adopted method, but more according to the growth which the vineyard showed the previous year. As it is usually believed that it is correct to prune long or short, according to the kind of the vine, and very often the same way of pruning is carried on every year, whether the vine may have grown strongly or not. This procedure is incorrect, for if the vine in the previous summer only forms feeble wood, it is easy to understand that its roots have also grown only a little, or that many must have perished. If this is the case, the entire ruin of such a vine can only be prevented by shorter pruning, as the roots are not sufficient and strong enough to furnish the nutriment for a heavy growth. But if the growth was too great, then the reverse condition must take place, and by too short a pruning, the fruit-bearing buds, which have advanced forward, may be destroyed. For these reasons, many writers justly recommend that, after a wet summer, in which the growth is greater than in a hot, dry season, more of the bows should be pruned, in order to preserve the fruit-bearing buds.

It is likewise known that a longer method of pruning causes more grapes, which otherwise are lost in the buds cut off. But in this case, unless the active power of growth of the vine is aided by specially strong manuring, for a few years, while thus the stock is strained more than is necessary, according to the expression of the vine-dresser, they kill themselves by overbearing, and once injured in that way, it is very hard to bring the vine again to its proper state. In the pruning, not only the fruitfulness of a single year, but also its continuance for many years, must be kept in view.

A practised vine-dresser, by means of the length of pruning, combined with a reference to the other circumstances, can regulate the active power of growth of his vine at pleasure. If the vineyard (for instance, a young stand,) has too strong an impulse, he weakens it by a longer pruning, for many years, until he has reached the right proportion. If, on the contrary, it is too weak, he seeks, by short pruning, to excite the growth till the desired strength again appears. But the right degree of active power of growth is that in which the vine sets grapes most abundantly, without being exhausted, and does not produce too many leaves, nor changes set grapes into tendrils.

As the active power of growth and the mode of pruning the vine are so closely connected, it is natural that the manuring of the vineyard must exert a great influence on the length of the pruning. We shall speak further of this in the chapter on manuring.

If the vine is not in an unnatural situation, for example, on a too fat or too meager soil, if it is adapted to its nature, and we do not observe that its shoots are particularly strong or too weak, the kinds of vines are to be clearly distinguished from each other, as also, for the most part, the place of the fruit-bearing buds, which vary very much upon the shoots. The dwarfish, small kinds, having slender shoots, the fruit-bearing buds are very close to the two-years' old wood, from which they have grown; while in the kind with strong shoots, the buds are further from the older wood. When, in pruning, the judgment is to be formed as to the power of growth, the vine-dresser must never loose sight of the peculiarities of the kinds; he may otherwise allow in the dwarfish kind of vines too much needless wood, but cut away the fruit-bearing buds in vines which produce strong shoots. In extraordinary cases, the vines may change their nature to such a degree that scarcely any true peculiarity is left.

Besides the reasons of which we have treated, why and how vines should be pruned, we should have respect also to the constancy of the mode of training, as regards their height and form. Without pruning the vine into a permanent form and size, it would grow gradually into a tree. But the maintenance of an equal height by pruning the growth of young shoots, yet offers further advantage for a constant rejuvination of the old wood of the vine, to which the vine-dresser must pay much attention.

But, in order to understand properly even the pruning, the vine-dresser must accurately distinguish the various parts of the vine. The relation of one part to the others must not be unknown to him, and he must become acquainted with all the peculiarities, in reference to the fruitfulness of the whole vine. He must therefore especially distinguish:

1. The stem from the division of the principal roots to the first division of the principal limbs. This part of the vine first passes into wood, and becomes hardened. Where it still serves to guide the sap upward, sucked in from the roots, its activity in the formation of new shoots is almost wholly extinct, and only in cases of a considerable loss of the shoots, the existing buds can be forced to penetrate the hardened bark. Hence new shoots show themselves, on such wood, only by way of exception, and these then usually are set so superficially that they are not fitted for the formation of new limbs. They are, therefore, usually unfruitful.

But if such shoots are strong, and firmly set, they can often be used for the renewal of the vines. They must, therefore be immediately taken care of, and pruned back to one or two buds, in order that they may be invigorated, if they are to be used for the renewal of the vine, or particular limbs. To induce the production of shoots, we must free the stem from the dry woody bark by an application of lime. The buds which are dormant beneath it will then be excited to vegetation. We can also aid the shooting forth of the buds, if it is desired, by making deep cross cuts in the stem or limb with a knife or chisel.

2. The limbs are the continuation of the stem, and if not considerably younger than the stem, they partake of all its peculiarities. They convey the sap from the stem to the younger shoots, and, on this account, are important, because they serve as the medium of bringing the various green

portions of the vine upon those places where it is desired to have them. Also, by gradually forming new shoots lower down, the whole plant may be renovated, so that we are in a condition to bring down nearer to the ground the limbs that are too high; hence strong shoots, growing on the lower part of the limbs, are to be well taken care of.

3. The young shoots may again be subdivided into:

(*a.*) Shoots that are two years old, pruned the previous year, the wood being at that time a year old.

(*b.*) Those which have grown the previous summer, and first formed a proper woody texture in the preceding autumn or winter, and were pruned, and therefore are one-year old or proper fruit-bud shoots, from which, during the next summer, the fruit-bearing shoots are produced.

(*c.*) The two-year old wood, if it has not been wholly removed by pruning, gradually passes over into the nature of limbs, and becomes old. Such additions increase the size of the vine too much, when they are not avoided by a young shoot growing down upon the limb. But, in pruning, the two-year old wood is particularly to be noticed, because, in the year when the pruning takes place, it forms the basis on which the fruit-bud shoots must be pruned. The shoots which proceed directly from the stem, or the old limbs, as a general rule, never produce grapes the first year. The two-year old wood, therefore, in a certain degree, forms the medium between the old hard part of the stem and the soft part of the year-old vine, and the fruitfulness of the latter depends on it. It is only when the shoots of a vine are, on the whole, sickly and feeble, single grapes are produced on the shoots proceeding directly from the stem on the limbs. The vine-dresser must therefore direct his attention to this point, *that the one-year old fruit-bearing limbs always set on two-year old wood, and not upon older.* If he neglects this rule, his product is only accidental.

In the choice of the one-year old wood for pruning, there arises the question, whether on the two-year old wood, we should take for pruning the lower or higher shoots? As to fruitfulness, they are alike; we must, therefore, look to the form of the vine, and in order to preserve this, and not to allow the vine to run high too quickly, we must try to keep the vine low by taking off the uppermost shoots.

A particular attention is to be paid to leave between the proper fruit-bearing shoots and the head, reserved spurs, which enable the vine-dresser to reduce the whole vine, or to bring down, in the next year, the bearing shoots to a lower place. If there is a chance to leave a spur between the fruit-bud shoots and the limbs, on the two-year old wood, such a spur must be left thereon, and if this is not the case, then a shoot from the limb must be used for that purpose. The main object of the spur is to produce fruit-wood. When such fruit-wood grows grapes on them it is well, provided they do not prevent it from getting a strong fruit-bud shoot for the next year.

(To be continued.)

THE INFLUENCE OF ELECTRICITY UPON THE GERMINATION OF SEEDS.

[Translated for the American Polytechnic Journal, from Professor Fleischer's "Experiments on Steeps."]

Reuter (see Kastener's Archive, vol. 18, p. 43) states that seeds planted in electrified earth germinate much sooner than seeds planted in earth not electrified; and (vol. 14, p. 474), that seeds which have been exposed for some time to the influence of a strong electrical current, lost the power of germination altogether. Also states, that seeds steeped in water charged with positive electricity germinate several days sooner, and it is probably the electricity which is contained in the dew, or atmospheric vapors, that cause seeds sown in the evening, and planted in the next morning, always to grow better than seeds which are covered with earth immediately after they have been sown (Dr. Reuter on "the soil and the atmospheric air in their material, gaseous, and dynamic influences upon the nourishment and perfection of plants, in regard to agriculture and forest culture," Frankfort, m. 1833, p. 306 and 307). According to Bishoff, seeds germinate sooner in an atmosphere highly charged with electricity than in the usual state (Manuel of Botany, by Dr. G. W. Bishoff, vol. ii. p. 192). Alexander Von Humboldt mentions a number of experimental philosophers, as, for instance, Nollet, Manbray, Lacepede, Achard, Cavallo, &c., who ascertained, through accurate observations, that electrified seeds germinate quicker, sprouted more actively, and blossomed earlier, and grew much more luxuriant (Aphorismen, p. 79.) Sir Humphry Davy mentions, in his Agricultural Chemistry, that rye placed in water which has been charged with positive electricity, germinates quicker than such placed in water which has been negatively charged. These experiments, although of an older date, have been confirmed through experiments made in England. Barley, wheat, rye, turnip, and radish seeds germinated sooner, the plants grew more vigorously, and were much more healthy, when the seeds were exposed to the influence of a feeble electrical current of little intensity. With other seeds, however, the same experiments gave results of an entirely opposite character. Among 55 experiments, with different kinds of seeds, 20 were favorably influenced by the electricity, 10 unfavorably, and 25 were not affected at all. Of the whole number of seeds used in these 55 experiments, 1250 succeeded through electricity, whereas 1253 did not show any sign at all (Thuringer General Garden Gazette, by Dr. Bernhardi, 1845, p. 171). Mr. Shepphard, in England, has made, of late, very interesting comparative experiments, of which we give here a short notice, although they inform us not how far the electricity here influenced the actual process of germiuation. By means of a large plate of copper, and a plate of zinc of the same dimensions, which were both sunk into the ground, and united by a copper wire; above ground, a galvanic current was formed, through the instrumentality of the moist soil. In that soil, and parallel to the plates, the seeds of lucerne, sainfoin, common clover, red beets, and yellow mangel-root, were planted in rows. Soon after the seeds had sprouted, the greater part of the young plants died in a peculiar manner. It had remarkable effect upon the turnips, which did not suffer in the least, but, on the contrary, arrived at an uncommon size, and yielded at least six times more than turnips planted upon non-electrified soil (Florists' Journal, 1846).

BRABANT MODE OF PRESERVING AND PREPARING MANURE.

In Belgium, the cattle are supplied three times a day with fresh litter. Straw cut in two is generally used, and when straw is scarce, as in the Campine, leaves, or heath sod, &c., are also used for litter. The dung is removed from under the cattle twice a day, and is thrown into a broad trench, which runs along the stable, immediately behind the cattle. The floor upon which the cattle stand is a little inclined towards the trench, and the urine, and all the water used in washing the stable, is there collected.

Besides cows, oxen, horses, and hogs are kept in the same stable.

When the dung is removed from under the cattle, it is thrown into the trench, and equally distributed therein, and the dung from the horses and hogs is carefully mixed with it. There are generally four holes left for the dung water to settle in, and when the manure begins to ferment, the dung water is taken from these holes, and thrown over the manure. This is done, sometimes, twice a day, because it is a regular rule with the Brabant farmers to keep the manure continually moist, so as to prevent a violent decomposition or fermentation. Every four weeks, the manure is hauled to the field or yard. Three or four days before hauling, no fresh dung is added; the horses are led about it to compress it more thoroughly, and the dung-water is thrown over it more frequently.

Before the manure is hauled, some farmers take off the upper layer, and throw it, afterwards, in the bottom of the trench, and upon that they cast the dung which has been kept under the cattle for three or four days previous to hauling. Although the manure remains many weeks in the stable, yet there is very little smell; even that strong smell of ammonia, which is common in all horse stables, is not there perceived, because the horse-dung is mixed with that of the horned cattle, and being more abundant, checks the violent fermentation to which the horse-dung alone is generally subject, as well as the extrication of ammonia and other disagreeable gases.

This mode of preparing the manure requires large roomy stables, but it has the advantages that the labor of removing the dung from the stable is easy, and very expeditious, the manure is more uniformly fermented and decomposed, without losing any of its fertilizing powers, as it does when exposed to the influence of the air in the yard.

Long-established experience has shown that the cows or oxen are not in the least injured by standing in mire, or by laying upon the dung, or by being confined the whole year to stables where the manure is kept for weeks.

The dung-water which accumulates in the trenches is carried to the field, and harrowed in. The manure is always ploughed in with a shallow furrow. The dark-colored dung-water, which collects around the manure heaps in the yard, and having passed through fermentation, is considered useless, and is allowed to drain off.

C. L. F., *Ed.*

WOOL AND WOOLLEN FABRICS.

The following article has been translated from a weekly journal, published at Berlin, in Prussia, which devotes its columns to statistics, commercial and financial laws, parliamentary reports, management of banks, railroads, &c., &c. It is a private undertaking, like the useful and valuable work of our enterprising countryman, Mr. Hunt. Otto Huebner, editor of the Nachrichten aus dem Gebiete der Statts-und Volkswirthschaft (No. 1, 1853), established, also, a *Central Archive for Statistics*, where he collects such matters as have reference to his undertaking, and exchanges his publication with those of the governments on the continent of Europe, and other parts of the world. The Central Archive of Mr. Huebner will, in time, furnish very important data for the statesman and merchant, and it is hoped that a similar institute will be established in this country, where the progress in every branch of industry, commerce, &c., is so rapid; where the intercourse with foreign countries is daily increasing, and where we have no bureau of statistics, to collect, arrange, and publish such valuable information for the general benefit of the public.

C. L. F., *Ed.*

Wool sold at the spring markets, in Prussia:

	SOLD. Ctr.	PAID, Thlr.*	average price.		SOLD. Ctr.	PAID. Thlr.	average price.
1826	126,816	7,953,718	61¾	1840	171,680	11,535,027	67¼
1827	110,037	7,774,012	70¾	1841	194,828	14,762,299	75¾
1828	121,588	9,402,187	77¼	1842	204,283	13,961,337	68⅓
1829	109,213	7,832,559	71¾	1843	165,129	10,685,627	64¾
1830	108,529	8,104,617	74¾	1844	192,141	14,812.056	77⅛
1831	96,211	6,666,821	69¼	1845	200,761	17,081,829	84½
1832	99,862	7,977,696	79⅚	1846	211,915	15,394,025	72⅔
1833	99,745	9,091,857	91⅙	1847	227,752	17,440,238	76½
1834	124,217	11,605,171	93⅓	1848	131,467	6,608,143	50¼
1835	129,867	11,849,000	91¼	1849	191,534	14,557,497	76½
1836	137,972	12,848,348	93⅛	1850	191,970	14,529,903	75⅔
1837	147,807	10,215,786	69⅛	1851	196,199	13,904,542	70⅞
1838	138,789	11,041,839	79½	1852	192,946	14,281,638	74
1839	161,546	12,770,682	79⅝				

The sales of the Prussian markets were, in the year 1852: Berlin, 75,873; Breslau, 49,500; Coblentz, 960; Koenigsberg, 9,460; Landsberg on the Warthe, 14,400; Magdeburg, 2,940; Mühlhausen, 750; Paderborn, 4,301; Posen, 14,942; Stettin, 19,213; Stralsund, 607. Of the markets of the Zollverein, which are not Prussian, we have no reports at hand. As the more important, we may mention Augsburg, Gotha, Bautzen, Stuttgard, Weimar, Dessau, Leipzic, Dresden, which, together, amount yearly to 18,000 cwts.

In the Prussian markets, in the space above mentioned, the prices were for 100 lbs.:

	THE HIGHEST PRICE.				THE LOWEST.		
For Extra Fine,............1835	Breslau	155	Thlr.	1848	Stettin	59
Fine,..........................1832	"	115¼	"	1826	"	46
Middle,.......................1836	"	97	"	1826	"	31½
Ordinary,....................1836	"	89	"	1826	"	26

In the spring markets, the prices were:

	IN BERLIN.				IN BRESLAU.			
	Extra Fine.	Fine.	Middle.	Ordin.	Extra Fine.	Fine.	Middle.	Ordin.
1826—29	118⅓	83⅜	61	35¼	119	87⅔	55¼	38¼
1834—37	140⅓	92⅓	78	51	140⅔	105⅝	87⅔	77⅝
1843—45	111⅞	89¼	63½	46¼	118¾	91¼	75	61⅞
1851	97⅓	75	61	42⅓	115	92½	69	50½
1852	69⅓	82⅓	66½	40⅓	130	105	80½	58

Ordinary wool, therefore, was dearer in 1852 than in 1826, but lower than in 1837, while fine and extra fine sorts, in Berlin, were cheaper than in 1826 and 1837; in Breslau, in 1852, higher than in 1826, but also lower than in 1837.

* A Prussian thaler is equal to 69 cents.

The lists of the Zollverein indicate:

	EXPORT.		IMPORT.	
Highest,............1835	181,746,		1850	221,425
Lowest,..............1851	72,744,		1834	90,373

The price abroad, therefore, was likewise lower, and at this price the wool was sold at home.

The fall of the price is to be ascribed to the circumstance that the Australian wool governed the English market, and this view is sustained by the fact that, in 1825, only 323,995 lbs., but in 1851 there were 44,000,000 lbs. of wool, imported into England from Australia, while there was, on the average of ten years, 1830–40, 26,000,000 lbs., but in 1851, only 9,000,000 lbs. imported into Germany.

This change was owing, evidently, to the high prices of wool in the first ten years, which everywhere encouraged sheep-breeding, and from the more rapid and cheaper transportation between England and Australia, and because the ships have outward and return cargoes, which is prevented in the intercourse between England and Germany by the high import duties of the Zollverein; the export of wool of the Zollverein is also burdened by an export duty of two thalers.

This export duty is a remnant of the regulations which existed, in former times, against the export of wool, and naturally accomplishes its object, and the more so, as the competition brings the prices so near to each, that the increase of two thalers is sufficient to prevent export. By the treaty of September, between Prussia and the Toll Union, this export duty is reduced to one half of a thaler.

The discoveries of Gold in Australia have so greatly raised the wages of labor, that there is reason to believe a decrease of the imports from thence will take place. But, during the first ten months of this year, England received, from her colonies, 46,163,013 lbs., for 47,457,845 lbs. in ten months of 1851, and 45,350,068 in ten months of 1850, so that the import was less than 1851, but more than in 1850, and the price appears to have ruled higher on the continent than in England, for she exported, of her own wool, in the 10 months of 1852, 11,966,672 lbs., for 6,565,479 lbs. in the year 1851. During twenty years, the whole yearly export of English wool was only three to four millions of pounds.

The number of sheep in Prussia was:

	1816.	1849.
Merino Sheep,........................	719,200	4,452,913
Half Improved,....................	2,367,000	7,942,718
Country Sheep,....................	5,174,186	3,901,277

This change of the quality of the wool must, necessarily, also exert an influence on the export, as the increasing want of ordinary wools, compared with the deficiency of production in Germany, was a cause of the rise of price during 1826 in this quality; and it caused, also, an increase of the importation of the same, and probably the want of the fine wool abroad did not rise higher than that for the coarser quality. As the number of sheep in the Zollverein, at present, is estimated at 22,000,000 head, the production of wool of these is to be taken at 440,000 cwt., and there was imported, in 1851,

Of Wool,..	160,618	cwt.
Of Yarn,......69,879 cwt.=in wool to	83,855	"
	244,473	"

There was, also, exported,

Of Wool,	72,744	cwt.
Of Woollen Yarn,.....ca.,12,000 cwt.=in wool to	14,400	"
	87,144	"
Which leaves to be wrought up,	597,329	"

That the export of woollen yarn, for 1851, cannot be accurately given, is owing to the reason that the complete lists of the traffic are not published in the Zollverein, as in other countries, a few days after the close of every month, or quarter, but 12 or 18 months after the course of a year, which includes the industrial value of the whole Zollverein bureau, and withholds the necessary information from the spirit of enterprise, which it might otherwise avail itself, every moment, in the comparison of the usual want with the import and export.

This evil prevents our estimate of the German trade in woollen to the latest period. The statistics reach no further than to 1850. Up to then, there were, in Zollverein, in woollen,

	IMPORTED.	EXPORTED.
	Prussian Centners.	
1834	11,969	51,654
1835	13,892	60,822
1836	12,500	67,950
1837	17.817	69,496
1838	21,091	64,025
1839	25,335	64,223

	IMPORTED.	EXPORTED.
	Zollverein Centners.	
1840	26,897	63,562
1841	31,618	67,709
1842	38,805	64,960
1843	31,977	69,593
1844	33,452	76,336
1845	38,063	76.494
1846	24,054	82,054
1847	17,604	89.625
1848	13,649	84,091
1849	15,761	103,655
1850	20,574	104,427

There were, therefore, in the Zollverein, in 1834, 39,685 centners, in 1850, 83,853 centners, more of woollen fabrics exported than imported.

In the same period, the export of France, in woollen, was:

1834	30,845	Zollverein-Ctr.
1840	46,515	"
1847	67,306	"
1848	79,812	"
1849	79,754	Zollverein-Ctr.
1850	81,674	"
1851	85,448	"

So that the export of France, in woollen, rose from 30,845 German centners, in the year 1834, to 85,448 centners, in 1851.

The increase, in the Zollverein, amounted to 110 per cent.; in France, to 178 per cent.

This difference is the more remarkable as, in the Zollverein, the manufacturers were aided by the export duty on wool, in purchasing the raw material, while, in France, they paid, for the same, a high import duty, the premium on export, which the greater part of the French woollen cloths enjoy, but the phenomenon shows, and appears to prove, that the raising of sheep in France, under the high protecting duty, causes less competition in domestic manufacture than is effected by the German sheep-breeding, in spite of the burdens and restrictions under which it is developed, and upon which the export duty is still in existence.

The export of England, in woollen manufactures (besides yarn), amounted, in 1834, to £5,736,871, in value; in the year 1851, to £8,375,824, after it had risen, in 1836, to £7,639,354, and in 1837, had fallen to £4,655,977. According to quantity, the difference between 1834 and 1851:

	1834.	1851.
(*a.*) Cloths, cassimeres, flannels, &c., pieces	1,910,086	2,637,290
(*b.*) Blankets, carpets, and mixed articles, yds.	6,689,147	69,253,594
(*c.*) Hose, pairs	173,063	189,893

There was a rise, according to quantity, therefore, of about 38 per ct. in *a*; of about 930 per ct. in *b*, and nearly 10 per ct. in *c*, while, according to value, there was an increase of 31½ per ct. The difference between the increase of quantity and value shows itself, partly from the circumstance that the former took place chiefly in goods mixed with cotton, and in part from the changes of price of wool and woollen fabrics.

The reports of the Zollverein bureau are, indeed, too imperfect to ascertain therefrom, accurately, what kinds of woollen fabrics have especially contributed to the rise of the exportation, but, from other sources, it may be conjectured that it was mainly the cloths.

We find the following statistics of the import of cloths and cassimeres into the United States of America.

According to official statements, which were, a short time since, given by the Bremen Commercial Gazette, the total imports, and that from the following countries, were:

	Germany.	Belgium.	France.	England.	Total.
1840	16,612	93,185	89,767	4,490,830	4,696,529
1841	18,171	143,153	180,478	4,597,145	4,942,867
1842	16,268	203,046	295,689	3,475,022	3,995,577
1843*	5,879	60,240	92,998	1,195,970	1,350,628
1843—44	43,877	350,123	594,548	3,784,456	4,777,940
1844—45	66,955	277,078	1,244,325	3,815,853	5,411,850
1845—46	198,210	298,194	1,330,701	2,354,394	4,192,310
1846—47	274,409	338,370	1,703,573	2,207,821	4,527,742
1847—48	716,931	396,712	2,466,302	2,777,612	6,364,145
1848—49	810,463	896,710	1,173,250	2,113,439	4,995,957
1849—50	1,000,231	769,799	1,639,706	2,771,282	6,184,190
1850—51	1,411,282	478,532	1,988,181	3,785,070	7,669,520

In the year 1851–52, this favorable state of German cloth manufacture does not seem to have continued. The Chamber of Commerce at Aix la Chapelle say, in their report for 1851, "If any thing has conduced to check the progress of the present manufacturers of cloths, it is the business relations of *North America*. The export to the *United States* has, for the year past, been no longer profitable, owing to the low prices, and the considerable loss on the exchange, to a very disastrous state of trade in that country. An increased import, with a diminished value of export, required important remittances on the part of the United States. The misfortunes by fire, in California, have been followed by losses and failures, and the distrust thus produced limited the credit, and also caused the foreign countries to call in their outstanding claims. These circumstances, in which the diminished value of exports caused greater remittances, produced a money crisis, which has increased the discount to 15–18 per ct."

This view of American commerce is, probably, not very exact, but that Germany, up to the middle of 1851, exported less cloth to the United States is established. In England, the whole export of woollen fabrics, in the first ten months of 1852, was greater than in 1851, viz;

2,412,225	for	2,317,351	pieces.
64,016,075	"	58,480,276	yds.

In the fact already mentioned, that the export statistics of the Zollverein

* Only for nine months, because a change took place, which required that the books should be closed at the end of July.

reach no further than to the end of the year 1850, and therefore are, at present, 22 months behind the English, no figures are furnished for comparison respecting the export of the Zollverein, desirable as this, doubtless, would be for those who have business with America, and who, therefore, may wish to know how much of the German fabrics go thither.

According to the above table, it appears that in the year 1848, while the consumption of most European countries, and the export of the same, was disturbed, and the price of wool and woollen fabrics hence were depressed, was the cause of the greater export to America, and filled the market there for 1849, but in the year 1850, by the impulse which the California gold harvests gave to speculation, as well as by the continued lukewarmness of European commerce, to have taken a new advance.

The import of *English* cloths and cassimeres in the *United States* did not rise in the same proportion with those of the German, Belgian, and French cloths, but in the years 1848–50 diminished, when the German import into America increased about 50 per cent. This was owing to the fact, that the causes which depressed the prices of wool, of fabrics, and of wages, on the continent, did not exist in England, and that the American manufactures of woollen fabrics are got up almost wholly after those of the British, and come naturally, for the greatest part, in competition with them, and that, as the course of the whole period of 12 years proves, the British manufacturers of woollens found, constantly, new and more profitable markets, particularly at home, where, for some years, the liberal policy of trade has changed, in some measure, the condition of the poor, they became a more useful, well furnished, class of laborers.

According to the official reports, the prices of American cloths and cassimeres were:

	1840.	1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.
Southbridge: Broadcloth 1. Qual. $\frac{6}{4}$	4. —	4. —	3. 25	3. —	3. 50	3. 50	3. 50	3. —	2. 12	2. —
2. "	3. 50	3. 62	3. —	2. 75	3. —	2. 87	2. 87	2. 50	1. 90	1. 87
3. "	3. 25	3. 12	2. 62	2. 62	2. 87	2. 75	2. 62	2. 37	1. 87	1. 75
4. "	3. —	2. 75	2. 50	2. 25	2. 35	2. 37	2. 25	2. 12	1. 62	1. 60
5. "	2. 50	2. 50	2. 25	2. 12	2. 25	2. 12	2. —	2. —	1. 56	1. 45
6. "	2. 12	2. 25	1. 87	1. 87	2. —	2. —	1. 70	1. 62	1. 40	1. 37
Northampton: Broadcloth...............	3. —	3. —	2. 75	3. —	3. —	3. —	3. —	3. —	2. 37	2. —
Lowell: Black Cassimere...............	1. 80	1. 70	1. 50	1. 50	1. 40	1. 35	1. 30	1. 30	- 90	1. —

Whether the reduced tariff, which went into operation in 1846, has stimulated the American manufacturers to greater exertions, as was always the case when there was a reduction or repeal of protective duties; whether, also, the increase of sheep in America has furnished them with a lower priced raw material, the reduction of price in general, as it has been found to be since 1847, is, in a great measure, to be ascribed to the impression of the extraordinary great import from Europe, and the circumstance that the *American manufacturers have learned* to work at such prices, is, perhaps, the cause that the European import, in future, will be less able to compete, hereafter, in America, than formerly, even if the American import duties were decreased.

RULES OF THE PATENT OFFICE.—No. 4.

We stated in our last that there were *seven* Examiners in the Patent Office. At the time we wrote there were but *six*, but it was confidently expected that the Bill providing for the seventh, which passed the House with so much dispatch, would also pass the Senate and become a law. The Bill was lost in the Senate, and there are therefore now six Examinerships.

Since we have been engaged in the transaction of business before the Patent Office, in behalf of inventors, we have been much surprised at the want of uniformity in the decisions upon applications for letters-patent under different classes of inventions. The constructions of Law and rulings of the Courts emanate from the Office from time to time under such different shapes, as to be exceedingly perplexing, and awaken the apprehension that principles of Law and the rights of inventors, may, ere long, give way entirely to caprice and arbitrary action.

If the correctness of our opinions in this matter should be called in question, we can publish some few recent cases entire, with the correspondence *pro* and *con*, and let those who are in doubt decide for themselves. How does this happen? and where is the remedy? The causes for these inconsistencies are several, and the remedy simple. As to the causes: *First*, the Examiners are embarrassed by an excess of business, and have not sufficient time to cultivate familiarity with the practical workings of inventions and the principles of Patent law, as laid down by the Courts. *Second*, there is a want of permanency in the Examinerships, owing to the insufficiency of the salary. By the time an Examiner becomes really qualified to act promptly and judiciously, he resigns, to avail himself in business of the knowledge and experience he has acquired in the Patent Office. *Third*, there are too many Examiners as the Office is at present constituted. There seems to be a necessity for more examiners, or some increase in the force of this branch of the Patent Office; but the present evils cannot be remedied by increasing the number of Examiners, without some provision for a supervisory and appellate tribunal. If there is any one proposition in connection with the reform of the Patent Office, more clear than another, it is this: *The Patent Office will always be embarrassed, and the rights and interests of inventors afloat, so long as the Commissioner of Patents cannot find time to supervise the reports of the Examiners.*

There are now six Examiners, possessed severally of different degrees of ability, knowledge, and experience in office, each having charge of distinct classes of inventions, and, as we have said before, each is a judge within his own precincts. Under the law it is the Commissioner's duty to decide; but it is a rare thing, in these days, for the Commissioner of Patents to decide questions of patentability. Owing to a most unfortunate misconception of the duties of this important Office, the employment of the Commissioner of Patents has of late years been mostly that of book-making; and it has come to this: that the letters and reports of Examiners, unfavorable to the grant of letters-patent, and the arguments and complaints of inventors and their attorneys in answer thereto, are rarely seen by the Commissioner, and thus, in fact, the Examiners are almost the sole arbiters and expounders of the law. How is it possible to expect any thing else but embarrassments and inconsistencies under such circumstances? We have repeatedly seen Examiners fretted, worried, and angry; we have heard an Examiner say more than once, that he would not consent to pass a certain claim though he felt sure the Courts would sustain it; we have often seen Examiners exulting in the hope or act of finding something to defeat a claim; and there is no concealing the fact that there is too much of a disposition on the part of Examiners to *reject* claims, and that where facts are wanting, abstractions and metaphysical refinements are resorted to, to carry out and foster this purpose; and lastly, we sometimes receive an Examiner's letter, which, for the credit of the Patent Office, ought to have been supervised and corrected as to *manner* as well as *matter*. In fine, it is plain to an *axiomatic* degree that the acts of the Examiner should be supervised, and that the necessity for supervision will increase with the number of Examiners; and equally plain are the duties of the Commissioner of Patents as defined by the statute. We are not inclined to be querulous, but we cannot shut our eyes to the really disastrous state of the Patent Office at the present time. When one Examiner rejects 90 per cent. of all the cases before him, and another Examiner 20 per cent., we feel persuaded that wrong must be done somewhere, and that reform is necessary. Before most of the Examiners the amount of unfinished business is so great, that a decision can hardly be looked for in a case, until four or six months have elapsed after the filing of the application; and this state of things, in our judgment, is not to be bettered by additional Examiners unless they have a *directing head*, who shall supervise them and expound the law. *Lastly*, the want of a sufficient appeal is one of the chief causes of the discrepant and arbitrary actions of Examiners, and one of the greatest grievances upon inventors. The Act of March 3d, 1839, providing for an appeal, appears really farcical, unless we suppose that the framers of that Act fully contemplated the faithful execution by the Commissioner of Patents, of the Act of July 4th, 1836 (Section 7), in regard to the refusal to grant letters-patent. Look at it! (Section 13, Act March 3d, 1839,) provides, "That there be paid annually out of the Patent fund to the Judge of Appeals, in consideration of the duties imposed, the *sum of one hundred dollars*." ONE HUNDRED DOLLARS, forsooth, to pay for hearing appeals, or rather, we should say, for correcting the errors of the Patent Office. It is clear that there was no anticipation at that time of six examiners. The mode of appeal has been recently somewhat changed, but in no respect, under existing circumstances, for the better. It is little better than a mockery, to impose upon Justice Morsell, of the Circuit Court, this extra and severe duty, for the paltry compensation of the appeal-fee of twenty-five dollars. It is now seven months since this change was made, and although a great number of appeals are before the Judge, yet he has returned his decision in only three cases.

One of the enormities in this matter of appeals is, that the inventor should pay the fee and costs in case of a reversal of the decision of the Patent Office. Take an instance, and no fiction: An Examiner rejects an application for letters-patent, and refers you to inventions which have no resemblance to the thing claimed, either through carelessness or misconception. You attempt to argue the case, and are told that you cannot be heard, and must go to the expense of an appeal. Is this justice? Notwithstanding these difficulties, we advise inventors to appeal, and to stretch their little privilege to its utmost tension, with a view of bringing about some speedy reform in this particular.

C. G. P., *Ed.*

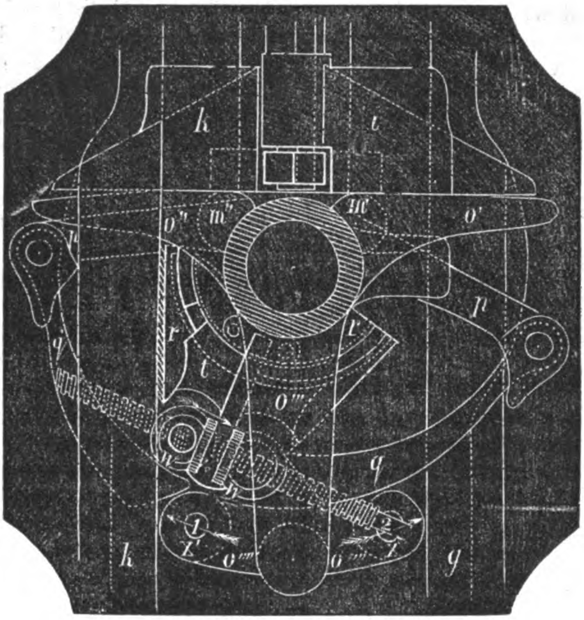
(To be continued.)

PATENT OFFICE REPORT.

IN our last No. we were understood to object to the provision of a laboratory for the use of the Patent Office. We did not make an absolute objection, but objected to it upon the ground that the Office was already embarrassed with arrears of business, and that this appeared to be adding labor to labor. We have no wish to interfere with the internal affairs of the Patent Office, and would hail the introduction of a Laboratory, or any thing else that would expedite the business of examination, and more particularly such facilities for investigation as would enable the Examiner to make up his reports in Chemical cases upon *reliable* analyses, but in the present state of the Office, the Examiner would evidently be retarded by any additional duty.

CLAIMS OF PATENTS.

Granted on the 15th and 22d of February, and the 1st and 8th of March, 1853, with explanations and diagrams, by Ch. L. Fleischman.



No. 9582. Horatio Allen and D. G. Wells, of New York—*Improved Adjustable cut-off Geering, for Puppet-Valve Engines.* Patented February 15th, 1853.

The inventors state in their specification, "that their improvements in Valve Geering have resulted from their efforts to simplify the arrangement of Cut-off Valves, patented by Horatio Allen, one of the parties to the present specification, 6th February, 1849.

"In that arrangement the toes, called in that patent secondary or loose toes, and the parts by which motion was given to the loose toes, to raise and lower the steam-valves, required several shafts to carry them. In their improvement the desired simplicity was obtained by placing the rock-shaft, which carries the exhaust-valve toes, in the same *plane with the valve-stems*, about midway between the upper and lower steam-chests. To this rock-shaft, so placed, the exhaust-valve toes are permanently attached, and on this shaft are placed the loose toes *p p*, as seen in the figure, or secondary toes, by means of which the steam-valves are operated. Motion is given to raise the loose toes by means of an arm *o* permanently attached to the rock-shaft *b*, and to lower them by means of an arm having its centre on the rock-shaft, and deriving its motion from any part whose motion commences with, or slightly precedes, the motion of the piston-valve.

"In the figure will be seen two curved pieces, or pawls, *q q'*, connected to the outer end of the loose toes by pins, on which they are free to vibrate. The lower ends of the pawls rest at the commencement of their upward motion against the rollers *x x'*, as shown in the pawl *q'*, but the surface by which it rests against the roller *x'*, is an inclined one, and unless kept from sliding in towards the rock-shaft, the toe *p'* would not be raised when motion was given to the arm o''', in the direction of arm. To provide for the control of the pawls, there is placed on the rock-shaft the arm *r*, which carries the two rollers *w w'* by means of the right and left hand screw *s*. This arm has a motion nearly coincident with that of the piston. The position of the rollers *w w'* is such, that at the beginning of the stroke, when the inclined end of the pawl *q'* rests against the roller *x'*, the upper surface of the pawl will rest against the roller *w'*, and as long as the roller *w'* is in contact with the upper surface of the pawl, the pawl must have the same motion as the arm o'''. The upper surface of the pawl is circular, and in its extreme outward position the centre of its circular surface is the centre of the rock-shaft. The parts described being adjusted as represented in the figure, and put in motion, the arm o''' carrying the roller *x'* will depend on the position of the roller *w'*. This adjustment of the two rollers *w w'* forms the adjustable feature of the cut-off, and is effected by placing each roller on an arm *t t'*, which are connected with the arm *r* by the right and left screw. By turning the screw in one direction, the arms carrying the rollers *w w'* will be separated, and by turning it in the other direction they will be brought towards each other, thus regulating the time when the valve descending by the motion of the arm *r* will arrive at its seat.

"To provide the means of working the engine by hand, there is placed on the rock-shaft the piece *m*, which is free to move round the rock-shaft. On this piece are short projecting toes, one under each of the lifters of the valve-stems, also a socket for the starting-bar. The piece *m* when worked in one direction will raise the steam and exhaust for the up-stroke, by means of the projections *n n* on the lifters, and when worked in the other direction will raise them for the down-stroke.

"This arrangement of the cut-off is exceedingly simple and compact, yet perfectly adjustable to any part of the stroke of the engine while in motion. It dispenses with the ordinary lifting-rods, thus leaving more room in front of the engine; and all the parts being supported on the rock-shaft, are under the immediate eye of the engineer. The side-pipes form the bearings for the rock-shaft, by having a pipe cast through them which is bored to the appropriate size.

"What we claim and desire to secure by letters-patent, are:

1. "The combination of pawls with the two arms, whereby the valves are lifted and tripped, as described.

2. "The construction of the arms provided with rollers, which, in their action, assist in transferring the pawls from one arm to the other, with the pawls and loose toes, as described.

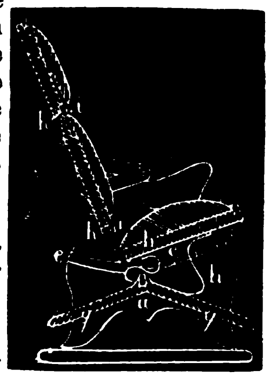
3. "The making the rollers *w w'* adjustable, with reference to each other, by means of supporting them on independent arms, and connecting them to each other and the arms by means of a right and left screw, whereby the point of cut-off may be altered.

4. "The mode of operating the loose toe, by means of pawls and rollers, substantially.

5. "The mode of working the valves by hand, by means of toes supported on the rock-shaft, substantially as herein described and represented."

No. 9583. JOHN BRIGGS, of Boston, Mass.—*Improvement in Railroad Car-Seats.* Patented February 15th, 1853.

These improvements are made upon a car-seat, for which letters-patent of the U. S. were granted to John Briggs, Esq., bearing date 6th of July, 1852.



The essential feature of this improvement before us, consists in a curved sliding-seat upon which the back rests, which slides in or out, and can be fastened in any desired position, by means of the notches *d d*. The annexed figure is a sectional side view of the car seat. *e* is a groove in the side of the frame *a*, in which the bar *c* travels. This bar has notches *d d* in its curved end; *g g* are foot-rests.

The curved bar *c*, and consequently the seat *b*, is kept in any desired position by the bent spring *h h* attached to the top of the foot-rests *g g*. The spring enters any of the notches *d d* and holds the seat firmly.

The spring by which the back of the seat is held when open, enters a metallic socket *i i*, from which it can easily be relieved when the back is to be folded up, on the spring *k k* attached to the outside of the back being pressed upon.

What I claim as my invention, and desire to secure by letters-patent, is a seat sliding in an arc formed in the frame-work of the chair, and fastened in any desired position, as above set forth, whereby the back is made to follow the motion of the seat in such a manner as to preserve a constant, or nearly constant connection and angle therewith.

No. 9584. Darius C. Brown, of Lowell, Mass.—*Improvement in Machines for Manufacturing Harnesses for Looms.* Patented Feb. 15th, 1853.

This improvement cannot be explained without the drawings, which are too complicated and extensive for our work, and we must refer to the claim alone.

What I claim as my invention, and desire to secure by letters-patent,

1st. Are the fliers L^1 L^2 constructed with a spring-nose, or its equivalent, so as to yield the twine when the needles draw the stitches into the rest, and to take up the binding-twine, or draw it tight when the stitches slip off of the needles.

2d. The apparatus, or its equivalent, for shoving the eyes off of the rod J^1, consisting of the cam J, slide d^6, lever d^3, rod d^5, and slide *e*.

3d. The revolving spring-nose flier L, or its equivalent, in combination with the needle a^5, or its equivalent, for the purpose set forth substantially as described.

No. 9585. Joshua C. Cary, of Richmond, Virginia—*Improvement in Adjustable Heading-Lever in Spike Machines.* Patented 15th Feb., 1853.

By this arrangement the heading-lever F can be so adjusted as to bend the end of the rod up or down, and effect the heading in either direction, and with only one motion upon its fulcrum. The matrix of the heading-lever is made to strike the end of the rod at the proper angle to bend the end of the rod, and draw up close with the griping dies, so as at all times to effect the heading in a perfect and sure manner.

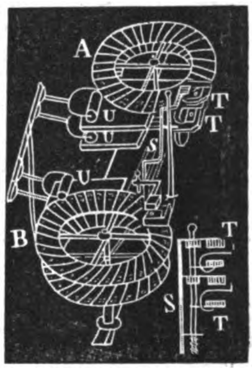
This arrangement can also be made to turn the head of the spike in the opposite direction to the point, or to make what is called a "reversed-headed spike," which is done by changing the position of the heading-lever, so as to work horizontally instead of vertically.

The figure shows a section of the machine. F is the heading-lever, moving on an axis G which can be adjusted by set-screws I I.

If the fulcrum is adjusted inside of the dotted line H H, the machine will effect a heading of the spike upward, and if adjusted outside of said line the heading will be effected downward. The dotted lines B B represent the lever working the movable jaw.

What I claim therein as new, and desire to secure by letters-patent, is sustaining the heading-lever upon a movable fulcrum, so as to be capable of adjustment to the requisite distance, inside or outside of a vertical line drawn, touching the plane of the face of the griping dies, for effecting the heading of the spike, either up or down, or otherwise, in one single motion upon its fulcrum, substantially as in the manner herein set forth.

No. 9586. RICHARD M. LESLIE, of Philadelphia, Penn.—*Improvement in paging Books.* Patented Feb. 15th, 1853.



The nature of this invention consists in two pairs of metallic wheels A and B (see figure), each wheel having a flange of spring sheet-metal, from one to two inches wide, and cut into slats from the outer edge of the flange in as far as the other edge of the solid wheel, thereby cutting the entire flange from the diameter at a tangent into spring-slats of uniform size. To the upper surface of each of these slats are cemented a copper type, forming permanent numbers from 1 to 1500, as may be required.

The wheels are supported horizontally by two metallic tubes about six inches high, the lower end of the tubes are attached to a brass plate which lies on, and is secured to, a table or bench. These wheels have an axle or rod which passes through the tube to a ratchet-wheel, and secured to its centre by a nut and screw. This ratchet-wheel is propelled by a treadle under the table, which revolves the slat wheels A and B, the distance of the width of one of these slats. Between the two pairs of slat-wheels elevated above the table are two upright metallic posts, elevated at an equal distance above the table, with two arms extending from each post to a position immediately under two spring-slats of each wheel, which are about to be pressed upon for the purpose of printing the number contained thereon, and to which slats they act as rests or supports. To each of these arms there is a frame T made of spring sheet-metal for placing the corners of the leaves of books, &c., when about to print the numbers thereon. There is a hole in the bottom of the frame, through which the type protrudes when the frame is pressed down underneath each of these frames; and fastened thereto is a knob which presses upon the slat immediately following the one in use, which prevents the frame from rubbing the ink from off the type to be used. Each of these metallic posts has a pair of sliding arms for the purpose of pressing the corners of the leaves that are in the frame upon the types or numbers about to be printed from. These arms are raised or lowered, by means of a rod S fastened to them, which, passing down through the table, is secured to and works by a treadle. There are two pairs of inking-tables U U, U', and in inking-rollers moving thereon located between the two pairs of slat-wheels in the rear of the arm-posts, each table being level with its opposite flange, and having a ledge underneath each flange for supporting the slats as the inking-rollers pass over them when inking the type; on the wheel A and B, there are four inking-rollers propelled forward and back by means of a rod attached to them running down and secured to the treadle, by which it is worked as described. The metallic plate secured on the top of the table, has grooves or slats, for the purpose of increasing or decreasing the space between the pairs of slat-wheels. There are also two slats attached to the arm-posts, which move on the plate when required, by the changing of the position of the slat-wheels, said changes being made for the purpose of accommodating machinery to suit various sized books.

The annexed figure represents a perspective view of the machine. A and B two pairs of slat-wheels. T is a metallic spring-frame for placing the corners of the leaves upon when about to make the impression. It has a hole in the bottom for allowing the type to protrude through when the leaves and frame are pressed down by one of the arms R. U U are inking-tables, W inking-rollers.

What I claim as my invention, and desire to secure by letters-patent, is:

1st. The spring-slat type-wheels, made after the manner, and operating for the purposes described.

2d. The combination and arrangement of the spring-slat type-wheels, the adjustable-posts S, sliding-arms R, spring-frame T, inking-rollers W with their tables U, and the rod K, with its ratchet and pawls, whereby I am enabled to number one side of four pages by a single movement of the treadle L, as above described and set forth.

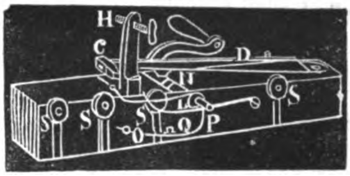
No. 9587. Louis F. Sheppard, Alhambra, Ill.—*Improvement in Artificial Teeth.* Patented Feb. 15th, 1853.

The nature of this invention consists in the application of a suitable metallic plate *d* (see figure) to the back and masticating portion *b* of the tooth or teeth, so as to protect them more effectually against injury when in use, as shown in the figure; *a* a section of an artificial tooth, the plate being so constructed as to cover the ends of the teeth which perform the chewing, and the back of the teeth may be partially or entirely covered, as may be most desirable to connect the covering of the ends to the plate *c d* (as seen in the figure), to which the teeth are fastened, and which connects them together, the ends of the teeth being fitted to receive the metallic plate by grinding or otherwise.

What I claim as my invention, and desire to secure by letters-patent, is extending a suitable metallic plate over the masticating portion of artificial teeth, to prevent them, more effectually, against injury from use, substantially as above described and set forth in the foregoing specification.

No. 9588. R. & B. White, of Menden, N. Y.—*Improved Saw-Setting Machine.* Patented Feb. 13th, 1853.

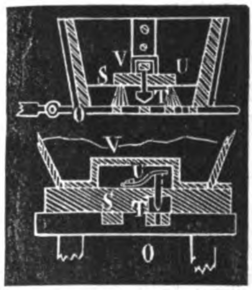
This improvement consists, according to the statement of the inventor, in a machine by which the teeth of a saw are set to any required angle, and more even than by the ordinary way, by means of a spring-hammer C (see figure), attached to the handle or spring D, so that the blow of the hammer is regulated by the spring, and strikes each tooth with equal force. The spring D is operated upon by a cam on the shaft N. The tooth-gage O P Q, or spring, takes hold of every other tooth, and draws the saw back into the required position to receive a blow from the hammer striking against the upright F; the tooth-gage O P Q being operated by a cam L on the same shaft N by which the hammer is drawn back, the teeth of the saw are always brought into the required position by means of the set-screws H and the wheels S S S S, so as to receive the blow of the hammer, and thus the teeth are all set even and alike.



What I claim as my invention, and desire to secure by letters-patent, is the combination of the spring-hammer, shown C and D, with the tooth-gage, shown O, P, and Q, both operating in the manner and for the purpose described and set forth.

No. 9589. David & Herman Wolf, of Lebanon, Penn.—*Improvement in Seed-Planters.* Patented Feb. 15th, 1853.

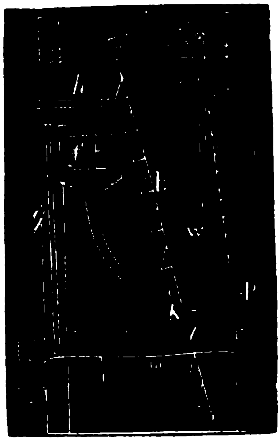
This improvement relates particularly to the arrangement of the clearers T (see figure), for keeping the openings in the slide, or slides O, always free from choaking. The clearer T moves up and down in a vertical opening in the bridge S, being held down upon the side by means of a flat spring U bearing against the upper end of the pin, so that as the slide reciprocates, or moves back and forth, the clearer rises and falls, forcing the seed through and keeping the apertures from choaking. This spring is covered with a cap V, which prevents the seed in the hopper from coming in contact with it. The lower end of the clearer is rounded so that it rises out of the seed aperture whilst the spring U will again force it down, and in this way the clearer is made to serve an important office in this seeding-machine.



Having described the construction and operation of our invention and improvement, we will next state our claims; therefore, what we claim as new, and desire to secure by letters-patent, is the movable clearer T, arranged and operating in the manner and for the purpose herein set forth, as represented in the above figure.

No. 9590. H. Bradford & E. Fitzgerald, of New York City—*Improvement in apparatus for separating ores, or other substances of different specific gravity.* Patented 22d Feb., 1853.

From the annexed drawing it will be seen that the peculiar manner of suspending by means of rod *w q*, and short rod *r*, and vibrating the pan *m* gives to it by machinery a motion resembling that given by hand in separating ores by panning on a shovel, which motion impels forward the substances to be separated, raised by the endless belt and buckets *b*, and carried through funnel *f* provided with a whirl *h*, into trough *k*, and from that upon the pan *m*. Upon the substances on the pan descends a current or currents of water through P, which has a fair action on them, and carries back such as have less momentum than the particles of the greatest specific gravity, which overcome the current and are discharged over the front end.



And it will also be observed, that the lighter particles which are carried back by the current of water will be discharged through a series of holes *i* in the bottom and about midway between the back end of the pan and the place where the ore mixed with water are delivered into the fan. These holes should not be so large as to disturb the surface of the water, and by suction draw down the particles that float on the surface; for it is well known that particles of certain descriptions of ore do not get fully or entirely wet, or that ore in thin flakes will float on the water, although of greater specific gravity than water, or the substances from which the ore is to be separated.

The particles that float on the surface will be carried back and discharged with the water over the rear end, where they can be collected. The pan, instead of being a regular curve, which is believed to be best, may be composed of inclined surfaces, although a regular curve or segment of a circle will be found to be best in practice.

The peculiar motion of the pan obtained as above described by having it suspended to the long pendulous *u*, and the short inclined rods *r*, or by having the rear end suspended in the same manner as the front, may be obtained by other equivalent means, such as having rollers or wrists attached to the sides of the pan, and running on ways or in grooves of the required form to generate the same motion in kind as that above described.

We claim as our invention, giving to the reciprocating pan, substantially such as above described, the peculiar motion above described, and by the means substantially as herein described.

We also claim giving the back movement to the said pan, in a less period of time than the forward movement by means of a crank or cranks, whose axis of motion is below or above the plane of motion of the rear end of said pan, or by equivalent means as described, and for the purpose specified.

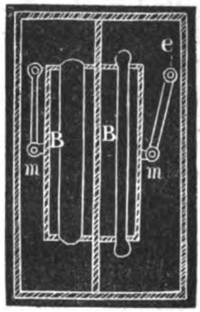
We also claim, in combination with a pan, having the motions, or either of the motions, substantially such as specified, and on which the ore, &c., mixed in water, is supplied at some point towards the middle or back, the employment of a current or currents of water descending the inclined or curved surface of the said pan, in the manner and for the purpose substantially as specified.

We also claim making the rear end of the said pan, with an inclination or curve upwards, substantially as specified, and for the purpose set forth.

We also claim making the said pan, operated as specified, with apertures back of the place where the substances to be separated are supplied, for the purpose, and in the manner substantially as set forth.

We claim, finally, making the front and rear ends, or either, of the pan having a vibratory motion, with a gradual curve downwards, substantially as specified, when the same is employed in combination with currents of water, substantially as, and for the purpose specified.

No. 9591. ALEXANDER A. CROLL, of London, England—*Improvement in Gas-meters.* Patented Feb. 22d, 1853.



"The object of my invention," says the inventor, "in this mode of constructing gas-meters, known as 'dry-gas meters,' is to prevent that flickering of the light so commonly resulting from the use of this kind of meter, and the production of an accurately registering apparatus, which may be depended upon."

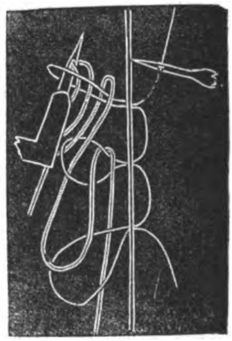
The inventor makes two movable partitions B (see figure), giving motion to two ears, such as *e e*, which work the valves and the registering wheels.

To obtain this accuracy in measuring gas in dry-gas meters, it is by employing as large a disk of metal, and surrounded by as narrow a margin of flexible material as possible.

"I claim the mode of arranging movable partitions or plates B, so that the flexible material at the circumference of the plates, shall not be bent but in one direction, substantially as set forth in the specification and accompanying drawings.

"I also claim the arrangement and combination of the cams *f f** and *i i** with the valves and movable plates B of a dry-meter, as set forth."

No. 9592. WILLIAM H. JOHNSON, Greenville, Mass.—*Improvement in Sewing Machines.* Patented Feb. 22d, 1853.

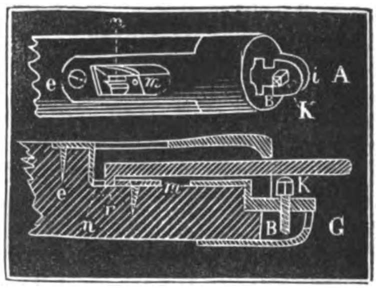


The figure shows the double-loop stitch, produced by this improved sewing machine.

The inventor claims "making the double-loop stitch, having the loops upon one side of the cloth, by means of two needles, combined and operating substantially as herein described.

"I also claim the making a seam, or uniting two pieces of cloth, by means of the double-loop stitch, herein fully described, consisting of a plain stitch, from a single thread on one side, and on the other of a continuous chain, formed of a succession of double loops from the threads."

No. 9593. ALPHEUS KIMBALL, Fitchburg, Mass.—*Improvement in Scythe-fastenings.* Patented Feb. 22d, 1853.

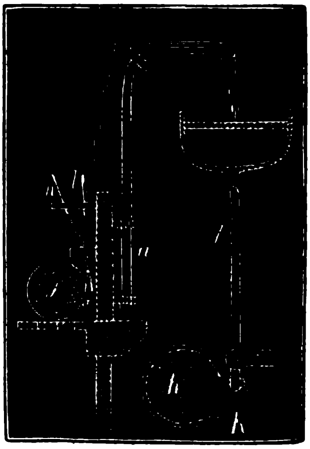


This is an improvement upon a scythe-fastener, patented by E. S. Clapp.

Figure A is a perspective view of the scythe-fastener, B the metal cap, K the screw to set the scythe with, the shank of which enters the cap, and hooks with the claw *r* (see Figure C) into the bush piece *m*.

The inventor "claims the method of securing the blade of the scythe to the snath, by passing the shank through the end of the stationary metal cap B, and securing it by means of the upward pressure of the screw K, in combination with the claw *r*, and bush piece *m*, constructed and operating in the manner substantially as described."

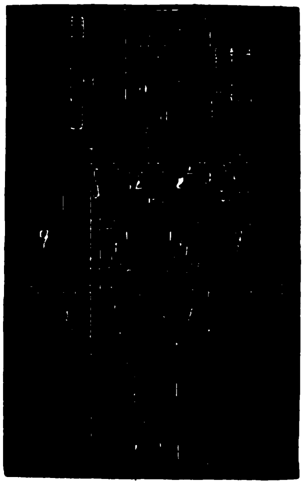
No. 9594. William Stirling Lacon, Great Yarmouth, England—*Improvement in Suspending, Lowering, and Liberating Ships' Boats.* Patented Feb. 22d, 1853.



In lowering the boat, the lever *l* is first pulled forward, in order to make the friction strap *k* retain its hold of the friction pulley *h*, and thus prevent the premature revolution of the shaft *f*; on loosening the friction strap *k* the boat will descend; by means of this strap the boat can be prevented from running down too fast.

The inventor "claims suspending ships' boats, by having the chains or ropes so connected with drums or barrels, substantially as specified, that the two ends of the boat shall descend together, and with equal, or nearly equal, velocity, and so that the chains or ropes shall be free to disengage themselves from the barrels, in combination with the mode of controlling the turning of the barrels by the weight of the boat, &c., substantially as specified."

No. 9595. James Moreland, Adrian, Mich.—*Improvement in Mortising Machines.* Patented Feb 22d, 1853.



The inventor makes the pitman-rod *d* (seen in the figure) extending down, and jointed to a noddle iron *e*. The pitman has a strap *o* extending down from the upper part, by means of which it can be elongated, whereby the chisels can be used for several inches longer before they are worn down and must be removed; below that part described, the pitman divides into three branches.

The cross-heads slide up and down on V shaped ways *f f*; it has a bar *e* across its front; to this bar the slide working the chisels are connected; on either side is a guide-frame *h*; they are caused to move the bar *e* entering a notch, and move with the noddle iron; at the upper end of this slide there is a projection *i*, which causes the slide to move to a certain point; when detached before it stops, which allows the withdrawing of the chisel from the work, before coming to a state of rest. A similar projection is below, to prevent the slide from being carried so high that the bar cannot be made to enter the notch. This forms a convenient mode of attaching and detaching either or both chisels, while the machine is running.

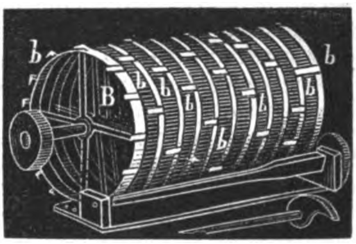
"I claim the combination of the cross-bar *e* on the cross-head, with the projecting dog i^2 on the movable way, for the purpose of withdrawing the chisel from the wood, on the back motion of the cross-head, substantially as set forth."

No. 9596. A. B. Taylor and S. Wilcox, Jr., Westerly, Rhode Island—*Improvement in Let-off Motion in Looms.* Patented Feb. 22d, 1853.

The explanation of the claim for this improvement in looms would require the drawing, which is too complicated for our work; we have to refer to the claim alone.

"We claim effecting and regulating the let-off motion, by the variable counterpoise lever, in combination with the sliding-worm pinion, when said worm-pinion is acted on by the yarn-beam, through a direct strain, communicated to it by the tension of the warp; the whole arranged and combined in the manner specified."

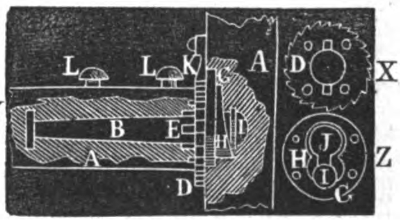
No. 9597. Richard Ward, Jerome B. Hubble, and H. C. Hubble, Naugatuck, Conn.—*Improvement in Machines for Turning Irregular Forms.* Patented Feb. 22d, 1853.



The cutter-wheel B is made of a series of separate metal rings, and secured on a shaft; the cutters *b b b b* are attached to the periphery of the circle, and are adjustable. The pattern developed on the surface of the wheel, will be the reverse of the pattern to be turned.

"We claim as our invention the use of a cutter-wheel, for turning irregular forms; the cutters being so arranged that the pattern may be disclosed in reverse, on its surface, when combined with the feed-motion herein described; so that, in turning said cutter-wheel, the desired irregular shape will be given to the article, without using guides or patterns, when the *whole* is constructed, arranged, combined, and made to operate, substantially as herein described."

No. 9598. A. N. & A. Case, of Gustavus, Ohio—*Improvement in Bedstead Fastenings.* Patented March 1st, 1853.



The four posts and rails of the bedstead are secured together by fastenings, as represented in Figure Y: A representing the rail, and A′ the post, B the tenon; on the end of the rail is screwed the rachet D (Figure X).

"Any degree of tension," says the inventor, "can be given to the bed-cord, by turning the side or end-rails A in the proper direction. The tension of the cord is retained by the pawl K. When the bedstead is disjointed, the rails are raised, so as to allow the head of the tenon to be withdrawn through the hole J of the piece G (see Figure Z) and fastened into the post A′."

"What we do claim as new, and our improvement, and what we desire to secure by letters-patent, is the combination of the inclined plane H and head I, with the pawl and rachet D and K, for the purpose of fastening bedsteads, and tightening the cord, in the manner specified."

No. 9599. Augustus C. Harig, Louisville, Kentucky—*Improvement in the Swivel Nibbed Keys for Door Locks.* Patented March 1st, 1853.

"By this arrangement," says the inventor, "it is obvious that no protruding portion of the key proper, by which the lock-bit is moved, is presented on the outside of the lock, and consequently, that no opportunity is afforded on that side for the application of pick-lock instruments to outsiders."

Figure 1, side view of the key with shaft and bits *c* and *d*.

Figure 2, side view of main-bit *c* and guard-bit *d*, with the latter revolved half round on its axis or tenon, and showing the position of the groove in the latter for the reception of the annular collar.

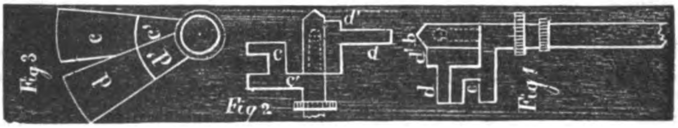


Figure 3, transverse section through the main-bit safety-guard, partially revolved.

"I am aware that the nib of the key has been fitted into the tubular shank, and so secured therein, by a pin fitting into a groove, that the burglar's instrument, when applied to the nib, would rotate it, without moving the key; and in connection therewith, I am also aware that the key, by a plate attached to the inner-lock plate, has been held, so that it could not be rotated, and I therefore do not claim these devices; but

"What I do claim as of my invention, and desire to secure by letters-patent, is the guard-bit *d* attached to the swivel-nib, in combination with the ordinary bit and shank of the key, constructed and operating substantially as herein set forth."

No. 9600. James McKay, of Philadelphia, Pa.—*Improvement in Rotary Steam-engines.* Patented March 1st, 1853.

An explanation of the claim, without drawings, is impossible; we are forced, in consequence of the extensive drawings and numerous figures, to give the claim alone. The inventor says:

"What I claim as my invention, and desire to secure by letters-patent, is the passages for the exhaust steam, arranged so that they shall cover and encircle the entire periphery of the stationary cylinder, and have their ingress and egress openings so arranged as to cause the exhaust steam, as it escapes, to envelop the whole surface of the cylinder, as described.

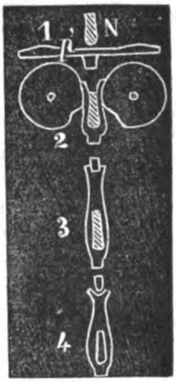
"In combination with the ordinary valves, and parts which form a passage for the steam to and from the engine, I claim the supplemental exhaust parts and valves, which act in conjunction with the ordinary exhaust valves, whereby a free egress for the exhaust steam is afforded, without leaving large open passages for the steam to waste in.

"I also claim the combination of the sliding-pistons, with self-adjusting valves and steam ways, which admit a portion of the steam that propels the piston behind its inner end to act as a spring, to press it out into the steam space, whichever way the engine may be turning.

"I also claim mounting or hanging the two cylinders on radial and axial journals, respectively arranged in a common plane, and at right angles to each other, whereby the two cylinders can accommodate themselves to each other, so as to avoid binding, substantially as herein set forth."

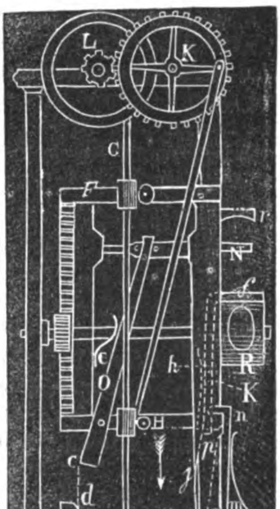
No. 9601. Jonas Simmons, of Cohoes, N. Y.—*Improved Machine for Making Axes.* Patented March 1st, 1853.

The object of the improved machinery is to accomplish the most difficult part of the process by machinery, and at one operation.



A bar of iron is forged (of the shape shown by Figure 1), of the proper width for the axe, but somewhat thicker than would be necessary if the work was to be completed under the hammer.

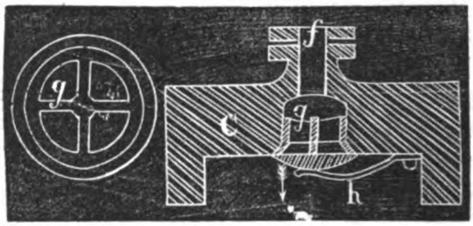
The rolls being placed in the position shown by figure, the bar p', heated to a welding heat, is laid on the rolls, with its centre supported by the *rest bar* f, with the *eye-bar* N lying above it. The machine being now put into operation, the frame F moves downwards, turning the rolls inwardly towards each other; the bars f and N carrying down between them the bar, the iron closing around the eye-bar (as shown in Figure 2), and having its edges kept separate by the scarfing-bar r. As the frame progresses downward, the bottom c of lever o, tripping against the stop d, draws the eye-bar out from the eye of the axe (as shown in Figure 4), when the axe falls from the *rest-bar* just as the frame F ceases to move downward. The motion of the frame is now reversed, and it goes upward, until the rest-bar f has reached its position again. When the frame reaches this point, the detent n, which has been kept back by the pressure of the lower extremity of the frame at p, drops into its notch in h, and holds the *rest-bar* f still, whilst the eye-bar N goes up with the frame, and then descends with the frame again. The object in permitting the eye-bar to move up whilst the rest-bar stands still, is to allow time and space to lay a fresh axe-bar in place of the one just made into an axe. As soon as the frame descends low enough to bring the bars into position (as shown in figure), in which they grip the axe-bar as in a vice between them, the lower point f of the frame, pressing at r, throws the detent m out of the notch at n, when the spring j forces the bar h forward with the stops k k into the side-necks t t, so that the frame, in its further downward course, carries the *rest-bar* and eye-bar down, together with the axe-bar, between them through the rolls, as above described, till the axe is dropped from the rest-bar.



It will be noted that as the lever O ascends with the frame F, and its lower extremity is released from the pressure of the stop d, the spring e forces the eye-bar out for service.

"I claim the arrangement of the devices, above-mentioned, for making axes, viz: *rolling dies*, with a *rest-bar* to support the iron whilst being rolled; and an *eye-bar*—arranged not only as a mandrel—to shape the eye of the axe, but with the *rest-bar* to hold the iron during the process of rolling; the *rest-bar* and *eye-bar* being connected with the machinery, to give them appropriate movements, to cause them to co-operate with the rolls in shaping the axe; and these parts further in combination with a *scarfing-bar*, for the purpose of shaping the blade to receive the steel-point, in order to complete the axe, substantially as the same is set forth in the within specification."

No. 9602. CHS. A. SPRING, Kensington, Penn.—*Improved Supplement Valve in Reciprocating Steam-engines.* Patented March 1st, 1853.



The nature of this improvement consists in a valve *g* (see figure), which opens towards the cylinder, as the arrow indicates, in such position in the steam-chest lid, that it will open by the pressure of the steam in the boiler, to permit the steam to pass from the latter into the cylinder; but whenever the pressure on the side next the cylinder becomes greatest, and steam begins to return to the boiler, then this valve *g* will close and arrest the reflux, so that whatever force is exerted in compressing the steam in the cylinder, before the piston, as it approaches the end of its stroke, will be given out again on the return of the piston, to aid in accelerating its motion, so that the force required to arrest the momentum of the moving parts at one stroke, is borrowed from the stroke, and added to the next.

"What I claim as my invention, and desire to secure by letters-patent, is the arrangement of a valve in the lid of the steam-chest, or the equivalent thereof, between the cylinder of a steam-engine and the boiler, in such manner that it will prevent the reflux of the lead-steam, by closing, whenever the pressure of the steam in the engine exceeds that in the boiler; and opening again, whenever the pressure in the boiler is greater, substantially as herein set forth."

No. 9603. WILLIAM TOWNSHEND, Hinsdale, Mass.—*Improvement in Looms.* Patented March 1st, 1853.

This improvement consists, as set forth in the specification, "in the construction of looms for weaving, whereby the harness and heddles are moved with greater certainty in all kinds of figured weaving, and with less machinery than heretofore employed: also the picking motion, for throwing the shuttle, is simplified; the warp is allowed to be drawn off the yarn-beam with more certainty and regularity, and the rock motion for the cloth is more effective, simple, and cheap; and lastly, the selvages to the cloth are formed by a peculiar arrangement of levers, to work the sheds of the warp." This improvement is represented in several figures, which are too complicated to be shown in our work; and we must refer those interested in these kinds of improvements, to the records of the Patent Office.

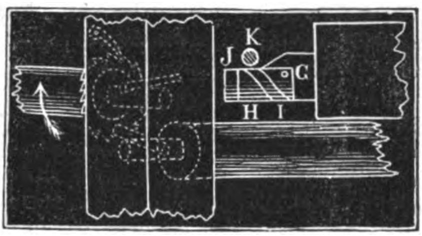
The inventor "claims the cam-wheel *l* on the chain-shaft 31 right-angle lever *l* 1, and staples or side-bolts 36 and 37, combined and acting as described and shown, to bring the picking motion into operation, alternately on each side, by the backward motion of the lay, as specified.

"I claim actuating the picker-staffs by the lay, on its backward motion, by means of the vibrating studs, when combined with levers 40 and 45, attached to the swords of the lay and bent-levers *m*, *m* 1; the whole arranged and combined in the manner described.

"I claim the levers *o* 2 and *o* 3, connected together by the adjustable-pin, so as to give greater or less motion to the selvage-warp, when actuated by the cam *o*, as described and shown.

"I claim the apron or straps 60, connected to the bar *s*, and kept to the cloth, by the proper weight or power, so as to cause sufficient friction to wind the cloth on the cloth-beam, when said apron and bar are moved or actuated from the lay, or otherwise, so as to produce the effects herein described and shown."

No. 9604. E. S. Taylor, Cleveland, Ohio—*Improvement in Bedstead Fastening.* Patented March 1st, 1853.



The figure shows a perspective view of a post and rails, with the improved fastening. The figure is a side-view of a rail-fastening. The inventor says:

"I claim as my improvement, and desire to secure by letters-patent, the combination of the pawl and ratchet with the spiral-grooved sections H I and H I' attached to the tenons G G, arranged and applied in the manner and for the purpose herein specified; namely, the tenons of one side-rail and one end-rail being furnished with the plates, having the spiral groove turning to the right and left, as described, turning in the direction of the arrow, and making a tight joint with the post; the other side and end rails having on their tenons a groove, passing around the tenon at right angles to the axis, and fitting the pins K, as described, so that, by having one side of the tenon on each end flattened, to enable it to pass the pin, in order to allow it to enter the groove, when, by turning in either direction, less than a complete revolution, the pin fitting into the groove prevents the posts and rails from separating; and by attaching the ratchets to the end of this side-rail and one end of the end-rail, with the pawls attached to the posts, as specified, by tightening of the cord, put on in the manner described, the whole frame of the bedstead is held firmly together, by the combined action of all the parts described; one end-rail and one side-rail remaining stationary, the other end-rail and side-rail turning as described, for the purpose of tightening the cord, both being secured by the pawl and ratchet."

No. 9605. William Wheeler, Troy, N. Y.—*Improvement in the Construction of Curry-Combs.* Patented March 1st, 1853.

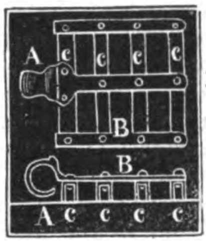


Fig. 1.

Fig. 2.

The nature of this improvement consists in making curry-combs with a thumb-loop A (see Fig. 1), instead of with handles, as they have been made hitherto. Figure 1 represents a top view of such curry-comb, and Figure 2 a side view.

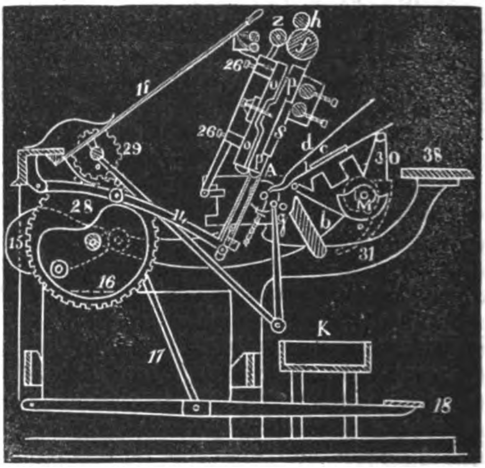
"What I claim as new, and desire to secure by letters-patent, is the application of a ring, loop, or fixture, on curry-combs, for the insertion of a thumb, as a guard and rest, therefore the ring or loop being made in one piece, with the back strap, as set forth."

No. 9606. Seth Adams, of Boston, Mass.—*Improvement in Printing Presses.* Patented March 8th, 1853.

The figure represents a longitudinal section of the press.

The pinion 29 on the fly-wheel shaft gives motion to wheel 28; on the shaft of which there are two impression-cams 15, one of which is shown in the section. On the same shaft are fixed also cam 16 for moving the inking-rollers over the type. On the inking-cylinder is placed the vibrating ink-distributing roller *h*, and the feed-inking roller Z. From roller *i* the ink is taken to ink-rollers *g′ g″*. These rolls are moved up and down over the type S. The rolls *g* give direction to the paper into box K as it comes from the platen, and passes between rollers *g*. 7 is a gage, against which the paper is placed for the purpose of registering it.

This gage is put upon a rod, and rests upon the platen *b* during the time platen *b* is at rest, and while *b* is going up to give the impression to the sheet; but when said platen returns to its place of rest, said gage is caught by a catch, and held suspended till the paper, which has been printed on the platen *b*, is carried downward by the motion of the tympan-cloth, to the two rollers *g*, when it is taken between them, and carried to the box K. In order to carry the sheet down to the rolls *g*, the tympan-cloth 30 on the platen *b* is moved downward as follows, viz: The tympan-cloth 30 is connected to the segment *a* by belts. This segment is on shaft M. When the impression has been given, and the platen *b* is returning to its place, the catch catches into a ratchet, thus turning shaft M and segment *a*, and giving motion downward to the tympan-cloth 30, which cloth carries the sheets with it to the "take-off" rolls *g*, between which rolls the sheet is taken and conveyed to box K. *c* is a gage against which to put the paper to register it. This gage is held to the platen *b* by a screw, and can be moved in the slot, to conform to different-sized sheets, by turning the screw, and then moving the gage as required. The chase, in which the type is locked, is keyed to bed *p* by a key; *s* is type, *p* the bed. The bed is screwed to the cross-piece *o o* by a screw. In order to adjust the bed, and give more or less impression, from set-screws 26 26, are screwed into the cross-piece *o o*, the ends of which screws set back against the bed. When these screws are turned, the impression is augmented or diminished, as circumstances may require. 38 is a table, on which to put the paper; it is screwed to each of the arms of the frame 31. The impression is given by the two cams 15 15 on the main shaft. 18 is a treadle, 17 connecting-rods, which are attached to fly-wheel and pulley by crank-pins and treadle. 11 is a hand-lever, for stopping the impression of press. This lever has on it a fork, which fits into the groove on a clutch; said clutch is fitted to driving-shaft of pulley 29, with a spline to prevent it from turning on said shaft. When this lever is moved to the right, it disengages the clutch from a corresponding clutch or pinion 29, and leaves the pinion on driving-shaft free or loose, so that the spur-geer and cams can stop.



"I claim, 1st, the combination of said vibrating platen with the sheet-holders, arranged as herein above specified, so as to be kept up a little distance from the platen, when in position to receive the sheet, and moving with said platen to the form, in order to hold the sheets thereon, and draw them from the type; also the gage from separating the sheets.

"2. I also claim the mode or means, herein above described, for keeping the sheet-holders up from the platen, when the sheet is to be placed; said means consisting of an arm on each end of the rod, on which said holders are fixed, and with which they turn and stop, against which said arms strike; the arrangement and operation being substantially as herein set forth.

"3d. I also claim the apparatus for delivering or taking off the sheets from the platen, after it is printed, consisting of the moving or sliding tympan-cloth, in combination with the turning segment *a*, to which an intermittent and reciprocating rotary motion is imparted by catch 47 and ratchet *e*, and spiral spring 48, operating as above specified."

No. 9607. Henry Bessemer, Baxter House, England—*Improvement in Cane-juice Evaporators.* Patented March 8th, 1853. In England, Feb. 24th, 1852.

Specification.—With regard to my invention of a method or methods of evaporating and concentrating saccharine fluids, without boiling or bringing such fluids in contact with pipes, or surfaces heated by fire or steam, in order that it may be fully understood, and in what respect the same differs from other methods of evaporating saccharine fluids already known or practised, I will first give a brief description of some of these methods, and then proceed to explain the manner in which I accomplish this object.

The evaporation of the saccharine juice of the sugar-cane, has, for a long period of time, been effected by applying fire to the bottom of the vessel containing the fluid to be evaporated; and this method is still extensively used in the British Colonies and many other countries; but it has been found that saccharine solutions, when exposed to a high temperature, soon acquire a dark color, part of the sugar being converted into glucose, and rendered uncrystallizable, in which form it is more generally known as molasses.

To lessen this evil, various modifications of apparatus have from time to time been used, in which heat is transmitted to the saccharine fluids by steam, circulating in pipes which pass through and among the fluid, and thus impart the heat necessary to boil it and throw off the aqueous portion in the form of steam; it further being found that boiling by steam also produces an injurious effect on saccharine fluids, and to remedy which numerous attempts have from time to time been made.

The apparatus invented by Howard for this purpose, and well known under the name of the "Vacuum Pan," is intended to lessen such injurious effects, by causing the fluid to boil and throw off vapor in a close vessel or pan, in which a partial vacuum is maintained by a suitable condenser and air-pumps, the boiling point of such fluid being lower in a vacuum-chamber than when under the influence of the atmosphere.

The heat, however, required to produce ebullition in the vacuum-pan, is transmitted thereto by steam-pipes, which pass in and among the fluid to be evaporated, the lower side of the pan being double, or jacketed, for the purpose, also, of containing steam.

Since the period of Howard's invention, other means have been devised and patented for evaporating saccharine fluids in such manner that the bulk of the fluid should be maintained below the temperature at which such fluids boil in the open air.

To effect this object Mr. Cleland invented an apparatus in which a convoluted worm or tube is mounted on a horizontal axis extending across the evaporating-pan or vessel, in such manner that a portion thereof is immersed in the fluid to be evaporated, to assist which steam is made to pass through the convoluted tube, and as it revolves upon its axis, a thin coating of the fluid is taken up upon it and exposed to the action of the surrounding atmosphere.

In order to heat the fluid to be evaporated, the pan or vessel is constructed with a chamber below it, containing steam, which steam, by contact with the bottom of the evaporating-pan, transmits heat to the fluid in which the revolving-tube is partially immersed.

After the publication of this invention a patent was obtained in England by Mr. Augustus Gadesden, whose invention consists of a revolving cylinder or drum, composed of bars or tubes.

This drum is mounted on an axis which extends across the pan, and at such a height above it, that the bars of the drum, as it revolves, may dip into the fluid to be evaporated, a thin coating of which is taken up upon them and exposed to the atmosphere, whereby it becomes cooled and assists in lowering the temperature of the fluid in the pan.

The pan or vessel is usually inclosed in a furnace, and fire is applied directly to the underside of it, for the purpose of heating the fluid therein. In like manner plain circular disks or plates of metal, have been mounted on an axis, and made to dip into the fluid to be evaporated and take up upon their surfaces a thin coating of it, which is thus exposed to the cooling influence of the atmosphere, and at the same time assists evaporation.

On the 15th of April, 1851, a patent was obtained for England, by Mr. Herman Schrœder, for "Improvements in manufacturing and refining Sugar," the invention consisting of a combination of steam-pipes with revolving disks.

Other plans have also been proposed, in which air has been forced below the surface of the fluid and allowed to bubble through it, and thus keep down the mean temperature of the bulk of the fluid below the point at which the same would boil in the open air.

Before entering into the details of my apparatus for evaporating saccharine fluids, I wish to be understood that I have discovered that in all cases, and in all forms of apparatus in which solutions of sugar are brought in contact with metal tubes or surfaces heated by steam, the heat thus transmitted produces an injurious effect in such saccharine matter, and also that to prevent such injurious effects of heat, it is not sufficient that the mean temperature of the fluid should be kept below the boiling point of such fluid in the open air, by exposing it in thin films or coatings to the cooling action of the atmosphere, while at the same time other portions of the fluid are in contact with metal heated by fire or steam, whereby the low mean temperature of the saccharine fluid in the pan, is the joint effect of exposing such fluid to an injuriously high temperature on one set of surfaces, and to an unnecessary cool one on others, and is not the result of the application of heating media, at a low temperature, as in my invention, which is hereinafter described.

In all cases where I apply heat to the bulk of the saccharine fluid in the pan, I prefer that the surfaces used to transmit such heat shall not exceed a temperature of 140 or 150 degrees Fahrenheit, and so ebullition cannot take place at this low temperature, I force large quantities of heated air, also, at about 140 or 150 degrees Fahrenheit, in contact with the fluid, which has the effect of keeping it at a uniform temperature, and of absorbing the aqueous portions of such fluid, which pass off in combination with the air in an invisible vapor.

The apparatus for carrying into effect my invention, is represented in the accompanying drawings, whereof Figure 1 is a cross-section of Figure 2. Figure 2 is a longitudinal vertical section of it, taken on the line C D, of

Fig 1.

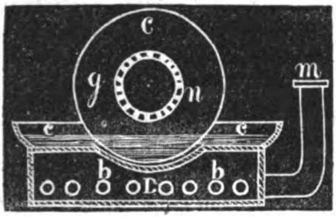


Fig. 2.

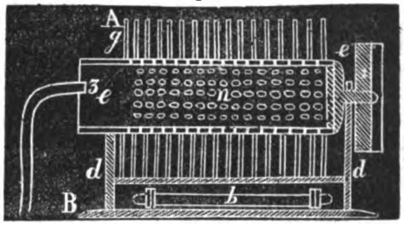


Figure 1. *a* is a tank or vessel (constructed of plate-iron, or other suitable material), for the purpose of containing water, which is kept at any desired temperature by the pipes *b* which pass through it and are heated by steam.

The upper part of the tank has a close cover riveted thereto, which is hollowed out so as to form the sugar-pan *c*, the central part of which is accurately curved, forming a segment of a cylinder, the rivets being countersunk, and the plates put together with butt-points, so as to leave no projections on the inside of the pan *c*.

At each end of the tank there are formed bearings d^1, and d^2, for the purpose of supporting a large tubular axle *e*, which is closed at one end by a suitable cover e'.

This cover is elongated, and forms an axis on which that end of the tube is supported. The opposite end of the tube e^3 is open and rests on the bearing d^1.

The tubular axle *e* has a screw-thread on it. This thread is to be about a quarter of an inch in depth, and of such breadth as to fit a plate *g* of sheet-metal, which is to be inserted therein.

The distance between the convolutions I prefer to be from half an inch to one inch; but it is by no means limited to these dimensions.

These plates of metal *g* have circular holes in their centre of about half an inch less in diameter than the axle *e*.

The plate *g* has a slit cut in it, and each edge of the metal next to this slit is reduced to half its thickness, in order that a similar edge of another plate may be riveted thereto without increasing the thickness at that part.

Instead of this mode of uniting the plates, the edges may be "plowed and tongued." A number of circular plates thus prepared, are sprung sufficiently to cause their under edges to be inserted in the spiral groove or thread of the axle *e*, on which they are fitted and riveted together. The above-described modes of joining the plates together constitute no part of my invention.

When as many plates are thus put on as will occupy the spiral groove from end to end, a *large screw* will be formed by them.

On that part of the axle *e* which intervenes between the spiral blades or threads of the screw, a great number of holes are drilled into the interior shown at *n*. These holes extend entirely around the axle, at a distance of a few inches apart, and are for the purpose of admitting jets of air in between the convolutions of the screw.

The action of the apparatus is as follows: The tank *a* is first filled with water, by the opening *m*, and steam is admitted to the pipe *b*, which consists of several lengths united by bends at each end, so as to form a continuous passage for the steam to rush through. Or, instead of these pipes, fire may be applied to the underside of the tank *a*, the object in either case being to heat the water, which forms a bath for the sugar-pan against the underside of which the water is in contact.

A thermometer may be inserted in the opening *m*, for the purpose of ascertaining the temperature of the bath, which I prefer to use at 150 degrees Fahrenheit. The opening *m* is left open to the atmosphere, in order to prevent (even with carelessness), the water from being raised above 212 degrees Fahrenheit, and consequently so as to prevent latent heat of steam from acting upon the metal against which the saccharine fluid is in contact, and although I have herein described water as being used as a heating medium, the heat may be transmitted to the fluid in the pan by heated air, or by any liquid or aeriform fluid, whose temperature is below 212 degrees Fahrenheit; or the process of evaporation may be carried on by the application of heated air to the fluid on the surfaces of the moving or revolving apparatus, without any application of heat to the bulk of fluid in the pan, otherwise than what it may obtain from the revolving apparatus, which becomes heated by the air so brought in contact therewith.

I also use a blowing fan, or other convenient air-forcing apparatus, which I connect with a pipe *t*. One end of this pipe is inserted into the open end e^3 of the hollow axis of the screw.

The air so forced, I prefer to heat to about 150 degrees Fahrenheit, by the application of heat to the pipe which conveys it to the evaporating apparatus, or by any convenient mode of heating air already known and practised.

The saccharine fluid is let into the pan so as nearly to fill it; rotary motion is then to be communicated from any first mover to the axle *e*, which should revolve at the rate of about eight or ten revolutions per minute.

As the screw revolves, it will take up upon its surface a thin coating of the saccharine fluid, and as the heated air rushes out of the numerous holes in the hollow axle, it will be brought in contact with the thin stratum of fluid thus presented to its action, the aqueous portions of the fluid will be absorbed by the air and carried off in combination therewith, while the saccharine fluid, on the screw, which has thereby become more dense, will again descend into, and mix with the fluid, while fresh portions are rising out of it to be acted on in like manner.

As the quantity of fluid in the pan diminishes, by evaporation, fresh portions should be added until the requisite density is attained. To prevent the deposit of the sugar, or the formation of a concrete mass on the bottom of the pan, I cause the screw to be fitted so as to come almost in contact with the bottom of the pan, whereby the blades of the screw will form a scraper, and remove any such deposit or concrete matter to one end of the pan.

This tendency to bring the charge to one end of the pan, renders it necessary to leave room on both sides of the screw at c^2, and c^3, for the fluid to return to the opposite end of the pan, and thus keep up a circulation of the fluid during the whole process.

When the charge is sufficiently concentrated, a sluice, properly placed at one end of the pan, may be opened, and the screw continued in motion, which will greatly facilitate the discharge of the syrup from the pan, which can then be refilled, and the process continued as before.

After the concentrated syrup leaves the pan, it should be heated before being allowed to crystallize, as already practised with syrup concentrated in the vacuum-pan.

Although the apparatus herein last described may be used for effecting the final concentration of the cane-juice, or other saccharine fluids, I prefer to use it only for the purpose of increasing the density of such fluids to

27 or 30 degrees Beaumé, in which case the screw may be made to move an inch or two clear of the bottom of the pan, because no deposit of crystals will take place at that density. The convolutions of the screw, or the disks, may, in that case, be made much closer together, in consequence of the degree of fluidity possessed by syrups at that density.

When two pans are to be used, *a* is a tank, or jacket, of cast-iron, or other suitable material, in the upper part of which there are two large cylindrical hollows *a′ a′*, forming the sugar-pan, and which are of such a radius as to fit nearly close to the large screws *b*.

I place between the large hollows a smaller one, which is for the purpose of receiving the thick syrup, which is scraped off the spiral blade during the emptying of the pan.

The axes of the screw are hollow, and perforated with numerous holes, for the distribution of air between the blades of the screws. Each axis is supported, at one end, by brass bearings in the plumber-blocks, and the large open ends of the axis are each supported by three friction rollers, which work in a case, bolted to the end of the tank.

The outer ends of the axes have spur-wheels keyed upon them.

On the end of the tank, and midway between the two screws, there is a plumber-block, which supports one end of the main driving-shaft.

This shaft has upon it a wheel that geers into both the wheels, so as to drive both the screws in one direction. The screws are made *one right*, and the other *left* handed, so that each of them move the syrup to opposite ends of the pan. At each end of the pan there is a space of a few inches in width, which communicates with both of the screws, so that the syrup moved by one screw flows freely along this space, and supplies the other screw, while the space at the opposite end, in like manner, allows the syrup propelled back again by the last-named screw to pass again into the first one, and thus a circulation of the fluid is obtained which equalizes its temperature and density.

When the concentration of the syrup is effected, the pan is to be emptied by reversing the motion of one of the screws, and thereby causing the syrup to be brought to that end of the pan, where a sluice is provided for drawing it off. To produce this change of motion, there is a wheel, which moves freely on a fixed stud projecting from the end of the tank, and is always in geer with the driving wheel of the screw.

After the greater portion of the syrup has been run off by the sluice, it will be found that a considerable quantity of it is still left adhering to the blades of the screws. In order to remove this portion also, a scraper is placed between the convolutions of the screws at that end farthest from the discharging sluice. The semi-fluid matter adhering to the screws will thus be removed, and made to flow into a gutter, and from thence it will flow into the space, and escape by the sluice. As the screws revolve, the scraper will be carried along a distance equal to the breadth of one convolution every time they turn around, and thus the entire surface of both screws will be cleansed by the action of one scraper.

The atmosphere of large towns (in which sugar refineries are generally carried on) has floating in it soot, dust, and other matters, which if blown with it on the wet surface of the screw, would render the syrup impure, and injure its color. I therefore force the air through silk, cotton, or woollen fabrics, and thus separate the solid matters from the air before allowing it to enter the screws. This filtration of the air may be readily accomplished by causing the air from the blowing apparatus to enter at one side of a wind chest, which has a central division, formed of some suitable textile fabric, tightly stretched over a frame. The air passing through this fabric will collect, and be carried off by a pipe proceeding from the opposite side of the chest from that of which it entered, while the solid matters floating therein will be separated by the fabric from the surface, of which they may be brushed from time to time.

Although the spiral blade, or screws, herein described, affords great facility in discharging the contents of the pan, and in scraping the bottom of it, nevertheless plain circular plates, or disks, may be used instead, and as this difference will not effect the general arrangement of the apparatus, the evaporation of the fluid taken upon their surfaces, and although I prefer to force heated air from the centre of such disks, it will, nevertheless, be obvious that a similar, though less perfect, result may be obtained by forcing such heated air between disks mounted on a solid axis.

Although I have herein described the mode which I prefer of evaporating saccharine fluids, by taking up their films or coating thereof upon revolving surfaces, it will, nevertheless, be obvious that plates or surfaces made to reciprocate, or otherwise move into or out of the fluid to be evaporated, may also be made to take up the fluid upon them, and exposed to the action of heated air, and may, therefore be used as a means of carrying into effect this part of my invention. And, further, instead of using revolving or moving surfaces as a means of exposing thin films of saccharine fluid to the action of heated air, fixed plates or surfaces may be used in a vertical or inclined position, without being heated otherwise than by the heated air which is forced between them for the purpose of absorbing the aqueous portions of such fluids.

These plates, or surfaces, may be placed in an upright tank, or vessel, open at the top, for the escape of the heated air and vapor, and connected at the bottom with a pipe, or trunk, through which heated air is forced by a fan-blower, or other suitable means, and thus a strong current of heated air will be made to sweep over the wet surfaces, and produce a rapid evaporation.

The plates, or surfaces, may be placed within a quarter or half an inch of each other, and the fluid allowed to flow on to the top end of them from perforated pipes, in connection with a reservoir, which may be supplied by a common lift-pump, from a tank or vessel into which the fluid falls after passing over the plates, and thus a repetition of the process may be carried on until the fluid has arrived at the desired density. I have not hereunto annexed any drawings of such apparatus, because the form, and arrangement thereof, will be readily understood by any workman, and admits of great variation without affecting the principle on which it depends.

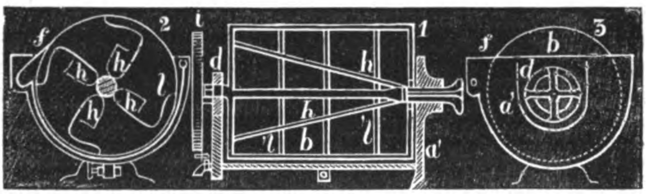
It sometimes happens that, owing to certain interruptions, caused by the state of the weather, or other circumstances, that a portion of the crop of canes of an estate is in danger of being lost or spoiled, unless they can be used with great expedition, and whenever, from this or other causes, it is requisite to increase the evaporative power of the apparatus herein described, I either increase the temperature of the air up to about 212 degrees Fahrenheit, or I turn on steam from any suitable boiler into the jacket, or tank, below the pan, the opening, or openings *m*, being closed for the purpose, and a pipe attached to the tank *a*, in connection with a steam-boiler, to which mode of heating, separately, I make no claim. I thus increase the rate of evaporation, considering it preferable, in such emergencies, to produce an inferior sugar to allowing the cane to be entirely wasted, from want of the means of sufficiently rapid evaporation.

"I claim the combination of a hollow and *perforated* shaft, connected with an air-blast apparatus, a series of plates, or a screw plate, placed around and on the shaft, and a reservoir, trough, or basin, for holding the liquor to be evaporated, all substantially as exhibited in sheet D of the above-mentioned drawings, and as above specified.

"2. And I also claim the combination of a hot-water vessel, and its heating apparatus, the cistern for holding the saccharine liquor, and the apparatus for effecting its evaporation, by means of hot air blown on thin or extended surfaces, a screw, or plates, as specified."

No. 9608. Henry Bessemer, Baxter House, England—*Improvement in Filters for Cane-Juice.* Patented March 8, 1853. England, Feb. 24, 1852.

Specification.—When cane-juice is drawn off from the "clarifiers," it is generally mixed with a small quantity of feculent matter, which should be separated therefrom before the juice is concentrated. I prefer, in all cases, that the cane-juice should be boiled for three or five minutes in the clarifier, in order that the whole of the albuminous matters which it contains should be coagulated, and their entire removal effected, by filtration, before the



process of concentration is commenced. When this, however, is not done, and the cane-juice is clarified in the usual way, without boiling it, I prefer to evaporate the juice until it arrives at a density of 25 degrees "Beaumé," when filtration should take place, and afterwards the final concentration of the syrup be proceeded with. My apparatus, above mentioned, is shown in the drawings, of which Figure 1 is a longitudinal vertical section of it; Figure 2 a vertical cross section of it; and Figure 3 is an end elevation of the same. *a*, in said figures is a vessel formed with a semi-cylindrical bottom, and with flat ends *a*. In this vessel there is a "drum" *b*, formed in part of circular disks of metal *b*, which are mounted on a shaft *c'*.

The disks are for the purpose of sustaining a covering of perforated metal, which forms the cylindrical part or shell of the drum. Each end of the drum is closed, and the axle of it passes through stuffing boxes *d*, formed in the ends of the vessel *a*. One end of this axis is made hollow, for the purpose of allowing the filtered juice to flow through it. The cylindrical part of the drum *b* is covered with a close-woven cotton cloth, or other fabric, which may be woven cylindrical, and without a seam, and made to fit very tightly to the drum. On one side of the vessel *a*, is placed a scraper *f*, formed of a thin blade of metal, which is made to press lightly against the drum. On the inside of the drum, there are four gutters *h*, which are placed in inclined positions, so that the lower end of each of them may be in communication with one of the four passages leading through the axis of the drum. The action of the apparatus is as follows: motion is communicated to the drum by means of the pulley *i*, so as to cause it to move at the rate of one or two revolutions per minute. The cane-juice is allowed to flow into the vessel *a*, where it will commence to flow or percolate through the woven fabric, or covering, and into the interior of the drum, leaving the solid impurities on the exterior surface of it. It will be observed, that the gutters *h* are elongated on one side. This elongated part is bent nearly at right angles, as seen at *h*, somewhat like the bucket of a water-wheel, so that as the drum revolves, the *filtered* cane-juice within it is lifted up, and caused to flow along the gutter, and through the hollow axle. This takes place with each gutter in succession, and thus prevents any undue accumulation in the interior of the drum, the rotation of which causes the coating of solid matter upon its surface to come into contact with the scraper *f*, which will remove such matter from the said surface of the drum, and cause the surface, when it again descends into the juice, to be so cleansed as to allow the process of filtration to be repeated through it, and thus the operation may be continued for an indefinite period, without interruption. In consequence of the filtering surface being thus alternately coated with solid matters, and cleansed, the impure matters, or scum, that are thus separated, fall from the scraper *f* into a suitable vessel, or receptacle, which may be arranged under it, and emptied as often as may be required.

"What I claim is the combination of the receiving vessel *a*, the rotating filtering drum (placed within the said vessel), the gutters *h* (within the drum), the hollow axle or shaft connected with said gutters, and the scraper applied to the outer surface of the revolving drum; the whole being arranged, and made to operate together, substantially in manner, and for the purpose, as herein before specified."

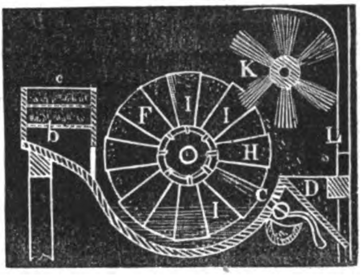
No. 9609. S. A. Clemens, Springfield, Mass.—*Improvement in Machines for Breaking and Dressing Flax.*

In the annexed figure, the flax is placed upon the endless apron *b b*, which presents it to the bite of feed rollers *d d*; it passes through space *l*, between the rests *m m*, to the beater *n* composed of two flat faces, with a space between. The beater is worked by a connecting rod and crank, to give it vibratory motion. On the other side of the beater are another set of rests *oo*, through which the fibres, separated from the woody parts, pass between the rollers *d'd'*; they are grooved, and the upper has also a longitudinal motion from the rollers—the article passes on to the endless belt *b'*. Below the beater *n* is a fan-blower, surrounded by a casing *g*; the spout *h* discharges a current of air between the faces of the beaters, to blow away the woody parts.

"What I do claim, and desire to secure by letters-patent, is the method of breaking and dressing flax, or other fibrous substances, by a beater, constructed in the manner described (vibrating on a central axis), between the faces of which the flax, &c., passes, as described, when this is combined with one or two pairs of rests, placed in close proximity to the edges of the beaters, between which the flax passes, substantially as described.

"And I also claim, in combination with the beater and rest, for breaking and dressing, as described the employment of a pair of rollers, each of which is grooved in the direction of its periphery, and one of which is made to vibrate in the direction of its axis, for the purpose of opening and softening the fibres, substantially as herein described."

No. 9610. Samuel Gardener, of New York—*Improved Magnetic Machine for Washing and Separating Gold.*



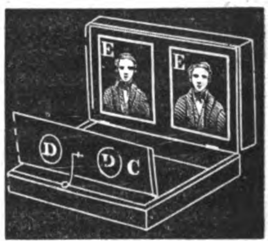
The annexed figure represents a section of the machine.

The gold is placed in a box C, the finer particles mixed with the magnetic oxide of iron are washed down in the trough, where the oxide of iron is separated from the gold by means of revolving magnets I I. The oxide is brushed off by the brush K, and is thrown upon the inclined plane D.

Outside the opening C, is placed a cylinder valve E′, which turns in suitable journal boxes, and which has a slot of corresponding size with C. This cylinder valve has a handle, by which it is turned to regulate the width of opening of C, the width of said opening depending upon the position of *d*.

"I claim the separating gold, or other metal, from earthy or other magnetic particles, by means of a rotary cylinder of magnets F, G, H, I, which magnets, at the same time they collect the magnetic particles, serve as agitators for agitating the water and the metal, and earthy or other foreign matter, with which it is mixed, for the purpose of washing away the said earthy and other foreign matter, the said cylinder of magnets being constructed and arranged, in relation to the trough B containing the aforesaid mixture, in any way substantially as herein set forth."

No. 9611. J. F. Mascher, of Philadelphia, Penn.—*Improvement in Daguerreotype Cases.* Patented March 8, 1853.



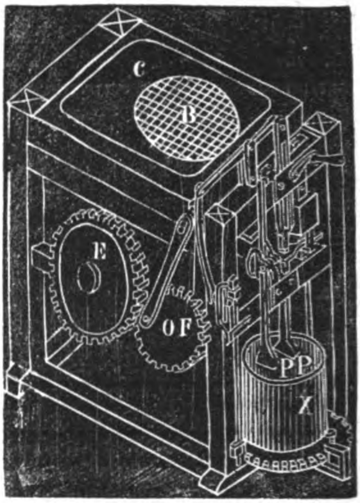
The inventor says, "By this arrangement, a perfect stereoscope is obtained, and the daguerreotypes, by binocular vision, are apparently formed into a solid figure like life." He claims,

"Constructing a daguerreotype case, with adjustable flap, or supplementary lid C, said flap, or lid C, being within the case, and having two ordinary lenses D D placed in it, by which, by adjusting the flap, or lid, as shown, a stereoscope is formed by the case, and the two daguerreotypes E E by binocular vision are apparently changed into a life-like figure."

No. 9612. Lysander A. Oscutt, of Albany, N. Y.—*Improvement in Machines for Moulding in Flasks.* Patented March 8th, 1853,

The nature of this invention consists in giving to the flask X (see figure) a continuous, or reciprocating rotary motion, as the nature of the article to be moulded may require; as for instance, such as may have lips, ears, or other projecting portions, which would be broken or injured by the rammers; the flask is rotated under the rammers P P until they approach such projection, when the motion of the wheel is reversed by an adjustable clamp, which trips the dog, and causes it to operate in a contrary direction. When the character of the work will admit of it, the clamp is removed, and the flask then has a *continuous* rotary motion under the rammers.

The rammers P P are so hung and operated, as that they may have an



automatic adjustment, vertically, whilst the flask is being filled and rammed with sand; and at the same time may be adjusted laterally, so as to operate in any desired portion of the flasks; both of these adjustments being available whilst the machine is in motion.

"What I claim therein as new, and desire to secure by letters-patent, is in combination with a flask, having a continuous, or reciprocating rotary motion, the rammer or rammers so arranged as to be made, at any time during their operation, to work in any portion of the flask, whilst, at the same time, they have an automatical adjustment, so as to rise in the flask, is filled and rammed, and adjust themselves vertically, in regard to the flask; the whole being accomplished substantially in the manner described."

No. 9613. Thaddeus A. Smith, of Albany, N. Y.—*Improvements in Moulding for Cast-iron Plates, with Dove-tailed Recesses.* Patented March 8th, 1853.

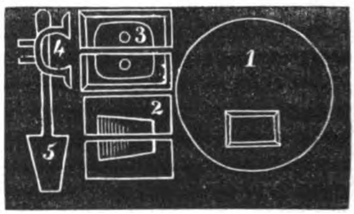


Figure 1 represents a pattern of a pot-hole cover, top upwards, with a square hole in it towards the one edge for the admission of the cup-pattern; the sides of the hole being bevelled upwards.

Figure 2, the cup-pattern, face upwards.

Figure 3, reverse.

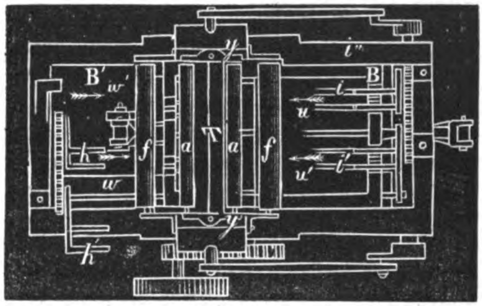
Figure 4, cross-section.

Figure 5, lifter or handle.

The method of using the pattern-cup in moulding is thus: The top pattern, with the cup in its place, is laid down in the flask, with the upper face uppermost (as shown in the drawing), and is then properly rammed up; when this has been done, the flask and pattern are reversed in the usual way, and the under side sanded and rammed up in the core. This done, the core is removed; the cover-pattern is to be carefully taken off, leaving the cup-pattern upon the sand. Then each half of the cup-pattern is to be moved carefully to the right or left, as the case may require, so as to have the dove-tailed core of sand complete, and is then to be lifted off. The flask and core can now be put together in the usual manner for the cast of the metal, which will give a pot-cover, with the desired cup sunk within it.

"I claim the process of moulding the recesses in the tops of stove-plates, intended for the reception of the lifters, by which such plates are handled (which recesses are required to be dove-tailed), by employing pattern-cups, shaped to form such recesses, divided by a vertical cut into two parts, so that the said cups can be removed from the core, formed by them, by moving each division of it horizontally from the core, before raising it off the sand, and by fitting the cup-pattern into the pattern of the stove-plate, so that the plate-pattern can be lifted from the sand, leaving the cup behind it, substantially as the same is set forth in the above specification."

No. 9614. Joel Tiffany, of Cleveland, Ohio—*Improvement in Machines for Dressing Shingles.* Patented March 8th, 1853.



This shingle machine operates in the following manner: After the shingles are rived out, they are first placed on the table-beds *u u′* alternately as the table passes from one end of the frame to the other; the shingle being placed on the bed *u′*, the bed or table rises and falls by the action of cams, so that the knife in the cross-head will not shave the shingle against the grain in passing from B to B′, but as the table returns from B′ B, it is elevated, and thereby the shingle is shaved from butt to point, the points being always in the direction of the arrows. By the raising and lowering of the table, as described, the proper taper is given to the shingle.

The shingles placed in the bed *u* are not shaved until the table returns from B′ to B; but as there is a shingle placed in the bed *u*, it is shaved as the table passes from B′ B; thus alternately as the table passes from B to B′, the shingles are shaved in the direction of the arrows, by the knives in cross-head T, which always moves in an adverse direction to the table; for instance, as the table moves from B′ to B, the cross-head passes from B to B′, by the action of the parts, as before described. The shingles are shaved on one side at a time; the first side is shaved in the bed *u′*, and are turned from the bed *u′* to *u*, and from *w′* to *w*, by which means the shingles are shaved on the other side, as follows: As the table passes from B to B′, the shingle passes in between the forks of the arms K″, and the instant the table moves from B′ to B, the shingle is conveyed from the bed *w′* to *w*, the arms taking the place marked *h*, which was occupied by the arms *h′*; and at the instant the arms *h″* begin to pass to *h*, the arms *h′*, which then occupied the place *h*, pass to the position indicated at *h′*, which throws the shingle from the bed *w* to the floor, ready for bundling.

The shingles are withdrawn from the arms *h* and *i* by the return movements of the frame. The principle and manner of the operation of the arms are alike on both ends of the machine. The arms *i′* convey the shingles from the bed *u′* to *u*, and the arm *i* gives place to it, passing to the position *i″*, and at the same time taking a finished shingle with it from the bed *u*, which had been previously placed there by the arms *i′* from the bed *u′*. A finished shingle is thrown from the machine at every passage of the table from B to B′ and B′ to B, which makes one stroke of the crank. The rollers *a a* and *f f* are for the purpose of keeping the shingle in place, when it is being shaved. The geer-wheels, by which the arms are operated, are hung on journals.

The springs *y y* are for the purpose of allowing the rollers to adjust easily to shingles of various thicknesses. The ends of the springs rest on the journal-caps.

"What I claim is the combination of parts consisting of the pinions *l l′* and *k k′* with the intermediate geers *m m′*; the levers *n′* and joint-levers *o* and *o′* and sections *u″* with the connecting-rods *p* and *s* and cam *o*, for the purpose of operating the arms *h h′ i i′*, as described, viz., turning and removing shingles at the same time from one side of a reciprocating bed to the other, and then, when its second face is dressed, throwing it from the machine in a finished state."

No. 9615. JOHN A. WAGENER, of Charleston, S. C.—*Improved Cannon-sight.* Patented March 8th, 1853.

The inventor says:

"The nature of this invention consists of an easy and correct mode of determining the highest point of the surface of a cannon, regardless of any position, which the wheels, on account of any uneven surface, may occupy; and of affording the gunner, at the same time, a perfect sight to direct and elevate the piece by, capable of regulation for any distance less than point blank, as well as to extreme range, according to degrees."

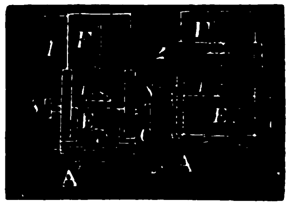


Figure 1, front sight.

Figure 2, rear sight, attached by means of spring-clasps to the cannon.

"What I claim as my invention, is the sighting apparatus, consisting of the corresponding pendula E, as described, hung between the graduated side-pieces or uprights C C, in connection with the protecting and regulating slide F, with its rifle-sights *r r'*, said pendula having free sway, by means of the rotary mounting of the uprights and upper part of the apparatus, on the screws and pivots *s s*, and the whole being attached and shifted into horizontal position on the cannon, by means of the movable spring-clasps A A and A' A', all constructed and combined as set forth."

MISCELLANEOUS.

WE share with inventors in the disappointment at the failure, in the Senate, of the bill which passed the House, providing for the publication of patents. We have, however, a word of consolation for them. With fidelity to our promises, we shall continue, in our journal, the publication of patents, giving intelligible descriptions and illustrations of the patents, as they may be granted.

THE HILLOTYPE.

The subject of the subjoined report, made yesterday by one of the committees of the Senate, being of interest to the general reader, as well as to the scientific class, we insert it in full.

Mr. James made the following report, which was ordered to be printed:

The Committee on Patents and the Patent Office, to whom was referred the memorial of Levi L. Hill, in reference to his alleged discovery in Heliochrome, or sun painting, so denominated by said Hill, ask leave to submit the following report:

Mr. Hill, having been before the committee, explained to them the history and principles of his invention, and submitted to their inspection numerous specimens of the productions of his art or invention. The committee have formed the opinion that those specimens afforded sufficient proofs that the inventor has solved the problem of photographic coloration. The committee had in their hands the plates, unprotected by glass or any other covering, and saw them freely rubbed and otherwise tested, confirming in their minds the fact of the invention and the durability of the pictures. It is believed that most of the philosophers, both in Europe and America, long since gave up as hopeless the search after this branch of science, which has now been discovered by one of our citizens, in one of the wild valleys of the Catskill mountains, far removed from the schools of art. The committee learn that Mr. Hill has arrived at this discovery, by which the works of nature may be copied in their original hues, through three years of persevering toil. The committee is informed by Mr. Hill, that his discovery has not yet been perfected in its practical details, which is not surprising, it being but little more than two years since he obtained his first result. But the beauty of the results to which the process has already attained would seem to afford evidence that it will be perfected at no very distant day.

The prospective utility and importance of this invention are very apparent in its application to portraits, landscapes, botany, morbid anatomy, mineralogy, conchology, aboriginal history, the reproduction of valuable paintings, and to various ornamental purposes. The committee are satisfied of Mr. Hill's claims to originality and priority of invention, and deem it but just and right that he should be suitably protected and encouraged; and that they deem it more particularly so, seeing that a rival claim has been set up in France, since the announcement of his discovery was made. The means by which this process is carried out being strictly chemical, it would seem that the existing patent laws would not afford to the inventor the security required. Owing, however, to the short period remaining of the present session of Congress, and the press of business, the committee have been unable to devise any better or more efficient mode by which to recognize the claims of Mr. Hill, than by recommending that his memorial, together with this report, be placed on the records of the Senate.

DE BOW'S INDUSTRIAL RESOURCES.

The following notice from *Hunt's Merchants' Magazine*, of this valuable work, meets our entire approval and concurrence, and we cheerfully commend it to the reading public.

"This is altogether the most important book on the industrial interests of the country which has been issued from the American press; important not only to the people of the South-Western States, respecting which it is so rich in details, but equally important to whatever citizen in other sections desirous to become acquainted with the incalculable riches of this portion of our common country. The work is prepared with great labor and research, not only on the part of the compiler, but many intelligent co-operators in various parts of the South, and its contents have been prepared originally, or compiled, or collected, or extracted from every source where industry and discrimination could obtain materials of value for such an important publication. But, although so varied, so extensive, and so important may be the contents of these volumes, respecting the industrial resources of a portion of our country, yet they are entitled to high commendation on another ground. They furnish the first systematic attempt which has been made to gather and systematize, within the compass of two or three volumes, the commercial resources of half the United States. The manner in which the work has been prepared and issued from the press, reflects high credit upon the diligence, discernment, and accomplishments of its author, while it can scarcely fail to meet with a very general and complimentary commendation for its fulness, accuracy, and completeness, upon all the subjects of which it treats. By reference to its title, its comprehensiveness of detail will be apparent, and some conception can be obtained by the reader of the assiduous labor and length of time required in the production of these volumes."

The work is for sale at the office of the *Review*, and at the leading bookstores.

EXTENT OF PRUSSIAN ELECTRO-MAGNETIC TELEGRAPH LINES.

At the close of the year 1852, Prussia had 474·3 miles* of telegraph lines, of which about 100 miles are subterranean, the rest air lines.

ACTION OF CONGRESS IN RELATION TO CURRENCY AND COINAGE.

1st. The relative standard of value between gold and silver has been altered at the rate of 0·691 per cent., in order, if possible, to keep American coin in the country. There is to be an entire new coinage of half-dollars, quarters, dimes, and half dimes, of less weight than the present coin. The present half dollar becomes worth nearly fifty-four cents, in comparison with the coin that is to be.

2d. A new three dollar gold-piece is ordered to be struck.

3d. The present three-cent pieces are to be freed in a good degree from the copper alloy that now disfigures them after being a little in use. These three-cent pieces now have 0·750 in silver, and are worth only two and a half cents really; but the new three-cent pieces will have 0·900 silver, and be of lighter weight, to correspond with the reduction in the weight of the half-dollar. The present three-cent pieces will not be worth so much as the new coin, but such is the demand for small coin that it is supposed the deterioration will not be noticed. (Congress ought to have provided for the redemption of these old three-cent pieces at the Mint, when it ordered to be struck the better and purer coin.)

4th. Some important changes have been made in the Mint, and in the establishment of Assay Offices. The California Mint is to be put in operation at an early period. (A new Assay Office was refused there.) In New York has been established an assay, parting, and refining office, with very important privileges, that relieve New Yorkers from sending gold bullion to Philadelphia at their private expense, and that imposes that cost upon the Government.

The provisions of the Assay Office in New York are almost better than a Mint, for they return coin for bullion deposited there, as well as cast bars and ingots, and they make Mint certificates receivable for Government dues within sixty days.

5th. There is to be a charge of a seigniorage, but at the actual cost in New York and Philadelphia, and this seigniorage in New York is to go to support the Assay Office here. Probably it will not be as much as it now costs to transfer bullion and gold-dust to and from Philadelphia.

6th. Here is a very important and significant provision in the civil and diplomatic bill, which may escape attention unless direct reference be made to it.

SEC. 5. "And be it further enacted, That when private establishments

* 100 American miles are equal to 21·365 Prussian miles.

shall be made to refine gold bullion, the Secretary of the Treasury, if he shall deem them capable of executing such work, is hereby authorized and required to limit the amount thereof which shall be refined in the Mint at Philadelphia, from quarter to quarter, and to reduce the same progressively as such establishments shall be extended or multiplied, so as eventually, and as soon as may be, to exclude refining from the Mint, and to require that every deposit of gold bullion made therein for coinage, shall be adapted to said purpose, without need of refining. *Provided*, That no advance in coin shall be made upon bullion after this regulation shall be carried into effect, except upon bullion refined, as herein prescribed."

The object of this section is to create private assaying, refining, and parting offices in New York and San Francisco, and, as in England, to separate that business from the Mints. The "Proviso" cuts off the large bullion fund, which has been run up to nearly seven millions of dollars, in order to keep the Philadelphia Mint efficient, and so puts the private establishments nearly on a par with the public establishments.

There are other important regulations in the various currency and coinage acts Congress has been passing, but these are the principal ones. Congress thus has passed a confused mass of laws, which will soon need amending and making agreeable one with another; yet, upon the whole, the people have been large gainers by the measures adopted.

A section in the Deficiency bill also provides for the seigniorage to be allowed, and for procuring dies, moulds, modes, &c., for the new coins authorized.

DESTROYING INSECTS ON TREES, PLANTS, AND SHRUBS.

Most of the methods known for accomplishing the above object have frequently failed; but the following, invented by a French chemist, has been tried repeated times, and always with the best success, where tobacco-smoke, tobacco-juice, and other means, were of no avail.

Take 2½ lbs. of black soap, 2½ lbs. of flower of sulphur, two pounds of mushrooms, that grow in moist ground of any kind, 30 quarts of water; divide the water into like portions, put one half into a cask, with the soap and the mushrooms, after they have been a little bruised; boil the other half of the water in a kettle with the sulphur, in a bag, and kept down to the bottom of the kettle by a stone, or other weight. The sulphur bag must be stirred by a staff, in order the better to saturate the water. By the increase of the quantity of materials, the effect becomes more powerful. The water thus boiled must then be thrown into the cask, and stirred about with a stick, till it has acquired the highest degree of foul odor, in which care is to be observed that the cask be shut up after the stirring about of the water.

This mixture must be scattered or sprinkled on the trees, shrubs, or plants, and in the first sprinkling it will destroy the greatest part of the insects; but frequent repetitions are demanded, in order to kill those which live under ground, especially the ants. To destroy these, 2 to 8 quarts of the mixture may be needed. Two ounces of nux vomica added to the previous mixture, grated and scraped off, and boiled with the flower of sulphur, will make this means more efficacious.

The best thing for use is a sprinkler made of tin, which will hold a good quantity; mouth-piece is flat, and perforated with rows of small holes.

"GUIDE TO THE PRACTICE OF THE PATENT OFFICE."

This is the title of a small official pamphlet, issued by S. H. Hodges, Esq., prior to his resignation of the office of Commissioner of Patents; but most of its contents will, no doubt, be retained, and acted upon by the present learned Commissioner, as the rules of that bureau.

We make a few extracts therefrom for the purpose of giving information to inventors, in an official form, as to the sphere of action of the bureau, and the importance of the correctness of papers drawn for letters-patent. He commences by saying:

"Before proceeding to furnish such information as this department may with propriety, it will be well to explain why it cannot answer some inquiries which are daily addressed to it. Letters are constantly received, in which the writers, after mentioning some discovery which has occurred to them, wish, before expending the time, labor, and money necessary to mature their invention, to learn whether it is really new, and capable of being patented, or whether they have been anticipated. It would be gratifying to comply with these requests, and to communicate the desired information, if it were practicable; and it is not for want of inclination that it is not given, but because the appropriate occupations of those employed in the Office will not admit of their undertaking it. Were the supposed discoveries ever so well digested, and even reduced to actual practice, to determine whether they are new and useful—in short, whether they are patentable—requires precisely the same course of examination, of scrutiny into their intrinsic merits, of comparison with previous similar contrivances, indeed all the labor and expense, which an application for a patent would demand. Now, there has not been for years a period when the examiners have been able to keep pace with the applications, and to go through with the labors legitimately imposed upon them. They have not a moment to spare for any gratuitous service. Every hour employed upon it must be at the cost of those who have gained a right to their official exertions, by paying the prescribed fees. Others cannot lay claim to them with any justice until they have paid the same price. Besides this, such an examination could not be instituted, and the result disclosed, without committing the Office in a way that would not be endured in the most ordinary tribunal of law. Even a cursory opinion might embarrass the further consideration and disposal of the case, and should not be asked for, any more than the views of a judge upon a question which he might be called to try. If adverse parties should come forward and learn that one had been given, it would be impossible to allay their jealousy, or remove the suspicion their denunciations, if they were defeated, would cast upon the proceeding. When it is borne in mind that, in addition to all this, such inquiries are almost always crude and obscure, without model or drawings to illustrate them, and susceptible of infinite modifications; and that under these modifications may lurk the germ of some important invention, which can only be elucidated and rendered distinct by a long course of examination and discussion (as often happens in the case of patented inventions), it is obvious that the only alternative is to uniformly decline answering them. Neither can a response be given to such letters as contain brief and imperfect descriptions of certain improvements, and ask if they have ever been patented. The writers are not aware of the labor involved in undertaking to furnish such information.

"A digest of all the patents which have been granted under this Government would furnish much of the information sought by these correspondents. Every inventor might then learn for himself how far he had been forestalled in this country. To a considerable extent he would have the same means of information as the officials of this department. The publications of foreigners, as well as those of our fellow-citizens, histories of inventions, scientific works, periodicals, and the like, are as open to him as to them. Until such a work is authorized by Congress, his next resource must be the meager accounts contained in the annual Reports of the Office, and the records, drawings, and models in its care. The last are arranged and spread before him as amply as the space afforded them will allow, and every facility for examining such as he desires will be accorded to him. Any records and drawings that he calls for will be cheerfully produced for his inspection, and he may have copies of such of them as he considers worth the cost of a moderate fee. Such as are deposited under caveats, or upon applications for a patent which are still pending, or which have not been withdrawn, though rejected, must be excepted. The interests of the parties in these cases cannot well be secured without preserving entire secrecy, and no information respecting their claims can be furnished without their written consent.

"Neither can the Office volunteer any opinion upon the numerous questions which may be raised in patent-suits. Inquiries as to the mode of prosecuting for infringements, as to the probable results, and others of this nature, must be addressed to those who devote themselves to such matters. The province of this department is to give information respecting only its own rules of practice. For the same reason, all questions as to the value of any invention must remain unanswered.

"Applicants would materially abridge the labors of the Office, and facilitate a speedy determination of their respective cases, if they would bear in mind that there are six requisites, uniformly insisted upon, before an application is considered ready for examination. These are, 1. the petition; 2. the specification; 3. the oath; 4. the drawings; 5. the model, or specimens, where the case admits of them; and 6. the payment of the appropriate fee.

"The importance of the specification is not easily overrated. The rights of the patentee are limited and defined by the claims embodied in it, and it forms the chief, often the only, rule for determining what they are. It constitutes, in fact, the contract between the patentee and the public; and the other parts of the application are, so to speak, but its appendages. It is very rare that any mistake in them furnishes a ground for assailing a patent; but patents are frequently impeached and annulled for some error in the specification. It is of vital consequence, therefore, that it be drawn up with skill and care.

"Besides describing the thing to be patented, it should, as a matter of precaution, contain full references to the drawings, if the case is proper for them; and some description of them may prove useful. It should be signed by the inventor (his executor, or administrator), and be attested by two witnesses.

"No great aid is to be expected, in drawing up the substance of the specification, from any forms. The character of the devices to be described varies so widely, and the details to be embodied demand such a different consideration and expression in different cases, that the language adopted on one occasion can rarely be employed on another, without great modification. There is hardly any class of documents in preparing which so little aid is to be derived from precedents; none where more depends on skill, experience, and ingenuity, or where these are more indispensable.

"Duplicate drawings will hereafter be required in every case that admits of drawings. They should be on sheets separate from the other papers, from eighteen to nineteen inches in length from top to bottom, and not less than thirteen inches across nor more than twenty-five, unless more space is necessary to exhibit the device or machine with clearness. They should be executed in artistic style; and such parts as cannot be otherwise made to appear, must be represented in detail, by plans and sections, which should be numbered and described in the specification.

"The Office cannot prepare drawings to accompany the applications. It furnishes certified copies of such as are on file, in proper cases, to those who call for them, but employs no one to draw for other purposes.

"The model should be made of durable materials, and be firmly constructed, so as to bear the frequent handling to which it is necessarily exposed. If of any soft wood, it should be painted, stained, or varnished. Its external dimensions should not, if practicable, exceed one cubic foot in measure. The name of the inventor, and that of the assignee, if the patent issue to him, should be permanently affixed to it, either by engraving or otherwise."

The importance attached to the specification, by the Commissioner of Patents, is just, and deserves the attention of every inventor. The drawing up of such papers should never be intrusted to persons who have not had great experience in these matters. A little extra time and money laid out in the first instance, would, in the end, save the inventor hundreds, and often thousands, of dollars, as many have found to their cost. It is easily understood why hats, coats, and shoes cannot be as well made by the *tyro* as by one who has learned the trade, and had experience in the manufacture. Yet many think the inventor of a machine can best prepare the legal document for securing it, without having even learned the statute law. The description of a machine is an art, and a very high one; and if to this be added the requirements of the law, and the definitions of the courts—all of which are to be regarded—the nice distinctions to be drawn between what is new, and what is old; the extensive knowledge required of the history and progress of the arts, and the practice of the Patent Office, every day growing more intricate, what art is there more difficult to become a proficient in? It is true many men undertake the business of preparing papers for inventors, no better qualified than themselves for the task, probably not as well; but there are others who are thoroughly educated for the profession; and if inventors would take the necessary pains to inform themselves as to the qualifications and standing of the attorneys they employ, we should hear less complaint of the uncertainty of patent property.

J. J. G., *Ed.*

THE

AMERICAN

POLYTECHNIC JOURNAL;

A New Monthly Periodical,

DEVOTED TO

Science, Mechanic Arts, and Agriculture.

CONDUCTED BY

PROFESSOR CHARLES G. PAGE, M.D.,
LATE CHIEF EXAMINER OF PATENTS;

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VOL. II.

JULY TO DECEMBER, 1853.

J. J. GREENOUGH, PROPRIETOR,
WASHINGTON: NEAR THE PATENT OFFICE.
NEW YORK: No. 6 WALL-STREET.

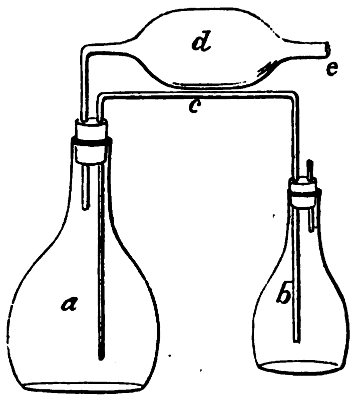
INDEX TO VOLUME II.

THE AMERICAN
POLYTECHNIC JOURNAL.

A NEW CARBONIC ACID APPARATUS.*

BY J. H. SALISBURY, M. D., ALBANY, N. Y.

THE apparatus here represented is one which was designed and constructed by myself in 1848. I have since used it in all my determinations of carbonic acid. It has been used on account of its convenience and the very accurate results which it affords.



a and *b* are two small, very thin, flat-bottomed flasks; *c*, a siphon tube; *d*, a chloride of calcium tube; and *f* a tube for admitting air into the flask *b*. *a* has a capacity of from one to two ounces, and *b* about one-half ounce. The bottom of the flask *a* is a little below the bottom of the flask *b*, so that the short arm of *c* passes to the bottom, or nearly to the bottom of *b*. The siphon tube *c*, and the chloride of calcium tube *d*, fit into the cork *g* air-tight, and the cork equally so into the flask *a*.

In cases where great nicety is required, a small chloride of calcium tube is inserted in the place of the short tube *f*, which admits air into the flask *b*. This dries the air which enters the apparatus during the escape of the carbonic acid. When this is used, it is inserted after the apparatus is weighed the first time, and before the acid is passed from *b* to *a*. It is removed after the carbonic acid has all escaped, and before the second weighing.

The weighed material from which we wish to obtain the carbonic acid, is

* An account of it was originally published in 1849, in my prize essay on the Chemical Investigation of Maize.—J. H. S.

inserted into the flask *a*, and a little water added; *b* is filled with acid (pure hydrochloric acid is the best generally), and the corks subsequently care fully filled into the flasks, air-tight, and the whole weighed. When the apparatus is weighed, the flask *b* is slipped down on the short arm of *c*, till its bottom is on the same plane with the bottom of the flask *a*. The apparatus then stands on the pan of the balance without support. After weighing, the short arm of *c* is passed to the bottom of the flask *b*. The mouth is then applied at *e*, and a little air sucked out of the flask *a*, which fills the tube *c* with acid from *b*; *c* being a siphon tube of small bore, the acid continues to pass over very gradually, till it is all, or very nearly all, transferred from *b* to *a*.

The carbonic acid escapes through the tube *d*, filled with chloride of calcium, which retains the water. After standing from ten to fifteen minutes, the mouth is applied to *e*, and air drawn through till it ceases to taste of carbonic acid. The apparatus is now weighed, and the loss gives very ac curately the amount of carbonic acid.

When we have finished using the apparatus, the flasks should be washed with distilled water, carefully dried, and small corks fitted into *e* and *f*, to prevent free exposure of the chloride of calcium to the moisture of the air. If the flasks are not dried, and *e* and *f* not corked, the chloride of calcium will very soon deliquesce.

ON THE DETERMINATION OF PHOSPHORIC ACID.

BY EDWARD T. BENNETT.

The important influence which the soil exercises upon the development of the vegetable kingdom, in supplying a large portion of the materials which build up its organism, renders it desirable to possess an easy and certain method of estimating the more important inorganic constituents, as well of the soil as of the plants it produces. Phosphoric acid unquestionably plays an important part in organic life, and of late much labor and attention have been bestowed in improving the methods of estimating it.

M. A. Reynoso, in the Chemical Gazette, No. 217, has published a method, which, if it gave satisfactory results, certainly deserves to be preferred before all others that have been proposed. But since, from a theoretical point of view, well-grounded doubts of its success can be raised, it seemed worth while to institute a few experiments as to its practicability. The method is founded upon the insolubility of phosphate of deutoxide of tin in nitric acid. A weighed quantity of tin, yielding a known amount of stannic acid, along with the substance to be investigated, is boiled with an excess of nitric acid till complete oxidation has taken place. The produced precipitate of mixed phosphate of deutoxide of tin and stannic acid is filtered, washed, and its quantity ascertained. The excess in weight above what the tin alone would have given, is taken as the quantity of phosphoric acid in the substance investigated. We must recollect, that, for a comparatively small quantity of phosphoric acid, a large amount of tin is requisite to insure complete precipitation. In the mechanical treatment, for example, in the washing of a large precipitate, small errors of a few millegrammes are very liable to occur, all of which naturally fall upon the phosphoric acid. Further, it is not improbable that in a very compound substance other bodies besides phosphoric acid may be precipitated; and again, it is a question, even when a large amount of tin is employed, whether small quantities of the phosphoric acid are not liable to remain in the solution. From the experiments which M. Reynoso adduces in confirmation of his method, it is clear that in some instances this was the case.

In order to ascertain whether, in the presence of other constituents of soils and ashes, any thing besides phosphoric acid was precipitated by boiling with nitric acid, some tin was taken, mixed with an equal or somewhat smaller quantity of iron, and boiled for perhaps an hour with strong nitric acid diluted with its bulk of water; a yellowish-white crystalline powder was obtained, which on washing on a filter passed through turbid, and appeared almost completely to dissolve in an excess of water. On continued boiling of this aqueous solution, the tin is reprecipitated. This experiment, which was many times repeated with different proportions of the substances employed, gives the interesting result, that tin, which when boiled by itself with nitric acid is so readily converted into insoluble deutoxide, produces, in the presence of iron and nitric acid, soluble double compounds, probably consisting of the oxides of iron and tin combined with nitric acid.

If combinations of phosphoric acid are dissolved in the smallest possible quantity of nitric acid, and to such a solution neutral chloride of tin and an excess of sulphate of soda are added, all the tin is precipitated as deutoxide, together with the whole quantity of phosphoric acid. If the bases are lime or alumina, they remain in solution. In this way it seemed not improbable that phosphoric acid might be determined in a satisfactory manner. With this view, a series of experiments were made, which have shown, that when, besides alumina and lime, iron also is present, a large proportion of it is precipitated along with the tin and phosphoric acid, and in a form insoluble in water. A favorable result has in vain been sought for by various changes in the process and manipulation.

We can therefore safely conclude, that to substances containing iron M. Reynoso's method is inapplicable; and even where it is absent, many precautions and the greatest care must be taken to avoid the numerous errors to which this method, under any circumstances, seems liable, and to obtain a certain and accurate result.

Queenwood, Dec. 10, 1852.

CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

Process for determining the Value of Soap. By Dr. Bolley.

To determine the value of a specimen of soap, it is necessary to ascertain,—1st, the percentage of dry substance; 2d, the relative proportion of fatty acid and alkali; 3d, the kind of alkali and fatty acid, or the substance replacing the latter; 4th, the intentional or accidental admixture of foreign organic or inorganic substances.

In most instances the consumer merely determines the percentage of water in soap, because this is the most usual and almost unavoidable admixture, and one which, as is known, may be present in a soap in considerable quantity, without in an equal degree influencing the exterior appearance, hardness, &c. The means of determining the percentage of dry substance are,—1st, drying a weighed quantity in a water-bath; and 2d, salting out, or introducing the soap into a saturated solution of chloride of sodium and boiling, by which means it concretes together into a solid mass tolerably free from water. With regard to the first method, many have no doubt found that when the soap has been heated for a long time in a water-bath, and has commenced to melt, it not only does not give off any more water, but becomes very hygroscopic, and attracts moisture again very rapidly.

Old Marseilles soap, exposed to a temperature of 86° F. for six hours, was found to have lost 3·2 per cent., and when kept at 212° F. for two hours, there was no further diminution in weight; after exposure to the air for a few hours, it weighed 1 per cent. more than at first. Several other specimens showed that soap, when heated to 212° F., increased in weight during the weighing. If such experiments were carried out by inexperienced persons, errors would be the natural consequence. The process of salting out may be applicable upon a somewhat large scale, with for example a pound of soap, and is then better adapted than the other to give trustworthy indications of the percentage of actual soap. But the determination of dry soap has no bearing upon the very important question of the possible presence of adulterating substances, still less upon the second and third points mentioned above.

It is by no means difficult to determine the quantity of alkali and that of fat in a soap; but the operation is far more tedious and troublesome when it is at the same time requisite to ascertain whether the soap contains free alkali or fat, and the proportion of one or other to the fat and alkali in combination. Nevertheless this question may not generally be of great consequence, as both errors would scarcely be owing to a fraudulent intention, and their magnitude would be confined within a narrow limit. The uncombined alkali in hard (soda) soap may be determined by exposing the soap in fine shavings to the air, so that the alkali may absorb carbonic acid, treating it with strong alcohol, and examining the insoluble residue, which may contain other salts or insoluble substances, for alkali. A process recommended by Stöckhardt is less troublesome; it consists in adding to a hot concentrated solution of soap, bitartrate of potash until the fatty acids begin to separate. The larger the quantity of bitartrate requisite, the larger the quantity of free alkali. This is certainly a mere comparative test, applicable to the examination of a number of different specimens of soap. It is not improbable that unsaponified fat is sometimes present in soap. Dumas determines it by separating all the fat by means of hydrochloric acid, resaponifying with baryta-water, and extracting the baryta-soap with alcohol, which dissolves only the unsaponified fat.

The process now to be described does not take into consideration the quantity of free and combined fat or alkali, but includes the estimation of all the four above-named conditions which determine the value of a soap, and is at the same time serviceable and easily carried out.

A gramme of the soap is weighed; hard soap in shavings: soft soap is weighed to *near* a gramme, because the addition and abstraction of small quantities is more inconvenient than a reduction in the calculation. The soap is introduced into a beaker-glass holding about on ounce, treated with a small quantity of ether, in which it does not dissolve, and then with a rather smaller volume of pure acetic acid: two layers are thus formed; the soap is rapidly dissolved; the upper layer containing the ether and fat or resin, with a little acetic acid; the lower layer, water, alkali combined with acetic acid, free acetic acid, the salts usually formed in the manufacture of soap, chloride of sodium, alkaline sulphate, and finally the foreign admixtures, whether soluble in water or not. If sand, powdered pumice-stone, clay, steatite, heavy spar, &c., are present, they remain at the bottom of the glass. Other substances of organic origin, such as starch, &c., are suspended in the layer of liquid beneath the ether. The entire mass is then poured off from the undissolved substances in the beaker into a large pipette, widened in the middle and bent upwards at the lower extremity so as to form a kind of separator. The liquids are allowed to remain in the wide part of the pipette until they have perfectly separated into two layers, and it may then be so managed that none of the ethereal liquid enters its lower extremity, which is turned upwards. The beaker-glass, together with the residue, if any, is then washed with ether and water, which are poured into the pipette; and by inclining it, or blowing gently into the upper end, the liquids may be partially separated. The addition of successive quantities of distilled water will then wash the ethereal liquid perfectly free from saline matters. This being effected, the ethereal solution of fat, together with the small quantity of water beneath it, are poured back into the empty beaker-glass, and the pipette is washed out with a mixture of strong alcohol and ether. A great advantage is thus gained, inasmuch as the small layer of water beneath the ether is rendered miscible with it by means of the alcohol; and if this is not the case at first, a few drops of alcohol must be added. It is for this reason advisable to avoid introducing too much water into the mixture when washing out the contents of the pipette into the beaker. It is also convenient to have the weight of the beaker marked upon it with a diamond. The ethereal liquid is then placed upon a water-bath, and left until nothing remains but the fat or resin, which, without altering the general principle of the process, may readily be recognized. When a trace of aqueous liquid remains beneath the fat, it is very difficult to remove it by evaporation, and the addition of alcohol to the ether is a very appropriate means of obviating this difficulty. When the smell of ether, alcohol, and acetic acid has become very feeble, the residue is weighed, and the weighing repeated after a longer-continued application of heat; it rarely happens that any decrease of weight is perceived on the second weighing, when the evaporation is carried far enough in the first instance. When several experiments are made successively with the same soap, the percentage of fat comes out in the several determinations agreeing in the second decimal place.

The fatty acid from one grm. of soap forms a layer of such thickness, that by slightly inclining the beaker-glass, the bulb of a small thermometer can be introduced, so as to determine the melting-point, by which means some idea may be formed of the kind of fat. If any insoluble residue remains in the beaker after the first treatment of the soap, it is dried and weighed, and its nature determined. The aqueous liquid which is separated from the ethereal solution of fat is introduced into a small capsule,* and carefully evaporated to dryness in a water-bath. The residue is weighed, and ought not to suffer any further diminution of weight when again heated in the bath. The presence of gelatine may be detected during evaporation by the appearance, starch by means of iodine solution, cheese-curd by the peculiar empyreumatic odor evolved on the application of a sufficient heat; other substances may likewise be readily detected. Their total quantity is estimated by the loss of weight on ignition. If the perfect clearness of the aqueous liquid, the small residue left on evaporation, and its radiated crystalline appearance, indicate that saline substances only are present, the residue may be ignited at once, and a previous weighing dispensed with. In this case the ash should contain very little carbon, and after this has

* A platinum or silver capsule, two inches in diameter, with a cover, so that it can be used as an evaporating dish or crucible, is the most convenient.

been perfectly burnt off, it may be examined to determine the quantity and kind of mineral substances it contains. Silica, if it has been added in the gelatinous form, will have become insoluble, and may be separated by filtration and weighed. The filtrate must be examined for sulphate of potash and chloride of sodium, and their quantity determined when there is reason to suppose that they are greater than could be accounted for merely by the impurity of the alkali used in the manufacture of the soap, or the introduction of chloride of sodium during the process. In case it is unnecessary to determine the admixtures named, the total percentage of alkali may be ascertained by treating the ignited residue with hydrochloric acid, evaporating to dryness, weighing, and calculating from the chloride of potassium or sodium the quantity of soda or potash. When it is necessary to ascertain whether besides soda there is potash present, or the reverse, this must be done according to the general rules of analysis, which it is not necessary to particularize here. The same remark applies to several other points. My object in the present instance is to furnish the chemist with a short method of ascertaining the value of soap, leaving the detailed execution of it to his own management.

For the usual purpose, then, this method enables us to determine the percentage of fat* and its melting-point, the insoluble admixtures,—sand, heavy spar, pumice-stone, &c. The loss on ignition gives approximatively the organic admixtures. The saline residue, converted into chlorine compounds, indicates the percentage of alkalies; in that from soda soaps, 58 parts are equal to 31 soda; and in potash soaps, 74 chloride of potassium are equal to 47 potash. The sum of these constituents (in centigrammes) deducted from 100 gives the percentage of water.

On the Analysis of Oils by means of Sulphuric Acid. By M. MAUMENE.

Fatty oils, when mixed with sulphuric acid, evolve heat. This property may serve to distinguish them: it distinctly separates the drying oils from those which are not so.

50 grms. of olive-oil were placed in an ordinary test-glass. The temperature having been ascertained by a thermometer immersed in the fluid, 10 cub. centims. of boiled sulphuric acid (1·834 sp. gr.) were *carefully* poured into it. The liquids were then mixed by stirring them with the thermometer, the rising of the mercury being watched at the same time. Commencing with a temperature of 77° F. for the oil and acid, the thermometer rose to 153° F.; increase 76° F. The mixture does not take more than two minutes. The maximum temperature is attained in one.

In another glass of the same kind, 50 grms. of poppy-oil were placed, and similarly treated with acid. From 79° F. the thermometer rose to 213° F.; increase 134° F.

It is necessary to observe, in this case,—1st, a very distinct evolution of sulphurous acid, which is not produced with olive-oil; 2d, a considerable puffing up of the fluid. In consequence of these two circumstances, the number 134° is too low. The difference between 76° and 134° is sufficient to afford a means of analysis. The experiment, repeated several times under the same conditions with the same olive-oil, has constantly given the same elevation of 76° F.

* The percentage of fat comes out somewhat higher than it really is, since the fatty acids are separated in the hydrated state, while in combination with potash and soda they are anhydrous. This circumstance is generally overlooked in the examination of soap, because the high equivalents of the fatty acids render its influence slight.

Experiments made upon olive-oil from different sources proved that the action of sulphuric acid is constant when the oil is pure and when the operation takes place at the same temperature.

The action of the acid is not less constant upon the poppy-oil. Experiments showed also that the actual amount of heat developed by this oil is 160° F., instead of from 128° to 134° F., as indicated by the above experiment.

This process of analysis may be applied to the olive-oils of commerce. These oils are frequently only adulterated with poppy-oil, and in this case their analysis may be exactly performed, if their qualitative composition be first ascertained.

But what would take place in case of adulteration with other oils? In order to reply to this question, I have determined the elevation of temperature produced by most of the pure oils. The result of my researches is, that oil of ben and oil of suet evolve pretty nearly the same amount of heat as olive-oil;

That the other oils produce a more considerable elevation of temperature, by means of which they may readily be distinguished from olive-oil; lastly,

That drying oils give much more heat than those which do not possess that property, and may be readily recognized thereby.

Oil of ben and oil of suet cannot be mixed with olive-oil; consequently whenever the latter gives an increase of temperature of more than 76° F., on its mixture with 10 cub. centims. of boiled sulphuric acid (at a temperature of 77° F.), it is not pure.

The preceding statement appears to me sufficient to show the use that may be made of sulphuric acid in the analysis of oils. In mixtures consisting only of two oils, the employment of this acid will assist greatly in determining the quality. Qualitative analysis having been effected, the quantities may frequently be thus deduced with precision.—*Comptes Rendus*, Oct. 16, 1852, p. 572.

On the use of Burnt Lime instead of Limestone as a Flux in Blast-Furnaces. By E. Montefiore-Levi *and* Dr. Emil Schmidt.

The study of the gases formed in blast-furnaces, with which the authors have been engaged for some years, has shown that the use of carbonate of lime as a flux is attended with great loss, and likewise that this loss may be obviated by using burnt lime instead. The gases were taken from a blast-furnace, 54 feet high, at Ougrée, at thirty-two places, 1 foot apart, and the percentage of carbonic acid determined.

According to calculation, 8000 kilogrms. carbonic acid require for conversion into carbonic oxide 2173 kilogrms. of carbon, and the quantity of heat developed in the combination of this quantity of carbon with 1 equiv. of oxygen is 2173·1386=3,011,778 heat units. At the same time, however, these 8000 kilogrms. of carbonic acid are reduced to 5092 kilogrms. of carbonic oxide by the action of the carbon, a change which is accompanied by the absorption of a quantity of heat equal to that developed by the combustion of the latter gas, *i. e.* 5092·2488=12,667,896 heat units. Consequently deducting the 3,011,778 heat units developed in the oxidation of carbon from the total number of heat units absorbed in the reduction of carbonic acid to carbonic oxide, there still remains a loss of temperature equal to 9,656,118 heat units, equivalent to the heat developed by the combustion of 1609 kilogrms. of coke.

These considerations led the authors to employ burnt lime in working blast-furnaces, and thus to obviate the loss of heat. The experiment was commenced at Ougrée in July, 1849. During the first few days the results were unsatisfactory, the management of the furnace was difficult, and the slags black and pasty. Subsequently, when taking into account the impurities of ordinary limestone, 63 parts of burnt lime were substituted for 100 parts of limestone; the working of the furnace, until it was let out at the beginning of 1851, was continually regular and good; during these eighteen months the most satisfactory results were obtained. The saving of coke and increase of production were, as the experimenters anticipated, very evident; moreover, the raw iron was of better quality, and all the interior parts of the furnace, especially the tymp stone, remained in a much better state of preservation than when limestone was used. The following table gives the quantities of coke consumed, in the production of 100 kilogrms. raw iron, in the above-mentioned furnace, during the four months before and the four after the alteration of the charging, all other conditions remaining the same:

With limestone.		With burnt lime.	
1849. March	150·0 kilogr.	1849. July	142 kilogr.
April	154·5 "	August	138 "
May	156·5 "	September	133 "
June	151·5 "	October	139 "
Average quantity	153·2 kilogr.	Average quantity	137·75 kilogr.

Average quantity consumed with limestone ....153·20 or 100 p. c. coke.
Average quantity consumed with burnt lime ....137·75 or 90 p. c. coke.

Difference............... 15·45 or 10 per cent.

The practical saving is therefore 10 per cent., which corresponds tolerably well with the theoretical results.

The experiment was repeated in 1850, in a second blast-furnace, with the same favorable result of increased production, saving of fuel, and easier working. The following table shows the quantity of coke consumed for every 100 kilogrms. of raw iron, and the production during the first six months (reckoned at twenty-eight days). The figures in the first column refer to the furnace in which limestone alone was used; the second column to the first-mentioned furnace, in which burnt lime alone was used; and the third column to the second furnace, in which limestone was used for three months, and burnt lime for the next three months. All three furnaces are constructed alike, smelt the same ore, and produce the same kind of iron:

	Quantity of coke in kilogr. consumed for 100 kilogr. raw iron.			Reduction during twenty-eight days in kilogrammes.		
	1. With limestone.	2. With burnt lime.	3. With limestone.	1. With limestone.	2. With burnt lime.	3. With limestone.
April	165	145	163	436,000	601,000	459,000
May	165	147	159	447,000	582.000	461,000
June	160	$147\frac{1}{2}$	164	477,000	588,000	488,000
			With burnt lime.			With burnt lime.
July	161	$146\frac{1}{2}$	$149\frac{3}{4}$	462,000	555,000	537,000
August	$158\frac{3}{4}$	145	146	465,000	536,000	552,000
September	153	$147\frac{3}{4}$	146	477,000	577,000	600,000
Mean	$160\frac{1}{2}$	$146\frac{1}{4}$	$154\frac{3}{8}$	461,000	573,000	516,000
Average from April to June	......	......	162	......	......	469,000
Average from July to Sept.	......	.....	$147\frac{1}{4}$	......	......	568,000

The very regular and uniform results given in this table, show that by the use of burnt lime the consumption of coke for every 100 kilogrms. of raw iron was reduced by 14 to $15_{\frac{1}{4}}$ kilogrms., while at the same time the production of iron increased within a certain period as much as 22 or 24 per cent.

Hitherto the opinion of metallurgists with regard to the use of burnt lime was rather unfavorable than otherwise; but since the above experiments were made at Ougrée, it has been employed with good results in England and Wales, among other places at Abershyne, where the results obtained were still more satisfactory than at Ougrée, inasmuch as the saving of coke effected by this means amounted to 12 kilogrms. for every 100 kilogrms. of limestone which was replaced by 63 kilogrms. of burnt lime.

New lime-kilns have recently been built at Ougrée; burnt lime has been employed there for two years and a half, and with uniform results, for which reason the authors recommend its general application, from a thorough conviction of the advantage to be gained. The entire saving, inclusive of the expense of burning the limestone, is stated by them to amount to 30,000 francs annually for each furnace.—*Zeitschrift des österr. Ingenieurvereines*, 1852, p. 145–150.

Remarks on the Structural Conditions of Iron. By T. R. v. Fuchs.

The difference in physical characters presented by the several kinds of iron is generally attributed to the presence of a variety of substances, among which carbon is considered the most important. It is contained in all kinds of iron, almost always accompanied by silicium, which perhaps exercises the same influence. Raw iron contains the largest quantity of carbon, bar iron the least, and steel is in some sort intermediate between the two; but the quantity of carbon does not in any case bear a constant proportion to the iron, nor are these three kinds of iron separated from each other by any definite limits. These two facts are sufficient to show that the carbon cannot be in a state of very intimate combination with the iron, and there are no sufficient grounds for assuming that the different conditions of this metal are determined solely by the quantities of carbon contained in it. The numerous, and in many respects valuable analyses of iron have served only to prove the truth of the above remark. Upon the gratuitous assumption that the varying percentage of carbon is the cause of the differences in character of iron, attention has been too exclusively devoted to this point, while another, and perhaps more essential one, the crystalline structure, has been overlooked.

Fuchs expresses his conviction that iron is a dimorphous substance, that there are, in fact, two species (varieties) of iron,—the tesseral and the rhombohedral. He considers it as proved that malleable iron belongs to the tesseral system; and if any doubt still exists, it may be inferred from analogy that such is the case, inasmuch as all other malleable metals possess crystalline forms belonging to this system.

The crystalline form of raw iron has not been ascertained with so much certainty, but Fuchs considers it highly probable that it belongs to the rhombohedral system, because it comes within the class of perfectly brittle metals, the crystalline forms of which, as far as we are acquainted with them, are rhombohedral.

But the difference between malleable and cast iron does not consist merely in the crystalline structure, which may be open to doubt, but likewise in the physical characters, and to some extent in the chemical be havior, for instance the cohesion, hardness, resistance to fracture, fusibility, oxidizability, solubility in acids, &c. He is of opinion that these circumstances alone would justify the inference that there is a specific difference between malleable and cast iron, which he compares with those presented by the modifications of sulphur, phosphorus, arsenious acid, by glass and Reaumur's porcelain.

Finally, with regard to steel, Fuchs is of opinion that it is an alloy of tesseral and rhombohedral iron. The percentage of carbon which it contains varies from 0·625 (Gay-Lussac) to 1·9 (Karsten). It cannot therefore be regarded as a definite and constant compound. It differs from other alloys in the circumstance that its characters may suffer considerable alteration without an accompanying addition or loss of substance, as in the hardening and softening of steel, changes which Fuchs supposes to be the result of an internal and alternating metamorphosis, by which the relative proportion of the two species of iron is altered. Thus, according to his views, in hardened steel the rhombohedral preponderates over the tesseral iron, and the reverse in soft steel. Vary hard steel would, therefore, from the very small proportion of tesseral iron, approximate closely to cast-iron; and this conjecture is favored by the low specific gravity of hardened steel. By the process of tempering, the proportion of tesseral iron in steel would increase with the temperature. The two kinds of iron in steel may be regarded as in a state of constant mutual tension, which may perhaps be the reason why steel retains permanently communicated magnetism, while malleable iron does not.

An experiment of Schafhäutl's* would appear to favor the above views. He submitted a piece of a razor-blade to the action of tolerably strong hydrochloric acid for several days, at the end of which time it was found to have been very unequally attacked. When washed, dried, and broken in a mortar, it furnished fragments, some of which could be powdered, while others were malleable.

With regard to the important and much discussed question of the alteration of malleable iron when exposed to continuous vibration, concussion, or torsion, in consequence of which it acquires a glanular fracture, Fuchs admits that such an alteration takes place even in the best-worked metal, but does not altogether agree with the explanation usually offered for it, viz., the gradual assumption of a crystalline texture; and is of opinion that it consists in the passage of the iron from a fibrous crystalline state to a granular crystalline state, a change in the aggregation, not an essential metamorphosis. When iron passes from the fibrous into the granular texture, the cohesion of the molecules is lessened; and by their aggregation into rounded groups, a heap of distinct particles is produced, which may be compared with what mineralogists call granular minerals. The continuity of the mass is thus to some extent destroyed, inasmuch as these granular particles only adhere together more or less, and consequently the greater the size and number of these particles the greater is the diminution in tenacity. According to the statement of Kohn, the original condition of iron thus altered cannot be restored by heating to redness and forging, but only by exposure to a welding heat; and Fuchs considers this a sufficient proof that this alteration of iron consists in a breaking up of the continuity of the mass. The restoration of this continuity requires that the granular iron should, by exposure to a welding heat, be rendered amorphous, when the cohesive force again becomes active, a condition which in

* Prechtl's Technologischer Encyclopädie Abhandlung über den Stahl, vol. xv. p. 377.

the case of most other bodies obtains only when they are liquid.—*Schweizerisches Gewerbeblatt*, September, 1852.

On the Detection of Cotton in Unbleached Linen. By O. ZIMMERMANN.

A piece of the stuff to be examined is well washed with boiling water and dried, then laid in a mixture of 2 parts of dried nitrate of potash and 3 parts of ordinary sulphuric acid, and left in intimate contact with it for 8–10 minutes, according to the strength of the fabric. After a complete washing and drying, the piece of stuff which has been changed by the nitric acid is decocted with ether, to which some alcohol is added; the more consistent the collodion thus obtained, the more cotton was there in the linen. If no cotton be in it, the ethereal decoction is scarcely thickened. If it is wished to determine the quantity of cotton, it is only necessary to weigh the linen after it has been boiled with water and dried, then to proceed as above, separate the collodion obtained from the residue (which is unchanged linen), wash this well with some ether and alcohol, dry and weigh it; the loss of weight gives the quantity of cotton with tolerable accuracy.—*Archiv. der Pharm.*, cxxii. p. 103.

On Soaps, and their Employment in Manufactures. By Prof. F. C. CALVERT.

It may perhaps be desirable that, before I enter into the technical details contained in this paper, I should give a short outline of the manufacture of soaps, and of their chemical composition. The manufacture of soaps may be ranged under two great heads, the one relating to soft soaps, and the other to hard soaps. Both soaps contain fatty matter; but in the former case it is combined chiefly with potash, in the latter with soda. There is also another important difference between these two classes of soap, for soft soaps contain all the substances which composed the fatty matter employed in their preparation, whilst in the soda soaps one of these substances is removed, namely, the oxide of glyceryle, or glycerine. Thus, in the manufacture of soft soaps, either the fatty matters mixed with a large proportion of fish-oil, or the fish-oil itself, are boiled with caustic lye; and when saponification is effected, and the whole sufficiently concentrated, it is allowed to cool; whilst in the case of hard soaps the caustic lyes employed contain a sufficient amount of water to dissolve the glycerine as it is removed from the fatty matters by the action of the alkali contained in the caustic lye. From these facts it may be seen that the chemical change which takes place consists in the substitution of oxide of potassium or sodium for the oxide of glyceryle existing in the fatty matters in the state of a margarate, stearate, or oleate, and therefore in the formation of a margarate, stearate, or oleate of potash or soda, soluble in water. It is easy to understand that a great variety of soaps must be manufactured to suit the various purposes to which soaps are applied in domestic and manufacturing concerns; and so we find that different qualities of soap are manufactured for boiling silks, clearing wool, or for clearing madder goods, and giving to the different colors obtained from this root a greater brilliancy and fixity. Strange to say, we are quite ignorant of the real composition which each of these soaps should present to produce the maximum of effect, and we are even unacquainted with the composition of those now employed. I have therefore thought that it might be interesting if I were to offer a statement of the results I have obtained in connection with this point. To arrive at a medium, showing the real difference which exists between soaps employed for the above purposes, I have been obliged to make a great number of analyses. This will be easily understood if we reflect that the quality of the soaps used by different parties, in a given trade, is so little examined, that even the soap used by a single firm varies as much as 25 per cent. in quality. The following general results I have however arrived at in calculating the composition of these soaps as containing 30 per cent. of water:

Composition of Soaps per 1000 *parts.*

	Calico printers' soap.	Silk dyers' soap.	Wool scourers' soap.
Fatty matters	640	619	614
Soda	60	81	86
Water	300	300	300

From these results we find that the soaps employed vary in the quantity of alkali according to the nature of their application; thus in 1000 parts of soap, there are 21 parts more alkali in the one used for boiling silk, and 26 parts more alkali in that employed for clearing wools, than there are in the soap best suited for clearing madder purples. These facts show us at once how important it is to inquire into the real composition of a soap before employing it for a given purpose. If, on the one hand, a calico printer were to use a soap which had the composition of the one used by the wool-scourer, he would cause the shade of his madder purples to fade; and if, on the other hand, the wool-scourer were to employ the neutral soap of the calico printer, he would have but imperfect results, owing to this circumstance, that in the latter case an excess of alkali is essential, not that the alkali may combine with the fatty matters of the wool, but that it may form an emulsion with the stearine and elaine discovered by M. Chevreul, and thus liberate the dirt which they fix on the wool. There is another point which deserves the serious attention of calico printers, and that is, the influence which soaps of different compositions must have on the different shades obtained in madder dyeing; for it must be obvious that the soap containing a slight excess of alkali, which is the best suited for clearing madder reds or dark pinks, would deteriorate the beauty of the madder purples. In the first case, the dyer has in view, not only to fix and brighten his reds or pinks, but further to remove the yellow coloring matter, and also partially the red; whilst in the latter a soap containing as little alkali as possible appears to me to give the best results. I have found by experiment the two following soaps to be best suited for these purposes:

	Soap for purples.	Soap for dark pinks.
Fatty matter	60·4	59·23
Soda	5·6	6·77
Water	34·0	34·00

Still we find that calico printers in general employ the same quality of soap for all shades of madder goods. Some dyers think that they overcome this difficulty by employing less or more of the same soap; but this is an error, not only as manifested by the above remarks, but because, as we shall show presently, the different soaps sold in the market offer in their relative composition differences which are equal to the different proportions they are in the habit of using for given styles or shades of madder prints. This fact can be easily proved by examining the qualities of soap which are supplied to a firm during a period of twelve months; for we find, as the following results show, that the quality of soap sometimes varies as much as 25 per cent. in value:

	I.	II.	III.	IV.	V.
Water	26·00	29·3	34·81	38·0	45·00
Fatty matter	66·00	64·0	56·00	55·4	46·01
Alkalies	7·56	6·3	6·98	6·1	5·80
Impurities	0·43	0·4	2·21	0·5	2·19

The figures also show that the quantity of the really effective agent, viz., the fatty matter, in a soap may vary from 46 to 66 per cent.; consequently it may be seen that a large sum of money is wasted by some of our large firms annually, for want of paying proper attention to one single article. It must be remembered that each piece of madder-dyed goods requires from 1 oz. to 4 oz. of soap to clear it. If we take the average at 2 oz. per piece, and admit that a print-works produces 100,000 pieces per annum, the quantity of soap used would be 12,500 lbs.; and if the soap be 25 per cent. under value, the loss would equal 4125 lbs.

It may be objected that the above soap was supplied to one firm only, and therefore its variation in quality might be owing to the inattention of persons connected with the firm. This remark would however have no value, as I have found similar differences of quality in the soap of other firms.

There is another fact connected with the use of soap by calico printers which deserves most serious consideration, and to which attention has not, so far as I am aware, been drawn, viz., that soaps are not at the present day, as formerly, made with one kind of fatty matter, but are manufactured sometimes from palm-oil, at other times with vegetable fluid oils, such as rape-seed oil, galipoli-oil, again with animal fatty matters, and lastly with the oily liquid called oleine, which is obtained when solid fatty matters are submitted to pressure to obtain a fatty matter having a higher fusing-point, and consequently more fit for the manufacture of composite candles. The liquid oleine, containing small amounts of margarine and stearine, is extensively employed at the present day in the manufacture of soaps. I have ascertained from direct experiment, that such a soap will not give the same brilliancy and fixity of color to the shades obtained from madder roots as a soap made with a vegetable oil composed of margarine and oleine, or with an animal fatty matter composed of margarine, stearine, and oleine; consequently if a dyer uses a soap of the former composition, it will prove, if not a direct loss to him, at least an injury to his goods, in disabling him from producing the maximum effect. I should also mention here, that I have found in print-works household soap of an inferior quality, and containing 10 per cent. and upwards of resins. These soaps have none of the properties required in calico printing, and must therefore prove a loss to the printer, as well as those soaps which are sometimes found to contain glue. I hope these facts will prove how highly desirable it is, that, with the existing composition both amongst our local firms and those of the continent, the indifference which exists as to the qualities of the drugs employed in print-works should cease, and that science united with practical knowledge should step in, and guide the application of chemical art in manufactures. Then, and then only, will our manufactures progress in a sound and remunerative manner.

I have also examined a great variety of soaps employed for domestic purposes, and have found their qualities to vary materially, as the figures underneath show:

	Hard soap.			Soft soap.	
	I.	II.	III.	I.	II.
Fatty matters, &c.	67·00	57·52	56·09	41·67	58.95
Water	26·81	36·00	39·14	49·49	32·15
Alkali	6·19	6·48	4·77	8·84	8·90

Fire-proof Bronze Color for Copper and Brass. *By* M. Dienst.

$\frac{1}{16}$th of an ounce of cyrstalline verdigris, and the same quantity of finely pounded muriate of ammonia, are to be dissolved in $\frac{5}{8}$ths of a pint of rain-water, the solution left standing covered for 3 to 4 hours, and then $1\frac{1}{2}$ pint more water poured into it. The copper vessel, which must be perfectly clean, is now to be held over a charcoal fire until it is equally heated throughout, and becomes uniformly tarnished. The copper is now to be rubbed over with the mixture, and then carefully dried.

After five or six repetitions of this treatment, the copper receives a brass color; after from six to ten repetitions, it acquires a fine yellow. If the copper is now to be changed from yellow to brown, it must no more be wetted whilst hot; if, however, it be desired to have it very pale brown, the process must be repeated twenty or twenty-five times. When the desired color is attained, the copper is to be laid in clean water, taking care however to clean it or dry it rapidly after taking it out. This must be done carefully. The copper is then held over a weak charcoal fire, when the bronze becomes permanent and fire-proof.

To give a fire-proof, brown, bronze color to brass, the following is the process:

$\frac{3}{32}$ of an ounce of crystallized verdigris and the same quantity of sal-ammoniac are mixed with $\frac{5}{8}$ths of a pint of rain-water, and left to stand for 2 to 3 hours. The brass is then to be rubbed over with it for 2 to 3 minutes, when it becomes green. $1\frac{1}{4}$ pint of rain-water is now to be added to the solution. The metal is now held over a charcoal fire, which must not be too strong, until it acquires a copper color. It is then again wetted, and left to dry by evaporation. When it has been treated in this manner four or five times, it becomes olive-colored. The heat may now be somewhat increased, but it is necessary to be very careful that the metal does not become too hot. When it has been treated nine or ten times in this manner, it becomes brown. As long as any greenish places are to be seen, however, this treatment must be continued, in many cases 20 to 25 times before the required color is obtained.

If however the metal be strong, the materials are to be dissolved in hot rain-water, and the metal rubbed with it immediately until it acquires a fine dark green color; it is then to be held over a strong charcoal fire, by which means it acquires a fine brown color after 10 to 12 repetitions of the treatment. It is necessary to be careful that the metal is equally heated throughout. If spots appear, they must be bitten out during the work and polished with brick-dust.—*Gewerbeblatt aus Würtemb.*, 1852, No. 1, p. 409.

Examination of Guano. *By* M. Melsens.

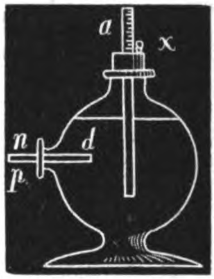
A solution of chloride of lime is prepared by extraction of chloride of lime with water; some hydrate of lime is added to the clear solution, which is then filtered. 1 grm. of guano enveloped in paper is then put into a bottle containing the above fluid, and the gas evolved collected. The value of the guano is determined by a comparison of the gases obtained with those procured from the best sorts of guano.—*Moniteur Industriel*, 1852, No. 1677.

ON A NEW VOLTAMETER.

BY PROFESSOR CHARLES G. PAGE, M. D., WASHINGTON, D. C.

THE Voltameter about to be described, I have had in use for a number of years, but for want of opportunity delayed its publication. The usual mode of collecting the gases in tubes, by displacement of the acidulated water, is attended with great inconvenience, from refilling the tube for each experiment, and the liability of the acid to be spilled about; and, in most cases, the hands or fingers must be immersed, in inserting the tube. The new instrument measures the amount of collected gases by a column of the liquid in the graduated tube.

Fig. 1.



Figs. 1, 2, and 3, are modifications of the principle. The most simple is Fig. 1, in which a common Woulfe's bottle is employed. The graduated tube *a* is inserted through the cork, previously well soaked in melted wax, and the platinum points *d d* are soldered to copper wires *p n*, which are cemented tightly in the glass tubes *s s* inserted through the side of the bottle. A little plug or stop-cock *x* passes through the cork or stopper, and is for the purpose of equalizing the pressure within and without the receiver. The wires *p n* being connected with a galvanic battery, the mixed gases rise into the upper part of the bottle or receiver, and by their pressure raise a column of liquid in the graduated tube. The height of this column marks the quantity of gas. By loosening the stopper *x* the liquid may be let down in the tube to the zero of graduation or any other point. The amount of acidulated water in the receiver should be kept uniform, and it is desirable that the receiver should be nearly full. Once properly graduated, the instrument is liable to no more inaccuracies than the common one, and becomes a very pleasant, convenient, and neat instrument for experimental purposes or for illustration. The modification, Fig. 2, is a little more expensive than Fig. 1, and Fig. 3 more expensive than either. Fig. 3 is, however, the most convenient, from the glass receiver being cemented to a wooden stand, to which are affixed two binding screw cups for battery connections. The form most easily kept in order—air and water tight—is Fig. 1. In letting off the mixed gases by plug *x*, care must be taken not to approach it with a match, lamp, or electric spark.

Fig. 2.

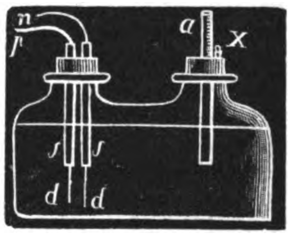
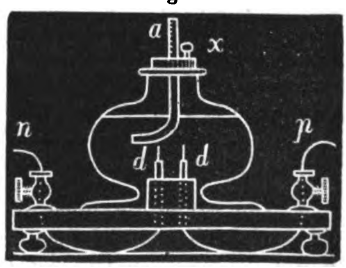


Fig. 3.



THE NEW PATENT LAW OF THE KINGDOM OF SAXONY.

DATED JANUARY 20TH, 1853.

Translated and abridged for the American Polytechnic Journal, by CHARLES L. FLEISCHMANN.

1. A PATENT (a privilege for an invention) is granted for a really new and proper invention, that is, for an invention which before the day of granting letters-patent shall not have been in use or known within the German Confederacy, nor described in any foreign or other works which would enable others to construct or employ said invention. For medicines, fancy toilet articles, articles of food, inclusive of articles of luxury, all kinds of samples and patterns, and for all such inventions or discoveries as are based upon scientific principles, no patent is granted.

2. Patents for improvements upon privileged inventions are granted; but the patented improvement can only be put into operation with the consent of the proprietor of the privileged original invention.

3. To citizens of Saxony, as well as to foreigners, letters-patent are granted. Foreigners who are not citizens of some one of the States of the German Confederacy, must appoint a citizen of Saxony as their agent, who can make application for letters-patent, and in whose name the patent is granted.

4. A patent-right can be assigned or transferred.

5. An invention, the inventor of which is a citizen of the German Confederacy, and for which he has obtained letters-patent in the State wherein he is citizen, can only be patented by the inventor himself, or his legal agent or successors.

6. The patent gives to the patentee the exclusive right to bring his invention into use throughout Saxony, and the patentee has a right to stop any person or persons who manufacture or make his patented article. The patentee, however, has no right to prevent the importation, or the sale and use of articles like his, in as far as the privileged articles relate to something other than mode of manufacture, or in machines or tools necessary for the manufacture.

7. The right conferred on the patentee under section 6 does not include such persons as know the nature of the invention before the grant of the patent. Letters-patent do not entitle the patentee to a license for a business or certain trade; he is subject to the existing laws and regulations concerning trades, &c.

8. Patents are granted for five years. They can, however, be renewed for another term of five years, provided that the patentee make application four weeks before the expiration of the term.

The application for a renewal is made at the Home Department; the patentee must surrender his old patent, and pay the fee mentioned in the Appendix.

9. The invention must be brought into use within a year after the date on which the patent has been granted, or the patent is considered forfeited. This term can be prolonged, however, by making application to the Home Department, four weeks before the expiration of said term, and by proving that the patentee was prevented by some unforeseen cause which was not in his power to prevent, and by paying a certain fee mentioned in Appendix under section 3.

10. The patent expires:

a.—After the expiration of the term.

b.—By annulling: patents are annulled, because—

aa.—The invention was not new.

bb.—The patentee used fraudulent means to obtain letters-patent.

cc.—The invention was already patented in one of the German Confederated States, and the holder of letters-patent for the kingdom of Saxony was neither the inventor nor legal successor.

dd.—That the description of the invention was not correct.

ee.—That the inventor did not put the invention into execution within the specified time.

11. The invention for which letters-patent are granted is considered as an undivided whole, so that the withdrawal must also take place, when a part only of a privileged invention comes under the clauses *a a*, *c c*, *d d*, and *e e* of paragraph 10.

12. The clause specified in § 10, under *a a*, does not take effect when a few persons only have knowledge of the invention, at the time of granting the privilege, and have kept the knowledge of it secret.

13. Every person has a right to propose to annul a patent, provided they can show cause and proof.

14. Application for letters-patent for a renewal must be made to the Home Department.

Besides the application for letters-patent, there is to be furnished—

a.—A specification; and when it is necessary to explain the subject more fully, also drawing or model.

b.—The fee (see Appendix, section 1).

15. The Home Department informs the applicant whether he is entitled to a patent or not; and when the grant is made, he will be also notified how much the fee and stamp-tax will amount to, according to Appendix, section 2. The fee must be paid within a given term. If the applicant does not pay the amount within the specified time, the Home Department considers the application as abandoned. When the fees are paid at the right time, the letters-patent are granted immediately.

16. The granting, renewing, or annulling of a patent, and also the prolongation of time to bring it into use, is made public in the Leipsic Gazette.

17. The specification, drawing, and models are kept carefully locked up during the duration of the patent. After the patent has expired or is withdrawn, the specification is published.

18. The patentees have lawful protection.

19 and 20 concern the legal proceedings in patent cases.

The fees and taxes for privileges are regulated according to the following

Appendix.

FEES TO BE PAID FOR PATENTS.

	Thlr.	Ngr.
1.—When application is made:		
For preliminary examination	5	0
Office tax, &c.	2	15
Sum total	7	15

2.—At the time of granting letters-patent for five years:

Stamp-tax	5	0
At present an additional stamp-tax	2	15
Patent tax	15	0
Sum total	22	15

3.—For a prolongation of the term for putting the invention in use:

Stamp-tax	1	0
At present an additional stamp-tax	0	15
Office taxes	2	15
Sum total	4	0

4.—For the renewal of a patent for another five years:

Stamp-tax	5	0
At present an additional stamp-tax	2	15
Office tax	2	15
Patent fee	40	0
Sum total	50	0

All applications for inventions, or relating thereto, must be written upon stamped paper.

Official Gazette Office of the Kingdom of Saxony, No. 1, 1853.

NOTE.—1 thlr. equal to 69 cents.

DECISIONS IN PATENT CASES BY THE SUPREME COURT OF THE UNITED STATES.

1847. WOOD *vs.* UNDERHILL & GEROW. 5 Howard, R., p. 1.

THIS case came upon a writ of error, from the Southern District of New York, and involved the validity of Wood's patent of 1836, for improvements in making brick, tile, and other clay ware, by combining fine anthracite coal and coal-dust with clay. The principal question was, whether the specification was so vague and uncertain as not to support the patent.

The law requires the specification to be so full, clear, and exact as to enable any person, skilled in the art to which it appertains, to compound and use the invention without making experiments of his own.

In patents for machines, the sufficiency of the description must, in general, be a question of fact to be determined by the jury.

This must be the case in compositions of matter, where any of the ingredients in the specification do not always possess exactly the same properties in the same degree.

When the specification of a new composition of matter gives only the names of the substances which are to be mixed together, without stating any relative proportion, undoubtedly it would be the duty of the Court to declare the patent void. So where it is apparent that the proportions were stated ambiguously and vaguely.

In such cases, it would be evident from the face of the specification, that the desired result could not be obtained without experiment.

In this case, the patentee directs, as a general rule, three-fourths of a bushel of coal-dust to one thousand of bricks. This would apply to such clay as is ordinarily used. He states that clay which needs the most burning will require more coal-dust. This is an exception, and not a general rule.

It may be that the qualities of clay generally differ so widely that the specification of the proportions, stated in this case, is of no value, and that the improvement cannot be used with advantage, in any case, or with any clay, without first ascertaining by experiment the proportion to be employed. If that be the case, the invention is not patentable.

If, from the nature and character of the ingredients to be used, they are not susceptible of such exact description, the inventor is not entitled to a patent.

But this does not appear on the face of this specification. Whether it was so or not, was a question for the jury, upon the testimony of persons skilled in the art to which the patent appertains.

The Court below having held, as a matter of law, that the patent was bad on its face, instead of submitting it to the jury to determine whether the invention could be used, under the description contained in it, without experiment, the judgment below was reversed, and a *venire de novo* ordered.

1848. HOGG & DELAMATER *vs.* EMERSON. 6 HOWARD, R., p. 437.

The verdict below was less than two thousand dollars, and the writ of error to bring up the cause was allowed by the court under that clause in the 17th section of the patent law of 1836, which empowers it to do so, in all "cases in which the court shall deem it reasonable to allow the same." The court below deemed it reasonable to allow only certain of the questions raised before them, to be brought to the Supreme Court by the writ of error. It was held, that the court below could not limit the questions to be brought up, but when allowed, the writ necessarily brought up for review all the questions to which exceptions were taken below.

Where the questions raised below are trifling, or have been clearly settled, or are those arising under the common law, and not under that patent law, it may be proper not to grant a writ of error.

A writ of certiorari was allowed, to bring up the residue of the record, containing the questions not already before the court.

The declaration was for violating a patent for an "improvement in the steam-engine, and in the mode of propelling therewith, either vessels on the water, or carriages on the land."

The evidence on the trial was a patent for "a new and useful improvement in the steam-engine," a "description whereof is given in the words of the said John B. Emerson himself, in a schedule hereto annexed, and is made a part of these presents." In the schedule, the descriptive words were the same as in the declaration. Held, that the evidence was admissible under the declaration.

In England, the patent contains no reference to the specification, except that one shall be filed. There, it is important that the title, or heading, be fuller than here, where it goes out with the specification, and forms a part of the patent itself. In this respect, our practice has been different from the English, since our first patent law of 1790. With us, the letters-patent and the descriptive specification are issued together, and form one instrument.

A petition always was, and still is, required to be presented by an inventor, to obtain a patent. In England, it is recited in the patent, and was required to be here, by the act of 1793. But, with a single exception, they appear not to have been so recited. The full description in the specification rendered this unnecessary.

There seems to have been no good reason, at first, unless it be a fiscal one, why more than one invention might not be embraced in a patent, as in patents for land. They might be set out separately, like the counts in a declaration. But, to obtain more revenue, the public officers have generally declined to issue letters including more than one, and courts have acquiesced in the practice as conducive to clearness, and if issued otherwise, to hold them null, as a general rule.

"But it is a well-established exception, that patents may be united, if two or more, included in one set of letters, relate to a like subject, or are, in their nature and operation, connected together."

Clearness in a specification is important to enable the Commissioner of Patents to judge whether the matter claimed is new or too broad. Also to enable the courts, when the patent is before them, to form a like judgment.

Where the thing claimed is particularly described, the patentee need not disclaim the old parts included in the machine.

The burning of records, models, and drawings, in the Patent Office in 1836, did not destroy the rights of patentees under their patents. The burning was no fault of theirs. "We cannot consent to be over astute, in sustaining objections to patents."

The English rule now is to construe patents "in the most favorable and beneficial sense, for the best advantage of the patentee."

"The true rule of construction in respect to patents and specifications, and the doings generally of inventors, is to apply to them plain and ordinary principles, as we have endeavored to do on this occasion, and not, in this most metaphysical branch of modern law, to yield to subtleties and technicalities, unsuited to the subject, and not in keeping with the liberal spirit of the age, and likely to prove ruinous to a class of the community so inconsiderate and unskilled in business as men of genius and inventors usually are."

1850. Wilson *vs.* Barnum. 8 Howard, R., p. 258.

Certificate of division of opinion by the court below. Question: "Whether, according to the true construction of the Woodworth patent, as amended, the machines made or used by defendant at the time of filing the bill, or either of them singly, do or do not infringe the said amended letters-patent." Held, that this is a question of fact for the jury, over which the Supreme Court has no jurisdiction, on a certificate of division. In such cases, its jurisdiction, under the statute, only extends to questions of law.

The question now presented in this case, is one, as to the identity of two machines. Its decision depends upon the testimony of witnesses, the examination of models, drawings, and the machines themselves, and the application of mechanical principles and combinations.

It would not be proper to take out of a case, during its progress, a single question of fact, and send it here, with the evidence, for the final decision of this court.

Although the act under which this certificate was made has been in force over half a century, this court has never taken jurisdiction of a question of fact. In a question of law, it requires the precise point to be stated, otherwise the case is remanded without an answer.

In this case, the court has no jurisdiction, and therefore it is remanded for the court below to proceed in as law and justice may require.

1850. WILSON *vs.* SIMPSON AND OTHERS. 9 HOWARD, R., p. 109.

Wilson claimed that an agreement by Woodworth & Strong, authorizing the use of the Woodworth planing-machine, was obtained by fraud, those who obtained it having alleged that one Emmons had invented it previous to Woodworth. Held, that the declarations of Emmons, in relation to his invention, cannot be given in evidence to sustain this position. Such evidence would be mere hearsay. It would be proving what the witness heard another person say, and not proving a fact.

When repairs destroy the identity of a machine, and encroach upon invention, and when the thing patented ceases to exist, it is no longer the same machine. Under the decision in Wilson *vs.* Ropeau, the defendants in this case are authorized to continue the use of the machines which they lawfully constructed before the patent was extended.

"But it does not follow, that when one of the elements of the combination has become so worn as to be inoperative, or has been broken, that the machine no longer exists, for restoration to its original use, by the owner who has bought its use."

Repairing partial injuries, from wear and tear, or accident, is only refitting a machine for use. "It is no more than that, though it shall be a replacement of an essential part of a combination. It is the use of the whole of that which a purchaser buys when the patentee sells to him a machine; and when he repairs the damages which may be done to it, it is no more than the exercise of that right of care which every one may use, to give duration to that which he owns, or has a right to use as a whole."

"When we speak of the right to restore a part of a deficient combination, we mean the part of one entirely original, and not of any other patented thing which has been introduced into it, to aid in its intended performance. Nor is it meant that the right to replace extends to every thing that may be patented. Between repairing and replacing there is a difference."

A purchaser has the right to repair a thing so as to give it what was its first shape, by filing, grinding, or cutting, to keep it up to the performance of its original use. "But if, as a whole, it should happen to be broken, so that its parts could not be readjusted, or so much worn out as to be useless, then a purchaser cannot make or replace by another, but he must buy a new one. The doing of either would be entire reconstruction. If, however, this same thing is a part of an original combination, essential to its use, then the right to repair and replace occurs."

The defendants replaced new cutters, and lawfully did so. They bought the right to do so. The machine would soon be useless, if they could not do so. This results from the structure of the machine. The replacement of the cutters, from time to time, is necessary to the use of the machine sold, and must have been so understood by the purchaser. It is the way in which the inventor intended the machine should be used, and it is the only way it can be used. Such a replacement of temporary parts does not alter the identity of the machine, but preserves it. The replacement was no violation of the plaintiff's rights.

R. H. G.

DECISIONS OF ASSISTANT JUDGE OF THE CIRCUIT COURT OF THE DISTRICT OF COLUMBIA,

In Matters of Appeal from the Decision of the Commissioner of Patents.

THE very large proportion of decisions of the Appellate Judge against the Patent Office, exhibits too plainly the errors of that office, of which we have had the occasion to complain. While we rejoice to see the final success of a meritorious inventor, yet we deplore the mischief occasioned by the delays and errors of the Patent Office. We have full confidence in the ability of Judge Mason to administer the Patent Office, but he has a Herculean task to bring up the arrears in that office; and the more laborious, as some of the examiners have of late made so many *extraordinary* reports against claims for patents, rejecting them upon the most far-fetched and overstrained analogies, each of which cases will be sure to come back to the office for a reasonable hearing, or be contested by appeal. We insist upon it again and again, that the business of the Patent Office can never be brought up until the examiners can be made to understand patent law, and check the growing propensity of looking at devices or inventions irrespective of their purpose or connection, of isolating the elements of a combination, and searching all over *Machinedom* for the *representative*, *equivalent*, or *analogues* of those elements, and finally of refining and abstracting upon matters of plain *common* sense character. We repeat it, the business of the Patent Office can never be brought up until certain reforms are made in the business of examination. We are sure that extra hours cannot do it; for it is plain enough, that the more bad work the examiners do, the more they will have to undo.

C. G. P., *Ed.*

In the matter of the appeal of Moses Marshall from the decision of the Commissioner of Patents, in the interference declared between the claims of the said Marshall and those of Mee, Rourke, and McKennon, assignees of John Mee. — KNITTING LOOMS.

Same *agst.* same. — KNIT FABRICS.

I, James Dunlop, Assistant Judge of the Circuit Court of the District of Columbia, certify to the Hon. the Commissioner of Patents, that on the 28th day of February, 1853, according to notice duly given, the parties appeared before me, the said Moses Marshall by Mr. Gillett and Mr. Dennis his counsel, and the said assignees of John Mee, in a written argument, by Mr. Brooks their counsel, Mr. Smith of the Patent Office being also present, and the said appeals were heard before me, at my office, Georgetown, District of Columbia, and argued by counsel on the 7th, 14th, 23d, 26th of March, 1853, upon the decision of the said Commissioner of Patents, and the reasons of appeal filed in the office, with the grounds and reasons of said decision fully set forth in writing, touching all the points involved in the reasons of appeal, and the evidence produced before the said Commissioner, and the same being fully heard, argued, and considered, I do, this 20th day of April, 1853, adjudge and determine, that the said decision of the Commissioner of Patents, of the 12th January, 1852, awarding priority of invention to John Mee, assignor to Mee, Rourke, & McKennon, in the cases of improvements in the Knitting Loom and Knit Fabric, be and the same is hereby affirmed.

JAS. DUNLOP.

Examined, J. T. F.

In the matter of the appeal of Patrick O'Reilly from the decision of the Commissioner of Patents, in the interference declared between the claims of the said O'Reilly and those of Chas. E. Smith, assignee of J. Dutton Steele, for patents for improvements in rails for railroads.

Upon appeal by Patrick O'Reilly from the decision of the Commissioner of Patents, awarding priority of invention to Charles E. Smith, assignor of J. Dutton Steele, of improvements for rails for railroads, I, James S. Morsell, Assistant Judge of the Circuit Court of the District of Columbia, certify to the Hon. the Commissioner of Patents that, according to previous notice duly given, the parties aforesaid appeared before me by their respective counsel, and the said appeal heard upon the decision of the said Commissioner of Patents, and upon the evidence, reasons of appeal, and arguments of said counsel, upon due consideration I do adjudge that there is no interference in the claims of the said applicants in relation to the matters contained in their respective specifications, and that the said Patrick O'Reilly is entitled to a patent for his said improved invention of rails for railroads, as stated in his specification, and that the said decision is erroneous, and that the same be and is hereby reversed and annulled for the error aforesaid.

JAMES S. MORSELL,
Assistant Judge, &c.

April 22, 1853.
Examined, J. T. F.

In the matter of the appeal of Cyrus H. McCormick from the decision of the Commissioner of Patents, in the interference declared between the claims of the said McCormick and those of Rufus L. Howard, assignee of William F. Ketchum, for patents for improvements in side-shield plate track-clearer or scraper in the grass-harvester.

In case of an appeal from the decision of the Commissioner of Patents, awarding priority of invention to William F. Ketchum, assignor to Rufus L. Howard, of invention of the side-shield track-clearer, or scraper.

I, James S. Morsell, Assistant Judge of the Circuit Court of the District of Columbia, certify to the Honorable the Commissioner of Patents, that on the day and place appointed for the hearing of this appeal, the parties appeared before me by their respective counsel; and the said appeal was heard upon the decision of the said Commissioner of Patents, and the reasons of appeal filed in the office, with the grounds of said decisions fully set forth in writing, touching all the points involved in the reasons of appeal, and all the evidence and papers touching the same having been laid before me, and the arguments in writing on each side being submitted, and carefully and duly considered, I do adjudge that the said decision of the Commissioner of Patents be and is hereby affirmed.

May 3, 1853. JAMES S. MORSELL.
Examined, J. T. F.

Ex-parte Samuel J. Seely.

Upon appeal from the Commissioner of Patents, refusing to grant a patent to said Samuel J. Seely, for a new and useful process of calcining limestone by the aid of an artificial draught, or blast of air, and certain improvements in the adaptation and application of means to carry the same into effect.

I, James S. Morsell, Assistant Judge of the Circuit Court of the District of Columbia, certify to the Honorable Commissioner of Patents that, according to due notice given, the party appeared before me by his counsel; Mr. Lane from the Patent Office was also present, and the said appeal was heard and considered upon the decision of the said Commissioner of Patents, and the reasons of appeal filed in the office, with the grounds of his said decision set forth, upon all the proof adduced in the case, and upon the arguments, filed in writing, I do adjudge that the said decision of the said Commissioner is erroneous, and the same is hereby reversed, and I do determine that the said Samuel J. Seely is entitled to receive a patent as prayed for.

JAMES S. MORSELL,
Assistant Judge, &c.

May 6, 1853.
Examined, J. T. F.

Ex-parte Jewett and Root.

Appeal from the decision of the Commissioner of Patents, refusing to grant a patent for alleged improvements in stoves, &c.

I, James S. Morsell, Assistant Judge of the Circuit Court of the District of Columbia, hereby certify that, according to previous notice duly given, I proceeded to hear the above stated appeal, and having heard and considered the same, I am of opinion, and do determine, that the decision aforesaid of the Commissioner, in this case, is erroneous and ought to be reversed, and the same is hereby reversed; and the said Commissioner is hereby directed to proceed according to the principles stated in the foregoing opinion.

Given under my hand this 19th day of May, 1853.

JAMES S. MORSELL.

Examined, J. T. F.

Ex-parte Hamilton L. Smith.

Appeal from the decision of the Commissioner of Patents, refusing to grant appellant a patent for a new and useful letter-file.

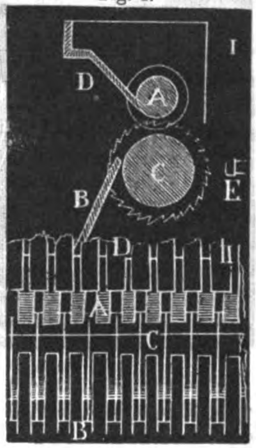
I, James S. Morsell, Assistant Judge of the Circuit Court of the District of Columbia, certify to the Hon. Charles Mason, Commissioner of Patents, that, according to notice duly given of the time and place appointed for the hearing of the above mentioned appeal, the same was heard upon the decision of the said Commissioner of Patents, and the reasons of appeal filed, and all the evidence, &c., in the said case, and having been duly considered, I do adjudge that the said decision is erroneous, and ought and is hereby reversed, and that the said appellant is entitled to a patent for his said improved letter-file.

May 23, 1853. JAMES S. MORSELL.
Examined, J. T. F.

THE COTTON-GIN AND ITS PATENTED IMPROVEMENTS.

(Continued.)

Fig. 1.



ON the 24th of April, 1841, letters-patent were granted to C. A. MCPHETRIDGE, for improvement in the cotton-gin. His improvement consists in substituting for the grate a metallic grooved roller, placed over the saw (see Fig. 1, Section I.) A represents the metallic grooved roller, C the saw, D inclined plate covering a part of the groove in the roller A, as shown in II.; B represents inclined plates placed between the saw; E brush.

Fig. 2.

ALBERT WASHBURN obtained a patent, on the 16th of June, 1841, for improvements in grates for a saw cotton-gin. The inventor claims the construction of the ribs for grates, as shown in Fig. 2. He makes at the point where the ribs are generally first worn out by the friction of the saws, a groove *b* of 1 to ½ inch wide, and a quarter of an inch deep; in that groove he places a piece of metal, glass, or hard wood, which is secured by means of a screw; the piece of glass, wood, &c., can be replaced when worn out.

Fig. 3.

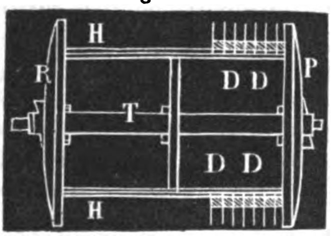


Fig. 4.

ALEXANDER JONES had letters-patent granted on the 17th of January, 1842, for an improvement in saw cylinder for cotton-gins.

The inventor constructs the saw cylinder as shown in Fig. 3; the saws are provided with notches, as seen in Fig. 4, and placed upon the cylinder frame, which has four bevelled rails H H; between each rail is placed a metallic ring D, and the whole is secured by metallic plates; P and R are fastened to the axle T by means of screws or wedges.

THEODORE J. JAMES obtained letters-patent for improvements in cotton-gins, dated May 7th, 1842. He claims the additional brush cylinder F, shown in Fig. 5, with the plate H and stationary brushes G G, behind which is placed a false grate D; the brush B is constructed and applied in the common way.

H. H. KELLEY'S improvement in the cotton-gin was patented May 19th, 1843. He places between the false grates *o o o o o* stationary brushes, as shown in Fig. 6. The brush B is placed in a cylindrical casing, which is provided with a spout D, extending upwards at an angle of 45°.

Fig. 5.

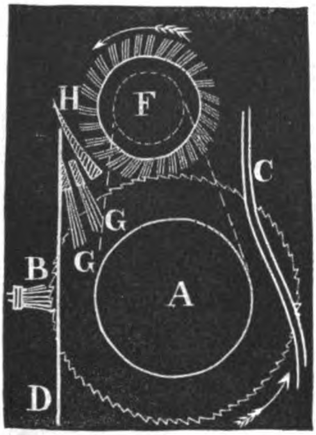


Fig. 6.

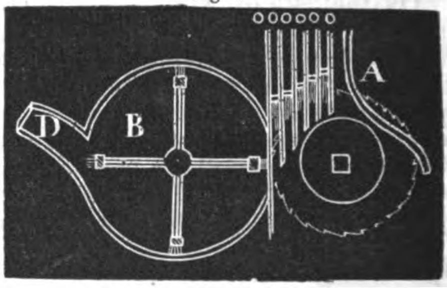
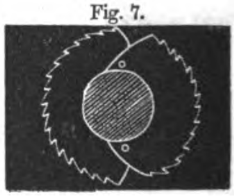


Fig. 7.



WILLIAM B. STEWART obtained letters-patent May 19th, 1843, for an improvement in the cotton saw-gin. The inventor constructed the saws of segments, as shown in Fig. 7, which are so arranged upon the cylinder that each segment operates alternately upon the cotton.

VINE-CULTURE AND CLIMATE OF MADEIRA.*

THERE is no end to the varieties of the vine in Madeira, if you listen to the cultivators, no two of whom, however, agree in giving the same name to the least important. I had no opportunity of seeing the fruit, but have examined the leaves of the only varieties which the cultivators think it worth while to separate; collecting them from different vineyards and comparing them carefully, so as not to be deceived in the names, which a person may easily be without this precaution. The juices of the *verdelho*,† *negro molle*, *bastardo*, *bual*, and *tinta* are commonly mixed together to produce the best Madeira wine, or that made in the southern part of the island, which is principally indebted for its flavor to the two latter. The tinta, when separated, produces a wine closely resembling Burgundy in color and

* Excursions in Madeira and in Porto Santo, during the autumn of 1823, by T. Edward Bowdich. London, 1825.

† The verdelho leaf has seven lobes, the sinuses of which are not strongly marked; it is of a dark green, but perfectly bald; the two lowest lobes are very indistinct. That of the *negro molle* has five distinct lobes, the two lowest closing but not adhering over the stalk; the sinuses are deep and round, the dentations large and rounded; it is slightly downy at the back (the nerves strong and projecting), and of a dark yellow green, inclining a little to red at the base. The bastardo leaf is rounder than most others; its lobes are indistinctly marked, and the dentations are large and sharp; it is of light yellow green, downy at the back, and the whole assumes a cockled appearance. Four of these sinuses of the bual leaf are very deep and sharp; the two lower indistinct; the dentations are sharp and irregular; the leaf is hairy on both sides. There are two varieties of tinta; the largest has SEVEN lobes, decreasing in size, and the sinuses very deep and rounded. The middle lobe is divided into two others, both indistinct; the smaller is of a more compact form, and the lower sinuses much less deep than others; both are of a dark green with purple spots, and downy at the back.

flavor when new, but much softer; becoming very like tawny port after it has been about two years in the cask; and not distinguishable, either in color or flavor, from rich old Madeira at the end of twenty years. It is the only red wine made in the island, and is suffered to ferment with the husks of the fruit remaining in it to fix the color. It would retain the character of Burgundy longer were it bottled earlier, but then there is the probability of its acquiring a bad flavor from the sediment. The paler wines, such as the pure verdelho, or north wine, acquire an amber hue with age; whereas those whose husks impart some portion of color to the juice during pressure, grow lighter with age. The *sercial** is said to be the hock grape, brought from Europe; this I cannot speak to, having no description of the hock grape, but it strikes me, that although the *sercial* is a dry wine, it is very unlike hock of an age to be transported.

There are at least three qualities of malmsey: the *cadel*, or candy,† is the best, but produces little; the *babosa* and *malvazion* yield pretty abundantly, but the latter is very inferior.‡ The fermentation of malmsey is checked earlier than that of the other wines, to increase its sweetness.

The best soil for the vine is *saibro*, or an equal mixture of *saibro* and *pedra molle*, or of the red and yellow tufa; the latter, from its lightness and looseness, would be washed away by the rains were it not mixed with some other soil. Equal portions of *saibro*, *pedra molle*, and *massapes*, which is a clayey earth, seem to be preferred in very airy situations; and I have seen layers of *pedra molle* alone about the roots of the vines in unusually moist localities.§ Of course the poorer cultivators are compelled to be content with the soil they find upon the spot; but when this happens to be *massapes*, they mix the *araya* (the volcanic cinder before mentioned) with it, and it is considered that the vine endures longer in this than in any other soil. It is said to last sixty years in it, if planted wide enough apart. The ground being turned up, the trenches are dug from four to seven feet deep, according to the nature of the soil, and a quantity of loose or stony earth is placed at the bottom, to prevent the roots from reaching the stiff, clayey soil beneath, which would oppose the growth. They water the ground three times if the summer has been very dry, leaving the sluices open until the ground is pretty well soaked; the less the ground is watered, the stronger the wine, but the quantity is diminished in proportion. Some cul-

* The leaf of the sercial has four rounded sinuses; the nerves are very strong, and by their projections give a cockled appearance to the leaf; it is of a very yellow green, and cottony on both sides. It is said to grow best under precipices, in places which attract the clouds, and the husk is very thick—is left longer than the others to ripen.

† The leaf of this has four very deep and rounded sinuses, with two others less distinct; each dentation has a small yellow tip; the back of the leaf is as smooth as the upper surface, and it is of a deep yellow green: the other varieties are less marked, but all have the same smoothness and yellow tips. It was introduced from Candia before 1445, by Prince Henry Colleção de Noticias, p. 11.

‡ The vine was tried in the island of St. Thomas, on the coast of Africa, before 1550; but although two crops were produced, it did not succeed, as it was concluded, from "the gross richness of the soil." The figs became delicious, and yielded two crops a year—the melons only one; olive, peach, almond, and other stone-fruit trees were introduced from Spain, but, although they grew beautifully, and to a very large size, they never yielded any fruit. Navegaçao de Lisboa a Ilha de S. Thomé, escrita por hum Piloto Portuguese, 1551; Colleçao, p. 99.

§ I analyzed the saibro carefully, and found 46·8 silex; 9·1 alumina; 27·3 oxide of iron; 2·7 soda; 3·8 water; 10·3 loss (principally vegetable matter), at a red heat in a platina crucible. The casealtra, a decomposing basaltic conglomerate (partially deposited above the compact or columnar), is extended near to the *saibro* and *pedra molle*. This is the heaviest soil; the specific gravity being 2·1. The barros (a coarser and less pure kind of clay than the massapes) and marracate, a drier kind of barros, are the least welcome soils a vine cultivator can find on his tract. The *pedra molle* seems to contain less soda, as well as less iron, than the saibro, which is of a lower specific gravity. Saibro 1·75; pedra molle 1·95; massapes 1·99; *araya* 1·99.

tivators lay cow-dung at the roots of the vines when they plant them, and when the wine becomes poor, mix a fresh quantity with the soil at the surface: others consider the animal manure injurious to the flavor of the grape, and sow the lupinus perennis among the vines instead; this they do in the January of every second year, culling it down and burying it, by turning over the surface of the soil, after the small rains, which prevail for about ten days at the end of April. An English acre will produce four pipes of wine under the most favorable circumstances; but one pipe seems to be the average, taking the vineyards throughout the island.*

The propagation by cuttings—and they prefer the *verdelho* of the north when forming a plantation in the southern part of the island, as it improves considerably from the better soil, climate, and aspect; on this they engraft any other variety they may wish: the grapes yield no wine until the fourth year.† The stalks of the arundo sagittata (the tops of which are used for feeding cattle), are used in making frames for supporting the vines, in the southern part of the island, and the salla rubra for tying them to this trellis-work. In the north part of the island, the vines are twined around the chestnut-trees: this firmer support being necessary, as it is said, on account of the high winds prevailing there; but they generally neglect to cut away the branches, which prevent the sun from reaching the vine, and it evidently languishes in the vegetable soil natural to the chestnut-tree. If a layer of light silicious soil, which the adjoining tufa would furnish, were laid above the vegetable earth, both trees would flourish equally.

The vines give fruit as high as 2700 feet in Madeira, but no wine can be made from it: the greatest height at which it is now cultivated for this purpose, is in the valley of the Coural das Freiras, which is 2080 feet above the sea. There is much dispute as to the best moment for pruning the vines—some prefer February, others the middle of March; it depends principally, however, on their foresight as to the weather when the flowering takes place, which is from six weeks to two months after the pruning. As to the treatment of the vines, I have remarked, that the produce of one year must frequently be treated very differently from that of another. When the grapes are green, the fermentation must be checked; when they are wet from unseasonable rains, it must be assisted; generally speaking, the riper the fruit, the more difficult the fermentation. A very agreeable liqueur is made in the island from the second pressure of the grape—the first being merely with the feet—into which an equal quantity of brandy is immediately thrown to stop the fermentation and produce sweetness. Gypsum is pretty generally used to clarify and mellow the wines while working, unless they happen to be of a green vintage.

The importation of foreign brandy is now prohibited; and even that made in Portugal is subjected to a duty, amounting to a prohibition—it is made from the north wine and lees of others. In the war time, all the houses were compelled to ripen their wines by stoves, as they held no stocks. Those who managed this themselves, rose the heat gradually, from about 60° to 90° Fahr.; others who trusted them to the public stoves, generally found that they were neglected until the last moment, and then all but boiled.

In the year 1813, 22,314 pipes of wine were made in Madeira.

The Portuguese once drew their principal supply of sugar from Madeira,

* The lizards devour immense quantities of grapes, and prefer the tinta.

† Miller, in his Gardener's Dictionary, tells us that in some parts of Italy there are vines which have been cultivated for 300 years, and that a vine not more than a century old is there called young.

but when the cane had succeeded in the West Indies, its culture was abandoned for that of the vine—introduced from Cyprus*—which became more profitable.

According to Kirwan, the mean temperature of Funchal is 68·9 of Fahrenheit. In January the mean temperature 64·18; Feb. 64·3; March 65·8; April 65·5; May 66·53; June 69·74; July 73·45; Aug. 75·02; Sept. 75·76; Oct. 72·5; Nov. 69·08; Dec. 65.

The rainy season of Madeira may be said to comprehend the months of October, November, December, and January, although the intervals of fair weather, during the two former months, generally exceed the periods of rain. This season is ushered in by the cessation of the northeast breeze, frequent calms, a prevalence of westerly winds at first, and of south and southwest, sometimes amounting to gales afterwards. The Sirocco is experienced here in a slight degree, and always arises from the eastward, and raises the thermometer to 90° in the shade. In Egypt it is called Kamsin, and blows from the S. S. W.

The annual quantity of rain which falls at Madeira is about 40 inches.

VINE-CULTURE—PROPAGATION BY GRAFTING.

This artificial mode of propagating the grape-vine is very old. was known two thousand years ago to the Phœnicians, who taught it to the Grecians and Carthaginians: from them the Romans became acquainted with it, and they again introduced it into their colonies in France, Spain, Germany, &c.

Columella, who lived about eighteen hundred years ago, gives a very detailed account of the various modes of grafting the vine practised by the Romans.

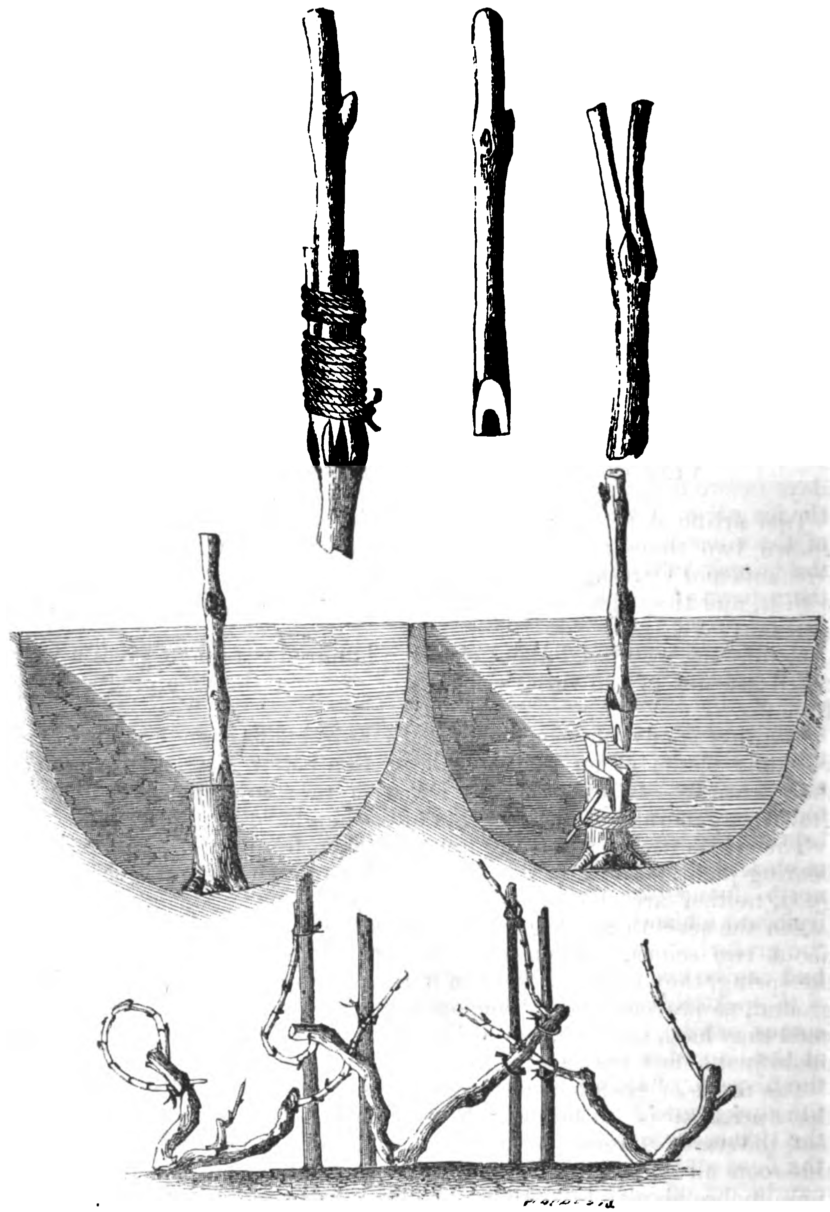
Grafting is advantageous where it is desirable to change young, healthy, vigorous plants of an inferior quality to a better kind, without removing them entirely—in cases where we wish rare sorts to bear soon, since graftings generally bear two years after they have been set.

The scions used for grafting must be taken from a very productive, full-bearing plant. The lowest buds near the old wood are not considered so good, neither are the buds situated high up on the shoot. The part between the seventh and the lowest bud is the most suitable, and will furnish about two scions. When they are cut before winter, or the first days in the spring, they must be kept in a cellar, or some cool place in the open ground, to prevent them from sprouting; very dry shoots must be kept until they have somewhat absorbed their superabundance of sap. Cuttings made just before grafting, are therefore not much valued.

The mode of grafting under ground is much practiced in Hungary, and the operation is as follows: When the buds have produced the second leaf, the earth is removed from the plant which is to be grafted, and the side-roots all taken away from the east shaft: the shaft is sawed off about three inches above the foot-root, or about six or more inches below ground. The roughness of the cut is smoothed with a sharp knife. The split is made with a knife or chisel. The knife or chisel is placed in the centre of the shaft, and with a wooden hammer a slight tap is given to produce the

* According to Cadamesto, therefore before the year 1445.

split. To prevent the split from extending too far down, the shaft is surrounded with a cord, where the split has to stop. The cleft is kept apart by means of a small wooden wedge. If the shaft is thick enough, two scions are generally placed upon it, but when it is of small dimensions,



only one is grafted upon it. The scion must have three healthy buds, and the lowest must come in contact with the shaft. The scion is inserted from one-half to one inch depth into the shaft. That part of the scion which is inserted in the shaft must be cut wedge-form; the bark must be preserved as much as possible, and the scion be carefully placed in the cleft, so that the bark of the scion shall exactly correspond with that of the shaft. (See the representation in the accompanying plate.) When the scion stands in its proper place, the wedge is gently removed, and the cleft closed with wax or tar, a bandage of bass is laid over it, and the earth replaced. The last and higher bud should reach above the surface of the ground, and it is perhaps advisable, in order to prevent it from being injured by the dry air and sun, to cover it with earth in the same way as we have described in planting cuttings. A small stake is placed near it, to indicate the plant, and to fasten the young shoots to it. Scham states that a practised hand can graft from sixty to seventy shoots a day, provided another hand opens the ground and removes the earth from the root-shaft. About the middle of May, the shoots begin to develop themselves, and the new shoots grow vigorously.

Noisette mentions a similar mode of grafting under ground practised in the vicinity of Lyons (France). The roots receive two or three splits; women attend to inserting the scions; another person follows, and presses earth around the shaft, and fills the holes up, leaving two buds above ground. Three men and one woman can easily graft ten or twelve ares* in one day.

At Funfkirch, Hungary, the vine-dressers graft upon young shoots scions of young green vines, and proceed in the following manner: Eight days before and after Whitsuntide, when the young shoots have grown to the length of about fourteen to fifteen inches, the vine-dresser selects such of the vines as he wishes to graft. He ascertains, first, if the shoots have the proper elasticity and strength for grafting, which he tests by bending them back and forth: if he finds them too brittle, he rejects them, because brittle shoots that are not elastic, will not answer for grafting. When he has made his selection, he cuts all the shoots clear off from the head, except three or four of the strongest. These shoots are cut off just below the eye of the third joint, counted from the head upwards. He then splits them, with a sharp knife, down and through the eye (see the representation in the accompanying plate). The green scion he cuts wedge-like, as shown in the figure, and places it in the cleft, and presses the parts gently together, and secures it with a flat thread or twine. It is to be observed, (*a*) that the leaves and eyes of the shoots to be grafted upon must be all removed, and only the lowest bud and leaves are allowed to remain, so as not to disturb the whole vegetative power of the shoots, and to leave one fruit-bud for another year, in case the grafting should not succeed. When the grafted shoot shows signs of life, the leaves on the shoot from the lower bud can be cut off, in order to force all the sap into the newly-grafted shoot.

(*b*.)—Attention must be paid, that the end of the wedge cut on the scion comes exactly in contact with the split through the bud. In about three, at the longest in six days, it will be seen, if the grafted scion has obtained the necessary sap, by the bud beginning to swell and showing life. When the vine begins to enlarge under the bandage, and swells out below or above the twine, the bandage must be opened, and made somewhat looser, that the flow of the sap be not interrupted. Later, the dry portion of the scion can be cut off, and the shoot fastened to a stake, to prevent any injury by wind or other causes. The following spring, the grafted shoots are pruned to 3–4 buds, and the plant is provided with a stake 6–7 feet high. The next year, the new grafted shoots can be used for layers, which are gene-

* An are = 0.0247 acres.

rally made before winter. This mode of grafting has the following advantages, namely:

1. In case that all the grafted shoots die, which, however, very seldom happens, the plant loses nothing in regard to its bearing power for another year.

2. Grafting above ground can be much easier accomplished, and the success of the operation shows itself in a few days, whereas the graftings under ground leave the vine-dresser in doubt for nearly half the summer.

3. In case one grafting should not grow, the others will, and the operation may be looked upon always as successful.

4. By this mode of grafting, 7–8 layers can be made, which facilitates a quick change of an old vineyard with bad kinds of grapes into good ones.

The scions must not be too hard; they should never be cut more than twenty-four hours before grafting, even if they are kept in moist moss.

Grafting in bore holes is another mode of grafting described by Columella, and still much practised in Hungary and Styria. It is performed in the following manner: The root-shaft is cut off six inches below the surface of the ground, and in the middle of it a hole is bored, in which a shoot is placed, which must be trimmed off a little on its lower end, to fit tight into the hole; the wound is then covered with moss and earth, or with clay, and the hole filled up.

The scion must be about the size of the auger; it is necessary to clean the hole very neatly from shavings. To give the sap a freer flow, and in order not to drown the shoot, it is sometimes necessary to make a few incisions in the shaft.

Grafting in bore holes is also easily done by boring holes in the limbs of a vine, and placing shoots of another vine therein. The limbs and shoots must be well secured to stakes, to keep both steady until the bore hole has grown over, and the shoot receives its nourishment from the limb; then the shoot can be cut off. This method of grafting is illustrated in the accompanying plate.

Lenoir states that grafting is resorted to in France, where the wine has an earthy taste. Grubbing removes it.

AGRICULTURE.

EXPERIMENTS IN MAKING BUTTER.

A BOARD of commissioners has been appointed by the Belgian Government, to examine various agricultural implements. The commissioners made also experiments with Lavoisy's churn, with cream of one and the same quality, temperature, and under like circumstances.

In one experiment, a small quantity of cream was much churned; in another the cream was slightly churned; and in a third experiment, a large quantity of cream was much worked by the paddle of the above-named churn; and they found that much churning, at fifty-four degrees Fahrenheit, had no influence upon the quantity of butter; that the slow or rapid formation of butter, or, in other words, the longer or shorter duration of churning, had no influence upon an increase or decrease of the quantity of butter in a given quantity of cream.—*Agriculteur Praesician*, *Oct.*, 1852.

EXPERIMENTS MADE WITH MILK-PANS OF VARIOUS MATERIALS, TO ASCERTAIN WHICH ARE BEST SUITED FOR DAIRY PURPOSES.

According to the experiments of Mr. Hinueber, of Moisburg (Germany), one hundred Hanover quarts of milk yielded in

Tinned milk-pans		7.07	Hanover lbs. of butter.		
Glass " "		7.04	"	"	"
Wooden " "	(not painted)	6.96	"	"	"
Earthen ware		6.92	"	"	"
Wooden " "	(painted)	6.67	"	"	"

According to the same experiments, there required for one pound of butter—

Of milk produced by stall-feeding, with green clover	15.00	Hanover quarts milk,			
" " " with green tare and clover	15.67	"	"	"	
By pasturing	12.84	"	"	"	

showing that the milk obtained from cattle fed upon pastures is richer in butter than milk got from cows which have been fed in the stable with one and the same kind of plants: even a mixture of tare and clover shows an increase over clover alone.

TO PREVENT URINE FROM PUTRID FERMENTATION.

[Journal de Chimie Medicale, Dec., 1852.]

Some time since, experiments were made to precipitate from urine its uric acid, and it was found that a small quantity of muriatic acid prevented the urine from putrid fermentation, and that it can thus be kept for a long time without acquiring a bad odor.

Similar experiments were repeated in the year 1851, and it was proved that the observation made at that time was correct.

In the month of September, 1851, a quantity of urine was mixed with muriatic acid, and exposed to the influence of the air and rain, &c., for nearly a whole year. The urine, during that period, did not change its condition, and in the year 1852, during a very warm period, it entirely dried up, and formed an odorless salt.

A FEW DAYS AT THE CUMBERLAND COAL-REGION IN MARYLAND.

We insert with pleasure the following interesting letter from an able engineer:

During an excursion to the Cumberland coal-region in December last, I took occasion to notice more particularly the coal mines at Lonaconing. Quite a little village had sprung up through the indefatigable exertions of the George's Creek Company. This Company, holding several thousand acres of highly valuable land, containing both coal and iron ore, had for years endeavored to make it available. Large sums of money had been expended in the attempt to make iron, but only with partial success, and all this on account of the seclusion of the location and the consequent high price in bringing the mineral to market. But as soon as the Baltimore and Ohio Railroad Company had decided on directing the course of the Great Western Railroad through Westernport—at the entrance of the George's Creek valley—the enterprising members of the George's Creek Company concluded to lay a railroad track through the whole extent of that valley, and thus establish at once a continuous railroad connection between their coal works and Baltimore city. The construction of a railroad of eight miles in length was, however, connected with considerable difficulties, on account of having to contend against the ravages of a wild and turbulent mountain creek. But all obstacles were successfully overcome, and the power heretofore unbridled and destructive will soon be turned to useful purposes as we see already an instance at the little village of Lonaconing. Here a large sized water-wheel moves a saw and grist mill and other labor-saving machinery, and busily engages the woodmen, the farmers, and the mechanics. The manufacturing materials are abundantly supplied from the immense tracts of woodland covering the hillsides to the very top of the mountain range. But not of these resources, and not of the excellent soil for farming purposes which covers the surface do I intend to speak—a still more productive treasure lies beneath the surface, lies in the extensive range of mineral coal and iron beds. The former embraces several veins of from two to fourteen feet in thickness. As yet the largest vein only has been sufficiently explored. That vein crops out at Lonaconing several hundred feet above the level of the creek, and on the west side of the valley. The slope of the mountain-side rises at some forty degrees. From this position the first main-heading adit is started, and follows a straight line in a westerly direction on a rise of one foot in one thousand, being the inclination of the coal bed; this has been explored for several hundred feet, still leaving a prospect for miles in extent ahead. At regular intervals along the main-heading adit, the cross-heading galleries turn off at right angles, opening the coal field north and south. Along the side walls of the cross-headings the chamber entrances are formed into regular squares, and thus allotting to the several associate parties of miners their work of excavation, wherefrom the assisting miners fill the coal cars and run them to the mouth of the adit.

A particularly advantageous feature of the Lonaconing coal works I desire here to notice: the railroad track in the main and cross-heading galleries lying two feet below the floor of the chamber-workings has thus secured to the miner perfectly dry and very convenient mining. These two feet of coal forming the floor of the vein are purposely left untouched in the chambers not only on account of the reasons above stated, but also in regard to the character of that part of the coal vein being interstratified with two small seams of slate, and thus affecting more or less the purity of the marketable coal. The other part of the vein, twelve feet in height, presents a breast of solid, pure coal, without the slightest trace of slate. This is a rare sight to the miner, and a rare satisfaction he enjoys considering on the little difficulty he is going to meet with in his laborious work. There is no costly machinery needed, no injurious gases have as yet been experienced, and with little care and small expense the underground works are made perfectly secure and safe. Where thus all the most favorable conditions have united and a systematic plan of operation is pursued, mining can be carried on at its minimum expense.

Passing through the underground works an idea has been suggested to my mind, to carry out which the existing arrangements here are peculiarly adapted. Why not lay the rails of the track two feet above the ground, and on cross-ties, floor over the width of the adit hermetically, and thus divide the same into two separate apartments? This produces a natural draft of air, besides securing to the water in the mine a never-obstructed passage, which otherwise we find so often impeded by the debris falling from the coal-cars. Galleries to the length of four hundred yards I have seen driven without having recourse to mechanical means for procuring ventilation.

The coal having once arrived at the mouth of the main-heading adit, requires no more handling; it is pitched from the mining cars into the eight-ton coal-car, stationed a few feet on a lower level, and from thence is sent on its way, without further interruption, to market. The fine coal, however, as much as will be the unavoidable result in mining, is converted into coke and used at Lonaconing for smelting and other purposes.

The quantity of coal which could be mined daily from a vein of so unusually large dimensions, from a coal-field of so easy access at various points, may be said to be almost without limit, but a judicious management will be guided by the demand and the availability of railroad and canal transportation.

In regard to the quality of the coal, I may with confidence assert that the Cumberland coal has established a reputation which ranks it among those of most general usefulness. It stands in favorable competition with the coal of the neighboring States, and will also compete successfully in regard to price. The expense of a ton of coal at the mine amounts to forty cents, all included, and the transportation to the Washington and Alexandria markets will not cost more than $2 10 per ton additional.

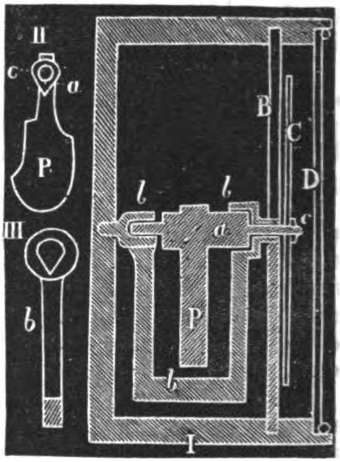
Under these circumstances, the prospects are highly encouraging, and not only may a large community soon rejoice in a plentiful supply of cheap and excellent fuel, but the enterprising coal company at Cumberland will also reap a rich harvest, to which their perseverance during many years' continuous struggle has justly entitled them.

JOHN HITZ, *Mining Engineer.*

CLAIMS OF PATENTS.

Granted on the 17th, 24th, and 31st May, and the 7th June, with explanations and diagrams by Ch. L. Fleischmann.

No. 9722. Thomas A. Chandler, Rockford, Illinois.—*Improvement in Pendulum Level.* Patented May 17th, 1853.

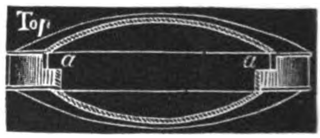


This invention consists in supporting the knife-edge or bearings of the axle of pendulums of indicators, in a hollow or concave, angular or knife-edge bearings, formed in the turning axle of a second pendulum, whereby changes in the position of the support of the pendulum are more accurately measured by the indicators.

Figure 1 represents at B the disk for the graduated circle; C indicator, D a plate of glass, *b* axle bent into a form resembling a bell-yoke, corresponding to the arch of the yoke, being made heavy so as to perform the function of a pendulum ball as well as that on an axle. P, pendulum, which has knife-edge bearings, as shown at II, that rest in cavities of a corresponding angular shape, as shown at III *b*.

"I claim the method of supporting the angular journals of the axle of a pendulum indicator, in turning and self-adjusting bearings of similar form to the angular journals, substantially, as herein set forth."

No. 9723. Moses Coburn, Savannah, Ga.—*Improvement in Violins.* Patented May 17th, 1853.

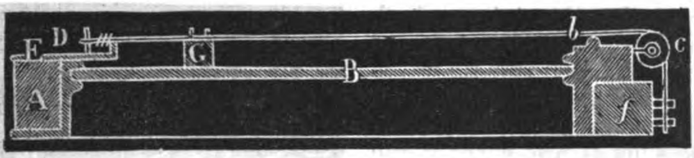


The nature of this new violin consists in making the apertures or means of communication, between the exterior and the interior, in the sides instead of at the top, as shown in figure at *a a;* this is to prevent the weakening of the centre of the top, and the consequent impediment to its perfect vibration.

"I claim the apertures, *a a*, in the sides, instead of in the top, substantially, as shown in Figs. 2 and 3, and described for producing the effect set forth in this specification."

No. 9724. Edwin Fobes, Boston, Mass.—*Improvement in Vertical Pianos.* Patented May 17th, 1853.

The inventor says, "My improvement is practically and usefully applicable to the piccolo upright piano alone, as were it applied to the long upright, it would cause the position of the straining-pins of the strings to be such as to render it impossible for a tuner to obtain access to them, while tuning the piano."



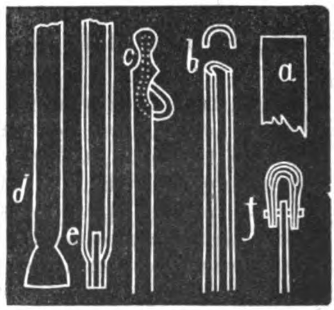
A represents the metallic frame, B sounding-board, D hitch-pins at the bar E, G bridge, *b* string, *c* roller, with two grooves on its periphery for the strings to pass over it; *f* wooden bar for the tuning-pins.

"What I claim as my improvement in the piccolo pianoforte, is the arrangement of the straining-pins, with their axes vertical, or nearly so, and parallel, or nearly so, to the general plane of the strings, and to stand above the iron frame, as set forth, the strings of each hitch-pin having guide-rollers applied to it, substantially as above set forth—my improvement enabling me to obtain sundry important advantages in the construction of and tuning of the piccolo pianoforte.

"And I also claim the improvement of extending the sounding-board upwards above the bridge, and in rear of the bridge-plate in the treble, and so as to be capable of vibrating in rear of and above said bridge-plate, substantially as above set forth."

No. 9725. Samuel Fox, Sheffield, England.—*Improvement in Umbrellas and Parasols.* Patented May 17th, 1853. English Patent dated 6th of April, 1852.

The inventor employs steel wire, say No. 13; when annealed, he passes it between a pair of plain rolls, and makes it flat, thus producing narrow strips or fillets, bringing it to a width of about No. 6 of the wire-gage. (Seen at *a* in fig.) These narrow strips are annealed again before they are passed through rolls, to give them the open through like form *b*; when they have that form, they are again annealed and straightened, and cut off into the proper sizes for ribs and stretchers.



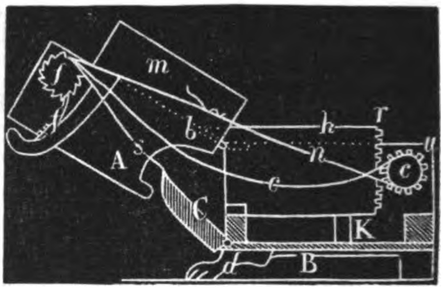
In the end of the rib, he introduces a wire, eye, and fastens it therein, by pressing it together, as seen at *c*; the other end of the rib he flattens, after a small piece of metal has been introduced. (See *e* and *d*.)

He further puts a strip of metal round the rib, and forces it into the trough of said rib to make the connection for the stretcher, as shown at *f*.

"I claim the improvement in the manufacture of umbrellas and parasols herein described, the same consisting in making them with ribs and stretchers of plate steel, bent in the trough-like shape as specified, in combination with eyes and connections applied essentially as described, whereby they are rendered comparatively much lighter than, and still possess all the requisite strength of those made with solid or round rods of metal, in the ordinary way, and, at the same time, the formation of the eyes and connections is facilitated."

No. 9726. Lewis L. Gilliland and Joseph R. Wagoner, Dayton, Ohio.—*Improvement in Sofa Beds.* Patented May 17th, 1853.

The annexed figure is a vertical cross-section of this modern sofa bedstead, showing the upper half of the sofa partly turned over in the act of



forming a bedstead. A is the back of the sofa, B the lower frame, C front-board, *e* and *f* two shafts, to which the canvas sacking C is secured. At each end of the shaft near the pinions are attached the straps *n*, which are worked by the same shaft as the sacking C. The turning of the roller *e* elevates the head and foot-boards *h*, which are fitted with racks *r*, into which pinions on the shafts *e* are fixed.

"I claim the hinged front-board, so arranged, that by the turning over the seat, to convert the apparatus from a sofa into a bed, the front-board C shall turn down to prevent it from forming a hard ridge under the sacking, which would be uncomfortable to lie on; and when the seat is turned back again, to reconvert the bed into a sofa, the front-board shall be lifted up again, by the act of turning the seat back into the proper position to support the sacking of the seat.

"Also the arrangement of the head and foot boards, so that the act of shutting up the bed will depress them, and opening it out will elevate them again, substantially as herein set forth.

"Also the arrangement of the turning seat of the sofa, and the sackings of the bed and seat in such manner, that by the turning of the seat to form the bed, the sacking of the latter shall be stretched, and by the turning up again of the seat to reform the sofa, the sacking of the latter shall be stretched, substantially as herein set forth."

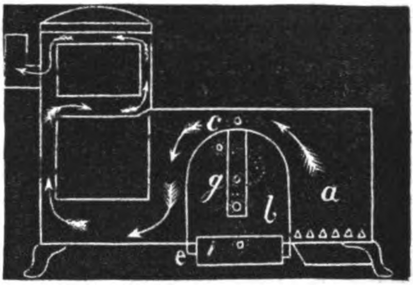
No. 9727. JOHN H. H. HAWES, Ithaca, N. Y.—*Improvement in Calendar Clocks.* Patented May 17th, 1853.

The nature of this invention consists in causing a clock calendar to supply its own changes for the irregularities in the length of the months, and showing the exact, and no fractional part of a day, week, or month. In combining with the day of the week indicator, the two wheels working together spring tight, so as to move together and independently of each other, for the purpose of allowing the day of the month indicator to run during the time that the change is taking place from the end of a short month to the beginning of the next month, while the day of the week indicator passes from one day to another in regular succession.

"I claim causing a calendar clock to supply its own changes for the irregularities in the length of the months, and showing on its dial the exact, and no fractional parts of a day, week, or month, by means of the combination of the wheel D, having thirty-one divisions, both of which run together and independently of each other, at intervals, on the same arbor, and the lifting pieces E F, for supplying the necessary changes in the length of the months; the whole being operated by the hook-piece J, in the manner herein described.

"I also claim, in combination, the wheel P, of seven parts, working spring-tight with the wheel *q*, and the catch-piece X, so that the two wheels may move together and independently of each other, for the purpose of allowing the day of the month indicator to run during the time that the change is taking place, from the end of a short month to the beginning of the next month, while the day of the week indicator passes from one day to another, in regular succession, substantially as described."

No. 9728. Mathieus Heim, Cincinnati, Ohio.—*Improvement in Cooking-Stoves.* Patented May 17th, 1853.



The figure represents a section of the cooking-stove; *b* is an open space, or arched chamber, for roasting; at each side of the stove depend hangers *c*, having each of them a button, over which the doors *e* hang slipped. A hole through both hangers and doors gives journal bearing to a spit *g*; from the hangers depends a pan *i* to catch the dripping, and crank to turn the spit; *a* is the fire-place, and the arrows indicate the circulation of the heat.

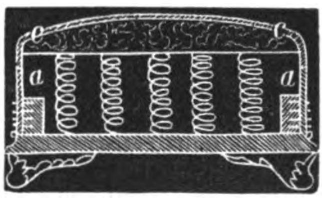
"I claim the open-bottomed space, or chamber *b*, behind the fire, encircled at sides and top by flue, and closed at the ends, by shifting or movable doors, as described, constituting an accessible and well-ventilated arrangement for roasting purposes."

No. 9729. A. H. Longley, Lebanon, Indiana.—*Improvement in Machines for Cutting Wooden Screws.* Patented May 17th, 1853.

The nature of this invention, says the inventor, consists of an auger arranged to operate inside of the screw-cutting apparatus, or a reducing tool, to make a tenon in front of a screw-cutting apparatus, so as to bore the hole or make the tenon, and cut the screw in it or upon it at one and the same operation, and thereby save twenty-five per cent. of the labor required to do the same work by the machine heretofore used for that purpose.

"I claim giving an equal progressive motion to the cutting tools, in combination with a differential rotary motion, for the purpose of cutting the screws at the same time the hole is bored, or the tenon is made, in the manner and for the purposes set forth, substantially as described."

No. 9730. Frederick Mathesins, of New York.—*Improvement in Upholstering Furniture.* Patented May 17th, 1853.



The nature of this invention consists in attaching to the edges of the brocatelle, hair-cloth, or other material, to be used for the outside or covering of chairs, sofas, seats, &c., ligaments or springs made of india-rubber or other elastic material. This elastic ligament, shown in figure at *a a*, is fastened to the right and left side of the covering *c c*, as well as to the frame-work of the seat of the chair, sofa, &c., so that when a person seats upon, this elastic spring will give a stretch to the extent of the pressure, without straining the outer or fancy covering.

"I claim covering the seats, or other parts of upholstered furniture, or other articles and things, by means and with the aid of elastic ligaments, or springs, attached to the edges of the covering, and to the frame-work of the article covered, in such manner that the outer or fancy covering, however much used or pressed down, upon being relieved from such pressure, will resume and retain an even and smooth surface, using for that purpose india-rubber, or springs, or any other elastic material, which will produce the desired or intended effect, substantially as herein set forth and described."

No. 9731. Julius A. Pease, New York City.—*Improvement in Seeding-Hoes.* Patented May 17th, 1853.

This invention consists of a double-bladed hoe, with a seed-box and drop attached to it at the bottom. It is so constructed and arranged as to drop four kernels of corn, at equal distances apart, into the opening in the ground of each blade, made by the stroke of the hoe. The seeds are covered by the back stroke of the hoe, as it is lifted from the ground.

The corn is dropped by pulling the slide near the end of the handle with the fore-fingers of the right hand, which brings the holes in the quarter-circle plates under the holes in the bottom of the box, allowing the kernels within the guards to pass through, and at the same time shutting off the grain from entering within said guards.

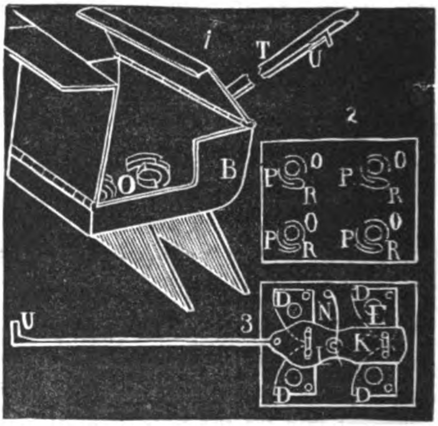
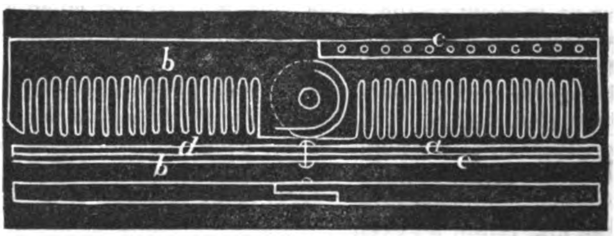


Fig. 2 represents the plate in the bottom of the box, with four holes for the kernels to pass through; O O O O are guards reaching two-thirds the way around each hole; P P P P are springs which play in front of the guard O; said springs are attached to quarter-circle plates D D D D, in Fig. 3, which works on the under side of the box B; said spring works through slats in the bottom of the box, and within guards R. E, Fig. 3, are holes corresponding in size with those in bottom of box B; near the centre of movable plate K is a pin L, against which bears a spring N, which keeps the holes shut in the bottom of said box; said movable plate K being attached to slide U, Fig. 1, near the end of the handle T, and worked as described above.

Fig. 1 shows the box with the lid open.

"I claim the combination and arrangement of a double-bladed hoe, with seed-box and drop, as before described, for the purpose of planting separate kernels of corn, at equal distances apart."

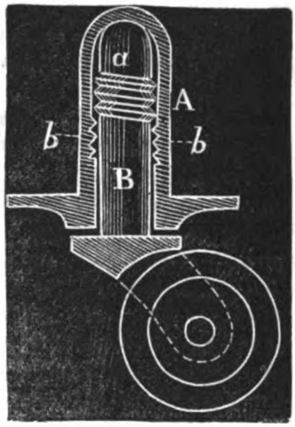
No. 9732. Wm. J. Thorn, Westbrook, Maine.—*Improvement in Pocket-Combs.* Patented May 17th, 1853.



This improvement consists in coupling two combs cut from one piece of ivory, horn, or wood, put together by a round joint, as shown in the annexed figure, representing also the old plan of joints in pocket-combs.

"I claim the manufacture of pocket-combs, with semicircular joints, in combination with strips overlapping them, substantially in the manner and for the purposes herein set forth."

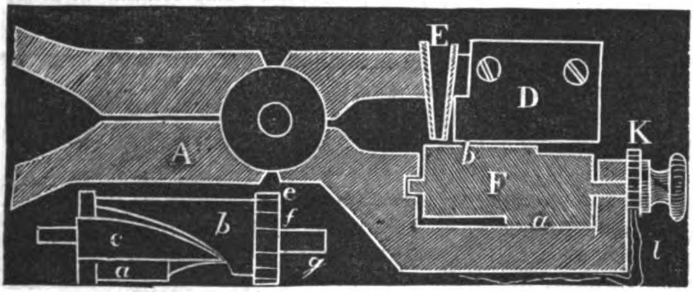
No. 9733. W. W. WADE, Springfield, Mass.—*Improvement in Casters for Furniture.* Patented May 17th, 1853.



The improvement consists in shank B, see figure, and the socket A; the shank B has a male screw about the middle part of shank, at *b*; on shank B, there is a male screw *a* to fit said female screw *b* in the socket. When the male screw of shank B passes the female screw in the socket A, it not only allows the shank to turn freely, but it will be held also in place by the two screws, and prevent the shank from falling out of the socket.

"I claim the arrangement of the male screw *a* on the spindle B, in combination with or respect to the arrangement of the female screw *b*, in the socket of the socket-piece A, and to the bearing surfaces of the said parts A and B, substantially as specified, or represented, whereby the spindle is not only preserved in the socket-piece by the two screws, but allowed freely to rotate, when its bearing surface is in contact with the bearing surface of the socket, as described."

No. 9734. HALSEY D. WALCOTT, Boston, Mass.—*Improvement in Graduated Cutters for Cloth and other Substances.* Patented May 17th, 1853.



The annexed figure shows a section of the cutter. E is a small tubular punch fixed to the lever A, and against the rear of the cutting-knife D, and in conjunction with the knife, cuts a button-hole, formed of a straight slit and a circular hole at one end of it. F is the adjustable and movable bed against which the knife acts, and on which the cloth rests. The bed is a separate figure, represented as formed of two triangular or trapezoidal pieces of metal *a b*, wrapped around a cylinder *c*; one of them, at one end, has a series of plane beds or surfaces *e*, *f*, *g*, &c., which rotate underneath the tubular punch E; a small notched wheel K and a spring *l*, retain the bed in its place.

By rotating the bed on its axis, the length of the button-hole made in the cloth, may be made longer or shorter, at pleasure.

"I claim, in its connection with the cutting-knife, the improvement of making the bed to move or rotate transversely, in combination with making the surface of it, which acts in conjunction with the knife, of variable length or lengths, in order, by moving or turning the bed around under the knife, different lengths of cut may be produced, substantially as set forth.

"And I also claim the improvement of combining with the knife and tubular cutter, and a rotary shaft or cylinder, placed under them, *the two* triangular or trapezoidal beds or surfaces *a b*, *arranged* on the shaft or cylinder, as described, whereby a cut, or button-hole, may be made of any desirable length, either with or without a hole at one end, as stated."

No. 9735. DAVIS L. WEATHERHEAD, Philadelphia, Pa.—*Improvement in Cleansing and Cooling Block-Dies in Rivet Machines.* Patented May 17th, 1853.

This improvement relates to the cooling of the closed or block-dies, in which rivets are headed and shaped, and consists in expelling therefrom the particles of oxide, cinders, &c., that fall from the articles being formed, by means of a current of water, steam, air, or other fluid, which is introduced.

While the operations of heading, &c., are going on, water is passed into the die, and runs out at the mouth of the same during the interval between the discharge of one block and the admission of another.

"I claim cleaning cinders, scales, and other obstructions, from a socket-die, made in a solid block, for the purpose of heading rivets, by forcing in at the closed end of the die a stream of water that washes out the cinders, &c., every time a rivet is discharged; the inner end of the socket of the die being closed, so that the pressure of the head of water is rendered available for forcing obstructions out of the die, as herein set forth."

No. 9736. SAMUEL J. SEELY, New York City.—*Improvement in Lime Kilns.* Patented May 17th, 1853.

This improvement consists in a method of calcining limestone, by the aid of an artificial draught of air maintained in the kiln, by means of mechanical blowers and a suction blown at the top, as shown in figure at A, and a forcing blown at the bottom of the kiln B.

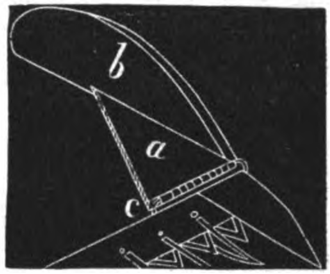
The inventor makes the kiln furnace also the boiler furnace, the boilers *s s* being placed over the fire. The heat by which the limestone is calcined, is supplied by one or more furnaces at the bottom of the kiln D D; and he works the car for supplying the kiln by the same steam-engine as shown at E.

"I claim the process herein described, of calcining limestone in a kiln, by the aid of furnaces and an artificial draught of air through the furnaces and the kiln, maintained by a mechanical blower, substantially as herein set forth.

"I also claim the combination of a suction blower at the top of the kiln, and a forcing blower at the bottom thereof, substantially as herein set forth.

"I also claim the method of regulating the production of steam, to generate the power for the engine, in proportion to the duty required of it, by setting the steam-boiler in the same furnace that supplies the heat for calcining the limestone, substantially as described."

No. 9737. Wm. F. Ketchum, Buffalo, New York.—*Improvement in Track-Clearers to Harvesters.* Patented May 17th, 1853.



The object of this improvement is to clear the track for the dead point, or when the machine is on the return swath, by removing the cut grass from the standing stubble, turning it in, out of the way, and preventing it from clogging or choking the cutters.

The inventor makes a shield-scraper, or raking-board *b*, which is connected with the outer end of the rack-piece *a* by a joint *c* or hinge, at an angle less than a right angle; this shield-scraper, or raking-board, has the effect to remove the cut grass from the standing stubble, roll and turn it in towards the machine, out of the way.

"I claim the scraper, or raking-board, constructed as described, or in any similar manner, and combined with the rack-piece, at an angle less than a right angle, substantially as in the manner and for the purpose herein fully set forth."

No. 9738. Richard Montgomery, of New York City.—*Improvement in Corrugated Plates for Steam Boilers,* &c. Patented May 17th, 1853.

This invention consists in making a plate of metal, with a margin on its edges, wide enough for the rivet holes, thick and flat (see figure at C), and its middle, or that portion included within the margin, thinner, *b*, but

corrugated, to render it stiff, the depth of the folds of the corrugation being inversely proportioned to the thickness of the middle, so that to whatever degree it may be reduced, it will still have the requisite degree of lateral strength imparted to it by the corrugation.

"I claim the corrugated metal plate, as herein described, with flat margins of greater thickness than its middle."

No. 9739. J. A. Woodbury, Joshua Merrill, and George Patten, of Charlestown, Mass.—*Improvement in Air-Engine.* Patented May 17th, 1853.

This invention consists in the application of caloric to air while in a highly compressed state, by which its expansive force will be greatly increased by the same amount of heat, four hundred and eighty degrees, as is required to double the volume of the ordinary atmosphere.

The inventors state that they have ascertained, by practical experiments, that if air be highly compressed in a receiver, and then subjugated to about four hundred and eighty degrees of heat, that its expansive force will be increased to double the amount exerted by the same prior to the application of heat.

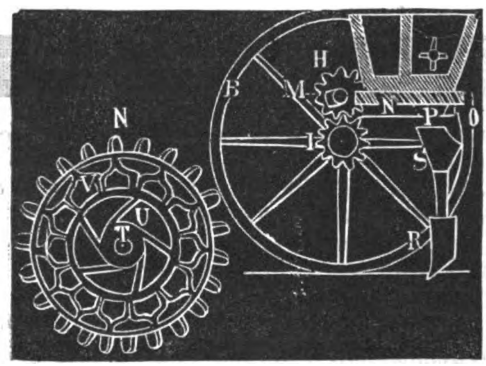
The most essential parts of this engine consist of a cylinder of the same construction as an ordinary steam-engine, an air-pump, and a receiver for containing the compressed air, and to which the heat is applied.

"We claim the mode substantially as specified, of using air as a motive power—said mode consisting in the employment of a receiver, in which air is to be highly *compressed*, *heated*, and maintained at or about a *uniform pressure*, a suitable working cylinder and piston, with the ordinary appendages, an air-pump or pumps, worked by the engine for supplying the receiver, when the same are connected or combined with suitable devices, as set forth, for cutting off and *working the air expansively*, and according to the degree of compression of the air, all substantially as herein set forth.

"We also claim, in combination with such an engine, the device for regulating the pressure of the air in the receiver, and economizing the power of the engine—said device consisting of the weighted bar, entering the receiver through a stuffing-box, and connected at its opposite end with the stop-cocks attached to the chambers of the air-pumps, substantially as described, intending to use any known means, for accomplishing the two-fold purpose, of regulating the pressure of air in the receiver, and opening the pump-chambers to the atmosphere, so that the pump shall be relieved from unnecessary labor."

No. 9740. WILLIAM CRESSLERS, Shippensburgh, Pa.—*Improvement in Seed-Planters.* Patented May 17th, 1853.

The nature of this invention consists in the manner of constructing the seeding-wheel, with a circular flange for dividing the grain from the lime, guano, ashes, or other material which may be sown with it, and the partitions in said seeding-wheel, for regulating the quantity and distributing the same regularly to the opening through which it passes out of the machine.



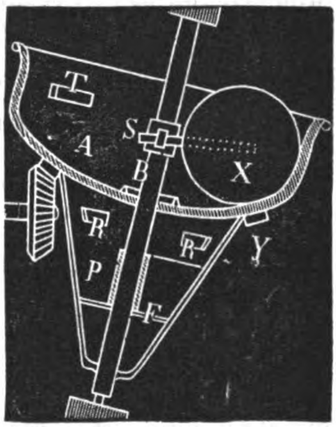
The annexed figure explains the invention. On the hub of one of the wheels B is a spur-wheel I, which gears into another H, attached to a shaft; on this shaft are two short screws M, which work into and rotate the seeding-wheel N, shown on a larger scale marked N. The seeding-wheel works underneath the hopper; through the cross-piece O is an opening P, to allow the grain and other materials sown to escape into tube S and shoe R.

From the hub T of the seeding-wheel N extend oblique spokes U, which form chambers for receiving lime or guano, &c., and carry it around to the opening P, and allow it to escape into tube S and shoe R. The space between the flange and the periphery of the seeding-wheel N is divided into smaller apartments or spaces for the grain, by means of the curved partitions V, each apartment receiving a certain quantity of grain, and moving it around to the opening P, from whence it is conveyed by tube to the ground.

The hopper is divided into two compartments; one for grain, the other for lime, guano, &c.

"What I claim is, in combination with the adjustable tube F, the seeding-wheel N, with its flange and partition, for adjusting, receiving, and carrying the grain and other material to be sown with it, around to the opening, whence it is conveyed to the ground, as herein fully described and represented."

No. 9741. HIRAM BERDAN, of New York City.—*Improvement in Machine for Pulverizing Auriferous Quartz, and Amalgamating the Gold.* Patented May 24th, 1853.



The nature of this invention consists in attaching, by a pin or axle, a box and sleeve, as seen in the figure at S, a ball or sphere X, of three thousand or more pounds weight, to the inclined shaft B of an inclined vase or bowl A, whose axis inclines a few degrees from a perpendicular, which ball or sphere is so fastened to the axis of the bowl as to have a combined rotary or spiral motion, by the turning of the said bowl upon its inclined axis, which may be effected by horse or any convenient power applied to gearing, which makes into the cogs on the periphery of the bowl at Y. This basin A is furnished with a proper supply of quicksilver, serving also as an amalgamator; the finely-pulverized gold is returned, while the earthy matters pass off with the stream of water flowing into the bowl and out of it, through openings T in its sides. The ball, or grinding sphere, is solid, or may be made hollow, so as to be easily transported; and, if hollow, is weighted with lead or sand, or any other heavy material, at the mines when it is to be used; the basin, which acts as an endless inclined plane, being turned upon its axis with a comparatively small amount of power, the ball in the mean time revolving continually, and by its own gravity keeping in the lower portion of the bowl, rolling over and twisting, and thus crushing and grinding the quartz successively presented to it by the continued rotation of the basin. This invention further consists in connecting with the bowl or basin a heating or fire-chamber, divided into four partitions P, with grate F, which chamber revolves with the bowl or basin.

"I claim—1st, Attaching the ball or sphere obliquely to the inclined shaft, by the pin-box and sleeve, substantially as described, in combination with the inclined shaft and inclined bowl, as herein set forth.

"2d, In connection with said bowl, I claim the heating-chamber or furnace, arranged, constructed, and operating in the manner and for the purposes herein specified."

No. 9742. Samuel R. Brick, Philadelphia.—*Improvement in Gas-Burners.* Patented May 24th, 1853.

This new gas-burner is provided, in the interior of the ordinary gas-burner, with a long centre conducting-pipe, surrounded by a long concentric capping-pipe, causing the gas to be suddenly deflected from the top of the conducting-pipe, and to descend, and thus have its pressure diminished, and afterwards pass through horizontal perforations in the base of the capping-pipe, into the area of the burner, and ascend to the burning point, by which means the supply for burning is made uniform, though the pressure in the main gas-pipes may vary; and blowing off the gas and waste is thereby prevented, and good combustion, according to the inventor's statement, is obtained, with a steady light.

a in the figure represents a common gas-burner, screwed on to the conducting aperture *b*, with its female screw, at base *e*, which screws on to the supply gas-pipe; C is the capping-pipe, with perforations horizontally *d d*.

"I claim the arrangement and combination of the centre conducting-pipe, and its capping-pipe inside of the common gas-burner, in the manner and for the purposes above described."

No. 9743. John B. Blair, Alton, Illinois.—*Improvement in an Engraving Machine.* Patented May 24th, 1853.

The nature of this invention consists in the arrangement of a machine so as to be capable of performing the work of a graver or other tool, to produce either mezzotint or other engraving with a greater uniformity and regularity than that at present done by hand.

The drawing is too complicated to be here represented, and we must content ourselves with the claims.

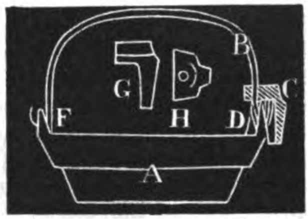
"I claim, first, the so combining of the needle, whether sharp or blunt, with a pentagraph, or other copying or tracing instrument, through the medium of double carriages, moving at right angles to each other, as that the dots or punctures of said needle may be dispersed or aggregated at pleasure, for the purpose of forming the lights or shadows—the character of the lights and shadows being indicated by a sliding scale, moving before the eye, or under the hand of the operator, substantially as described.

"I also claim the combination and arrangement of the sliding-bar H′ on the bar I′, the cords 15, 17, 19 (the first cord connecting the sliding-box with the spring lever D′, and the two latter connecting the sliding-box with the pedal), and the arms 23, for the purpose of moving, by means of the pedal K′, the wheel E′ towards or from the centre of the wheel F′, on the face of which it works spring-tight, to change its motion, and give to the needle a relatively changed motion, substantially as specified.

"I also claim, in combination with the carriage and needle, the wheel G, with its lifting piece *d*, and the cam-wheel H, or their equivalents, for changing the character of marks, lines, or dots, upon the plate to be engraved at pleasure—and this I claim, whether the same be operated in connection with the pentagraph or not, substantially as described."

No. 9744. Thos. H. Dodge, of Nashua, New Hampshire.—*Improvement in Kettle Bails.* Patented May 24th, 1853.

The inventor places on the bail of a kettle or other vessel, a sliding dove-tail shaped sliding piece C, which is made to slide on and around the bail B of the kettle or pan A, and when it is desired to have the bail in an upright and permanent position, to slide down to one of the sides of the kettle, and its dove-tail or other shaped end to fit snugly in a female dove-tail or other shaped groove cut in one of the ears or flanches of the kettle, in the manner shown in the annexed figure; the said flanches having the dove-tail cast either on their outside or inside, as desired.



The figure represents a frying-pan, A and B the bail in a vertical position, and secured by the dove-tail or other shaped sliding piece C. This fastener C is secured on the bail, and the eyes of the ears D F on the pan; A is a side view of the sliding piece, and H a view of the same seen from below.

"What I claim is the sliding dove-tail or other shaped piece C, which slides on the bail B, in combination with the female dove-tail, or other shaped groove *b*, cast in the flanch or car E', either on the inside or outside, for keeping the bail B permanently fixed in any position desired, and for any length of time, and at the same time admitting of its being left loose, and operating, if desired, like the ordinary swinging bail."

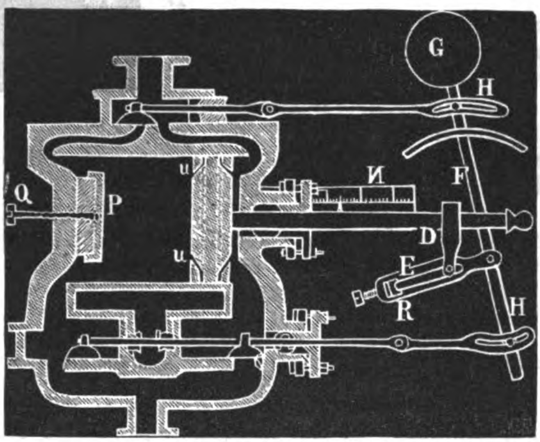
No. 9745. JOHN C. FLETCHER, Burlington, Iowa.—*Improvement in Radiator for Stoves.* Patented May 24th, 1853.

The inventor combines with the fire-chamber A and escape-pipe C a series of concentric flues, having communicating passages one with the other, so that the product of combustion shall commence in their passage in the outer flue, and passing through the series, and escape at the centre flue, so that the heat of one flue shall be communicated to the next succeeding one, and by heating and warming that to prepare it for rarefying the air and transmitting the draft more rapidly through the series.

"I claim the interposition between the fire-chamber and the exit-pipe of a stove, of a series of concentric flues, so arranged as that the heat of one flue shall pass through the partitions, and in whole or in part be transmitted to the next flue, or portion of the flue, in advance, and prepare it for transmitting the draft through the series, substantially as described."

No. 9746. JOHN HARTIN, of New York City.—*Improvement in Water-meters.* Patented May 24th, 1853.

"The nature of this improvement consists in providing the cylinders inside with a sliding box or stop P, which is adjusted in its position by a screw Q, by which means I can limit," says the inventor, "the stroke of the piston by causing it to strike against the said box or stop, for the purpose of preventing the pin in the arm D from straining upon the stop R in the slotted arm E, after tilting the lever F by the sliding box P in the cylinder, and the sliding piece R in the slotted connecting piece E have to be regulated proportionally, so as to have the oscillating ball G, with its lever F, operate the valves properly, I make slits in the two connecting rods H H, which operate the valves, and make likewise a slit in the connecting piece E; by the combination of these two slitted connecting rods H H, and the slitted connecting piece E with the oscillating ball G and lever F, I obtain a sudden change of the valves whenever the piston has moved to a certain place in the cylinder. I make the fluid itself cause the piston to move tight in the cylinder by means of openings *n n n* on the faces of the piston; these openings run obliquely towards the inside of metallic rings placed in

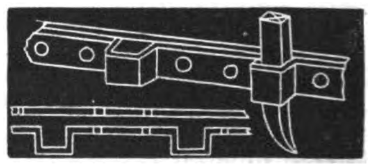


grooves around the piston through the said openings; the fluid presses against the inside of the metallic rings (which are cut through in one place), and causes them to expand and press tight against the cylinder. I place an index N near the piston rod, and a finger on the piston rod, by which means I ascertain how much fluid is drawn off from the cylinder.

"I claim the adjustable box or stop P in one end of the cylinder, for the piston to strike against, for the purpose of preventing the pin in the arm D from straining upon the stop R in the slotted arm E, after the tilting of the lever F, substantially as herein set forth."

No. 9747. Lewis Lupton, Winchester, Virginia.—*Improvement in the Construction of Harrows*. Patented May 24th, 1853.

This new harrow is made ot any shape or form, of bar-iron or stout strap-iron, which is bent into angular recesses or sockets; upon this bar a straight or flat bar is fastened by means of rivets, and when thus completed makes convenient sockets for the tines or teeth to be secured therein, as shown in the figure.



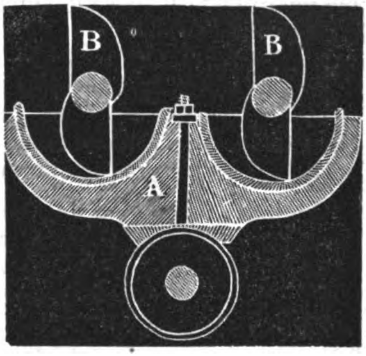
The shape of the harrow may be varied at pleasure.

"I claim constructing the frame of a harrow, of double metallic bars, or of flat straps or pieces of metal, and the forming of sockets thereon, by bending the metal or otherwise, for inserting the teeth or tines, in the manner described, and the uniting the bars or pieces of metal, and the combining therewith, the manner of bracing or staying the same by the rod C C and couplings E, specifically as herein before set forth.

"I claim simply the improved method of construction, as specified."

No. 9748. STANISLAS MILLET, of New York City.—*Improvement in Meat-Cutter.* Patented May 24th, 1853.

This machine consists of a revolving dish A (see figure), having a stationary cover fitting tightly at the edges. A pair of cutters B B play through slits in said cover, and act upon the meat within; the dish, which is made to present itself to their action, in all possible directions, by the constant rotation, brings the meat to be cut constantly under the cutters, by a pair of scrapers fitting the bottom of the dish.



"I claim the combination of a set of revolving knives, or cutters, with the top plate and revolving dish, formed as described, and operating so as to effect the subdivision of the matter, by the action of the cutters upon it, in passing through the slots in the cover, substantially in the manner set forth herein."

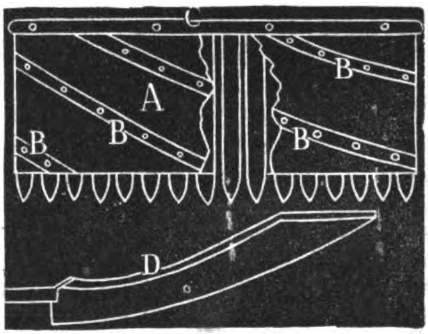
No. 9749. THOMAS NELSON, of Troy, N. Y.—*Improvement in Watches and Chronometers.* Patented May 24th, 1853.

The nature of this improvement in watches is clearly set forth in the claim.

"I claim the method of constructing watches or chronometers of any kind, so as to permit the employment of a spring barrel, of a size that shall occupy nearly the entire interior diameter of the watch-case, or frame, and which I effect by placing the movements upon the top of the barrel, and communicating the motion of the barrel to them, by means of a ring fixed on the interior of the case, or frame, with teeth on its inner edge, concentric with the barrel, into which teeth, the teeth of one or more wheels of the movements may cog or take, substantially as set forth in the above specification."

No. 9750. JEPTHA A. WAGENER, Pultney, N. Y.—*Improvement in Clover Harvester.* Patented May 24th, 1853.

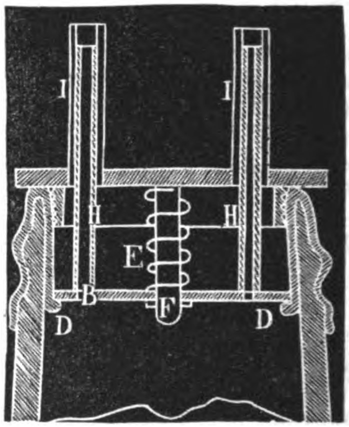
The improvement consists in a cylinder A (see figure), set with spiral knives B B B arranged to act in combination with teeth, curved to correspond with the circle traversed by the edges of the knives upon the cylinder, which act in concert with a straight stationary knife C, placed at the base of the teeth, so as to shear the heads of clover from the stalks, there being only sufficient space for the heads between the cylinder and the teeth, so that the heads only are gathered; also in making flanged teeth, shown at D, cutting the top away so as to form a seat for the stationary knife, and allow the teeth to spring and vibrate towards or from each other.



"What I claim is the above arrangement of the solid or hollow cylinder, set with knives on its periphery, as described, and just near enough to the fixed knife, or to the concave of the fingers, to admit space enough to allow the clover heads to pass through without being crushed, and so that the combined action of the forward movement of the machine, and the adjustable guard-plate R and the knives, the stems may be drawn in and severed close to the heads.

2d. "Making the teeth so that they will spring and vibrate towards or from each other, substantially as described and represented."

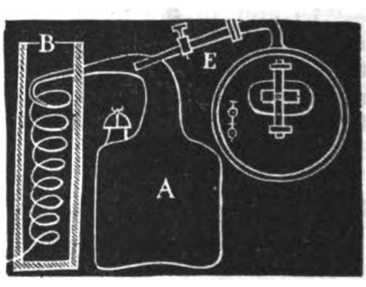
No. 9751. Alex. J. Walker, of New York City.—*Improvement in Spirit Lamps.* Patented May 24th, 1853.



The inner tubes H of this lamp shown in the figure, which carry the wick, are secured to circular movable plate B, the said plate being connected to the cap or cover by means of a vertical rod F, having a spiral spring E, wound on it, the said spring E being situated between the cap and the lower plate, and forces the plate down over the vertical rod, when the cap is unscrewed, and thereby draws the inner tube H downward, and consequently causes the other tubes I to extinguish the light instantaneously; this spring also serves to keep the circular protection plate firmly down against a circular flange D, formed round the inside of the wick of the lamp, and thereby prevents the fluid possibly getting above said plate, except through the inner tubes becoming heated, and exploding.

"I claim the employment of the plate B, which serves as a protection against the fluid rising too high, and becoming heated, and exploding, and also as a support for the inner tubes, in combination with the spiral spring E and rod F, the rod serving to connect the said plate with the top of the lamp, and the spring to hold the plate B firmly down on the flange D, and also to throw up the cap and extinguishing tubes instantaneously, after the top has been unscrewed, the whole being constructed, arranged, and operating in the manner herein shown and described."

No. 9752. Madison Page, Williamsburgh, N. Y.—*Improvement in the Process of Distilling Rosin Oil.* Patented May 24th, 1853.



In these processes, a common still A, shown in figure, of any form, with a condensing worm B, is used in connection with a steam pipe *e*, whereby steam is introduced in such a manner that the steam does not come in contact with the rosin, but only with the vapors arising from the rosin.

The first process is, to extract the acid from the rosin, next the naphtha, and lastly the oil, and each product is procured separately from the others. The mixture is first expelled, the heat is then raised, and the acid discharged; when that ceases to flow, the steam is admitted through the pipe *e*, and the worm is now connected with the still —the heat is kept up until the naphtha ceases to flow; the heat is again raised in the still, and the steam always freely admitted, until the oil begins to flow; the temperature must be kept up until the oil ceases to flow.

When the heat is again raised still higher, and a second portion is distilled over, after which a third increase of heat must take place, and continued till all the oil is expelled from the rosin. The pitchy substance in the still is drawn off. To make oil for lubricating purposes, the oil distilled at the lowest temperature is redistilled with steam as mentioned above. The oil distilled by means of the next higher temperature is redistilled with steam, and used by curriers.

"I claim the employment, in the manner and for the purposes described, in the manufacture of rosin oils of different qualities, redistilling the same, and purifying it, substantially as herein set forth, by the introduction of the steam into the commencement of the goose-neck, above the rosin in the still, so that the vaporized oils from the rosin will pass through, and be commingled with said steam in their passage to the worm for condensation, for the purpose of purification, &c., as above fully set forth."

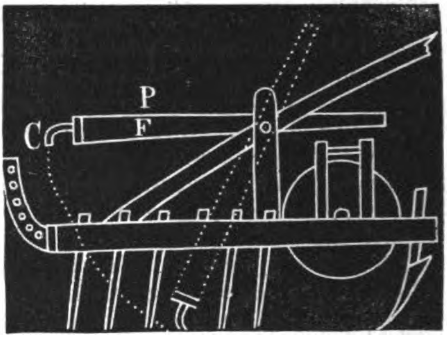
No. 9753. DUNCAN E. McDOUGAL, Troy, N. Y.—*Improved Door-Fastener.* Patented May 31*st*, 1853.

This door-fastener is intended for travellers, and to be of a portable nature; it consists of a plate A, shown in figure, which bears against the inner fall of the door, having its lower end bent in the shape of an elbow, so as to form a hook or lip *e*, to be inserted under the bottom edge of the door; on the back of plate A is a bar, with ratchet teeth D, and a series of holes; to this bar two curved or other suitable-shaped levers G H, are secured by movable pins. The lever G is attached at its other end to the claw or floor-plate I, provided with sharp spikes, which are driven in the floor. The lever H is connected to the ratched bar of plate A by a pin, the bar H having a recess at *i*, into which either of the ratchet teeth fit, when the screw J, which is at the other end of the lever H, is set in one of the recesses or lever *g*, and turned until the recess *i* catches in a tooth of bar D, and screwed tight to form a pressure between the two levers, giving a horizontal direction of plate A against the door B, whereby the door is firmly secured.

"I claim combining the levers G H, or their equivalents, with the retaining lipped plate A C, and claw plate I, and set screw J, or their equivalents; the said screw serving to operate the levers and force the plate A C horizontally against and under the door, and retaining it firmly in that position, by means of the same and said levers, in the manner and for the purpose described."

No. 9754. PHILIP H. KECK, Morgantown, Va.—*Improvement in Cultivators.* Patented May 31st, 1853.

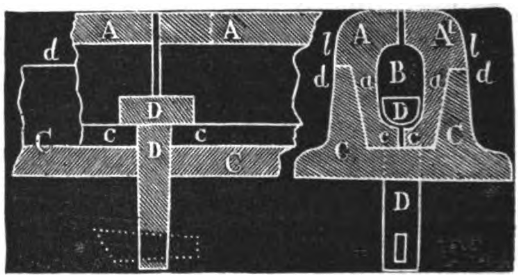
The nature of this invention consists in constructing a cultivator, which combines a harrow, roller, and plough, so arranged as to assist each other,



when used together, and to be used separately, and attaching thereto a *balancing pivot*, for the purpose of facilitating the turning of the implement, whenever it is required. When the cultivator arrives at the extremity of the field, the lever F is allowed to fall, and it comes in the position, as shown in the figure by dotted lines. The sharp bill-hook C enters the ground, and by the forward motion of the cultivator it is raised from the ground, when it can be easily turned by a slight pressure upon its rear arms or handles.

"I claim, 1st, The combination of the balancing pivot (P) with a cultivator, constructed as herein described, for facilitating the turning of the same, as herein specified."

No. 9755. Richard H. Middleton, Alexandria, Va.—*Improvement in Compound Rails.* Patented May 31st, 1853.

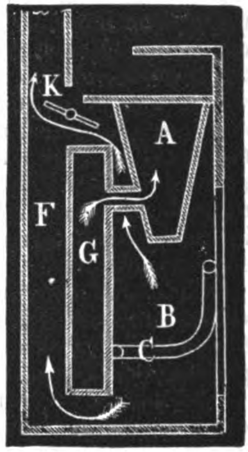


The inventor makes a tripart rail, the two upper portions of which resemble the ordinary split rails, and the third or lower part is a continuous box or case rail, to contain and bind together the two upper parts, as shown in figure. Either half of the split rail (A or A′) is formed of a bar or side *a*, projecting over either side, and forming a shoulder *d b*; the bar *a* has a flanch *c*; the top surface of this flanch forms a hollow curve or seat for the heads of the holding-down bolt D; when the half rails A and A′ are placed in their position, they form a tubular channel B between them. The half rails are seated within the box or case-rail *c*, the shoulder *d b* of the split or half rail resting upon the sides *d d*.

To secure this compound rail to the sleepers, bolts D having semicircular heads corresponding to the hollow curved surface of the combined top faces of the flanches *c* pass through the bottom of the half rails, case rail, and sleeper, and are wedged, keyed, or secured up from underneath.

"I claim the combination of the continuous case rail with the split rail, the halves or parts of the latter being constructed with shoulders that rest on the sides of the case rail, while their lower edges fit into and rest upon the bottom of the same, and the whole being arranged, substantially as shown and described."

No. 9756. Charles Neer, Troy, N. Y.—*Improvement in Fireplaces and Stoves.* Patented May 31st, 1853.

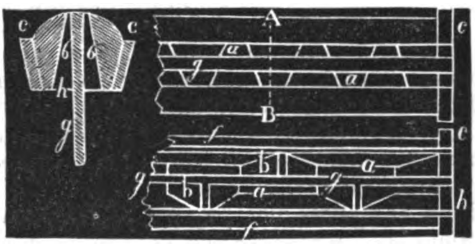


The annexed figure is a vertical section of such a fireplace. A represents an inverted pyramid, B the fire-chamber, C the grate, G hot-air chamber, F flues, and K draft damper.

"I claim the combining with the fire-box of a fireplace, heating stove, or furnace, an inverted pyramidal-shaped air-chamber, open at top, and suspended over the fire, so that the inclined sides thereof shall radiate the heat and throw it against the fire-box plates on all sides; and this I claim, when the fire-box is flanked or surrounded by a series of one, two, or more air-heating and smoke and gas flues G, F, G, F, for the purpose of exposing all the heated plates to the current of air to be warmed and drafted into the room or apartment to be heated, substantially in the manner and for the purpose herein described."

[*No. 9757 withheld by the Patent Office.*]

No. 9758. Marie Louise Roucaut, of Paris, France.—*Improvement in Grate Bars.* Patented May 31st, 1853.



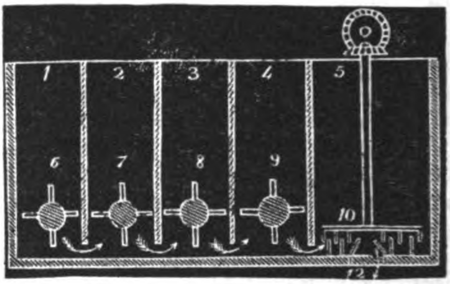
This improvement consists in connecting the bars of furnaces and other grates of an arched or partly arched form, and with a double row of parallel air-holes made in the length of the bars, which, when properly combined, prevent, according to the statement of the inventor, clogging of combustible to the bars, and improves the combustion, and produces economy of fuel. Fig. 1, in the annexed representation, shows the top view of a bar, which is in form of an arch. Fig. 2, a section through Fig. 1, as A B. Fig. 3, a plan of the bar seen underneath; *d* are inclined parts widening from the top towards the bottom.

"I claim the construction of bars of furnaces and other grates, of an arched or partly arched form, provided with two parallel rows of air-holes, substantially as herein described."

No. 9759. Arnold Buffum, New York City.—*Improved Gold-washer and Amalgamator.* Patented May 31st, 1853.

The figure annexed represents the gold-washer; 1 2 3 4 are centrifugal amalgamating compartments; 5 is a centripetal discharging compartment; 6 7 8 9 are agitators. The discharging aperture is in the centre of the bottom of the centripetal compartment at 12, surrounded by a conical inclined plane. A series of circular channels, within one another, surround the conical inclined plane, and connecting with each other by openings; they are about two inches high; above it is a revolving guiding table 10, which brings the ore in close contact with the quicksilver.

The bottom of the amalgamator is covered with quicksilver; the water and ore are introduced at 1, when it is agitated by the revolving-wheel or agitator 6, which washes the ore and moves it through the connecting opening direct upon the surface of the quicksilver; when it has passed through 2 3 4, and it arrives at the compartment 5, the centripetal force carries the impurities circularly in the channels through the aperture 12, when the inclined plane prevents the escape of the quicksilver.

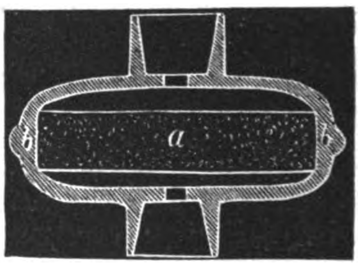


"1st, I claim the furnishing of the centripetal discharging compartment, with a horizontally revolving, water-moving, and ore-guiding table, in combination with a discharging aperture, surrounded by a conical inclined plane at the centre.

"2d, I claim the arrangement of the circular guiding channels, with connecting openings, so adjusted as to secure an irregular spiral passage from the periphery to the aperture at the centre. I claim these arrangements for gold separators, whether the centrifugal and centripetal compartments be used in combination, or either of them separately."

No. 9760. Wm. H. Jennisons, New York City.—*Improvement in Compositions for a Filter.* Patented May 31st, 1853.

This improvement consists in a composition of animal charcoal of a coarse nature, say thirty pounds, mixed with sixty pounds or more of finely ground glass; to which is added boiled starch, sufficient to cause the particles to adhere together, which is moulded into the desired shape of the filtering medium and dried, and afterwards vitrified, which forms a porous, hard medium, that does not require any support from wire gauze or perforated plates within the filter.



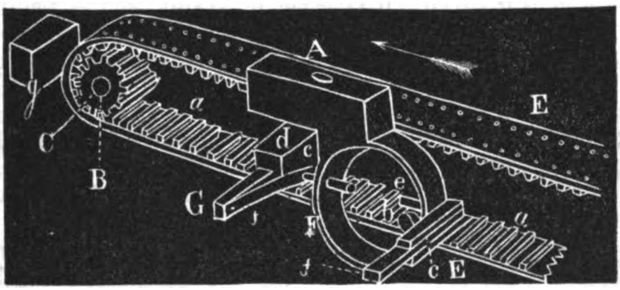
In the figure, *a* represents the filtering medium, and the case *b* which is made of gutta-percha.

"I claim the combination of animal charcoal, glass, and starch, or its equivalent, treated in the manner set forth, for a filtering composition, as specified."

No. 9761. Henry Baker, of Catskill, New York.—*Improvement in Converting Rotary into Reciprocating Motion.* Patented June 7th, 1853.

This invention is more particularly designed for the purpose of driving the bed of a printing-press, or the bed of any other machine to which it is desired to communicate reciprocating, rectilinear motion.

The motion is communicated in the first place from the revolving shaft B to one of two wheels or pulleys C, around which an endless belt or chain E is placed; the wheels or pulleys, and belt or chain being so arranged that the belt will move in a direction parallel or nearly so with the desired reciprocating movement. To the object which is to receive the reciprocating movement, is attached a ring F, which lies nearly close to the belt or chain; the minor diameter of the said ring being about equal to that of the pulleys on which the belt or chain runs. Two pins *e e* are fitted to slide freely through the periphery of the ring on opposite sides, both the said pins being parallel with the band, and being caused by springs *f f* applied to them to project a short distance into the ring. To the endless band or chain E is attached a stud *b*, which projects into the ring close within the periphery, at right angles to the above-named pins; and as the band moves, this stud catches one or the other of the pins, and propels the ring and whatever is connected with it. As that part of the endless belt or chain, which is on one side of the wheels or pullies, moves in the opposite direction to that on the other side, the stud will move in opposite directions alternately. The sliding pins are so placed that when the stud moves in one direction it catches with one, and when it moves in the other direction, with the other; and each of the pins being drawn back from the ring by a lever G attached to it, catching against a stop *g*; at the time the stud reaches either pulley or wheel, it is passed by the stud, which runs round the wheel or pulley with the belt or chain, and catches the other pin, and by its reversed movement drives back the ring in the opposite direction to that in which it moved before the stud arrived at the wheel or pulley.



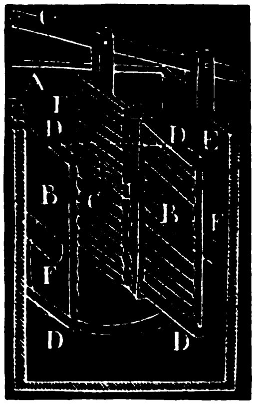
In the figure, A represents the part to which the bed of the printing-press is fastened; B the driving shaft and pinion C; E is a leather belt with cogs *a a*, which passes over pinions; C is one of these pinions. The ring F is secured to the bed A, having two knuckle pieces *c c'* which receive the fulcra *d d'*, two small levers G G', to which the sliding pin *e e'* is attached, said pin passing through the ring F. The springs *f f'* are applied to the levers to keep the points of the pins *e e'* projecting into the ring.

The stops *g g'*, by which the levers are caused to draw back the pins, are attached to the frame of the press at each end and near the belt. The stud *b* catching against the periphery of the ring under the pin *e'*, drives the bed in the direction of the arrow.

"I claim the ring F, with its sliding pins *e e'* attached to the object to which reciprocating motion is to be given, in combination with the stud *b*, or its equivalent, attached to the endless chain, substantially as herein set forth; the points or ends of the said pins *e e'* being caused to project through to the interior of the ring to catch the stud *b*, or equivalent, and being withdrawn, alternately to allow it to pass by springs, levers, and stops, substantially as described."

No. 9762. Thos. A. Dugdale, Richmond, Indiana.—*Improvement in Washing Machines.* Patented June 7th, 1853.

The inventor places in a suitable box A (see figure), two wash-boards B B, with rollers D D D D; the centre wash-board C is attached to a lever G, the clothes being secured to wash-board C, and worked up and down between the boards B B. The cord E E passes over the rollers on the top of the wash-boards, and secured to the sides of the box to prevent the two wash-boards B B from rising.



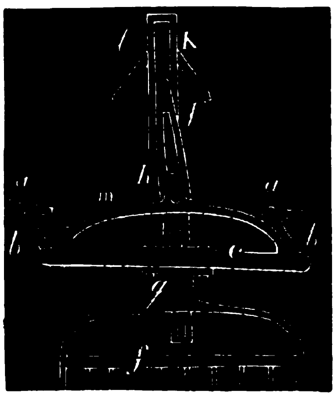
F F are floats of wood secured to the inside of the wash-board B B, by means of cords, as shown in drawing, which causes the wash-boards to be drawn together.

"I claim combining the wash-boards, cords, and floats, substantially as above described."

No. 9763. Henry W. Hewitt, of New York City.—*Improvement in Propellers.* Patented June 7th, 1853.

The nature of this invention consists in giving to the paddles in their circuit a greater longitudinal than vertical motion, imparted by a crank motion, modified by the vibratory motion of a beam or beams, which vibratory motion of the beam is derived from the crank motion, so that the motion of the paddles shall be generated by the combined motion of the crank and the beam; the beam increasing the motion of the paddles in the direction of the propelling action beyond the diameter of the circle generated by the crank, whilst the motion towards and from the water is received directly from the crank or cranks.

It further consists in making the vibrating beam, in the combination above specified, to slide on its fulcrum, by reason of which combination the paddles begin to move back in the direction of the propelling action, before the cranks in their descent reach the horizontal line, in carrying the paddles down towards the water, and continue this motion in the direction of the propelling action, until after the cranks in rising, have passed the horizontal line or dead point, thus avoiding what is called backwater. There are three cranks on two shafts, connected by three bars, like *c*, shown in fig.; *f* the paddle bar, fixed to bar *c*. To give the longitudinal motion in addition to what is imparted to the paddles by the cranks, each carriage is provided with two studs *g*, and the carriage is embraced by the lower end of a beam *h*, which is made double at the lower end for that purpose, to embrace the studs *g*, so as to strike thereon freely. The upper end of beam *h* is attached to a cross-head *j*, which slides between ways *k*, in gallows frames *l*, erected above the guards; said beam is attached to an arch-piece *m*, extending over the carriage and bar *c*, and connected with the end thereof.



"I claim giving to the paddles, in their circuit, a greater longitudinal than vertical motion, imparted by a crank motion, substantially, as specified, in combination with the vibratory motion of a beam or beams, derived from the same crank motion, substantially and for the purpose specified.

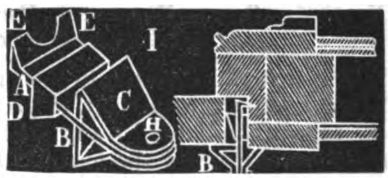
"And I also claim, in the combination above specified, making the beam or beams slide on the fulcrum or fulcra, substantially as specified, by means of which additional element in the combination, I am enabled to impart to the paddle or paddles the back motion, in the direction of the propelling action, more than the lower half of the crank motion, substantially as specified, and for the purpose set forth."

No. 9764. W. S. HUBBELL and A. BARRET, Kingsville, Ohio.—*Improvement in Compositions for Treating Wool.* Patented June 7th, 1853.

In treating wool for manufacturing purposes, the inventor uses instead of oil alone a composition of oil and alcohol, taking two-thirds by measure of oil and one-third by measure of alcohol. The inventor states in his specification, that wool treated with his composition does not require washing previously to the various stages of its manufacture from the raw state to its finish in cloth.

"We claim the treating of wool with a composition of oil and alcohol, to prepare and fit it for the several manufacturing operations for which oil has been and is now employed."

No. 9765. SAMUEL P. KITTLE, Buffalo, N. Y.—*Improved Door Fastener.* Patented June 7th, 1853.



This invention consists in providing the door to be fastened with a metal bar A, sufficiently thin to allow the door to shut; this bar has spurs E E, which are pressed into the wood, forming the rabbet, by closing the door. (See sectional figure.) The other end of the bar, which projects beyond the fall of the door when closed, is provided with a stop or rest B, which, when the door has been closed, secures it so long as the edges or spurs retain their hold in the rabbet.

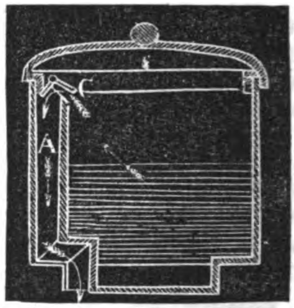
Fig. 1 represents a perspective view of the door fastener with cap on. Fig. 2 represents the mode of applying it, showing a section of the fastener and a section of a door and casement. A bar, B stop or rest, C brace, D cap, H the rivet which holds the pieces B and C to plate A, and upon which B and C turn.

"I claim the construction of the bar A, having the edges E E with the stop or rest B, having the lips F and G constructed and arranged as described.

"I further claim the combination of the cap D, with the bar A, the effect of the cap being to fill up the space between the edge of the door, when closed, and the casing, as described, all for the purposes, and constructed in the manner, substantially as set forth in the accompanying specifications and drawings."

No. 9766. R. W. BELSON, of Philadelphia, Pa.—*Improvement in Boilers for Cooking-Stoves.* Patented June 7th, 1853.

This invention consists in a stove boiler, provided with an escape-tube, to conduct the steam and odors into the chimney or flues of the

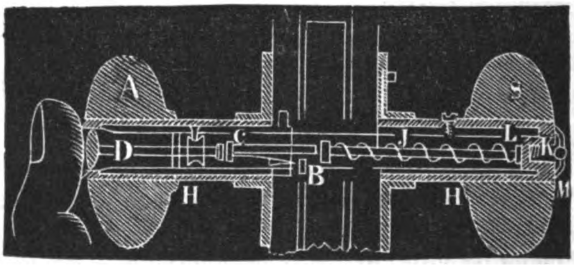


stove. When the tube A (as shown in figure) is open into the boiler, before the boiling commences the smoke from the stove is apt to pass into the boiler. This occurs whenever the draft of the stove is feeble, or a great amount of fuel is thrown on to the fire at once, or when the cover is suddenly raised, and when the cover of the boiler is off, the smoke may escape in the room. To obviate these defects, I employ on the top of said tube A a valve C, so constructed and arranged, that it may be controlled by the movements of the cover of the boiler, so that when the boiling commences and the cover is tightly in place, the valve shall be lifted from its seat, and the tube open for the escape of the steam. (See the arrows shown in the section of said boiler.) When the cover is entirely removed, the valve is closed by its own weight. If the cover is placed tightly on, as it must be, before boiling commences, then the valve may be only slightly open; or, if the cover is placed unevenly on the side or edge next the valve being raised up, then the valve will be closed entirely; and as soon as steam begins to form and the odors escape into the room, then the cover must be shut down closely, and the valve will be opened accordingly. All this will be readily comprehended by reference to the figure.

"I claim the employment of a valve, in combination with the escape-tube of culinary boilers, such valve being controlled by the cover, or in any equivalent manner, substantially as herein set forth."

No. 9767. OLIVER ELLSWORTH, Hartford, Conn.—*Improvement in Operating and Locking Knob Bolts.* Patented June 7th 1853.

The inventor attaches to the tumbler of the latch a pin or preventer E, which bears upon the bolt, to prevent the bolt from being pushed back into the case of the latch by any instrument from outside. (See figure representing a section of the lock.) D, the thumb-piece or disconnector, when pushed in comes in contact with the end of the rod C, forces it towards the inside knob S, carrying the pin (attached to the rod and known as rod-pin)



out of the teeth of the outside knob-tube A, and into the cavity or oblique side contained in the side of the lock-case, and the latch has now become a lock.

The only way of opening the lock from the outside, when thus disconnected, is by the introduction of a key, which fits over the thumb-pin, and on to the end of the spindle. The inside knob S has an *extender k*, which serves, 1st, to disconnect the outside knob A; 2d, to lengthen or shorten the rod *c*.

"I claim, 1st, The '*Preventer*,' E, attached to the tumbler of the lock, for the purpose of preventing the bolt being forced inward, by means of any instrument from without, as herein described.

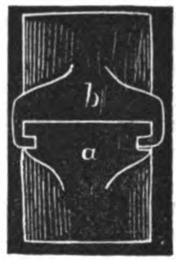
"2d, I claim, in combination with the pin and spring, the 'oblique sides' or 'angles,' cavity, or opening made in the side of the case of the lock, and shown in Figs. 22, 34, and 35, for purposes already set forth, *i. e.*, for the purpose of converting my *lock* into a *latch*, or restoring the connection between the outer knob and spindle, by means of the rod-pin coming in contact with the oblique sides, when the inside knob is turned, thereby turning the spindle, and causing the rod-pin to be moved out, by reason of the FRICTION of said rod-pin upon the *sides of said cavity*, as herein set forth.

"3d, I claim the introduction of a key through a door-knob, for the purpose of turning the *spindle* of the lock, thereby causing a *lock* to be converted into a *latch* (from the outside), as described in the specification.

"4th, I claim the 'thumb-pin,' or 'disconnecting-pin,' which pin passes through the outside knob, and into the spindle, thereby forming a connection with the rod, for the purpose of converting the *latch* into a *lock*, at pleasure, from the *outside* of a door, as herein set forth."

No. 9768. R. J. FALCONER, of Washington, D. C.—*Improved Hose-Coupling.* Patented June 7th, 1853.

This invention consists in employing the taper or draw-slide to hold and bind together the two parts of the coupling-joint, in place of the common and very inconvenient mode of uniting them by a screw-joint. *a b* are the parts of the coupling represented here as locked together, making the joint complete. They are to be attached to hose in the usual mode of attaching screw couplings. The advantage gained is particularly important in the saving of time to fire companies. Where screw couplings are used, it is very difficult, and sometimes impossible to effect a coupling while the water is flowing through the hose, and much time is consumed in stopping off the water and in screwing up. The draw-slide coupling can be used while the water is flowing with full force, and the joint is made in an instant of time.



"I claim the employment of the slide coupling, in combination with the collars of hose, in the manner and for the purpose set forth, by which I am enabled, in the case of water hose, to effect the coupling with the utmost facility, while the water is flowing through the hose."

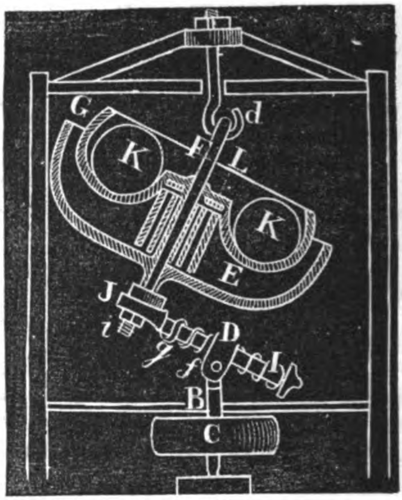
No. 9769. P. G. GARDINER, of New York.—*Improved Arrangement of Quartz Pulverizer and Gold Amalgamator.* Patented June 7th, 1853.

The nature of this invention consists in the arrangement of a pulverizing and an amalgamating basin, with a screen interposed between them, the said basins being attached to the same shaft, and operating together, as shown in this figure.

B is the driving-shaft, which receives its motion through belt-pulley C; the upper shaft is forked, to receive a block D.

E is the lower or amalgamator basin, with centre-shaft F, to which is firmly secured the inner or crushing basin G, with the balls K K. The upper part of shaft F is supported by a hook *d*.

The lower end of shaft F is connected by a crank-rod I to the shaft

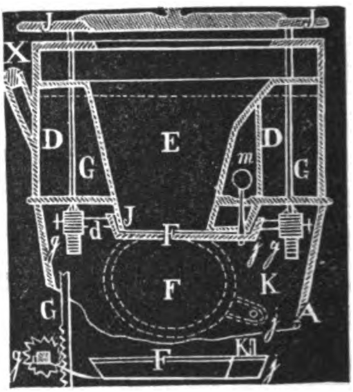


B, which is fitted to work freely in a hole made in the block D, at right angles to the pivots *f*; at one end is pivoted a metal box J, which is bored to receive the journal *i*, on the lower end of shaft F. A spring *g* is applied between the block D and shoulder on the rod I.

The quartz is fed into basin *g*, and is then subjected to the action of the balls K; the stream of water let into basin *g*, washes up all the finely-pulverized particles, and carries them through the screen L into the amalgamator E.

"I claim the arrangement of the vibrating, pulverizing basin and amalgamating basin attached thereto, with the screen interposed between the two—said basins being connected to the same shaft, and constructed and operating as described."

No. 9770. Herman Goldsmith, Jr., of New York City.—*Improvement in Water-Closets.* Patented June 7th, 1853.



This improvement consists in portable water-closet, having an annular water-chamber D (see figure), at the upper part of the closet, which contains a valve *m*, so arranged as to open when the pan or basin F closes, and allow a requisite quantity of water to pass around the pan or basin, and between the pan or basin and the flange of the orifice, the pan or basin closes, thus hermetically closing the orifice, and preventing the escape of effluvia; said valve closing when the pan or basin is opened, and thus preventing the escape of water from the chamber.

A is the lower part of the vessel of the closet; D is the annular water-chamber, in the centre of which is the opening E of a conical shape, said opening having a flange *b* projecting downward, around which fits closely the pan F; this pan is attached to a shaft *d*, which has a spiral spring wound around it, and two pinion-racks G G resting against it; when the board J J is depressed, the two racks G G work the pinions *g g* on shaft *d*, to which the pan F is attached, and opens said pan F; when the basin rises, the pan closes.

To prevent the effluvia from escaping, the inventor makes the pan with a nozzle *j* and with a small vertical rod K; this rod K throws up a ball which or valve within the water-chamber D, and allows the water to fill up the pan F, and between the pan or basin and the flange *b*, thus hermetically closing the lower orifice of the opening E.

The water cannot escape from the chamber D in any undue quantity, because there is no atmospheric pressure above, it being closed air-tight at X.

"I claim the annular water-chamber D, at the upper part of the closet, with a valve, so arranged as to open when the pan or basin closes, and allow a requisite quantity of water to pass around the sides of the pan or basin, and between the sides of the pan or basin and the flange l of the orifice—thus hermetically sealing the orifice, and preventing the escape of effluvia—such valve also closing, when the pan or basin is opened, and thus preventing the escape of water from the chamber; the valve being constructed of a sphere or ball m working over a circular opening l in the bottom of the water-chamber, or constructed in any other manner."

No. 9771. LEON JAROSSON, Jersey City, N. J.—*Improvement in Painting on Cloth.* Patented June 7th, 1853.

Extract from Leon Jarosson's Specification.—To paint on felt, or woven woolen goods, I proceed as follows: The cloth is first perfectly bleached, in the ordinary manner, with soap and sulphur. A tepid water-bath is then prepared, into which is placed as a mordant, bi-sulpho hydro-chloride of tin, until the liquid weighs 3°, Beaumé (acid weight). This mordant is composed of muriatic acid, sulphuric acid, and block tin, in about the proportions of 18 lbs. of the first, 9 lbs. of the second, and 2¼ lbs. of the third; the whole being warmed in a sand-bath, whilst chlorine gas is introduced by a pipe or otherwise to saturate it. Into this mordant the cloth is placed, and allowed to remain about three quarters of an hour, when it is sufficiently charged with the mordant to receive the chemical colors to be laid or painted upon it, even when one color is laid over the other, to the extent of several colors—the mordant retaining its power of taking and holding the quantity of color necessary to give depth and richness to the picture. After the cloth is taken out of the mordant, it is wrung out and the creases carefully shaken out, and after a period of about ten minutes, should be placed in a liquid prepared with 20 parts of cold water to one part of clear chloride of lime water at 2½° Beaumé, where it is allowed to remain about three minutes, after which it is washed in clean water, and taken out and dried. This prepares the fabric for the receiving of the colors.

The primitive colors which I use are various, being chiefly vegetable, but using some mineral and some animal colors, and the various shades thereof are made by mixing the colors or reducing them with gum-water, prepared from the gums Arabic or Senegal, which should be well bleached or purified, and dissolved in water in the proportions of about twelve ounces of the gum to one quart of water. By mixing or commingling the primitive colors, any other tints may be produced according to the taste of the artist; which mixed colors may be further changed in shade, by reducing with gum or other water. The mordant (it might be proper to state) which I use, is entirely colorless, and as I use cloth as white as it can be made, so as to clearly show the finest tints, it is important in the practice of my art, inasmuch as a mordant prepared of sulpho-muriate of tin is tinged with yellow, and imparts its color to the cloth. The picture should be commenced with the lighter shades first, and finished with the darker ones, allowing each color, after it is put on, to dry before another is put over it, and thus great richness is given to the picture which is being painted on the cloth, whilst the mordant retains its chemical affinity for the colors, and fixes them permanently in the cloth successively as they are laid on.

The most expeditious and economical manner of putting on the figures or designs, is to have the outline, or so much of the figure as may be necessary, lithographed and struck into the cloth, by which means any number of copies of the same design may be produced, and which will obviate the necessity of employing artists to sketch out the figures; for with a copy before the operator, and the outline established, the colors may be easily blended in.

I use for the purpose of sketching in the figures (when not lithographed), and for many of the sharper lines, a gold or common pen or style, a brush, and a small roll of felt or other cloth, and sometimes for pressing or working in the colors more deeply into the cloth, I use a smooth piece of wood, ivory, or glass, which may be easily cleansed and not affected by the colors.

After the figure, landscape, design, or ornament of any kind is fully painted on the cloth (and it might be proper here to state, that up to this part of the operation, the colors are neither fully developed or permanently fixed or set), the cloth is stiff with the gum and colors, and it is first rolled in a damp cloth (or laid between damp cloths), to soften and moisten it. Each piece is then separately rolled up in a clean white cloth, and suspended in a steam-chamber, so that the rolls shall not touch each other or the sides of the chamber. This is necessary to prevent the colors from running or mixing with each other. The steam-chamber being tightly closed, the steam is allowed to enter the chamber, and the cloths or rolls remain therein from forty-five to ninety minutes, or in proportion to the bulk or size of the piece to be operated upon. This steaming may require one, two, or more separate operations, although as a general thing, for small articles, one will serve the purpose. When two operations are necessary, the rolls or goods should be turned upside down, or reversed end for end at each, to prevent colors from running. This may be more economically done by machinery from the outside, and it may be found necessary to keep the rolls in continuous motion in the steam-chamber, and would obviate the necessity of opening the chamber, or handling the hot rolls or goods being steamed. After the painted cloths are properly steamed, for brightening and fixing the colors thereon, they are taken out and exposed to the air, for twenty-four hours, more or less, to dry and allow such of the colors, as blue and green, which require the re-oxygenation of the air to give them life, and to fully develop themselves. Smaller articles will of course require much less time. After the steaming and drying, the fabrics are allowed to lie in clear water until the gum therein dissolves; after which they are dipped up and down, without rubbing, until the colors cease to run, and for this purpose a running stream of water is the best. When well washed or rinsed as above, they are rolled up in a clean white towel or cloth, and beaten by the hand or otherwise, to drive out the water, and if any color remains in the towel, wash and dry again, until the excess of coloring matter, or that which the mordant has not combined with, is entirely washed out. Brush the fabric lightly, with the nap or grain of the cloth, and put a piece of white paper over it, and iron it with a moderately heated iron, being careful not to scorch or injure the cloth or colors. The colors are now fully developed and permanently fixed, or set, and the article ready for the market. There may, and doubtless will be, many modifications of this general plan developed by experience, when the business is largely entered into, and much of the manual labor be performed by machinery; and by describing only what as yet, in the infancy of the art, may be considered a very crude operation, I do not wish it to be understood that I confine myself to the precise process or manipulation herein set forth, but to vary the same, as long as I retain the general principle of the operation herein set forth.

I would again repeat, that my invention differs from block or roller printing in this, that by blocks or rollers one color cannot be put upon another—that for each separate color, a separate block or roller must be used. In my invention the colors may be laid one upon the other, with the same implements at pleasure, and to any extent, preserving the tints of all, and giving tone to the picture. It differs from oil paintings upon canvas, or water-colors on silk, satin, or velvet, as these are on the surface, perishable, and can only be ornamental, whilst mine are in the body of the cloth, imperishable, and both ornamental and useful.

"I claim the painting upon cloth, previously prepared with the mordant herein described, that will combine chemically with colors laid on over the other, and blended by means, substantially as described; by which I give great richness to the figures, whilst the tint of each is carefully preserved, and developing and fixing permanently the colors, by steam, and restoring the cloth to its natural pliable state, by washing out the excess of coloring matter, substantially in the manner described."

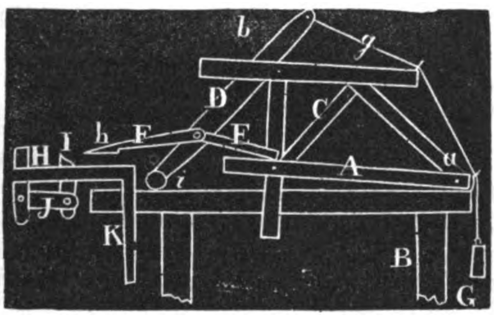
No. 9772. Gerard Sickles, Brooklyn, New York.—*Self-acting Platform for Ferry Bridges.* Patented June 7th, 1853.

The nature of this invention consists of attaching to a ferry bridge a platform in such a manner, that when the boat approaches, that the platform covers entirely the space between the boat and the bridge.

A represents the ferry bridge working by pivots *a*; C the frame which supports the lever-frame D; its pivots or bearings *b* work in oblong slots.

E F is the platform, the end E resting upon the bridge A. The leaf F is maintained in its position over the water by means of a joint. To the lever-frame D there are attached cords or chains *g g*, with counterpoise C.

The leaf F has a notch on the under side *h*. H represents the ferry boat approaching the bridge A; I is a vertical pin projecting above deck, se-



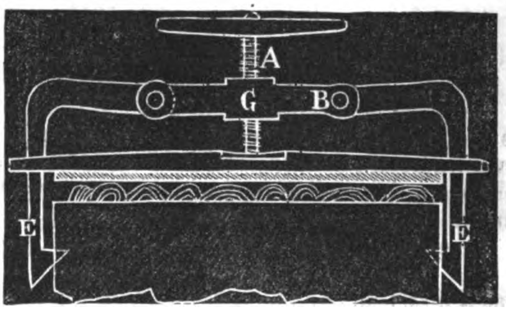
cured by a pivot to lever J, having a fulcrum at *j*; when the boat approaches, the cutwater *k* strikes the cross-bar *i*, and forces the lower end of the lever-frame inward and downward, and raises the weight *g*. The leaf E is then of course moved further upon the bridge A, and the leaf F gradually falls upon the front part of the deck of the boat; and as the boat moves inward or towards the bridge, the pin I is depressed by coming in contact with the edge of the leaf F, and the edge passes over the pin; and when it has passed it, it is forced upward by the weight of the lever J, and catches into the notch *h*, and the boat is secured to the platform.

"I claim applying or attaching to a ferry bridge, or other boat-landing, a movable platform, so arranged with any suitable mechanism as to be operated upon by the boat as it approaches the bridge, in such a manner that the boat causes the platform to move inwards and downwards when the boat is coming into the slip; and the mechanism or weights, herein described, or their equivalents, cause the platform to follow the boat outwards and upwards, when the boat is leaving the slip."

No. 9773. Geo. W. Wight, of New York.—*Improvement in Screw-presses for Packing-boxes.* Patented June 7th, 1853.

This improvement consists in a screw-press forcing down the tops of packing-boxes, and retaining them firmly in their place until they are screwed or nailed down.

In the annexed figure, A represents the male screw, which works in the female screw G; the nut has two arms extending horizontally from it B; to this, arms or levers provided with hooks E and E, are hinged; the follower F embraces the hooks D and E.



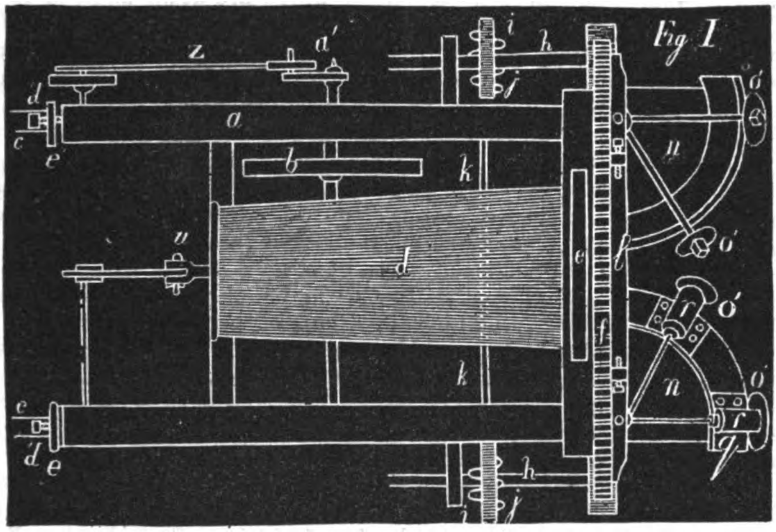
When a top has to be screwed down and fastened, the hooks D and E are driven into the side of the box, and when the screw is applied, these hooks are drawn inwards and upwards, and held tight.

"I claim the bending of the upper portion of the arms or levers E E from a vertical position, and tending towards each other until they reach and are joined to a cross-piece or yoke B by joints, at any desired point between the centre of said yoke and the vertical portions of the uprights, thereby giving an oblique or inward direction to the hooks F F, when the yoke is caused to rise, by the operation of a vertical screw."

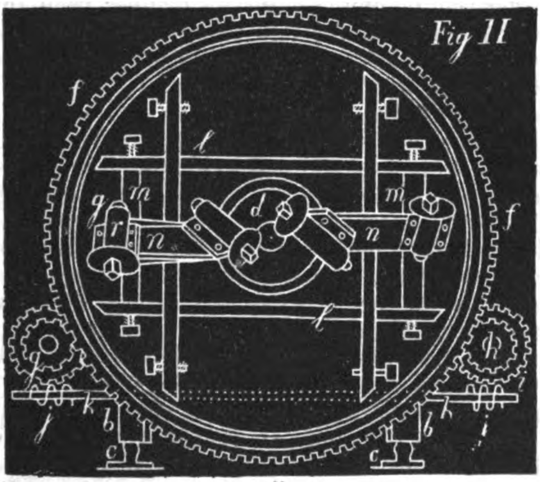
No. 9774. Ebenezer Talbot, Windsor, Conn.—*Machine for Boring Rock-tunneling.* Patented June 7th, 1853.

The nature of this invention consists in so employing one or more metal rollets, or one or more sets of rollets, with the periphery, adapted to cut away the surface of the stone by rolling against it, that they shall describe in their action the segment of a circle from the centre to the circumference of the tunnel, or other perforation, in combination with a slow motion around the said centre of the tunnel or other aperture, whether the two said motions be continuous, intermittent, or reciprocating; whilst at the same time the entire machine, or that portion of it which carries the rollet or rollets, is capable of being advanced for the feed motion, in the direction of the axis of the tunnel, or other aperture that is being cut.

In the accompanying Figures I. and II., *a* represents the frame of the machine, the platform of which is mounted on slides *b b*, fitted to and sliding on rails *c c*, laid on the bottom of the tunnel as the boring progresses. These rails may be laid in any appropriate manner, or, instead of the rails, the platform may be provided with wheels to run directly on the bottom of the tunnel, or otherwise intended to move thereon.



On the frame is mounted a hollow shaft *d*, which is adapted to turn in appropriate boxes *e e* in the standards of the frame, so that it can turn freely and accurately. To the forward end of this hollow shaft is properly secured a cog-wheel *f*, the cogs of which are engaged by a pinion *g*, on a shaft *h*, provided at the other end with a cog-wheel *i*, which engages a worm *j*, on



a transverse shaft *k*, that is to receive motion in any appropriate manner from the driving power, for the purpose of giving a slow rotary motion to the wheel *f* and hollow shaft.

The front face of the wheel is provided with flanches or arms *l*, in which are hung two rock-shafts *m m*, which carry two sectors *n n*; and as both are alike, the description of one of them will be sufficient.

The sector *n* is provided, at or near the ends, with two rollet-cutters *o o*, mounted on appropriate arbors, the axis of which are at an angle of 45 degrees (more or less) with the axis of the rock-shaft.

The arbor of each rollet is fitted to turn freely but accurately in a tube *q*, the bore of which is eccentric to its outer periphery. This tube is in turn fitted to a box *r* on the sector, so that it can be turned and moved endwise therein, for the purpose of setting the rollet as may be desired, and there secured in place by a temper screw, or other appropriate means.

The object of this mode of adjustment (which will be made the subject of a separate patent), is to set the cutting edges of the two rollets, so that one shall, in the vibrations of the sector, describe a different track from the other, that one may cut what the other does not; and it will be obvious from the foregoing, that this adjustment can be effected by turning and sliding the eccentric tubes, in which the arbors of the rollets turn.

The rollets are formed and operated in cutting into the stone or other substances, in the manner of what is known as Wilson's Machine for Dressing Stone. The inner ends of the two sectors are jointed to two connecting rods *s s*, which extend into the hollow shaft, and which are jointed at their other end to a cross head or a sliding rod *u*, which is appropriately guided in the hollow shaft as it receives a reciprocating motion by a connecting rod from the arm of a rock-shaft, that in turn receives motion from the piston-rod of an appropriate steam-engine, the details of which need not be described, as the required reciprocating motion can be derived from any other appropriate mechanical agent.

The arm of the rock-shaft, which receives motion from the piston-rod of the engine, is in turn connected by a rod *z*, with a crank *a'*, on the shaft of a fly-wheel *b*, to ease off the shocks which would otherwise be produced by the strokes of the engine.

The feeding motion for turning the wheel *f*, which carries the cutting apparatus, can be derived in any appropriate manner from the shaft of the fly-wheel, or from the rock-shaft; and as the means for giving such motions are numerous and well known to machinists, it is deemed unnecessary to give a particular description of any one of them.

From the foregoing it will be seen that as the entire machine is advanced, the rollet-cutters are brought in contact with the face of the rock, or other hard substance to be cut, whilst the vibratory or reciprocating motion given to the sectors in opposite directions, causes the cutting edges of the rollets to describe each a track from the centre of the wheel *f* to the periphery and back again, each one describing an arch of a circle in the plane of the radii; and as the wheel *f* is rotated with a slow motion, a series of cuts will be made by the periphery of the cutters which will be nearly in the direction of the radii, gradually shifting around the entire circle, and so on in succession, the entire machine being moved forward by any desired means to keep the cutters against the face of the stone.

And although I have described the machine with two sectors and two rollets on each sector, it will be obvious that it can be made with only one, or with more than two, and each sector with one or more rollets.

I do not wish to confine myself to the use of vibrating sectors for operating the rollets, as it will be obvious that the rollets can be connected with the periphery of a wheel or wheels having a continuous rotary motion, imparted by cog-wheels or their equivalents, by means of a shaft passing the hollow shaft *f*, or by any other suitable means. And as to the mode of rotating the cutting apparatus about the centre of the tunnel or other aperture to make the series of cuts, it will be obvious that this can be done by a continuous or intermittent motion in one and the same direction, or reciprocating.

And finally: as to the progressive motion of the entire cutting apparatus in the direction of the axis of the tunnel or excavation to keep the cutters against the face to be cut, it can be continuous or intermittent, and may be communicated in various ways, such for instance as screws *d′ d′*, topped in standards *e′ e′*, secured to the bottom of the tunnel, and acting against the end of the frame, or by means of levers acting against the frame and abutting against some solid part of the tunnel.

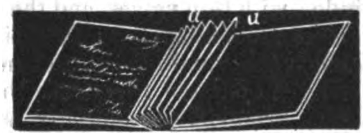
"I claim the method of applying a rollet-cutter or cutters, for boring or excavating tunnels and other apertures in rocks, or other hard substances, by causing the said rollet-cutter or cutters, or set of rollet-cutters, to cut segments of circles from the centre, or near the centre, to the periphery of the tunnel, or other excavation, with the concavity towards the machine, in combination with a motion or motions around the centre of said tunnel, to cause the said cutter or cutters to act in succession on the entire surface to be cut away, substantially as described."

No. 9775. J. Hornig and L. Luess, Union Hill, N. J.—*Improvement in Artificial Stone.* Patented June 7th, 1853.

The composition consists in silex seventy parts, clay eighteen parts, and twelve parts of common salt, or substances containing sodium or potassium in sufficient quantity to cement the silex and clay, by means of heat, together; when two parts of chalk are added, the composition receives a fine white color; ten parts of dross of copper gives it a greenish color; fifteen parts of dross of iron gives it a grey or black color. To give it a very remarkable degree of hardness, and a granite-like appearance, mix sixty parts of sand, fifteen of clay, ten of salt, and fifteen of quartz slate. The employment of powdered quartz, instead of sand, gives it a greater hardness, especially when five parts of powdered glass are mixed with the rest of the composition.

"We claim the mode or process of forming artificial stone, that is to say, the employment of silex, alumina, and salt, mixed and treated in the manner set forth, and in the proportions designated, in the manufacture of artificial stone, meaning by salt, the chloride of sodium, or its equivalent, as set forth."

No. 9776. Hamilton L. Smith, Cleveland, Ohio. *Improvement in Paper Files.* Patented June 7th, 1853.



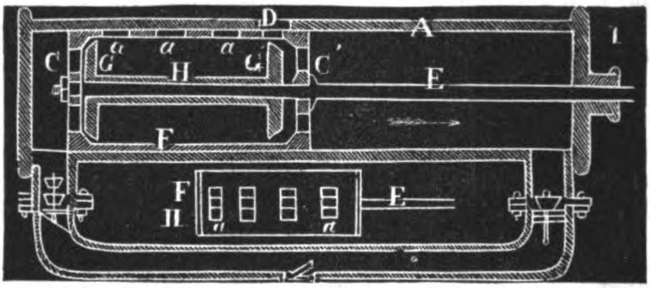
This invention consists in a series of narrow leaves, *a a* (see the figure), which are bound together in the form of a book. The outer margins of the narrow leaves are coated on one side with a glutinous substance, in such a manner, that simply moistening it will secure the margin of a letter or other paper applied to it. The narrow leaves can also be numbered, and an index added.

"I claim the paper file herein described, with prepared adhesive leaves, or margins, as a new article of manufacture."

No. 9777. Levi P. and Wm. F. Dodge, Newburgh, N. Y.—*Improvement in Pumps.* Patented June 7th, 1853.

This improvement consists in connecting the valves G G′ (see figure), of the piston heads C C′ (which are themselves kept at a certain distance apart) by a tube H encircling the rod E, whereby their simultaneous operation is insured, one closing at the precise moment the other opens, while the piston heads are connected by a thin cylinder F, open on one side to communicate with the discharge pipe D, said piston heads having valve openings through them for the admission of the water into the space between them. Fig. I. represents a section of the pump. Fig. II. is a smaller view of the piston detached from the pump; *a a a* are the openings for discharging the water through the opening D; C C are the piston heads, F hollow cylinder, which fits easily within the pump barrel A, and is secured to the piston-rod E, so as to be incapable of sliding thereon.

On the upper side of the piston cylinder F, opposite the discharge aperture D, there is a passage or series of passages *a a a*, to allow the water to



pass out freely from interior of the piston. G G′ are conical puppet valves, connected by the tube H, which slide easily over the rod E.

In the figure the pistons are supposed to be just commencing the stroke in the direction of the arrow; the valve G of the piston C being closed, and the water entering the barrel behind it, the valve G of the piston C′ being open, the water in part of G is being forced out through D, and that in front of the piston C rushing through to supply its place.

"We claim the combination of the cylindrical piston, constructed as herein described, with its valves, and the induction and eduction passages, so that the water all entering said cylinder under pressure, alternately at its ends, and being discharged under pressure, through the opening or openings at its side, tends to expand the same, substantially in the manner and for the purpose set forth.

"We also claim the combination of the piston heads, without the cylinder, with thin valves, and the induction and eduction passages, when these valves are united (to insure simultaneous action), as described, the water entering through the piston heads into the space between the same, and being discharged therefrom through a lateral eduction orifice, the whole being arranged substantially as described; thus dispensing with chambers and partitions in the barrel and valves, at the eduction port, preventing leakage, and rendering the pump or engine more simple and effective, and less liable to derangement."

RE-ISSUES.

From March 1st to May 24th inclusive, 1853.

No. 230. Ed. Hamilton, Bridgeport, Conn.—*Excluding Dust from Railroad Cars.* February 15th, 1853.

"What I claim as my invention, and desire to secure by letters-patent, is inducing outward currents of air through the windows of railroad cars, to prevent the entrance of dust, &c., by the action of the surrounding air on deflectors, combined with the sides of the car, substantially as specified, and operating on the principle set forth."

No. 231. N. Hodge, North Adams, Mass.—*Brakes for Cars.* Dated Oct. 2, 1849; re-issued March 1, 1853.

"I claim my improvement in actuating the brakes of a car, having two trucks, that is to say, I claim a combination of two levers *f f'*, a rod *h*, two levers *c c'*, and rods *d d'*, as applied to the brakes and two windlasses of the car, and operated by either of the windlasses, so as to bring down at the same time the brakes of both trucks upon the wheels thereof, with the same, or practically the same, degree of force; and whether when the car is running on the railway, the axles of one truck, or of the wheels of one truck, are thrown or moved out of parallelism with those of the other truck, or the rubbers or brakes become unequally or of an unequal thickness, as above stated."

No. 232. Adam Hays, Pittsburgh, Pa.—*Splints for Fractures.* Patented Aug. 13, 1850; re-issued March 8, 1853.

"What I claim as my invention, and desire to secure by letters-patent, is the *cutting out a portion of the splint* to afford an opportunity for dressing as often as may be necessary, the *upper and lower portions of the splint* being kept firmly united, by means of the brace B, so as by extension and counter-extension, to keep throughout the treatment the proper relative position of the parts concerned, the *slide* being replaced after each dressing, or any other device, substantially the same."

No. 233. Wanton Rouse, Taunton, Mass.—*Self-acting Mules for Spinning.* Patented Nov. 2, 1852; re-issued March 15, 1853.

"What I claim is, 1st, Governing the revolution of the spindles in winding the yarn on the cop, and also in backing off during the progressive stages of the building, by means of a cam B, or any equivalent device of irregular form, circumferentially with the said irregularity, varying from end to end, the said cam or equivalent being caused to operate upon the mechanism which drives the spindles in any way that will produce the results herein set forth.

"2d. The mechanism for causing the finger *d*, through which the irregular surface of the cam B, or its equivalent, acts upon the mechanism which drives the spindles, in backing off and building on, to traverse the said cam, and to be kept close to its surface, consisting of the screws *e* and *k*, the nut *j*, cord or chain *f*, lever G, and stud *h*, operating in combination, in the manner substantially as set forth."

No. 234. THOMAS J. SLOAN, of New York City.—*For Screw Blanks.* Patented Feb. 25, 1851; re-issued March 29, 1853.

"What I claim as my invention, and desire to secure by letters-patent, are the lifters, which select and lift the blanks, etc. from the hopper, substantially as specified, in combination with ways or conductors, or the equivalents thereof, as specified, into or on to which the blank, etc., are transferred, as specified.

"And I also claim giving to the lifters, or to the inclined ways, or their equivalents, a lateral motion, in combination with a stop or detector, substantially as specified, for the purpose of arresting the operation of the lifters, until a further supply is required, as specified.

"And, finally, I claim the sliding carrier, with its recess for receiving and holding the screw blanks, substantially as specified, in combination with the spring fingers, substantially as specified, for taking the screw blanks from the carrier, and presenting them to the jaws as specified."

No. 235. L. F. MARKHAM, of Cambridgeport, Mass.—*For Trimming Books, &c.* Patented April 19, 1848; re-issued April 18, 1853.

"I claim the turning and adjustable book-holder, arranged as herein above described, so as to be made to assume either of the three positions herein above specified, and so that the three edges of a book may be trimmed by a single adjustment of the same in said holder, and by the movement of said holder on its pivot, consecutively to each of the aforesaid three positions, whether such holder be combined with a reciprocating knife or cutter having any other shape or motion.

"I also claim the adjustable frame F, in combination with the turning book-holder, or the turning and adjustable book-holder, for the purpose herein above specified.

"I also claim the combination of the table (on which the book-holder is supported), arranged so as to be gradually raised to convey the edges of the book to the knife, with a reciprocating knife, or any other knife or cutter having any other shape or motion."

No. 236. BENJ. CHAMBERS, of Washington, D. C.—*Fire-Arms.* Patented July 31, 1849; re-issued April 19, 1853.

"I claim a hinged breech-piece which is easily moved into and out of place, in closing and opening the gun, for the purpose of loading, swabbing, &c., substantially as described."

No. 237. BENJ. CHAMBERS (assignor to Joanna Chambers), of Washington, D. C.—*Cannon Lock.* Patented July 31, 1849; re-issued April 19, 1853.

"I claim the method of securing the lock to the gun, by means of the sectional or quarter screws *t t'*, for the purpose of speedily opening or removing the lock, to supply it with the cap, pellet, or other material, by which the gunpowder is ignited, and for firmly holding the same in place on the gun, when it is to be discharged, substantially as herein described.

"I also claim forming the gun-lock in such a manner, that the hammer-rod and the percussion-rod shall be in separate pieces, laying axially within the same barrel, whereby the coiled main-spring is made to urge the hammer rod against the head of the percussion-rod to discharge the piece, and the recoil-spring on the percussion-rod is made immediately to draw back and hold the valve, which closes the interior of the lock against access of smoke and gases, as herein set forth."

No. 238. W. F. Ketchum, Buffalo, N. Y.—*Reaping Machine.* Patented July 10, 1847; re-issued April 26, 1853.

"I claim—1. Placing the cutter-bar and cutters lower than the frame of the machine, and opposite the side of the plane of the wheel, in such a manner as to leave unobstructed space below the frame, and also between the wheel and the cutters, with their supports, to allow the machine to pass freely, and without clogging, over the cut grass or grain, as set forth.

"2. I also claim placing the cutters lower than the frame and axle, and in or nearly in the same vertical plane with the axle on which the frame hangs and vibrates, and parallel or nearly so to said axle, so that the vibrations of the frame on uneven ground shall not materially elevate or depress the cutters, as herein set forth.

"3. I also claim the endless chain of cutters, in combination with the guard teeth, operating substantially as described."

No. 239. Cyrus H. McCormick, of Chicago, Ill.—*Reaping Machine.* Patented Oct. 23, 1847; re-issued May 24, 1853.

"What I claim as improvements on the reaping machine secured to me by letters-patent, bearing date the 21st of June, 1834, and the 31st of Jan., 1845, is placing the gearing and crank forward of the driving wheel, for protection from dirt, &c., and thus carrying the driving wheel further back than heretofore, and sufficiently so to balance the rear part of the frame and the raker thereon, when this position of the parts is combined with the sickle back of the axis of motion of the driving wheel, by means of the vibrating lever, substantially as herein described.

"And I also claim the combination of the reel for gathering the grain to the cutting apparatus, and depositing it on the platform with the seat or position of the raker, arranged and located as described, or the equivalent thereof, to enable the raker to rake the grain from the platform, and deliver and lay it on the ground at the side of the machine, as described."

No. 240. Moses Pond, Boston, Mass.—*Improvement in Cooking Ranges.* Patented Feb. 25, 1851; re-issued June 7th, 1853.

"I claim the improvements by which the hot-water back is connected with plate G, and by means of which said hot-water back may be either readily removed at any time, or applied in such manner, that the directions of its water-pipes may be disposed, so as to accommodate the bath boiler into which they are usually led, on whatever side of the range the said bath boiler may be placed; the said improvement consisting, *first*, in the connecting piece H, and the attachments of it, and the hot-water back, the whole being made to operate together, substantially in the manner as above set forth.

"*Second.* In a second set of attachments (fixed on the opposite face of the water back), in combination with the first set thereof, as described.

"I also claim the peculiar arrangement of flues, which lead the smoke and volatile products of combustion directly around the oven; the said arrangement of flues causing the heat to course against a portion, or one half of the bottom of the oven; next into another flue, which takes it *backwards*, and against the other portion or half of the bottom of the oven; thence up a flue against the oven; thence through a flue extending over and against a portion or half of the top of the oven; thence into and through another flue, which carries it backwards, and over and against the top of the oven, and conveys it to the chimney, or discharge flue, not meaning to include in such arrangement the radiating chamber or space Y Z, herein before mentioned."

"And I also claim the two recesses *l m*, and two flue-plates *p q*, applied to the plate K′, in combination with the two valve openings X A′, their damper and cover plate, as applied to the top plate of the oven frame, and used under an arrangement of oven flues, substantially as described; the same allowing of the adaptation of the oven to either side of the fire-place, or the use of two such ovens and their frame in connection with the fire-place, all essentially as herein before stated.

"I also claim the improvement, by which the oven can be raised and readily removed, and by which the smoke is prevented from passing underneath the partition which separates the flues on top of the oven; the same consisting in the sliding or gravitating plate G′, affixed to the partition, and made to operate substantially in manner as specified."

DESIGNS.

Patented in the United States Patent Office, from 15th of February to 24th of May.

No. 546. Chas. Waterman, Meriden, Conn.—*Sewing-bird.* Feb. 15th, 1853.

"What I claim is the design herein represented by the feathered bird upon the wing, bearing a burden upon its back."

No. 547. Alexander Edmonds, Mt. Pulasky, Ill.—*Cradles.* Feb. 15th, 1853.

"I claim the design and configuration of the ornaments above described and set forth, forming together an ornamental design for a horological cradle."

No. 548. Thos. Ball, of Boston, Mass.—*Bust of Daniel Webster.* April 19th, 1853.

"I claim the new design of a bust of Daniel Webster, of colossal size, as represented in the drawing above referred to."

No. 549. E. M. Manigle & George Phipps, of Philadelphia, Pa.—*For Water-cooler.* April 19th, 1853.

"We claim the design and configuration of the ornamental water-cooler, herein above described, and set forth in the accompanying drawings."

No. 550. Chas. Chinnock, of New York City.—*For Clock-case Fronts.* April 19th, 1853.

"I claim the design and configuration of the plate shown in the drawings and described, forming the front of a clock-case."

No. 551. Chas. Chinnock, of New York City.—*For Clock-case Fronts.* April 19th, 1853.

"I claim the design and configuration of the metal plate, represented fully in the drawings which are herein explained, the same forming the front of a clock-case."

No. 552. Chas. Chinnock, of New York City.—*For Clock-case Fronts.* April 19th, 1853.

"I claim the design and configuration of the plate, as described and represented in the accompanying drawings, forming the front of a clock-case."

No. 553. Jacob Beesley (assignor to Wm. P. Cussen), Spring Garden, Pa.—*For Cooking Stove.* April 19th, 1853.

"I claim the combination and arrangement of the ornamental forms and figures, represented in the accompanying drawings, and forming together an ornamental design for cooking stove."

No. 554. S. H. Sailor, Philadelphia, Pa.—*Cooking Stove.* April 19th, 1853.

"I claim the configuration and arrangement of the ornaments in bas-relief, as described in this specification and annexed drawings, on the front plates A and D, feed-door B, curved surface E, doors C and F, panels G, and legs K and L, forming a new and original design of cook-stove, denominated the 'Victor Complete.'"

No. 555. Robert E. Deitz, New York.—*For Girandoles and Candelabras.* April 26th, 1853.

"I claim the combination and arrangement of the ornaments, as above described and set forth, to form an ornamental design for girandoles, candelabra, &c."

No. 556. Jeremiah Hills, Newton, Conn.—*For a Lady's Hair Comb.* April 26th, 1853.

"I claim the design and configuration of the series of loops forming the chains, as herein described and represented in the accompanying drawings."

No. 557. Smith & Brown, Philadelphia.—*For Portable Range.* April 26th, 1853.

"We claim the design and configuration of the mouldings and ornamental work, as herein described, forming an ornamental design for a portable range."

No. 558. Samuel Sailer, Philadelphia.—*For a Cooking Stove.* April 26th, 1853.

"I claim the configuration and arrangement of the ornaments in bas-relief upon the doors A B C and D, side plates F, bed plate K, back W, and feet P, as described in this specification and the annexed drawings, forming a new and original design for cook-stoves, designated as 'The Capitol.'"

No. 559. John C. Smith, Philadelphia.—*For a Portable Range.* April 26th, 1853.

"I claim the configuration and arrangement of the ornaments and mouldings upon the plate B, door A, and foot C, as set forth in this specification and accompanying drawings, forming a new and original design for the front of a portable range."

No. 560. James L. Jackson, New York City.—*Grate Frame.* May 3d, 1853.

"I claim the combination and arrangement of figures, flowers, and ornaments, herein represented, the whole forming an ornamental design for a grate frame."

No. 561. J. L. JACKSON, New York City.—*Grate Frame.* May 3d, 1853.

"I claim the combination and arrangement of the figures, flowers, and ornaments, herein represented, the whole forming an ornamental design for a grate frame."

No. 562. JAMES L. JACKSON, New York City.—*Grate Frame.* May 3d, 1853.

"I claim the combination and arrangement of the figures, flowers, and ornaments, herein represented, the whole forming an ornamental design for a grate frame."

No. 563. JAMES L. JACKSON, of New York City.—*Grate Frame and Summer-piece.* May 3d, 1853.

"I claim the configuration and arrangements of the figures, flowers, and ornaments, herein represented, the whole forming an ornamental design for a grate frame and summer-piece."

No. 564. S. A. SAILOR (assignor to J. G. Abbott and A. Lawrence), of Philadelphia, Pa.—*A Cooking Stove.* May 10th, 1853.

"I claim the configuration and arrangement of the ornaments in bas-relief, and mouldings on the front plate P, side plates H, back plate X, base plate V, and doors A and D, door and panel F, feed-rollers K, draft-doors M, and feet P′, as fully set forth and described in this specification and annexed drawings, forming a new and ornamental design for the cook-stove, designated as the 'New World.'"

No. 565. JULIUS HOLTZER, of Spring Garden, Pa. (assignor to J. G. Abbott and A. Lawrence, of Philadelphia, Pa.)—*For a Cooking Stove.* May 10th, 1853.

"I claim the configuration and arrangement of the ornaments in bas-relief, and mouldings on the doors A E and F, plates C and S, and feet U and V, as fully set forth and described in this specification and annexed drawings, forming the ornamental design of the cook-stove, designated as the 'Enchantress.'"

No. 566. E. T. ROBINSON, of Boston, Mass.—*For a Cooking Stove.* May 10th, 1853.

"What is claimed is the ornamental configuration or design, as exhibited in the accompanying drawings."

No. 567. S. D. VOSE, Albany, New York.—*Parlor Stove.* May 24th, 1853.

"I claim the combination of mouldings and ornaments, as arranged in the parlor stove D, the whole forming an ornamental design."

MISCELLANEOUS.

THE ADVANTAGES OF STEAM IN BAKE-OVENS WHILST BAKING BREAD.

[From the weekly paper of the Society of Trades, at Cologne, 1852, p. 190.]

It is a well-known fact that steam which is generated during baking and retained in the oven, produces in the finer sorts of bread (tea-bread), that beautiful and glossy appearance. It is therefore desirable to generate and to retain steam as much as possible in the oven during baking. To produce the necessary amount of steam, some bakers put green wood in the oven, or place a vessel containing water therein; but both methods are not reliable, because, in the first place, the steam is sometimes produced too late, and the wood when charred smokes, and gives the bread a disagreeable taste. To remedy this, it has been proposed to place a metal-tube in the oven, and when the oven is charged, to introduce into the tube water from outside the oven, say about ½ to 1 gallon, according to the size of the oven; the water passes through the tube into the oven, where it finds its way through some of the crevices or joints into the heated sand upon which the floor is laid, and it is generated at once into steam, in sufficient quantities and at the proper time. This simple arrangement does not require any changes in the common bake-ovens.

A NEW MIXTURE USED IN WASHING CLOTHS.

In Berlin, Prussia, the washerwomen use a mixture of 2 ounces of turpentine and ¼ ounce of spirits of sal ammoniac well mixed together. The mixture is put into a bucket of warm water, in which ¼ a pound of soap has been dissolved. Into this mixture the dirty clothes are immersed during the night, and the next day washed.

The most dirty cloth is perfectly freed of all dirt, and after two rinsings in fresh water, the cloth has not the least smell of turpentine. The cloth does not require so much rubbing, and fine linen is much longer preserved by it.

NEW KIND OF COVER FOR SUGAR.

Instead of covering sugar with clay, Messrs. Dupret and Dangereau, of Bourdeaux, use clay slabs, which have been, previously to burning, mixed with saw-dust. These allow the water to pass freely through, and are much cleaner to be handled, and yield a larger quantity of sugar than the usual mode of covering with clay.

A NEW KIND OF CHIMNEY-BRUSH.

S. Mueller exhibited at the last industrial exhibition at Augsburg (Bavaria), a chimney-brush, which is not only simple in its construction, but also durable, cheap, and very effective, and does not get in the least injured or affected by wet soot. This brush consists of a wooden body, which is either square or oval, small or large, according to the shape and size of the chimney. The body does not consist of one piece, but is composed of a number of small boards of one inch in thickness: each board is covered with tin, and provided with two wooden pins, except the lowest one. The pins fit in holes in the board, placed over it in such a manner that when the boards are placed upon each other they cannot be turned; in order to make the whole still more solid, an iron bolt is passed through, and screwed tight by means of a screw. The bolt has at each end a ring, by which the brush is drawn up and down the chimney. Instead of bristles, Mueller uses short pieces of clock-spring, of 2 to 3 inches in length, and ½ to 1 inch in width; these springs are nailed upon the boards in a spiral direction, so that every part of the chimney is operated upon by the springs. The springs being much stiffer than bristles, and sharp at their ends, it is easily perceived that when such a brush is drawn up and down in a chimney, that even the most tenacious particles of soot are removed. Experience has shown that three rows of springs are sufficient.

REGENERATION OF BURNT STEEL.

Railroad-Engineer Malberg, of Prussia, proposed to regenerate burnt steel by heating it to a red heat, and putting it, when in that state, into boiling water. Repeated experiments instituted at the Royal Polytechnic School, and at the Royal Mint, at Berlin, have proved perfectly successful.

The Society for the Promotion of Industry of Prussia, is about to publish the memorial of Mr. Malberg, and has voted him a silver medal.

[Transactions of the Promotion of Industry in Prussia, 1852.]

TO REMOVE TIN FROM COPPER VESSELS.

There are many instances in which it is desirable to remove tin from copper vessels, which is accomplished in the most perfect manner by immersing the vessels in a solution of blue vitriol. The tin disappears entirely, and the copper gets as bright as when new.

Old tinned copper brings a low price on account of the tin, which mixes with the copper when melted; by this simple mode such copper can be made more valuable.

[Polytech. Notizblatt. 1853, No. 3.]

TO REGENERATE OLD PLASTER ORNAMENTS.

The best kind of plaster of Paris comes from Montmartre, near Paris, and contains 41·00 sulphuric acid, 29·39 lime, 7·63 carbonate of lime, 3·81 insoluble substance, and 18·77 water. Clugny found in old plaster, which had been used for ornaments in buildings, 9·00 sulphate of lime, ·88 carbonate of lime, and 12 insoluble parts. When such old plaster is properly burnt, it can be again employed for any kind of plaster-work. The burning must be well conducted, and allowed to continue only one-fourth of the time which is required for burning raw plaster of Paris. Old plaster, when reburnt, hardens quicker than fresh or raw plaster of Paris.

TO PURIFY GRAPHITE FOR LEAD PENCILS.

[From Runges Grundriss der Chemie, 1 vol. p. 69.]

"To purify graphite," says the author of the above-named work, "I made numerous experiments, and with great success. The best mode is to mix pulverized graphite with very strong sulphuric acid. The mixture gradually acquires a high temperature. After 36 hours it is washed, and the graphite thus obtained is of superior quality, and makes excellent and cheap pencils.

"The pound of English graphite costs in Berlin $1·85, and a pound of Spanish graphite only costs 8 cents: when the latter is treated with 4 pounds of sulphuric acid (at 3 cents a pound), it gives ¾ of a pound of graphite, which is as pure as the English. Those who employ this mode of purifying the Spanish graphite on a large scale, will do well to manufacture green vitriol at the same time, whereby the cost of sulphuric acid will be nearly covered.

WATER-PROOF MASS FOR FRICTION MATCHES.

According to Krutzer, of Vienna (Austria), the following mixture makes a good water-proof mass for friction matches: Six grains of colophonium are boiled in four grains of spirits of turpentine, and allowed to cool. In a retort are separately heated to about 122 degrees Fahrenheit eight ounces of water, twelve grains of red-lead, zinc-white, or some other like color, one grain of phosphorus; the whole is well stirred, and when removed from the fire, the stirring is continued until it is cool; the water is then separated, and the residuum is mixed with the resinous mass. This mixture is sufficient for 500 matches.

GAS FROM WOOD FOR LIGHTING CITIES.

The old free Reichstadt Heilbronn is the first German city which has been illuminated with gas generated from wood.

Dr. H. Fehling, professor at the Polytechnic School at Stuttgart, Wurtemberg, says, in an article published in the Allgemeine Zeitung, that, according to the experiments made at Heilbronn, wood gas was found to be equally as good as coal gas; and that there is no doubt, judging from the successful experiment made on such a large scale as that at Heilbronn, that this kind of gas will be introduced in many German cities where wood is cheaper than bituminous coal.

The employment of wood for making gas has the advantage, that the residuum or products obtained during the dry distillation are more useful and valuable than those from bituminous coal.

The gas obtained from wood is entirely free from sulphur; wood gas is, however, not odorless, but the odor is more pleasant than that from coal.

In cities or manufacturing places, where there is a great quantity of charcoal consumed, wood gas could be produced much cheaper than bituminous coal gas, and the enormous amount of gas which is now lost in the forest in burning charcoal would be saved, and the charcoal obtained in close retorts would be of a better quality.

The writer of the article referred to, says further: In the North of Germany, where there is no mineral coal and little wood, but great quantities of turf, the latter could be employed for gas, and probably will give as good a gas as wood.

CHANGES IN THE PATENT OFFICE.

Judge Mason has evinced his appreciation of the professional character of the Patent Office, in retaining under his service the greater part of the permanent officers and the *employees*. The promotion of Mr. Peale to the examinership does credit to his discernment and sense of justice.

ADDITIONAL FACTS ON THE HISTORY OF THE STEAMBOAT.

Professor Kuhlmann has discovered in the library of the capital of Hanover a document, which goes to show that Papin constructed a boat, and propelled it by means of wheels, which were set in motion by his steam-engine. The Journal l'Invention of Paris, May, 1852, says, in allusion thereto, that "the scientific as well as the technological priority of the discovery of steam belongs to two Frenchmen, Solomon de Cans and Papin, and that it is indisputable. Now, if the application of Papin's steam-engine for propelling boats is a fact, then from 1615 (Solomon de Cans) to 1688 (Papin), the discovery of steam as a propelling power belongs entirely to France. The inventions of Newcomen and Cauley, the forerunners of the illustrious Watt, date from the year 1705. The first patent of Watt dates from 1769. It is in that patent that the double action of the steam-engine is first described."

Every discovery in physics which has resulted in great advantages to the human family, has been gradually developed; first some phenomenon is noticed, upon which new facts are grafted; these attract the attention of thinking men, who further pursue the subject, till at last the work is consummated by some fortunate perfecter of what has before been nearly accomplished; such is particularly the history of the steam-engine—the greatest force ever yet subdued to the control of man. This wonderful new discovery of the claims of Papin to originating the idea of propelling vessels by steam, can hardly be properly weighed till we have the document itself before us. But it is sufficient for us to know that no practical results grew out of his speculations. It is a rule adopted in law, that the first to practically demonstrate an invention, is the rightful owner, and not the theorist who devises but never puts it in practice. We shall hereafter give a series of articles on propelling vessels, in which we hope to show the exact progress of devices for this purpose, and by which the just amount of merit of all the projectors may be measured. There is no positive proof of the birthplace of De Cans, and if there was, he fills a very small space in the history of the steam-engine, while to the present time all the ingenuity of Papin's countrymen has been unable to show any practical results from his labors in steam, save the safety-valve and the digester. J. J. G., *Ed.*

THE PATENT OFFICE.

The appointment of Judge Mason to the Commissionership has already been attended with very beneficial results; and we most ardently hope he may be able to bring up the arrears of business. It requires now more than six months to reach an application in its regular turn for examination, and the results of such a delay are, in some cases, disastrous in the extreme. As we have said in a former communication, we do not believe the work of the Patent Office can ever be kept up, unless a new law be introduced making it optional with the inventor to take his patent or not, or a new mode adopted of administering the present law. Under the auspices of the present Commissioner, the work has already begun; and from the promptness with which he has overruled and reversed the actions of the Examiners in important cases, inventors will take encouragement that their rights are not to be sacrificed upon technicalities or abstractions, and that justice shall not be cheated by long delay.

We do not wish to meddle with the internal affairs of the Patent Office, but we cannot pass over in silence one feature which ill comports with our republican institutions, and cannot fail to surprise citizens and foreigners visiting the Patent Office. If there is a necessity for it, to say the least, it looks badly. "No Admittance!" emblazoned on a translucency in every door from the Examiner's down to the Messenger's room. "No Admittance!" without even the respectful qualification, "except on business." There are, doubtless, other ways of preventing interruption to the officers in the discharge of their duties, but this seems to have been preferred, unfortunately we think. It would hardly offend more if it were to be displayed on the doors of the executive mansion.

O. G. P., *Ed.*

BOOK NOTICE.

Stuart's Naval and Mail Steamers of the United States.

We note with satisfaction the publication of such works as the magnificent quarto now before us with the above title. This shows that we can accomplish undertakings as great in the literature of mechanics, as we have succeeded in doing in the practice. This work is a substantial and creditable record of another of the glorious triumphs of American genius, enterprise, and perseverance, for which every engineer and artisan should feel grateful to Gen. Stuart: if his pecuniary success is as great as his merit, he will have nothing to desire.

We cannot, however, while commending so valuable an acquisition to the library of the engineer, withhold the expression of our regret, that the preface of the work should have been defaced with the elevation of the name of an experimenter in caloric engines, to a level with a Watt, Evans, Fitch, and Fulton. We conceive it to be in bad taste ever to laud too highly the living; but to praise a man for the victories he has yet to achieve is unpardonable, especially in a work devoted to the recording of scientific facts. If Captain Ericsson succeeds in his attempt to supersede, or even rival steam, it will be quite time enough to write his eulogy; and a whole volume like the present, written by as able a pen as that of General Stuart, will not be too much to record his victory; but as yet no facts have transpired to win for him a place beside his great predecessors.

We are sorry also to see General Stuart disfigure his work by introducing at its close a controversy, better suited to an ephemeral newspaper, than a grave work on so elevated a subject; it was not the place for such matter.

Passing these defects, we find a fund of useful information of a truly practical kind, important to all who are interested in ocean navigation, by steam; and we are not very much disposed to criticise any defects that may have crept into this edition, all of which may be corrected in future, and such vacancies supplied as will render the work a complete summary of the progress of ocean navigation in this country.

The following rule has been promulgated by the Commissioner of Patents; we give it for the information of the public:

It is hereby ordered, that hereafter no caveat be placed in the secret archives of this office, unless accompanied by an oath of citizenship and originality of invention.

CHAS. MASON, *Commissioner.*

PATENT OFFICE, *July* 6th, 1853.

THE AMERICAN

POLYTECHNIC JOURNAL.

THE MANUFACTURE OF WROUGHT-IRON DIRECTLY FROM THE ORE.

SINCE the recent advance in the price of iron, great attention has been paid to the means of producing it, and a new stimulus has been given to invention, guided for the most part, as is often the case, by persons unacquainted with the rationale of the manufacture, involving as it does a knowledge of chemistry and very skilful manipulation. No business, perhaps, holds out so many fascinations to the tyro as this; and even the experienced iron-master is rarely daunted by failure, but manfully bears up and struggles through the well-known crises under which the trade has labored in this country against foreign competition and a glutted market, till the time has at last arrived when the demand so much exceeds the supply, that there is likely to be a large amount of capital turned towards this branch of industry.

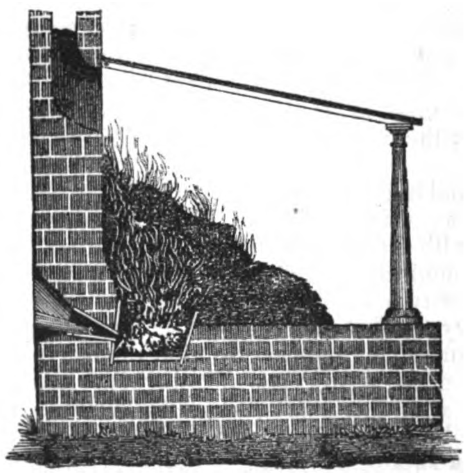
Wrought-iron manufactured directly from the ore, is a term used in contradistinction to wrought-iron from pig or cast iron, which is made in a blast furnace, and then submitted to another process in what is termed a puddling furnace, by which most of the wrought-iron, now brought to market, is produced, either with or without passing through an intermediate refining process.

This mode of making iron requires so much skill, labor, and fuel, and demands so large an outlay of capital, as to prevent our competing heretofore successfully with Great Britain in the manufacture; hence the necessity of a more economical mode of procedure; and further, our rich magnetic ores cannot be readily worked in this way without a mixture with poor ores and much difficulty; and these ores form an important part of our supply.

Iron has been manufactured directly from the ore from the earliest ages; and in some parts of Asia the most primitive mode is still practised; the ore being smelted with charcoal, as a fuel, in a temporary, rude, open fire, with a blast made by hand-bellows. The iron from which is made the celebrated Damascus sabres, that can be doubled without injury, and with edge so true and keen that a coat of mail will not turn it; and the exquisite Damascene gun-barrels, famed for their strength and lightness, are the results of this manufacture, produced by a slow and labored process. The following figure of a Persian or Asiatic forge, well illustrates the rude operation. A hollow is formed in the ground, its bottom being coated with clay; after which it is lined with fine charcoal-dust, moistened and rammed hard all around; the ore, broken to small size, is put into this upon a bed of charcoal, and a layer of charcoal is laid over it; then another layer of ore, followed by one of charcoal, and so on alternately to a considerable

height; the whole heap being covered with a layer of fine charcoal. A twyer is then introduced near the bottom, at a proper angle; it is formed of clay or pottery-ware, and receives the blast from a rude bellows, worked by hand. The fire is introduced at the twyer, and the process commences and continues from three to four hours; at the end of which time some twenty-five to fifty pounds of iron can be taken out, of very pure quality, and forged on large flat stones or anvils; peculiary rich ores are required for this purpose, but the iron is unequalled.

The earlier method of making iron, above described, has been improved upon in modern times by the forge and bloomery fires; one of which is well represented in the following sectional elevation. It will be seen that



its general features closely resemble the ancient device, and its results are much the same; the advantage being simply in manipulation and convenience. But still this mode of making iron is more expensive than that more round-about-way of first making pig-iron in a blast furnace, and then converting it into blooms, in a reverberatory or puddling furnace.

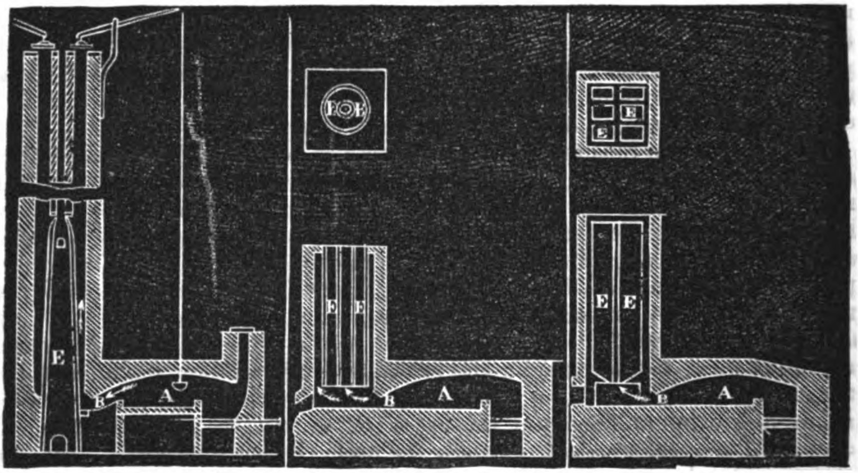
In this way the iron manufacture has descended to the present time; and in seeking to improve the mode of making iron, it is well to understand what is necessary to produce the result, and then aim at the simplest and most direct way to attain the object. Without going into a critical and minute analysis of the various processes, or the rationale of their requirements, we will attempt to give, in a few words, our views upon the subject, in which, we are aware, we differ somewhat from many received authorities and practical experimenters.

The first process in the manufacture, is to drive out of the ore all the foreign substances which can be volatilized, and thus expelled. To effect this successfully, requires a free exposure to the atmosphere, and possibly a commingling of oxygen with the iron. Whether this latter be necessary or not to the future conversion of ore into iron, or whether the presence of the oxygen facilitates the separation of the foreign matters from the ore, we will not stop to discuss; it is sufficient to know that the ore, when roasted, is highly charged with oxygen; and this process seems essential to the most perfect results. It is practised with almost all ores, and is too well known to require a description in this place, of the various modes by which it is effected in Europe and America.

After the ore is roasted, the next process is to deprive it of its oxygen; and for this purpose many complicated and expensive inventions have been made, according to the theories of various original inventors, or their followers. It is needless to say that this process is probably the simplest and easiest to accomplish of any in the manufacture. The ore should be pulverized and mixed with a due proportion of carbon, regulated by the nature of the ore and the quality of the carbon, to be determined by the skill of the operator, or by experiment. It must then be submitted to a moderate heat, not to exceed a cherry red, for several hours, which causes the oxygen to separate from the iron and unite with the carbon, for which it has a greater affinity, and thus pass off as a carbonic oxide gas; this should have a free escape to expedite the process; but most of the inventors of late years have erroneously supposed, that inasmuch as the oxygen was to be expelled, and atmospheric air contained oxygen, it must be carefully excluded, and all the products of combustion, from the heating fire likewise.

In consequence of this view, several devices have been made, and some of them patented, for keeping the ore close while deoxydizing. One of the earliest devices patented in this country, of this character, was that of Quilliard, patented in 1841. This patent was for the combination of a close chamber with a reverberatory furnace, so as to be heated thereby. Subsequently, Dickerson, of New Jersey, experimented with a very superior ore, in a close furnace; and he took out a patent for an annular chamber, to be heated outside and in from the furnace fire. This might be considered an improvement upon that of Quilliard; but his claim to every thing substantially the same, would seem to cover the same ground. Be that as it may, we are not aware that either of them made iron to any profit; and we believe that both of them abandoned the manufacture. Soon after Dickerson's experiments, a neighbor of his, one Renton, made a slight modification thereof, by substituting flat tubes for Dickerson's annular chamber. The advantage of this change it would be rather difficult to see; nevertheless, he obtained a patent; and more recently both patents have been united by purchase. They are based upon the idea that it is necessary to keep the ore in close chambers while deoxydizing, so as to exclude every thing from it, especially the products of combustion from the furnace, and the atmospheric air containing oxygen. This is only in part correct. There is no doubt that a strong blast of atmospheric air, blown directly into and through the ore, would retard, and perhaps destroy the deoxydizing process; but no specific device is required to exclude either air, or the products of combustion, in order to effectually complete the deoxydizing of the ore, which we have known to be perfectly done by simply throwing the pulverized ore and carbon commingled into a common reverberating furnace over night, after the work of the day was done; and the next morning it was found perfectly deoxydized, ready to commence work with, and made good and perfect iron, equal to the best puddled iron. A want of knowledge of this fact has led to much useless expenditure of time and money, in expensive devices for deoxydizing ores.

We give below the inventions above named, together with the claims of the inventors.



Quilliard's Furnace. Dickerson's Furnace. Renton's Furnace

Patent for an improvement in the Furnace for the manufacture of Malleable Iron directly from the Ore. Claude S. Quilliard, December 23, 1841.

"I claim the combining of one or more reverberatory furnaces with a chimney or stack, containing in its lower part a deoxydizing furnace, which I have denominated a crucible, in such manner that the said crucible, and the contained ore and carbonaceous matter, shall be heated by the flame and escape heat from the reverberatory furnace, or furnaces, by an arrangement and combination of respective parts, substantially the same with that herein made known."

Patent granted to Alexander Dickerson, 13*th of March, and reissued* 21*st of August,* 1847, *for Apparatus for manufacturing Malleable Iron.*

"What I claim is, *first*, the manufacturing malleable or wrought-iron direct from the ore, by means of a furnace, combining a chamber, containing the charge of ore and fuel, with a closed forge-fire below the same, and communicating therewith, containing a continuation of the charge and the loup of wrought-iron formed therein; said forge-fire being provided with a large door, for the introduction of a portion of the charge, excluding the air therefrom during the process, removing the loup when formed, and clearing out the fire preparatory to another charge.

"*Secondly*, the use of movable bars or slides, in combination with the said closed forge-fire and chamber, inserted and passing through the charge, to serve as a temporary grating to sustain the upper portion of the charge, or a new charge, whilst the lower portion is burning down, and the loup is taken out."

Patent granted to James Renton, for improvement in Apparatus for making Wrought-Iron direct from the Ore. Dated 23d of December, 1851.

"I do not wish to limit myself to the use of a puddling furnace for the final operation, nor to the use of mineral coal, as the same result in kind may be produced by a bloomery. What I claim as my invention, is the arrangement of a series of flat vertical tubes (or the equivalent thereof), in a vertical stack, substantially as described, when these are combined with a puddling or other furnace, substantially as described, by means of an interposed ore box, substantially as and for the purpose specified.

"I also claim combining with each of the deoxydizing tubes, as described, and at the middle and near the lower end thereof, a double inclined plane, substantially as described, to insure the equal descent of the charge of ore, as described.

"And I also claim, in combination with the series of deoxydizing tubes and the ore box, substantially as described, the employment of a series of stationary, and a series of adjustable inclined planes, substantially as described, to regulate and insure the equal discharge of the ore from each, and from the whole series of tubes, as described."

The next important step in the process of converting ore into iron, is to burn or drive out the carbon, and such other impurities as still adhere to it. This has always proved difficult, and requires the greatest skill in the management on the part of the workman. The best efforts of the metallurgist have failed to effect a rapid disunion of the carbon and iron; and the result, however perfect, has been slow and expensive.

Within the past year a new device has been introduced, which promises to hasten the decarbonizing process, and rapidly separate the iron from the slag, or bring it to nature, as it is technically called. If this invention fulfills its early promise, it will create a revolution in the manufacture of wrought-iron, and reduce its cost very materially. This new device is the invention of an experienced workman, by the name of Whipple, and consists in introducing a blast, either hot or cold, above the products of combustion, of a reverberatory furnace fire, directly over, or nearly so, the point upon the hearth where the iron is gathered. This blast forces downward the whole body of heat and combustibles directly upon the ore, producing a most intense heat, easily regulated, and supplies a sufficient quantity of oxygen to unite with and bear off the carbon of the ore, while the other foreign substances are melted, leaving the iron to be gathered and welded into a ball rapidly and in a pure state. This is the first introduction, we believe, of a blast into a furnace for making iron directly from the ore; and its effects in this manufacture are quite wonderful, bringing up this mode of manufacturing iron from being the most expensive and making it the cheapest. We need not enlarge upon this device, as we published the patent in our number for June.

Many attempts to use a blast at the sides of the puddling furnace have been made in making wrought-iron from the pig, but they were failures. An attempt was also made in such furnaces to introduce the blast in puddling pig-iron behind the fire, blowing over the fire-bridge, but with no better success. And until the blast was introduced into the new manufacture, and in a peculiar way, it never tended to improve the iron business.

We have thus hastily sketched the progress of manufacturing malleable iron directly from the ore. Many more interesting details might be given, but our space will not permit us to enlarge.

J. J. G., *Ed.*

AGRICULTURAL EDUCATION.

It is universally admitted that to become well versed in any other trade, profession, or business, men must study hard, devote to it their time and money, and practically acquaint themselves with its details and operations. But the farmer, it would seem to be thought, may at once, and without any preparation, and with scarcely any skill in handling his implements of husbandry, or knowledge of raising crops and stock, feel qualified for his business, and be authorized to speak as an adept about all matters belonging to agriculture. This is one of the grand errors of the day. Thorough training is as needful to the farmer as to any other man, if he means to take a high stand, and have his opinions entitled to regard. We propose, therefore, to occupy some pages on this subject, and to sketch the plan of a system of agricultural education, such as might meet the deficiency now existing among us.

In countries where the land is divided into small tracts, the state of agriculture is generally good; the farmers pursue some system of culture, and, by industry and economy, make up for a higher knowledge of agriculture, such as would enable them to obtain greater products from their lands. But where the land is in the hands of few—where the farms are large, requiring much manual labor, a great number of working cattle and stock, implements and buildings—a higher degree of agricultural knowledge is indispensable, such as enables the owner to obtain from the capital thus invested the highest and most lasting net profit. We say lasting net profit; a profit produced by a proper system, keeping the lands in high states of cultivation, and by a proper rotation of crops and abundant manuring, continually increasing its productiveness.

For this purpose, an acquaintance with the practical as well as theoretical science of agriculture is requisite, not merely one of a pattern system, which may work well at a model farm, under certain circumstances and in certain localities. There is no such thing in farming as a pattern system after which all and every farm can be fashioned and shaped.

Every locality, and nearly every latitude, requires a different system; and slight as these differences may appear to the inexperienced, yet these slight deviations have great influence as to the ultimate results in farming operations; and to know how to adjust, regulate, and manage such changes, to plan them properly and carry out a thoroughly digested system, demands the study of the general as well as the special rules in farming; the application and division of labor, the economy of farming—all this involves problems difficult to be solved, and knowledge of data and facts upon which the solutions are based.

But where are the institutions where these data can be acquired? Where are the schools to teach the farmer and planter how to apply the established rules deduced from experience? Where are the schools where the farmers can learn how to manage, successfully, a farm on the Gulf of Mexico or in the State of Maine, on the Atlantic coast, or on that of the Pacific ocean—that is, with profit?

We have no such schools; and why have they not been established long ago? Are the farmers already so well versed in the knowledge of agriculture that they do not require such institutions? Are their farms so well conducted, are their lands so productive, that all further improvement is unnecessary; or are their farms so profitable, that a higher productiveness and better results are considered impossible? The immense tracts of exhausted land extending from the Mason and Dixon line southward, do not seem to show such signs of a high state of agriculture.

Many of the southern plantations remind us much of the large estates of *Hungary* and *Russia*. The nobles of those countries, like our planters, have large estates, plenty of manual labor at their command; but, nevertheless, those estates did not formerly pay one quarter per cent. on their real value, and were losing concerns altogether to the owner, just as many plantations are to the planters. Some of those vast estates of the Hungarian and Russian noblemen were only used for pastures for half-wild horses and coarse-wooled sheep; they were scarcely considered worth any thing, until the agricultural schools of Moegelin in Prussia, those of Saxony, Bavaria, Wurtemburg, and Switzerland, furnished them with intelligent and properly educated agriculturists, and, through their management, those very worthless estates became mines of wealth to their owners—the once barren tracts soon produced rich crops of grain, and supported large herds of fine cattle; and Russia and Hungary have since become large producers of fine wool.

Had we proper agricultural schools, the same beneficial effects would be produced in the south: planters would have no cause of complaint; they would not be obliged to emigrate to the unhealthy bottoms of the Mississippi to retrieve their fortunes; and in fact the southern States would afford a much more pleasant aspect than they do now, possessing, as they do, all the conditions for agricultural prosperity—a fine climate, a productive soil, plenty of labor, and an intelligent population.

Much of this deficiency is ascribed to slave labor, to the lower rates of the prices for the staple articles, and to the exhausted state of the lands.

It always sounds to us paradoxical, that plenty of manual labor, which is at the command of the planter at every minute of the day, weeks, months, year and years, and which is by no means dear, should be unprofitable and ruinous. We think that the ruinous effect of slave labor lies in the want of knowledge how to employ that labor properly, and to the best advantage.

What use are the well-drilled and brave troops in the hands of an inexperienced general? What use are the best tools in the hands of an unskilful artisan? What is labor in the hands of an inexperienced and uneducated planter? We leave to the reader to answer these questions.

Every producer is liable to the fluctuation of prices in his products; he must change his crops when it becomes necessary; and he therefore must have knowledge of the culture of the various agricultural plants, and of the treatment of the various domestic animals, in order to be able to change in time, when he sees that this or that crop, or this or that kind of stock, will not pay. As to the exhausted land, the planter can blame no one but himself; there is no soil which will bear crop after crop without ever receiving some kind of manure. The exhausted land but too truly proves that there is a great dearth of knowledge in agriculture—that there is the want of a regular system in farming.

How comes it that the "Dutchmen" of Pennsylvania, as they are generally termed, are invariably acknowledged to be good farmers? Because they have brought with them from their fatherland a system of farming, requiring them to manure one-third or one-fourth of the lands under tillage regularly every year. These men have adhered to the mode of farming practised by their fathers and ancestors; they transplanted that stereotyped system upon the fertile region of Pennsylvania—the same system which has kept the lands of their fathers thousands of years in a perfectly productive state, and on the same soil which was ploughed by the Romans in the time of the Emperor Augustus.* We do not mean to say that the Germans of Pennsylvania farm their lands according to proper rules and the principles of agricultural science, or that their system of farming is to be imitated; or that they could not do better—far from it; they have yet much to learn; but they were wise enough to adhere to an old, well-tried system, and their fields show the result of it. Every one who visits that portion of Pennsylvania where the Germans reside will be agreeably surprised with the appearance of the fields, meadows, and those large barns and manure heaps, the secret of their success. Every strip of land is well cultivated and tended with care; every meadow drained or irrigated. The whole aspect of their estates show that they love and cherish the soil. They work themselves; their daughters and wives work; all work. They have little hired labor, and yet, with that small amount of labor, they produce large crops, and are very prosperous. To these "Dutchmen" Pennsylvania owes much of her wealth, her prosperity, the high rank which she holds among her sister States, and the fortitude with which she endured the memorable financial crisis. The Germans of Pennsylvania seldom emigrate to the West, to exhaust or ruin another tract of land, and when they are *obliged* to move, in order to make their children also independent tillers of the soil, they always carry with them their industry; and their good farming has become proverbial throughout the Union.

Had the southern planter gone to work in a similar manner; had he only now and then endeavored to remunerate his lands for the excessive cropping, with a few loads of manure; had he followed a regular rotation of crops; had he kept up a system of farming and not of exhausting, the aspect of things of our neighbors would be a different one. That ruinous system was begun by the first settlers: all wanted to get rich too fast, without reference to their successors, and the future prosperity of their adopted country. The deed is done; but it is not too late to remedy the evil. The remedy consists not in the analysis of the soil, not in the study of chemistry, nor in a patent manure; neither is it the knowledge of the fine points of a horse, cow, or bull, the production of the tallest corn, largest tobacco leaf, or a great crop of wheat, cotton, or sugar. All such knowledge and all such speculations do not strike the evil at the root.

We do not undervalue the importance of a chemical analysis, nor the knowledge of chemistry; and even patent manures are useful, and so is the knowledge of the domestic animals, and the skill to raise fine corn, crops, &c.; unquestionably, all that is necessary to be understood by an agriculturist. But we want him, above all, to know how to calculate, and not merely how to guess; we want him to do so understandingly, with reference to established facts, and according to approved data; to draw up proper

* See Fleischmann's Report on Agriculture, in the Report of the U. S. Patent Office, 1847.

plans for farming operations, in accordance to any given locality, climate, and circumstances. We want no guess work, no patent rotation, no patent system. Let him go to the work with pen in hand, and let him prove by figures that he has chosen a rotation which corresponds to the existing circumstances—which supplies the wants of his stock—and that the stock will supply, in return to the field, the necessary amount of manure; and that the stock repays the fodder, &c., through milk, wool, or otherwise. Let him calculate the amount of manual and animal labor necessary for his farm; and let him determine upon such crops as will pay best for the labor. In short, let him make out a regular plan, and when he has thoroughly considered all its bearings, and there are many, let him adopt the plan and carry it out systematically; let him adhere to it, and only allow such changes of crops or stock as may be necessary. We have already stated that changes may become necessary, according to circumstances; but the whole system must stand firm, except in case that new discoveries are made, which entirely overthrow the old, well-established practice of farming. Such estimates, such calculations, require a vast amount of knowledge and experience, not only of a practical and purely agricultural nature, but they involve also scientific knowledge.

How many planters or farmers have ever commenced in this way; and how many planters or farmers manage their lands in accordance with plans and modes as above mentioned? Very few, we presume; and, were we strict in our inquiries, perhaps none. Most of the great plantations in the South are managed by overseers—good managers in their way—but inexperienced in agriculture. What becomes of the farm in the hands of such men? Complaints are made that the plantation does not pay; and farming is stigmatized to be a poor business; slave labor the worst kind of labor imaginable. Remedies are looked for in agricultural periodicals; chemists are employed to analyze the soil; a few bags of guano are sent for; a new plough, or some new patent machine is bought; but neither books, nor *guano*, nor patent machine will answer, and the great unfailing remedy is at last resorted to: master and servants move to the bottom-lands of the Father of all Waters. But what becomes of the abandoned lands? They are left for the northern and eastern emigrants to retrieve. These farmers from the North are neither agriculturists of great repute; yet they are all more systematic, keep more cattle, make a few loads of manure; they are a more industrious, shifting, saving, go-ahead people, and gradually reclaim again the forsaken soil.

In our view, the only remedy for the South is to establish good agricultural schools, and, instead of sending their boys to the great mills where doctors and lawyers are turned out in *short order;* instead of making their sons military or professional men, let them be sent to agricultural schools, where practical, theoretical agriculture is properly taught; where the youth of the South are initiated into the secrets of managing with profit the estates of their ancestors; where they may become accomplished gentlemen, useful in all walks of life; in the legislative hall of the State and country; in engineering, mining, architecture, manufacturing, and agriculture.

A few years would show the beneficial effects of such schools, and in few scores of years, the lands of the South would show another aspect and other results; rich crops would cover the improved lands; large flocks of sheep and herds of cattle would supply cheap manure; and slave labor might be rendered highly valuable.

But, should the South ever apply our proposed remedy—should it adopt the plan of educating their sons in agricultural schools—let them establish *good schools*, or *none;* schools which keep in view the importance of practical knowledge. Let them be careful not to make their pupils too learned; take care that you do not fall into the error of the early similar European establishments; where it was thought indispensable that every pupil should be a chemist, mathematician, botanist, natural philosopher, &c.; and where the practical knowledge of farming was lost sight of. Fortunately, the Germans have changed their views in regard to the education of agriculturists. They found out that a youth, in a few years, cannot acquire full knowledge of all sciences, and become also proficient in practical knowledge of farming. Let such attempts alone. It is the duty of the professors to point out to the pupils the practical bearings of sciences upon agriculture, and furnish him with rules, applicable and necessary to practice.

Should a scientific question ever arise, which the young agriculturist cannot solve, he will always find men who make science their exclusive study, and they will provide him in a short time with a correct and reliable solution. When the pupil has once entered upon the practical field of action, he has not time to follow closely all the experiments and discoveries in the sciences; he must be content with general results. And the practical man must leave it to the man of science to show the nature and bearing of the discovery.

It is sufficient that the pupils learn to appreciate the influence of the science, and understand the general principles and the application of discoveries and results.

In the year 1838, when the question arose how the Smithsonian fund should be most advantageously applied "to the benefit of mankind," we submitted most respectfully our views to Congress, and suggested that they might apply a small portion—only a portion of that munificent donation—for a national, agricultural school, which would have cost, land, buildings, apparatus, stock, &c., as much as has the present fanciful building, with its many towers, minarets, and loop-holes, reminding the beholders of the institutions of feudal times.

We know very well that at such a school all the sons of farmers of the Union could not have been educated; but we thought it would form a central agricultural institute, from which hundreds would have gone forth and built up new institutions. Some argued against the practicability of agricultural institutions, by stating that a boy from the State of Maine or Louisiana, educated in the agricultural school near Washington city, in latitude 39, could learn very little of use for his own northern or southern latitude.

Such arguments made us smile, and we asked most deferentially, if two and two did not make four in latitude 39, as well as in the frigid or torrid zone; if certain rules and laws in science were not the same all the world over; and if the physician educated in Edinburgh could not cure a disease in Calcutta as well as in the mountains of Scotland. The principles of agronomy, of chemical as well as mechanical agriculture, the general rules of raising crops or animals, of the economy of farming, answer for all latitudes of the globe. Pupils could learn in such a school, north or south, east or west; they could learn to conduct a farm in any part of the United States, as well as in the land of the Celestials.

An agricultural school, as we propose, requires means to establish it, and it cannot be expected that a private individual will sacrifice his fortune for the sake of his fellow-agriculturists; and for this reason, it must necessarily be undertaken by the government.

It requires an extensive tract of land, many buildings, apparatus, live-stock, implements, and a fund to cover the pay of the Professors, &c.; and this involves a large amount of money; but never was money laid out more advantageously to any country, than in an establishment of such a character. We give here the general outlines of such a plan as we consider necessary for a perfect institution. Should such a plan ever be executed, and our advice be thought useful, we are always ready to assist in carrying out one of the most important undertakings of the age.

GENERAL PLAN FOR AN AGRICULTURAL INSTITUTE.

Course of Instruction.

PRINCIPAL DEPARTMENT.

This should embrace instruction in the following branches:

I. *Agronomy*, the science which treats of the different primitive earths and other substances of which the soil is composed, viz., silex, alumin, lime, magnesia, iron, vegetable matter, &c.

Soils are named according to the mixture of the primitive earths, and their value results from this mixture.

II. *Agriculture*, which teaches the proper cultivation of the respective soils so as to produce the most perfect crops, is divided into two parts:

1. *Chemical Agriculture*, treating of—
   a. Manures in general.
   b. Vegetable manures.
   c. Mineral manures.
2. *Mechanical Agriculture*, treating of—
   a. Agricultural implements.
   b. Modes of ploughing.
   c. The cultivation of land.
   d. Fencing.
   e. Draining.
   f. Irrigation.
   g. Culture of meadows.
   h. Culture of pasture-lands.

III. *Vegetable Productions*, referring to the culture of—
   a. Cereal grasses.
   b. Leguminous field-plants.
   c. Plants cultivated for their roots.
   d. Herbage plants.
   e. Grasses.
   f. Plants used in the arts and manufactures; such as flax, dye-plants, plants producing oil, hops, tobacco, medicinal plants, &c.
   g. The vine.
   h. The mulberry.
   i. Fruit-trees.

IV. *Animals Used or Reared by the Agriculturist*—
   a. Horses.
   b. Mules.
   c. Cattle.
      1. Dairy.
      2. Fattening.
   d, Sheep, and particularly the knowledge of wool.
   e. Breeding and rearing swine.

f. Fowls.
g. Silkworms.
h. Bees.

V. *Economy, or the Method of Planning and Conducting a Farm*, treating of—

a. Labor in general.
b. Labor performed by men.
c. Labor with cattle.
d. The best mode of conducting farms.
e. Bookkeeping.
f. The laying-out of a farm; the nature and quantity of manure required for a certain system of a rotation of crops.
g. Change or adoption of a system of farming.
h. The different systems of rotations.

SECOND DEPARTMENT.

1. Veterinary.
2. Technological agriculture, such as making sugar, distilling, brewing, making cider, burning lime, &c.
3. Culture of forest-trees.
4. Agricultural architecture, and
5. Civil engineering, as connected with agriculture.

THIRD DEPARTMENT.

Auxiliary Sciences.

1. Chemistry.
2. Natural philosophy.
3. Mineralogy and geology.
4. Botany and physiology of plants.
5. Zoology.
6. Meteorology.
7. Mathematical sciences.
    a Arithmetic.
    b. Theoretical and practical geometry.
    c. Mechanics.
8. Drawing of machines, animals, plants, and landscapes.

To illustrate the sciences, there should be—

1. An extensive farm, with a field for experiments, workshops, technological laboratory, apparatus for making sugar from beet or cane, for brewing, distilling, &c.
2. A botanical garden.
3. A collection of the best and most approved implements, or models of them.
4. A library.
5. A geological collection, properly arranged according to their chemical characters, and with relation to different soils.
6. A philosophical apparatus.
7. A collection of skeletons of domestic animals, for the study of comparative anatomy and the veterinary art.
8. A collection of insects.
9. A collection of seeds.
10. A laboratory, with apparatus for chemical experiments.

The Farm

Serves for the practical illustration of the theory. It is of the greatest importance to give a practical illustration of all the subjects treated of in the course of the lectures, and according to the different periods and seasons.

The system of husbandry of such an institution must therefore be extensive, as well as complicated, so as to show all branches of agriculture in their full extent. The operations which cannot be shown on a large scale should be exhibited on the experimental fields. The farm should contain at least 640 acres of land, for cultivation, which should be divided into two equal portions, to show two different systems of rotations. First, a system which has for its object to gain as many different products as possible, and to procure the manure by stall-feeding; a system which is favorable where labor and capital is plenty, land valuable, and a ready market for the vegetable and animal products.

The second system, favorable when labor and capital are scarce, land plenty, and the object a grazing farm.

One hundred acres of *meadow*, to show how natural meadows can be improved by draining, irrigation, manuring, &c.

Two hundred or more acres *pasture-land*, to show the difference between artificial and natural pasture, and the manner of improving it.

A *vineyard*, of ten acres, for the culture of the indigenous and foreign vine, and the manner of making wine.

A *hop-garden*, of four acres, for the culture of the best kinds, showing the manner of taking the crop, drying, and bagging.

For *experimental fields*, forty acres, to show the culture of all plants useful in agriculture, to try new kinds, and also for experiments on manure, rotation of crops, and raising seed for distribution.

A *vegetable garden*, of ten acres, for the supply of the institution, and to show the different varieties of vegetables, useful in husbandry, and the best culture of them.

A *mulberry plantation*, of six acres, which should contain all the best varieties of the mulberry, to show the culture of them, and which might serve also to supply the cocoonery with leaves.

An *orchard* and *nursery*, of 20 acres. The greatest portion of this area should be destined for a nursery, to show the manner of raising and improving fruit-trees. The fruits of the orchard should supply the establishment, and show the process of making cider.

Five hundred acres of *wood-land*, to supply the establishment with fuel, and to show the culture of forest-trees, the manner of burning charcoal, &c.

A *botanical garden* of three acres should contain all indigenous plants which might be probably useful, and which could be introduced into agriculture; also for raising plants from seeds imported from foreign countries, the medicinal plants for husbandry, &c.

A Mill.

A large institution of this description should grind its own flour and corn-meal; consequently, it becomes necessary to erect a mill with two pair of stones, which will also serve to show the pupils the management and construction of mills.

Workshops.

To give the pupils a knowledge of the manner of constructing agricultural implements, as well as to enable them to estimate the costs of buildings, machines, &c., and to apply the acquired theoretical principles of machinery practically, there should be five workshops, viz.:

A Machine shop,
A Wagon-maker's shop,
A Blacksmith's shop,
A Cooper's shop, and
A Carpenter's shop, &c.

Each of these shops should be conducted by a skilful mechanic, who could attend to the work required by the establishment, as well as teach the pupils the use of tools.

The pupils should learn to forge, to shoe a horse, to make a wheel, a wagon, to stock a plough, and to build out-houses.

It is not intended to make them masters of these trades, but to enable them, in case of necessity, to construct any thing belonging to a farm.

Steam-Engine.

The mill, the apparatus of the technological laboratory, the straw-cutter, thrashing-machine, the machinery of the workshops, the pump, which supplies, through a reservoir, the whole establishment with water, should be put in operation by an engine of twelve-horse power.

Buildings.

The buildings for such an institution should be substantial, plain, and economical. This proposed establishment would require, viz.: The institute, or main building for the pupils, a horse-stable, ox-stable, calf-stable, cow-house, dairy, root and steaming house, piggeries and poultry-houses, sheep-shed, barn and stack yard, granary and cart-shed, shed for the grist-mill, straw-cutter, threshing-machine, workshops, engine, with reservoir and pump, bee-house, and cocoonery.

Live Stock.

Working cattle.—About 14 horses and 24 oxen would be required to perform the necessary work, in case the two systems of husbandry are to be adopted for 640 acres.

For procuring the necessary manure for the two systems already mentioned, and to show the breeding, rearing, and fattening of live stock extensively, there should be:

2 stud horses (for light and heavy breeds).
16 breeding mares, exclusive of the working horses.
160 head of cattle.
1200 sheep.
50 swine.

The live stock should consist of the most choice foreign and native breeds.

Implements.

A collection of the most important and improved implements should be at hand, viz.: ploughs, cultivators, horse-hoes, sowing-machine, harrows, rollers, horse-rakes, reaping and mowing machine, corn-sheller, root-choppers, carts and wagons, straw-cutter, threshing-machine, harnesses, &c.

Persons requisite to Manage the Institution.

A Director, who should have the entire control of the whole establishment.

A Treasurer and two clerks, to keep accounts and attend to all the transactions of the institution.

For the tuition of the pupils, there should be, exclusive of the director, five professors, and a teacher in the higher branches of agriculture.

The practical manipulations ought to be taught by—

A superintendent of the farm.

A superintendent of the stables, who also should teach riding and breaking horses.

A machinist.

A gardener.

A shepherd.

The domestic affairs of the institution should be attended to by a steward.

The prosperity of such an institution depends entirely on the director, who must have received a theoretical and practical education at an agricultural school, and must have enriched his knowledge by extensive practice, and by travelling; he should be acquainted with the principal living languages, to inform himself of the progress of agriculture in other countries.

The professors should be well versed in their sciences, and acquainted with agriculture, as the tuition of a science with regard to the practical applications demands not only an entire knowledge of the sciences, but also of the object to which it is applied.

The superintendents of the different branches should be practical men, and free from prejudice against book-farming.

Every individual connected with the establishment should possess the best moral character.

Conditions of Admission.

Every applicant for admission should present a certificate of his good moral character, and be possessed of a good ordinary English education, and capable of comprehending a popular course of lectures. Physical strength being requisite to perform the work required on the farm, they should be at least of the age of fourteen years.

The number of pupils should not exceed one hundred at the commencement of the institution, and should be divided into three classes.

The first class, not exceeding fifty in number, should obligate themselves to stay two years, and perform the work of the farm, where they should receive board and lodging free, attend every evening on a lecture on the work performed during the day, and be exercised in reading, writing, and arithmetic. Their employment should be arranged so that every one may become acquainted with all the different branches of the institution. Should the pupils of this class desire to enter a higher class after the first year, they should prove their capacity by an examination; and then they will be obliged, like the pupils of the second and third classes, to pay for board and tuition.

The second class, not exceeding two hundred and fifty in number, should stay two years to acquire a theoretical and practical knowledge of agriculture and all the branches connected with it. Pupils of this class are to attend to the different work of the farm, &c., every other day. Should a pupil of this class desire to enter the third class, he must undergo examination.

The third class, intended for twenty pupils. In this class such pupils only should be admitted as have been two years in the second class, and desire to perfect themselves as professors for similar establishments. The pupils of this class should also assist in the superintendency of the pupils in the other classes.

Order of the Day.

The signal for the hour of rising and retiring, as well as for the different meals, the commencement and termination of the work, should be given by a drum.

The hour for rising in spring and summer, should be half-past four o'clock; in fall and winter at 6 o'clock.

One quarter of an hour after rising, the roll is called, then they take breakfast; after which the pupils proceed to their different occupations, in the stables, field, barn, garden, workshops, &c., according to directions received the evening before.

At 10 o'clock A.M. the pupils are summoned by the drum from their work to their rooms, where they prepare themselves for dinner, and having a recess until 1 o'clock P.M., at which hour they return to their work, during the spring, fall, and winter seasons, and at 3 o'clock P.M. during the summer season, according to the order of the day.

The drum calls them to get ready for supper, during the spring, summer, and fall, at 6 o'clock; during the winter at 5 o'clock, which allows a recess until 7 o'clock, when supper is served.

After supper, at 8 o'clock, all the pupils proceed to the museum, where the report of the day's work is read and explained, and at the same time the order for the next day's work is communicated. They remain there till 9 o'clock, employed in writing their journals, and reading, &c., at which hour the drum calls to bed.

Half of the number of the pupils are exempt each day from out-door work, and they remain at home engaged in theoretical studies. They assemble after breakfast at the museum, where they study their lessons. At 7 o'clock A.M. in the fall and winter, at 6 o'clock in summer and spring, they proceed to the riding-school, where they receive lectures on horsemanship and breeding horses, &c.

After this they return to the lecture-rooms, where lectures on different sciences are given until 11 o'clock.

At half-past 11 A.M. they dine, and have recess until 1 o'clock, when the regular lectures recommence till 6 o'clock P.M.

Supper at 7 o'clock, as already mentioned.

On Sundays the pupils have to attend divine service.

Discipline.

Experience has proved that military discipline is the only and most expedient mode of keeping a large number of young men in obedience and order.

Republican institutions require every man to be a defender of his country in case of invasion or war; in all agricultural countries, where the farmers constitute the greater bulk of the population, the farmers furnish the largest quota of citizen-soldiers.

A knowledge of military duties and discipline would be therefore highly useful to the young farmer and to the country in case of emergency.

We recommend a new feature of combining with an agricultural institute military discipline and regulations, and it would be necessary to provide the pupils with arms and a plain uniform. They should undergo once or twice a week some military exercises, as far as it may be compatible with the nature of an agricultural school.

Estimate of Cost.

1360 acres of land, fenced in, at $20 per acre	$27,200
The buildings, including the furniture of the institute	60,000
Live stock	20,000
Implements, harness, a large balance-scale, &c	5,000
Apparatus for the technological laboratory	4,000
Grist-mill	1,500
Pump, water-reservoir, and hydrants	800
Steam-engine of twelve-horse power	1,500
Tools and lathes for the workshops	600
Library	5,000
Physical and chemical apparatus, collection of minerals, insects, skeletons, &c	3,000
Floating capital	20,000
Making	$148,600
A fund to cover the salaries of professors, director, &c., at 6 per cent	$140,000
Total	$288,600

Or about $300,000. The expenses for a steward and servants required for the service of the pupils and professors, should be paid from the income of board.

The treasurer and clerks, and the superintendents of the different branches of the farm, should be paid from the revenue of the farm, and the surplus should be applied for the accommodation of more pupils, of the increase of the library, apparatus, &c.

The salary of the director	$2,000
The salary of five professors, at $1,000	5,000
Salary of a teacher	600
Salary of a drill-sergeant	400
Total	$8,000

CH. L. FLEISCHMANN.

Sept. 1853.

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EXPERIMENTS ON THE CAPILLARY ATTRACTION OF THE SOIL.

Explaining some important and interesting Principles and Phenomena in Agriculture and Geology.

BY J. H. SALISBURY, M. D.

From numerous observations which have been made at different times on the peculiar appearance of the surface of soils, clays, &c., during the warm summer months, and the fact that they, when covered with boards, stones, or other materials, so as to prevent them from supporting vegetation, become in a comparatively short time much more productive than the adjacent uncovered soil; led to the belief that the soil possessed some power within itself, aside from the roots of plants, of elevating soluble materials from deep sources to the surface.*

To throw some light upon the subject, in May, 1852, I sunk three boxes into the soil—one 40 inches deep, another 28 inches deep, and a third 16 inches deep. All three of the boxes were 16 inches square. I then placed in the bottom of each box three pounds of sulphate of magnesia. The soil which was to be placed in the boxes above the sulphate of magnesia, was then thoroughly mixed so as to be uniform throughout.

The boxes were then filled with it. This was done on the 25th of May, 1852. After the boxes were filled, a sample of soil was taken from each box, and the percentage of magnesia which it contained accurately determined. On the 28th of June another sample of surface soil was taken from each box, and the percentage of magnesia carefully obtained as before.

The result in each case pointed out clearly a marked increase of magnesia. On the 17th of July, a sample of surface soil was taken a third time from each box, and carefully examined for magnesia; its percentage was found to be very perceptibly greater than on the 28th of the preceding month. On the 15th of the months of August and September following, similar examinations severally were made, with the same evident gradual increase of the magnesia in the surface soil.

The following are the results as obtained:

	Percentage of Magnesia.		
	Box 40 in. deep.	Box 28 in. deep.	Box 16 in. deep.
May 25th,	0.18	0.18	0.18
June 28th,	0.25	0.30	0.32
July 17th,	0.42	0.46	0.47
August 15th,	0.47	0.53	0.54
September 15th,	0.51	0.58	0.61

Before the middle of October, when it was intended to make another observation, the fall rains and frosts had commenced; on this account, the observations were discontinued. The elevation of the magnesia, as shown in the above experiments, evidently depends upon a well-known and com-

* Dr. Alex. H. Stevens, of New York, was, I think, the first to suggest this idea. He speaks of it in his address, delivered before the State Ag. Society of New York, on the *Food of Plants*, in Jan. 1848. No accurate experiments were performed, however, to fix it with a degree of certainty, till these were made which appear in this paper.

mon property of matter, viz., the attraction of solids for liquids, or what is commonly denominated capillary attraction. This may be clearly illustrated by taking a series of small capillary glass tubes, and insert one extremity of them in a solution of sulphate of magnesia or chloride of ammonium, and break or cut off the upper extremities just below the height to which the solution rises. Expose them to the sun's rays; the water of the solution evaporates, and the fixed sulphate of magnesia will be deposited just on the upper extremity of the tube. As the solution evaporates, more of it rises up from below, keeping the tubes constantly full; yet no sulphate of magnesia passes off: it all, or nearly all, remains at, or rises just above, the evaporating surface. Just so in the soil; as the water evaporates from the surface, more water, impregnated with the soluble materials from below, rises up to supply its place. As this evaporation goes on, it leaves the fixed materials behind in the surface soil at the several points of evaporation.

This explains why we often find, during the months of July, August, and September, a crust of soluble salts covering the surface of clay deposits which are highly impregnated with the alkalies, or any of the soluble compounds of the metals, earths, or alkaline earths. Also the reason in many instances of the incrustations upon rocks that are porous and contain soluble materials. It also helps to explain the reason why manures, when applied for a short or longer time upon the surface of soil, penetrate to so slight a depth. Every agriculturist is acquainted with the fact that the soil directly under his barn-yard, two feet below the surface (that is, any soil of ordinary fineness), is quite as poor as that covered with boards or otherwise, two feet below the surface in his meadow; the former having been for years directly under a manure heap, whilst the latter, perhaps, has never had barn-yard manure within many rods of it.

The former has really been sending its soluble materials up to the manure and surface soil; the latter to the surface soil and the vegetation near or upon it, if uncovered.

The capillary attraction must vary very much in different soils; that is, some have the power of elevating soluble materials to the surface from much deeper sources than others. The pores or interstices in the soil correspond to capillary tubes; the less the diameter of the pores or tubes, the higher the materials are elevated. Hence one very important consideration to the agriculturist, when he wishes nature to aid him in keeping his soil fertile, is to secure soil in a fine state of mechanical division, and of a highly retentive nature.

Nothing is more common than to see soils retain their fertility with the annual addition of much less manure than certain others. In fact, a given quantity of manure on the former, will seem to maintain their fertility for several years; while the latter, with a similar addition, quite lose the good effects of the manure in a single season.

The former soils have invariably the rocks, minerals, &c., which compose them in a fine state of division; while the latter have their particles more or less coarse.

EMPLOYMENT OF WATER FOR IRRIGATION IN THE AGRICULTURE OF NORTHERN ITALY.

[From the work "Italian Irrigation," by R. Baird Smith, F. G. S.]

SUMMER MEADOW IRRIGATION.

The traveller, in the central valley of the Po, is familiar with those vast plains of meadow land which form the characteristic feature of the agriculture of that region, and supply food for the cattle, on which the wealth of the irrigated districts is so materially dependent.

These meadows are locally divided into two principal classes, the permanent and the temporary—meaning by the latter term such as are introduced into the rotation of crops adopted in the irrigated region. Of the permanent, there are two kinds, the summer and the winter meadows—*prati irrigatorii simplice* and *prati marcitorii*. The permanent summer meadow, being that which is under irrigation from the end of March to the middle of September, is now restricted; and so much advantage has been found from introducing the temporary meadow in rotation with other crops, that the former is used only in localities not well adapted for general cultivation. The winter meadows are peculiar to Italian agriculture; and as being so, it may be worth while to give, presently, some details regarding their formation and maintenance.

In adapting land, either for permanent or temporary summer meadows, the general principles to be followed are few and simple. It is essential that the surface should be so disposed as that each part of it should receive readily the water from the main channel of distribution. In practice, this is effected, in all possible cases, by taking advantage of such natural inequalities of level as admit of the water being delivered from culminating lines. When nature is not so favorable, the soil is lowered in some places, and raised in others, until the requisite condition has been obtained. The extent to which this latter process has been carried, especially in Lombardy, is very remarkable. In one of the estates I saw near Milan, excavation in one place, and raising in another, were in progress, over an extensive area, ranging from three to as much as five feet in depth; and I was informed, by the proprietor, that he anticipated an expenditure for this single operation of from £10 to £12 per acre. This, however, I must add, was not an average case, and is referred to here simply as an illustration of the extent to which the system may be carried, with reasonable hope of a fair return, in time, on the capital expended.

It is further requisite that the water should spread itself in a thin uniform sheet over the surface of the land. This is effected by disposing the soil in gently inclined planes, the dimensions of which vary exceedingly, according to the practice of different localities, and also according to the peculiarities of the soil. Where the land is very light and absorptive, the planes, locally termed *ale*, have a breadth sometimes as low as from twenty-five to thirty feet; while, in heavy retentive soil, this dimension is increased to eight and even ten times these numbers. Colombani mentions* that for summer meadows in the province of Lodi, the breadth in the direction of the slope is 140 meters, or nearly 460 feet, while the length in the direction transverse to the slope is 180 meters, or 590 feet, which would make each of the great compartments contain an area of about six acres English. To each such compartment a main irrigating channel, of about three feet in breadth, running in a direction transverse to the slope is allotted; and in summer meadow it is not usual to have minor channels, unless special local circumstances render them absolutely necessary. The slope given to the surface of the meadow is, when practicable, two-tenths per 100; or, in English measure, about three inches in each 100 feet.

It must, however, be remarked, that in travelling through the irrigated districts, I found an interminable variety of dimensions in every part of the system of irrigation; and in fact, all such details are regulated in Northern Italy, rather by a sort of practical instinct on the part of the *compari*, or men to whom the distribution of water is intrusted, than by any established or universally received rules. Such specific numerical statements as I may give here, are therefore to be regarded merely as averages.

A third provision, essential to the efficiency of meadow irrigation, is to have ready means of drainage, so as to prevent any stagnation of the water on the land. To secure this, a drainage channel is carried along the base of the slope of each compartment, parallel to the main irrigating channel into which the surplus water is collected and carried off by some natural line of discharge; or, as is far more generally the case, made available for the irrigation of another compartment at a lower level. The importance attached to these drainage, or surplus waters, locally termed *colatori*, is very great throughout the whole of the irrigated region.

Passing over lands richly manured, as they universally do, they become charged with fertilizing matter, and have a value often considerably superior to their original one. Their temperature also becomes higher than when issuing directly from the canals; and this is found to act as a powerful stimulant on the production of the grass. In subordination to the general topographical features of the country, the compartments of the meadow lands are, whenever practicable, made to slope from north to south; the irrigating and drainage channels, accordingly, running from east to west. It is not, of course, always possible to carry this arrangement into effect; but the advantage of having the land to be irrigated inclined similarly to the canals of irrigation, is so manifest that it is always thus disposed when it can be done.

From the article on Agriculture, in the work entitled "*Milano e il Suo Territorio*," I have derived the following details regarding the produce of permanent summer meadows. These meadows are cut thrice during the season; and each cutting supplies a kind of hay, distinguished by a peculiar name. The first cutting in May is termed *Maggengo;* the second in July, *Agostano;* and the third about the end of August, or beginning of September, *Terzuolo*. The grass growing after the third cutting, which is termed *Quartirola*, supplies pasturage to the cattle at the end of autumn. If irrigation is commenced very early in spring, some lands supply four crops, the second being distinguished as *Magghengino*. The annual production may be calculated as follows, in

* Idrodinamica, p. 139.

English measures, assuming the *fasci* of Milan to be equal, as they very nearly are, to $1\frac{1}{2}$ cwt. each:

	Cwt.	
Hay from first cutting	24·375	per acre.
Hay from second cutting	18·5	"
Hay from third cutting	13·9	"
Total of Hay per acre	56·775	

The value of the pasturage of the *Quartirola* is about eight shillings per acre; and the average price of hay in the irrigated districts may be taken at 2*s*. 6*d*. per cwt. The gross value of the produce of an acre of permanent meadow in Lombardy would, therefore, be about £7 8*s*. per annum. The expenses will be indicated hereafter. The temporary summer meadows (*pratia vicenda*) of those which are introduced into the rotation of crops, are arranged similarly to the preceding, in all that regards irrigation. The essential conditions in both cases are the same; only in one the land remains continuously under grass, while in the other it is so only for two or three years. The ordinary period of rotation is, for five years, in the following order:

First year, wheat, cut about the middle of July, grass-seeds being sown with the wheat. 2d, 3d, and 4th, meadow, under irrigation, and abundantly manured. 5th, Indian corn or flax. After flax pulled at the end of June, millet is immediately sown, and comes to maturity about the end of October of the same year. A sixth year is occasionally added to the period, when another crop of Indian corn is taken, and the rotation again commences in the same order.

In illustration of several points connected with this subject, I may give here the following comparative statements of expenditure and return from irrigated and unirrigated lands in the *Lumellina*, which is one of the best irrigated districts of Piedmont. They were prepared by an excellent authority—a gentleman in charge of a number of the canals in the provinces of *Mortara* and *Novara*, and are the results of actual experience on a property consisting of 3,750 acres. I believe, therefore, they may be accepted as tolerably correct. The originals being all in Piedmontese measures, I have reduced them throughout to their equivalents in our own.

Comparative statement of expenses and returns from irrigated and unirrigated land in Piedmont.

YEAR.	NATURE OF CULTIVATION.	EXPENSES.	RETURNS.
First year. Indian corn.	1st. Culture of one acre of good strong land, in the usual rotation of five years—without irrigation.		
	Manuring—purchase carriage, and spreading of 135 cwt. of stable manure, at $4\frac{1}{2}d.$ each	£2 10 6	
	The ploughing and harrowing are executed in return for the grass and the gleaning of the Indian corn after the harvest. Other field-work is paid for en metayer, with one-fourth of the produce.		
	Produce in grain, deducting seed and the portion due to the metayer, 21·6 bushels, at 3*s*. 4*d*. each.		£3 12 0
Second year. Legumes.	Manure—two-thirds of the quantity used the first year	1 13 8	
	Three ploughings and harrowings, at 4*s*.	0 12 0	
	Produce in legumes, deducting seed and portion due to the metayer, 18 bushels, at 3*s*. 11*d*. each		3 10 6

YEAR.	NATURE OF CULTIVATION.	EXPENSES.	RETURNS.
Third year. Wheat.	One ploughing and harrowing, at 4s.	£0 4 0	
	Produce in straw		£0 8 0
	Do. in grain, deducting seed and portion due to the metayer, 17·16 bushels, at 5s. 10d. each		5 0 1
Fourth year. Wheat.	Four ploughings and harrowings, at 4s.	0 16 0	
	Manure, as in the first year	2 10 6	
	Produce equal to that of the third year, viz.:		
	Straw		0 8 0
	Grain		5 0 1
Fifth year.	Four ploughings and harrowings, at 4s.	0 16 0	
	Produce in straw		0 8 0
	Produce in grain, deducting seed and portion due to the metayer, 17·16 bushels, at 3s. 4d.		2 17 2
		£9 2 8	£21 3 10
	Deduct expenses		9 2 8
	Net returns for five years		12 1 2
	Annual per acre	2 8 2	
Means of three years. Meadow.	2d. Culture of the same land as the preceding, converted into an irrigable meadow. The averages of three years are given.		
	Manure.—150 cwt. of stable manure, at 4½d. each	2 16 3	
	Charges for irrigation channels, and spreading manure	0 12 6	
	Watering, cutting, making, and carriage of hay	1 7 8	
	Produce of three cuttings 72 cwt. of hay, at 2s. 4d. each		8 8 0
	Rent received for pasturage after the third cutting		0 8 4
	Totals	£4 16 5	£8 16 4
	Deduct expenses		4 16 5
	Net annual produce of one acre of irrigated meadow		3 19 11
	COMPARATIVE STATEMENT.		
	Annual produce of one acre of irrigated land	3 19 11	
	Annual produce of one acre of unirrigated land	2 8 2	
	Excess per acre in favor of irrigation	£1 11 9	

The preceding details show results on strong good land in the Lumellina. It may be interesting to give an example of the same kind for light and rather inferior soil in the same locality.

YEAR.	NATURE OF CROP.	EXPENSES.	RECEIPTS.
First year. Indian corn.	1st. Culture of an acre of light and sandy soil, in a rotation of four years—unirrigated.		
	Manure as in No. 1	£2 10 6	
	Labor is paid for en metayer, as in No. 1, with one-fourth of the produce.		
	Net produce, deducting portion due to the metayer and seed, 16·7 bushels, at 3s. 4d. each		£2 15 8
Second year. Legumes.	Manure equal to first year	2 10 6	
	Three ploughings and harrowings, at 3s. 4d. each.	0 10 0	
	Net produce, 14½ bushels, at 3s. each		2 16 9
Third year. Rye.	Ploughing and harrowing	0 3 4	
	Net produce		2 9 7
	Straw		0 6 8

YEAR.	NATURE OF CROP.	EXPENSES.	RECEIPTS.
Fourth year. Rye.	Five ploughings and harrowings, at 3s. 4d.	0 16 8	
	Net produce		2 9 7
	Straw		0 6 8
	Totals	£4 0 6	11 4 11
	Deduct expenses		4 0 6
	Net returns for four years		£7 4 5
	Annual return per acre	£1 16 1	
	2d. Culture of an acre of the same land as the preceding, converted into an irrigated meadow.		
	Averages of three years.		
	Manure.—150 cwt. of manure, at 4½d. each	£2 16 3	
	Cost of irrigated channels, and spreading manure	0 12 0	
	Cost of watering, cutting, making, &c.	1 2 9	
	Produce of three cuttings 60 cwt. of hay, at 2s. 4d. each		7 0 0
	Received for pasturage after third cutting		0 5 0
	Totals	£4 11 0	£7 5 0
	Deduct expenses		4 11 0
	Annual net return of one acre of irrigated meadow		£2 14 0
	COMPARATIVE STATEMENT.		
	Annual net produce of one acre of irrigated land.	2 14 0	
	Annual net produce of one acre of unirrigated land	1 16 1	
	Excess per acre in favor of irrigation	£0 17 11	

The preceding details apply to summer irrigation in Piedmont. The following show the net rent derived from a farm of about 350 acres, thoroughly irrigated, in the province of Milan:

Rent in money paid to the landlord per acre		£1 19 6
Minor items paid in kind		0 1 3
Communal (parish) charges paid by the tenant		0 1 8
Government charges paid by tenant		0 9 4
Proceeds of sale of wood reserved by the landlord		0 1 9
Gross rent per acre		£2 13 6
Deduct proportion of expenses paid by the landlord, as follows:		
Government and communal charges	£0 11 0	
Repairs of buildings and hydraulic works	0 2 9	
Expenses of administration, inspections by engineers, &c	0 2 0	
		0 15 9
Net per acre		£1 17 9

Such land as is referred to in these details, sells for from £40 to £45 per acre; so that the interest on capital thus invested does not much exceed four per cent. The gross returns from irrigated meadow land in the Milanese have formerly been estimated at £7 8s. per acre; and if these data are to be depended upon, it would appear that the rent is just one-fourth of the total amount of these returns.

As regards the quantity of water to be given to meadow land, there is great variety of opinion, as might be expected in a matter dependent on so many variable elements. There are three ways in which this quantity is estimated: 1st, By the volume of water in continued discharge required to irrigate a given area of land; 2d, By the total depth of water spread over the soil, either at each watering, or during the whole season of irrigation; 3d, By the total cubic contents of the mass of water employed.

According to an experiment of De Regi, the details of which I reduce to English measures, the continued discharge of one cubic foot per second is sufficient for the irrigation, in twenty-four hours, of four acres. Hence, as the total volume discharged during that time amounts to 86,400 cubic feet, and the area watered to 174,240 square feet, it appears that a stratum of water, equal to nearly six inches in depth, was in this case spread over the surface of the meadow. And as the general period of rotation may be taken at fourteen days, it would thence appear that a continued discharge of one cubic foot per second, would suffice for the irrigation of (12×4) 48 acres of meadow land, there being precisely twelve periods, of fourteen days each, in the season of summer irrigation. The above estimate, however, implies that the whole water is absorbed by the soil, which, in point of fact, is never the case.

Lombard engineers calculate the absorption in each watering as ranging from one-half to one-third of the total quantity of water employed. Hence, supposing it to be the larger of these proportions, it appears that after the irrigation of 48 acres had been effected, half a cubic foot would be available, as what is locally termed *colatori*, for farther employment, and similarly in successive series, till the entire quantity was exhausted. Effectively, the irrigating power of any given quantity of water employed in meadow irrigation, is held by practical men to be equal to twice the area watered on the first application. According to De Regi's experiments, therefore, one cubic foot of water, perfectly economized, would be sufficient for the irrigation of 96 acres of permanent or temporary meadows.

In the article on the agriculture of irrigated Lombardy, formerly quoted, it is stated that (reducing the numbers to English equivalents) one cubic foot of water is sufficient for the irrigation, in the ordinary period of rotation, of 38 acres only; or, if account be taken of the surplus waters of twice this quantity, being 76 acres in all.

It is usual in grants of water made at the present day throughout the provinces of Verona and Mantua, to adhere to the data established by the treaty of 1764, between the Venetians and the Austrians, for regulating the distribution of the waters of these districts. The period of rotation here is stated to be seven days; and according to one series of experiments, a cubic foot per second would be sufficient for the irrigation of 3½ acres in twenty-four hours, or for 22½ in periods of seven days; while by another series, under more fortunate circumstances, these numbers are just doubled. Hence, in this instance, it would appear that taking an average, and supposing the entire surplus waters economized, the effective irrigating power of a cubic foot per second would be very nearly 68 acres, and proportionally more as the period of rotation was extended.

Finally, Tadini mentions, as the result of numerous experiments made by him on the irrigation of meadows, that a mass of water equal to 35,000 cubic feet, is sufficient for an area of 107,100 square feet, being a stratum of about 3¼ inches at each watering, which would give an effective power to the cubic foot equal to that established by De Regi, or about 96 acres.

It may, therefore, I think, be safely concluded that a stratum of water, about four inches deep, leaving half the quantity in the soil, and the other half available for farther use, would be abundant in all cases; and if provision to this extent be made, the differences due to variety of soil and other circumstances, would be sufficiently provided for. In conclusion, I may note that, after summing up the results of experience in France and Italy, M. de Buffon comes to the conclusion that the irrigation of an acre of meadow requires, under average circumstances, the continued discharge of 18¼ cubic inches of water, which gives an effective power per cubic foot per second of 93 acres; and this I believe to be a very close approximation to the truth, as the following summary shows:

De Regi's estimate	96 acres	per cubic foot	per second.
Milanese estimate	78	"	"
Veronese and Mantuan estimate	68	"	"
Tadini's estimate	96	"	"
Buffon's estimate	93	"	"

MARCITE, OR WINTER MEADOW IRRIGATION.

VIEWED in reference to its superficial area, the winter irrigation of Italy is extremely limited, not exceeding, in Lombardy and Piedmont, from 12,000 to 15,000 acres. The great mass of the water consumed there is spread over the land between the middle of March and the beginning of September; for the remainder of the year it does no more than maintain the above-mentioned limited extent of winter meadow. In this point of view, the contrast between the irrigation system of Italy and India is striking. The winter harvest of the latter, or that sown about October or November, and reaped in April or May, is, as respects irrigation, by far the most important; while the Italian cultivator rarely has occasion to irrigate any of the corn-crops, except the maize. These products would, in India, be inferior, equally in quality and quantity, without the use of water; and hence it is that, during the entire year, irrigation is in demand.

The periodic rains modify, to some extent, and even occasionally supersede the necessity for water during the latter summer months, or from July to September; but as rice and sugar-cane must always be irrigated, the water cannot be considered idle even within these limits. It thence arises that the average area of irrigation in India is considerably in excess of that in Italy. We have seen, at the close of the preceding section, that about 90 acres is the average extent of ordinary irrigation by one cubic foot per second in the latter country.

In India the statistics of the canals there show that the same quantity of water, being employed during the whole year does, so to speak, just twice the work, the area irrigated by a continued discharge of one foot being equal to 180 acres. We have no data by which we can reduce this quantity so as to show the elements of which it is composed. It is merely a general average obtained by dividing the total area watered by the volumes of the canals employed. There is, however, no species of cultivation in India or elsewhere, that I am aware of, similar to the *marcité* of Northern Italy; the quantity of water required for which is enormous, and the details of the cultivation altogether peculiar. I propose, therefore, giving to this section some details illustrative of this remarkable species of culture, for which I am indebted chiefly to a work by Signor Dominico Berra, entitled *Dei Prati del Basso Milanese detti a Marcité*, published at Milan in 1822. In my travels through the irrigated districts, I was constantly referred to this book as containing the best account of the winter meadows yet extant.

The right to water for winter irrigation commences on the eighth of September, and terminates on the 25th of March. It is essential to the establishment of a winter meadow, *a marcité*, that entire command over the water should be held by the proprietor; for intermittent irrigation is not adapted to this species of culture. Continuous irrigation, suspended only for the time required to cut the grass, is the first requisite for entire success. The water thus employed is derived either from the ordinary canals of irrigation, from springs, from the smaller streams, or, lastly, from the surplus or drainage of other irrigated lands at higher levels. Of these sources of supply, the springs and the drainage waters are the best. It is essential to the success of a winter meadow, that the water employed should have as high a temperature as possible. Hence it is that the springs, being always warmer in winter than water freely exposed to the influence of the atmosphere, are preferred to any other means of irrigation during this season. In illustration of this point, Signor Berra mentions that on the 14th of February, of the year in which his work was published (1822), the thermometer of Reaumur indicated, at six in the morning, an atmospheric temperature of $-1^{\circ}\cdot5$, about 35·5 Fahr. On immersing the instrument in the tube (tinello) at the spring-head, it at once rose to $+10\cdot5 = 56$ Fahr., showing a difference of 12° of Reaumur, or 27° of Fahr., between the temperature of the spring and that of the external atmosphere. As the water passes to a distance from the spring, it of course parts with this excess of temperature; and hence it is invariably to be observed that the finest meadows are those nearest to the fountain-head. The water from the ordinary canals, being generally about the same temperature as the air, does not produce the same stimulating effects on the *marcité*, with exception, however, to that which is collected in the *Naviglie Interno* of *Milan*, and the *Vecchabbia*. The water in these lines passing through the subterranean channels of the town, and charged with an abundance of fermenting matter, is found not only to retain a higher temperature, but farther to stimulate the productive power of the meadows by deposits so rich as to excel every other species of manure.

So abundant are these deposits, that the surface of the fields becomes speedily elevated by them, and it is necessary, at intervals of two or three years, to lower the levels, so as to insure easy irrigation. The material thus removed is greedily sought by cultivators in the vicinity as a most powererful and valuable manure. The supplies from canals present one material advantage over those from springs, in being practically invariable. As no *marcité* can possibly survive the want of water, for even very short periods, the intermittent nature of the supplies from springs, which vary much with the variations of the weather, cause considerable uncertainty; and hence the canals, as being constant in this respect, are, in spite of their low temperature, in request with the cultivators.

The worst water of all for the use of winter meadows, is that derived directly from such rivers as the Olona, Lambro, &c.; for not only is the temperature low and the supply uncertain, but the deposits brought down after the rain are most injurious to the meadow produce, and to the cattle fed upon it.

The quality of the drainage waters from other farms, as applied to *marcité*, depends upon the source whence they have originally been derived, and the nature of the soil, or the species of cultivation over which they may have previously passed. The surplus waters of a well-tilled and richly-manured farm, are more valuable than in their original condition, for they are charged with fertilizing matter. It has hence become a rule in the establishment of a series of winter meadows, at different levels, which are to be irrigated from the same source, to manure most archly those near the head of the supply, whether spring or canal, and to make the water itself the medium of conveying the manure to the others below. The presence of this manure is supposed to raise, in some degree, the temperature of the water, a point always much insisted on by Lombard and Piedmontese agriculturists, who hold that in proportion as the heat of the water becomes greater, so much better is it adapted for the kind of cultivation now under notice. The order of succession in quality of waters for *marcité* may, therefore, be stated thus: 1st, Sewerage canals, like the *Vecchiabbi;* 2d, *Fontanili*, or springs; 3d, *Ordinary canals* of irrigation; 4th, *Colature*, or drainage waters; 5th, Rivers, like the Olona, Lambro, &c.

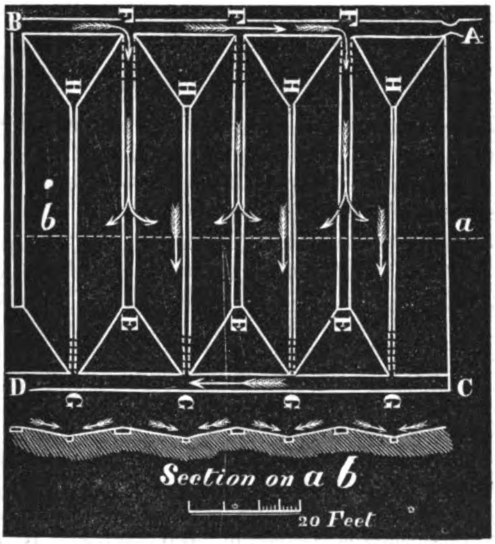
The following are the details, given by Signor Berra, for the preparation of the land of winter meadows, as derived both from the practice of the most experienced Lombard farmers, and from experiments made on his own property.

Having cleared the land of weeds and roots of all kinds, it is ploughed and manured carefully in April, and Indian corn is then sown, as being the crop with which it is held to be best to prepare for the *marcité*, requiring, as it does, repeated weeding and clearance of the soil. The crop being reaped in October, the roots are carefully removed, the land ploughed and harrowed, and its surface smoothed as much as possible. In this state it is left until the beginning of January, when the works necessary for irrigation are commenced. It is of importance to the economy of these operations that they should be executed in winter, as labor is then more abundant and cheaper than at any other period of the year.

The assistance of the *comparo*, or the man charged with the distribution of the water, becomes necessary at this stage. Long experience and traditional rules have made this class of men very expert in all details of the minor works of irrigation. Most frequently they are guided in their levelling operations solely by the eye, and their instrumental apparatus consists of only a few pickets of different lengths, and a line. With the assistance of these, the first step the *comparo* takes, is to mark out, on the highest level of the field, the direction and breadth of the principal irrigating channel, locally termed the *roggia adacquatrice.* The dimensions of this channel necessarily vary with the quantity of water available for distribution; but care should be taken to restrict them as much as possible, it being cause of complaint that such channels are almost invariably made too large, and a serious amount of good land is thereby lost. When the position of the main channel has been fixed, the field is then divided into a series of rectangular compartments, termed *piane*, or *ale;* between each two of which, and at right angles to the main channel, there is established a minor irrigating channel, or *roggetta.* The breadth of each plane, in a well-constructed winter meadow, is never more than from 25 to 30 feet; the length is more variable, and depends on the quantity of water at command. It is usually, however, about eight or ten times the breadth. The planes slope from the minor channel on each side at the rate of ·03 in 1; or when the breadth is 30 feet, the slope would be very nearly 12 inches. With this slope the water, passing from the main to the minor channels, is discharged from the latter in the form of a thin and ever-moving veil, which, flowing over the surface of the planes with just sufficient velocity to prevent congelation, supplies the grass with continual stimulus. In addition to the minor irrigating channels, on the crests formed by each two planes, there are minor drainage channels established in the little valleys between the same, called *scolatore*, all of which discharge themselves into a main drainage channel carried along the lowest level of the meadow, called the *scolatore maestre.* The following diagram will illustrate the general arrangements for irrigation and drainage. There are varieties of dispositions adopted in practice, according to local peculiarities of level, &c.; and of these I propose to give some illustrations in the plates; but at present I restrict myself to a single general example.

ARRANGEMENT OF A MARCITE FIELD.

Plan.



A B, main irrigating channel.

C D, main drainage channel.

E F, minor irrigating channels, generally 12 inches wide and 6 or 7 deep.

G H, minor drainage channels, about half the above dimensions.

Planes from 25 to 30 feet in breadth, with a height at the crest of 12 inches.

The earth, from the irrigating and drainage channels, is spread over the planes with singular dexterity, so as to give them the requisite slope; and when these arrangements for irrigation are completed, another ploughing and harrowing are given, and the land is then left untouched until the end of February or beginning of March, when it is once more ploughed, harrowed, and carefully cleaned of all weeds which may have shown themselves.

When it is necessary to level the field, a machine, called a *raggia*, being simply a large scoop drawn by two oxen or horses, is employed. It is managed after the fashion of a plough and cut-off layer of the more elevated parts of the land, the earth being then transported to those at a lower level, and deposited there. If levelling operations have been necessary, a fourth ploughing and harrowing are given after their completion, so as to prepare the soil for the seed. In April oats are sown, with about 4½ bushels to the acre. After harrowing, clover and the lolium perenne* are sown, in the proportions of one-fourth of a bushel of the former, and one bushel of

* Italian rye-grass.

the latter per acre. The ground is then rolled with a heavy stone or wooden roller, so as to be perfectly levelled. Care must be taken, however, to do this only when the land is perfectly dry, as otherwise the seed adheres to the roller, making it necessary to sow a second time in autumn.

The construction of the small drainage channels is usually deferred until the sowing has been completed; and they are then made with ease, as their breadth does not exceed nine, and their depth six inches. It is usual to leave spaces at both ends of the meadow sufficiently large for carts to pass. These are indicated in the diagram by dotted lines; and the irrigation and drainage waters are carried across them by small wooden funnels. Irrigation is given to the new meadow in June, July, and August; and on first admitting the water, great attention is paid to removing all obstacles to its free circulation over the surface.

In illustration of the expense of forming winter meadows, the following details are given.

The superficial area was five acres; the land had been previously under crop; was moderately level and easy to work.

15th Nov.—	1st ploughing	£1	12	6
25th Jan.—	2d ploughing	1	12	6
	Harrowing	0	5	0
4th March.—	3d Ploughing	1	12	6
	Harrowing	0	5	0
2d April.—	Excavation of minor irrigating channels	3	16	6
	Levelling the plains	2	12	6
	Digging	0	4	6
	Use of the raggia, or earth-scoop	0	8	6
	Final ploughing	1	12	6
	Final harrowing	0	5	0
	Spreading manure	0	4	6
	Sowing	0	4	6
	Rolling	0	4	0
	Main channels of irrigation and drainage	1	17	6
	Total expense for five acres	£16	17	6

The outlay in this instance was therefore £3 7*s.* 6*d.* per acre; but the example is certainly below the average, for, as will be seen by reference to the details, the levelling operations were extremely trifling. While there are extreme cases which rise far above it, I believe that an average of about £6 per acre will very fairly represent the ordinary cost of forming a winter meadow.

As land under *marcité* may be said to be in a constant state of production, it is of necessity very richly manured. The materials required are supplied in abundance by those vast dairies which are maintained throughout the whole of the irrigated districts of Northern Italy. And I may give here a condensed abstract of the observations of Signor Berra on this branch of the subject. Foremost among the manures for *marcité*, he places the refuse of those large pig-sties which are attached to every farm, and in which the otherwise useless products of the dairy are consumed. So important is this manure considered, that farmers who do not themselves manufacture cheese or butter, always make it a condition with the parties to whom they dispose of the produce of their cows, that a certain number of pigs shall be maintained on the farm. It is usually calculated that three pigs supply, in the course of the year, manure sufficient for one acre of *marcité*. The manure is given in the liquid form, and is distributed awkwardly from casks or low carts, which traverse the field. The arrangements for storing the manure are very inefficient, as it is exposed in open tanks, and great wastage is incurred. Sometimes, though but rarely, it is kept in covered masonry cisterns. It may be applied at any season of the year, care only being taken to give it immediately after cutting, as it injures the grown grass.

The stable manure, both solid and liquid, is usually mixed with earth before being applied to the field. In a corner of each *marcité* meadow is to be seen an oblong mass, which is formed of the clearances of the irrigating and drainage channels, the fresh earth removed from the surface of the land, and the manure from the horses and cows in the stable.

These are all formed into a compost, which is applied to the *marcité* in the proportion of about 250 cwt. per acre during the year. Linseed-oil cake reduced to powder, and mixed with lime, in the proportion of seven of the former to one of the latter material, is a very common manure for winter meadows. About 15 cwt. of this compost is considered sufficient for an acre, and the mixture of its constituents should be made at least ten days before it is applied to the land. When so applied in autumn, some time should be allowed to elapse before water is admitted. In the vicinity of Milan, the refuse of soap-works, and like manufactories, is largely employed as a manure, and is highly valued by the cultivators in this locality; the effect being great, owing to the salts of soda and potash which it contains,—one of the richest manures available in the matter which collects within the irrigating and drainage channels themselves, more especially in the vicinity of large towns, where the sewerage waters are made use of. I have already mentioned that at Milan this is greedily sought, and it is found to stimulate exceedingly the productive power of the soil. The value of this material operates prejudicially in one respect, by leading to an extensive enlargement of the channels after each clearance. It is calculated that in the province of Lodi, nearly one acre in every hundred of the irrigable land is thus rendered useless, which, in a great area, becomes a matter of great consideration, amounting, as it does in this single province, to more than 1500 acres.

The quantity of water required for *marcité* is enormous. From the statistics given in Part II. it appears that one cubic foot of water per second is sufficient for the irrigation of about 3½ acres only. On this point I was favored with a memorandum by Signor Brioschi, a Milanese engineer of high reputation, of which I give a translation here, reducing the local to English measures.

"While it is impossible," M. Brioschi remarks, "to establish *marcité* without having a great deal more water than is necessary for the irrigation of the land, it is somewhat difficult to determine the precise quantity, as this must vary with local circumstances. However, I will assume that the area of a winter meadow is seven acres. The quantity of water which I conceive to be necessary for the perfect irrigation of this surface, is six cubic feet per second; of which 4½ becomes available for further use in the form of *colatori*, or surplus waters. The estimate, therefore, would stand thus:

	Cubic feet per second.
Original irrigation of seven acres	6
Surplus after irrigation	4½
Quantity of water absorbed..	1½

"The quantity actually consumed by an acre of *marcité*, amounts accordingly to $\frac{1.5}{7} = 0{\cdot}2$ of a cubic foot nearly; and the total quantity of six cubic feet, if thoroughly economized, would be sufficient, in actual practice, for the irrigation of from 15 to 18 acres, being from 2½ to 3 acres per cubic foot." This result corresponds very nearly with that shown in the general statistics of winter irrigation formerly referred to. The average charge for one cubic foot of continued discharge during the winter months, is very nearly £3. Hence, the expense of water in *marcité*, may be estimated at about 20*s*. per acre, under average circumstances.

Colombani* states, that in localities where the surplus waters are lost, it requires very nearly one cubic foot of water, in continued discharge, for each acre of *marcité*,—an estimate which confirms that of Brioschi. It thence appears that over this area there passes, in twenty-four hours, the enormous mass of 86,400 cubic feet, or nearly 390 tons, or 14,400 gallons of water!

As regards the produce of *marcité*, the following particulars may be interesting. They are given as the results of careful measurements and observation, made personally by Signor Berra, on his own property, and with land of average quality, but possessing no special advantages, such as vicinity to large cities, or command of sewerage waters. The yield per acre is given as follows:

	Cwt.
1st cutting in February	84
2d, from March to April	126
3d, from April to May	131·25
4th, from May to beginning of July	73·5
5th, from July to middle of September	63
Total per acre during the year	477·75

or very nearly 24 tons of grass. The *marcité* meadows, in the vicinity of Milan, however, give full twice this quantity, being cut in November, January, March, and April, for stable-feedings; and in June, July, and August, they furnish three crops of hay, while in September they afford an abundant pasturage to the cattle. They thus give seven crops during the year; and the ordinary yield per acre is estimated at from 45 to 50 tons, with half as much more in remarkable instances.

Of the ordinary *marcité* meadows, it is considered that 35 acres supply grass and hay sufficient for the maintenance, during the year, of 50 cows stall-fed, except in September and October, when they are turned out for pasture; 20 acres are sufficient for the supply of grass during seven months; and 15 more furnish the hay required during the three winter months. To give an idea of the money returns, we assume that the proprietor of fifty cows has twenty acres under *marcité*, the expenses and returns connected with which are as follows:

EXPENSES.

	£	s.	d.
Preparation of the land, of irrigation channels, &c., for 20 acres	£6	3	6
Manure, 259 cwt. per acre	63	5	7
Labor in spreading and carrying do.	2	7	0
Labor in cutting during seven months, carriage of grass, &c.	19	13	9
	£91	9	10

RETURNS.

	£	s.	d.
Food for 50 cattle in February, for fifteen days, at 3*d*. per head (being the price paid by proprietors of cattle, not farmers)	£9	7	6
Do. from March to middle of September, for 195 days, at 6*d*. per head	243	15	0
Pasturage, at 8*s*. 9*d*. per acre	8	15	0
Value of manure	52	12	0
	£314	9	6
Deduct expenses	91	9	10
Total for 20 acres	£222	19	8

or £11 2*s*. 6*d*. per acre.

* Idrodinamica, p. 136

The proprietor of the land has been supposed to be also the proprietor of the water; but should he not be so, the net returns would be decreased by 20*s*. per acre, as the price of irrigation.

The produce of the plantations invariably, surrounding irrigated lands, is valued at £1 6*s*. per acre annually. Hence, the entire returns would amount, in case of the water belonging to the proprietor, to £12 8*s*. 6*d*., and otherwise to £11 8*s*. 6*d*. per acre. It is usually calculated that the net returns are divided equally between the landlord and the tenant. The rent from such land as the above would therefore be from £5 to £6 per acre.

When cattle are not fed on the farm, but the produce is disposed of either as grass, or made into hay, the net returns range from £7 to £8 10*s*. per acre.

In the vicinity of Milan the returns are very much higher, not merely because of the greater produce, but of the better prices the demand of the city insures. It is not usual to find the *marcité* here yielding a rent equal to the highest net returns elsewhere, the tenants paying from £10 to £12 per acre, and occasionally, under circumstances peculiarly advantageous, even double these sums.

These details, regarding a cultivation so peculiar as that of *marcité* meadows, will not, I trust, be altogether uninteresting. Owing to the immense consumption of water it requires, it can be employed profitably only in countries where there is no demand for irrigation of any other kind during the winter months. This, as I have already shown, is far from being the case in India; but as there may be special circumstances which might admit of the system being employed,—as, perhaps, in the valleys of mountain streams, or in localities where water is now running to waste, as in mill-streams, &c.,—I have thought I might, with propriety, enter into the particulars now given.

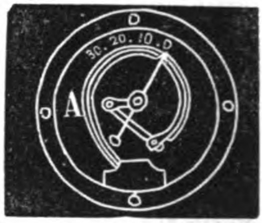
Not far from the Porta orientalis of Milan, in the yard of the hospital, is such a *marcité*. The hospital is a low one-story square building, of 560 paces on each side, and incloses about 47 acres of land, which is laid out in a *marcité*. Burger mentions it also in his work, "The Agriculture of Lombardy," and says that he examined the grass, and found $\frac{5}{10}$ lolium perenne, $\frac{4}{10}$ white clover, $\frac{1}{10}$ bromus mollis, dianthus, plantago ranceolata, achillea mellifolium, rumex actosella, &c. We visited the same *marcité* in the beginning of the month of May, in the year 1846, and found also some varieties of the ranunculus, salvia pratense: a portion of the grass was cut, and, judging from the great number of hay-cocks, the yield must have been enormous.

CH. L. F., *Ed.*

CLAIMS OF PATENTS.

Granted on the 12th, 19th, and 26th July, and the 3d August, with explanations and diagrams by CH. L. FLEISCHMANN.

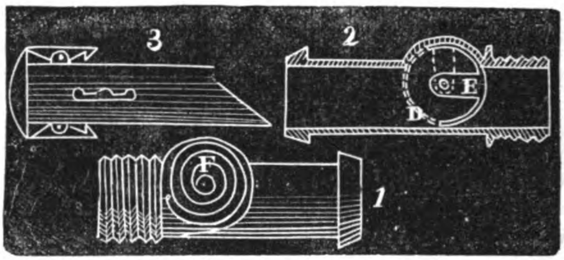
No. 9836. E. H. ASHCROFT, Boston, Mass.—*Improvement in Pressure Gauges.* Patented July 12th, 1853.



The chief feature of this gauge consists in an elastic flattened tube of precious metal, bent in a horseshoe, spiral, or other curved shape, and possesses a certain degree of elasticity. One extremity of this tube is fixed in position, and connected with a stopcock, by means of which a communication can be opened, between it and the steam or other fluid, whose pressure is so measured; the other end being hermetically sealed, is left free to be moved by any force tending either to straighten or bend the tube. This closed extremity of the tube is connected either directly or by a link and a toothed sector and pinion to an index pointer, which traverses the area of a dial-plate, graduated to given pressure. In the figure representing the gauge, A is the elastic bent tube.

"I claim the method herein described, of rendering the indications of the Bent Tube Pressure Gauges permanent and reliable, by constructing said tubes of precious metal, as herein set forth."

No. 9837. CHAUNCEY W. CAMP, Hartford, Conn.—*Improvement in Shot Chargers.* Patented July 12th, 1853.

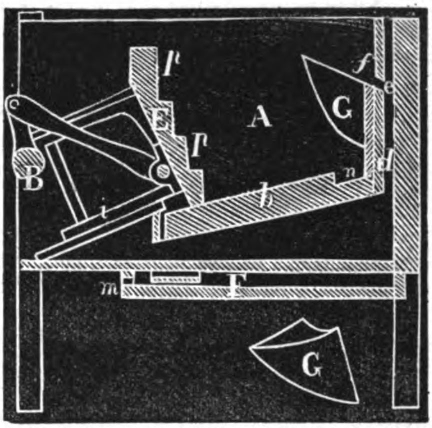


The Figures 1, 2, and 3, represent the improved shot chargers. 1, a side view of the charge-tube; 2, a section of the same; 3, a side view of the slide.

When the slide is pushed in the charge tube, the point of the bevel strikes the lower part of the revolving cut-off at D, and the bevel part of the slide forces the revolver round till it gets to the position at E, which allows the shot in the belt to pass freely into the slide, and when full and withdrawn for use, the force of the spring F, which is attached to the axis of the revolving cut-off outside of the charge-tube (see Fig. 1), causes the revolver to act upon and cut off the shot from the bevel part of the slide, and instantly close up the opening as at D, preventing more shot escaping from the belt, avoiding the risk of waste while the slide is out and in use; also, in case of accident or other cause, the slide should come out, all waste and loss is prevented.

"I claim the manner and method of making, and the application of the *revolving cut-off and spring* to shot chargers, substantially in the manner, and for the purpose as herein set forth and described."

No. 9838. E. J. Dickey, Hopewell Cotton Works.—*Improvement in Butter Workers.* Patented July 12th, 1853.



The inventor describes the mode of working his improvement as follows:

The butter to be worked is placed in the box between the partition *d* (see Figure) and the reciprocating presser E, which is then put in motion. Upon being pressed up by said presser, the butter is divided by the cutters or knives G G, &c., and the buttermilk contained therein, near said cutters, is forced up along their surfaces by the pressure, and flowing into the grooves *e e*, &c., is discharged into the trough F, whence it is caught through the orifice *m* into a suitable receiving vessel. The butter is prevented from following the presser as it recedes in its motion, by the recess or depression *n*, and being caused to overhang by the shape and inclination of the said presser, it falls over, and thus presents a new surface to be acted on in the next return of the presser. The knives G G, &c., may be inclined all in one direction, whereby the butter will be gradually worked towards one side of the box; then by inclining the knives in the other direction, the butter will be moved back to the other side; and thus the inclination of the knives may be reversed as many times as desired. The butter is in this manner worked till it becomes a homogeneous mass, and the buttermilk is entirely extracted therefrom, and is discharged, partly by the channel *f*, as before described, partly by the recess *n*, whence small orifices through the bottom *b* drain it off, and a portion runs down said inclined bottom, and is discharged through the orifice *b* into the trough F.

My above-described machine for working butter, may also be applied to cutting cheese curd, and other similar uses.

"I claim the adjustable knives G G, &c., arranged within the box of said machine, and operating in conjunction with the reciprocating presser, substantially in the manner and for the purpose herein set forth.

"I also claim the recess or depression *n*, in the bottom of the box, for the purpose of preventing the butter's adhering to the presser, and being drawn back during its receding motion—substantially as herein described."

No. 9839. Geo. M. Dimmock, Springfield, Mass.—*Improved Apparatus for Illustrating the Motion of a Pendulum upon the Earth's Surface.* Patented July 12th, 1853.

"I claim the application to an artificial globe of one or more pendulums, the rods of which are formed of delicate springs, so as to vibrate evenly to all points of the dial, the plane of which is at right angles to the pendulum when at rest.

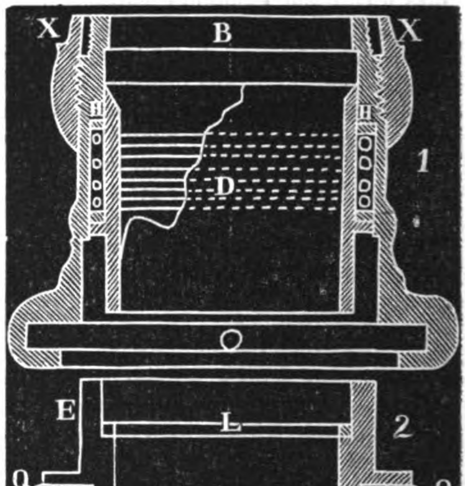
"Second, I claim the bending or springing the pendulum rods, to counteract the gravity of the earth, so when at rest they will be straight, and on the line from the point of suspension and the centre of the globe; furthermore, I claim any thing substantially the same."

No. 9840. JOHN J. FULTON, Monongahela City, Pa.—*Improvement in Tanning.*

After having bated and cleansed the hide, the inventor employs from two to three pounds of muriate of ammonia, in combination with seven pounds of nitre for a pack of twenty slaughter hides or one hundred calf skins; dissolves the ingredients in water sufficient to corn the hides; they are left in such a bath until there has been enough absorbed of the composition. Afterwards, these hides are placed for one day in a weak bark liquor; he then places them in strong bark liquor from three to five days, when they will be in good condition for laying away in strong leeched liquor.

"I claim the use of muriate of ammonia, in combination with nitre, for the purpose of suspending putrefaction, adding strength to the animal tissues, and for usual purposes in the manufacture of leather, as set forth."

No. 9841. SMITH GROOM, Troy, N. Y.—*Improvement in Hose Coupling.* Patented July 12th, 1853.

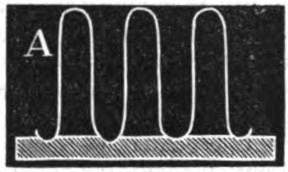


This improvement consists in a swivel E (see Figure 2), which passes into an outer chamber B (Figure 1), until the packing L rests against the spiral spring conduit D, which recedes by pressing the points of the bolts O are brought to a line with it, and then is projected into the outer circular groove O by the bolted springs Q and N, and is effectually coupled simply by pressing the same section together; the said section being left to swivel or turn either way. By sliding up a small lock or bolt attached to and across the circular guard-plate S into the partition P with a key knob, will make the coupling perfectly secure from being uncoupled by accidents.

To separate the said sections, the lock-bolt R is pushed back, then by pressing against the knob K, the circular guard-plate S is turned, in order to bring the studs V from their usual place at the detent W, up to the sides of the spring-bolt N and Q, which will press back the spring-bolts, and withdraw the bolt-heads within the periphery of the partition P; and then spiral spring F acting on the spring conduit will throw the sections A and B apart.

"I claim the spring conduit D and the appendages by which it is moved longitudinally, and is held firmly against the packing L and the pads H, or rim in which the packing rests to prevent the joint from leaking, in combination with the arrangement of spring-bolts and their appendages, as shown on section A, with the circular groove O, for the purposes therein set forth."

No. 9842. RICHARD MONTGOMERY, of New York City.—*Improvement in Sheet-Metal Beams.* Patented July 12th, 1853.



The object of this invention is to produce metallic beams of greater lightness and strength, and at less cost, which is effected by bending sheet-metal in such a form as will give it the proper rigidity and transverse strength, as shown in figure.

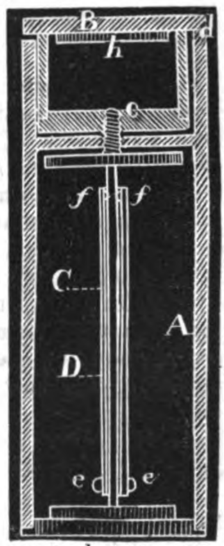
"I claim a beam formed of sheet-metal bent into a series of longitudinal folds, the sides of which are flat and parallel, and the tops and bottoms uninverted and inverted arches respectively. I also claim the combination with such a beam of a pair of saddles to support its ends, substantially as set forth."

No. 9843. MYER PHINEAS, New York City.—*Improvement in Metallic Pens.* Patented July 12th, 1853.

This improvement consists in forming the back of the pen, just behind the nib, as shown in figure, into a series of narrow ribs, separated by narrow slots, and connected on each side of the pen by a flat plate, which yields readily to slight pressure, and allows the arches of the ribs to approach towards, and recede from, each other, to permit the back of the pen to bend.

"I claim constructing the back of the pen with a series of transverse ribs and slots, and leaving two flat springs beneath, nearly parallel to the back, and free to bend between the ribs; the effect of this construction being to give to the pen combined stiffness and flexibility within certain limits, resembling that produced by a series of vertebral articulations, and which is found to render the working of the pen more easy and pleasant than any form of metallic pens heretofore essayed."

No. 9844. H. G. ROBINSON, Schuylkill Haven, Pa.—*Improvement in Coin Safe and Detector.* Patented July 12th, 1853.



To detect counterfeit coin, the gauge-box B is withdrawn from the case A. If the coin will pass snugly through the recess *d* into the box, it must of course be of the same dimensions as a genuine coin; and if counterfeit, it will be lighter. The clamps *c* are then withdrawn from the case A, and the small points *ff* are inserted in fulcrum holes, which are placed at certain points on the outside of case A, forming a kind of balance, so that, when a genuine coin is in the box B, and the box adjusted within the case *a*, the case *a* will exactly balance, or be in equilibrium when the case is suspended at the fulcrum holes, the coin being represented by *h*. If a counterfeit coin be of the same weight as a genuine one, it will necessarily be larger, and will not pass through the recess *d* into the box B; weighing in this case would be unnecessary. If the receptacle or gauge-box B contains several coins, they must be all removed when a coin is to be tested by weighing; and the coin to be tested should be moistened with spittle, to cause it to adhere to the end of the box, as shown in the figure at *h*, as a change of position of the coin would cause great inaccuracy in weight.

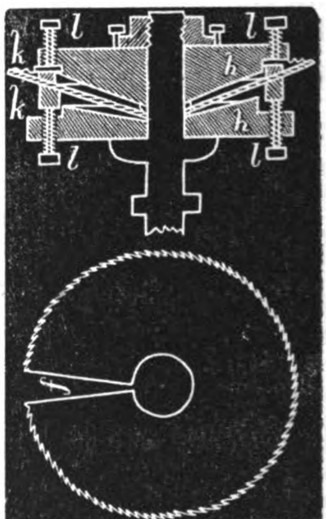
"I claim the peculiar construction of the implement, and the manner in which the several parts are arranged: by which construction and arrangement, I combine a portable receptacle for both coin and bank notes, convenient for the pocket, and a counterfeit coin detector. The implement being formed of a cylindrical case A, having a gauge-box or receptacle B at one end; and the remaining portion of the case inclosing the clamps C for the purpose as shown, and otherwise constructed and arranged, substantially as set forth in the body of the specification."

No. 9845. Samuel T. Sanford, Fall River, Mass.—*Improvement in Boring-Machines.* Patented July 12th, 1853.

The nature of this invention consists in fitting the auger to a stock, which is connected by a ball and socket, or other universal joint, with a long pole, which is attached to a suitable standard or base, in such a manner as to move in horizontal and vertical arcs, and in giving revolution to the auger by means of a pulley, which is fitted to its shank, and driven by a band from another pulley, which is fitted to a shaft working in the base or standard.

The attachments of the pole allow the auger to be easily brought to any required point in the bottom or any other part of a vessel, and to be held in position to bore in any direction.

"I claim fitting the auger stock F by a ball and socket, or other universal joint, to an arm E, which is connected with a fixed base or standard, so as to be capable of moving in arcs at any angle to each other, and giving rotary motion to the auger so arranged, by means of a pulley attached to the auger, and a band receiving motion from a pulley on a shaft at the butt end of the pole or arm, substantially as described."



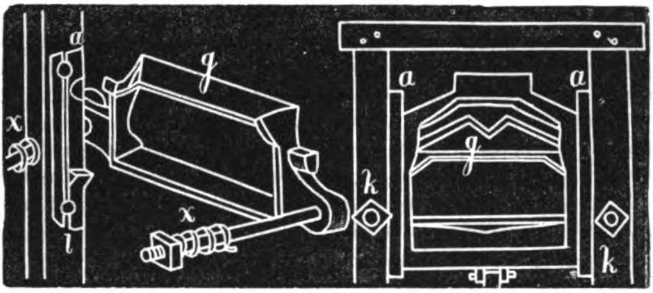
No. 9846. Ephraim R. Wells, Uniontown, Penn. —*Improvement in adjusting Dishing Saws.* Patented July 12th, 1853.

This improvement consists in adjustable rings K and K′ (see figure), which are regulated by screws *llll* passing through their respective washers *h′* and *h′*, by which to the saw any required curvature can be given. *f* represents a common circular saw, in which an angular incision is made, extending from the eye to the edge of the saw.

"I claim the adjustable rings in combination with the concave and convex washers, as described, for the purpose of holding and regulating the saw to any required curvature."

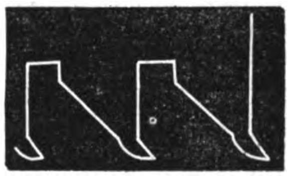
No. 9847. J. P. Smith & C. W. Seely, Albany, N. Y.—*Improvement in Straw-Cutters.* Patented July 12th, 1853.

The figure represents the improvement, *k* being the knife, *g g* the frame against which the knife operates; this frame is adjusted by means of a spring, shown in a separate figure: the springs pass through the frame-post, and are regulated by means of screws K K.



"We claim the arrangement of the metallic guide, in combination with the knife-frame, and the knife formed as herein specified, and with the frame against whose front edge the knife is intended to play; the said last-mentioned frame to be adjusted to its place by springs and screws, contained in hollow boxes or cars, and by trunnions and shoulders, substantially in the manner set forth in the specification."

No. 9848. Nathan T. Coffin, Knightstown, Indiana. *Improvement in forming Teeth on Mill Saws.* Patented July 12th, 1853.

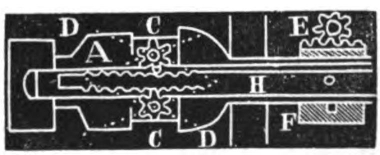


The nature of this invention consists in forming the chisel point of the tooth, as shown in figure, entirely by swedging, which operation is accomplished by means of a die, in which the ordinary straight-edged tooth is secured and the bent or chisel form given to the point by repeated blows of the hammer; also in dressing and sharpening the saw by the use of a file-gauge, in which the files are so arranged that no one tooth can be operated upon more than another, and by means of which the cutting edges are kept in the same plane, and any inequality in the set of the teeth removed.

"I claim the dies E and C, and gauge A, constructed as described, by means of which uniform chisel points are given to saw teeth by swedging, substantially in the manner and for the purposes specified.

"Also the combination of the files *r* and *g*, the block O, turned surface *f*, and regulating screw *h*, forming together the file-gauge F, by means of which, when used in combination with the bevelled file X, the chisel-pointed saw-teeth herein described are dressed, jointed, and have their edges rendered uniform, substantially in the manner specified."

No. 9849. Charles F. Brown, Warren, R. I.—*Improvement in Adjustable Screw-Propellers.* Patented July 12th, 1853.



The nature of this invention, as shown in the figure, consists in adjustable blades set in the hub of screw-propellers, for the purpose of altering the pitch of the screw, and for bringing them to a position to offer no material resistance to the vessel's progress when under sail.

A represents the hub; C C′ the pivots; and D D′, dotted lines, the adjustable paddles; E pinion; F the slide working the rack H.

"I claim arranging the pivots C C′ of the adjustable blades D D′, out of the centre of the hub, or at a distance from the axis, and carrying them right through the hub, substantially as described, whereby they obtain a greater depth of bearing, without placing one blade behind the other, and thereby rendering it necessary to cut away and weaken the after part of the vessel unnecessarily. This I claim without reference to precise means by which I turn the said pivots to adjust the blades.

"I also claim the employment of one of the adjustable blades of the screw-propeller as a rudder in case of need, when the said blade is operated for the purpose by mechanism, substantially such as is herein described, which also serves to adjust the blades as a propeller."

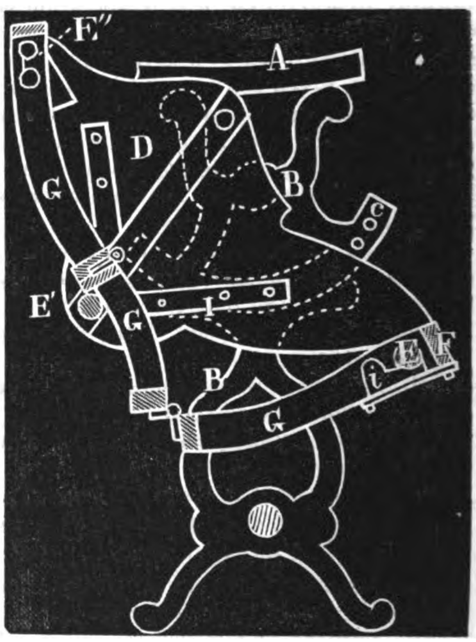
No. 9850. Linus Yale, Jr., Newport, N. Y.—*Improvement in Locks for Banks.* Patented July 12th, 1853.

"I claim pressing the form of the key upon inert tumblers, or their equivalents, which shall retain said impression while being separated from the key, and beyond reach or influence through the key-hole, before they can touch the fence, for the purpose and in the manner substantially as described.

"I also claim, in combination with inert tumblers, the cross-bolt D, which takes the strain of end pressure on the main bolt, and acting as a tumbler carriage, to convey the tumblers beyond reach or influence through the key-hole, when it moves to the fence out of its locked position with the main bolt."

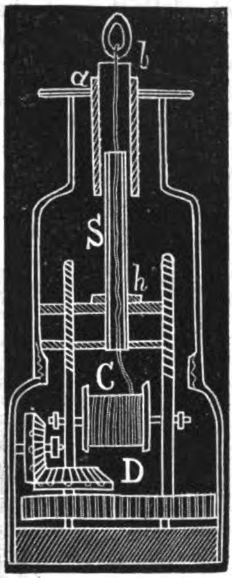
No. 9851. Charles P. Bailey, Zanesville, Ohio.—*Improvement in Railroad Car Seats.*

The figure represents the improved car seat, and the inventor claims "so hanging a reversible car seat, whose seat when reversed forms a portion of the back, and *vice versa*, as that it shall occupy the same space after it is reversed that it did before, or hang between, or nearly so, the same parallel lines that it did before reversing, and so that also the seat backs may have an adjustment together, or independent of each other, substantially as described; and this I claim, whether the seat is divided into two or more parts, or used without division, as herein set forth."



No. 9852. Samuel T. Barnes, Columbus, Ohio.—*Improvement in Press-mould Candlesticks.* Patented July 19th, 1853.

The nature of this invention consists in furnishing the press-mould candlestand, with a tube *a*, shown in figure, in the centre of the mould, through and out of which the candle b is forced by pressure, so as to supply it with a wick through the said tube, the wick being drawn from a spool c, attached to the lower part of the press D. The wick-tube S in the mould is stationary, and not allowed to extend up quite as high as the top of the mould, and the wick is drawn up and brought out of the top of the candle-tube a, so as the tallow when forced out will draw the wick off of the spool and up the tube, and thereby provide the candle with a wick as it is pressed out of the mould, by means of the press-plate h, worked by screws and gearing D.



"I claim the wick-tube s s, to guide and retain the wick in the centre of the candle, in combination with a wick so arranged on a spool as to supply a continuous wick as the tallow is forced out, to form the candle, substantially in the manner described."

No. 9853. James C. Booth, of Philadelphia, Pa.—*Improvement in Process for obtaining Chromates.* Patented July 19th, 1853.

The nature of this invention consists in reducing the oxide of iron in chrome, or either wholly or in part by means of carbon in any of its several forms, or by means of any of its compounds, which are or may be employed as fuel, such as carbonic oxide, carburetted hydrogen, as the first stage of the manufacture; and *secondly*, in removing the iron reduced by means of sulphuric acid. The remainder of the process of manufacture is similar to that which is now in common use. The inventor employs chromic iron in powder form, and mixes it with powdered charcoal, about one-fifth of the weight of the ore. It is exposed to heat in a reverberatory furnace. When reduced, it is raked out and thrown into dilute sulphuric acid, whereby the iron is dissolved. This solution still containing free acid, is drawn off and run upon a fresh charge, to saturate fully the free acid, after which it is again drawn off and evaporated to crystallization, so as to produce copperas in a state adapted to commerce. The residue in the vats is well washed and dried; it is then mixed with carbonate of potash, or with carbonate of potash and saltpetre, and heated in the process usually employed in the manufacture of chrome.

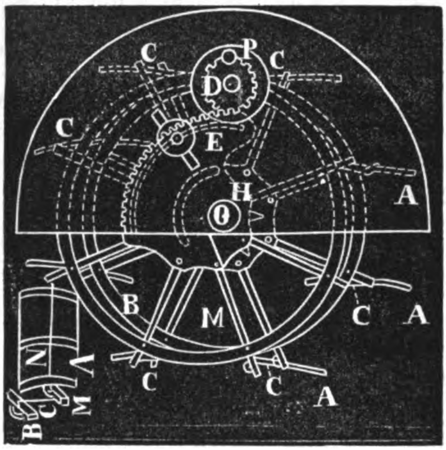
"I. I claim the reduction of chrome ore by the carbonaceous materials, as herein described, as a stage in the manufacture of chromate potash.

"II. The art or process of manufacturing chromate and bichromate of potash from chromic iron ore, by means of the reduction of the oxide of iron, and the removal of the reduced iron by the several substances and modes, substantially as herein enumerated and set forth.

"III. I claim the process of reduction and removal herein described, in connection with the old process of reduction herein described, or in combination with the equivalent therefor."

No. 9854. A. H. Brown, Washington City, D. C.—*Feathering Paddle-Wheels.* Patented July 19th, 1853.

Specification. The figure shows a longitudinal view of paddles. A A A A represent the curved paddles as held in a vertical position by the guide-wheel B, through the action of the crank, C C C C, &c. D represents the pinion, geared into the rack-cam E, at the point from which the regulators of the paddles commence their action, in order to adjust the paddles to any desired angle. P represents a drum on the inner side of the boat connected with the pinion, and on the shaft of the same, over which drum a band or rope passes, and which is connected with the steering of the vessel in such a manner that, by the movement of the steering-wheel, the drum and pinion may be made to revolve, whereby the angle at which the paddles enter the water may be instantly and readily changed.



F is an eccentric cast upon the rack-cam E, and turned perfectly true and smooth, in order to act as a journal for the collar or flange G, which is also cast upon the hub or plate H of the guide-wheel B; which collar is also turned and adjusted to the outside convex surface of the eccentric F, in order to play freely around. C C C C are the cranks on the paddles, and represented in a vertical position, and secured to the arms of the guide-wheel with collars and bolts passing through the arms, similar collars and bolts being also used upon the end of the arms M M, &c., of the main wheel, in order to hold the paddles in any position in which they may be placed by the action of the regulator. N, &c., are bars to which the paddles are secured to the crank-shaft. The length of the arms of the crank must agree with the elevation of the centre of the eccentric above the centre of the main shaft O.

The figure also represents the pinion D at the opposite end of the rack-cam E; and from having caused the rack-cam to travel one-fourth of the diameter of the wheel, it will have caused the paddles A A to assume a horizontal position.

In order to adjust the paddles to any desirable angle, it is only necessary while the boat is either stationary or in motion, to loosen the bolt screwing the rack-cam to the wheel-house by one turn of the nut, and turn the crank attached to the pinion D, by which means the paddles can be thrown into any position in an instant, and secured to that point by a turn of the nut upon the rack-cam belt. In case of the loss of the rudder of the vessel, or if the vessel does not readily obey the rudder, the band or rope passing around the drum P, and connected with the steering-wheel of the vessel, will cause the revolution of the pinion D, whereby the angle at which the paddles enter the water will be changed; by this means the vessel can be easily steered.

The advantages possessed by my paddle-wheel, in addition to those possessed by other adjustable wheels, are: 1st, the paddles having the curved form have a much greater propelling power than an ordinary flat paddle, as the paddle acts upon the water like the curved foot of the duck. This form of paddle has been applied to the stationary paddle, but its application has failed in that case, because what is gained by the curved paddle in entering the water is lost by lifting the water as it leaves. The advantages of the curved paddle can only be obtained in connection with the adjustability and feathering of the paddle-wheel.

By my combination of the rack-cam and pinion with the eccentric, the angle at which the paddle enters the water may be changed with greater facility and rapidity than by any other arrangement before devised.

The paddles being thus rendered so easily adjustable, by combining the drum with the pinion and rack, or the adjusting apparatus, I have a new means of saving the vessel in case of accidental loss of the rudder. The arm and paddle-adjusting machinery being connected with the steering-wheel, in the manner above described, is instantly converted into a steering apparatus by causing a variation between the two wheels in the angles at which their paddles enter the water. The same apparatus may also be applied to assist the rudder to turn the vessel more suddenly.

"I claim the combination of the pinion D, rack-cam E, and steering-drum P, with the eccentric F, for the purpose of adjusting the paddles, and converting them into a powerful steering apparatus.

"I also claim the combination of the curved paddle, with any apparatus for adjusting and feathering the same."

No. 9855. Isaac Brown, of Baltimore, Md.—*Improvement in the Mode of Driving Saws.* Patented July 19th, 1853.

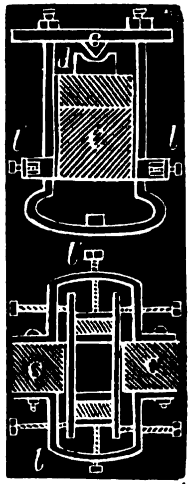
The nature of this invention consists in so applying the power of steam to the saw-gate or frame of a saw-mill, that if the gate or frame should vibrate laterally, or otherwise run out of line, said defect shall not be communicated to the piston or cylinder, and cut, cramp, or otherwise injure them. The inventor attaches on each side of a fender-post a steam cylinder; through such cylinder pass in proper stuffing-boxes the piston-rods, furnished with a single piston-head, and extending sufficiently far beyond each end of the cylinder, so that one end of each rod may be almost in contact with the under side of a projection from the saw-frame; and the other ends of said rods may be also nearly in contact with another projection from the saw-frame.

The object in leaving the rods unconnected with the saw-frame, is for the purpose of preventing the play of the gate from being communicated to the piston, and causing them to cut or bind the packing or cylinder.

"I claim the mode herein described, of applying the power of the engine to the saw-gate or frame, without being permanently connected therewith, so that the piston shall in a great measure be relieved from any lateral motion which the gate may have, which causes it to bind or cut in the cylinders, substantially as described."

No. 9856. N. T. Coffin, Knightstown, Indiana.—*Improvement in Flanging Mill Saws.*

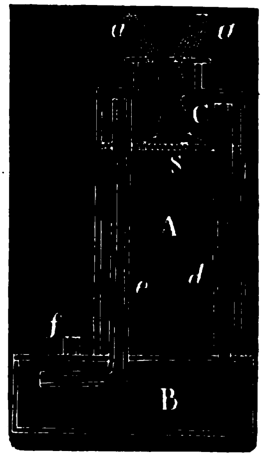
To regulate the pitch of the saw, the inventor uses the screws $l\ l'$, as seen in the figure, whereby he is able to accomplish it with great facility, ac-



cording to the size of logs; for instance, small logs require the saw to be more vertical than for logs of larger dimensions. The knife-edge c, and hollow or grooved plate d, permit the stirrup to be moved backward or forward without binding or twisting.

"I claim the combination of the stirrup hung upon a knife-edge, with the adjusting screws $l\,l'$, for the purpose of regulating the rake of the saws in the manner described."

No. 9857. CHARLES JAMES CONWAY, New York City.—*Improvement in Lamps.* Patented July 19th, 1853.



The improvement in this lamp consists in a cylinder A. (See vertical section represented in the figure.) To the top are attached the burners *a a*; the upper part of the cylinder A is divided from the lower by a partition S, thus forming a chamber C into which the wicks are placed.

There are two tubes *e d* which pass up from a reservoir B into the cylinder A, and through the partition S into chamber C.

The cylinder A is soldered on to the top of the reservoir B; so is the tube *d*, which passes through the top of B, and is open at the bottom and top; the tube *e* passes through the top of B, and makes an elbow, and running along under the top of B; the extremity is open.

The fluid is poured into the reservoir through the tube *f*; this tube is closed, and the lamp held in such a position that the cylinder A gets in horizontal position, in order that the fluid flows into the wick-chamber C through tube *d*, whilst the air escapes throrgh *e*; when the wicks are saturated, the lamp may be placed in its proper position and lighted.

When the lights show that the fluid in contact with the wicks is nearly exhausted, the lamp may be held in a horizontal position without extinguishing the lights, and the wick-chamber will be thus immediately replenished.

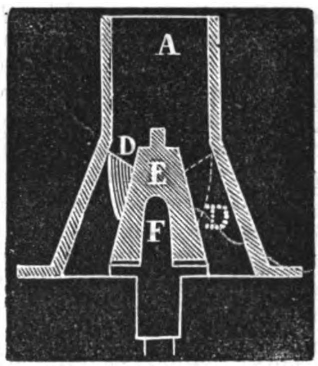
"I claim that peculiar construction by which two chambers or reservoirs are combined in the same lamp, one containing the wicks and the fluid which saturates them, and the other forming the receptacle into which the fluid is poured, and the two chambers communicating by means of two pipes or tubes, the whole arranged and operating as described; by which means the wick-chamber is filled, and may at any time be replenished from the larger reservoir by simply changing the position of the lamp from a vertical to a horizontal direction; and the larger reservoir may be supplied without bringing the can or filler near the burners."

No. 9858. JOHN JACKSON, Andover, Mass.—*Improvement in Spinning-Jacks.* Patented July 19th, 1853.

The nature of this improvement consists in a simpler method of forming the cops and bobbing, and is an improved method of stripping the spindles preparatory to "winding on" the thread.

"I claim the stop R, in combination with the tappet e^4, or gear j', for the purpose of arresting the motion of the latter at the instant the belt is shipped upon the pulley b, that the gear j' may be left in the precise position necessary for the performance of another duty the instant it is again set in motion, without being carried past this position by momentum or otherwise, *when* the brake R is so arranged, in connection with the lever S, or otherwise, that it shall be withdrawn by the mechanism which shifts the belt at the instant the gear j' is again set in motion; the operating the winding on mechanism, raising the stripping wire, and depressing the building wire in the proper order, and then shifting the belt on to the fast pulley, at the close of these operations, by means of a single-cogged gear in combination with the tappet placed upon its side—the whole arranged and combined in the manner substantially as specified."

No. 9859. EDMUND MUNSON, Utica, N. Y.—*Improvement in Eyes for Mill-Stones.* Patented July 19th, 1853.



The inventor constructs the eye of the stone in such a manner, that the central cone supporting the runners shall be sustained by spiral wings extending from the cone to the inner surface of the eye; these wings so constructed as to prevent choking and clogging, and causing a current of air to pass into the eye and between the stone, thus facilitating the feeding of the grain, and also supporting the stone.

In the figure, A represents the eye; D D are spiral wings. These wings fit between the inner periphery or side of the conical portion of the eye and the cone E. F, the spindle.

"I claim the spiral wings arranged in such manner as to perform the double office of feeding the grain and supporting the stone."

No. 9860. RALPH C. PRATT, Canandaigua, New York.—*Improvement in Machines for Ditching.* Patented July 19th, 1853.

The nature of this invention consists in forming a simple, self-acting implement of revolving shovels, with a beam and casing, and a cutting and scraping point for ditching.

"I claim the ditching machine, consisting of a beam and casing, or their equivalents, in one or more parts, with a cutting and scraping point, hung on the shaft of a revolving-wheel, with shovels attached to the outer circle of the wheel, which self-act by turning the wheel, and forming a bucket in connection with the casing, so as to carry up the earth to the inclined sides, the whole being operated and constructed substantially as herein described."

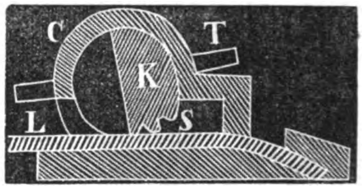
No. 9861. JOHN FARREL, of Philadelphia, Penn.—*Improvement in Lining for Fire-proof Safes.* Patented July 19th, 1853.

The nature of this invention consists in the introduction of flour, grain, or other vegetable substances, into the space which such safe is usually filled with,—non-conducting materials, which can be combined with lime, cement, or other similar materials.

The inventor considers the new composition of flour, grain, &c., a good material to resist the transmission of heat.

"I claim the application and use of flour, grain, maize, starch, or other vegetable substance of a like nature, either alone or in combination with lime, cement, or similar substances, in the construction of fire-proof chests or safes, substantially as described."

No. 9862. BARDFORD ROWE, Albany, N. Y.—*Improvement in Gripes for holding Leather.* Patented July 19th, 1853.



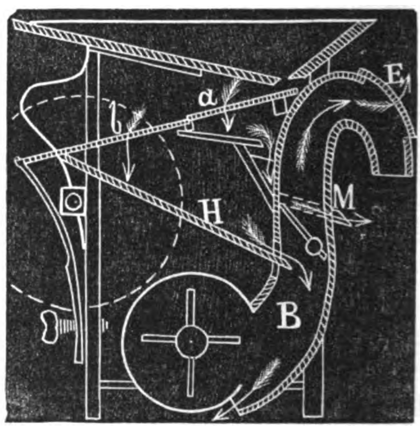
The principle of construction of the gripe is shown in figure. K represents the key, being cylindrical, and fitting the bore of the cap C.

The back angle of the key, where the flat and cylindrical surfaces meet, is cut away at or near a right angle to the flat surface, and grooved lengthwise, as shown at S.

When the leather L is introduced, the key K is turned from the right to the left by means of a handle T, so as to bring the edge at or near S down firmly upon the leather; when the leather is drawn from the gripe, it will tend to turn down the grooved edges S of the key more firmly.

"I claim the construction of a gripe composed of a key turning within a socket or chamber, the key being a solid cylinder with a portion of its surface cut away, in two faces parallel with its axis, and at an angle with each other; one face being grooved lengthwise, and the chamber being a hollow cylinder, with a portion of its space filled up parallel with its axis, and having a longitudinal slit through it for nearly its whole length, corresponding with the cut away part of the key, so that when the key is in the chamber, a strap of leather or other material can pass through the chamber and under the key, as described in this specification."

No. 9863. GEO. B. SALMON, Elmira, N. Y.—*Improvement in Grain Winnowers.* Patented July 19th, 1853.

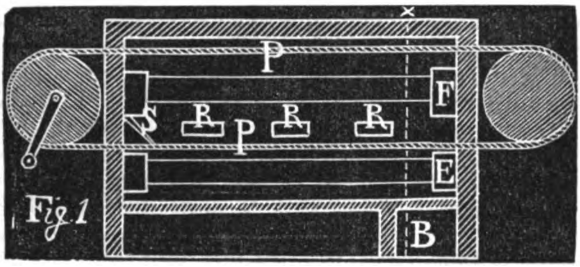


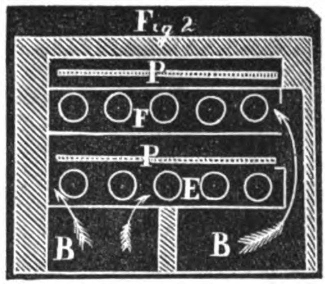
The figure and claim explain the improvement.

"1st. I claim the expansion of the upper part of the blast-spout B, into the circular, irregular, enlarged head, with an opening or mouth at the lower extremity, partly covered with the sieve E, for the purpose of allowing the force of the blast to be exhausted, the screenings immediately falling through the opening or mouth of the head, while the blast and dust escape through the screen E, the blast being governed by a slide, substantially as fully set forth and described.

"2d. I claim the arrangement and construction of the graduated sieve *a b*, of unequal fineness, the portion *a* being protected from the action of the fan-blast, so that the small substances, such as cockle, &c., passing through and falling on the bottom board of the sieve *a*, passing off at the trough and spouts M M; and when the grain arrives at the coarser part of the sieve *b*, it passes through and is acted upon by the fan-blast, while larger substances than wheat pass over the end of the sieve *b*, and fall on the floor, substantially as herein fully set forth."

No. 9864. Ephraim Treadwell, New York City.—*Improvement in Baking-Ovens.* Patented July 19th, 1853.





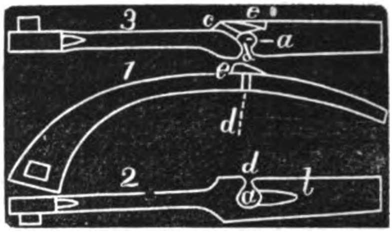
The nature of this invention consists in making a perpetual oven, having side-doors in it for charging and discharging it at intermediate points between the ends of the oven, in combination with upper and lower independent heating flues and furnaces, for directing the entire heat from one set of furnaces through flues on the upper side of the article to be baked, and the entire heat from the other independent set of furnaces, through flues at the under side of the article to be baked, which are placed upon an endless belt.

B B are furnaces having separated sets of flues, communicating with chambers E and F, shown in Fig. 2; P, endless apron upon which the articles to be baked are placed, and removed through the doors R R R, shown in Fig. 1; S is a scraper.

"I claim the use of a perpetual oven, having side-doors in it, for charging it and discharging it at intermediate points between the ends of the oven, in combination with upper and lower, and independent heating flues and furnaces, for directing the entire heat from one set of furnaces through flues on the upper side of the article to be baked, and the entire heat from the other independent set of furnaces through flues on the *under* side of the article to be baked, substantially as herein before set forth."

No. 9865. W. H. Thompson & Richard H. Plummer, Biddeford, Maine. *Improvement in Compressors for Flyers.* Patented July 19th, 1853.

The nature of this invention consists in adapting the compressor to the speeder flyer, and to work on a bobbin having two heads, whereby two and a half as much roving on the speeder-bobbin can be wound, and gain 150



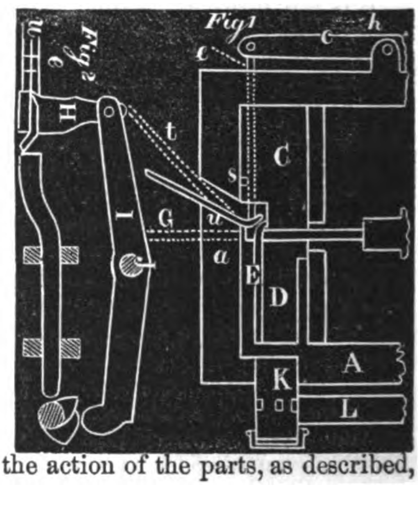
per cent. of wind on each bobbin, according to the statement of the inventors, who set forth in their specification:

"In order to enable us to apply the compressor to the double-headed bobbin, we make it where the roving passes through it, not only *thicker*, but narrower than it is usually made, for fly-frame flyers; and we make a hole *a* through it of much smaller diameter than the hole necessary to it when used on the flyer of the fly-frame. We next form a groove or channel *b* in the front edge of the compressor, and leading into the hole *a*, as seen in Figure 2. Out of such hole, and on the *rear* edge of the compressor, and extending from the opposite side of the hole, we form another groove *c* (see Fig. 3). We also make an opening *d* down from the top of the compressor into the hole *a*, and nearly at a right angle with the grooves *b c*, or passage made by them, such opening being to enable an attendant or person to readily slip the roving sideways into the hole *a*, instead of inserting it endwise through it, while its angular position with respect to the passages *b c* prevents the thread from slipping out of them. In order to compensate for the strength lost by cutting the passage *d*, we increase the width of the compressor underneath the hole *a* by a projection or rib *e*, shown at 1, which rib also serves as a guard to prevent the roving from doubling under the compressor, and thereby being injured or broken.

"By means of the small hole, and the guide-grooves leading into and out of it, we cause the roving to be kept close to the coil or layer on the bobbin, and much closer than can be effected when using the large hole compressors, as used on the fly-frame. Besides this, we are enabled to so reduce the width of the compressor, as to enable us to employ it on the speeder-bobbins.

"We claim the combination of the guard-rib *c*, with the hole *a* and the passage *b*, and the opening *d*, substantially in manner and for the purpose as specified."

No. 9866. PHILIP P. TRAYSER, Baltimore, Md.—*Improvement in Spike Machines.* Patented July 19th, 1853.



The inventor describes the operation of his improved spike-machine as follows:

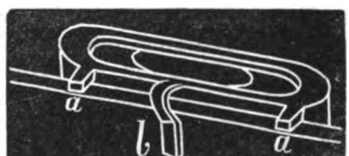
When the knife has been advanced far enough by the act of closing the die D, shown in Fig. 1, top view, to pass the rod *u*, the cam *h* then acts upon the lever *c*, which pushes the stake or stump *e* forward, so that the bending of the rod is in this case effected by the movement of the stump *e* in one direction, simultaneously with the movement of the stump *a*, or knife E, in the opposite direction, the two latter bending the two ends of the rod over the stump *e*, as represented in Fig. 1. The rod *r*, when thus bent by the action of the parts, as described, will have a tendency at its outer or long end to assume a long and gradual bow, as represented by the dotted lines *t*, which tendency will increase as the iron becomes cool and stiff, and will be diminished when the metal is very hot and plastic. As this long curvature in the rod would render it exceedingly inconvenient to feed it, and would vary the angle of inclination of the bent with respect to the heading-punch, it would cause an irregularity in the form of the heads, and would be otherwise objectionable; it is therefore necessary to have the rod straightened; this is readily effected by the attendant of the machine swaying the outer end of the rod back in the opposite direction to that in which it tends to curve, which will have the effect of counteracting the tendency of the rod to bend. It will be necessary for the attendant to sway the rod round more as it becomes cooler and stiffer; by this means a uniform bend will be given to the end of the rod, and thereby uniformity in the form and size of the head of the spikes will be ensured.

C is the stationary portion of the griping and shaping die; D is the movable portion of the griping die, and carries with it the knife E, which severs the rod *u*, and a stump or projection *a* which aids the bending of the rod; G is the notch or groove in the end of the frame, through which the rod is passed to the dies; H is the pointing die, and I the lever which operates it; J, rock shaft and fulcrum of lever I, shown in Fig. 2; K is the toggle-lever by which the die D is worked; L the lever by which K is actuated.

"I claim the combination with the knife which severs the blank from the rod, of two stumps, either or both moving, whereby while one blank is being headed and pointed in the dies, the end of the rod for the next blank is cut off and bent preparatory to forming a head, substantially as described.

"I also claim the method of heading spikes by bending the end of the rod preparatory to upsetting, before placing it in contact with the dies, whereby the heated rod is kept a shorter time in contact with the dies, and therefore heats them less, while at the same time it is not detained longer than usual out of the dies, so that by this method the dies are better protected from the excessive heating, the rod from cooling, and the whole operation expedited and improved, substantially as herein set forth."

No. 9867. SYLVESTER J. SHERMAN, New York City.—*Improvement in Mounting Spirit Levels.* Patented July 19th, 1853.



This improvement consists in providing common spirit levels with a spring-catch *b*, as shown in figure, and bearers or projections *a a*, to be placed upon a square or ruler, or levelling instrument.

"I claim the spring-catch to hold the level in place upon the square or ruler, in combination with the bearers, the latter being so formed in respect to the level, that when they are placed upon a horizontal line, the bubble will be in the middle of the glass, and thus a horizontal or a vertical line may be ascertained from a ruler or from a square, when said level is attached, substantially as set forth herein."

No. 9868. THOMAS C. WEILDON, Hartford, Conn.—*Improvement in the Manufacture of Wigs.* Patented July 19th, 1853.

The nature of this invention consists in the method of fastening and attaching the hair with a gluten to the net-work or other materials of wigs, toupees, bands, braids, curls, &c., or any other kind of hair-work.

"I claim the method of fastening and attaching the hair to wigs, toupees, or any other kind of hair-work, by means of any kind of glutinous substance, in the manner and for the purpose substantially as herein set forth and described."

No. 9869. CHS. WILLIAMS, Philadelphia, Pa.—*Improvement in the Preparation of Bristles for Brushes.* Patented July 19th, 1853.

The band or ferules that confine the bristles are drawn over about two-thirds or three-fourths of the length of the bristles from the flag end (that being smaller than the root), and then submitted to the action of heat, by being placed (with the root down) upon the top of a boiler heated by steam. The heat displaces the moisture from the roots, and contracts them in a remarkable degree, according to the statement of the inventor, so as to enable the operator to draw the bristles with ease to their proper place within the band or ferule, and made ready for finishing.

"I claim as new in the manufacture of that class of brushes known as 'drove-work,' preparing the bristles by the application of heat to the roots, substantially in the manner and for the purpose which I have herein fully set forth."

No. 9870. LEONARDO WESTBROOK, New York City.—*Improvement in Gutta-Percha Stereotype Composition.* Patented July 19th, 1853.

The nature of this improvement consists in a substitute for type-metal for the purpose of stereotyping, and taking casts from types, cuts, and engravings, and for embossing and other purposes, being an improvement on Josiah Warren's invention and process for similar purposes.

SPECIFICATION.—Article 1st. I first take shellac and plumbago, or graphite, of each three parts, to which I add one part of asphaltum—melt and mix them thoroughly together; I then take thirteen parts of gutta-percha in its crude state, and cut it into fine shreds with a cutting machine constructed for the purpose; I then put the gutta-percha and the above described compound into a grinding apparatus constructed for the purpose; I then make a solution of the sulphate of copper in water, in the proportions of one pound of sulphate of copper to one gallon of water. This solution, sufficient in quantity to cover the mass, is then heated to about 212° Fahr., and passed through a tube or siphon into the mass in a regular stream, while the grinding apparatus is set in motion and the whole passed through it; after which the new compound thus formed is passed between iron rollers that are immersed in the heated solution of sulphate of copper and water in the same proportions as described above; and it is rolled out into thin sheets, and then if found free from foreign substances, it is ready for use.

The object of grinding and working the compound in the above-described solution is to destroy its elasticity and ductility, and to render it sufficiently and permanently hard and cohesive when formed into plates, casts, dies, moulds, or forms to withstand the necessary pressure or force requisite to produce the desired result.

The new compound thus prepared I immerse in hot water, and when sufficiently soft, I work it into the desired shape with my hands, being careful to keep a smooth and polished surface on one side by means of rubbing over it finely powdered ivory black or graphite. I then place the polished surface on the type engraving, or other form, from which a *fac simile* is desired to be taken. I then put them into a press with a smooth and level bed-plate and platen, between which and on each side of the form to be taken are placed two bearers of solid material one-eighth of an inch thicker than the type or form. The platen of the press is then brought down until it presses firmly on the bearers, where it is retained until the composition becomes cool and hardened, which requires from five to ten minutes, when it is then taken out of the press, and the composition is removed from the form, and it is then an exact matrix or mould of the form on which it has been impressed. I then place this matrix or mould on a block of mahogany, or other hard wood, of the desired length and breadth, and a quarter of an inch thinner than the bearers; and after preparing another portion of my composition in the same manner as described above, I place it on the mould, put it in the press, and bring the platen down to the bearers as before, and retain it there until it is cool, when it is taken out, the mould removed, and the plate being an exact *fac simile* of the original, is ready for printing.

I take a piece of box, or other finely-grained wood, of the size and thickness required, and with suitable and peculiar shaped instruments, I design, engrave, or impress the object or subject desired; this being done, I take an impression with my compound, herein specified, from the block in the following manner:

First, I confine the block in a chase one-eighth of an inch higher than the surface or level of the block; I then take a sufficient quantity of my compound to form a plate in its soft or yielding state, which I mould in proper form; I then rub on the part that will come in contact with the wood, ivory black or graphite, which destroys its adhesive qualities; it is then laid upon the block and put to press, the platen of which being perfectly level, is brought to bear upon the chase. By this process I produce a *fac simile* of the design, which may be printed from as soon as blocked in the manner as aforesaid.

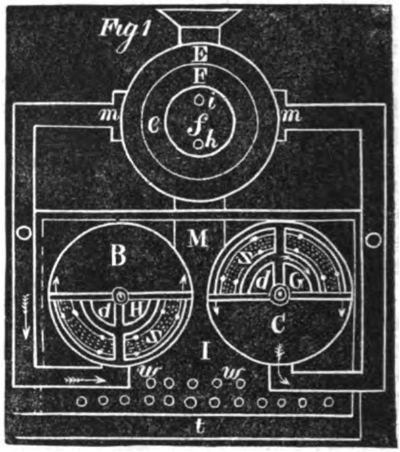
Article 3d. When the above specified compound is to be used for embossing paper, foil, silk, or any other yielding substance or material, either from dies in wood, steel, or any other substance, I secure the die or bed-plates of an embossing press; I then take a sufficient quantity of my composition in its yielding state, and after moulding it with the hands to its proper form, and applying the ivory black or graphite, for the purpose as aforesaid in Article 2d, I place it against the lick-up which is attached to the plunger, by the downward movement of which the composition is brought into contact and is compressed into the die. It remains in this position until cool, when the plunger may be raised, and the composition will adhere to the lick-up. I am now furnished with an upper force or die for embossing, which will give a sharper impression, is more durable, and requires less time for its adjustment, than by any other process or materials now in use.

Article 4th. For the production of articles practical and useful from said compound—such as jewelers' cases, daguerreotype cases, fancy boxes, or the duplicating of elaborate carved work—this is my process of working my composition into any of the above-named articles:

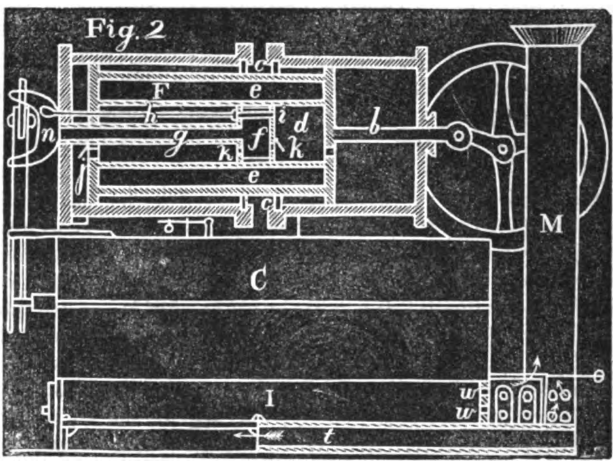
Furnished with a model of the article to be duplicated, I procure a chase of proper dimensions, in which I place a sufficient quantity of my compound in its yielding state, covering the surface of it, as before specified, with ivory black, graphite, or pearl powder; on it place my model; I then put it to press, the platen of which is brought to bear upon the chase. When the compound has cooled, I remove the model and the mould is, formed, from which, by a second application of my composition prepared in the same manner, and the use of a proper-shaped follower, I produce a *fac simile* of the mould. In the second application it is necessary to use bearers of a proper thickness between the platform and platen of the press.

"I claim the compound, herein described, of shellac, plumbago, or graphite, asphaltum and gutta-percha, treated by sulphate of copper and water, in the manner described, as a substitute for type metal."

No. 9871. Austin O. Wilcox, Philadelphia, Penn.—*Improvement in Air Engines.* Patented July 19th, 1853.



The nature of this invention consists in the employment of interchanging circulators G G and H H, shown in Fig. 1, which are situated within, and occupy one-half of the capacity of each heat-reversing vessel B C, and are so arranged as to alternately transfer the air or other fluid to the heating and cooling divisions of the upper half of said vessels, and in the same movement to cause the air to pass through renovating plates Z Z, whether placed within the circulators and transmitting the air, or placed without the circulators and the air forced through them. Secondly, in placing an inwardly-pressing packing *c c* (see Fig. 2), in the open end of each working cylinder, and in combination therewith the construction of the working piston (being of the requisite length), of a little less diameter



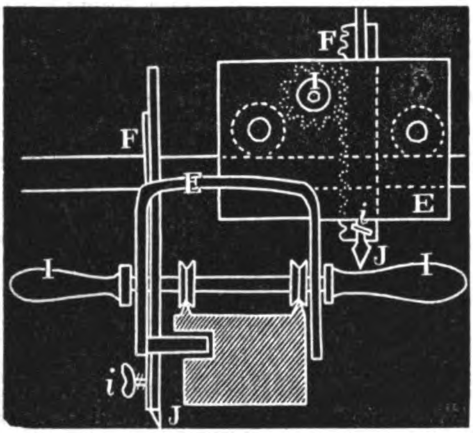
than the interior of the cylinders; whereby the friction-surface is confined to the periphery of the piston, in order to sufficiently exclude its lubricating fluid from the contact of the hot air within the cylinder.

"I claim the interchanging circulators G G and H H, situated within and occupying one-half of the capacity of the heat-reversing vessel B C, and so arranged as to alternately transfer the air, or other fluid, to the heating and cooling divisions of said vessels; in the same movement to cause the air to pass through renovating plates Z Z, &c., or their equivalent, whether placed within the circulators and transmitting the air, or placed without the circulators and the air forced through them, substantially as herein described.

"I also claim placing an inwardly-pressing packing *c*, in the open end of each working cylinder; and in combination therewith the construction of the working piston (being of the requisite length) of a little less diameter than the interior of the cylinders, whereby the friction-surfaces confined to the periphery of the piston, in order to sufficiently exclude its lubricating fluid from the contact of the hot air within the cylinders, substantially in the manner herein set forth.

"I claim the barrel *d* and stationary hollow piston *f*, with its supply-tube *g*, aperture *i*, valves *h* and K K, in combination with the working piston *f* and its valves *j j'*, for the purpose of supplying air or other fluid to the cylinders, when desired, substantially as herein described."

No. 9872. FREDERICK HESSE, Bethlehem, Pa.—*Improvement in Paper-cutting Machine.* Patented July 19th, 1853.



The nature of this invention consists in having an adjustable knife or cutter J (see figure,) placed within a sliding-stock E, and so arranged that said knife or cutter may be regulated to cut the required depth, by merely turning the handles I, by which the sliding-stock is moved upon the bed.

"I claim cutting paper, pasteboard, or other articles by means of a knife or cutter J, attached to the rack-bar F, which makes into a pinion G, said pinion being hung or attached to a spindle or shaft H, to the ends of which the handles I I of the sliding-stock E are secured, the above parts being attached to the sliding-stock E; by which device the knife or cutter may be elevated or depressed, as desired by the operator, while working the sliding-stock upon the bed-piece B, as herein set forth."

No. 9873. CYRUS C. BISBEE, Rochester, N. Y.—*Improvement in Shower-bath Tables.* Patented July 26th, 1853.

The nature of this invention consists in constructing a table or other similar piece of furniture, in such a manner as to contain a suitable apparatus for a shower-bath.

The four legs containing tubular standards, which can be elevated by means of rack and pinions, with the shower-tray, which is placed under the leaf of the table. The lower tray, which is also under the leaf of the table, can be let down when to be used.

"I claim the combination of the upper and lower tray, substantially as herein described, so that they shall simultaneously recede from each other to elevate the water and set up the bath, and approach each other to pack away the bath and convert the apparatus into a table."

No. 9874. RICHARD C. BRISTOL, Chicago, Illinois.—*Improvement in Rotary Steam-Engines.* Patented July 26th, 1853.

"I claim the combination and arrangement of the outward radiating pistons, or their equivalents, with the sliders, steam ways or passages, and abutments, in such manner that the sliders are free from lateral friction, by pressure of the propelling medium in passing the abutments, and are worked outward and kept up to their bearing by the pistons, substantially as specified, whereby promptness and certainty are insured in the outward action of the sliders, counteracting pressure to their inward radiation removed, and a tight but free action of the sliders throughout their entire travel produced, essentially as set forth."

No. 9875. WILLIAM V. BURTON, Orange, Ohio.—*Improvement in Ploughs.* Patented June 21st, 1853.

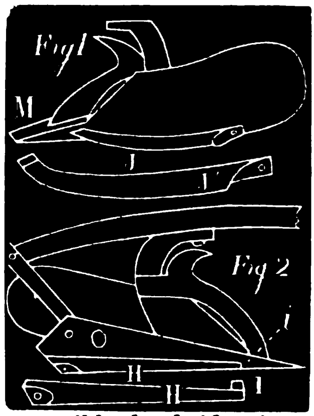


Fig. 1 represents the plough, seen from the side where the mould-board is placed; the inventor attaches to the lower edge of the mould-board a piece, marked J, that he calls land-cutters, which are secured to the point M by means of a tenon, fitting into a mortise made into the point. Fig. 2 shows the land-side, with a reversible land-side piece O, into which a counter-side H fits, and is secured by means of tenon I in the mortice *i*.

"I claim first the manner of securing the points of the land-side land-cutter J, and counter-side H, by the lock couplings or joint, formed in the mortice *i*, by the curvature of the tenons I and *i*, as herein set forth.

"Second. I claim the plough-point M, and a reversible land-side piece, in the manner specified, whereby the land-side piece and point M are made reversible."

No. 9876. F. B. HUNT, of Westfield.—*Improvement in Mills for Grinding Apples and other substances.* Patented July 26th, 1853.

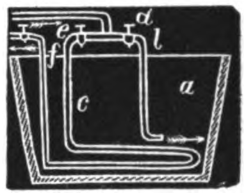
The nature of this invention consists in the employment or use of two endless belts—a stationary and movable one—said belts having spurs or teeth upon them, and arranged in a manner as to feed equally well small or large articles or substances to the cutters.

The lower belt is double the length of the upper belt; the lower one remains in its horizontal position; the upper one is adjustable: it can be elevated or depressed, so as to allow the space between the two belts to be greater or less, according to the size of the article to be carried to the cutters or knives which are placed upon a cylinder.

"I claim the employment or use of the endless belts C and D, arranged as described, viz., the upper belt C having an adjustable roller *c*, which upon being elevated or depressed, causes the belts at the discharge ends to be brought nearer together, or separated further apart, thus allowing the belts to be adjusted to feed or convey to the cutters all the different articles or substances which at present require each a separate and distinct machine.

"2nd. I claim in combination with the two endless belts, arranged as described, one or more cutters or cutting cylinders G M, said cylinders being placed loosely on their axes, and secured by set screws, as herein described, by which several forms of cutters may be used, according to the work required to be performed."

No. 9877. DAVID A. JANES, Cincinnati, Ohio.—*Improvement in Processes for making Glue.* Patented July 26th, 1853.



This improvement consists in washing the tanners' scraps thoroughly by small quantities in a thick cream of lime, and to pile them under the protection of a roof in layers. The moist scraps direct from the pile are washed, and in order to be freed from all calcareous matter, they are placed in a bath of diluted sulphuric acid, again carefully washed and ready for boiling, which is done in a steam apparatus, as shown in figure.

a represents the tub; *b* the open steam-pipe; *c* close steam-pipe; *d* and *e* stop-cocks for the admission of steam; *f* stop-cock to regulate the pressure of steam within the coil.

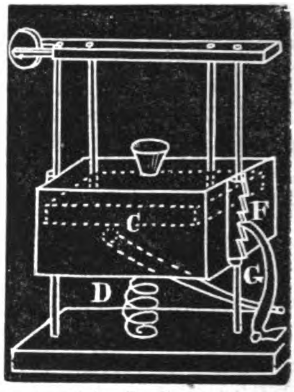
"I claim, first, the method substantially as described, of preservation and conversion into glue of the tanners' scraps, &c., by open piling successive layers of scrap, coated by cream of lime (in place of the lime steeping heretofore resorted to), followed by the application of sulphuric or other suitable acid, which, combining with the lime, prevents its deleterious action on the glue, and supersedes the necessity of the atmospheric exposure, now resorted to.

"Secondly. The combination with the said previous treatment, the process substantially as described, of making glue by means of the combination of direct and indirect steam, acting in concert or separately, according to the stage of the process, and the relative heat and moisture required, avoiding on the one hand the injurious scorching effects of the open furnace, and on the other hand the serious inconvenience of undue dilution by the open steam jet."

No. 9878. OWEN REDMOND, Rochester, N. Y.—*Improvement in Lamps.* Patented July 26th, 1853.

The object to be attained by this plan is to retain the surface of the oil on the same level or height with the burner at all times, no matter what the quantity of oil contained in the fountain may be.

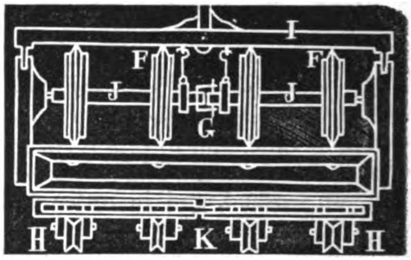
When this oil fountain, shown in figure, is to be filled, the catch G is disengaged from the ratchet F, and as the oil is introduced, the fountain



descends by itself. The governor or float C, shown in dotted lines, prevent the oil from splashing, and serve as a check on the spring D, which retains the surface of the oil in the fountain constantly at a uniform height with the burner.

"I claim resting the oil fountain for lamps upon a spring or springs so constructed as to retain the surface of the oil in the fountain constantly at a nearly uniform height; and this I claim whether used with or without a float, as above described and set forth."

No. 9879. Milton Satterlie, Louisa, Illinois.—*Improvement in Seed Planters.* Patented July 26th, 1853.

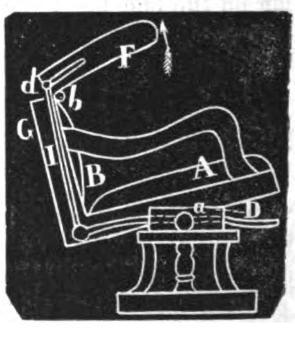


The nature of this invention consists in adapting the drill more perfectly to the undulations of the ground, by uniting the shafts of the drill-wheels F (see figure), by a hinge or joint G in the centre, that allows the wheels, or either shaft J or J′, to rise or fall with the undulation of the ground, without affecting the wheels or the other shaft, both shafts being supported at their inner ends by bearings, to which they are loosely hung or attached by hooks to the swivelling bar I, so that an easy play or flexibility is given to the shafts. The drill wheels are of angular section at their peripheries.

In the same line with wheels F, back of the hopper, are placed the covering wheels H that work in brackets projecting from a swinging frame K, which is jointed in the middle, so as to admit of vertical play. The wheels have a deep angular groove on their peripheries.

"I claim the arrangement of the drill and covering wheels, or their equivalents, on flexible axles, so that the said wheels, or their substitute, will rise and fall to accommodate themselves to undulating ground, whereby the grain in all the furrows is planted at an equal depth, and equally covered, substantially as specified."

No. 9880. Wm. M. Warren, Watertown, Conn.—*Improvement in Railroad Car Seats.* Patented July 26th, 1853.



The nature of this invention consists in attaching the hinged back to the stationary back, in such a manner that the seat will be inclined as the hinged back is raised and brought to a horizontal position, when the hinged back is depressed and placed against the stationary back.

The hinge or joint *d* in the strip I, shown in figure, with the hinged back partly raised, is rather above the hinges *d b*, and therefore by raising the adjustable back, the line of the hinge *d* being in the line of fulcrum, the hinges *b b* bear down upon the top of the stationary back B, and as the seat A is hung on pivots *a a*, the seat will of course be inclined, as shown in figure. By depressing the adjustable back F, the hinges *b b* elevate the seat and bring it to a horizontal position. The cross-piece D turns, and the seat may be turned in any direction in which the cars go.

"I claim attaching the hinged or adjustable back F to the stationary back B by means of the hinges *b b*, and having a jointed or hinged metal strip, the metal strip being above the line of the hinges *b b*; by which arrangement the seat A is inclined or brought to a horizontal position, as the adjustable back is raised or depressed, as herein shown and described."

No. 9881. EZRA R. BENTON, Cleveland, Ohio.—*Improvement in Bran Dusters.* Patented July 26th, 1853.

The nature of this improvement consists in the arrangement of the feeding apparatus in such a manner that the bran is fed into the machine by an inward current of air, which at the same time permits all heavy substances to fall into a spout and be excluded; secondly, in the use of inwardly acting blasts of different degrees of strength at the top and bottom of the duster, their forces being proportioned in such a manner that the upper blast will feed the bran into the machine, and drive the flour outward through the inclosing sieve, while the lower current only counteracts the downward pressure of the upper blast, so as to prevent any flour being discharged with the bran at the aperture in the bottom of the bran duster; and thirdly, in the arrangement of teeth in lines ascending in the direction opposite to its motion around the revolving cylinder, in such a manner that their action by the revolution of the cylinder tends to lift the bran, or at least, to prevent its falling too rapidly to the bottom.

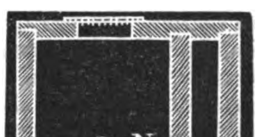
"I claim the combination of the two inwardly-acting drafts of air, of different degrees of strength, produced by the oblique fans *g g*, &c., and *i i*, &c., when their forces are proportioned in such a manner that the upper blast will feed the bran into the machine, and drive the flour through the sieve H, while the lower current only counteracts the downward pressure of the upper blast, so as to prevent any flour from falling to, and being discharged with the bran at the aperture *j*, in the bottom of the duster—substantially as described.

No. 9882. JACOB H. CAROTHERS, Davidsburg, Pa.—*Improvement in Corn Planters.* Patented July 26th, 1853.

The nature of this invention consists in suspending the planting at any time by grappling the periphery of the wheel by two hooked levers, which are worked by means of a rod behind the hopper, and conveniently placed at the command of the operator.

"I claim the method of stopping the seeding apparatus by grappling the periphery of the driving wheel, in the manner herein described."

No. 9883. SYLVESTER DAVIS, Claremont, N. H.—*Improvement in Bee Hives.* Patented July 26th, 1853.



The nature of this invention consists in constructing the float for the feeding drawer of multiplied series of thin slats, in such a manner that the upper series upon which the bees stand can never come in contact with the surface of the fluid bee food, whereby the possibility of swamping the float, and miring or drowning the bees, is prevented.

"I claim the manner of constructing the float K or N, viz., of two parallel series of slightly separated thin slats, placed one directly over the other, and separated by two or three cross slats, and supported by similar cross slats beneath the whole, for the purpose of allowing the bees to feed without being liable to be mixed in the food beneath."

No. 9884. ZIBA DURKEES, Alden, N. Y.—*Improvement in the Beaters of Smut Machines.* Patented July 26th, 1853.

The nature of this invention consists in covering such revolving cylinders, beaters, or wings, of any ordinary construction, with wire netting or cloth, by which simple means a uniform uneven, but smooth, surface is preserved, which has great durability, and can be renewed at a very trifling expense when worn away, and performs the work thoroughly.

"I claim the covering of the revolving cylinder, wings, or beaters, of smut machines, with wire netting or cloth, for the purpose of providing an uneven but smooth heating or rubbing surface, and at the same time give great durability to the said parts, substantially as described."

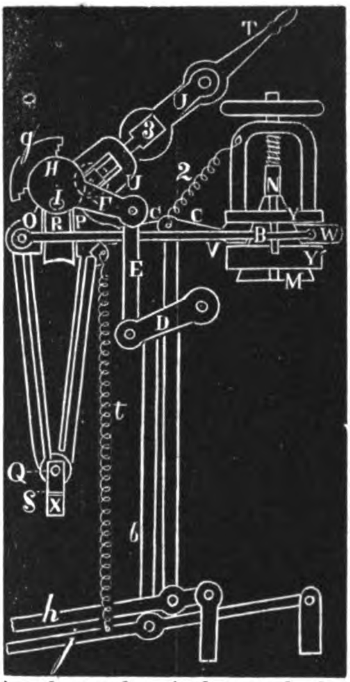
No. 9885. F. O. DESCHAMPS, Philadelphia, Pa.—*Improvement in Omnibus Lanterns.* Patented July 26th, 1853.

The nature of this invention consists in placing the lamp within a case, the lower part of which is formed of glass, and the upper part of a metal cap, in which cap is placed a lens. The case is intended to be inserted in the top or roof of the omnibus or stage, immediately behind the driver; the lower and glass portion being below the top or roof, and within the omnibus or stage, and the metal cap containing the lens above the top or roof. By this arrangement, the same lamp illuminates the interior of the omnibus, and also affords light to enable the driver to see distinctly.

"I claim constructing the case of the lamp in the manner substantially as described, viz., the lower part A of the case being constructed of glass, and the upper part B of metal, having a lens E inserted in it; by which construction the lamp C, when placed as herein shown, is made to illuminate the interior of the omnibus or stage, and also to afford light on the top or roof of the omnibus or stage, to enable the driver to see distinctly what money or ticket he may receive, and to facilitate him in giving change."

No. 9886. JOHN A. ELDER, Saccarappa, Maine.—*Improvement in Currying the Backs of Books.* Patented July 26th, 1853.

In the frame of the machine, within which are placed the clamps O P, seen in figure, having a hole at the lower ends to receive the shaft Q, the ends of which are supported in the boxes, which are so fitted as to be raised and lowered by means of two inclined planes attached to a traversing bar X, which bar is moved back or forth, and its jaws or clamps height with reference to the position of the roller K, shown in dots, adjusted by a screw. Previous to being placed in the clamps, the book R is sewed and glued in the usual manner; it is then subjected to the action of the roller K and its back changed, the whole being rounded and the outer sheets or leaves turned outwards, nearly at right angles, just above the top of the clamps—the recess thus formed being about equal to the thickness



of the cover of the book. In order to keep the centre of the book, whether it be thick or thin, in the same position, one jaw of the clamp O is connected by means of the two parallel rods B B with the ends of a horizontal rod or bar W, which extends nearly across the breadth of the machine; the other jaw P is attached to the toggle-joint C C, the opposite end of the toggle-joint being attached to the horizontal bar V, which is parallel with the bar W.

Between the above-named bars W and V, a pyramidal or wedge-shaped block of cast-iron M is placed, the breadth of the lower end or base being such as to adapt it to the thickness of the thinnest books required to be bound, and tapering upwards at such an angle as to adapt the top of the pyramid to the thickest books. The screw N, which plays vertically in a suitable frame or support, is attached to the top of the wedge M, which is raised or lowered by turning the wheel attached to the screw. As the wedge is raised by this screw, the parallel bars W and V are thrust further apart, thus causing the jaws P and O to approach each other. As the wedge is lowered, the bars W and V approach each other, and cause the jaws P and O to open wider. To the centre of the toggle-joint C a vertical rod *a* is jointed, extending downwards to the joint in the treadle or lever *h*, one end of the lever being jointed to the frame of the machine, and the other being in a suitable position for the pressure of the foot upon it, by which means the toggle-joint C is depressed, and the jaw P brought firmly up to the side of the book R, the lever *h* being held down by a suitable catch O in opposition to the action of the spring 2. The roller K, which hangs eccentric to the book, is of greater length than the longest book that is to be bound, is made to traverse over the back of the book, and turns freely in suitable boxes placed opposite to each other, and supported working in slots in the swinging frame U U, to which a handle T is attached. The height in the slots of the boxes may be adjusted by turning the screw 3. Upon each side of the frame of the machine, and near its front, there is a large circular aperture in which the axis H turns when the treadle or lever *i* is raised or lowered, the motion being communicated by means of the vertical rod *b*, the rocker-shaft and arms D, the rods E, and the arms F, which is affixed to the axis H. Two pivots I pass through the lower part of the swinging frame U, just below the boxes, and thence pass through and turn in the axis H, the pivots I being the centre of motion of the swinging frame U, as the handle T is moved back and forth to carry the roller K over the back of the book. By the movement of the axis H the roller is carried back so as to allow the book to be lifted upward, and removed from the jaws of the clamps without coming in contact with the roller K. As the book is placed in the clamps from below, the outside leaves are kept smooth and in place. One or more springs *t* are attached to the treadles, and so fastened at the upper end as to lift the treadles when the catches *o* and *p* are removed. By raising or lowering the boxes of roller K, and jaws or clamps *o* and *p*, the radial distance from the roller K to the centre of motion I is changed—thus diminishing or increasing the curvature of the back of the book.

"I claim, first, hanging the frame carrying the pressure-roller K upon, and eccentrically to, the centre of motion of the arms F, so that the centre of motion of the frame can be raised at pleasure, in the manner and for the purposes described.

"Second. The combination of the wedge M and bars W and V, when connected with jaws of the clamps as described, for the purpose of keeping the centre of the book, whatever its thickness, vertical with the bearings G of the swinging frame U, as described and set forth."

No. 9887. Daniel B. Hinmam, Philadelphia, Pa.—*Improvement in Dyeing Yarn parti-colored.* Patented July 26th, 1853.

The nature of this invention consists in pressing the yarn between series of separate and adjustable or changeable bars of hard wood, whose pressing faces are parallel to each other, in such parts and for such distances as are not intended to be dyed, while the parts of the yarn of such distances as are to be dyed, remain without being pressed between and beyond the sides of the bars; the dyeing liquor in the dye-tub coming freely in contact with these parts, while it is excluded from those parts that are pressed between the faces of the adjustable bars. The parts that are pressed therefore remain of the original color or colors, and the parts not pressed are dyed by the liquor in the dye-tub.

"I claim the employment of series of separate and adjustable or changeable bars, one above the other, in an adjustable press, and pressing between their faces the parts of the yarn not intended to be dyed, while the liquor is in contact with and dyes the parts of the yarn between the sides of the bars, substantially as described."

No. 9888. Levi Pittman, Tom's Brook, Virginia.—*Improved Plotting Theodolite.* Patented July 26th, 1853.

This improvement consists in arranging a traversing scale over the dial, upon which a piece of paper is fastened to mark the plot upon, and rule a line by the traversing scale and note the course, so that when the instrument is taken to the position sighted to and the distance measured, it can be marked upon the line, and the point measured upon the paper by the traversing scale, which is then moved back and the needle-box replaced, and the next point sighted to and the needle-box removed, and the line and course marked. Also in applying an adjustable index to the traversing scale, so as to measure minute divisions accurately.

"I claim, first, the adjusting index or its equivalent, in combination with the graduated scale upon the traversing ruler and the horizontal dial, substantially as described.

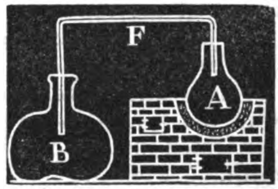
"I also claim a dial such as is herein described, fixed upon a staff or socket B, in combination with the revolving frame C (turning under said dial on the socket B), and carrying the traversing ruler K and a suitable sight-vane, constructed and operating as described."

No. 9889. Rapp & Wright, Buffalo, N. Y.—*Improvement in Straining Saws by Compressed Air.* Patented July, 1853.

The nature of this invention consists in the application of compressed air, so applied to piston-heads working in cylinders at each end of the saw, and to which heads the saw is connected by its ends, by rods, as that the tendency of the compressed air to push or pull apart the piston-heads, shall be exerted to the straining of the saw, and thus keep it perfectly strained, without the use of a gate saw-frame.

"We claim the application of compressed air to the straining cylinders of saws, when said cylinders are so connected with each other that the compressed air shall alternately pass from one cylinder to the other during the reciprocating action of the saw, and combined with the air-pump and pressure-valve, for the purpose of regulating and maintaining the intensity of the strain on the saw, substantially in the manner described."

No. 9890. Frederick G. Vetterckk, of New York City.—*Improvement in Dyeing Compounds.* Patented July 26th, 1853.



The inventor mixes 10 pounds of sulphuric acid with four pounds of cold water, and lets it stand for six hours; he places in the receiver B (see figure), four pounds of prussiate of potash, and three gallons of boiling water, and in the retort A five pounds of manganese, and four pounds of common salt, and adds the mixture first mentioned; the pipe F is adjusted and luted, and the whole is left quiet for six hours. After that time, a slow fire is applied and kept up under A for six hours, during which time the chloride formed in the retort A will pass over into the receiver B, which is then taken off and hermetically closed, and the compound is ready for use.

To use the compound, he prepares a mixture of sulphuric acid and water, and places it in a retort similar to A; in another receiver he puts eight pounds of the salts of tin, and two pounds of tartaric acid, and three gallons boiling water, and manages in the same manner as the kali compound above mentioned, six hours without and six hours with fire; this operation produces chloride of tin.

To six pounds of the first, or "kali compound," he adds two pounds sulphuric acid, mixes the whole with about one hundred gallons of water in a common dyer's kettle, and brings it to 212° Fahr., and places the wool therein and lets it remain three-fourths of an hour; this gives the green ground color; in the same kettle of dye he adds three pounds of kali compound and two pounds of vitriol, and heats it to 200° Fahr., puts in the wool, and lets it remain therein for three-fourths of an hour. Thus he produces an endless variety of shades by slight changes of the proportions of the ingredients and the degree of heat.

"I claim the making of the kali compound, substantially as herein set forth, as a basis for a blue die."

No. 9891. Henry Lee Norris, New York City.—*Improvement in Preserving India-rubber in the Liquid State.* Patented July 26th, 1853.

The nature of this invention consists in treating the milk or juice from the caoutchouc tree, within three hours after it is drawn from the tree, after having been strained, with a concentrated liquor of ammonia or its equivalents; to every pound of juice one ounce of the fluid ammonia is added, and well mixed. This compound, when placed in air-tight vessels, can be preserved for a long time and transported to great distances. When this compound is put upon a polished surface, and left to evaporate slowly, it forms a very elastic, tough, and transparent article.

"I claim the compound consisting of the native juice of the caoutchouc with aqua ammonia, or the equivalent thereof, substantially as herein set forth, when said ammonia or its equivalent is mixed with said juice of the caoutchouc in a liquid state, by means of which the juice above named is preserved for a great length of time, and can be manufactured at less expense than the india-rubber of commerce, which is mixed with other foreign substances.

"I also claim the solid elastic article, when manufactured from the said composition of matter, as above described."

No. 9892. JAMES A. BAZIN, Canton, Mass.—*Improvement in Reed Musical Instruments.* Patented August 2d, 1853.

"I claim, 1st, flatting the thirds, sixths, and sevenths of the scale by means of the regulating cylinder E, constructed as described, or by any other analogous contrivance, in the manner and for the purpose substantially as set forth.

"2d. The valve, constructed as described, of the two parts *s* and *o*, with the springs *u* and *v*, or their equivalents, in combination with the perforated plate *n*, for the purpose of sounding the note flat or sharp, as set forth.

"3d. The combination and arrangement of the sliding bar *a''*, the buttons *g''*, the bent wires *i''*, and the pins *e''*, by which means the key-board may be unlocked and moved in either direction by one hand, in the manner set forth.

"4th. I claim the use of two or more wind-chests in the same instruments, for the purpose of providing a separate supply of air for the bass and treble notes, as herein set forth.

"5th. The peculiar arrangement of the bellows and wind-chests, the latter being placed below the former, and communicating with the reed-box by means of flexible passages passing up through the bellows, as described, which arrangement of parts enables me to make use of two wind-chests, in the manner and for the purpose set forth.

"6th. Hanging the pedal with a movable fulcrum, to prevent friction upon the foot, and to enable it to be operated with more ease and convenience, as set forth.

"7th. The construction and arrangement of the air-passages above and below the reed, as described, for the purpose of admitting the air, and permitting it to escape at the butt end of the reed, as set forth.

"8. The presser bar H, so constructed and arranged as to keep down the rear portion of all the valves, while their front portion is left free to be operated by the keys, thereby modifying the tone of all the notes of the instrument, as set forth."

No. 9893. GEO. W. BROWN, Tyleville, Illinois.—*Improvement in Seed Planters.* Patented August 2d, 1853.

The nature of this invention consists in horizontal wheels or distributors, placed in the bottom of the hopper. These wheels have a variety of sized holes, to suit different kinds and sizes of grain, so as to graduate the quantity to be planted as desired; these holes being in pairs, the oscillating motion of the wheels passes one of these holes under a stationary cap, dropping its portion of seed into the tube; while the mate hole being out from under the cap, receives a portion of seed, and the cap graduates the amount of seed it carries to the tube in its turn, by the oscillating motion of the wheel or distributor.

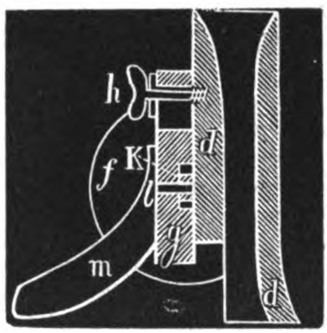
The cutters can be raised, by means of an arrangement of levers, clear from the ground, and the planting wheels press the earth on the seed nearly equally as well on uneven as on smooth ground.

"I claim, 1st, the oscillating horizontal wheels or distributors in the bottom of the hoppers, having slots and holes of various sizes, in combination with the stationary caps and pins, for the discharge of different kinds and quantities of seeds, as set forth.

"2d. The arrangement of the covering rollers, mounted as described, and performing the purpose of covering the seed, elevating the cutters in turning around, and also in adjusting them to different depths, as set forth."

No. 9894. Lebbeus Caswell, Harrison, Maine.—*Improvement in Seed-planters.* Patented August 2d, 1853.

The nature of this invention consists in the gauge-wheel *f* attached to an adjustable slide *g*, which can be raised or lowered, and fastened by a set-screw *h*. The axle *k* of the gauge-wheels *f f* turns at its centre on a fulcrum *l*, so that in case either wheel meets with any inequality in the ground, the said wheel will rise or fall, without producing any corresponding rise or fall in the plough, which is thus enabled to operate at a uniform depth. The hill is covered, after the seed is dropped, by the coverer *m*, attached to the slide *g*; *d* is the spout through which the seeds are dropped into the ground.



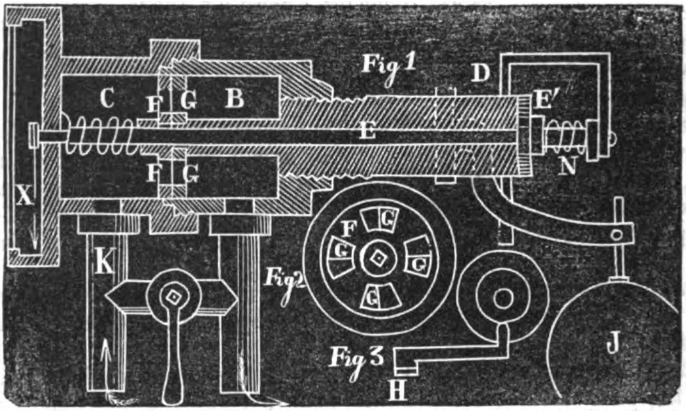
"I claim placing the axle of the gauge-wheels on a fulcrum in an adjustable slide, as above described, so as to plant at any desired, and at the same time, a uniform depth, as above set forth."

No. 9895. Samuel R. Clime, Philadelphia, Penn.—*Apparatus to regulate the supply of Water to Steam-boilers.* Patented August 2d, 1853.

The nature of this invention consists of a water-chamber outside of the boiler, provided with a valve-seat and valve, which, by means of an internal arrangement, the water is regulated in its course to the boiler in such quantities as may be required; the valve upon said valve-seat is caused to be opened and closed by the movement of said internal arrangement; thus producing the result above mentioned, and keeping a regular supply of water in the boiler.

The water enters at K, and fills up the water-chamber C; but before it can get to the pump it has to pass through the valve F F and seat G G. If there be a sufficient quantity of water in the boiler, the passage will be closed; and if not, it will be opened accordingly, as represented in figure 2, showing the valves G G G G, and valve-seat F.

The valve G being stationary and F movable, the turning of valve F is done by the rod E, as E′ is a small wheel and cap which forms a coggle-joint or cogs; the cap fits tight against the body of the machine, and is kept in place by the spring N; the motion of the rod E and appendage is produced by the lever H (as shown in separate Fig. 3) fitting into one of the cogs in the circumference of the said wheel, the lever H moving upon the pivot fastened on the collar B, and kept in its place by means of the guide D, which derives its motion from the float J, being inside of the boiler.

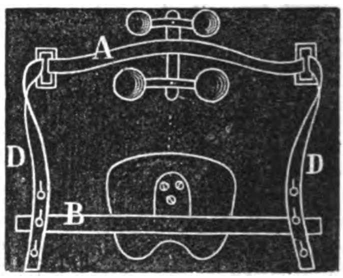


The slightest motion of the float J is communicated to the rod E and valves F; and the hand X, attached to the rod E, shows upon the dial R the operation of the apparatus.

"I claim the water-chambers above described, and the contrivance and machinery by which their action is aided and facilitated."

No. 9896. H. B. CONANT, Geneva, Wisconsin.—*Improvement in Abdominal Supporters.* Patented August 2d, 1853.

The nature of this invention consists in constructing the supporter in a manner (as shown in the figure), that the pressure may be varied at pleasure, and the same supporter worn by persons of different sizes.



The inventor "claims constructing it with two encompassing springs A B, attached respectively at their centres to the front and hind pads (the hind spring being slightly curved upwards in the middle, and the front spring correspondingly curved downwards, and both springs straight on their flat sides, as described), and uniting said springs, at their adjacent ends, with straps D D, of adjustable lengths, whereby its pressure may be varied at pleasure, and the same supporter worn by persons of different sizes, substantially as herein set forth."

No. 9897. THOS. J. EDDY, Waterford, New York, *Improvement in Railroad Car-wheels.* Patented August 2, 1853.

The nature of this invention consists in connecting the solid hub B and chilled-rim A of a cast-iron wheel, by means of a series of spokes D and a disk C, all cast in one piece, and severally formed and arranged in such a manner that they will not be strained by the contraction of the metal as it cools and solidifies at the time the wheel is cast.

"I claim a cast-iron car-wheel made in one piece, in which one end of the hub is united to the rim by means of a disk, and the other by means of a series of spokes, substantially as herein set forth."

No. 9898. C. S. Boynton, New York City.—*Improvement in a Paper-ruling Machine.* Patented August 2d, 1853.

The nature of this invention consists in the employment of feeding guides, attached to the endless apron, for the purpose of properly feeding the paper to the pens.

In the employment or use of guides or stops, attached to the selvedge of the apron, said guides or stops, as the apron moves, acting upon the pen-beam, and causing it to be elevated at proper intervals, so that the pens will not rest upon the paper, and consequently the paper be only ruled at such parts or distances corresponding to the adjustment of the guides or stops.

"I claim, 1st, the employment or use of the guides D, by which the paper may be properly adjusted upon the apron C, and fed underneath the pens *d*.

"2d. The guides or stops H, attached to the selvedge of the endless apron C, for the purpose of elevating the pens *d* from the paper at required distances, according as the guides or stops are adjusted upon the apron, and thereby causing the paper to be ruled in lines of the desired length, and having the requisite spaces between them, as herein described."

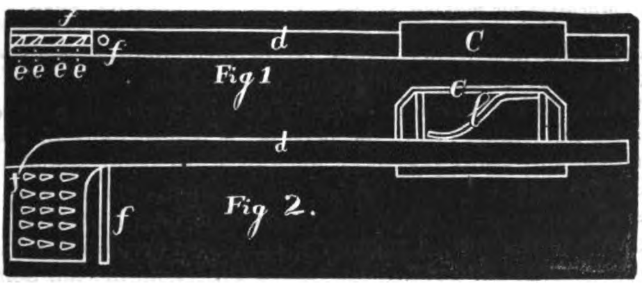
No. 9899. Jos. R. Miller, Jersey City, N. J.—*Improvement in Submarine Tunnels.* Patented August 2d, 1853.

"I claim constructing submarine avenues, by casting them in short, manageable sections, sinking each successively to its place, and uniting their ends successively by means of flanches, bolts, and packing, substantially as described; when these are combined with a lip or lips, at the end of each section, to insure the bolt-holes, and other corresponding parts, to come and rest opposite to each other as each succeeding section is sunk to its place, and when the structure is made to rest upon a graded bottom as the work progresses, and is held thereto by superincumbent weight when completed."

No. 9900. Jos. A. Scholfield, Westerly, Rhode Island.—*Improvement in Temples for Looms.* Patented August 2d, 1853.

Figure 1 represents a plan view of the temple, with the upper plate removed.

Figure 2 is a side elevation of the same



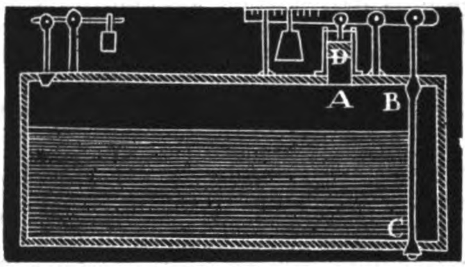
c the holding box, attached to the beam by means of screws; *d* the shank of the temple; *s s* the plates; from the lower project the spurs *e e e e*, inclining towards the box *c*; *f* is a pin; *l* is a spring to hold the temple in its place.

When the reed comes up to the cloth, the latter will be drawn back, and the inclined position of the spurs will allow it to slip over their points; as the reed moves forward, the cloth ceases to draw over the points of the spurs, and they again penetrate the cloth, and hold it until another revolution of the loom again draws it back.

"I claim the application of a stationary spur-plate to the temple, with the pins in said plate inclined at an angle to the breast-beam, so as to allow the cloth to be drawn over the tops of said pins as the lay beats up, and from their inclination preventing the cloth from receding during the backward motion of the lay, in the manner and for the purpose described."

No. 9901. JOHN M. REEDER, Memphis, Tennessee.—*Improvement in the construction of Steam-boilers.* Patented August 2d, 1853.

The nature of this invention consists in providing the upper part of a steam-boiler with *two* openings A and B (as shown in figure), in addition to that for the safety-valve, and one C at the bottom of the boiler. The



apertures in the top of the boiler are closed; one by cylinder D and piston, and two by the valves, corresponding with the openings B and C, which are so arranged as to pass the water from the boilers on to the fire under them.

"I claim the application to steam-boilers of stem H, valves I and J, and the mode of their operation, which will, at any given pressure, allow the water in the boilers to pass freely on the fire under them, thereby reducing the steam, and prevent explosion, as herein described."

No. 9902. J. R. RICHARDSON, J. WESTERMAN, and E. WILDERS.—*Improvement in Machines for making Spikes.* Patented August 2d, 1853.

The nature of this invention consists, 1st, in the manner of forming the point of the spike, viz., by means of rollers in combination with broad dies resting against their disks; the rollers being attached to slides or carriages, which work on adjustable beds; the beds being placed more or less oblique with the spike, and consequently a long or short point, whichever is desired, given the end of the spike, as the carriages are moved, and the rollers pressed against it. This will be fully described hereafter.

2d. In giving to the header, when the spike is completed, a very slight return motion before the jaws are separated. This motion being barely sufficient to relieve the jaws from the pressure of the head of the spike, but still leaving the head in the header while the jaws are opening and being withdrawn from the spike, so that, when the header is finally withdrawn, the spike, being cleared from the header and jaws, will fall out of the machine—the header thus performing the duty of a clearer.

3d. In the combination of a holder, of peculiar construction, with the guiding and cutting loop, the punch, the under die, and movable jaw, for the purpose of holding the spike blank against the said die and jaw, while it is being cut off from the rod, and carried over to the stationary jaw. By these means I am enabled to cut off the spike at its head-end, without loss of time, and at a sufficient distance from the ends of the dies and jaws, to leave material outside thereof to form the head.

4th. Also in connecting the gauge, against which the rod is fed, with the pointing carriage, so that, when the point is being made, the gauge will be carried away, and the point permitted to elongate without any separate motion of the gauge.

The inventor "claims, 1st, the manner of forming the point of the spike, substantially as herein shown and described, viz., by means of the combination of the wide dies resting on the disks of the rollers and the pointing rollers, arranged and operating substantially as set forth.

"2d. Slightly withdrawing the header after the head is completed, for the purpose of relieving the jaws from its pressure before they begin to open, and holding it in that position with the spike-head therein, until the jaws are opened, and the movable jaw and die are nearly or quite withdrawn from the spike, then withdrawing the header to its farthest position from the dies, allowing the spike to fall, thus causing the header to perform the duty of a clearer, substantially as described.

"3d. The combination of the cutting-guide loop, the cutter, and the holder, as constructed and operating with the movable jaw and movable die, for the purpose of cutting off the blank at a sufficient distance from the ends of the dies to leave material for the head, and carrying it over to the stationary jaw at the same operation, substantially as described.

"4th. Attaching the gauge firmly to the carriage of the pointing rollers, so that it will be withdrawn as the point is drawn out by the rollers, and returned to its position, when the pointers are withdrawn, without any other mechanism to actuate it, as described."

No. 9903. Ithiel S. Richardson, Boston, Mass.—*Improvement in Atmospheric Telegraph and Railway*. Date of English patent December 7th, 1852; patented in the United States August 2d, 1853.

The nature of this invention consists in improvements in the method of transporting freight and passengers through air-tight cylinders; the pressure of the atmosphere behind a movable plunger, being used to propel the load, the air in advance of the plunger being exhausted; by means of which improvements, the inventor states, "he is enabled to transmit letters, packages, and even more bulky articles of freight, and passengers, from one point of the country to another, at a great rate of speed."

"I claim, 1st, the check-plate *n*, consisting of three pieces; two being stationary, and the third, or middle one, revolving between them, air-tight, constructed as described, or in any manner substantially the same, and for the purposes set forth.

"2d. The turn-table constructed, as described, of the ring W, and its station box *c*, in combination with the rings *t* and *r*, or their equivalents, as herein set forth.

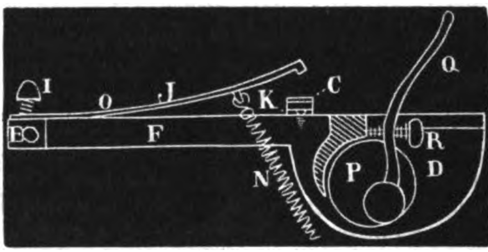
"3d. The method of announcing the arrival of the plunger by means of the compression of the air within the cylinder at the instant of the arrival of the plunger, operating through the orifice in the cylinder, the valve *q'* and the hammer *t'*, as described, or in any other manner substantially equivalent thereto, the compressed air being the agent.

"4th. And lastly: the combination of the pendant weighted lever E'' with the valve f'' and spring o'', or analogous devices, by which means the valve is drawn up to its seat, when no longer kept open by the pressure of the atmosphere, and firmly locked in that position until the lever is again tripped by the passing plunger or load."

No. 9904. STEPHEN P. RUGGLES.—*Improvement in Printing Press.* Patented August 2d, 1853.

The nature of this invention consists in so arranging a series of diverging springs (see figure), upon a plate K, extending across the rear or lower part of the platen D, as that they will make a guide for the paper when it is sliding on to the tympan; said springs allowing of being forced down by the paper-holder, so as to be condensed between the type and the "furniture" of the press.

The paper, guided by the diverging springs C, is placed on the tympan,



when the platen is drawn up by the arms, eccentrically arranged on the circular plates on the shaft which drives the press, until it reaches the paper-holder J, which, by the resistance of the spiral-spring N, presses down the paper-guides, and then clasps the paper between said holder and the tympan, and holds it until it receives the impression, and falls back to nearly its lowest position, when the paper-holder is released by the relaxation of the spring, and the sheet is removed.

F is one of the arms; E the rock-shaft; P eccentric shaft, passing through the platen D; I set-screw; O lever; R set-screw, resting against the platen, to regulate a heavy or light impression.

The figure represents an end view of the platen, detached from the press.

When it is desired to stop the impression, the lever Q, on the eccentric shaft, which passes through the platen, is drawn down, or nearly so, which lowers the platen on its axis, so as to prevent it from reaching the form.

The diverging springs C, which are arranged on the gauge K, when the platen is thrown back to receive the paper, rise up and form a guide for the paper, as it is sliding on the tympan.

"I claim the combination of the adjustable gauge with the diverging springs, for catching and guiding the edge of the sheet when it is sliding to its position, substantially as herein described."

No. 9905. NATHAN THOMPSON, Williamsburg, N. Y.—*Improved Mode of Indicating the Height of Water in Steam-Boilers.* Patented August 2d, 1853.

The nature of this invention consists in a method of stopping the main engine, and bringing it absolutely to a state of rest, when the water level becomes dangerously low, which is accomplished by a float, throttle-valve, and an appropriate connection between the throttle and the float; the whole so arranged and connected, that the falling of the water gradually contracts and finally closes entirely the area of the steam-pipe, at first slowing down, and at last completely stopping the main engine.

Upon the float is a pin, which rises perpendicularly, which prevents the float from rising only to a certain height, never higher than the ordinary working water-level.

"I claim, in the method substantially as herein described, of slowing and stopping the main engine by means of a float or its equivalent, which is governed in its position by the height of the water in the boiler, whereby I am enabled to furnish a reliable, and not to be disregarded intimation, of the level of the water in the boiler.

"Secondly, a hook and pin, or their equivalents, in combination with a boiler float, whereby said float is prevented from acting during ordinary fluctuations of the water level, substantially in the manner and for the purposes herein specified."

No. 9906. William Van Anden, Poughkeepsie, N. Y.—*Improvement in Machinery for making Railroad Chairs.* Patented August 2d, 1853.

The nature of this invention consists in arranging and combining with a suitable frame a shaft propelled by any convenient power, on which is secured a cam for operating a lever for depressing the die for holding the metal, while being cut by a pair of roller-shears, which are forced upwards by a second lever, operated by a second cam, also on the driving-shaft, the operation of the rollers being to cut the grain of the metal more perfectly than by a fixed or punching cutting arrangement. Also, in combination with the said roller-shears, two adjustable benders, secured at each side of the machine on the ends of levers, operated by cams on the ends of the driving shafts, for the purpose of bending over the lips of the chair as they are cut and raised by the action of the roller-shears, so as to give them the form of the die, from which the chair is discharged by a forked rod on the end of a connecting-rod working on the main or driving-shaft, and projected out by a cam on the driving-shaft, as the shears, benders, and die are restored to their original position, to push the chair off the head of the die, and projected back again by a second cam on the opposite side of the driving-shaft for that purpose.

"I claim, first, the combination of rollers with adjustable shear-stocks, for cutting and shaping the lips of wrought-iron railroad chairs, substantially as herein before set forth, and their combination with the dies for that purpose.

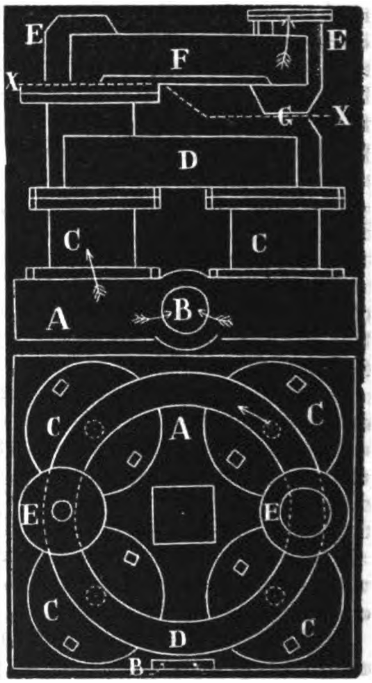
"The use of a *movable* drop upper half, or female die, in combination with a stock, substantially as set forth, and their combination with the discharging apparatus, operated substantially as herein before set forth.

"The use of adjustable and removable benders, in bender-stocks, in combination with the levers and cams on the main-shaft for operating the same in an oblique and downward direction, and their combination with the dies and cutters for making wrought-iron railroad chairs."

No. 9907. Stephen Waterman, Williamsburg, N. Y.—*Improved Mode of Obviating the Danger from Steam-Boiler Explosions.* Patented August 2d, 1853.

The nature of this invention consists in the combination with the safety-chamber and the safety-plate of a cold-water reservoir, which has communication at its lower part with the safety-chamber, and at its upper part with the steam-space of the boiler, which said communications are closed when the boiler is in proper operation, but are caused to open by the bursting of the safety-plate. The reservoir contains such a quantity of cold water as would, when admitted to the safety-chamber or steam-space of the boiler, condense the steam and reduce its pressure to the degree considered desirable for safety; and it is placed in such a position that, if the pressure above the water in the reservoir be made the same as that in the boiler—the proper communication being open—the water will descend into the boiler or safety-chamber by its gravity. When the plate bursts, and both communications are thereby caused to open, the steam from the boiler is admitted to the reservoir, and the pressure above and below being equalized, the water is caused to descend into the chamber or boiler.

"I claim the combination with the safety-chamber and safety-plate of a cold-water reservoir D, which has means of communication L, at the lower part, with the safety-chamber or steam-space in the boiler, and F, at the upper part, with the steam-space in the boiler; which said means of communication are closed, when the boiler is in proper operation, by cocks E and G, or their equivalents, which are caused to open by the tearing apart of the safety-plate, in any manner substantially as described, for producing the effect herein fully set forth."



No. 9908. Jesse Young, Franklin Furnace, Ohio.—*Improved Arrangement of Pipes for Hot-blast Furnaces.* Patented August 2d, 1853.

This invention consists in a series of annular horizontal pipes D (shown in figure), connected by short vertical pipes C and E, which also serve as supports or pedestals, and a hollow base upon which the pipes rest, and through which hollow base A, the cold air is admitted into the pipes.

"I claim the arrangement of a series of angular horizontal pipes D, short vertical connecting pipes C E E′, which also serve as supports or pedestals, and a hollow base A, through which the cold air passes into the pipes, and upon which hollow base the pipes rest; by which arrangement the air is made to pass slowly through the pipes and base, and is exposed a sufficient length of time to the action of the heat to become heated with a small expenditure of fuel."

No. 9909. Austin Olcott Willcox, Philadelphia, Pa.—*Improvement in Hot-Air Engines.* Patented August 2d, 1853.

The effective power of this engine, states the inventor, "is to the actual pressure of air below the piston as the volume of air, when cold, is to its volume when heated, after deducting the usual loss by friction, &c.; or in other words, as the capacity of the transferring cylinder is to the capacity of each working cylinder; and when the diameter of said transferring and working cylinders are equal, this ratio will be as the comparative lengths of their respective strokes. Any desirable amount of pressure on the piston is produced by condensing the medium, thus forming a powerful engine, which occupies comparatively little space. The engine is rendered more compact by having the renovator in the piston itself, and by applying the fire immediately under the cylinder.

"I claim placing the economizing disks *g* within, or attaching them to, the driving piston itself, whereby I am enabled to effect the complete rarefaction of the heated air, while the piston is descending, and before the cold air is again let into the cylinder, substantially in the manner and for the purposes herein described.

"Inclosing the exhaust-end of each single-acting working cylinder with an air-tight head, when combined with a self-acting valve *m*, which opens from said exhaust-end of the cylinder into the eduction-pipe *r*, in order to exclude the external atmosphere, and also for the double purpose of enabling any degree of rarefaction to take place within the exhaust-end of the cylinder without the return of air from the reservoir E, and to allow the spent air finally to escape to said reservoir, substantially as herein set forth.

"Inclosing each working cylinder within a jacket *f* (of any suitable material), regularly increasing in thickness, from the bottom to the top, in such a manner that when it is surrounded by water or other fluid, the temperature of the working cylinder will be kept reduced to a proper and nearly uniform degree (without much waste of heat), so as not to injure the lubricating fluid inside, whereby I am enabled to apply the heat of the furnace immediately under said cylinder, thus obviating the use of an expansion-heater, substantially as herein described.

No. 9910. Jean Coupier and Marie A. C. Mellier, of Paris, France.—*Improvement in the manufacture of Paper-stuff.* Patented August 2d, 1853.

This process consists in general in the treatment of straw and all crude or raw herbaceous matters, with a solution of hydrate of soda or potash, and thereby dispensing almost entirely with machinery, as commonly employed for similar purposes.

"We claim, first, the process, herein described, of reducing straw and other similar vegetable matters into pulp, for making paper; said process consisting in applying and circulating the solution of the hydrate of soda or potash, in the manner above mentioned, and at or about the strength indicated, in combination with the apparatus, substantially as described; by which means we are enabled to effect the reduction of a very large amount of pulp with a comparatively small quantity of liquor, and preserve also the requisite strength in the liquor, and also obtain facility for its evaporation.

"The employment of hypochlorites in the process of bleaching straw or similar vegetable matter, when prepared as above for the purpose of making paper, substantially as herein set forth, that is to say, using them at or about the strength set forth in the specification, viz., 3° Beaumé; and we claim this degree of strength only when employed upon such materials."

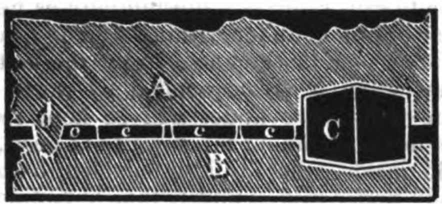
No. 9911. Julius Herriet, New York City.—*Improvement in Elastic Type for Printing on Irregular Surfaces.* Patented August 2d, 1853.

The nature of this improvement consists in forming letters, figures, or other characters to be desired, to be printed or stamped on irregular surfaces, or on smooth but hard surfaces, by moulding a very elastic substance in a mould made of plaster of paris, containing the requisite impressions or figures. The best substance the inventor found to be three parts of cooper's glue, and two parts of molasses. This substance, when well mixed, is poured into the mould, and when cold, taken out, and ready for use.

"I claim making, by casting in moulds, or by pressure-plates, with raised characters or figures, the entire substance of such plates being sufficiently elastic as to adapt it to printing, substantially as described."

No. 9912. Geo. T. Parry, Spring Garden, Pa.—*Improvement in Anti-friction Boxes.* Patented August 2d, 1853.

The nature of this invention consists in the employment of a series of rollers, made in the form of double frustums of cones, united at their bases C (as shown in figure), and adapted to run in grooves of nearly corresponding form, made in the surfaces, between which they are interposed.



The inner frustums of the rollers, and the corresponding parts of the surfaces of the grooves between which they are interposed, are made on bevels proportioned to the diameter of the rollers, and the grooves in which they run, such as would represent the pitch-lines of bevel cog-wheels of the same proportions, whereby the rolling of the rollers about a common centre is accomplished without slip.

"I claim making the rollers in the form of double frustums reversed and united at their bases, and travelling in circular grooves of nearly corresponding form of the surfaces, between which the rollers are interposed, substantially in the manner and for the purpose herein specified."

DESIGNS

Patented in the United States Patent Office in July and 2d of Aug., 1853.

No. 579. Samuel Pierce and J. J. Dulley.—*For a Cook Stove.* Patented July 12th, 1853.

No. 580. John Mason, Providence, R. I.—*For Cooking Stove.* Patented July 19th, 1853.

"I claim the new design, consisting of the flower-work and ornamental figures, composed of the raised leaves and spear-heads, as herein above described and represented in the drawings, for the front side and back plates of a cooking stove."

No. 581. J. J. Dulley, of Troy, N. Y.—*Cook Stove.* Patented July 19th, 1853.

"I claim the ornamental design and configuration of cook stove, such as herein described and represented in the annexed drawing."

No. 582. J. E. Merriman, Meriden, Conn.—*Design for Sewing Bird.*

No. 583. Elihu Smith, Albany, N. Y.—*Parlor Stove.*

No. 584. Hosea H. Huntley, Cincinnati, Ohio.—*For a Stove.*

No. 585. Hosea H. Huntley, Cincinnati, Ohio.—*Cooking Stove.*

No. 586. Thomas Barry, of New York.—*Cooking Stove.*

No. 587. Reuben H. N. Bates, of Providence, R. I.—*Cooking Range.*

No. 588. Julius Holzer, Philadelphia, Pa.—*Cooking Stove.*

"I claim the design and configuration of the ornaments and mouldings, herein described, forming an ornamental design for a cooking stove."

No. 589. A. Gerould and J. H. Ward, Middletown, Conn.—*Sewing Bird.*

"We claim the design, herein represented, of an entire bird in a sitting posture, constituting an ornamental design for a sewing bird."

RULES AND FORMULÆ FOR CONSTRUCTING MACHINES AND PARTS OF MACHINES.

[Translated and prepared for the American Polytechnic Journal, by M. C. Gritzner, Civil Engineer, and C. L. Fleischmann.]

(Continued from page 360, vol. 1)

LONG TRANSMISSION AXES.

Long transmission axes, and especially those used in spinning and weaving factories, ought to be so constructed that the angle of torsion will be the same for axes of large as well as small diameters, and in proportion to the length of the axes.

For such axes we have

$$d = 6{\cdot}299\sqrt[4]{\frac{\mathrm{N}}{n}}.$$

The angle of torsion will be

$$\Theta^{\circ} = \tfrac{1}{627} \text{ for cast-iron.}$$
$$\Theta^{\circ} = \tfrac{1}{940} \text{ for wrought-iron.}$$

The following table contains the results of the formula for d:

Table of Diameters for long Transmission Axes.

According to the formula $d = 6{\cdot}299\sqrt{\frac{\mathrm{N}}{n}}$.

N expresses the effect in horse-power, n the number of revolutions per minute.

$\frac{\mathrm{N}}{n}$	d	$\frac{\mathrm{N}}{n}$	d	$\frac{\mathrm{N}}{n}$	d	$\frac{\mathrm{N}}{n}$	d
0·00124	1·18	0·01978	2·36	0·1526	3·94	1·602	7·09
0·00174	1·28	0·02723	2·56	0·2234	4·33	1·988	7·48
0·00229	1·38	0·03663	2·76	0·3164	4·73	2·441	7·87
0·00296	1·48	0·04817	2·96	0·4358	5·12	3·575	8·66
0·00391	1·58	0·06250	3·15	0·5862	5·52	5·060	9·45
0·00626	1·78	0·07966	3·35	0·7725	5·91	6·972	10·23
0·00953	1·97	0·10011	3·54	1·0000	6·30	9·379	11·02
0·01407	2·17	0·12430	3·74	1·2750	6·70	12·360	11·81

Resistance of Axes against momentum.

Transmission axes which have to resist momentum must be calculated according to dynamical and not statical laws. If there is, for instance, a fly-wheel connected with the axis, and the axis is required to be strong enough to take up the momentum of the fly-wheel without breaking, the axis must be made so strong, that the effect, $\frac{1}{2}\,\frac{\mathrm{T}^2}{\mathrm{G}}\,\mathrm{V}$,* which is necessary to break the axis apart, is greater than the momentum of the fly-wheel.

We call

Q the weight of the ring of the fly-wheel,
C the velocity of this ring,
g = the increase in the velocity of a body falling in open space in every second, expressed in inches.

* T = coefficient for breaking.
G = modulus of elasticity for torsion.
V = volume of the axis.

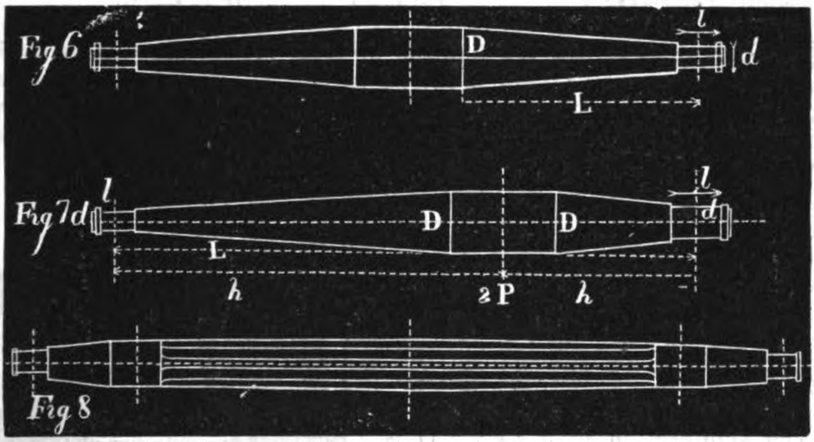
In order that the axis shall not break, there must be

$$V > 4 \frac{G}{T^2} \frac{Q}{2g} C^2.$$

Revolving Axes which are exposed to bending.

To show the mode of calculating the dimensions of such axes, we give two examples:

1. *Construction of an axis of a walking-beam which is supported on both ends, and the weight applied in the middle of it.*



In Fig. 6, 2 P pressure (of the walking-beam) upon the middle of the axis.

d = diameter } of a journal.
l = length }
D = diameter of the axis next to the walking-beam.
L = distance of the walking-beam from the middle of the journal.

Then we have

$$d = 0{\cdot}077\sqrt{P},$$
$$l = 0{\cdot}3428 + 1{\cdot}21\, d,$$
$$D = d \sqrt[3]{\frac{L}{\frac{1}{2} l}}.$$

2. *Construction of an axis which is supported on both ends, and where the weight is applied at some point between them.* (See Fig. 7.)

According to Fig. 7, we have

Weight on the journal d . . $2\,P \frac{\lambda_1}{\lambda + \lambda_1}$,

" " " d_1 . . $2\,P \frac{\lambda}{\lambda + \lambda_1}$,

Diameter of the journal d . $d = 0{\cdot} \sqrt{2\,P \frac{\lambda_1}{\lambda + \lambda_1}}$,

" " " d_1 . $d_1 = \sqrt{2\,P \frac{\lambda}{\lambda + \lambda_1}}$.

$$\text{Length of these journals} \begin{cases} l = \;\; + \;\; d, \\ l_1 = \;\; + \;\; d_1, \end{cases}$$

Diameter of the axis where the wheel is connected with the axis,

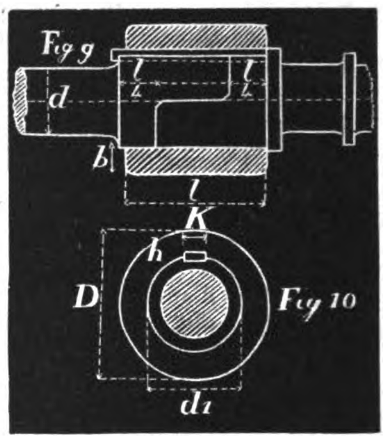
$$D = d \sqrt[3]{\frac{L}{\frac{1}{2}l}},$$

$$D_1 = d_1 \sqrt[3]{\frac{L_1}{\frac{1}{2}l_1}}.$$

Axes which are exposed to bending as well as torsion.

To construct such axes the diameter must be first determined as to the torsion according to the formulæ given for transmission axes, without regard to bending, and then the axis is to be strengthened by ribs, as shown in Fig. 8, or otherwise, so that the addition alone is strong enough to resist the bending momentum.

Coupling of Axes.



N = amount of horse-power, which is transferred by the coupled axis,
n = number of revolutions per second, and
d = diameter of the coupled axis.

The signification of $d_1\ l\ \delta\ k\ h\ D$ is evident from the figures 9 and 10.

The formulæ are thus:

$$d = 6{\cdot}299 \sqrt[3]{\frac{N}{n}},$$
$$d_1 = 1.25\, d,$$
$$l = 1{\cdot}063 + 1{\cdot}9\, d,$$
$$\delta = 0{\cdot}197 + \tfrac{1}{3}\, d,$$
$$D = 0{\cdot}394 + 1{\cdot}92\, d,$$
$$k = 0{\cdot}9\, \delta,$$
$$h = \tfrac{1}{2}\, k.$$

No. of the	d	d_1	l	δ	No of the	d	d_1	l	
I.	1·18 1·28	1·60	3·50	0·62	IX.	3·94 4·33	5·41	9·29	1·64
II.	1·38 1·48	1·85	3·87	0·69	X.	4·73 5·12	6·40	10·79	1·90
III.	1·58 1·78	2·22	4·43	0·79	XI.	5·52 5·91	7·38	12·28	2·17
IV.	1·97 2·17	2·72	5·18	0·92	XII.	6·30 6·70	8·37	13·78	2·41
V.	2·36 5·56	3·11	5·93	1·05	XIII.	7·09 7·48	9·35	15·28	2·69
VI.	2·76 2·96	3·71	6·67	1·18	XIV. XV.	7·87 8·66	9·84 10·83	16·02 17·92	2·82 3·08
VII.	3·15 3·35	4·17	7·42	1·31	XVI. XVII.	9·45 10·23	11·81 12·80	19·02 20·51	3·35 3·61
VIII.	3·54 3·74	4·69	8·17	1·44	XVIII. XIX.	11·02 11·81	13·78 14·76	22·01 23·51	3·87 4·13

DECISIONS IN PATENT CASES BY THE SUPREME COURT OF THE UNITED STATES.

1850. Hotchkiss & Others vs. Greenwood. 11 How. R., 248.

Writ of Error from the Ohio U. S. Circuit Court, where a Bill of Exceptions was taken to the instruction given by that court to the jury. The plaintiffs below claimed that the defendants had violated their patent for manufacturing door and other knobs of clay and porcelain. The Supreme Court say, that in the case before them, "the knob is not new, nor the metallic shank and spindle, nor the dove-tail form of the cavity in the knob, nor the means by which the metallic shank is fastened therein. All these were well known and in common use; and the only thing new is the substitution of a knob of a different material from that heretofore used in connection with this arrangement.

"Now, it very well may be, that, connecting the clay or porcelain knob with the metallic shank in this well-known mode, an article is produced better and cheaper than in the case of the metallic or wood knob; but this does not result from any new mechanical device or contrivance, but from the fact that the material of which the knob is composed, happens to be better adapted to the purpose for which it is made. The improvement consists in the superiority of the material, and which is not new, over that previously employed in making the knob.

"But this of itself can never be the subject of a patent. No one will pretend that a machine, made in whole or in part of materials better adapted to the purpose for which it is used, than the materials of which the old one is constructed, and for that reason better and cheaper, can be distinguished from the old one; or, in the sense of the patent law, can entitle the manufacturer to a patent. The difference is formal, and destitute of ingenuity or invention. It may afford evidence of judgment and skill in the selection and adaptation of materials in the manufacture of the instrument for the purposes intended, but nothing more.

"Unless more ingenuity and skill, in applying the old method of fastening the shank and knob, were required in the application of it to the clay or porcelain knob, than were possessed by an ordinary mechanic acquainted with the business, there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention. In other words, the improvement is the work of the skilful mechanic, and not of the inventor."

1850. Hogg & Delamater vs. Emerson. 11 How. R., 587.

This cause was brought up from the Circuit Court for the Southern District of New York, and was twice before this court. See 6 How. R., 437.

All the questions properly raised below are brought up by the Bill of Exceptions, and the judge who allows the Writ of Error, under the statute, when the recovery is less than two thousand dollars, has no right to prescribe which shall be brought up.

The questions determined, on the former argument (6 How. R., 437), affirmed.

The language of a patent is that of the commissioner, while that of the specification is that of the patentee.

In his specification, Emerson describes his invention as "an improvement in the steam-engine," and also as a "mode of propelling therewith either vessels on the water, or carriages on the land." The improvement in the steam-engine is not in generating steam, but in applying it. When used on land, he shows how to apply the engine, and when used for steamboats, it is connected with "an improved spiral paddle-wheel." Emerson's patent was not defective, nor likely to mislead in describing the improvement.

It is well settled that a patent covering more than one invention is not void, if they are connected in their design and operation.

Here all the improvements are in relation to propelling carriages and vessels by steam, and they only differ when applied to the one or the other. All are part of one combination when used on the water, and differing only, as the parts must, when used to propel in a different element.

"If one set of letters-patent is permissible for one combination consisting of many parts, as is the daily practice, surely one will amply suffice for two or three portions of that combination."

In determining whether a machine can be made from letters-patent, it is proper to refer to the drawings which form a part of the patent itself. The specification governs, and the drawings illustrate.

If a verdict is too large, if they were properly instructed, it is the fault of the jury and not of the court, and the error cannot be corrected on a Writ of Error.

The judgment below was affirmed.

DECISIONS OF THE ASSISTANT JUDGE OF THE CIRCUIT COURT OF THE DISTRICT OF COLUMBIA.

William F. Tyson vs. *Ebenezer Beard and Rankin.* Appeal from the Decision of the Commissioner of Patents.

I, James S. Morsell, Assistant Judge of the Circuit Court of the District of Columbia, certify to the Hon. The Commissioner of Patents, that, according to appointment and due notice for the hearing of the appeal in this case, the above-named William F. Tyson, by his attorney, and an examiner from the office, appeared, and the statement of the reasons of appeal, and the original papers and evidence in the case, together with the statements of the examiners on oath, being laid before me according to law, and the case submitted on written argument, and the same being fully considered, I do decide and adjudge that the decision of the Commissioner of Patents in favor of said Ebenezer Beard, awarding to him the priority of invention in the above case, and refusing to grant a patent to the appellant for his said invention, was erroneous, and the same is hereby reversed, and that a patent ought to issue to said appellant for said improvement, as intended for canal navigation.

June 9, 1853. JAMES S. MORSELL.

Ex-parte William F. Maule.

Appeal from the decision of the Commissioner of Patents, for refusing a patent to him, the said Maule, for an alleged invention of a new and improved metallic paint.

I, James S. Morsell, Assistant Judge of the Circuit Court of the District of Columbia, certify to the Hon. Commissioner of Patents, that upon the appeal, by the above-named Wm. F. Maule, from the decision of the Commissioner of Patents, for refusing to him a patent for an alleged invention of a new and improved metallic paint, after due notice given of the time and place of hearing said appeal, and on the case being submitted to my consideration upon the arguments of the appellant, and the original papers and reasons of appeal, and the ground of the decision of the said Commissioner fully set forth in writing, all which being duly considered, I have decided, and do hereby decide and adjudge that the decision of the said Commissioner, refusing said patent, was correct, and the same is hereby affirmed.

Given under my hand this 13th day of June, 1853.

JAMES S. MORSELL.

In the matter of the appeal of Richard Montgomery from the decision of the Commissioner of Patents, refusing the said Montgomery a patent for a late improvement in Lamine beams for bridges, &c.

In this case the party suffered a non-suit, agreeably to the consent of Montgomery, as intimated in his letter, of which the following is a copy:

WASHINGTON, *June* 11, 1853.

HON. CHARLES MASON, *Commissioner of Patents.*

SIR:—I have the honor to inform you, that I have withdrawn, with your concurrence, and without prejudice to my rights, my appeal to the Hon. James S. Morsell, Judge, &c., from the decision of your office, refusing a patent for my improved "Corrugated Plate Beam;" and I now request that you will be pleased, in accordance with our understanding, to transfer the certificates, &c., of scientific and practical men as to the value, importance, and patentability of my beam, from the files of the case of the withdrawn appeal, to the file of the application now pending, to be made a part of the evidence in this case.

Very respectfully your obedient servant,

RICHARD MONTGOMERY.

INNOVATIONS.

Always on the alert, and ardent for improvements and novelties, we are nevertheless strenuous against *innovations*. Of this order, decidedly is the attempt to lug into scientific communications the word *physicist*. A word that cannot be spoken, better be broken. The English language is sufficiently charged and chargeable with hissing, without affecting more of it; and if any man can pronounce *physicist* without a perfect *phiz of sibilation*, we will procure him a patent for liquidity of articulation. Everybody understands what is meant by philosopher, and we have great respect for the cognomen. It is sententious, euphonious, and full of meaning; not so much, perhaps, from its etymology as from association and logical import. A philosopher must be a lover of science, and a *real lover* of science must be a philosopher. This axiom is our maxim, and we adhere to the term philosopher as graphic and intelligible. We can discriminate, by the distinctions of mathematical, mechanical, chemical, natural, and practical philosophers, and be understood. The term natural philosopher ought now to designate the naturalist, as Cuvier, Humboldt, or Agassiz; but whether this acceptation should prevail or not, they are all philosophers, and may have any worthy conventional cognomen.

C. G. P., *Ed.*

BOOK NOTICE.

The Practical Draughtsman's Book of Industrial Designs, and Machinists' and Engineers' Drawing Companion; forming a complete course of Mechanical, Engineering, and Architectural Drawing. New York: Stringer & Townsend.

The Drawing Book appears, from its first number now on our table, to be well calculated to supply the wants of the mechanics, engineers, and architects, as well as young beginners, and will no doubt prove to be a valuable assistant. Drawing is a branch of education which has been too much neglected heretofore by the artisan; and although a better spirit is being diffused, there is still a great want of knowledge and taste observable in the construction of machinery in manufactures, and even in architecture and the fine arts, arising mainly from a want of training in the rudiments of linear drawing. We are of that old-fashioned school who do not believe there is any royal road to this art; and we have but little faith in uneducated genius. The art of drawing, with mathematical accuracy, is often absolutely necessary, and always useful to every operative, as well as to the engineer and architect: to the artist it is indispensable for success.

The work now before us seems well calculated to supply the growing want for such information. Its authors are a sufficient guarantee for the correctness of its details; and the execution is highly creditable to the publishers, and quite equal to the English edition, of which it is a reprint. It is a valuable acquisition to the very large class who need works of this character.

J. J. G., *Ed.*

THE AMERICAN

POLYTECHNIC JOURNAL.

PROGRESS OF IMPROVEMENTS IN PROPELLING VESSELS. No. 2.

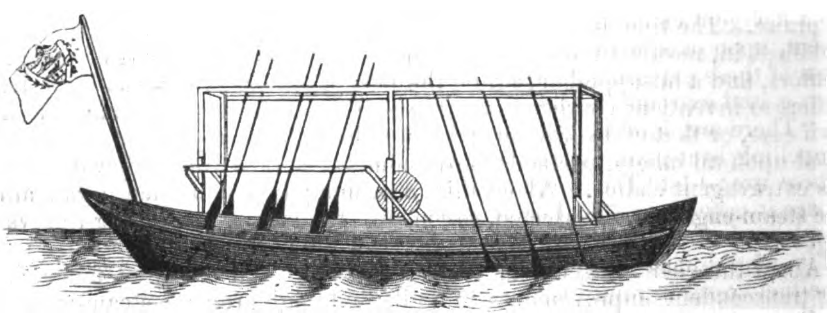
Recurring back to the suggestions of the earlier mechanicians for propelling vessels by an artificial mechanism, we find that the Academy of Sciences did, in 1757, propound as their prize essay, the project of moving vessels by other aids than wind or oars. The celebrated Daniel Bernouilli demonstrated the effect of several mechanical combinations to supersede the power derived from wind or oars. He gave the preference to paddle-wheels, which, he suggested might be moved by steam or gunpowder. We are not aware that any practical result grew out of his suggestions, although they were not unknown to Dr. Thornton, one of the associates of Fitch in his successful experiments upon the Delaware at a more recent period. Gautier, a canon of Nancy, also wrote an essay very remarkable for its clearness, particularly from a man living in an inland town, of secluded habits, and totally ignorant of maritime affairs. In the details of his scheme he shows much more mechanical tact and resource than Bernouilli. He describes an engine with several ingenious modifications to produce a rotary motion, to turn paddle-wheels projected on each side of the boat.

There would be great difficulty in attempting to unravel the interwoven claims of the numerous competitors for the honor of inventing navigation by steam, which arose about the close of the last century; we shall, therefore, only name the aspirants, and, as far as possible, give to each his meed of praise. The time is now past for the crimination and recrimination then indulged in, mostly from a too grasping disposition on the part of some inventors, and a misapprehension on the part of others, as to what their true claims to inventions consisted of. Each rival was anxious to make out his own case, or that of his favorite; boldly charging piracy, fraud, and falsehood upon all others, particularly those most likely to overshadow or curtail his extravagant claims. About this time, many ingenious men began, after the steam-engine was perfected, to conceive the idea of employing it advantageously.

About the year 1772, Oliver Evans, who has been rendered famous for his transcendent improvements in mills and high-pressure steam-engines, was attracted to the power of steam by an experiment with water confined in a gun-barrel, made by a neighboring blacksmith's boy; and having long desired to move wagons over common roads by artificial power, this seemed to open to him the way to effect his long-cherished purpose, In 1781 he described his ideas for propelling carriages and *boats*, as well as other machinery, by this power, and in 1785 he published an account of his paddle-wheel boat. But the favorite scheme with him was a steam-carriage, which he declared, as early as 1804, could be made to travel at a speed of fifteen miles an hour; for the boat project, although not abandoned, was neglected; and, in consequence of a want of funds, even the carriage had to give place to his better-comprehended mill improvements and other machines, by which he gained a subsistence. As he never came in contact as a rival with Rumsey or Fitch, they both spared him in their controversy.

In 1785 or 1786, James Rumsey, of Virginia, engaged in a mode of making a boat to be propelled by steam, of which he made a practical test: his mode was to draw water into a pipe through the bottom of the boat, and then expel it at the stern, in the manner of Dr. Allen, as described in our previous article, which, as we have already seen, was attempted more than fifty years before. This, like its predecessor, was a failure, although its author and his advocate, Barnes, treat it as a perfect and successful invention. About the same time, A. Donalson, of Philadelphia, worked upon the same device, but without success. We merely introduce these names as searchers after the valuable invention which was yet for all practical purposes sleeping in the womb of time.

Contemporary with Rumsey was the celebrated John Fitch, justly acknowledged as the first successful experimenter with steam to actuate paddles for the purposes of propulsion. It is unfortunate that his true position as an inventor had not been more clearly seen by himself and his friends, for then we should have been spared much of the angry discussion of claims with Rumsey, who, in reality, did not employ the same means, or indeed any means suggestive of his invention. In a communication to the Columbian Magazine, in 1786, Fitch clearly describes his invention as a double-acting horizontal engine, with a twelve-inch cylinder actuating an eighteen-inch wheel, which is connected with a series of paddles of most curious and ingenious device—they are paddles having handles or long straight arms; the lower ends of these arms near the paddle-blades are connected with cranks, the upper ends of the arms passing up through holes in a permanent frame above. All the paddles in one set are parallel with each other at all times, and, as the cranks revolve, are thrust forward, then downward, dipping into the water, and, after sweeping backward, rise out of the water for another dip.



This vessel, of which we give the above representation, was worked upon the Delaware, at Philadelphia, and ran, according to the statement of Dr.

Thornton, the superintendent of the United States Patent Office, at the rate of *eight miles an hour* a measured distance opposite Philadelphia; and it afterwards ran *eighty miles in a day*—which, if there is no error in the statement, is incomparably beyond any other attempt at propelling vessels ever attained up to that time. For this astounding success, the Dr. says in his account of the affair, "The Governor of Pennsylvania, Mifflin, attended by the council in procession, presented to the Company, and placed in the boat, a superb silk flag, prepared expressly, and containing the arms of Pennsylvania."

There seems to be some proof that not only Evans, but Fitch and his associates, suggested, about 1786, the employment of paddle-wheels similar to those now in use, but neither of them introduced them; and it is pretty clear that Fitch had many objections to them, some of which have been revived more recently.

The era of steamers was evidently now at hand, and efforts for their production were making in America by many ingenious mechanicians. Rumsey had gone to England, and no doubt proclaimed the success attained here; still all the most eminent and least sanguine engineers discountenanced the idea, and every discouragement and stumbling-block was placed in the way to oppose a final success, while the numerous failures heretofore seemed to warrant the correctness of their conclusions. But its advent could not be much longer delayed; the thing was shadowed forth, and constantly essayed by many in both hemispheres.

One of Fitch's greatest opponents was Mr. Latrobe, an eminent and highly-talented architect, whose opinions unfortunately had great weight with the public; and, as in all new countries, his fame as an architect gave him a position as an engineer which his knowledge did not warrant. About the year 1800 Latrobe wrote: "After the American Revolution, a sort of mania began to prevail, which, indeed, has not yet entirely subsided, for impelling boats by steam-engines. Dr. Franklin proposed to force forward the boat by the immediate action of the steam upon the water. Many attempts to simplify the working of the engine, and more to employ a means of dispensing with the beam in converting the libratory into a rotary motion, were made. For a short time a passage-boat, rowed by a steam-engine, was established between Bordentown and Philadelphia, but it was soon laid aside. The best and most powerful steam-engine which has been employed for this purpose (excepting, perhaps, one constructed by Dr. Kinsey, with the performance of which I am not sufficiently acquainted) belonged to a few gentlemen of New York. It was made to act, by way of experiment, upon oars, upon paddles, and upon flutter-wheels: nothing in the success of these experiments appeared to be sufficient compensation for the expense, and extreme inconvenience of the steam-engine in the vessel.

"There are, indeed, general objections to the use of the steam-engine for impelling boats, from which no particular mode of application can be free. These are:—1st. The weight of the engine and the fuel. 2d. The large space it occupies. 3d. The tendency of its action to rack the vessel and render it leaky. 4th. The expense of maintenance. 5th. The irregularity of its motion, and the motion of the water in the boiler and cistern, and of the fuel-vessel in rough water. 6th. The difficulty arising from the liability of the paddles or oars to break, if light, and from the weight if made strong. Nor have I ever heard of an instance verified by other testimony than that of the inventor, of a speedy and agreeable voyage having been performed in a steamboat of any construction."

Fortunately for mankind, such opinions only serve to retard, like breathing points for renewed exertion, the course of inventive genius, which otherwise might become exhausted from over-activity; another effort, and the opinion of croakers is silenced, and the admiring world at last crowns genius triumphant.

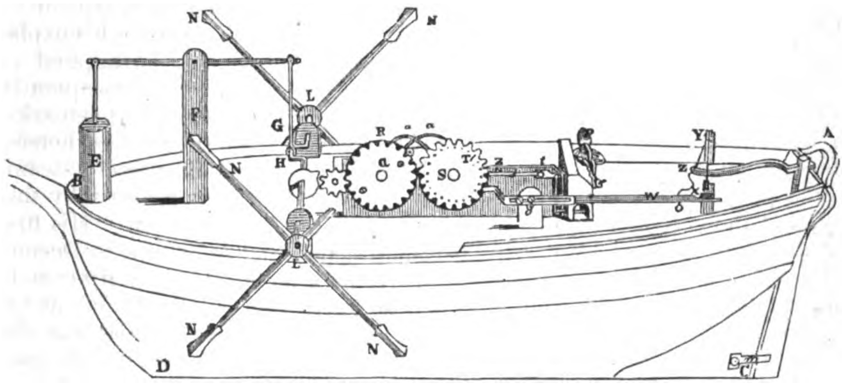
Another attempt to propel vessels by the power of a steam-engine was made by Mr. Patrick Miller, of Dalswinton, in Scotland, which is more important from the fact that Great Britain claims through him the honor of the invention of steamboats. In 1787, he published a description and drawings of a triple vessel, moved with wheels, and gave a short account of the properties and advantages of the invention. "In the course of his explanations, he *suggested* that the power of a steam-engine may be applied to move the wheels so as to give them a quicker motion, and consequently increase that of the ship." So says his son; but, from subsequent remarks, it is evident he had no settled idea on the subject. He thought of horses, and even the wind, to propel the wheels of his experimental vessel; steam, it seems, was suggested by an humble friend to Miller, as appears by this very candid narrative, and the hint was accordingly carried out. His first experiment with steam was on a very small scale; and some time in December, in the year 1789, about four or five years after Fitch's experiments at Philadelphia, his first boat moved on the Forth and Clyde Canal, at the rate of seven miles an hour. After this experiment, Miller's boat was dismantled and laid up, and the scheme abandoned, as was previously the case with those of his predecessors, and he thus lost the golden opportunity of immortalizing himself as the introducer of a new device for propelling vessels, but without their excuse of poverty.

Charles, the third Earl of Stanhope, noted for his numerous important inventions, among other things experimented, in 1795, with a method of propelling boats by steam. He adopted the device previously attempted by Genevois, to move his vessel by what are now known as duck-foot paddles—oars made to open out a broad surface while impelling the boat, and, on the return stroke, closing up into a small compass, like the web-feet of water-fowl; these were placed under the quarters of the boat. The engine which gave them motion was of great power, and acted on machinery that produced a horizontal stroke, but, says Stuart, "notwithstanding the diminution of the surface which was produced by the conformation of the oars, the reaction occasioned by their being drawn backwards was so great, that the flat-bottomed vessel, with which the experiment was made in Greenland Dock, did not move with a velocity exceeding three miles per hour. It has been mentioned that paddle-wheels were suggested to his lordship to produce the required speed, but the hint was thrown away by the noble projector." The hint above referred to was given by Robert Fulton, of whom we shall come presently to speak: he was then living in England, and corresponded with Lord Stanhope on the subject of moving ships by steam some time in 1793.

We find in the 10th vol. of the Repertory of Arts, published in London in 1799, a figure of a steamboat, a copy of which is annexed.

The invention is thus set forth: "A description of a new fire-ship (to be rowed by steam) that will conduct herself into an enemy's port, without any person being on board; with an exact drawing of the model, as laid before the Admiralty in October, 1796. By Mr. Edward Thomason, of Birmingham."

He says, "The first thing I had to contrive was the mode of applying the oars; it struck me that the most simple method would be, by fixing them to one or more fly-wheels on each side of the vessel. Convinced that this would answer, my next consideration was, the machinery necessary to be attached, so as to move the rudder at any given time, whichever way it might be required. This completed, a third movement was wanted, to make the vessel set fire to her combustibles, at the very time she arrived among the vessels in the enemy's harbor; this I at last invented to my entire satisfaction. The construction of which ship I shall now describe, after observing, that the machinery is placed *on deck* in the figure, that it might be more intelligible.



"A B C D, Fig. 1, is the vessel (any one unfit for service would do); E F G the steam-engine, which produces a rotative motion, by means of a crank H. I I are the arms of the crank, which pass through the upright sockets K K, wherein the spindle of the crank moves. L L are the fly-wheels, fixed on each end of the spindle of the crank; the arms of which N N are the oars, each passing through the surface of the water at every stroke of the steam-engine. As the wheels are placed perfectly true, and opposite to each other, the oars must fall on the water, on each side of the ship, at the same instant of time, which compels the vessel to keep a rectilineal course, if the rudder is kept in a straight position."

The rest relates to a method of steering and setting fire to the vessel when it has reached the enemy's ships; but that part of it is foreign to our purpose, and may well be omitted: the device was never carried out, but seems to date back to 1796, and is very perfect in its arrangements.

William Symington, who had, like Evans, attempted to apply steam to the propulsion of carriages, was called in to aid Mr. Miller in his experiments before related. Symington seems to have been more sanguine of success than Miller had been, for, after his patron had abandoned the project, he pursued it; and about twelve years later he interested Lord Dundas to assist him to make another experiment on the Forth and Clyde Canal on a larger scale, to obtain a towing power which would be an economical substitute for horses. In 1801–2 Symington says he experimented with an engine having a steam-cylinder twenty-two inches diameter and four feet stroke, which proved well adapted for the intended purposes. In March, 1802, the steam-tug, having Lord Dundas and several others on board, took two loaded vessels, each of seventy tons burden, in tow with great ease through the canal, a distance of nineteen and a half miles, in six hours, with a head wind, or at the rate of three miles and a quarter per hour. This was deemed satisfactory by the inventor; but there were objectors, and the scheme was abandoned. Symington imagined all subsequent success was due to his experiments, and all the knowledge of more recent experimenters was obtained from him. He even relates, circumstantially, conversations he had with Fulton, and the knowledge he imparted to Bell, but we think in both instances it wants confirmation.

In the foregoing sketch we have seen the very great number of attempts to propel vessels by steam, most of which were crude and abortive, and the few efforts that were made in the right direction abandoned by their faint-hearted projectors; the most noted engineers of the times were incredulous and skeptical; some passed by in silence, others laughed at the mad attempts of those they deemed fanatics, insane, or hopelessly ignorant and visionary. They were strengthened in their opinions by the results, and could point with confidence to the time and money fruitlessly wasted, in disregard of their superior knowledge. But man is like the laborious pismire, who, finding a moat to cross, boldly plunges in and meets destruction, to be followed by another and another, till a bridge of the sacrificed is made, upon which one at last succeeds in surmounting the obstacle; after which posterity rushes over, regardless of the dear-bought comfort they enjoy, and the elevation and refinement to which they have been raised, without an effort on their part. On the other hand, we may be led to think too little of the last bold and successful adventurer; but consider what nerve and sagacity it requires to brave the danger, when all before without exception have failed; unlike the little insect in one particular, who is guided to his fate by instinct, without knowledge of his danger; each fallen predecessor makes the way of the inventor more perilous and uncertain. Nothing but success, absolute success can be any palliation of his rashness. Pity! he can expect none if he fails! all the world knew long beforehand he would fail! any school-boy could have told him so, and his rashness only meets its merited reward.

He must be a bold man, and great, who dares brave all this for the reward of advancing the world a little farther; and few there be who succeed. And even when success attends them, and they are crowned with glory, as a Savary, a Newcomer, a Watt, a Fulton, of these how few attain other reward than a sculptured monument!

Heretofore we have recorded nothing but failure and abandonment; we now come to the crowning success in steam navigation—a success which has been acknowledged by all the world.

Robert Fulton and John Stevens were compeers in the race, and we shall try to deal justice to all. We shall in the next article attempt fairly to lay their merits before our readers, together with their assistants, after which we will trace the subsequent minor devices, giving a type of each.

WATER-MEASUREMENT SYSTEM OF THE MILANESE FOR IRRIGATION.

[From the Report on Italian Irrigation by R. Baird Smith, F. G. S., Captain in the Army, vol. ii.]

As preparatory to the detailed description of the *modulo magistrale* of Milan, I may first state, in outline, the essential conditions which, according to the most approved Italian authorities, are to be fulfilled by a trustworthy apparatus for the measurement of water employed in irrigation. To claim rigid accuracy for any such apparatus, in the present condition of hydraulic knowledge, is impossible; but where the object is the practical one of measuring the water issued, within reasonable limits of error, satisfactory results may, I think, be obtained.

The general laws by which the motion of fluids are regulated are sufficiently familiar to make it unnecessary for me to dwell at any length upon them. The basis of all formulæ for discharge by orifices is the Torricellian theorem, published first in 1643, which establishes the law that "if no disturbing causes interfere, the velocity of a fluid on issuing from an orifice in the side of a reservoir, is that which would be acquired by a heavy body in falling freely from a height equal to the distance between the surface of the fluid and the centre of the orifice." According to the first principles of accelerated motion, the velocity of a freely falling body is proportioned to the time consumed in acquiring it, and the height to the square of this time. Hence we have the elementary expressions,

$$v = \sqrt{2 g h} \text{ and } h = \frac{v^2}{2 g},$$

in which v represents the velocity of the fluid on issuing from the orifice, h the height corresponding to this velocity, and g the constant of gravity; whence it follows from the relations thus established between the velocities and the heights corresponding to them, that if a series of orifices be opened in the same vertical line in the side of a reservoir, the curve which results from taking the heights as abscissæ, and the velocities due to these heights as ordinates, will have its abscissæ proportional to the square of its ordinates; or, in other words, the curve in question will be the parabola, the properties of which supply the means of calculating with simplicity the velocities corresponding to given heights, as has been done by De Regi, in his "Tavola Parabolica per le Bocche d' Irrigazione," a work which I found of high authority among the engineers of northern Italy in all hydraulic calculations.

The means thus existing for determining the velocity due to given heights of water, it might seem that, to obtain the discharge, it was only necessary to multiply the area of the section of the outlet by the velocity corresponding to the head of pressure, or battente, over it. But, in truth, there is no branch of physics in which the theoretical correspond less with the observed results than in hydraulics, and the most approved formulæ with every possible correction are still far more rigidly accurate. There are numerous distributing elements to be taken into account, some of which remain still but imperfectly determined. First, the coefficient, representing the force of gravity, varies with the latitude and the elevation of the locality; and it is necessary to the accuracy of the discharge, that its exact numerical value should be known. Second, the discharge from an orifice is modified by the resistance of the air, and never in practice conforms to the theoretical condition of a vacuum. In cases of outlets for irrigation, the discharge almost invariably takes place in a fluid medium, and is modified by the resistance of the water. Third, there is scarcely a single condition of the supplying channel, as regards its form, its inclination, the material of which it is composed, and numerous other physical circumstances which do not react on the volume discharged from a given outlet under a determinate pressure. And, fourth, the form of the outlet itself is of the last importance to the estimate of the volume of water it is capable of discharging under given circumstances. According as this form varies, the coefficient representing what is technically called "the contraction of the vein," varies also, and to an extent which influences in the first degree the discharge from it. The determination of this coefficient has been the object of many series of experiments, the most complete being that of MM. Poncelet and Lesbros, published in 1832, under the title of "Experiences Hydrauliques Metriques," for an abstract of which I am indebted to the "Idronamica" of Colombani. According to these experiments it appears that, for orifices of the dimensions and with the pressures most common in irrigation, the mean coefficient of contraction is between 0·62 and 0·63. But even at best these results must be used with caution, as many circumstances will occur in actual practice to modify them. I do not know that any satisfactory experiments have been yet made on the discharges of outlets partially or wholly immersed in water, as is constantly the case with the heads of channels of irrigation. Many new conditions arise in such cases to complicate the problem, and I confess I have little or no confidence in any of the existing means of solving it. The best result that can at present be obtained should therefore be regarded as simply an approximation to the truth, and nothing more. The conditions essential to the practical working of a good system of measurement are thus stated by Brunacci ("Memoria," p. 71).

"In order that orifices in two separate reservoirs maintained constantly full, should discharge equal quantities of water in equal times, it is necessary—

"1. That the two orifices should have exactly the same area, the same form, and especially the same perimeter.

"2. That they should be placed at the same depth beneath the surface of the water.

"3. That the plates or partitions in which the orifices are cut should have the same thickness.

"4. That the water in both reservoirs should be equally calm or equally distributed on its surface, or throughout its mass in the vicinity of the orifices.

"5. That the directions in which the water passes through both orifices should be the same.

"6. That the water, if not stagnant, should arrive at the two orifices with the same velocity.

"7. That the discharge of the water from the orifices should be equally free or equally checked—that is, if canals are attached to the outlets, they should have equal sections, slopes, or other conditions.

"8. That if the discharge is made in water the reaction should be the same in both cases."

These conditions were originally indicated about the middle of the sixteenth century, and they include nearly every thing that could influence the discharge. It will be seen, however, that some of them are purely theoretical, and their attainment in practice should not be possible. Looking simply, therefore, to the demands of an ordinary irrigation system, a module which effected perfectly the following results, would leave little to desire; and in proportion as existing forms do effect them, they may be ranked higher or lower in the scale of practical value. The results sought are—

1. That wherever placed, outlets nominally of equal discharge should always furnish, in given times, exactly the same quantity of water.

2. It is an essential result that the discharges should be equal, however the level of the canal of supply may vary.

3. The measuring apparatus should be so constructed as to render it impossible for its proprietors, or any other person whatsoever, to alter in any way its discharge, without leaving traces of such attempts easily to be recognized.

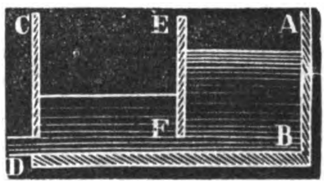
4. That the manner of working the apparatus should be so simple as to require no more than the ordinary intelligence on the part of the officials intrusted with its regulation, so as to avoid all risk of its being injured either by their awkwardness or ignorance.

5. That no calculation should be necessary in regulating the discharges; but when alterations of the quantity of water were necessary, they could be made at once by the mere adjustment of the measuring apparatus.

6. The apparatus should occupy but a limited space, so as to admit of its being applied to all localities.

7. The normal discharge or unity of measure being once determined, the apparatus ought to be so constructed as to insure constancy of volume from large and small outlets.

When these seven conditions are exactly fulfilled, the problem of a measure of water, perfectly applicable to the wants of the most extensively developed system of irrigation, will be solved. I may now proceed to show in how far the *modulo magistrale* of Milan has effected this; and, first, as regards the elementary principles on which its construction is founded.



Let A B C D be a vessel supplied with water, having an outlet at D, and divided vertically across its breadth by a partition or diaphragm E F, which can be placed at variable heights above the bottom of the reservoir. On investigating the phenomena of discharge under these circumstances, the early Italian experimentalists found—

First. That there was established between the two compartments of the reservoir a constant difference of level, and that this difference was proportionally greater according as the opening of the diaphragm was less in comparison with that of the outlet. In other words, the opening at D remaining constant, and that at F being variable, the difference between the levels of the water in the compartments A E F B and F E D C was found to be proportional to the difference between the areas of the outlets and D F. As F became less in proportion to D, the difference of level increased, as might have been expected.

That if instead of maintaining the level of water in the reservoir constant, it was subjected to elevations or depressions, the variations corresponding to these were found to continue proportional to the heights originally established in the two compartments respectively, for a given condition of the orifices of discharge and communication; in other words, if, when the level in the reservoir was maintained constant, the heights of water in the two compartments were to each other as 3 to 1; then a depression of the level of the first compartment, to the extent of, say 3 feet, would produce in the second a depression of one foot; 18 inches in the first, 6 inches in the second, and so on.

3. That this principle was not effected by the employment of two or more partitions; that is to say, the same relative proportions were maintained between the variations of level and the original heights of water in the first and last compartments, whatever addition was made to the number of the intermediate diaphragms.

The application in practice of the principle here stated is sufficiently clear and simple. Suppose the first compartment A B E F to be a canal or reservoir, E F the sluice-gate at the head of an irrigating channel, and D the regulating or measuring outlet, it is clear that by raising or depressing E F, according as the variations in the level of the main canal render necessary, a fixed and constant height of water may be maintained over D, and that condition, which in all irrigating countries has been recognized as the most important to a good module, may thus be practically secured. I need scarcely remark that as the physical circumstances of canals of irrigation make changes of level very frequent, a certain amount of fluctuation in the volumes discharged by every module must necessarily be tolerated. What this amount may be is of course dependent on local considerations and convenience, but the moment it is passed, an apparatus, constructed on the principles above noticed, furnishes the means of at once re-establishing it in its normal condition. But it is to be observed further, that, independently of the power thus supplied to establish, when it is considered necessary, an exact pressure on the measuring outlet, the sluice, or *paratoja*, produces an important effect by its mere presence. For, on the principle expressed in the second of the results of the Italian experimentalists before given, the variations of level in the main canal produce on the water within the module the minima of alteration, and the greater the difference of height between the water outside and inside the sluice, the more marked is the diminution of the effect of changes of level in the former. As a numerical illustration of this point, it has been found that in the Milanese module, when the difference of height between the water on each side of the sluice amounted to 6·96 feet, a depression of level outside, or in the canal, to the extent of 4½ inches, led to a variation in the interior of the module of a little less than a single inch. The pressure on which the discharge of the module so intimately depends was, therefore, affected to the extent of about one-fourth of the variation in the supplying canal, and the same proportion would continue if the sluice should remain in a fixed position. Its passive influence, so to speak, is accordingly of material use in practice. Although the introduction of the regulating, or, as it is sometimes termed, the hydrometric sluice, is the most important step in the improvement of the measuring apparatus of Italy, there are other circumstances which are also very essential. These are the distance of the measuring outlet from the head, the form of the chamber included between these points, the form and dimensions of the chamber below the measuring outlet, the proper dimensions of the measuring outlets themselves. These latter conditions vary exceedingly in different cases; and in looking to the approved modules of Northern Italy two distinct points are to be noted. 1st, That each exhibits in the *paratoja*, or hydrometric sluice, a fixed and fundamental portion of the apparatus destined to insure constancy of pressure on the measuring orifice; and 2d, That they exhibit various arrangements, differing in each, designed to regulate the condition and movement of the water in the module, both as affected by the supplying canal and the channel of distribution. These general remarks may prepare the way for a clear conception of the module of the Milanese, which I now proceed to describe.

The historical sketches of the great canals of the Milanese, given in Part II., have rendered unnecessary any detailed account of the circumstances under which the modulo magistrale was introduced. The crying evils arising from the fraudulent appropriations of the waters of the Naviglio-Grande were the moving causes to the establishment of this measure. From the commencement of the thirteenth to that of the sixteenth century, grants of water in the Milanese were made in the *rodigine*, the synonym, as formerly mentioned, of the Piedmontese *ruota*, the French *aëil de meule*, or the moulin d'eau, and literally, in English, "the wheel." The *rodigine* was the quantity of water passing through an opening of 12 local square inches, of which the sill was placed at 8 inches above the canal-bed in the Naviglio-Grande, and 4 inches for the river Olona. The water-inch, however, was a measure quite as undetermined and unsatisfactory as the *rodigine*.

It is not until the beginning of the sixteenth century that we find any accuracy introduced into the water measures of the Milanese. In 1503, the following instructions were issued:—1. That all outlets should be made in slabs of granite or marble, with a fixed height of 4 local inches. 2. That they should be established in the banks of the canals without accompanying dams, spurs, or any other like works. 3. That the outlet, properly so called, should have attached to it a chamber in masonry of the length of 9 braccia (17¾ feet), of which the lateral walls parallel to each other should form on each side a return of 3 inches (5·893 English inches) in excess of the breadth of the outlet. 4. Finally, that the sills of the outlets should be established at heights fixed for each canal according to the depth of the water in it.

The first rude outline of the modulo magistrale is to be traced in these regulations. An attempt is made to regulate the discharge from the outlets by the introduction of a masonry chamber; but as yet the means of establishing a fixed pressure had not been devised. It was between 1559 and 1561 that the hydrometric sluice was first employed, and then in association with the module of Cremona, which, as we have formerly seen, combined with it, by a sort of perverse ingenuity, as large a number of imperfections as such an apparatus could display. Ten years later, or in 1572, Soldati submitted to the magistracy of Milan the modulo he had invented; and it is curious to note that it was constructed on purely empirical data, for at that period it may be said that the scientific principles of hydraulics were scarcely known. In the history of the Naviglio-Grande I have given the conditions of the problem, as submitted by the magistrates to the engineer of Milan, and of these I may repeat here the three which may be considered fundamental.

1. To indicate the best unit for the measurement of water employed in irrigation, and such a method of distributing it as should be injurious neither to the public treasury, to navigation, nor to the consumers.

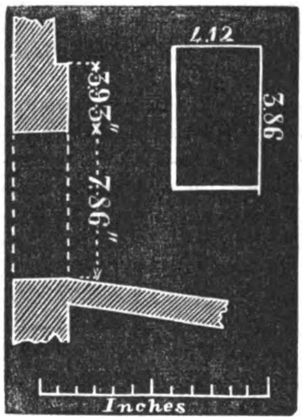
2. To discover an apparatus which should be competent to discharge in a given time, by outlets of fixed dimensions, a constant volume of water, whatever may be the variations in the level of the supplying canal, or that this volume once fixed under a known pressure, should be rendered per-

fectly independent of the variations which might take place either in the level of the water or in the form or direction of the canal.

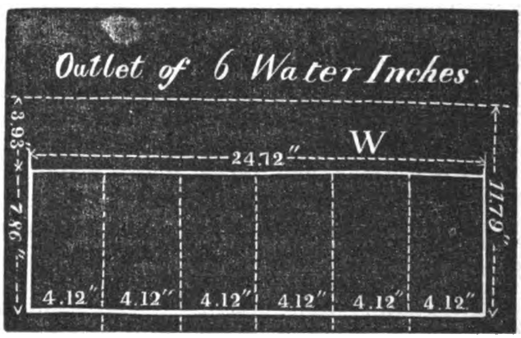
3. To construct the apparatus so that it would oppose all possible obstacles to that system of fraud or alteration by which a greater quantity of water had been obtained than was originally granted, and which had hitherto prevailed throughout the country.

These instructions were fulfilled by Soldati in the following way: The unit of measure fixed upon was called the *Oncia Magistrale*, and is that quantity of water which flows freely, or under the sole influence of pressure, through a rectangular opening, having a uniform height of four local inches (7·86 English inches), a breadth of three local inches (4·12 English inches), and a constant pressure of two local inches (3·93 English inches) above the upper edge of the outlet. The diagram below exhibits to the eye the dimensions of this unit of measure.

Oncia Magistrale of Milan in English Measures.

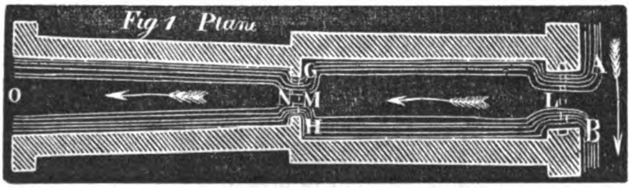


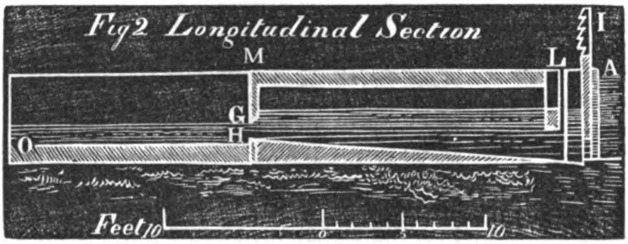
It is essential that the above dimensions should be rigorously observed, and especially that the constant pressure of 3·93 inches over the outlet should be maintained. When one outlet is designed for the discharge of several water-inches, the breadth only varies in the proportion of three local linear (4·12 English) inches for each additional water-inch, the height and the pressure remaining constant, as thus:



The outlets are cut with care in a single slab of stone, which varies in different localities, being in some granite, in some mica slate, and in some marble. To preserve them from being tampered with, an iron rim is fixed upon them of the exact dimensions corresponding to the discharge. They ought invariably to be cut in a simple plate, with no arrangement of any kind to increase the volume beyond that due to pressure alone. The thickness of the slab varies somewhat with the dimensions of the outlet, but in a rigidly exact module this dimension should be fixed in common with all the others. These are the conditions applicable to the measuring outlets. To illustrate the other arrangements of the module, I give below a plan and section of it in its complete form.

Modulo Magistralo of Milan.





The head A B, Fig. 1, is placed on the bank of the canal of supply with the sill C D, Fig. 2, on the same level as the bottom of this canal. It is formed of two side walls or cheeks, of good masonry, in brick or stone, with a flooring generally of the latter material. To prevent erosive action, the bed of the canal, for such distance as the force of the current may render necessary, is paved with slabs of stone or boulders, both above and below the head. The outlet of the head is usually made of the same breadth as that of the measuring orifice G H, Fig. 2, while its height is regulated by that of the head itself. The sluice-gate, or paratogia, I K, Fig. 2, works in grooves, and is fitted with a rack and lever, by which it can be readily raised or depressed at pleasure. As the surface level of the canals of the Milanese varies comparatively little, the upright of the sluice has a small catch, in iron or wood, attached to it, by which it is kept at a fixed height corresponding to the requisite pressure on the orifice G H, Fig. 2. This little catch is locally termed the *gattellò*; and as it is provided with a lock and key, the latter of which is intrusted to the guardian of the canal, the proprietor of the water-course is supposed to be restricted to his legitimate supply; and probably is so within reasonable limits, provided always, that the guardian is incorruptible. In rear of the sluice-gate, at the head, is placed the first chamber L M, Figs. 1 and 2, called, in the language of irrigation, the *tromba coperta*, or covered chamber. It has, in the established form of the modulo, a fixed length of 10 braccia, equal to very nearly 20 English feet, and a breadth variable according to the size of the head sluice, which it exceeds by the fixed quantity of five local inches on each side, or ten on the entire breadth, being nearly 1·64 English feet. The bottom of the covered chamber D H, Fig. 2, is formed with a slope to the rear, or as a ramp: the height of this slope H *h*, is equal to eight local inches, or 15¾ English inches, very nearly; and its object is to diminish the velocity with which the water reaches the measuring outlet G H. Further to assist in effecting this object, the perfect modulo is provided with a horizontal top of stone slabs or planks, called the *cielo morto*, the under surface is at precisely the same height as the water ought to have over the outlet G H, so as to secure the fixed discharge, that is, 3·93 English inches, above the upper edge G H. The great purpose of the apparatus being to secure the discharge taking place under simple pressure, the *cielo morto;* which may be roughly rendered the "deadening cover," is found to reduce the irregular motion of the water in passing from the sluice A B to the measuring outlet G H.

To admit of ready inspection of the state of the water within the covered chamber, the following arrangements are made: The entrance to the chamber is covered by a stone slab of convenient thickness, shown in section at E, Fig. 2, the lower surface of which is precisely on the same level as the upper edge of the outlet G H. The height of the ramp H *h* being 15·72, and that of the outlet G H being 7·86, the surface of the slab at E should be just 23·58 English inches above the sill of the head C D. An open groove L D is made in the masonry, large enough to admit a graduated rod or measure; and when the water stands at a height of (23·58 + 3·93) 27·51 inches above the sill at D, it is known that the proper head of pressure exists at G H. As it is found to be greater or less, the sluice is raised or depressed, so as to adjust the pressure to the fixed standard.

The slab of stone, in which the measuring outlet is cut, being fixed at G H, Figs. 1 and 2, immediately in rear of it there is placed the *tromba scoperta*, or open chamber. Its breadth at N, Fig. 1, is two local inches, or 3·93 English inches, greater on each side than that of the measuring outlet, or in all 7·86 inches. Its total length N O is very nearly 17¾ English feet. Its side walls, which are perpendicular, like those of the covered chamber, have a play outwards, so that the breadth at O is 11·79 inches greater than at N, or 15·72 inches in excess of that of the regulating outlet G H, being the same as that of the covered chamber throughout. To insure the free run of the water from G H, the flooring of the open chamber has a drop or fall of 1·96 inches at H, and an equal quantity distributed uniformly between H and O, Fig. 2. There is therefore a total fall from the under edge or lip of the measuring outlet to the end of the open chamber of 3·93 inches, or, as the length is 17·72 feet, very nearly 1 inch in 54. When the water reaches O, it enters the channel of distribution, and becomes the property, either temporarily or permanently, of the parties to whom the grant of it has been made. Arrangements at O vary. Sometimes there is a fall from the end of the modulo to the bed of the channel, but generally the two are on the same level, the latter being carried forward at the usual slope for such works.

From the preceding details it therefore appears that the modulo magistrale, in its normal form, has a length of nearly 37¾ English feet, and a breadth variable according to the quantity of water it is designed to measure. If a single "water-inch," for example, be the volume, the breadth of the covered chamber would be 25·54 inches, and that of the open chamber 13·75 at its upper and 25·54 at its lower extremity. The flooring of the former rises 15·72 to the rear, while that of the latter falls 3·93 in the same direction.

It is essential to the effective operation of the regulating sluice in the modulo magistrale, that there should be a difference of level between the water in the canal and in the apparatus of at least 7·86 inches; and as the height of water in the latter must be 27·51 inches, the depth of water in the canal of supply must necessarily be not less than the sum of these numbers, or 35·37, being very nearly 3 feet. In this case the relative heights of different parts of the works are given below, the bottom of the canal of supply being the zero line.

	English inches.
Bottom of the canal	0·00
Level of the water in the canal	35·37
Level of the water in the interior of the modulo, giving the constant pressure	27·51
Level of under surface of the stone slab at the mouth of the covered chamber, and of the upper edge of the measuring outlet	23·58
Level of lower edge of measuring apparatus at the end of the ramp of the flooring of the covered chamber	15·72
Level of the flooring at the head of the open chamber	13·75
Level of the flooring at the termination of the open chamber	11·79

In analyzing this modulo, two essential objects become apparent, to the fulfilment of which the various details just given are directed. 1st, To maintain on the measuring outlet a constant pressure; and 2d, To make this pressure as much as possible, the sole force influencing the discharge. To the first object are directed the different mechanical arrangements at the head, the paratoja duly provided with the *gatello*, and, to a certain extent, the *cielo morto*. To the second belong the interior arrangements of the covered chamber, with its sloped flooring and fixed top; while the free passage of the water is secured by the open chamber, with its small fall at the head and continued inclination of the bottom.

I purpose giving in the description of the plates the details of several examples of canals of distribution regulated by the modulo magistrale, which will illustrate the extent to which, in practice, the normal form has been departed from. I examined personally a great number of these works, and I can scarcely say I found any which conformed rigorously to the prescribed form. The lengths of the chambers varied continually, and, apparently, according to the fancy of the engineers by whom they had been constructed. One-half the normal lengths was a not unusual proportion; but the breadths, with reference to those of the measuring outlets, were usually observed more carefully. In a great number the deadening cover was wholly dispensed with; in many more the backward slope of the flooring of the covered chamber did not exist, though the lower edge of the measuring outlet was maintained at the prescribed height of 15·72 inches above the level of the sill of the head of the canal. All these variations are unquestionably imperfections, though they cannot be said to destroy the utility of the apparatus; and it is matter of regret that they should have been permitted to grow up as they have done. Discretion in changing the details of a measuring apparatus should be vested in the government only, which can from time to time sanction such alterations as seem likely to add to the efficiency of the work; but for private parties to be allowed to follow their own caprices, is ruinous to the existence of any well-defined and generally recognized system of measurement. Its results become uncertain; its unit ceases to be a fixed quantity, and things relapse into that state which favors fraud by defying easy verification.

An apparatus so extensively employed, and linked in its action with interests so important as the modulo magistrale, has necessarily engaged much attention, and caused no small amount of discussion among mathematicians and engineers. Though admitted on all hands to be the best form yet devised for use in irrigation, these discussions have drawn attention to some sources of error, which affect its results very materially.

In seeking to ascertain the real value of an *oncia magistrale* of water, as measured by the *modulo magistrale*, I have been struck by the variety of results different authors give. I am indebted to the *Idrodinamica of Colombani* for some of the following values, to the tables of the Piedmontese government for others, and I give them to show practically that the modulo of Milan cannot yet be said to have fulfilled its object perfectly.

According to the calculations of De Regi, in his Tavola Parabolica, pp. 67, 68, the value of an oncia magistrale is 2·43 cubic metres per minute, or in English measure very nearly 1·42 cubic feet per second.

Bruschetti gives a long detail of experiments made in 1744 by the engineer Merlo, on the Muzza canal (Stor. Irrig. p. 230 et seq.), to determine the value of the Milanese oncia, the mean result of all of which is to make it equal to 1·57 cubic feet per second. Signor Mazzeri, who was kind enough to communicate many details of this kind to me in person, estimates the value of the oncia at 1·21 cubic feet per second.

Brunacci estimates it at 1·46 cubic feet per second, while the Department of Public Works in Lombardy consider it to be equal to 1·64 cubic feet per second. The highest estimate, so far as my examination has gone, is that last mentioned, or 1·64 cubic feet per second, while the lowest is 1·21 cubic feet per second, as given by Signor Mazzeri, and generally adopted by the engineers of Lombardy. The difference between these extreme estimates is very considerable, being between one-third and one-fourth of the total quantity discharged.

The origin of these differences is owing to a cause which affects the whole of the modules of Northern Italy. The experience on which the estimates of the engineers are founded has been generally derived from dealing with small quantities of water not exceeding one or two inches.

The estimate made by the government is founded on the experience of the results on the great canals, where the outlets are of almost uniformly large dimensions. Now it is certain that, all other circumstances being alike, the quantities of water discharged from large outlets are proportionally greater than those discharged from small ones. Hence the oncia magistrale, as determined by experiments with the former, has a decidedly higher value than when determined from the latter. The cause of this is clear. To give a discharge, say of six water-inches, the breadth of the outlet is made six times that for one inch, the height and the pressure remaining in both cases the same. The proportion between the sectional areas and the perimeters of the outlets become, however, materially altered, and the influence of the perimeter, in effecting the contraction of the vein, diminishes gradually as the size of the outlet increases, and in a similar proportion, the discharge becomes greater. In elucidation of this remark, I may state that in an outlet for one oncia magistrale, the ratio of the section to the perimeter is as 1 to 23·33; of 2, as 1 to 16·66; of 4, as 1 to 13·33; of 8, as 1 to 11·66; of 10, as 1 to 11·33, or about half what it is for one oncia; of 20, as 1 to 10·66, and so on; and there are real differences of discharge due to the variable ratios now given. Very serious pecuniary loss may consequently be the result either to the proprietors or the consumers of the water. The recognition of the differences between the discharges of large and small outlets was very early made in Lombardy. In the module of Cremona, invented in 1561, no single outlet was allowed to be more than 15·72 inches high and 38·12 inches broad, equal to about 12 or 13 once magistrale. In the Milanese single outlets have been restricted for nearly three centuries and a half to discharges of from 9 to 12 once. In Piedmont they have been more careful, and have there limited single outlets at 6 once, which by general consent seems to be the most approved size for diminishing to the utmost the error due to the inequality of discharges from large and small openings. For practical purposes therefore, and taking the mean of the various estimates of the value of the oncia magistrale, just adverted to, I think it may safely be considered as equal to very nearly $1\frac{1}{2}$ cubic foot per second. The following short extract from Brunacci (Mem. sulla Dispensa delle Acque, p. 140), showing the conclusions at which he had arrived after a minute discussion of the various methods in use for measuring water throughout Italy will close appropriately this section:

"On the grounds previously detailed, we are of an opinion,

"1st. That of all the methods in use throughout Italy for the measurement of water, the method of the Milanese is the most convenient.

"2d. That, in addition to reducing the local to metrical measures, the other precautions to be adopted in perfecting its operation are as follows:

"First. To establish by careful observation, with an hydrometer, the variations of the height of water in the canal of supply, and to mark on a scale the respective positions of the sluice-gate required to neutralize such variations in the interior of the modulo.

"Second. To enjoin the guardians to be most careful in fixing the gate at the special point prescribed for each variation, so that the *battente* or pressure may be constant.

"Third. To make no outlet greater than eight times the unit of measure, and when a discharge greater than this is necessary to obtain it by the construction of two or more outlets in the same edifice, with the precautions formerly described, so that each outlet shall be quite independent of the other, and have all the essential conditions of constancy, just as though it stood by itself.

"Fourth. Finally, to substitute for each oncia of the braccio of Milan in the dimensions of the apparatus, one-half a decimetre (or 1·96 English inches)."

The following table shows approximately the volumes of the principal water measures referred to in the preceding sections, and may be useful for reference:

Table showing the Volumes in cubic feet per second of the following Water Measures of Lombardy.

	Volume in cubic feet per second.	Ratio of each to the Oncia Milanese as unity.
1. Oncia Milanese	1·50	1·
2. Oncia Lodigiana	0·77	0·513
3. Oncia Cremonese	0·7175	0·478
4. Quadretto Veronese	5·0890	3·392
5. Do. Montovana	11·0005	7·333

CLIMATE OF GREECE.

[Translated for the American Polytechnic Journal, by CHARLES L. FLEISCHMANN.]

DIRECTOR C. TRAAS, M. D., in his work entitled "*Climate and Vegetable Kingdom*," Munich, 1845, says: The excessive formation of roots of the plants of Greece, depends on the same causes as in the plants of the Arctic region, or in plants grown upon mountains, near the region of snow, because great heat and dryness, like great cold under certain circumstances, produce the same effect.

That the formation of large roots is not very beneficial to the culture of plants is obvious, as this development takes place at the expense of those organs which are more important to the development of the plant, whereby vegetation is retarded and impaired, although it might become useful to agriculture in the transformation of annual plants into perennial ones.

The ancient inhabitants of Greece feared rain and wet when the vine and olive were blossoming. During our stay, says Traas, we had occasion to fear the contrary.

At Alexandria and the Delta, the temperature rises during the day to 100° Fahrenheit; the mean of temperature in lower Egypt is about + 70 or 75 Fahr. The predominating winds are from the north, N. N. E., N. W., always cool, moist, and charged with sea-salt, sometimes forming quite thick incrustations during a single night.

The Kamsin, a southeast wind, blows in April and May, and is considered dangerous.

The Simoom, blowing from all points, is much feared in the desert on account of its violence.

Few of the European fruits succeed there; the annona, squamosa, bambusa, tamarinds, &c., grow better.

At Athens the thermometer never falls below + 44° Fahrenheit. This degree of temperature, however, kills the riçinus, Gossypium jumelii, potato and luzerne, which is never the case as to these same plants at Pyros and Navarin, Rolamata, or Malta. At Athens the snow remains an inch deep on the ground sometimes from three to four days. The greatest cold is in the month of January; in that month some forest trees begin to blossom, and in sunny places on the mountain spurs many plants appear in bloom, among which the anemones are the most conspicuous. In the autumn north and northeast winds are most prevalent; and late in December the south and southeast winds. Thunderstorms and earthquakes occur oftener in the autumn and winter. The great heat commences about the latter part of May, when the cruciferii and umbelliferi begin to disappear, and the caryophyllares and composites develop themselves. This has reference only to the plains and hilly portion of the country.

During the following months the labiates appear, and the leguminosæ constitute the principal part of the flora of Greece, accompanied by the whole tribe of thistles.

About the latter part of July and in the beginning of August, the heat reaches its highest point, and 105° to 110° Fahr. are nothing uncommon. During full moon, there is, through the day-time, an increase of heat perceptible; whereas, during the new moon, the sky shows only a few floating clouds. The north wind is most prevalent, which blows periodically along the east coast, from the Bosphorus over Eubaea and Attica.

This wind is the regular cloud-maker, but does not bring rain. During the night the wind ceases, but begins again between nine and eleven o'clock. The southwest wind is preferable about that time of the day, especially when it comes from over the sea.

In the latter part of June, the dew ceases to be formed in the higher located places. The plains of Xirobuna are dried up, and the red thistle and capparis spinosa are the only living plants. Locusts enliven the gray olive-trees, and fill the air with their dreary music day and night. And Hesiod sings: "And where the thistle blossoms, and the singing cricket sitting among the leaves of trees, sending forth its shrill notes, without rest, under the wings of the ever-busy summer."

About the middle of September new life begins in the vegetable kingdom.

The abundant dews produce Scilla maritima and autumnalis, Cyclamen persicum, Atractylis gummifera, Merendosa caucasica, Calchicum variegatum and montanum, Crocus sativas, Sternbergia lutea, and Leontodon gymnanthum, followed soon by Crocus striatus and vernus, Erica verticillata.

This new impulse of vegetable life is a little retarded by the temperature of the winter months; and in January the blossoming of the grain crops begins.

The highest point of development of the flora is in March and April, and it rises gradually in the more elevated points of Xirobuna, and in the beginning of July it reaches the mountain regions.

The greatest quantity of rain falls in the months of November and December. The number of rainv days at Athens were as follows:

In 1836	40	rainy	days.
" 1837	54	"	"
" 1838	34	"	"
" 1839	45	"	"
" 1840	50	"	"
" 1841	45	"	"

an average mean of forty-four days.

The quantity of rain in the mountains and table-lands may be double what it is at Tripoliza or at Libadia.

From May until October it never rained, at least not so much as to deserve the name rain; and when it sprinkled, it came with a southwest wind.

The proper rainy season is in the autumn, and begins about the middle of October.

Attica is favored with but little rain, which is to be ascribed to the prevailing north and northeast winds, and its open situation towards the south. The Gulf of Lepanto (Corinth) is famous for its periodical winds and sudden squalls, which come from the passes of the Parnassus, and Chionas, and of Salona, and blow with violence over the surface of the gulf.

Theophrast remarks that in Milos the harvest generally began thirty or forty days after planting.

In the dry islands of the Archipelago destitute of wood and water, Andros, Euboca, and the Northern Sporades excepted, grain is sown in the month of November; and when there is no rain, even in the months of January, and is harvested in the beginning of May and June. At Attica and Salamis the harvest begins in the latter part of June; in the Peloponnesus, upon the interior table-lands, as at Arcadia, Elis, Pylos, the harvest is a fortnight later; in Phocis and North Bœotia, about the middle of July.

ARABIAN HORSES:

THEIR POWER OF ENDURING FATIGUE, HUNGER, AND THIRST, ETC.

[Translated for the American Polytechnic Journal, by Chas. L. Fleischmann.]

Gliocho, speaking of the Arabian horse, says: The endurance of an Arabian horse, as to fatigue, hunger, and thirst, is so extraordinary that it verges on the marvellous; the experience I had on that subject has convinced me beyond all doubts.

The Orientals demand of their horses, above all, endurance, a good relish of food, liveliness, speed, lightfootedness, and suppleness in the act of stopping at the fullest speed, as well as in the most rapid evolutions, or in bending its head round towards its hinderpart. The Oriental is the most exacting horseman, but he never will indulge himself in rest, nor partake of the slightest refreshment before he has provided for his horse; and there is a proverb in the East, which says, "Mount your horse as an enemy, but treat it like the best of your friends!" This proverb is kept to the letter. The Oriental horseman rides his horse on long and distant journeys, twelve to fourteen hours during the day in a slow and regular walk. I myself, says Gliocho, rode from Damascus to Constantinople, upon very bad roads, in twenty-two days, and from Constantinople to Bucharest in thirteen days, and yet it is a distance of about 600 miles of very bad road, and a considerable part of it leads over the Balkan.

The master of the horse of the King of Wurtemburg, Baron von Taubenheim, who visited the East in order to purchase horses for his royal master, says in his letters: "The pure blood is not proved or warranted through pedigrees, but it is the scrupulous, I might say hippological sense of the Arabs of the desert, who propagate only that blood, which has proved to him the most serviceable and satisfactory, during fifteen or twenty years."

In England, for instance, a single task of the many which the Arabian horse has to undergo in the desert, would be considered sufficient to stamp such a horse as a celebrated steed.

And if we suppose that such a celebrated steed begets offspring equal to himself in every respect, yet can we expect that the size, courage, endurance, intelligence, vigor, and health can be propagated to the same degree as from a steed which not only retains these qualities, but which is kept in continual activity all his lifetime, constantly renewing them. I do not know how to exemplify this better than by comparing such a horse with a pointer of the best breed, who, after having been used for the propagation of his species, is never allowed any more to exercise his qualifications as a hunter. The offspring of such a pointer would no doubt inherit the beautiful form of their parent, but his principal quality, the delicate sense of quick scent, would finally be lost.

When we observe how the Arabians treat their horses, we must be struck with the fact that not only the bodily but also the intellectual qualities of the horse are kept in a constant development, and this accounts for their high intelligence; and the many incredible stories which are related as to the astonishing feats of the Arabian horse are indeed true. I myself have had opportunity to make very remarkable observations; for instance, I saw an Arab who was thrown from his apparently wild stud horse, but in the very moment the rider touched the ground, the horse stood still by the side of his master.

Baron Taubenheim, in speaking of his tour on the Lebanon, states that he visited that mountain and a part of the desert upon a mare only 12½ hands high, 18 years of age, and he says: "I never recollect that I have been so grateful to a horse for its services. No one can imagine the miserable state of the road upon the Lebanon; a continued climbing over rocks, whereby the horse has to step often two to three feet up or down; and sometimes over the most dangerous and toilsome spots, over loose, ragged rocks, near the edge of precipices; or through swamps and marshy spots: and over such a road the mare travelled from six o'clock in the morning to eight o'clock in the evening, without stopping; and I assure you that in the last quarter of an hour I had not felt the least decrease of her fire and energy. I have, literally speaking, not touched the bridle of my horse for days in succession. It is really wonderful with what ingenuity these horses walk; they change continually their step, according to the state of the road. In the beginning it was very unpleasant to me to see my horse select the rugged, rough road, instead of the smooth one. I tried to teach her to keep to the latter, but I soon found that upon a smooth road she often slid, and in order to prevent that, her preference was for the rough road, where she could keep a firm footing. At home I might prefer a tall hunter, but more from vanity than any other reason, measuring as I do seven feet; but thus much I say, that I believe that the Arabian horse, such as it is in its own country, can undergo more hardships and fatigue than any English horse. It might be that on a day of battle I would select an English horse, but for a whole campaign a good Arabian horse is worth more than two English horses."

In the Arabian horse there is an energy, a firmness of muscle, a spirit, or what we commonly express by the term blood, which is not found in any other breed of horses; and I consider them the only means to produce good breeds, or to regenerate the horse in general.

THE COTTON-GIN.

On the 4th of April, 1844, letters-patent were granted to Eleazer Carver, of East Bridgewater, Mass., for an improvement in the cotton-gin, consisting in a guard to hold the fibres of cotton while on the teeth of the saws, in such a manner as to enable the brush to operate more perfectly in taking the cotton off from the teeth of the saws, in loose, uniform quantities. This guard extends downward between the saws, within half an inch, when the brush strikes the teeth of the saws, and the guard also shuts off the current of air, and leaves the cotton undisturbed until it comes in that position.

Figure 1 represents a vertical section of the gin, as it would appear if it were sawed in two from front to rear, and viewed by a person standing at the end, and showing the operating parts of the gin. A the cylinder; B

Fig. 1.

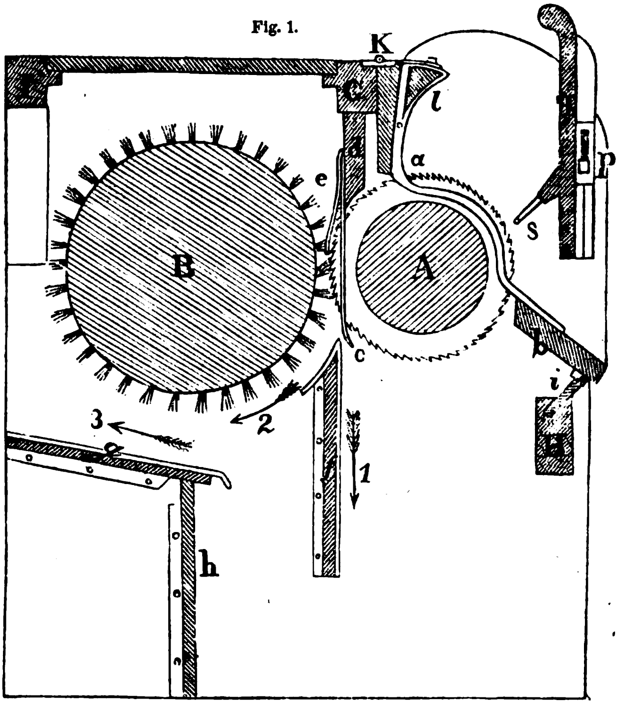
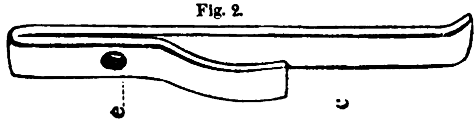


Fig. 2.



the brush; F the seed-board; H the front-piece; G the gratefall-piece; I the back-piece, being all cross-sections of the corresponding parts in Fig. 1. *a* is the main-grate, on which the seed-cotton is put to be ginned, fastened at its upper end to the gratefall-frame, and at its lower end to the lower part of the gratefall-frame *b*. *c* is the moting-grate (see Fig. 2, representing a perspective view of such grate-bar), attached to the cross-piece *d*, which is supported at the ends by grooves in the upright parts, to which the gratefall-piece G is attached. In setting up the gin, this cross-piece should be placed in these grooves, before the gratefall-piece is put on. These moting-grates are hung to this cross-piece by a single screw *e*, so as to permit them to swing sidewise or vibrate a little. *f* is the perdendicular tinned board, down the front side of which arrow (1) the motes drop; while the clean cotton follows the brush over and inside of it, as (2). *g* is the oblique tinned board, over which the clean cotton passes, as (3), while some of the motes fall between it and the perpendicular tinned board *f*. *h* is the bottom board, placed perpendicularly between the oblique tinned board *g* and the floor of the gin. Much depends upon the proper position of the tinned boards *f* and *g*, in order to separate the cotton from the motes well and not waste it. No particular directions for their adjustment can be given for all cases, as their proper position depends, in some degree, upon the size and character of the lint room and other circumstances. They are movable, and are to be attached to the walls or ceiling of the gin, by nails through the cleats on the ends of them. A little attention and observation will enable a person to adjust them properly. By moving *f* up or down, or *g* out or in or up or down, the draft of air through the gin may be regulated, so that it shall be strong enough to carry the clean cotton through the gin, but not strong enough to draw the motes along with it. They are represented in the drawing near their proper and relative position. The upper edge of *f* should be about as high and as near the moting-grates, as is there shown. *b* is the lower part of the gratefall-frame, which rests on the heads of the tempering screws *i*, which screw into the front-piece H. By lifting up at *b*, the whole gratefall and main ribs are raised off the cylinder and saws, swinging on the butt hinges at *k*. *l* is the movable breast-curve, which may be moved backward or forward, as desired, swinging on the hinge-joint *m*, and is adjusted by the set-screw at *n*, which screws into the top of the breast-curve. In setting up and running the gin, the following directions should be observed:

Care should be taken to have the gin sit level, and also to have the saw-cylinder placed parallel with the shaft of the band-wheel, so that the band will keep its place on the drum and pulleys. The gin should bear fairly at every corner on something that will give it a firm support, to prevent rocking, trembling, or getting out of place while in use. The gin may be placed close up to the lint-room partition; and cut a square hole in the partition of such size, that the ceiling inside the gin shall just fit the edges of the hole. A small hole should be cut in the partition to accommodate the brush idler, which hole should be covered on the inside by a box, so as to prevent the ginned cotton from interfering with the idler.

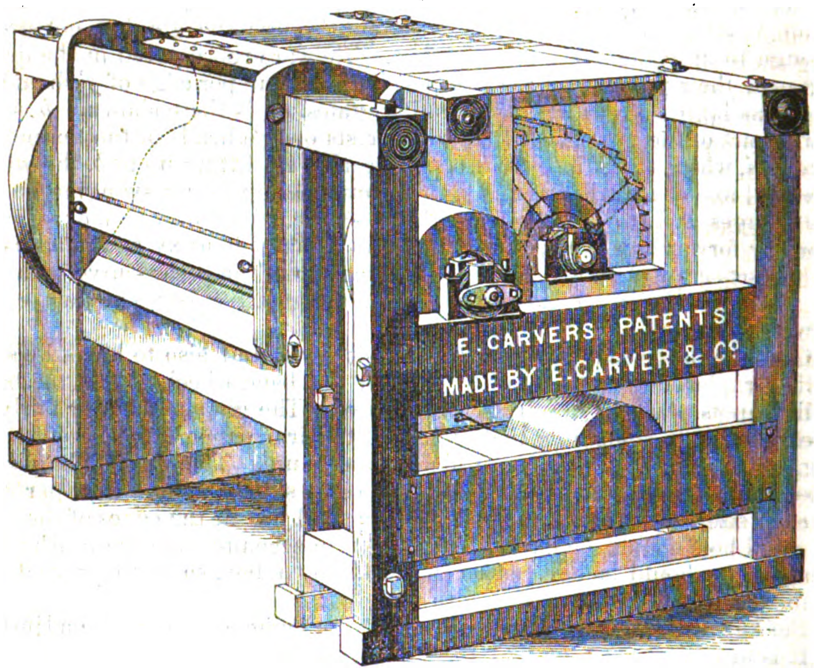
Before starting the gin, the cops on all the gudgeons should be adjusted.

It is to be observed next, if the saws are midway in the spaces between the ribs at that point where the cotton is taken through. If they are not, they should be so adjusted by the tempering screws at each end of the cylinder, which move the cylinder endwise. Care should be taken that the tempering screws should not press too hard against the end of the cylinder-bar, so as to make them heat, but just enough to keep the cylinder in place; then screw up the square holding nuts, to keep the tempering screws in place. In adjusting the cylinder by the tempering screws, the ginner should be reminded that he should start back the screw at one end of the cylinder, before he sets up the screw at the other; if he do not, he will be likely to spread the frame.

The gudgeons should be well oiled. They should be carefully watched the first two or three days, and kept lubricated by lard or good oil, to prevent heating or wearing rough.

When the gin is started, let it run empty at first, in order to see that it runs perfectly free and light, and that the saws pass midway in the spaces between the ribs, as before mentioned. Then put in a small quantity of seed-cotton, and watch its operation. If it turns freely on the grates, and the cotton is taken off from the saws clean by the brush, the gin may then run with a full-sized roll. But if the teeth of the saws are not kept clean, when the gin is first started, see that the brush-belt is sufficiently tight, and use *cotton-seed* instead of seed-cotton, say for the space of half an hour or so, which will take off the roughness or rust which prevented the free discharge of the cotton. The gin will require closer attention for the first few days, and may not work so easy, or make so good cotton, as after it shall have run a short time. Wet or very damp cotton should not be ginned in that state, as the injury done to the cotton, and the danger of injury to the saws and gin, would be much more than the trouble and expense of having it dried. Ginned cotton should not be admitted into the gin in any considerable quantities.

Fig. 8.

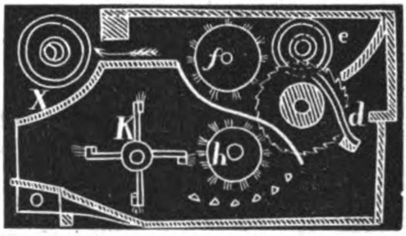


In order to gin fast or slow, observe the following:—If you wish to gin very fast, drop the lower part of the gratefall *b*, by turning down the screws *i*, so that the underside of the rib *a* shall come nearly down to the cylinder. This will let the saws project further through between the ribs. Then draw the movable breast-curve *l* forward as far as it will come. This shortens the curve, and bears the roll down more firmly upon the saws, and enables the teeth of the saws to fill more regularly and certainly. To make it gin slow, raise the lower part of the gratefall *b*, by turning up the screws *i*, so that the saws will not project so far through. Then set the top of the breast-curve *l* back. This will give a larger sweep to the curve, and thus let the roll rise up the curve and turn more lightly. By moving the breast-curve *l* out or in, the speed of ginning will be altered, perhaps sufficiently so without altering the gratefall *b*.

The cleaning and discharging the seed properly from the roll, is regulated by the sea-board F, which is movable, and may be moved up or down, out or in, and held in place by the thumb-screws. Too many seeds should not be carried in the roll, nor should they be discharged imperfectly cleaned. If the gin does not discharge the seed fast enough, the seed-board should be raised and brought outward. If the seeds are discharged too fast, and imperfectly cleaned, it should be lowered and carried in towards the saws. In the section, the seed-board F is seen in nearly its proper place and position. The grating of points *s*, near its lower edge, should not approach too near the saws or ribs.

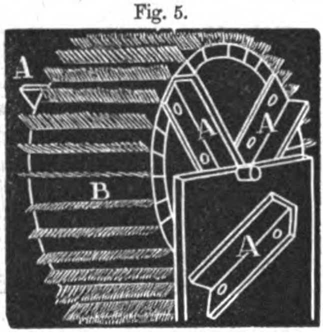
The saw-cylinder may have 150 or 200 revolutions per minute. But it is desirable in all cases to give it a regular and uniform motion, in order to secure the best operation of the machine.

Fig. 4.



The improvement in the cotton-gin of John H. Sherard, of Livingston, Al., for which he obtained letters-patent, dated April 30, 1844, consists in making short ribs *d* (as shown in Fig. 4), in front of the saw-cylinder, and placing over said saw-cylinder a revolving grate *e*, composed of a number of rings, as shown in figure, marked X, which play between the saw; behind the revolving grate there is mote-brush *f*. The cotton is taken off from the saws by means of a slow-brush *h*, and the brush K removes it from the brush *h*, as shown in Fig. 4.

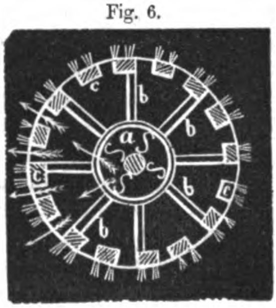
Fig. 5.



To Eleazer Carver, of Bridgewater, Mass., letters-patent were granted on the 4th of January, 1845.

The nature of this improvement consists in providing the brush-cylinder B with fans A (see Fig. 5), which are attached to the side of said cylinder, for the purpose of producing a sufficient and regular current of air through the gin, so as to discharge the clean cotton through the machine.

Fig. 6.

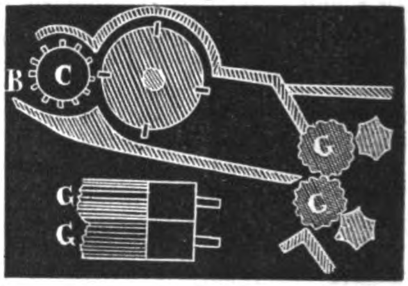


On the 15th of September, 1845, Edwin Keith, of Bridgewater, Mass., obtained a patent for a new kind of brush for cotton-gins, which had for its object to remove from the saw the fibres in small quantities, and to blow them from the brush-wheel by a current of air drawn in at one or both ends of the brush-wheel, and to force it out between the brush-bars; and separate at the same time the mote and other impurities.

Fig. 6 represents a section of the brush-wheel. *a* is the centre upon which the arms *b b b b* are fixed; at the end of the arms are the brush-bars *c c c c*, and upon them the brushes. The spaces between the brush-bars, through which the air, in the direction of the arrows, is forced out.

On the 11th of December, 1845, Theodore Ely obtained letters-patent for improvements in roller cotton-gin. He makes the rollers (shown in Fig. 7), marked G G, fluted; the ends of these rollers are smooth, but throughout of the same diameter as the fluted part, so as to run and work upon the smooth part.

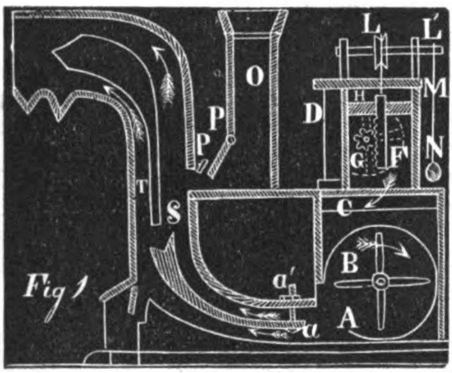
Fig. 7.

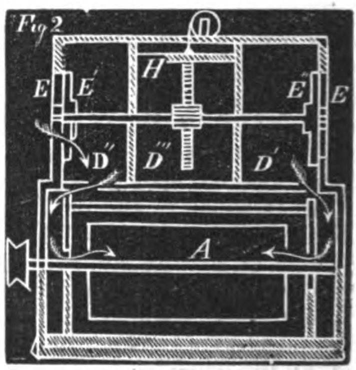


CLAIMS OF PATENTS.

Granted on the 9th, 16th, 23d, and 30th of August, with explanations and diagrams by CH. L. FLEISCHMANN.

No. 9913. SAMUEL CANBY, Ellicot's Mills, Maryland. *Improvement in Winnowers of Grain.* Patented August 9th, 1853.

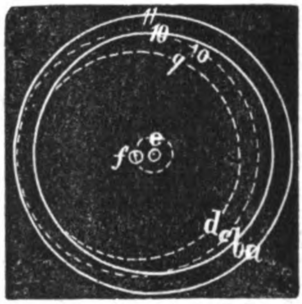




The nature of this invention consists in constructing above the fan-chamber A (see Figs. 1 and 2), and opening into it, a regulator, consisting of three apartments D′ D″ D‴, the exterior D′ D″ containing openings E in their sides, for the admission of the air to the fan, the central department D‴ being furnished with a piston H, suspended by a cord passed over an exterior pulley L, and balanced by a weight N at the extremity of a lever M attached to the shaft L′ of the suspending pulley L; the under side of the piston H being attached to a rack-rod F, meshing into a pinion G upon a shaft I, extending across the three apartments, and thus operating two valves E E″ in the exterior chambers, and upon the same shaft as the pinion; so that the accurately-balanced piston H shall open the air-passages, as the blast is weakened, or diminish their extent when the blast becomes too strong. Further, in arranging in the front part of the hopper O, a swinging door P, which shall cause the grain to distribute itself evenly over the bottom of the hopper before raising the door and passing out, thereby causing the grain to flow in a uniform current into the first blast-channel, which is regulated by weight R and screw. The blast is passed through the channels S and T, so that the uniform current of grain entering the first shall, after being acted upon by the blast, pass steadily into the second blast, when the cleaning is completed. The amount of blast admitted into the several channels being regulated by a swinging-valve *a* operated by screw *a'* at the entrance of the channels, so as to divide the blast according to the required amount of air for each channel.

"I claim the construction of the receiving and discharging passages for the grain; that is, the passage at door P, passage C, and passage C'', in the manner and for the purpose as set forth."

No. 9914. F. Dibben & L. Ballman, of New York.—*Improvement in Multiplying Gearing.* Patented August 9th, 1853.

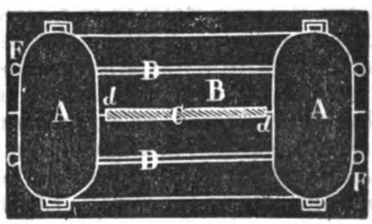


The nature of this invention consists in transmitting rotary motion by means of the difference of proportion between two pairs of toothed wheels, or their equivalents; two of the wheels, viz., one of each pair having a common fixed axis, and the other two wheels gearing into them having a common axis, which is capable of revolving round the said fixed axis, by the difference of proportion between the two pairs of wheels, that is to say, the difference between the proportion that the circumference of the two wheels of one pair bear to each other, and the proportion that the circumference of the two wheels of the other pair bear to each other.

The inventors say in their specification: "We will suppose the circles *a* and *b* in diagram (see figure), to represent the pitch lines of two annular or internal toothed wheels, hung loosely upon the common axis *e*, and the dotted circles *c* and *d* to represent the pitch lines of two toothed wheels, both fast together upon the common axis *f*; *c* rolling on *a*, and *d* on *b*; and both the axes *e* and *f* stationary in relation to each other. Suppose the circumference on number of teeth in the wheels to be in the following proportions, $a = 11$, $b = 10$, $c = 10$, and $d = 9$; then, if all the circles are made to revolve, *a* will make 100 revolutions for every 99 of *b*, &c."

"We claim the employment, in any manner substantially as described, for the purpose of transmitting rotary motion at a multiplied or decreased speed, of two pairs of toothed or friction wheels, *a*, *c*, and *b*, *d*, combined and arranged as described, to wit, the said wheels being placed upon two axes *e* and *f*, one *f* of which is capable of revolving round the other *e*, one wheel of each pair being on the axis *e*, and the other wheel of each pair being placed upon the axis *f*, as herein set forth."

No. 9915. Dodge & Burgers.—*Improvement in Life-Boats.* Patented August 9th, 1853.



The nature of this invention consists in constructing a platform C (see figure), stationary in the central horizontal plane; and the two sets of thwarts are secured in the boat at fixed points on opposite sides of, and at equal distances from, the platform.

A A represents the hull of the life-boat, consisting of a water-tight vessel. B the interior of boat. C the floor or platform. *d d* openings to allow the escape of water. D D thwarts, two sets. F F guard-rails or life-rods, secured in fastenings.

"We claim the central fixed platform C, which is secured in the opening B of the boat, in a plane passing centrally and horizontally, or nearly so, through the same, or which may be said to form a partition between two opposite recesses, substantially as described, the said platform serving as a floor to the boat, whichever side is upwards, and being, from its fixed position, incapable of becoming disarranged by any accident."

No. 9916. George W. Eichell, New York. *Improvement in Setting up Ten Pins and Returning Balls.* Patented August 9th, 1853.

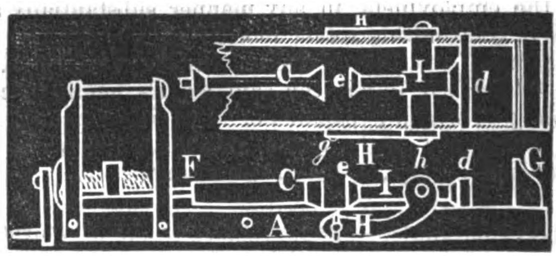
This invention consists in setting up the pins from the heads of the table, by means of a weight attached to the butts of the pins, by means of cords passing through the table; the weight is operated by means of a platform directly under them, which can be operated from the head of the table and lowered, whereby the pins are set up, and then raised to admit of the pins being knocked down,

The ball is returned by combining to the further end of the table in rear of the pins a delivery surface, which is jointed on to the end of the table, and inclined towards the rear, and also to one side for the purpose of collecting the balls, together with an elevator of the ordinary construction operated from the head of the table, by which means the balls are raised to the required elevation for their return through an inclined trough.

"I claim setting up the pins of an alley by an apparatus operated from the head of the table, or elsewhere, by means of a weight or weights attached to them by cords, when combined with the elevation-board, which raises and sustains the weight or weights to admit of the pins being knocked down, as herein described.

"I also claim the use, at the back end of the table, of a delivery-board, applied and constructed as described, in combination with an elevator, for the elevation and return of the balls, substantially as described."

No. 9917. Benj. H. Green, Princeton, New Jersey.—*Improvement in Carpenters' Clamps.* Patented August 9th, 1853.



The nature of this invention consists in constructing the clamp in such a manner as to make it applicable to many different sizes of articles.

A pair of arms H H (see figure) are attached, one on each side, to the beam A, by means of bolt *g*; said arms vibrate upon the bolt *g*, which may be transferred to other holes in the beam A. Through the curved end of the arms passes another bolt *h*, and through bar I, which has a large jaw *d* on its shorter, and a small jaw *e* on its longer, arm. Said bar I is made to turn free upon the bolt *h*. A bar C having a small jaw on one end may be attached to the larger jaw F, but removable at pleasure. When said bar is attached to the jaw F, the small jaw *e* of the bar I is brought opposite its jaw, as shown in figure. This arrangement is used for clamping small articles; when large articles are to be clamped, the small bar O is removed, and the bar I reversed.

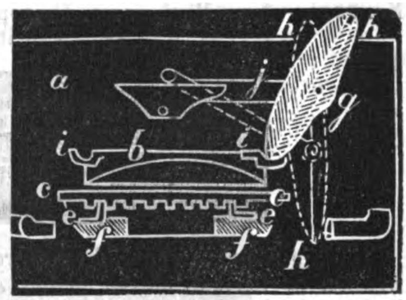
"I claim the combination of the adjustable vibratory arms H H, and reversible jaws *d e*, with the adjustable clamp, for the purpose of presenting jaws of different sizes, and at different distances from each other, substantially in the manner herein set forth."

No. 9918. JOHN HARTIN, New York.—*Improved Method of Drying Paper.* Patented August 9th, 1853.

The inventor states: "When paper is dried by passing it between opposite jets of air, issuing from perforations in air-vessels, it is found that the jets of air indent the paper and make its surfaces rough and uneven." The nature of his invention consists in drying the paper by conducting it between opposite series of equal-sized fans, revolving with equal velocities—causing a pressure of air of equal force to act simultaneously upon opposite sides of the paper, by which he says he insures smooth and uniform surfaces to the same.

"I claim drying paper by passing it between opposite series of equal-sized fans, which revolve with equal velocities, by which a pressure of air of equal force is made to act simultaneously upon opposite sides of the paper, and thereby insure smooth and uniform surfaces upon the same, substantially as herein set forth."

No. 9919. SAMUEL HICKOK, Buffalo, N. Y.—*Improvement in Railroad Car Seats.* Patented August 9th, 1853.



This invention consists in the manner or method of constructing the car seats, so that they can be easily changed in either direction, and converted from a position to sit upright to that reclining seat, and *vice versa*.

a is the support for the outer end of the seat, to which the frame of the seat is secured (see figure). The end pieces of the frame are secured to the support *a* and sides of the car. Secured on opposite sides and to the bottom of the sliding-seat, are two steel notched bars *c c*; these have notches cut in them on their under sides; and secured to the side-rails *f f* are metal plates *e e*, which fall into the notches in said bars *c c*, which confine the seat in position. The notches are so placed on these spring-bars that they catch alternately—that is to say, one catches when the seat is slid to the right, and the other when the seat is slid to the left—whereby the seat can be slid out either to the right or left, by pressing the end of either of said spring-bars, which project in front, regardless of which side the back of the seat is placed.

The back *g* is attached in a stronger manner than usual, by substituting a bar or bolt *l*, which passes through the wood of the back, and is riveted or attached to the rods *j*. The back *g* is capable of being shifted from side to side in the usual manner; but, in order that it may be inclined when the seat is slid out, it is capable of being raised and connected to the seat, or disconnected and let down at pleasure, by providing a hole *h* in each of the corners of it, which holes are formed by a notch cut in the wood, and a metal bead which passes around the edge of the wood of the back. These holes fall over hooks *i* of corresponding size, secured to the ends of the pieces *b'* of the sliding-seat, thus constituting a hinge or joint, so that, when the back is raised and resting on the hooks *i*, its inclination will be governed by the position of the seat, and it will be more or less inclined according to the distance which the seat is drawn out.

"I claim constructing a railroad car seat by connecting and arranging the sliding seat with the revertible back, hinged at the extremity of the reversing arms, and combining therewith the double-ratchet bars, in such a manner that it can be easily converted in either direction into a day or night seat, and at the same time not occupy more space than the ordinary stationary seat, substantially as set forth.

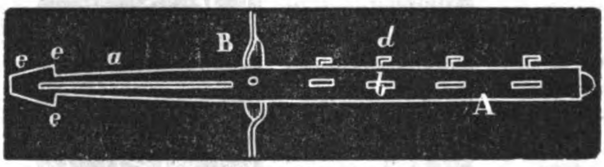
"I also claim the triangular foot-rest, in combination with the sliding seat, whereby it is made adaptable to the seat when used either as a day or night seat, substantially as set forth."

No. 9920. Lewis S. Ingraham, Cuyahoga Falls, Ohio.—*Improvement in Winnowers.* Patented August 9th, 1853.

The nature of this invention consists in making the screens stair-shaped or fluted, and vibrating them perpendicularly or diagonally, instead of traversing, whereby the grain is made to fall successively from one stair or flute to the next, in combination with a plain screen, which may be used either before or after the stair-screen.

"I claim the stair or fluted screen, constructed and operated substantially as described, for the purposes set forth."

No. 9921. John W. Jenkins, Greenport, N. Y.—*Improvement in Iron Posts for Fences.* Patented August 9th, 1853.

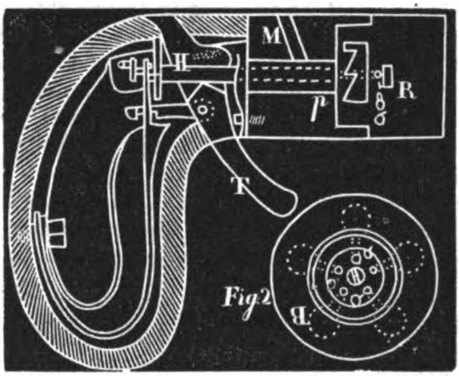


The figure represents the improved iron fence-post A, with the arrow-headed or barbed-bottom pieces *e e e*; to the post is attached a twisted cross-piece B; *b* the openings for boards or rails; *d* hooks for wire.

"I claim the arrow-headed or barbed bottom *e e e* of the post, in combination with the twisted cross-piece, substantially in the manner and for the purposes herein set forth."

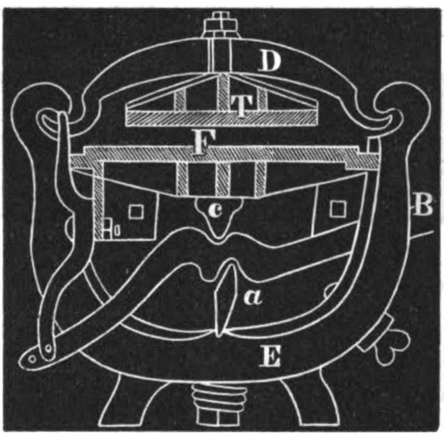
No. 9922. George Leonard, Shrewsbury, Mass.—*Improvement in Fire-Arms.* Patented August 9th, 1853.

This improved pistol is operated as follows: The trigger T (see figure), is drawn back; the notch in the lever drives back the main-spring, which carries back the hammer H at the same time the pin *p* carries down the point of the ratchet-lever, and turns the revolving fire-guide R; when the hammer H is nearly back, one of the percussion pills in the priming magazine M drops into the hole in the hammer-guide; the motion of the trigger being continued, the lip of the main-spring lifts off the notch of the lever, when the main-spring drives forward the hammer, and the pills are exploded in the bottom of the hole in the revolving fire-guide; the fire is guided through small hole *o* in the revolving fire-guide, into one of the fine small holes into the barrels, with which it is coincident, and the barrel is discharged. The finger being now released, the trigger-spring drives back the lever-trigger and ratchet-lever into their first position. Fig. 2 shows the positions of the barrels in dotted circles, and the corresponding holes *o o o o*.



"I claim a revolving fire-guide, which, by the continued operation of the fire-arm, shall successively communicate fire to the different charges of several barrels."

No. 9923. John Lewis, Buffalo, N. Y.—*Improvement in Printing-Presses.* Patented August 9th, 1853.



The nature of this invention consists in constructing a swinging-rail D, as shown in figure, and a pressure-rail E, in combination with the lever power, in such a manner as to bring the power upon the centre of the platen T by one motion of the lever B.

F represents the bed-plate.

"I claim the swinging-rail D and the pressure-bail E, constructed and operated substantially as herein set forth."

No. 9924. EBEN. L. MILLIS, Rochester Depot, Ohio.—*Improvement in Corn-Shellers.* Patented August 9th, 1853.

The nature of this invention consists in a toothed cylinder and a concave, which has for its object the separation and reduction of the larger ears of corn to something like a uniform size with the smaller ones, before they pass to a second cylinder and concave, where they are finally shelled.

"I claim reducing the larger ears of corn to be shelled, to a nearly uniform size with the smaller ones, by passing the whole through between a toothed cylinder and concave, where the large ears are caught and partially reduced or operated upon preparatory to their passing with the smaller ones through between a second cylinder and concave, where the entire operation of shelling and separating takes place, the whole being performed substantially in the manner herein described."

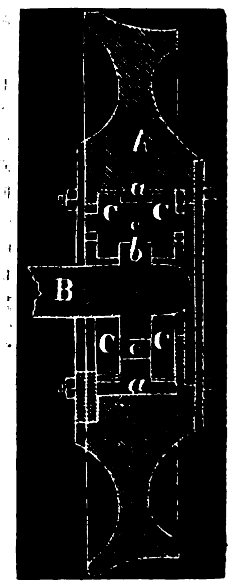
No. 9925. JAEL G. NORTHRUP, Syracuse, N. Y.—*Printing-Press.* Patented August 9th, 1853.

The nature of this invention consists in combining with a vibrating bed, a series of intermittingly rotating platens, so that the sheets may be placed on the platens in the most convenient manner, and fall from the platen after receiving the impression without requiring a delivery apparatus.

The platens are four or more in number, and are so regulated as to bring the particular platen of the series which carries the sheet that is to receive the impression, into a proper position for the bed carrying the form to come up against it.

"I claim the combination of the series of intermittingly rotating platens with a vibrating bed, when so arranged as that the delivery of the printed sheet is from the lower of the series of platens, so that it may drop from the platen on to the paper table, or into a drawer, substantially as described."

No. 9926. JAMES PATTERSON, Frankville, N. Y.—*Improvement in Friction-Rollers.* Patented August 9th, 1853.



The nature of this invention consists in arranging within a central aperture of the car wheel A, and around its axle, a series of anti-friction rollers, each of which has bearing portions of different diameters, the larger C C (shown in diagram) of which roll upon the inner periphery *a* of the car wheel, and the smaller *c* upon an enlarged portion *b* of the axle B. Their proportion may be such that the inner circumference *a* of the wheel shall bear the same ratio to that of the larger portions of each roller as the circumference of the enlarged portion *b* of the axle bears to that of the smaller portion of each of the rollers. A represents the car wheel, B the axle of the car.

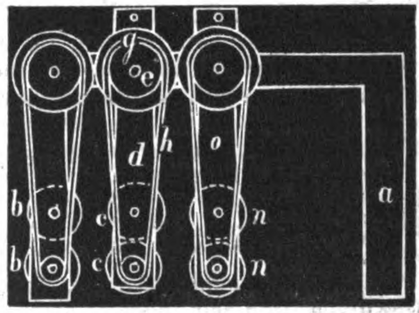
"I claim fitting the bearing of a rolling car wheel on a fixed axle, with a series of friction-rollers, having bearings of large diameter to run in contact with the wheel, and of smaller diameter to run in contact with the axle, the latter being enlarged at the point of contact with the rollers, as herein specified."

No. 9927. *Cancelled.*

No. 9928. A. B. Seymour, Hudson, N. Y.—*Improvement in Rolling Railroad and other Iron.* Patented August 9th, 1853.

The inventor says he arranges a series of pairs of rollers, two or more in a line, or nearly so, that they shall be self-adjusting in their distance apart, to the elongation of the bars in the process of rolling.

If the bar in passing between the first pair of rollers is elongated more than to correspond with the increased motion of the second pair of rollers, by virtue of the self-adapting principle this second pair of rollers will, during the operation, recede from the first pair; and so with reference to a third, or any number of pairs of rollers. And if in passing through between the first pair the bar should not be sufficiently elongated to correspond with the increased motion of the second pair, the second pair, during the operation, will approach the first pair.



In the accompanying figure *a* represents the frame, and *b b* the first pair of rollers mounted on fixed bearings, except that one of the rollers is adjustable to the other. Motion is communicated to this pair of rollers in the usual way from some suitable motor.

Just back of this first pair there is a second pair of rollers *c c*, mounted in the lower end of a pendulous frame *d*, suspended at its upper end to a shaft *e* hung in the upper part of the frame *a*. The first pair of rollers are geared together by cog or spur-wheels, and on the shaft of one of these rollers there is a belt-wheel *g* which by a belt *h* communicates motion to a cog-wheel in the upper part of the frame *a*, and this cog-wheel engages a corresponding wheel on the shaft *e* on which is suspended the pendulous frame of the second pair of rollers; and this last named wheel carries a pulley to communicate motion by a belt to a pulley on the shaft of one of the rollers of the second pair; and as the pulley is on the shaft to which the pendulous frame is suspended, it follows that the moving of the frame will not affect the communication of the driving power.

A third pair of rollers *n* are mounted in a pendulous frame *o* back of the first, and in every particular like the second pair; and if desired, the series may be increased in number, each succeeding one being mounted in the same manner.

The second pair of rollers must be geared to turn faster than the first, the third faster than the second, and so on throughout the series. The relative motions of the pairs of rollers will depend upon the extent of the reduction of the iron by each pair. As the iron passes through from between the first pair of rollers, it is caught by the second pair; and as it passes from the second pair it is presented to and caught by the third pair, and so on throughout the series, whatever may be the number of pairs.

"I claim the employment of a series of pairs of rollers, so arranged that the pairs in the series shall be free to move from or towards each other to adapt themselves to the condition of the metal in the process of rolling, substantially as and for the purpose specified."

No. 9929. Joshua Stevens, of Chicopee, Mass.—*Improvement in Repeating Fire-Arms.* Patented August 9th, 1853.

"I claim to so construct and combine together substantially as described, the lock, trigger, and mechanism for rotating and locking and unlocking the chambered cylinder, as that while by a simple pull of the trigger, the operations of unlocking and rotating the magazine or chambered cylinder, relocking it, and discharging the cock, shall be caused to take place by power applied to the trigger alone; the elevation of the cock, or the cocking of it, shall be previously effected by the hand of a person, or means entirely separate from the trigger, as described.

"And I also claim the combination of the stirrup *v*, the spring-bolt *p*, and the lever G, arranged and made to operate together, substantially as specified.

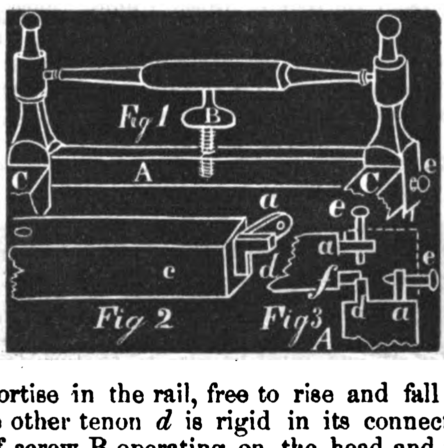
"I also claim the combination of the sectoral plate *o* (made as described) with the spring-bolt *p* and its slot *q*, the said plate being applied and made to operate essentially as explained.

"I also claim the method above set forth, of constructing the lever G, viz., of two parts *g h* (turning on one common pin) in combination with their confining and adjusting screws, the whole being substantially in manner and for the purpose above described."

No. 9930. *Suspended.*

No. 9931. Geo. W. Baynes, Thomas Hinty, and Minter Jackson, of Glenville, Va.—*Improvement in Bedstead-Fastenings.* Patented August 16th, 1853.

The nature of this invention consists in so constructing the bedstead fastenings that one of the tenons, marked *a* in Fig 1, being pivoted

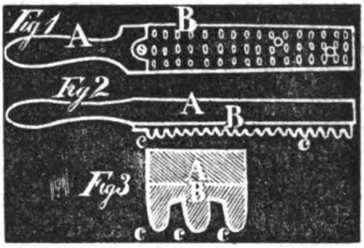


or swung in a mortise in the rail, free to rise and fall in the mortise of the post, while the other tenon *d* is rigid in its connection with the rail, may by means of screw B operating on the head and foot rails, securely fasten not only these rails, but the side ones also by the same device.

Fig. 2 shows a rail with the pivoted tenon *a*, and rigid tenon *d*. Fig. 3 shows the position of the tenons in the post, rigid tenon *d* in the rail A resting upon the rigid tenon *f* in the side-rail *g*, the pivoted tenons *a a* in both rails being secured by means of pins.

"We claim the combination and arrangement of the tenons *a a*, pins *e e*, tenons *d* and *f*, with the screw B, for the purposes set forth and shown."

No. 9932. William Beach of Philadelphia, Pa.—*Instrument for making Meat tender, called "Beach's Meat-Maul."* Patented August 16th, 1853.

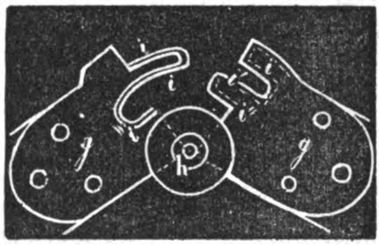


The nature of this invention consists in securing to an oblong block of wood provided with a handle, as shown in Figs., a metallic plate of tapered teeth of such form as when made to penetrate any meat cut to the thickness of a steak or cutlet, by a blow, shall make the steak tender, &c.

Fig. 1 is a view of the plate B with teeth *c c* fastened with screws to handle A. Fig. 2 is a side view of the same, and Fig. 3 a section.

"I claim forming a meat-maul for the purpose designed, by securing to one end of an oblong block of wood, whose opposite end is formed into a handle, a series of rows of tapered teeth of the form described, cast on a plate, or driven singly into the wood, as may be desired."

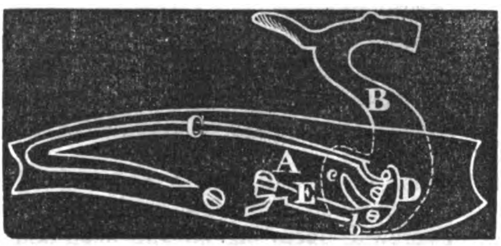
No. 9933. John Binder, of Chelsea, Mass.—*Improvement in Hinges applicable to the joints of Iron Bedsteads, &c.* Patented August 16th, 1853.



To diminish the friction upon the centre pin, the inventor devised the hinge represented in the figure. *h* is the pin upon which the two halves *g g* of the hinge turn; the two halves are toothed, the bearing surfaces *i i′ i″* being arcs of a circle whose centre is the centre of the pin *h*. The jaws or teeth are chamfered for the purpose of preventing lateral motion.

"I claim the method herein described, of constructing a hinge with the circular bearing surfaces *i i′ i″* for the purpose set forth."

No. 9934. P. F. Charpie, Mount Vernon, Ohio.—*New and improved Gun-Lock.* Patented August 16th, 1853.



In this improved gun-lock the dog E (see figure), of the main spring C is connected to the hammer B by means of a screw *b* passing through a curved slot *c* in the lock-plate A, in combination with suitable packing encompassing the slot on the outside of the plate. On the outside of the plate A and surrounding the slot *c* there is a circular recess, in which recess is placed a suitable packing, which prevents moisture from entering the lock. The inventor says the advantages of this lock are:

1st, The thorough protection from moisture, which is prevented from entering the lock by means of the packing.

2d, The cheapness with which these improved locks can be made.

"I claim the connecting the dog E to the hammer B, by means of a screw *b* passing through a curved slot *c* in the plate A, in combination with the packing *e* which encompasses the curved slot, by which combination I am enabled to place the main spring and dog on the inside of the lock-plate, and prevent the admission of moisture within the lock, as herein set forth."

No. 9935. Thomas Crossley, of Roxbury, Mass.—*Improvement in the manufacture of Carpets.* Patented August 16th, 1853.

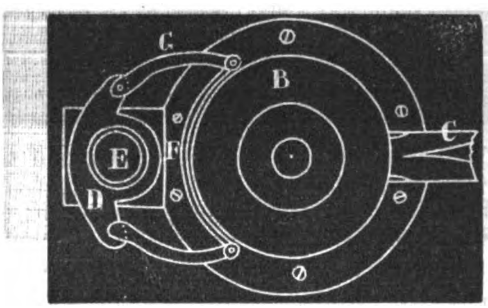
The process by which this new improved carpet is produced, is as follows:

The inventor uses uncolored or slightly colored filling. The filling is beat up very hard over the stretched warps, in order to conceal the latter entirely from view, and prevent the passage of the coloring matter from one side of the carpet to the other. The fabric thus produced is then printed upon one or both sides.

"I claim a single-ply printed carpet, made by combining the warps and filling in the manner described, and subsequently printing them on one or both sides; I having discovered that fabrics woven in this manner could be printed on one or both sides without the colors passing through and discoloring or intermingling with the colors on the opposite side of the fabric."

No. 9936. Benjamin F. Delano, Chelsea, Mass.—*A Rudder-Brace.* Patented August 16th, 1853.

The nature of this invention consists in the application to the rudder-head of a lever or brace which is permitted to turn freely upon a pintle or centre projecting from the deck of the vessel, which lever is suitably connected to the rudder-head by arms with flexible or hinge joints, by which means the rudder-stock is caused to turn freely in the opening in the deck through which it passes, which opening may then be made sufficiently large for the purpose to avoid the friction and straining, and to give the rudder an additional support, rendering it more secure and safe in its position.

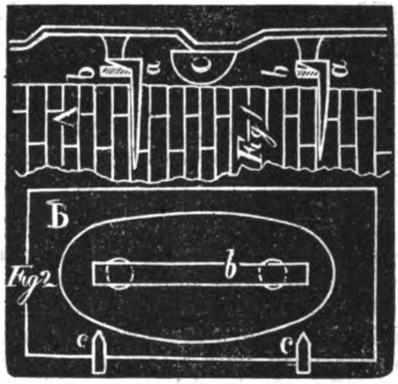


A is the deck of the vessel, B the rudder-head, C the tiller, D a lever vibrating upon the pintle E projecting from the deck, F a portion of a metallic ring, G arms.

"I claim, 1st, The brace D connected with the rudder, substantially as described and operating in the manner set forth.

"2d, The combination of the brace D with the elliptical tiller H, or any other analogous device, for the purpose of actuating the rudder by the application of power to the braces instead of to the rudder itself."

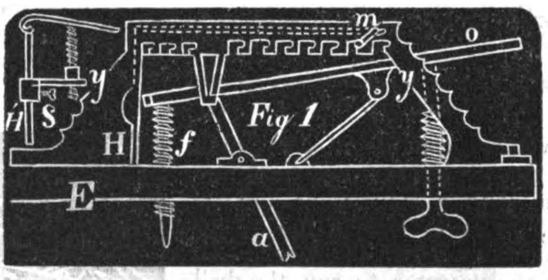
No. 9937. MICHAEL B. DYOTT, of Philadelphia, Pa.—*Improvement in Facing or Veneering Buildings.*—Patented August 16th, 1853.



In the Figs. 1 and 2, A is the wall to which the plates B are fitted, which are hung by the loop *b* upon spikes against the wall, each plate being further held by projections *c c* cast on said plate which enter the back of the next adjoining plate below it; the space between the plates and wall is filled up by a liquid cement.

"I claim the method herein described of supporting a veneering or facing of thin cast-iron or other plates upon their inside, and uniting the same firmly with the external surface of the building, by so fixing the plates in relation to the wall as to leave a sufficient *space* between them to allow a cement in a liquid form to be poured in to fill the space and all the interstices of the plate perfectly, solidify around and upon the hooks and other fastenings, exclude the air and all dampness whereby the veneering is strengthened, protected, and preserved as fully set forth."

No. 9938. AARON W. GEAHEART, Beallsville, Ohio.—*Improvement in Machines for preparing Spoke-Timber.* Patented August 16th, 1853.



The operation of this machine is as follows: A piece of timber intended for a spoke is laid on the bench *o* (see figure), with one end against the fixed rest and the bridle in contact with the other end, the operator seated on the bench E, with his foot on the lever *a*, causes the sliding ways *y y* carrying the bridle *m* to move towards the rest, and securely clamps the piece of timber; the ordinary drawing-knife is then applied, until all the surplus wood above the ways *y y* is removed. The adjustable bench *o*, whose height is regulated by turning the screws *f f*, when the first side of the timber is to be dressed to a straight edge, is set parallel with the upper edge of the ways *y y*, and at a sufficient depth to merely insure the edge being straight. After dressing any desired number on the one side, the table or bench *o* is raised higher and adjusted for thickness of the spoke, the dressed side is placed downwards on the bench and the knife applied as before; the same is done with the edges, and with the view of giving the taper or diminish to the spoke, one end of the bench is raised higher than the other. The rounding the corners of the spoke is an after operation in both cases.

By an additional device (see Fig. 2), which is to be placed on H, the bevel may be given the tenon end of the spoke, by which the disk of the wheel is obtained.

"I claim the arrangement of the adjustable bed *o*, the bridle or clamp *m*, the sliding-guide or gauge *y*, and foot-lever *a*, for the purpose, and operating in the manner herein before substantially set forth."

No. 9939. ARSHAL H. MCKINLEY, of Higginsport, Ohio.—*Improved Socket for Auger-Handles and Braces.* Patented August 16th, 1853.

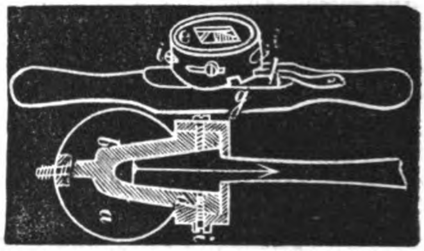
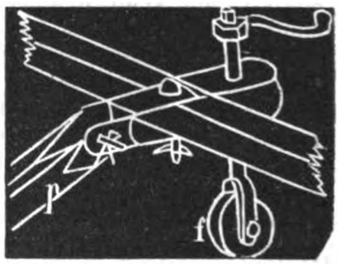


Fig. 1 is a perspective view of the handle with the improved socket attached to it. Fig. 2 is a section of the socket and handle, showing the position of the shank of the tool. *a* is the handle, *b* the socket, *d* the circular head with a cap or cover *e* secured to the head by means of screws *i* passing through slots, *h* a spring attached to the handle passing through notches *f g* holding the cap in its place.

"I claim the peculiar arrangement of mechanism by which I enable the shipping and unshipping of the bit and handle of an auger, or other boring tool; that is to say, the socket having a circular head and vibrating cap, whose aperture can be made at one position to coincide with the mouth of the socket, and in the other position to oppose its straight edges to the projecting corners of the shank, the cap being retained in the desired position by spring and notch, as described, or its equivalent."

No. 9940. JACOB MUMMA, of Mount Joy.—*Improvement in Draught Apparatus of Seed-Planters.* Patented August 16th, 1853



This improvement consists in combining a tongue (see figure), having a vertical and lateral motion, with a supporting and directing wheel, so as to relieve the horses from the strain they incur in other drills, and to enable the operator to run the drill straight forward, and keep it in its course, even if the horses deviate considerably.

"I claim the combination of a tongue having motion vertically and laterally, with the directing and supporting wheel, substantially as set forth."

No. 9941. E. K. ROOT, Hartford, Conn.—*Improvement in the Compound Screw-drop or Hammer.* Patented August 16th, 1853.

"I claim the method of elevating the drops or hammers, by means of a screw having a continuous rotary motion, in combination with the mechanism, or its equivalent, for disconnecting the drops or hammers from the screw to permit them to drop, substantially as described.

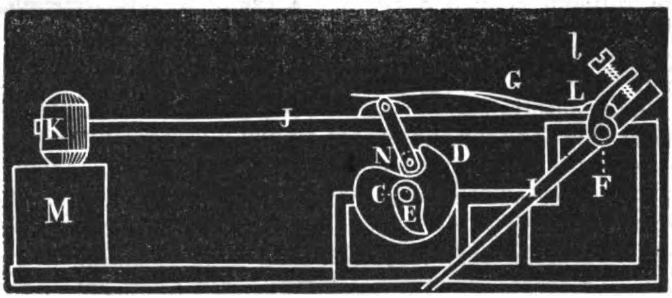
"I also claim the method of disconnecting the drops or hammers by the rotation of the elevating screw, which is notched to catch and act upon the finger or its equivalent, connected with the slide or its equivalent, to force it back and clear the thread of the screw, substantially as specified.

"I also claim, in combination with the slide which connects the drop or hammer with the elevating screw, and with the finger on the slide, or their equivalents, the employment of a catch-lever, or its equivalent, for holding up the drop or hammer when it is liberated from the elevating screw, and there to hold it until it is required to be dropped, substantially in the manner described.

"I finally claim, in combination with the slide which forms the connection with the elevating screw, and with the catch that holds the said slide when liberated from the elevating screw, or their equivalents, the employment of the rebound latch, or its equivalent, which liberates the parts by the rebound when the drop or hammer strikes, substantially as specified."

No. 9942. William Van Anden, Poughkeepsie, N. Y.—*Improved Trip-Hammer.* Patented August 16th, 1853.

The nature of this invention consists in having a hammer-shaft J (see figure) attached to a collar, which works loosely around the shaft F, to which a spring G, which forces down the hammer-shaft J, is attached. The spring is made to act more or less upon the hammer-shaft by means of a set-screw



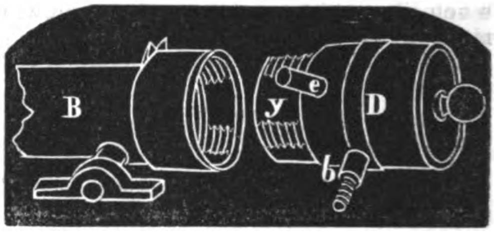
b and lever I, against which the cam D operates, which rotates with the shaft C, and bears against the friction-rollers N N, elevates the hammer-shaft J; the cam E as it rotates, bears upon and depresses the lower end of the lever I. The upper end of lever I consequently bears against the set-screw *b*, and the shaft F, to which the spring is attached, is turned; and the spring G bears or presses upon the hammer-shaft J, and when the highest points of the cam D have passed the friction-rollers N, the spring G of course forces the hammer-shaft J downward, and the hammer K strikes the anvil or block M.

By depressing or elevating the set screw *b* there will be a greater or less pressure of the spring G upon the hammer-shaft J; consequently there will be a greater action of the cam E upon the lever I, and the shaft F will be turned considerably, and the spring G be made to bear with increased pressure upon the hammer-shaft. The reverse takes place when the set screw is elevated.

"I claim, first, attaching a collar L to one end of the hammer-shaft J, said collar L working loosely over a shaft F, which has a spring G attached to it for the purpose of forcing down the hammer-shaft. The shaft F being provided with a set-screw *b*, or its equivalent, and lever I arranged as described, by which, upon properly adjusting said set-screw, or its equivalent, the hammer may be made to descend upon the block or anvil M with greater or less force, as desired.

"Second. I claim the employment or use of the friction rollers N N, attached to a vibrating frame O, and arranged substantially in the manner as herein shown, for the purpose of relieving, instantaneously, the cams D D from the pressure of the rollers, when the highest points of the cams have passed the lowest centres of the rollers, thus preventing the wearing of the cams at their highest points, as set forth."

No. 9943. JOHN P. SCHENKL, of Boston, Mass., Assignor to JOHN P. SCHENKL and ADOLPH S. SARONI.—*Improvement in Breech-loading Fire-Arms.* Patented August 16th, 1853.



The nature of this invention consists in cutting a male screw upon the end of the breech D (see figure), and a corresponding female screw upon the interior of the barrel B. The screws are marked off in regular corresponding sections, and the threads upon every alternate section *y* in each are cut away, so that by turning the breech, when both are slipped together, one-sixth of a revolution, the threads will engage with the female screw of the barrel B, and both will be drawn firmly together. The operation of unscrewing, withdrawing, and loading, is accomplished by an apparatus attached to the ring D and in *e* and *b*.

"I claim the above-described combination of parts for the purpose of operating the movable breech, constructed and arranged substantially as described."

No. 9944. WILLIAM HARRISON BABBIT, Waynesburg, Pa—*Improvement in Hill-side Ploughs.* Patented August 16th, 1853.

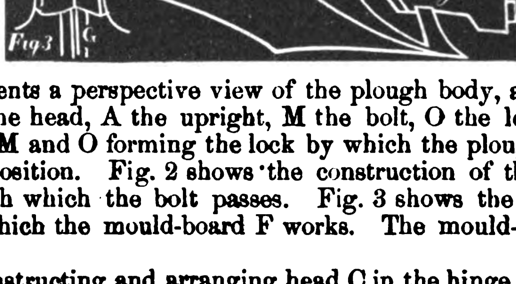
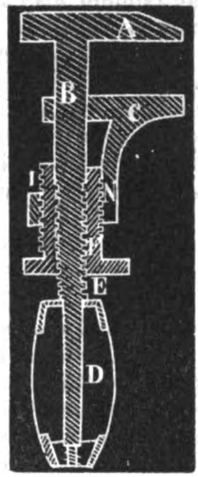


Fig. 1 represents a perspective view of the plough body, and a portion of the beam; C the head, A the upright, M the bolt, O the lever, and F the mould-board—M and O forming the lock by which the plough body is kept in the proper position. Fig. 2 shows the construction of the head C, and the hole through which the bolt passes. Fig. 3 shows the head with the groove G, in which the mould-board F works. The mould-board is shown in Fig. 4.

"I claim constructing and arranging head C in the hinge which connects the beam of the plough with the upright A, so as to lock said hinge by means of bolt M before the pivot of said hinge, and by lever O behind said pivot, for the purpose of making the bearings in said hinge adjustable, substantially as herein set forth."

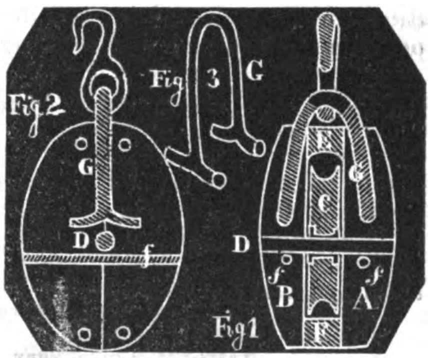


No. 9945. AURA G. COES, Worcester, Mass.—*Improved Screw-Wrench.* Patented August 16th, 1853.

The figure represents a section of the improved screw-wrench, and the inventor claims the combination and arrangement of the screw-tube G, its male and female, or external and internal screws I F, the screw E on the shank B, the amulus K, and its female screw, as applied to the sliding jaw, the whole being made to operate together substantially in manner, and for the purpose of enabling a person to readily move the sliding jaw C on the shank with a velocity compounded of the velocities of motion of two female screws on two female screws, as described.

No. 9946. WILLIAM COLEMAN and STEPHEN G. COLEMAN, Providence, R. I.—*Improved Ship's Block.* Patented August 16th, 1853.

A and B represent the two cheeks (see Fig. 1), C the sheave, D sheave-pin, and E F wooden connecting pieces. The inventors make no use of straps, but employ a staple or eye G, as shown in Fig. 3.



"We claim as our invention the above-described mode of constructing the hook-and-eye staple of the ship's block, and supporting it within, and by means of the cheeks, without any extension of it around and in contact with the sheave-pin, and whether each of the cheeks is made whole or in two parts, as herein before specified; and in combination therewith, we claim the mode of sustaining the sheave-pin, and connecting the two parts of each cheek, viz., by a metallic rod extended through them, and directly under and against the sheave-pin, substantially as specified."

No. 9947. ALPHEUS C. GALLAHUE, Alleghany City, Pa.—*Improvement in Machines for Pegging Boots and Shoes.* Patented August 16th, 1853.

"I claim, first, the sliding lever *n′n′* (having a hook *p p* thereon for entering the staple of the last), which, passing through slots in the uprights *4s 4s* of the turn-table, secures the last to said table S′ S′ by the introduction of the wedge *q′*, as set forth.

"2d. I claim the turn-table S′ S′, mounted on the sliding-table V′ V′, which works on ways upon the moving-table W′ W′, and is actuated by springs G G, for the purpose of keeping the edge of the sole at all times in contact with the gauge *a* when this is combined with mechanism for giving the turn-table a semi-revolution at the point where its centre is brought opposite the awl by the motion of the table W′ W′, that regularity in inserting the pegs may be secured.

"3d. I claim the combination of the spring K′, lever 16, catch 3*s*, or their equivalent sliding-wheels D and 9, racks 6 and 5, mitre-wheels F and B, by which a semi-revolution is given the turn-table, while the pegs are being inserted around the heel, by the shifting of cog-wheel 9 from rack 7 into 6, on the release of lever 16 from catch 3*s*, and the return of said cog-wheel 9 into rack 7, on the release of spring H from catch L, by which means it acts on the upper side of lever 16, as set forth.

"4th. I claim the cam 53, rod 52, secured to hammer *r* and helical spring *f*, by which a graduated driving stroke is given the awl *d*, and its rod in combination with cam 2, rod *h*, upon which slides the hammer Y, and helical spring *g*′, by which a driving stroke is given the peg-driver alternately with that of the awl and its rod. It being understood that I do not claim the general feature of a hammer and rod carrying an awl, and spring for driving the awl operated by a cam, as this has been done heretofore, but the particular mode or combination in which they are used, as here claimed.

"5th. I claim giving the peg tube and driver a side motion independent of the awl and awl rod, by means of cam O and lever A, or their equivalent, for the purpose of bringing the peg directly over the hole punched in the sole of the shoe by the withdrawn awl, the whole constructed and operating substantially as set forth and shown.

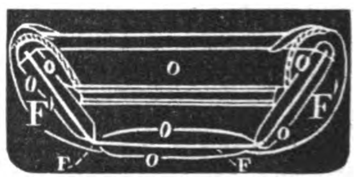
"6th. I claim the combination of cam O and stirrup *m* with the swing peg-cutter R, by which the peg wood is split with the grain of the wood from below by the knife at 55, and at the same time forced in the tube in R; it being understood that I do not claim the general feature of a peg-cutter forming one side of the tube through which the peg is driven, but only the particular mode of applying it as here claimed."

No. 9948. Gibson North, Philadelphia, Pa.—*Improvement in the Oven Doors of Cooking-Stoves and Ranges.* Patented August 16th, 1853.

To prevent the escape of heat through the oven doors, the inventor coats them on the inside with any suitable enamel.

"I claim the application of an adhesive coat of enamel, or other substance answering the same purpose, to the inside of the oven doors of ranges or cooking-stoves, substantially as described."

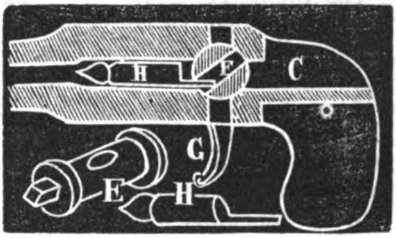
No. 9949. Abijah R. Tewkesbury, Boston, Mass.—*Improved Boat or Scow.* Patented August 16th, 1853.



The improved boat or scow the inventor makes of an entire sheet of india-rubber F (see figure), or other flexible water-tight material, lined inside and outside with boards *o o*, and so arranged that when they are not in use that the side can be turned down into the same plane with the bottom, and stored away, requiring little room, and in case of danger they can be used for life-boats, by elevating the sides of the boat and fastening them properly together. The india-rubber sheet around the corners are held fast by proper rope, as shown at F′.

"I claim as my invention the above-described improved method of constructing a boat, viz., by attaching its sides and ends to its bottom by water-tight hinges, in combination with connecting the edges of the sides and ends by water-tight flexible gores, substantially as described; and so that the boat may be unfolded, or the sides and ends be turned down into the plane of the bottom thereof, as herein before explained."

No. 9950. Henry Stanton, of U. S. Army, New York.—*Improvement in Discharging Breech-loading Fire-Arms.* Patented August 16th, 1853.



The nature of this invention consists in constructing fire-arms with a movable breech, in such a manner that it will, when placed in one position, form a prolongation of the bore, to allow the load to be introduced through it into the chamber of the piece, and when placed in another position, will close the butt end of the bore, igniting at the same time the charge, by shearing through the fulminating compound attached to the cartridge, as shown in the figure.

C represents the chamber; E the cylindrical plug, with an aperture F; G the trigger; H the cartridge, with the fulminating charge attached.

"I claim the method herein described of firing the charge of breech-loading arms by the breech itself, in the act of closing, thereby dispensing with the ordinary lock, and greatly simplifying the construction of arms, and diminishing correspondingly their cost and liability to get out of order, and increasing their durability and efficiency.

"I claim the method of igniting the charge by shearing through the fulminating compound attached to the cartridge, substantially as herein set forth."

No. 9951. Luther Atwood, of Boston, Mass.—*Improvement in Processes for Purifying Alcohol.* Patented August 23d, 1853.

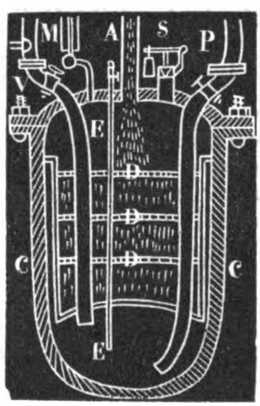
The inventor takes finely-ground manganese oxide 3 lbs., nitrate of potash or nitrate of soda 5 lbs., in a state of moisture, and slowly melts them in a crucible, continuing the heat until the melted mass passes from a fluid to a stiff, pasty mass. When cold it is powdered and kept for use.

For every gallon of alcohol of 85 or 90 per cent., he uses two ounces of the manganese compound dissolved in eight ounces of water.

This proportion is the average quantity required for common alcohol, but so much should be used as is sufficient to destroy the odor of the fused oil, and the purified alcohol must then be distilled.

"What I claim is the use of the manganates and permanganates existing as soluble compounds, however obtained, for purifying alcohol, so as to adapt it to nice purposes."

No. 9952. Moinier & Boutigny, of Paris, France.—*Improved Method of Generating Steam.* Patented August 23d, 1853.



The nature of this invention consists in so forming the generator as to cause a direct production of steam at high temperature, 500° or upwards, by means of ejecting water at the top, or near the top of the generator, when the same is in a heated state, and causing the water to come in small quantities in contact with the surfaces of perforated metallic diaphragms, placed within the generator, and also to come in contact with the sides of the generator so as to increase the evaporating surface of the generator.

A represents the feeding-pipe; C boiler; D diaphragms; E set-pipe; M steam-gauge; P purger; S safety-valve; V mouth of steam-boiler.

The inventors state: "The manner of using our boiler is very simple. It is, firstly, heated with but little or any water in it. When the fire is first lit, about a quart of water is introduced into the boiler by means of a hand-pump. This water penetrates the boiler by means of the pipe or cock A placed in the centre of the cover, and falls on the first diaphragm D, by which it is scattered and evaporated; what is not evaporated on the first falls on the second, and from the second to the third, &c., &c., the surplus, if there be any, falling upon the bottom.

When the water has been thus introduced, the boiler is put in connection with the steam gauge M, and when this is observed to stop mounting, a fresh quantity of water is added, for the production of additional steam; when the gauge shows a pressure of from five to eight atmospheres, the machine is put in train for heating the cylinder, and for working. Ordinarily, from three-quarters of an hour to an hour are necessary to get in full operation, after which the boiler is supplied by means of a force and lift pump, or any other mechanical arrangement, worked by the engine or machine.

A boiler of the size before described usually evaporates from eight to nine gallons of water per hour, under the pressure of from five to ten atmospheres. The number of revolutions of the fly-wheel being known, it is easy to calculate the volume of water which must be raised by the pump to supply the above quantity of water, and not exceed it. The state of the level of the water is ascertainable by means of the test-cock D, and the superfluous quantity of water may be discharged by the purger P. The feeding of the boiler should be continuous, and the boiler should never contain but a small quantity of water, nor can it, as the mouth of the boiler or boiler-tube V opens near the bottom of the boiler or steam generator.

"What we claim as our invention is the generators for generating steam at high temperature from water introduced into the generator, when in a highly heated state, and injecting or introducing water from the top, or near the top of the generator; when this mode of feeding or introducing the water is combined with the series of perforated metallic diaphragms described, arranged one above another in the generator, so as to subdivide the water, and at the same time increase the evaporating surface of the generator, substantially as described, the water being gradually heated and subdivided in its passage through the apertures or meshes of the diaphragms, before it comes in contact with the more highly-heated surface of the generator, substantially as described."

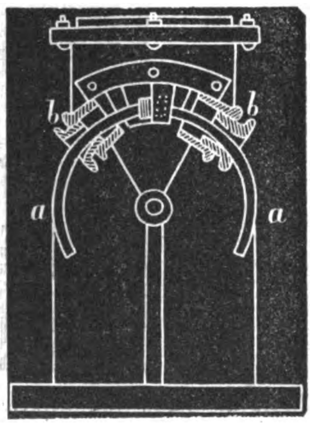
No. 9953. James B. Duff, of New York City.—*Improvement in Soap-cutting Machine.* Patented August 23d, 1853.

The nature of this invention consists, first, in the employment of a traversing slatted bed or carriage, having a hinged head-piece or follower, in combination with a series of vertical and horizontal yielding wire-cutters; one end of each of the vertical cutters, which cut the soap into slabs, being secured to a horizontal rod underneath the slatted bed, and the other end carried underneath another horizontal rod also underneath the said bed, and then up through the slatted bed and through a horizontal cross-piece above it and over a roller at the top of the frame, and then having a weight attached to it. And one end of each of the horizontal wire cutters, which trim off the top and bottom of the lump of soap, is secured to one side of the frame of the machine, and the other end is carried entirely across the bed and through the opposite side of the frame and over a pulley, and then weighted.

The object of thus securing the wires and attaching weights to their ends is, that when the soap is fed up to the wire-cutters they may be allowed to yield and form a loop while cutting the soap, and thereby cut it perfectly smooth and straight, for it is found that if the wire-cutters are kept taut and in rigid contact with a thick lump or cake of soap, they are caused to have a wavy, zigzag, or tremulous motion, and consequently they cut the soap uneven, and also cause greater resistance, as the soap is forced up against them by the traversing carriage.

"I claim making the wire-knives arranged and set with weights capable of yielding, so that they will form a loop in passing through the soap, and consequently cut it smooth and straight, in combination with the feeding slatted bed, or any other equivalent device for feeding or forcing the soap up to the said yielding wire-knives, the whole being constructed and arranged, and operating essentially as herein described."

No. 9954. MORRIS J. GARDNER, of York, PA.—*Improvement in Oscillating Steam-Engines.* Patented August 23d, 1853.



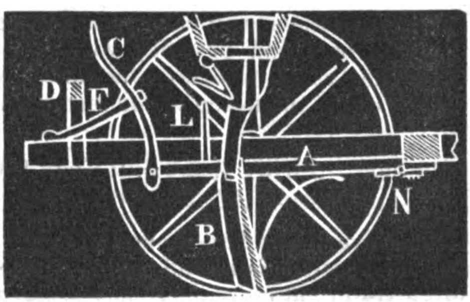
The nature of this invention consists in the manner of introducing the steam through circular tubes into the steam-chest, and at the same time constituting the tubes the circle around which the cylinder oscillates. The inventor fixes permanently upon the steam cylinder, made in the ordinary way, a circular steam-chest and packing-boxes, making the journal the centre of the segment of the circle which the tubes describe, and which the cylinder necessarily makes as it oscillates over these tubes.

a a the circular tubes, being made stationary on the frame of the engine; *b b* large circular tubes attached to the steam-chest, containing the packing, and glide over the tubes *a a*.

"What I claim is the mode of introducing the steam, the circular steam-tubes, the circular steam-chest, and packing-boxes, operating in the manner herein described.

"I do not, however, confine my claim to the precise position or dimensions of the various parts described in the foregoing specification, but to use such positions and dimensions substantially the same, as may be best adapted to produce the desired effect."

No. 9955. PETER HORN, Hagerstown, Maryland.—*Improvement in Seed-Planters.* Patented August 23d, 1853.



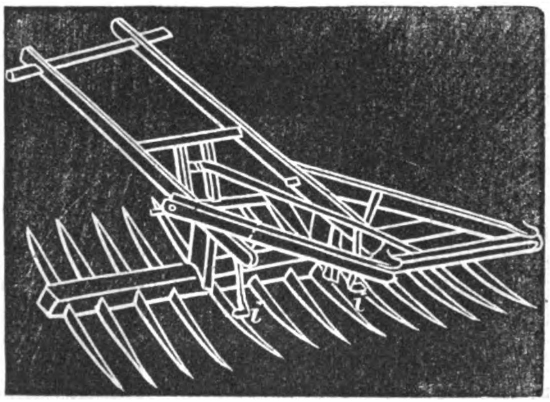
The nature of this invention consists in providing the boot B with an arm, which is attached to the frame of the planter by a hinge N, and is operated by a lever A, whose fulcrum F is also attached to the frame, and by which the boot B may be lowered or elevated at pleasure, and at the same time to close the aperture of the hopper by means of a spring *a* and the projection L.

To the arm A is attached a projection L, which, when the arm is elevated in passing over uneven surfaces, strikes the spring as shown in the figure, and raises it, thereby closing the aperture through which the seed passes into the boot and thence into the ground, and thereby saving the grain which would otherwise be lost.

"I claim the spring *a* in combination with the projection L, and arm or lever A, for the purpose of opening and closing the recess through which the seed passes, substantially as set forth.

"Second. I claim the arm or lever A in combination with the lever C and fulcrum F, for the purpose of raising or lowering the drill-tubes, and operating the spring *a*, substantially as herein set forth and described."

No. 9956. Frederick B. Parker, of Queensville, Indiana.—*Improvement in Hay-Rakes.* Patented August 23d, 1853.

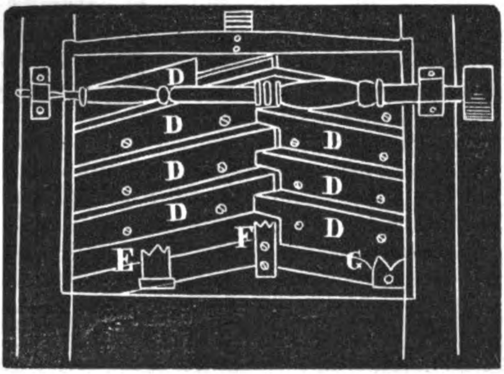


By means of this improvement the tipping of the rake is prevented by any other force than the intentional one of the operator. For this purpose a pair of steel springs *i i* are attached to the front ends of the handle-bars, projecting downwards. These springs terminate at their lower ends in bent lips, as represented in the figure, so as to form catches resting upon the edges of two of the front tines, in such a way as to hold them down with sufficient force, and on the other hand to allow them to slip past when released by the forward pressure of the operator against the handle, which, by lifting the hind stop out of the way of the back tines, permits the revolution of the rake in the usual way.

"I claim the spring catches projecting downwards from the front ends o the hand-bars, and provided with sloping lips, which, bearing upon the front tines, assist in holding the rake to its place until relieved by the withdrawal of the main-stop in the manner described."

No. 9957. Milton Roberts, of South Levant, Maine.—*Improvement in the Arrangement of Cutters for Turning.* Patented August 23d, 1853.

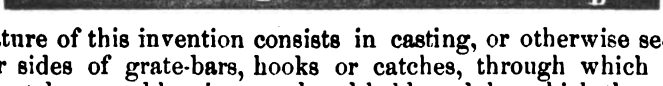
The invention relates to an improved latter attachment for turning beds, bedstead-posts, chair stuff and the like; and consists in placing a series of knives or cutters and beading-tools, one or both being used, in a suitable frame, said frame being moved in a direction transversely of the stick to be turned. The stick is centred in an ordinary lathe, and the frame with its guides are so attached to the latter as to allow the knives to come in contact with the stick as the frame is moved; the knives operating upon the stick sufficiently to give it the required form, during a single stroke or vibration of the frame.



In the figure, D represents two sets of knives in an inclined position; one set is longer than the other, and act with a drawing cut, and make smooth work; the lowest knives finish the work, and, consequently, are nearest the stick. E, F, G, are beading tools attached to the lower part of the frame.

"I claim the arranging straight-edged and grooved cutters on a frame moving parallel to the axis of the lathe, when said cutters are placed in pairs obliquely to the piece to be turned, each set forming salient angles with each other in the frame, by which arrangement each set acts by a gradual drawing cut upon the piece, the grooved tools following to finish the work."

No. 9958. Samuel Van Syckel, Little York, N. J.—*Improvement in Grate-Bar.* Patented August 23d, 1853.



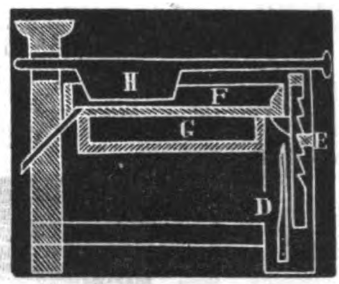
The nature of this invention consists in casting, or otherwise securing to the under sides of grate-bars, hooks or catches, through which series of hooks or catches a rod-bar is passed and held, and by which the grate-bars are prevented from warping or twisting by the heat, or from falling down if one end should slip off.

A the grate-bar; B the catch or hook; C the bar.

"I claim forming a hook or catch upon the under side of the grate-bars, and passing through or over said hooks or catches a holding-bar to prevent twisting or warping, substantially as described."

No. 9959. Miss Lettie A. Smith, Pineville, Pa.—*Improvement in Butter Workers.* Patented August 23d, 1853.

This invention consists, first, in combining with a butter-tray or pan F a cooling-drawer G or reservoir, which is placed under it, and into which ice



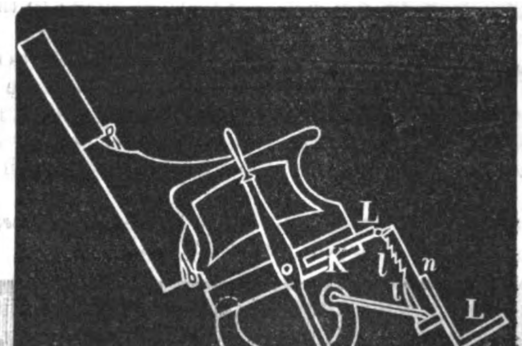
is placed for keeping the butter in a cool state while being worked.

2d. In an adjustable apparatus for working the butter, one end of the handle of the worker H passing through a circular opening in the back of the stationary frame, and the other end extending over the front part of the tray. This adjustable apparatus or working-lever is formed with acute angles at the sides of its working face so that it may serve the double purpose of breaking or pressing the butter, and turning it over.

"I claim, first, the combination of the cooling-drawer or ice-box G, with a butter-tray F, for the purpose described. I do not claim in general the device of the working-lever in combination with a butter-tray or table; but I claim forming such working-lever with acute angles at the sides of its working face so that it may serve the double purpose of breaking or pressing the butter, and turning it over."

No. 9960. William M. Warren, Watertown, Conn.—*Improvement in Railroad Car Seats.* Patented August 23d, 1853.

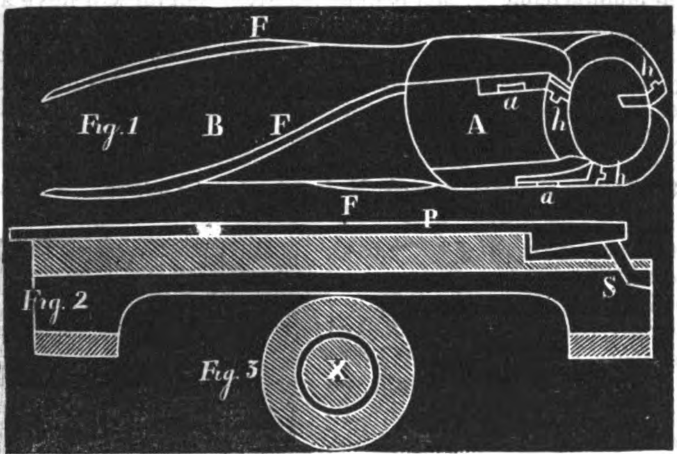
This invention consists in the employment or use of sliding foot-boards placed under the seat, as shown in the figure.



"I claim the manner in which the foot-boards L L are constructed and arranged, viz., the foot-boards being attached by joints to slides K K, said slides having racks *l l* on their upper surfaces and working on beds I I, connected by hinges; the under sides of the slides being provided with spurs or clicks *n n*, which catch into the racks, and retain the foot-boards when pressed upon by the feet; the beds being retained underneath the seat, when the foot-boards are not in use, by means of the catches M M, or by any other convenient mode."

No. 9961. L. A. B. Walbach, Pikesville Arsenal, Maryland.—*Improvement in Boring Cannon.* Patented August 23d, 1853.

The nature of this invention consists in producing a cylindrical hole in any solid metal, by boring out an annulus of the diameter of the required hole, leaving a central core, two-thirds, more or less, of the diameter of the bore, which can be broken off when the annulus is completed to the required depth, and removed in a solid mass, instead of being cut into fine chips, or shavings, as in the ordinary way of boring.



The core X, shown in Fig. 3, can be removed by breaking it off at its base, by means of a wedge, or by means of a cutter.

A represents, in Fig. 1, the cutter-head of the boring tool, *h h h* boring cutters, *a a* reamers or sink cutters, B the shear, and F F F the spiral flanges to carry off the chips.

To feed the tool S for cutting off the core (see Fig. 2), the inclined plane or wedge P is to be fed forward upon the tool by a screw, or otherwise. Generally the weakest and most defective part of a solid casting for a gun is along the centre or axis; hence when a core is taken from that part it is necessarily the very best possible portion of the material which can be selected for inspection.

"I claim the method, herein described, of boring cannon, or the barrels of other ordnance or fire-arms by perforating the same with an annular hole, which leaves a central core, in combination with a second operation for detaching and removing the core, substantially as specified, whereby the amount of material to be reduced to chips, the time and labor of boring, and the wear of tools, are greatly diminished, and the accuracy of the work increased.

"I also claim the transverse cutter, or the equivalent thereof, for grooving or cutting off the base of the core, substantially as specified.

"I likewise claim the method herein described of ascertaining the quality of the gun, by taking out a core of sufficient diameter and length from the axis or centre of the bore, to be tested mechanically or otherwise."

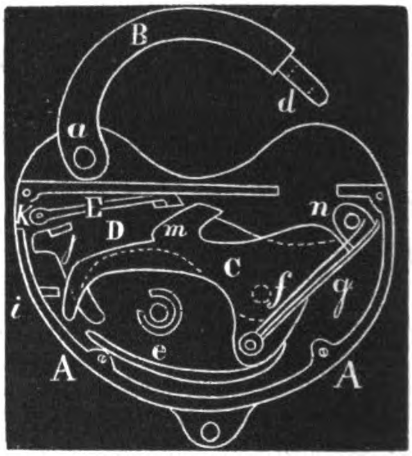
No. 9962. Zachariah Allen, Providence, R. I.—*Improvement in Counterpanes.* Patented August 23d, 1853.

The nature of this invention consists in weaving cloth of a width equal to the length required for a counterpane, the weft of the cloth being composed of cord and thread woven in alternate order, the thread being the usual size for the warp employed, and the cord considerably thicker, the different wefts being so woven as to form a ribbed surface. The thickness and twist of the cord should be such that when woven its tension and rigidity will produce kinks by its tendency to untwist, that will form helicoidal curves, and give to the ribs a wavy and undulating surface.

After the web has been woven in this manner, it is divided transversely by cuts parallel to the strips into length equal to the width it is required to make the counterpane. Each counterpane thus cut off will have a selvedge at its ends, and will require hemming at the sides.

"I claim the ribbed counterpane, herein described, as a new manufacture, it being so made that the thickness and twist of the cords forming the ribs on the same, by their tendency to untwist, will give to the said ribs a wavy or undulating surface, as herein set forth."

No. 9963. HENRY RITCHIE, Newark, N. J.—*Improved Padlock.* Patented August 23d, 1853.

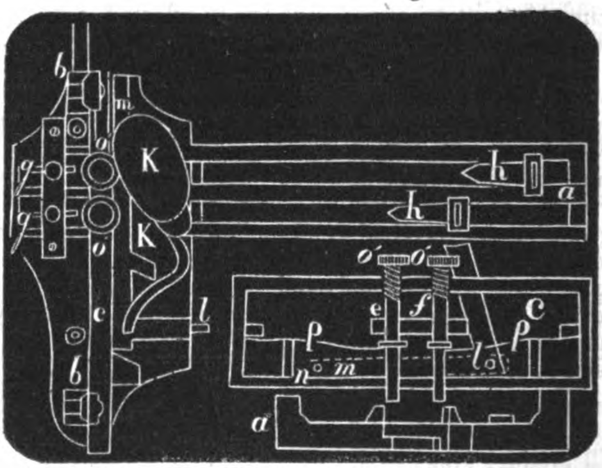


In the figure, A represents the case, C the bolt, D the tumbler, E the guard or lever, having its fulcrum on K.

When this padlock is in a locked state, the tooth *j* bears against the bolt C, and underneath the notch and the guard E against the shoulder *m*. To withdraw the bolt from the shackle, the guard E and tooth *j* are first elevated to clear the bolt by means of the key, which acts first on the tumbler D, and raises stop *j*, the tumbler also raising the guard E. The key then acts upon the bolt, and the spur or projection C is withdrawn from the shackle *d*.

"I claim the combination of the bolt C, guard E, and the double-toothed tumbler D, one tooth *n* of said tumbler fitting in the shackle *d*, and the other tooth *j* fitting in the notch at the back of the bolt. The bolt, guard, and tumbler operating as set forth in the body of the specification."

No. 9964. SNOW MAGOUN, Boston, Mass.—*Improved Machine for Cutting and Bevelling Printers' Rules.* Patented August 23d, 1853.



The strip of metal from which the rule is to be cut is placed upon the bed-piece *a* (see Fig. 1), and rigidly held by the set-screws *g g*, and at the end by the slides, fastened in any desired position by set-screws. The tool-carriage *c c* is moved forward and back across the bed-piece *a*, by the handle K K turning on a fulcrum at *l*, and jointed to the arm *m*, which is attached to the tool-carriage at *n*. The tools are depressed as the cutting progresses by the screws *o o*, and raised up again, when the screws are relieved from the tools, by the springs *p p* (see Fig. 2).

"I claim the machine herein above described for cutting and bevelling printers' rules, constructed with a sliding tool-carriage, which carries the cutting tool forward and back across the rule, as above set forth."

No. 9965. Edgar W. Foreman, New York, N. Y.—*Improvement in Diving-Bells.* Patented August 23d, 1853.

The inventor states in his specification:

"The peculiarity in operation of this invention is, that by the combination of a reservoir of condensed air at the surface in communication with the diving-chamber and the traversing-block, it is practicable at all times so to regulate the equilibrium of internal and external pressure, and to control the movements of the bell. 1st. Exceedingly light and weak materials may be used in construction. 2d. That the specific gravity of the diving-chamber, through the medium of the compressed air as a motor, may be instantaneously changed, and either ascent or descent may be attained solely at the will of the operator within said chamber. The condensed air acting instantaneously causes an expulsion of a certain desired amount of water. A corresponding buoyancy is thus effected, which may be absorbed by a weight, say a stone to be transported to a designated spot. The power from the reservoir thus gives vertical movement to the machine, and must be operated on, which upward motion may be checked at any moment by properly working the air and water valves. The mass thus held in suspension, is now moved by the arrangement of anchors and cables passing over the movable pulleys as described. The point of traction of the cables being regulated by the movable block. The desired spot being reached by allowing the admission of water, the mass or the machine itself will descend to the bottom, but not occupy the precisely desired spot; by successive actions of the air-valve, vertical, and at the same time horizontal movements may be effected, until the machine or suspended mass occupies the indicated spot.

"Difficulties arising from attempts at movement on an unequal bottom are obviated by the facility of acquiring these movements instantaneously. A very great facility also exists from this combination of the reservoir of compressed air and the diving-chamber, of descending to great depths, inasmuch as the operator can descend gradually at will, assuming a greater pressure of air, and gradually accustoming himself to such increase till very great depths may be attained both with safety and comfort.

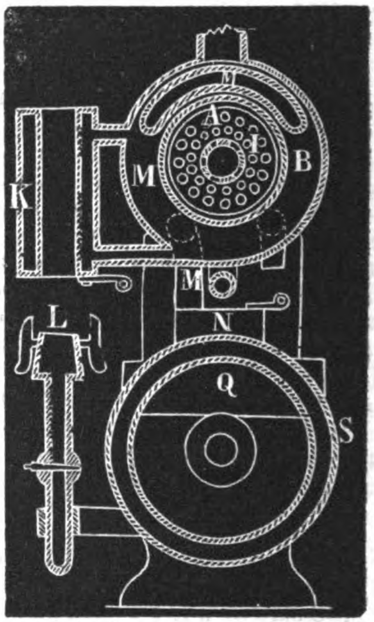
"I claim the combination of the reservoir of compressed air at the surface in connection with the diving-chamber or bell, and the arrangement of the movable block or pulley as herein described, whereby the chamber or bell may be moved and directed at the will of the operator within, for the purpose above set forth."

No. 9966. M. B. DYOTT, Philadelphia, Pa.—*Improvement in Hot-air Furnaces.* Patented August 30th, 1853.

In the figure, A represents the fire-chamber, B the fire-grate, C a cylinder or flue, D a passage from the fire-chamber into a drum E, F a pipe passing through the drum serving as a partition to cut off the communication all around the interior of the drum, and communicates with drum G; H a pipe communicating with drum G and drum E; I pipes, K the door, L ash-pit, J shell.

"I claim the combination of the internal cylinder or flue C, with the drums E G arranged in the manner described, by which combination a great amount of heating-surface is exposed."

No. 9967. OLIVER P. DRAKE, Boston, Mass.—*Improvement in Benzole Vapor Apparatus.* Patented August 30th, 1853.



The nature of this invention consists in an apparatus for evaporizing benzole, or other suitable volatile hydrocarbon, and mixing it with atmospheric air for illumination. The figure and claim explain this invention.

"I claim the combination of the heater K, and gas-burner L, with the water-vessel B and vaporizing-chamber A, substantially as specified, so that by means of the said heater and gas-burner, and the pipes connecting them with the water-vessel B and the chamber A, the whole or a part of the mixture of air and benzole vapor produced by the apparatus may not only be used in any convenient place for the purpose of illumination, but also for heating the water of the vessel B as specified.

"I claim for the purpose of vaporizing benzole, or other suitable volatile hydrocarbon, and *mixing* it with *air*, the combination of the *closed* vaporizing-chamber A, the rotary vaporizer or disseminator I (placed therein), and the rotary meter-wheel Q, and its closed case S, or an air-forcing apparatus, as made to force a stream of air into the hollow shaft of the vaporizer, and through or against saturated portions of the disseminator, and into the vaporizing chamber or regenerator, so as to vaporize the benzole or hydrocarbon and mix it with air, substantially as above specified.

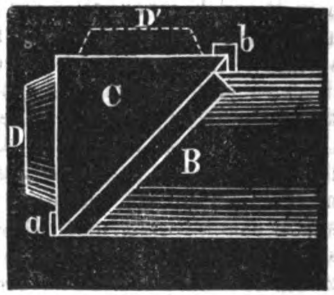
"And, in combination with the rotating meter-wheel and its case, and the hot-water vessel B, I claim the coiled induction air-pipe M, as made to pass through the water in the vessel B, and thereby receive heat therefrom, so as to warm the air as it passes through the pipe and to supply oxygen to the volatilized vapors, and for the purpose of facilitating the evaporation of the same.

"And in combination with the induction air-pipe M, I claim the chamber N, and its regulator slide and orifice applied for the purpose of supplying cold air to the warmed air or to the meter-wheel, in order to diminish or regulate the temperature of the air passing into the said wheel and forced into the vaporizing chamber.

"I also claim the peculiar mode of making the rotary disseminator or vaporizer (I), viz., of two perforated heads or disks, a hollow perforated shaft, and strands of lamp-wicking, or other absorbent material, stretched from one head to the other, as specified.

"And for the purpose of an air-blast apparatus, I claim the application and use of the meter-wheel, its closed case and liquid therein, substantially in the manner as above specified, not meaning to claim the method of using the meter for the admeasurement of gas, and wherein the wheel of the meter is turned by the gas itself, but meaning to claim it as having its wheel operated by a separate power and applied in conjunction with the water and closed case, and induction and eduction pipes for the purpose of blowing air, as specified."

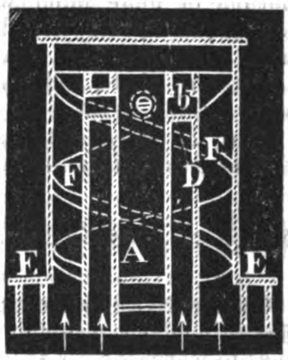
No. 9968. B. R. Finch, Jr., New York City.—*Improvement in Stove-pipe Collar.* Patented August 30th, 1853.



The nature of this invention consists in having a collar C (see figure), attached to the end of the flue B which projects a short distance from the stove; one side of the collar, as well as the end of the flue, being bevelled at an angle of 45°. By this arrangement the collar may be so placed or attached to the end of the flue that the pipe may project horizontally (see D) from the stove, or perpendicularly (see D') from it, as desired; said collar being movable or reversible, and fitted to the flue by means of a flanch *b* and button *a* on the end of said flue.

"I claim the reversible collar C, constructed, arranged, and applied to a stove in the manner and for the purpose substantially as shown and described in the body of the specification."

No. 9969. Thomas S. Gore, Jersey City, N. J.—*Improvement in Stoves.* Patented August 30th, 1853.



The nature of this invention consists in surrounding an inner cylinder or chamber A (see figure) of the stove with spiral flues F, so arranged or connected to the base E, that the heat which passes down the spiral flues will meet or unite with a main flue or pipe connected to the ordinary smoke-pipe.

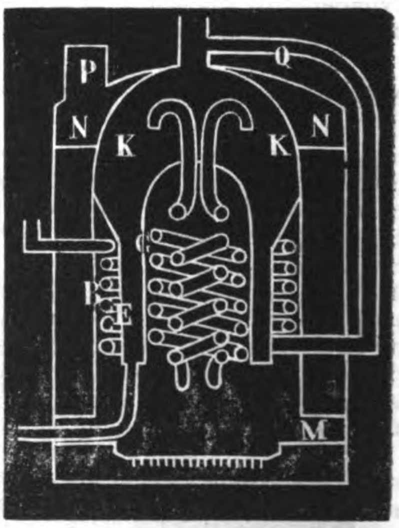
"I claim the spiral flues F F surrounding the cylinder D, arranged and connected to the base E, substantially as shown and described, for the purpose of obtaining a large extent of heating surface for the flues, and also for forming a space between them for the admission and heating of cold air, as set forth."

No. 9970. Lansing E. Hopkins, New York City.—*Improvement in Conductors in Machines for forming Hat-bodies.* Patented August 30th, 1853.

The nature of this invention consists in a bifurcated conductor, so constructed and arranged as to place the exhaust cone between two jets of fur.

"I claim the bifurcated conductor and blast above described, said conductor having its openings opposite each other, or nearly so, and having the cone between them, substantially in the manner and for the purposes set forth."

No. 9971. Benjamin Irving, Green Point, N. Y.—*Improvement in Steam-boilers.* Patented August 30th, 1853.



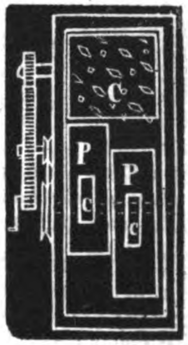
In this boiler the gases escaping from the ignited fuel rise into the cylinder G (see figure), and between the cylinders B and E, where they are consumed and made to heat the coils and other surfaces. The products of combustion descend and pass off into the circular flue M, from whence they escape through vertical tubes into the circular flue N, which is in immediate communication with the chimney P. The steam generated from all these heating surfaces rises into the dome or steam-chamber K, from whence it is taken off in the pipe Q, or from any other part of the steam-chamber.

"I claim, 1st, a boiler composed of an external water-jacket D, of cylindrical or other form, with a steam-chamber at the top, and with or without one or more inner water-jackets *d* connected with the outer water-jackets, substantially as described, when either water-jacket contains one or more vertical coils of steam-pipe *o o* whose lower ends connect with one of the water-jackets, and whose upper ends discharge into the steam-chamber, substantially as set forth.

"2d. Drying the steam by passing it through a coil within or between the water-jackets, substantially as set forth."

No. 9972. John Krauser, Reading, Pa.—*Improvement in Cider-Mills.* Patented August 30th, 1853.

The fruit drops into the cell between the front face of piston P (see figure) and the grinding cylinder C, whilst another portion rests upon the top surface of piston P′.

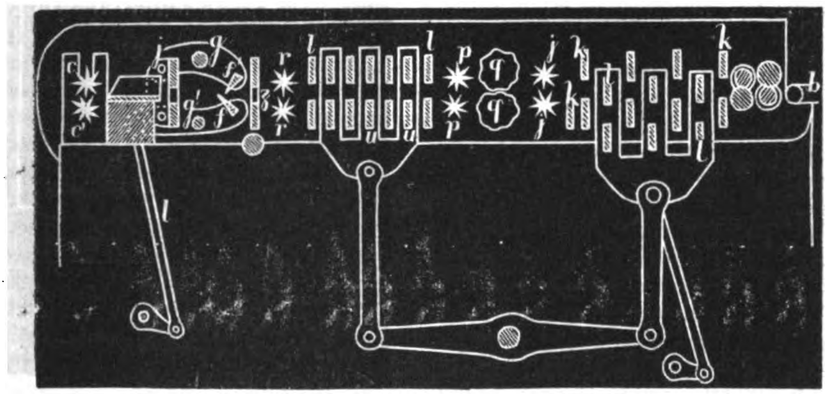


By turning the crank the cylinder C is made to revolve rapidly, whilst the revolving eccentrics, which are fast on the shaft, move the pistons P P′ in opposite directions. Piston P forces the fruit in front of it gradually against the exterior of the cylinder C, in order to reduce the fruit by the action of its teeth to a fine pomace. P′ operates exactly like P.

"I claim, in the first place, so arranging the hopper with reference to the several operating parts of the machine, that the fruit or other substance contained therein shall not rest directly upon or against the roughened exterior of the grinding-cylinder, but directly upon so much of the upper surface of the anterior ends of the pistons or plungers as shall be found operating or exposed within its inclosed sides, for the purpose of agitating the incumbent substance so as to insure and facilitate the filling of the cells, as the pistons recede from the cylinder.

"And, in the second place, which is a consequent of the first, viz., to cause the incumbent substance to press upon the cumbent, or that contained within the cells, so as to oppose the upheaving or ejectment of the same whilst in the act of being pressed against the passing teeth of the revolving cylinder *c*, by the action of the alternating pistons or plungers, as herein more fully described and set forth."

No. 9973. C. S. Leavitt, Maysville, Ky.—*Improvement in Hemp and Flax-breaking Machines.* Patented August 30th, 1853.



b endless feed apron; *j* feed rollers; *k k* stationary blades; *l l* movable blades; *q q* flying rollers; *p* second pair of feed rollers; *r* third pair; *t t* stationary and *u u* movable blades; *z* slot; *c′* delivery rollers; *f′ f′* combs set in arms *g′ g′*, and worked by rock-shaft *l′*.

"In my improved machine," states the inventor, "the flax or hemp to be broken is fed to the machine on an endless apron, which supplies it to two pairs of grooved rollers, from which it passes between an upper and lower set of stationary blades, the spaces between the blades of each set being sufficient to break the stocks in given lengths by means of blades which work vertically in the space between the blades of each set. The movable blades are also made in two sets with a space between the two sufficient for the passage of the flax or hemp, and hence the blades have a breaking motion up and down. From these blades the flax or hemp passes to, and is carried along by two pairs of fluted rollers, so far apart as to admit between them two fluted and toothed rollers, which rotate with much greater velocity than the fluted feed rollers on each, so that the flax or hemp held and carried forward by the feed rollers is acted upon on both surfaces by the alternate rows of flutes and teeth to strip off the broken fragments of bark or woody part of the plant. Thence the flax or hemp passes between another set of breaking blades similar to the first set, but with the blades nearer together. During this last breaking operation, the flax or hemp is also held and carried forward by another pair of fluted feed rollers, which deliver it between two stationary blades, beyond which the fibres are finally stripped and cleansed of the impurities by two vibrating combs, that is, two blades, whose edges are serrated and hung on the ends of vibrating arms, which give to them a reciprocating and curvilinear combing action. Thence the fibres pass through a slot in a plate hung to the other ends of the vibrating arms, by the vibration of which a scraping action is produced on the sliver of fibres, which then passes between the oblique sides of a trough to two fluted delivery rollers.

"I claim the combing apparatus as described, in connection with the pieces *i' i'*, which move alternately up and down, to hold the hemp or flax against the action of the combs *f f*."

No. 9974. William H. Mitchel, Brooklyn, N Y.—*Improvement in a Machine for Distributing and Composing Types.* Patented August 30th, 1853.

The nature of this invention consists in means for distributing the types from the form and setting them up in rows within grooves, a given letter in each row, with the faces of the types upward and the bottoms of the types in a line; from which grooves the types are removed, each row of a given letter at a time, and placed within slides or conductors, which supply them to an apparatus connected with finger-keys. The striking of any given finger-key drops one of the corresponding types on one of a series of belts, which are moved by competent pulleys. This series of belts is elongated as the latter approach the delivering end of the machine, and is combined with a diagonal belt, so that any given type dropped on any one belt takes an equal time to reach the point of delivery; that is, the composing apparatus, and consequently the types reach that point in the same order in which they are dropped by the finger-keys. This is effected by the diagonal belt aforesaid, to which the types are transferred from the series of belts by means of small shoots; this diagonal belt carrying all the types to one point of delivery, where, by means of a conductor and composing-wheel, they are set up in a line ready to be placed in the galley in lines of the required length for transfer to the composing stone.

"First. I claim the feeding-belt or belts 2, combined with the inclined plane C, wheels 12, and grooves to distribute the type in the manner specified.

"Second. I claim the mode herein shown for forming the distributing stick, with the points 16, spring 17, lips 18, and keys 21, 22, and 23, so as to drop one type at a time on its side, as specified.

"Third. I claim the bridge and form of groove to separate the thick from the thin types as they slide down the incline C, as specified.

"Fourth. I claim a series of belts, of length increasing towards the point of delivery of the types, in combination with a diagonal belt to receive and convey the said types from the series of belts to the composing table, or other point, in the order in which the types are dropped on the series of belts, as specified.

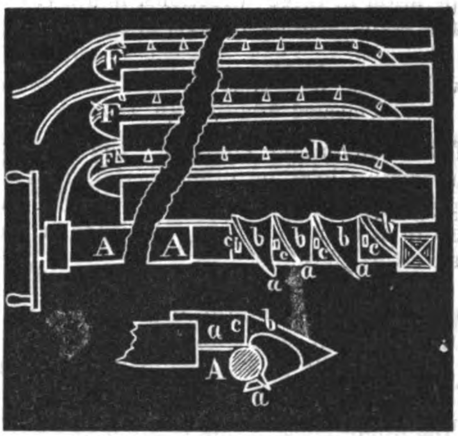
"Fifth. I claim fitting the key for dropping the types so that it shall give a partial rotary motion to the shaft 30, to operate on the fork, or any analogous device to drop the types.

"Sixth. I claim the fork 26, 27, and blocking-piece or stopper 25, to drop one type at a time, when moved by the key, or any similar means, as specified.

"Seventh. I claim the composing-wheel 43, to receive and set up the types, either in the composing or distributing apparatus, as specified, and I claim the combination of the said wheel with the fingers 45, on the wheel S, or with the bar 14, to supply said wheels, as specified."

No. 9975. FREDERICK NISHWITZ, Williamsburg, N. Y.—*Improvement in Grain Harvester.* Patented August 30th, 1853.

The nature of this invention consists in the peculiar construction, and arrangement of cutters and fingers. The cutters *a a* project at right angles in spiral lines, from the shaft A, and pass between slots *c* in the fingers *b*. The grass or grain cut by this machine passes between the fingers *b*, and



they having an oblique position, viz., the upper edge of each finger projecting a little over the lower edge of the finger adjoining it on the right side. The grass or grain will be bent as shown in the dotted lines, consequently the cutters *a a* cut off the grain with an oblique cut.

In the employment or use of flanged rollers, arranged as will be hereafter shown, for the purpose of throwing or detaching the grass or grain from the discharging ends of the belts.

"I claim, first, the combination of the fingers *b* and cutters *a*, or their equivalents, constructed, arranged, and operating in the manner and for the purpose substantially as herein shown and described.

"Second. I claim the employment or use of the flanged pulleys F F F, arranged as shown, for the purpose of throwing or detaching the grass or grain from the belts D D D."

No. 9976. Samuel Darling, Bangor, Me.—*Improved Apparatus for Grinding and Shaping Metals.* Patented August 30th, 1853.

To grind things of varying shape with facility, the inventor arranges a table under the grinding-stone in such a manner that it may be speedily raised or lowered to adjust it to the required distance from the stone according to the thickness of the body to be ground, and to the thickness to which its surface is to be reduced; it also admits of the table being set at any desired angle horizontally, so that if a blade with an edge thick and the other thin, like a scythe, for example, is required to be ground, its upper face presents a level surface to the stone. The firm attachment of the body to the table prevents the lateral vibrations, while the straight longitudinal run of the bed is intended to insure the production of an even and regular finish of the article operated on, all irregular scoring of whose surface is to be prevented by the lateral movement of the article taking place only at the end of the longitudinal movement of the carriage. By this mode of operation, successive straight narrow parallel breadths of the article to be shaped or finished are subjected to the action of the stone until its entire surface is dressed.

"I claim the combination of the holder of the article to be ground, with a grindstone or grinding disk, substantially in the manner herein set forth, so that the article and the stone will change positions relatively to each other during the operation in three directions, namely, towards each other, and parallel with and transverse to the axis of the stone."

No. 9977. Andrew Ratston, West Middletown, Pa.—*Improvement in Saw-Mills.* Patented August 30th, 1853.

"The nature of this invention consists," the inventor specifies, "as follows: First, in sawing logs or other descriptions of timber lengthwise with a saw operating in a horizontal position, for the purpose of enabling the saw to be run at a much higher velocity than it can be with safety when operated in a vertical position.

"Secondly. In such an arrangement and combination of the horizontal saw with the other parts of the saw-mill, that the saw will run through and beyond each end of the log, or other description of material operated upon, and whilst in that position will be automatically let down a distance equal to the thickness of stuff desired to be cut, and the motion of the carriage reversed, to bring the saw again into action; and so on until the log or other material acted upon, shall be entirely sawed into the dimensions required.

"Thirdly. In forming teeth on both edges of the saw, in combination with the arrangement of parts for reversing the movement of the carriage and feeding it back and forth, and also for shifting the position of the saw at the termination of each run through the log or other material, substantially as hereinafter set forth.

"Fourthly. In making the said double-toothed saw broader at one end than at the other, or uniting two single-toothed saws back to back, and spreading them apart at one end, for the purpose of throwing the double series of teeth into oblique positions to the line of movement of said saw or saws.

"Fifthly. In connecting the operating pitman to the saw-gate through the medium of two vibrating arms T and V, which are jointed at one end to each other, and to the pitman, and at the other end respectively to the saw-frame and saw-gate; and so arranged that one of the said arms will be in a line, or nearly so, parallel with the direction of the saw, and the other at right angles thereto, for the purpose of enabling the saw-frame to rise and fall without being strained by the varying inclination of the pitman to the direction of the saw, substantially as hereinafter set forth.

"Sixthly. In the combination and arrangement of the transverse sliding-bars *u v*, &c., and their movable fastening irons *a' a'*, &c., with the levers O O and the carriage H, for the purpose of rigidly and readily confining a log or other piece of timber to the carriage preparatory to being sawn, substantially as hereinafter set forth.

"Seventhly. In combination with my said horizontally acting saw, in the graduating hook *f'*, and its set-screw *d'*, combined with the shaft B, and the series of cams *l l*, &c., on the shaft G, in such a manner that the saw-frame is governed in its movements, and is held in any desired position for sawing dimension stuff, substantially as hereinafter set forth.

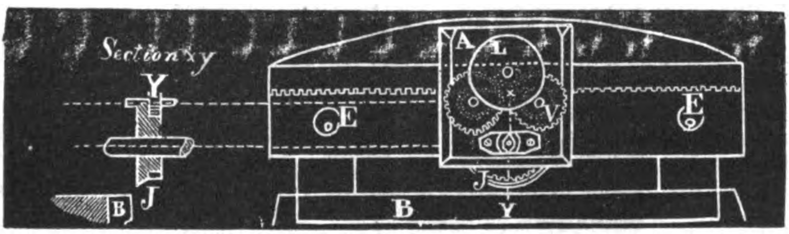
"I claim, first, sawing logs, or other descriptions of timber, into lumber by means of a reciprocatory saw, operated in a horizontal position, substantially as herein set forth.

"Secondly. I claim such an arrangement and combination of the horizontal saw with the other parts of the saw-mill, that the saw will run through and beyond each end of the log, or other description of material operated upon, and whilst in that position will be automatically let down a distance equal to the thickness of stuff desired to be cut, and the motion of the carriage reversed, to bring the saw again into action without stopping the machine, and so on until the log or other material operated upon shall be entirely sawn into the dimensions required, substantially as herein set forth.

"Thirdly. I claim connecting the operating pitman E, with the saw-gate, through the medium of a secondary pitman U, connected with the saw-frame, and saw-gate, substantially as described, so that the operating force shall be applied in a direction nearly coincident with that of the saw in its successive positions, for the purpose set forth."

No. 9978. Stephen P. Ruggles, Boston, Mass.—*Improved Machine for Cutting Sheet Metal.* Patented August 30th, 1853.

The nature of this invention consists in so hanging the shear or separating blades B and J (J being a rotary blade—see figure), as that their cutting



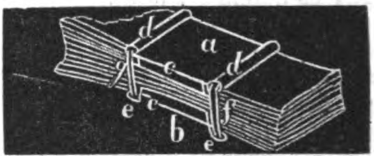
edges shall be in the same line, and one so placed above the other as not even to come in contact, much less overlap each other, by which means the inventor purposes to cut perfectly straight, square, and smooth edges, without the least warping or twisting of them, and with great diminution of power, from the fact that the cutting edges need not pass into the sheet or plate more than from one-half to two-thirds of its thickness, and yet it shall be entirely separated, and with smooth edges. And also in hanging the cutting blades or stocks on which they are supported, upon eccentric pins or bolts E E, for the purpose of giving them the most accurate adjustment, which they require with the varied thicknesses of metal sheets to be cut.

If the pulley L is set in motion, the box A, which carries the rotary blade J, will move along, as apparent from the figures.

"I claim the so hanging of a traversing and a fixed cutting blade, one or both, as that their cutting edges shall not overlap, or come in contact with each other, by which means I am enabled to divide sheets of metal, without twisting or warping their edges, and at great saving of power, substantially as described.

"I also claim the connecting of the upper and lower portions of the frame when each carries one of the cutters, on eccentric bolts, suitably provided with screw and nut, or their equivalent, for giving the blades on the said two parts of the frame a perfect adjustment one above the other, substantially as described."

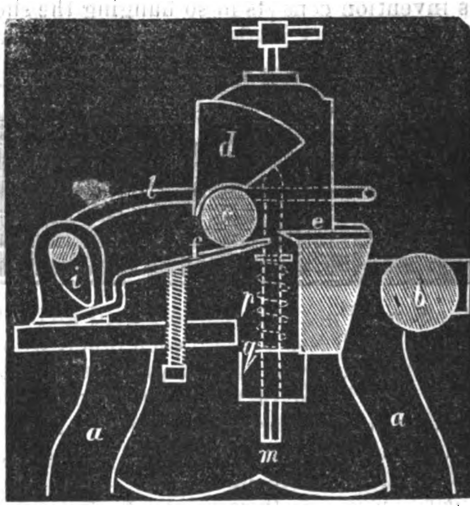
No. 9979. DANIEL WINSLOW, Portland, Me.—*Improvement in Paper Files.* Patented August 30th, 1853.



The paper file is formed of two plates *a* and *b* (see figure), each of which has a lip *c* turned at an angle from each end of it. Each plate has also its two side edges bent down, *d d* and *e e*, in order to cover two endless elastic bands *f g*. Between these plates *a* and *b* the papers are to be placed.

"We claim the combination of the plates *a* and *b* with the elastic bands *f* and *g*, so arranged as that the side-edges of the top plate shall be bent down upon the bands and hold them securely, while the side-edges of the bottom plate are turned, but left far enough from the bottom plate for the bands to move freely between them and the said plate; the edge-lips of both plates being so beat inwards, and rounded on the corners, as to protect the bands from being chafed or worn, as described."

No. 9980. CHARLES WESTON, Salem, Mass.—*Improvement in Machines for Splitting Leather.* Patented August 30th, 1853.

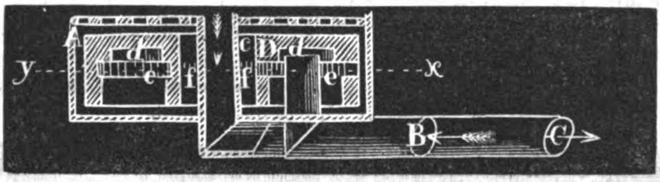


The nature of this invention consists in an arrangement for adjusting and holding the spring-plate, by attaching the arm which operates the cams to a spring-rack, so that the spring-plate will not only be susceptible of adjustment for the different thicknesses of the split, and exert a constant and uniform pressure upon the same, but will also yield to the various inequalities of the hide, as it is drawn through the machine.

a a frame-work; *b* roll upon which the leather is wound; *c* pressure-roll set in the turning-bar *d*; *e* stationary cutting-knife; *f* spring-plate, turning upon journals; *i* cam, and *k* its shaft which is attached to arm *l*, which is held by the rack of the movable rod *m*; *p* spiral spring, shown in dotted lines; *q* stationary stud, against which the spiral spring bears.

"I claim the arrangement herein above described, for exerting a constant and uniform pressure upon the leather, and at the same time allowing the spring-plate to yield to the inequalities of the hide, the same consisting in a spring-rack for holding the arm which is connected to the spring-plate by the turning-shaft and cams, as above set forth."

No. 9981. WILLIAM WIGSTON, of New York City.—*Improvement in Apparatus for purifying Gas.* Patented August 30th, 1853.



The nature of this invention consists in what the inventor terms a "scrubber," which is a float of wood, or other material, of circular or other form, of sufficient buoyancy to float in the purifying liquor, with an interior cavity above the surface of the liquor, and with passages leading from the said cavity through its sides. The gas enters through the inlet pipe, which rises through the liquor and opens into the cavity above its surface, escaping through the passages through the sides. These passages are so arranged that they are almost or entirely submerged, when there is no pressure of gas, but that, when there is a pressure, the float will be raised so as to bring a small portion above the surface, to allow the escape of the gas in very thin streams, and thereby bring every portion of it into contact with the liquor.

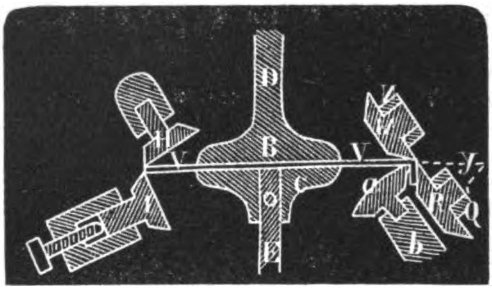
A lower part of a dry lime purifier: *x y* surface of the liquor; B inlet pipe; C outlet pipe; D scrubber (made of wood); *c* circular opening in the scrubber; *d d* annular cavity in the scrubber; *e e* and *f f* passages.

"I claim constructing the scrubber or float D, with a cavity *d* to receive the gas above the surface of the fluid, and partly submerged passages *e e f f*, leading from the said cavity through the sides of the float, to allow the escape of the gas from the cavity, and cause its distribution over the surface of the fluid in thin streams, to produce a diffused contact with the fluid, as described."

No. 9982. ELLIOT SAVAGE, Berlin, Conn.—*Improved Machinery for Cutting and Bending Metallic Disks.* Patented August 30th, 1853.

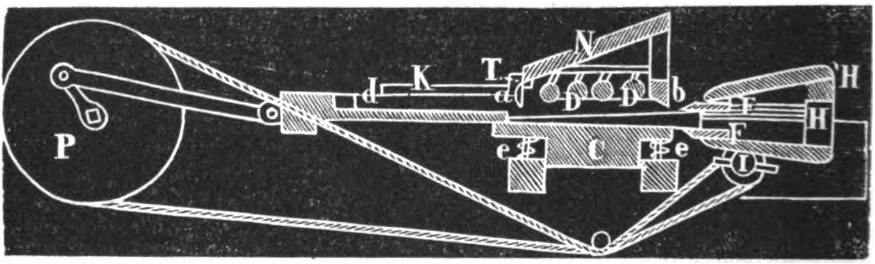
By applying to the two rollers R and *a* the support-roller M, the plate is firmly held at or near its outer edge; the bending down of it is effected by the action of the bending-roller R. When the plate is put in revolution, the roller R is moved around against it, and turns down the edge against the conic surface of the roller *a*.

B and C the circular disks or gripers; E and D rotary shafts; H and I cutting-rollers; N vertical arm supporting the roller M; Q vertical arm supporting the roller R. N and Q are affixed to a movable frame. The bending-roller R can be turned into position *y*.



"I claim the combination and arrangement of the roller M with the roller *a* and the binding-roller R, so as to operate together, and independently of the clamps B C, substantially as specified."

No. 9983. Elijah Valentine, Palmer, Mass.—*Improvement in Shingle Machines.* Patented August 30th, 1853.



The shingle to be dressed is placed into the recess *d* (see figure), and is carried forwards therein past the mouth T, and under the series of rollers D D D D; when the driver passes backwards, the catches *a* arrest the shingle, and cause it to fall upon the platform C; and as the ledges K K pass from under the arbors of the rollers D D, they all in succession fall upon the said shingle, and exert sufficient force to flatten it in case it should be warped, and cause it to pass freely under the after mouth-piece *b*, to be operated upon by the knives during the next return movement of the driver. As soon as the driver is brought back again to its fullest extent, another rived shingle is placed in the recess *d*; and as this is carried forward, the front end of the driver strikes against the end of the shingle first carried into the machine, and forces it under the after mouth-piece *b* in contact with the knives F F; which knives as they approach each other (in consequence of the forward movement of the shingle patterns) impart the proper taper to the shingle, and give to it perfectly smooth surfaces.

"I claim the series of rollers D D, &c., placed above the platform C, when they are combined with the ledges K K, which rise from the sides of that portion of the platform that receives the rived shingles to be operated upon, and so arranged that when a rived shingle is first carried forwards, the said rollers will be elevated above its upper surface by the said ledges, and when the driver is drawn back it will at the same time pass from under the said shingle, and from under the rollers, thereby allowing the shingle to fall upon the platform C, and the rollers to fall in succession upon the upper surface of the shingle, for the purpose of giving to the said shingle such a shape and position upon the platform, that it will be carried outwards again by the next forward movement of the driver, and be operated upon by the dressing-knives, substantially as herein set forth."

RE-ISSUES.

No. 246. JOSIAH WARREN, of New Harmony, Ind.—*Composition for Stereotype Plates.* Patented April 25th, 1846; re-issued July 26th, 1853.

No. 105, additional to 5630. By ELISHA S. SNYDER, Charlestown, Va. Granted August 23d, 1853.

"I claim, first, the peculiar construction of the rotary apparatus, formed of concavo-convex aprons or shields *a b c d e* combined with the curved prongs *e f g h*, the said rotary apparatus, Fig 5, used in combination with the threshing cylinder H, Fig. 1, specifically as set forth.

"2d. I claim setting the spout E at about an angle of 45° with the horizon, and adding the escape-pipe B to prevent the grain from flying about."

DESIGNS.

No. 590. THOMAS BALL, of Boston, Mass.—*Statue of Daniel Webster.* Patented August 9th, 1853.

"I claim the new design for a statuette of Daniel Webster, as herein above described and represented in the drawings."

No 591. J. W. VAN CLEVE, of Dayton, Ohio.—*Cooking Stove.*

No. 592. S. H. SAILOR. Patented August 23d, 1853.

"I claim the configuration and arrangement of the ornaments in bas-relief, and mouldings on the plates A B C D and E and door F, as set forth in this specification and annexed drawings, forming a new and ornamental design for a stove called the 'seven-plate stove.'"

No. 593. P. A. PALMER, of Leroy, N. Y.—*Design for a Milk-Stool.* Patented August 30th, 1853.

"I claim the ornamental design and configuration of a milk-stool, such as herein described and represented."

No. 594. FREDERICK SCHULTZ, Philadelphia, Pa.—*Design for a Cook Stove.* Patented August 30th, 1853.

"I claim the configuration and arrangement of the ornaments in bas-relief, and mouldings on the plates A H and X, doors B and C, and oven-door I, and foot B′, as described in this specification and annexed drawings, forming a new and original design in cook stoves known as the 'Evening Star.'"

No. 595. Smith & Brown, Philadelphia, Pa.—*Design of a Hot-air Parlor Stove.* Patented August 30th, 1853.

"We claim the configuration and arrangement of the mouldings and ornaments on the front, top, and base of the stove, together with the form and configuration of ornaments on the front and urn, as fully set forth in this specification and annexed drawings, forming a new and original design for the stove known as the 'hot-air parlor.'"

ON A NEW STYPTIC.*

BY M. PAGLIARI.

This styptic forms the subject of a long communication to the Academie des Sciences by C. Sedillot. Its composition is as follows: eight ounces of balsam of benzoin, one pound of sulphate of alumina and potassa, and ten pounds of common water are boiled for six hours in a glazed earthen vessel, care being taken to add fresh quantities of boiling water, so as to supply the loss in evaporation, and to stir continually. At the end of this time the supernatant liquid is separated from the undissolved benzoin, which has lost its odor and inflammability, and filtered, and preserved in glass bottles. The liquid thus obtained is limpid, and of the color of champagne; its taste slightly styptic, and its odor pleasant and aromatic, and when evaporated it leaves a transparent deposit on the sides of the vessel.

The styptic properties of this preparation seem very remarkable. A single drop immediately coagulates a cupping-glassful of blood, and a larger quantity (equal proportions) converts the blood into a firm and resisting solid. Applied to a wound, the hemorrhage ceases almost immediately, in consequence, as it would seem, of the formation of such clots upon the orifices of the bleeding vessels. The application also produces no irritation and inconvenience, nor does it interfere in any way with the process of cicatrization.

The cases given are well authenticated, and the results such as to leave no doubt as to the valuable styptic properties of the preparation. There are cases of obstinate primary and secondary hemorrhages after surgical operations; one from a severe cut in the finger; some from the extraction of a tooth. In these cases a piece of lint was soaked in the styptic and bound upon the wound.—*Gazette Medicale de Paris.*

* Having been once before deceived by a French styptic, we take this with many grains of caution. C. G. P., *Ed.*

THE AMERICAN

POLYTECHNIC JOURNAL.

PROGRESS OF IMPROVEMENTS IN PROPELLING VESSELS. No. 3.

BY J. J. GREENOUGH.

Robert Fulton was born at Little Britain, in Pennsylvania, in 1765. His means of education were limited, but he seems early to have displayed the traits of character for which he was afterwards so celebrated, and to which he owed his great fame for indomitable perseverance and varied resources in overcoming difficulties such as have been possessed by few. He was of Irish parentage, to which was added a truly American training, a combination of circumstances that has added so many brilliant stars to the galaxy of great American names.

At first, his tastes and inclination led him to practise painting; this he did with some skill and talent; and in pursuit of information on that art, he boldly ventured abroad, with little means, and was patronized by his countryman West, then in the zenith of his fame. Fulton, like most of his countrymen, had more than one trade by which to gain his bread, and could become engineer, writer, or painter, as occasion required; but he early manifested an inventive genius, and soon turned his attention to mechanics. One of his first efforts was in canal navigation, about the year 1790, in England; subsequently he went to France, where he experimented in exploding gunpowder under water; the results he offered to the French government, but was not patronized by it; he then, with true cosmopolitan *sang froid*, offered it to the Dutch government, and subsequently to England; but finally, Bonaparte, while first consul, appointed a commissioner with funds and power to give him the necessary assistance to carry out his experiments. In connection with this subject, he made a sub-marine boat, which seems to have been entirely successful so far as diving, moving, and remaining under water was concerned.

The following account of this structure is from St. Austin, a member of the tribunal: "The diving-boat, in the construction of which he is now employed, will be capacious enough to contain eight men, and provision for twenty days, and will be of sufficient strength and power to enable him to plunge one hundred feet under water, if necessary. He has contrived a reservoir of air, which will enable eight men to remain under water eight hours. When the boat is above water, it has two sails, and looks just like a common boat; when she is to dive, the mast and sails are struck." In making his experiments, Fulton not only remained a whole hour under water with three of his companions, but had the boat parallel to the horizon at any given distance. He proves that the compass points as correctly under the water as on the surface, and that, while under water, the boat made way at the rate of half a league an hour, by means contrived for that purpose. This device alone deservedly placed him in the rank of true inventors, but owing to the slow rate at which he moved under water, he of course could never attach his torpedoes to a vessel in motion; he therefore failed to fulfil the expectations of the French government, which caused them to abandon the project.

The experiments with this boat were made at Havre, in the winter of 1801, and the following year, where he created no little excitement. At Brest he immersed his Nautilus five, ten, and even twenty-five feet with ease. Colden thus describes his experiments, when he remained under water for an hour. "During the first descent, they were in utter darkness. Afterwards he descended with candles, but found a great disadvantage from their consumption of vital air. He next fitted, near the bow of his boat, an aperture, one inch and a half in diameter, with glass, and he found this admitted light sufficient to enable him to count the minutes on his watch. Finding he could descend to any depth, and rise to the surface with facility, his next object was to try her movements as well on the surface as beneath it. His boat had one mast, a mainsail, and jib. He weighed anchor and hoisted sail (July, 1801); there was only a light breeze, and therefore she did not move on the surface at more than the rate of two miles an hour; but it was found she would tack and steer, and sail on a wind, or before it, as well as any common sailing-boat. He then struck her mast and sails; and perfectly to prepare the boat for plunging required about two minutes. Having plunged to a certain depth, he placed two men at the engine, which was intended to give her progressive motion, and one at the helm, while he, with a barometer before him, governed the machine, which kept her balanced between the upper and lower waters. He found that with the exertion of one hand only, he could keep her at any depth he pleased; the propelling engine was then put in motion, and, on coming to the surface, he had moved about five hundred yards; he then again plunged, turned her round while under water, and returned to near the place he began to move from; this he did several days successively. He found that the boat was as obedient to her helm under water, as any boat could be on the surface, and that the magnetic needle traversed as well in the one situation as in the other."

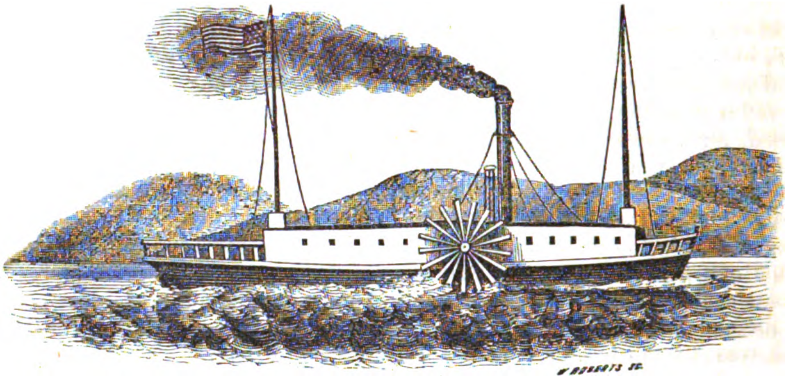
In one experiment he descended, accompanied by three other persons, and remained under water for several hours, taking with him a globe of about a cubic foot capacity, in which he condensed atmospheric air for a supply. "He descended," says Colden, "to the depth of five feet; at the expiration of an hour and forty minutes, he began to take small supplies of pure air from his reservoir, and he did so, as he found occasion, for four hours and forty minutes; he then came to the surface, without having experienced any inconvenience from having been so long under water."

The foregoing experiments with his Nautilus, probably determined him to proceed with his devices for propelling boats on the surface of the water by steam. Numerous have been the claimants for the honor of having instructed him in his knowledge of this subject. In Scotland, Symington declares he gave him his education therein, not only theoretically, but practically. According to Stuart, Dr. Cartwright, during a journey from London to Paris, "explained to him a mechanism to move vessels by steam, and he drew a plan of it in the presence of some of his family, which he presented to Fulton, expressing his regret that his circumstances were not so favorable as to enable him to be at the expense of making the experiment."

Again, his knowledge has been attributed to Captain Samuel Morey, of New Hampshire, a man of great genius, who tried some experiments in propelling, witnessed by Chancellor Livingston, at an early day. The friends of N. I. Roosevelt and Mr. Stevens have also set up claims for the credit of inciting him to his successes. Others contend that he knew well of Fitch's experiments, and even witnessed them. Be this as it may, he could hardly have obtained all his knowledge from any one source, and he showed a judgment and skill in applying knowledge, from whatever source gained, but little if at all inferior to an originator; he saw the errors of his predecessors, and avoided them; he supplied their deficiencies, and thus succeeded. These are the best qualities of a true inventor, and the result showed he possessed them in a high degree.

In 1796, Fulton went to reside in Paris. He formed an acquaintance with Robert Livingston, our Minister to the Court of France, on his first arrival there. In their conversations, they coincided in opinion upon the importance of the introduction of steam navigation, especially on the extensive rivers of the United States. They finally agreed to experiment upon the subject, and to Fulton was left the principal direction of the construction. They freely canvassed the schemes of all the American and other experimentors, and tried, in a small way, endless chains of paddles, but abandoned them. From Fulton's report of his experiments at Plombieres, where he first made them, it was understood, says Livingston, that he had developed the true principles upon which steamboats should be built, for the want of knowledge of which, all previous experiments had led to no useful results. But as many things, which were apparently perfect when tried on a small scale, had failed when practised on a large one, they determined to build an "operating boat" upon the Seine. This boat was to be propelled by wheels. The boat was finished in the spring of 1803, "and," says the biographer of Fulton, "they were on the point of making the experiment with her, when one morning, as Fulton was rising from his bed, in which anxiety had allowed him but little rest, a messenger from the boat, whose precipitation and apparent consternation announced that he was bearer of sad tidings, presented himself to him, and exclaimed—'Oh, sir, the boat has broken in pieces, and gone to the bottom!'" and, on examination, it was found the weight of the engine was too great for her, and a wind, which raised a ripple in the river, caused her to yield to the great pressure and break down.

This was a time to try the fortitude of the schemer, and nothing but that indomitable perseverance for which he was noted, saved him from total failure; but he was not to be daunted by any such obstacle. By great exertions the parts were raised from the bottom of the river, and a new boat was built, larger and stronger: her length was sixty-six feet, and her width eight feet. Fulton's experiment with this boat drew a great concourse of spectators to witness it; it was made in August, 1803, on the Seine. The wheels and engine worked according to his expectations, but her speed was not so great as he had calculated upon: sufficient, however, was proved to induce him, together with Livingston, to order an engine of Boulton & Watt, to be sent to New York, for an experiment upon American waters, and Fulton returned to his own country to carry out the magnificent project. He found no persons here, however, sufficiently enthusiastic to aid with funds, but his staunch and unyielding friend and partner, Livingston, who had obtained a renewal of his former exclusive right to navigate the Hudson with steam-vessels. In the spring of 1807, notwithstanding the pecuniary obstacles, as well as the mechanical difficulties with which Fulton had to contend, the vessel was completed and launched on the East River; the Watt engine was placed in it, and in August, 1807, she was first tried.



This vessel, of which the above is a representation, was named the Clermont, the name of the residence of Mr. Livingston; she was one hundred and thirty-three feet long, eighteen feet in breadth, and seven feet deep; the boiler was twenty feet long, seven feet deep, and eight feet broad; the steam-cylinder was two feet in diameter, with a stroke of four feet; the diameter of the wheels was fifteen feet, the buckets four feet long, with a dip of two feet. The burden was one hundred and sixty tons; she was built in 1806, and launched in 1807.

At the first trial, Fulton and Livingston had invited many friends to witness it; but few, however, of the crowd present had any faith in the scheme; but after it was crowned with success, "nothing," says Colden, "could exceed the surprise and admiration of all who witnessed the experiment. The minds of the most incredulous were changed in a few minutes. Before the boat had made the progress of a quarter of a mile, the greatest unbeliever must have been converted. The man who, while he looked on the expensive machine, thanked his stars that he had more wisdom than to waste his money on such idle schemes, changed the expression of his features as the boat moved from the wharf, and gained her speed; his complacent smile gradually stiffened into an expression of wonder. The jeers of the ignorant, who had neither sense nor feeling enough to repress their contemptuous ridicule and rude jokes, were silenced for the moment by a vulgar astonishment, which deprived them of the power of utterance, till the triumph of genius extorted from the incredulous multitudes which crowded the shores, shouts and acclamations of congratulations and applause." Though her performance far exceeded the expectations of his friends, Fulton perceived that there was an error in the construction of her paddle-wheels; he lessened their diameter, so that they did not dip so deep into the water, and it was manifest that the alteration tended to increase the speed.

"This same vessel, the Clermont, soon after sailed for Albany; and, on her first voyage, arrived at her destination without any accident. She excited the astonishment of the inhabitants of the shores of the Hudson, many of whom had not heard even of an engine, much less of a steamboat. There were many descriptions of the effect of her first appearance upon the people on the banks of the river. Some of them were ridiculous; but some of them were of such a character as nothing but an object of real grandeur could have excited. She was described by some, who had indistinctly seen her passing in the night, to those who had not a view of her, as a monster moving on the waters, defying the winds and tide, and breathing flames and smoke.

"She had the most terrific appearance from other vessels which were navigating the river when she was making her passage. The first steamboats, as others yet do, used dry pine wood for fuel, which sends forth a column of ignited vapor, many feet above the flue, and whenever the fire is stirred, a galaxy of sparks fly off, which, in the night, have an airy, brilliant, and beautiful appearance. This uncommon light first attracted the attention of the crews of other vessels. Notwithstanding the wind and tide were adverse to its approach, they saw, with astonishment, that it was rapidly coming towards them; and when it came so near, as that the noise of the machinery and the paddles were heard, the crews, in some instances, shrunk beneath their decks from the terrific sight; and others left their vessels to go on shore, while others prostrated themselves, and besought Providence to protect them from the approach of the horrible monster which was marching on the tides, and lighting its path by the fires which it vomited."

The distance run to Albany was about one hundred and fifty miles, which was accomplished in thirty-two hours, giving an average speed of about five miles per hour; the return voyage was made in about the same time. This triumphant success at once established the fame of Fulton, whose character now rose from that of a wild schemer, to the high position of a public benefactor: honors and credit were showered upon him, and the enthusiastic public were willing to sink the merits of all others to elevate him still higher in the world's estimation. But there were other and worthy competitors in the field at the same time, entitled to the thanks of coming generations, who aided materially in the first success, and who have since done much more to perfect what was then so auspiciously begun. Fulton lived to reap his full meed of praise, and at his death received a public funeral, more imposing, perhaps, than any civilian had ever before had.

We reserve the claims of John Stevens, a co-laborer in the field, for our next article.

J. J. G., *Ed.*

ON THE USE OF "FONTANILI," OR SPRINGS FOR IRRIGATION.

BY R. BAIRD SMITH, F. R. S.

I HAVE had occasion to refer frequently to the use of natural springs for irrigation in Italy, and it seems to me that I may appropriately give some more special account of these valuable sources of supply, and of the methods by which their waters are made available for useful purposes.

Throughout the whole of the great plain on the left of the Po, forming the irrigated region of Piedmont and Lombardy, there occurs water-bearing strata of sand or gravel at depths which vary materially. In a zone about three miles in width, following generally the parallel of 45° 28′, and extending from the River Sesia to the Oglio, there is a very remarkable abundance of subterranean waters met with, at depths varying from 9 to 15 feet. The influence of the canals of irrigation on the level of such springs is very perceptible—as in the vicinity of the Canal Martesana and also near Milan, where the depth of the water-bearing stratum does not exceed 4 feet. The springs, however, most in request for irrigation, rise from greater depths, and are connected with the permeable alluvial beds which stretch away towards the rising land in the northward of the plain. In seeking for these springs, there are a number of natural signs which are followed as guides; and though the faith in the magic virtues of the divining-rod, which once prevailed universally throughout these districts, may now have passed away, the fountain-seeker, a much-employed member of the community, has still his traditional signs, which gather round the source he is in search of. Where, in the spring time, the verdure of a meadow is of a deeper green than the general mass, or the soil of a field has a darker or damper appearance than the rest, there he considers it desirable to try his fortune. When, in the summer, the gnats are seen hovering in masses over a particular spot, and resting very close to the soil, he suspects that aqueous vapor is ascending from below, and that a spring must be near the surface. At all seasons of the year, light vapors rest over the hidden springs at night and morning, and to these the searcher gives attention, with a sort of practical instinct in recognizing their indications, which long observation creates.

Supposing that, by these or other similar signs, the existence of springs is sufficiently indicated, excavations are made through the surface soil to those beds of sand or gravel which form the sub-soil of the whole irrigated plain; and as new threads of water, rising on the surface, continue to show themselves, so does the excavation extend until a supply, adequate to the demand, has been obtained, or until the area of the head of the spring reaches the limit beyond which it cannot profitably be carried, owing to the value of the land. The small jets of water forming the springs, rise, of course, in variable volume, and with variable force; and in the large spring-heads (locally termed *teste dei fontane*) it is only the more important of these that receive special attention.

In the irrigated plains of Piedmont and Lombardy, the depth to which the excavation for springs has to be carried, very rarely exceeds 8 or 9 feet; and, owing to the natural slope of the country from north to south, this depth is soon worked out, and the channel brought to the level of the soil. The shape of the spring-head is determined entirely by the manner in which the jets (termed, on the spot, the *occhi*, or eyes of the spring) are distributed. Among the immense number I saw, there were none that affected any regularity of form, though the banks were trimmed and cared for with more or less attention, according to the tastes or habits of the proprietors. I observed, generally, that those in the Milanese were kept in better condition than either in Piedmont or the other parts of Lombardy.

Passing through the sandy strata, the jets are liable to obstruction from the matter the water carries with it, or from collections of earthy or vegetable deposits in the head. It is therefore necessary to protect them from these, and this is done by inclosing each jet with a wooden tube of variable depth, but generally ranging between 6 and 10 feet. This tube, of about 3 or 4 feet in diameter, slightly conical in form, is made of alder-wood or oak, about 1 or 1½ inches in thickness, bound with three or four strong hoops. It is, in short, very like a cask without a bottom, and it is forced into the soil until its upper rim is a few inches above the surface of the water in the spring-head. On one side of the rim a small cut is made, through which the discharge of the water takes place, and occasionally, though rarely, the top is covered over.

The excavation of the flooring of the spring-head is carried to a depth of about 1 foot or 18 inches below the level at which the jets are distinctly visible. The sides are either formed in long slopes and sown with grass, or, as in many instances I saw near Milan, neatly riveted with small piles and planks, and having trees planted all around, so that the spring-heads are generally picturesque spots. Occasionally it happens that the entire basin becomes filled with water, in such manner as to make it difficult to discover the localities of the jets. My kind friend, M. Charles Noe, drew my attention to an example of this kind in the Vercellese, and informed me that the method usually employed to discover the jets, was to leave the water undisturbed for some time, when the surface becomes covered with water-cresses, which were invariably much denser over the sites of the jets than anywhere else. I saw this very distinctly in the case in question, and the indication is considered on the spot an almost infallible one. When the dimensions of the head and the consequent volume of water have been tolerably well ascertained, the next process is to excavate the channel of irrigation (locally termed *asta di fontana*). Regarding this, there is nothing special to remark, as it is merely an ordinary channel, having dimensions and slopes varying according to local circumstances. When the soil is very porous, wooden or metal pipes are occasionally in use to economize the water, though it is but rarely that such expedients have to be employed. As all springs become the private property of the parties on whose lands they are found, their value may be ascertained by a comparison with the sums paid for like quantities of water derived from the ordinary canals of irrigation.

We have formerly seen that a volume equal to 1 cubic foot per second, may be purchased in perpetuity for about £280. The discovery of a spring giving from 5 to 10 cubic feet, which are the ordinary limits, increases the value of the property on which it is found, by from £1,400 to £2,800; and as the expenses scarcely equal, in average cases, a hundredth part of these sums, it is easy to understand the extent to which the system has been carried, and the importance attached to it, especially as the command of spring-water is so valuable in the establishment of *marcité* meadows.

The great and the minor canals of Northern Italy, derive, occasionally, no inconsiderable portion of their supplies from the subterranean waters. The depth at which their beds are usually placed beneath the surface of the soil, brings them within the limits of the water-bearing strata, and on all occasions when the main supply from the rivers is cut off, the effect of the springs is very perceptible. It is indeed generally held that the proportion due to these is equal to from one-fifth to as much as one-third of the total volume. The Naviglio Taverna, of which the entire discharge is nearly 30 cubic feet per second, draws only 15 of these from the Canal Martesana, the remaining half being from springs opened during the progress of the excavation for the bed. In this case the capital value of the additional supply of water thus obtained does not fall below £4200, and similarly with the private Canals Litta, Cattaneo, Visconti, Barmetti, Borromeo, and, in fact, nearly the whole which form the branches of the great arterial lines.

It would be in vain to attempt to give any rigid estimate of the total quantity of water supplied by springs for agricultural purposes, as no perfectly trustworthy data exist on which to base it. I will therefore merely mention here, that in the *Notizie Civile e Naturale su la Lombardia*, Lombardini calculates the total quantity utilized in the Lombardian Provinces at 2160 cubic feet per second, and that Michela, in the notes attached to his History of the Canal of Caluso, estimates the volume for the Lumellina alone at 788 cubic feet per second. We shall certainly be under the truth, if we estimate the whole throughout the irrigated plain of Northern Italy at 3000 cubic feet per second, of which the value in money is not less than £840,000 sterling. With these details, I terminate the third part of this report. My object has been, not so much to enter into very minute particulars on the practice of irrigation, as to give a general idea of its most noteworthy features. The irrigation system of Northern Italy demands, as essential to its existence, the possession of large capital and the concentration of property in the hands of wealthy proprietors. To this combination its actual development is due; and, however well the system of small farms may act in Upper Lombardy, I believe it would be the entire ruin of those provinces whose fertility has been produced entirely by their canals of irrigation, constructed at vast original outlay, and maintained at present by heavy and annually-recurring expenses, beyond the means of small proprietors to defray. To establish, in well-adjusted proportions, the various kinds of irrigated culture I have adverted to, and to insure an adequate return on the capital thus invested, requires farms of large areas, and working capital of considerable amount. In a calculation I have now before me, it appears that, to work efficiently an irrigated farm of 640 acres, it would require on the part of the tenant command of capital to at least the extent of £6000, while the amount sunk by the landlord in constructing canals, farm-buildings, and in levelling operations necessary to adapt the land for irrigation, is estimated at £40,000. Unless such sums are at the command of the one party, and have been invested by the other, the maximum advantages of irrigation are not to be obtained, as the water has not full justice done to its capabilities.

It is clear, therefore, that for Lower Lombardy, the existing arrangement of large farms, held by superior tenants under liberal landlords, is not only the best, but, I believe, the only system adapted to a region whose agriculture is based on irrigation, and where the government does not assist in the construction of works of distribution. If measures be taken to alter the distribution of property—to replace the large by small proprietors—I feel quite certain that the descent of Lower Lombardy, from its high position among the productive regions of Europe, will be rapid and invariable. These remarks do not apply at all to Middle and Upper Lombardy, where irrigation enters but little, if at all, into the system of husbandry.

There, subdivision of property has not yet, so far as my observation went, been productive of any injurious effects whatever; but I must repeat, that circumstances are wholly different in provinces whose agricultural life's-blood, so to speak, circulates in their irrigation channels. Even now the financial pressure checks the essential freedom of this circulation; and if carried so far as to lead to permanent embarrassment on the part of existing proprietors, and the necessary partition of land to meet demands so oppressive, government will most unquestionably soon have cause to feel that they have realized the ancient fable, in killing the bird that for so many centuries has been laying eggs of gold for their use.

THE NEW ENGLISH PATENT LAW.

The hasty manner in which the Patent Law Act of last year was finally passed, after dragging listlessly through nearly an entire Session of Parliament, rendered it a matter of certainty that a supplemental Act would be required, to modify or enlarge some of its provisions. This, the Session which has just closed has afforded us; and we are now enabled to congratulate both inventors and the public on some important amendments in the law of patents, affecting their interests. In the first place, the Commissioners are empowered to certify printed or manuscript copies or extracts of specifications, and thereby render them legal evidence in all courts of law. It is obvious that this arrangement will greatly facilitate the production of evidence in trials for the infringement of patents, by reducing the cost of office copies to the smallest possible amount. Another important feature in the new Act is, that, whereas the former Act ordered that all specifications should be printed and published, but omitted to limit the period in which this "consummation devoutly to be wished" should be realized, the law of 1853 enacts that certified copies of all specifications hereafter to be filed in the office of the Commissioners, shall be transmitted to Edinburgh and Dublin within twenty-one days of the date of such filing. We find no penalty annexed for the omission of this duty, but we have reason to believe that arrangements have been made for its fulfilment; and the public may therefore confidently expect to receive within a few days an instalment of the debt which was contracted by the Commissioners on the 1st October last. But perhaps the most important provision of the new Act remains to be noticed. It is to the effect that, in case a specification has not been filed within the time limited by the letters-patent, and such delay has been occasioned by accident, the Lord Chancellor shall have power to extend the time of filing to a period not exceeding one month. This is a most liberal and prudent provision, and we trust it will be the precursor of a rule which it is in the power of the Commissioners to make, viz.: that any party holding a power of attorney from a patentee may be enabled to go through the formality of signing and sealing his specification. By the adoption of this simple regulation, the necessity which now exists, in cases where the inventors are residing abroad, for obtaining patents in the name of patent agents and others, having no pecuniary interest therein, would no longer exist, and thus the expense of transfer deeds would be avoided. The following is a copy of the new law:—

"Whereas it is expedient to amend certain provisions of the Patent Law Amendment Act, 1852, in respect of the transmission of certified copies of letters-patent and specifications to certain offices in Edinburgh and Dublin, and otherwise to amend the said act: be it therefore enacted, by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

"I. Section thirty-three of the said Act, and such part of section twenty-eight of the said Act as directs that in case reference is made to drawings in any specification deposited or filed under the said Act, an extra copy of such drawings should be left with such specification, shall be repealed.

"II. The Commissioners shall cause true copies of all provisional specifications left at the office of the Commissioners to be open to the inspection of the public, at such times after the date of the record thereof respectively as the Commissioners shall by their order from time to time direct.

"III. A true copy, under the hand of the patentee or applicant, or agent of the patentee or applicant, of every specification, and of every complete specification, with the drawings accompanying the same, if any, shall be left at the office of the Commissioners on filing such specification or complete specification.

"IV. Printed or manuscript copies or extracts, certified and sealed with the seal of the Commissioners, of letters-patent, specifications, disclaimers, memoranda of alterations, and all other documents recorded and filed in the Commissioners' office, or in the office of the Court of Chancery appointed for the filing of specifications, shall be received in evidence in all proceedings relating to letters-patent for inventions in all courts whatsoever within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, and Her Majesty's colonies and plantations abroad, without further proof or production of the originals.

"V. Certified printed copies, under the seal of the Commissioners, of all specifications and complete specifications, and fac-simile printed copies of the drawings accompanying the same, if any, disclaimers, and memoranda of alterations filed, or hereafter to be filed under the said Patent Law Amendment Act, shall be transmitted to the office of the director of chancery in Scotland, and to the enrolment office of the Court of Chancery in Ireland, within twenty-one days after the filing thereof respectively, and the same shall be filed in the office of Chancery, in Scotland and Ireland respectively; and certified copies or extracts from such documents shall be furnished to all persons requiring the same, on payment of such fees as the Commissioners shall direct; and such copies or extracts shall be received in evidence in all courts in Scotland and in Ireland respectively, in all proceedings relating to letters-patent for inventions, without further proof or production of the originals.

"VI. Where letters-patent have not been sealed during the continuance of the provisional protection on which the same is granted, provided the delay in such sealing has arisen from accident, and not from the neglect or wilful default of the applicant, it shall be lawful for the Lord Chancellor, if he shall think fit, to seal such letters-patent at any time after the expiration of such provisional protection, whether such expiration has happened before, or shall happen after the passing of this Act, and to date the sealing thereof as of any day before the expiration of such provisional protection, and also to extend the time for the filing of the specification thereon; and where the specification, in pursuance of the condition of any letters-patent, has not been filed within the time limited by such letters-patent, provided the delay in such filing has arisen from accident, and not from the neglect or wilful default of the patentee, it shall be lawful for the Lord Chancellor, if he shall think fit, to extend the time for the filing of such specification, whether the default in such filing has happened before, or shall happen after the passing of this Act: provided always, that, except in any case that may have arisen before the passing of this Act, it shall not be lawful for the Lord Chancellor to extend the time for the sealing of any letters-patent, or for the filing of any specification, beyond the period of one month.

"VII. And whereas doubts have arisen whether the provision of the Patent Law Amendment Act, 1852, for the making and sealing new letters-patent for a further term, in pursuance of Her Majesty's order in Council, in the cases mentioned in section forty of the said Act, extends to the making and sealing of new letters-patent in the manner by such Act directed where such new letters-patent are granted by way of prolongation of the term of letters-patent, issued before the commencement of the said Act: and whereas it is expedient that such new letters-patent granted by way of prolongation shall be granted according to the provisions of the said Patent Law Amendment Act: be it declared and enacted, that where Her Majesty's order of Council for the sealing of new letters-patent shall have been made after the commencement of the said Act, the said provision of the said Act for making and sealing in manner aforesaid of new letters-patent shall extend, and shall, as from the commencement of the said Act, be deemed to have extended to the making and sealing in manner aforesaid of new letters-patent for a further term, as well where the original letters-patent were made before, as where such original letters-patent have been issued since the commencement of the said Act.

"VIII. This Act, and the Patent Law Amendment Act, 1852, shall be construed together as one Act."

Annexed is the draft of a rule, which, in substance, may be expected to issue shortly from the office of the Commissioners, to determine the practice relating to copies of specifications filed under the new law.

"All copies of specifications directed by the Act 16 and 17, Vic., c. 115, sec. 3, to be left at the office of the Commissioners, on filing the specification, shall be written on sheets of foolscap paper, briefwise, and upon one side only of each sheet. The copy of drawings (if any) left with the same, must be made as heretofore, and according to Rule III. of the 1st October, 1852."

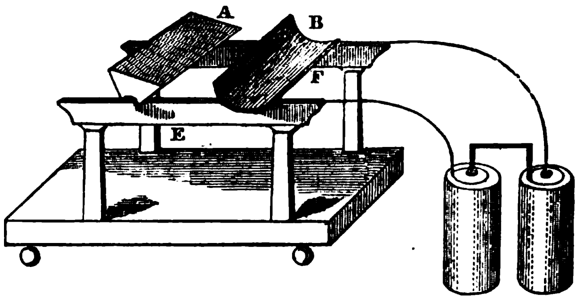
VIBRATIONS OF TREVELYAN'S BARS BY THE GALVANIC CURRENT.

BY PROF. CHARLES G. PAGE.

The vibration of Trevelyan's bars by the action of heat is an experiment more interesting than familiar, and one which has been variously and vaguely explained by most authors. It will not be necessary for me to recapitulate the several descriptions and solutions of this phenomenon, as the novel experiment about to be detailed will embrace substantially the whole subject.

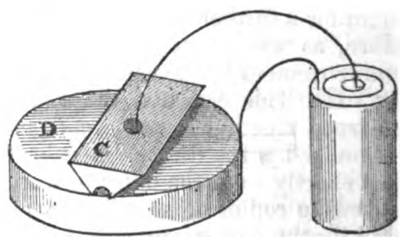
Some years since, while exhibiting to a class the vibration of these bars by heat, it became inconvenient to prolong the experiment, as the vibration ceases as soon as the temperature of the bar is somewhat reduced, and I was induced to seek for some method by which the vibratory motion could be produced and continued at pleasure without the trouble of reheating the bars for each trial. After various fruitless efforts, I obtained a most beautiful result by using the heating power of a galvanic current. Fig. 1 shows

Fig. 1.



the mode of performing the experiment with the battery. A and B are the two forms usually given to Trevelyan's bars, which, when to be vibrated by the action of heat, are made of brass, and weighing from one to two pounds, and after being sufficiently heated, are placed upon a cold block of lead, as seen in Fig. 2. The two bars may be placed upon the same block, though the vibrations are apt to interfere when two are used. When the bars are to vibrate by the galvanic current, they may be of the same size and form as above, and of any kind of metal,—brass, or copper, or iron, however, seeming to be most convenient. One or both of the bars may be placed at once without reference to temperature upon the stand, as in Fig. 1, the bars resting upon metallic rails E, F, which latter are made to communicate each with the poles of a galvanic battery of some considerable heating power. Two pairs of Daniell's, of Smee's, or of Grove's battery of large size are sufficient. The battery I employ, consists of two pairs of Grove's with platinum plates four inches square. The vibration will proceed with great rapidity as long as the galvanic current is sustained.

Fig. 2.

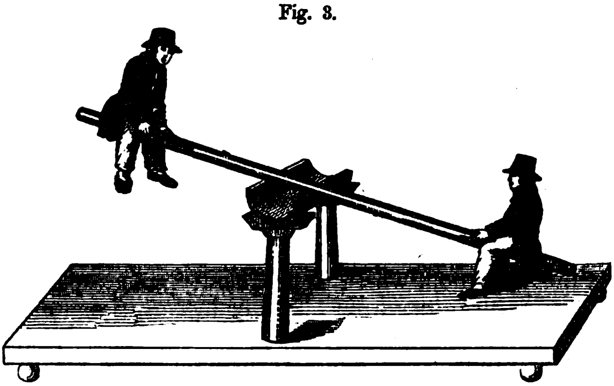


In Fig. 2, one pole of the battery is connected with the metallic block and the other pole with mercury in a little cavity in the centre of the vibrating bar. The experiment succeeds much better with the rails, as in Fig. 1, and quite a number of bars may be kept in motion by increasing the number of rails and passing the current from one to the other through the bars resting upon them. The rails are best made of brass wire or a strip of sheet-brass, though other metals will answer, the harder metals which do not oxydate readily, however, being preferred. A soft metal like lead is not so favorable to the vibrations in this experiment, although, in Trevelyan's experiment, lead seems to be almost the only metal that will answer to support the bar, which is usually made of brass.

Prof. Graham and other authors have attributed the vibration of Trevelyan's bars to the repulsion between heated bodies, and others have classed the phenomenon with the spheroidal state of heated bodies. I do not consider that any repulsive action is manifested or necessary in either of these cases, nor do I know of any instance in which a repulsion has been proved between heated bodies.* It is obvious some other solution is required for this curious phenomenon, and it appears to me that the motion is due to an expansion of the metallic block at the point of contact, and upon this supposition, it appears plainly why a block of lead is required. That is, a metal of low conducting power and high expansibility is necessary, and lead answers these conditions best.

The size of the bars may be very much increased when the galvanic current is employed, and some curious motions are observed when long and large cylinders of metal are used. If they are not exactly balanced, which is almost always the case, they commence a slow rolling back and forth until finally they roll entirely over, and if the rails were made very long they would go on over the whole length. An inclination of the rails is required in this case, but it may be so slight as not to be perceptible to the eye.

Fig. 3.



If a long rod of some weight be placed across one of the bars, as shown in Fig. 3, the vibrations will become longer, and by way of amusement, I have illustrated this with a *galvanic see-saw*, as it may be termed.

It is well known that where mere contact (without metallic continuity) is made by metals conveying the galvanic current, the metals become most heated at the point of contact, and if the current be frequently broken, the heat at these points is still more augmented. It is for this reason we are able to use various kinds of metals for the experiment, without reference to their conducting powers and expansibilities.

RICE CULTIVATION IN THE IRRIGATED DISTRICTS OF PIEDMONT AND LOMBARDY.

BY R. BAIRD SMITH, F. G. S.

THE rice cultivation of Piedmont and Lombardy, is divided into two classes—permanent (locally termed risaje da zappa, from the use of the spade in its tillage) and temporary (risaje da vicenda), which forms a part of the rotation of crops in the irrigated districts.

* Repulsion between bodies and particles of bodies are in this case distinct.

The permanent rice cultivation is restricted exclusively to low, marshy localities, unsuited for any other culture. It abounds in the swampy districts of Mantua and Verona; and though inferior in quality and quantity of produce to the other kind, it is still of great value, as being the only crop which soils so wet are capable of affording. When rice is introduced into the rotation, this extends over 9 years, generally in the following order:—1st year, wheat, with grass seeds; 2d, 3d, 4th, meadows; 5th, 6th, and 7th, rice; 8th and 9th, Indian corn, or other crops, varying from year to year.

A clayey, impervious soil, with a small proportion of sand near the surface, is found to be the best for rice. As the plant passes its existence in water, the details of the culture are directed to securing this condition. The means employed are much the same in Italy as in India. The surface of rice-land is made as nearly as possible horizontal; and where variations of level occur, a series of terraces is formed, each of which is carefully levelled. Compartments are then marked out, of which the dimensions are extremely variable, and each is surrounded by earthen walls or banks about two feet high. Connection is established between the compartments at high and low levels, so that the water entering the first, passes on to the others, and thus maintains a very gentle movement, which keeps the supply always fresh. It is an open question among Italian cultivators, as to whether large or small compartments are best. With equal heights of water in each, many think superficial area a point of little practical importance; but in the best rice provinces, as in Novara and Mortara in Piedmont, and in the Milanese, a preference is given to the system of small divisions, containing each from 3 to 6 acres. Within such limits there is much greater facility in managing the irrigation, which is frequently, and especially when the crop is threatened with injury from blight or insects, a matter of great delicacy. If the animals are aquatic, the rice-field is laid dry for a time; and if otherwise, it is flooded; the much-dreaded enemies being thereby disposed of, whether they proceed from land or the water.

When the divisions are duly formed, the rice-ground is ploughed and carefully weeded in spring. If the soil be too wet for the use of the plough, as in marshy localities, it is broken up by the spade—a tedious and unhealthy process. After the ground has been thus prepared, water is admitted for the purpose of verifying the levels, and of consolidating the partition walls of the different divisions. It is necessary to remove all trees from the immediate vicinity, as shade is very hurtful to the crop.

The period of sowing extends from the beginning of March to the beginning of May. The new rice-lands are sown first, those which have been established for one or more years, at a later period, as the soil is benefited by exposure for some time to the heat of the sun. Rice in the husk (locally termed risone) is employed as seed, in the proportion of from 3 to 4 bushels per acre, according to the nature of the soil. It is sown by hand; and as the land is literally in the state of mud, it is very laborious and very unhealthy work for the cultivator. It is necessary not to sow thick; and in proportion as the land is strong, the quantity of seed is diminished. It is usual to soak the rice-seed in water for twenty-four hours previous to sowing, with the double object of quickening its vegetation and preventing it floating on the surface of the water, as, without this precaution, it occasionally does. If new rice is employed as seed, it requires to be sown early, that is, in the course of the month of March; old grain is sown later—in April, or at the beginning of May.

Twelve or fifteen days after sowing, the young plants rise above the surface of the soil, and as they increase in height, the sheet of water is gradually increased with them, so that merely their tops show above it. The fields are kept in this flooded state until the plant flowers, which, according to the time of sowing, takes place between the middle of July and the middle of August. About this time the flooding of the crop is replaced by regular but abundant irrigation at intervals of a few days. When the head becomes well formed, the grain of good size, and the color changes from deep to lighter yellowish green, all use of water is discontinued, the land is drained as dry as practicable, and in ten or fifteen days afterwards, the crop is fit for cutting. The rice-harvest in the North of Italy ranges, according to circumstances, from the middle of September to the beginning of October; and the crop is cut with the scythe when large compartments are used, and with the reaping-hook in the smaller ones. The grain is made into small sheaves, about 25 to 30 lbs. in weight, and with a constant length of 18 inches. When the plants are longer than this, they are cut higher, and the stubble is afterwards ploughed in as manure. The threshing is effected after the Oriental fashion, by the treading of bullocks or horses; and the grain is subsequently dried for some days by exposure to the sun. It is then stored, and, during the winter, when water is cheap and abundant, it is cleared of the husks in the rice-mills attached to the farms, which are worked by water-power.

The produce of rice-land necessarily varies much according to soil and supply of water. The permanent rice-lands receiving but little manure, and being in low, marshy localities, difficult to cultivate efficiently, yield much less than those introduced into the usual agricultural rotation. In the provinces of Mantua, Verona, and Novara, where permanent rice-lands are extensive, the average produce per acre is estimated at from 30 to 35 bushels of uncleaned grain, or risone; while the temporary land in the same and the adjoining provinces, yield about one-fifth more, or about 40 bushels per acre. Of the latter class, however, there are many which yield much more, even to 60 or 70 bushels. The process of cleaning reduces the rice to about one-third of its bulk; so that, for permanent land, the produce would be nearly 13 bushels. As an illustration of the produce of rotation rice-lands, I give the following, to which my attention was directed by a skilful Lombard proprietor of much experience in this cultivation. It is given in vol. ii. of the work entitled, "Milano e il suo Territorio," p. 140, and exhibits actual results, which I have reduced to their equivalents in English measure.

Statement showing the Produce per Acre of Rotation Rice-land in Lombardy.

	Uncleaned Rice. Bushels.	Cleaned Rice. Bushels.
1st year	57.7	17.6
2d do	49.6	16.8
3d do	54.4	20.2
4th do	44.5	16.6
Totals	206.2	71.2
Annual means	51.55	17.8

The larger produce of the first year is due to the land being new; that of the third year is the result of thorough manuring. By the fourth year the land shows signs of exhaustion, no manure having then been given. It will be noted that, as the rice-land becomes older, the proportion of cleaned or uncleaned rice increases; or, in other words, the grain is more easily separated from the husk in the latter years of rotation. The cleaned rice may be valued at 6*s.* the bushel; hence, the gross average return per acre is £5 6*s.* 9*d.* The expenses of cultivation were only about 15*s.* per acre, and supposing the expenses of water to double this amount, we have a net return of £4 11*s.* 9*d.* per acre. It is mentioned that in certain years this same land has yielded 25 bushels of cleaned rice, thus giving a net return of £7 5*s.* per acre. With a species of cultivation so cheap and so profitable, it is not wonderful that all attempts to restrict its extension should have failed. No sanitary regulations have yet offered more than merely temporary impediments to its progress. It has extended, and is extending even now; and though the impression of its unhealthiness is universal, the temptation of its profits is too great to be resisted. I shall have occasion to show hereafter what has been done to reconcile sanitary and pecuniary interests, not, I would hope, necessarily incompatible in this case; to do so at present, would lead me away from my subject.

It is peculiarly difficult to form any precise estimate of the quantity of water necessary for a given area of rice-land. Unlike all other irrigated products, which require only occasional watering, at more or less distant intervals, rice is flooded continuously for at least three months of its growth. The fields are then a series of ponds, so to speak, receiving constantly such new supplies as are necessary to compensate for wastage by evaporation, absorption, and other causes. In such a system it is evident how great the influence of soil must necessarily be; it is in fact the most important consideration of all, and with its variations vary also the quantities of water required.

According to the best Italian authorities, one cubic foot per second is sufficient for the irrigation of from 35 to 40 acres of rice, being from 45 to 50 cubic inches per acre. This is fully twice the quantity required for meadow irrigation. In the Milanese, it is held that land under rice absorbs, every 24 hours, a stratum of water having a depth of 0.47 inches, or very nearly half an inch. In Verona and Mantua, the daily consumption is estimated at just double this quantity. In the South of France, where winds similar to the regular hot winds of the Indian summer prevail, the depth of water to be supplied daily to rice-ground is estimated at 0.663 inches. It is calculated that in the North of Italy and centre of France, the daily evaporation varies between 0.78 and 0.117 inches, while in the south, and under the influence of the hot winds, it increases to between 0.156 and 0.195 inches. Assuming the average daily loss by evaporation to be 0.180, we have for supplying the plants, and for loss by filtration, a stratum having a depth of 0.473 inches, which, from all the testimony I have been able to collect, is practically abundant. From these data it may therefore be safely concluded, that a continued discharge of from 45 to 50 cubic inches of water per second is sufficient for the irrigation throughout the season of one acre of rice-land, supplying, as this volume would do, a daily stratum having a depth of between 0.62 and 0.68 inches.

In estimating the cost of irrigation for rice-land, I find it stated that water to be so employed is sold throughout the greater part of Lombardy, at an annual rate equivalent in English money to £26 per cubic foot per second. Supposing this volume to be sufficient for the irrigation of 40 acres, we have a rate of 14*s.* 6*d.* per acre for water in rice cultivation.

I have a little more to add on the subject of the employment of water in agriculture throughout Northern Italy. The meadow and the rice lands may be said almost to divide between them that vast volume of water which is every year poured over the face of the country. The irrigation of Indian corn or flax consumes but a comparatively small portion of the supply, and

I have not considered it necessary to advert to it in any detail. I conclude this section with a tabular statement of some statistical details, which may be useful for reference.

Numerical Details connected with the Employment of Water for Irrigation in the Agriculture of Northern Italy.

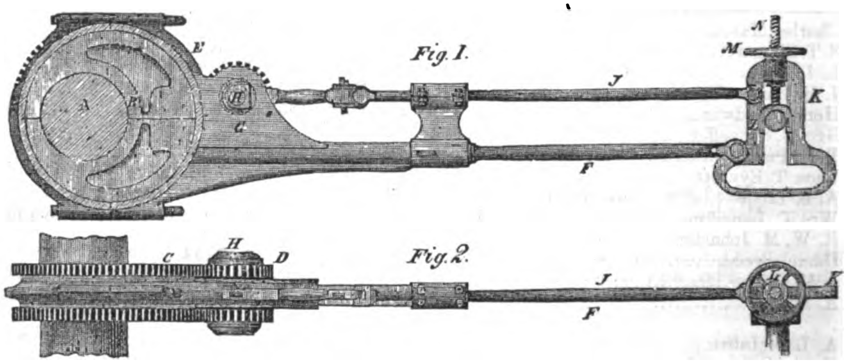
	Number of acres irrigated by one cubic foot per second.	Number of waterings. During the month.	Number of waterings. During the season.	Depths of strata of water. Each watering.	Depths of strata of water. Monthly.	Depths of strata of water. For the season.	Price of irrigation per acre.	Produce of grain per acre.	Net value of produce per acre.
				inch.	inch.	inch.	s. d.	cwt.	
Summer.—Meadows	90	3	18	2.34	7.02	42.12	5 9	224	£3 10s. to £4
Winter.—Meadows.....................	3	30	150	7.92	237.6	11.88	21 0	450	£7 to £12
								bu.	
Rice	40		100	0.62		62	14 6	17.8	£5 to £7
Indian Corn, Flax, &c................	180	1	6	3.93	3.93	23.58	3 6	50	£2 to £3

COLLINS' DUPLEX ECCENTRIC VALVE MOTION.

We present a cut of Collins' Duplex Eccentric Valve Motion, which appears to us likely to become one of the most valuable and useful improvements of the day. We commend it to the attention of our friends who are constructing steam-engines, as well worthy their notice in several points. The advantages that have been claimed for it, are: 1st. A reduction of the first cost of the engine, by simplifying and reducing the parts, at the same time rendering it more manageable. 2d. Adjusting at all times its own feed to suit the demand upon it. 3d. In point of economy of working the steam, as the whole operation of cutting off is performed by the common slide-valve, or ordinary puppet-valve (requiring but one slide-valve), which is so adjusted that it gives a lead upon the exhaust, and feeds the steam to the piston upon the instant of *striking the centre, with the port wide open, the exhaust being also wide open before* TURNING THE CENTRE, thereby relieving the piston from the necessity of driving the lead back into the port, and on its return from the opposing influence of the exhaust, which *is then escaping through a wide open port*, doing away with wire-drawing either in the feed or exhaust. It will be perceived that the engine must do more work with the same pressure of steam if these advantages have been gained, and it seems to us they have been in a great measure.

This, together with 33 per cent. saving of fuel, guaranteed by the owners of the patent, entitles it to notice. The cut-off is variable from an $\frac{1}{8}$ to $\frac{7}{8}$, and self-adjusting.

This attachment is intended to take the place of the present eccentric rods; A being the main shaft of the engine, B the main eccentric, and K a link in which the crank of the rocker-shaft is placed. By the main eccentric B B, the long throw forward and backward is obtained through the rod F, which connects with the link K, which operates the rocker-shaft, and through it the valve. By the revolutions of the wheels D D, which are eccentrics (or equivalents), two short motions in opposition to the throw of the large eccentrics are made, by which four motions in one valve are obtained; and those motions, adjustable at the will of the engineer, are so arranged that the entire feeding and exhaust ports must be open when the engine is coming upon her centre, thereby giving the whole pressure of the boiler upon the piston at the instant of its progress forward, and at the same instant of time having the exhaust port *wide open*, and continuing open to



the end of the stroke. Through the movable link K, the engineer can, by the adjusting wheel M, raise or depress the box L so that the feed of the cylinder will be cut off at $\frac{1}{4}$ to $\frac{1}{2}$, or $\frac{3}{4}$, or any intermediate point; working at all times the whole pressure of the boiler until the instant of cutting off. We also perform the same by attaching the governor to the link K, so that it rises or falls to suit the work to be performed, so that in case of throwing off machinery, she will cut off instantly to suit the power required, and will feed again so soon as required. To stop the engine, run the brass box L down into the horizontal slot O, when the valve's motion ceases instantly. By this arrangement one rocker-shaft, one eccentric and rod, one steam-chest, valve, and other appendages are dispensed with, making the engine much more simple, manageable, and effective.

From the foregoing, the mechanic will at once see the advantage of this attachment, in the instantaneous opening of the feed and exhaust ports, and cutting off at any point with one valve, feeding the extra pressure of the boiler at the starting of the piston, and saving friction and machinery.

This invention is now on sale by its proprietors, Messrs. Rose, Middleton & Tifft, at No. 192 Broadway, New York, where models are shown of its construction and operation.

A List of the Officers employed in the United States Patent Office.

Names.	Office.	Salary per Annum.	Date of Appointment.			From whence Appointed.	Duties.
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E. Foreman......	" "	"	12	"	"		" "
John Van Sautvoord	" "	"	15	"	"	N. York.	" "
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Samuel P. Bell........	" "	"	1	"	"	N. York.	Assistant Machinist.
Wm. W. Turner.......	Librarian.	"	1	Sept.,	1852.	"	
Wm. Slicer.............	Machinist.	1250.	4	June,	1853.	Md.	
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James S. Ewbank....				April,	1853.	N. York.	
I. H. Phillips..........		Am't receiv'd for copies of drawings			1852.	Penn.	
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H. Holt.................				May,	1853.	Iowa.	
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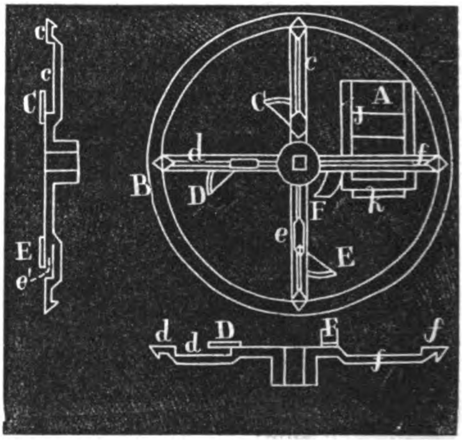
P. M. McGill..........				June,	"	Dist. Col.	
Elliott Coues..........				"	"		
L. Elliott..............				July,	"		

CLAIMS OF PATENTS.

Granted on the 6th, 13th, 20th, and 27th of September, with explanations and diagrams by M. C. GRITZNER.

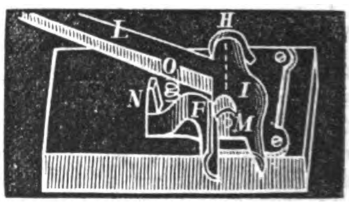
No. 9984. J. T. ASBURY, Taylorsville, N. C.—*Improvement in Straw-Cutters.* Patented Sept. 6th, 1853.



The nature of this invention consists in so arranging the cutting knives (see figure), C, D, and E, that one-third of the feed shall be cut by each of the knives, as they successively come in contact with the straw; the knives being properly fastened to three radial arms *c*, *d*, and *e*, of a vertical wheel B, to effect the cut as described; the fourth arm *f* of the wheel being furnished with a cam F for moving the feeding apparatus; the arms being also constructed with recesses *c'*, *d'*, *e'*, *f'*, for permitting each to pass over the protruding portion of the uncut straw while its respective knife is making its cut. A, cutter box; *k* and *l*, feeding rollers.

"I claim the combination of the three cutting knives C, D, E, as described, with recessed arms *c*, *d*, *e*, *f*, whereby one-third of the feed of straw is cut successively by each knife, the protruding uncut portion passing through the recesses *c*, *d*, *e*, *f*, in the arms, during the operation, substantially as specified."

No. 9985. P. H. E. & J. BLAKE, of New Haven, Conn.—*Improvement in Nut-Crackers.* Patented September 6th, 1853.



The object of this improvement is to regulate the extent to which the compression of the nut is carried, according to the different sizes of nuts.

The improvement consists in the arrangement of the jaws in relation to each other, and to the axis on which the movable jaw turns, and in combining therewith stops to limit the motions of the movable jaw in both directions. F, fixed jaw; I, movable jaw; N, stop; H, M, axis on which the movable jaw turns. This axis is parallel to the plane in which the jaws diverge, and to the line in that place which bisects the angle of divergence.

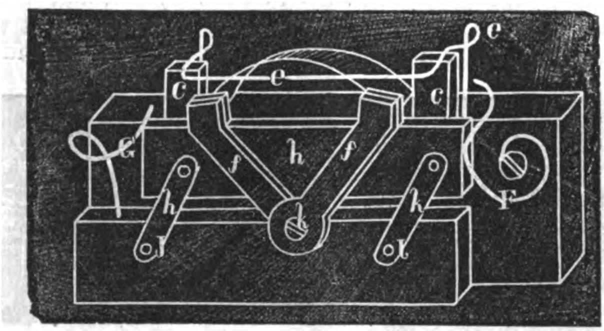
The nut to be cracked is placed between the jaws (which jaws, by means of a spring *o*, are always kept open) until it comes in contact with both, and then the lever L is depressed.

"1. We claim the divergence of the jaws in a plane, which is parallel to the axis of motion, as herein described and shown in the drawing, whereby nuts of different sizes are all received at a uniform distance from the centre of motion.

"2. We claim the divergence of the jaws in a plane, parallel to the axis of motion, in combination with the two stops, collectively, which limit the motions of the movable jaw, as herein described.

"3. We claim the divergence of the jaws in a plane, parallel to the axis of motion, in combination with their extension beyond the supports of the axis, as described and shown in the drawing, whereby the line of the axis of motion is brought in close proximity to the acting faces of the jaws without impairing free access to them to introduce and remove the nuts."

No. 9986. James Barnes, of Franklin, N. Y.—*Improvement in Machines for Edging Leather Straps.* Patented September 6th, 1853.



The nature of the improvement consists in constructing the machine so that by drawing through it strips of leather of different widths they are all rounded to the same curve, so as to give uniformity to the swelling of different parts of a harness, with one knife, and without the change of any part of the machine, a single movement adjusting the gauge to any width desired. *d*, circular knife; *e*, *e*, spring to hold the leather tight to the gauge; *h*, *h'*, *h'*, three sides of a parallelogram jointed together, the upper part *h* of which is movable round the points J, J: *h* touches the front sides of the columns *c*, *c*, and against its ends press the springs F and G: *f*, *f*, pair of dividers, with a shoulder on each leg, to rest upon the upper edge of *h*, and hold the leather straight to the arc of the knife: *f*, *f* turn round *k*.

"I claim the combination of the parallelogram and inverted dividers, as a regulating gauge, to work in front of the edge of a curved knife, so that strips of leather of different widths may be rounded to feather edges with the same perfection, without the change of knife, or any part of the machine; the whole being constructed substantially in the manner herein described."

No. 9987. Victor Beaumont, of New York, N. Y.—*Improvement in Printing Presses.* Patented September 6th, 1853.

This press consists of a printing cylinder A A, on a part of the surface of which, from B to B', are fixed the forms of type, the remainder B C B' of the surface being used as a distributing table.

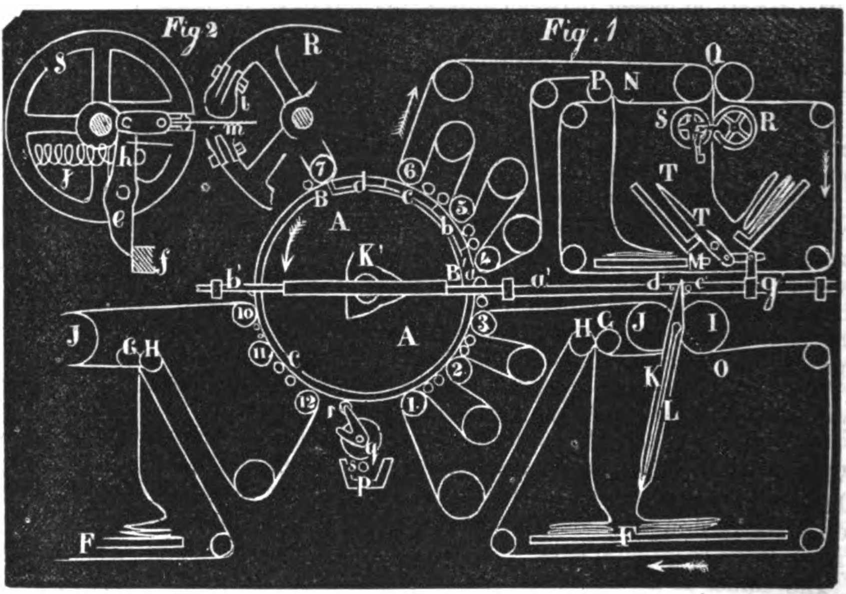
Around this large cylinder are fixed twelve impression cylinders, Nos. 1, 2, 3, 4, 5, 6, &c., and between them are elastic inking rollers.

Under the printing cylinder is the ink-fountain *p*, the rollers *q* and *r*, to distribnte ink on the distributing table, and the shaft *s* by means of which the machine is made to revolve.

The impression cylinders are made to follow the motion of the printing cylinder by their friction against it at their ends.

The cylinders R and S constitute a cutting apparatus. All the other cylinders or rollers are parts of an arrangement making the machine self-feeding.

A continuous sheet of paper being wetted, and disposed in piles by folding the paper alternately left and right, is carried to the machine, and placed upon the table F. The end of the paper is then engaged between the rollers G and H, and the machine being put in motion, it is carried between endless tapes around the impression cylinders 1, 2, 3; it is printed by them, and comes out of the rollers I and J, and there it passes between the two parallel boards K and L, fixed on the axis O, and whose motion backward and forward folds again the paper in a pile as it was at first. These boards or plates are fastened together on their vertical sides.



This pile is then carried and placed on the upper table in M, and there engaged between the rollers N and P, after having been turned so as to print the other side of the paper under the impression cylinders 4, 5, and 6.

The paper comes out in Q, and then passes between the two rollers R and S, by which it is cut in sheets, that are piled left and right by the fly T T.

To operate thus in the printing of a newspaper, for example, all the forms of type are fixed together on the printing cylinder, *a* and *b* being for the one side, and *c* and *d* for the other side of the newspaper sheet. Thus on the same surface of the continuous sheet of paper are printed alternately one inside and one outside page of the newspaper; and when the continuous sheet has been reversed and carried to the upper table, then this order is changed, and one outside and one inside page are alternately printed on the reverse surface of the continuous sheet.

The operations described are repeated in a similar way on the other half of the machine (which being the same as the other, is only partially shown in Fig. 1).

As represented in the drawings, the types occupy one-third of the surface of the printing cylinder, and their impression cylinders must be fed by the same continuous sheet of paper, consequently the plan requires four continuous sheets of paper to be used together, and it will be shown that each sheet will be printed all over, and that no part of it will receive more than one impression.

If, for example, we consider one impression cylinder, say No. 1, the paper will pass between it and the printing cylinder, with just the velocity of a point in the circumference of either of them. After a revolution of the printing cylinder, a portion of the continuous sheet, equal in length to its circumference, will have passed forward, and as the types occupy one-third of that circumference, one-third of that portion of the continuous sheet of paper will be printed and two-thirds will be white; these two-thirds will be printed by the two other impression cylinders, No. 2 and No. 3, and the continuous sheet will run out of them printed all over.

The length of paper between two of the impression cylinders is equal to the length of the type, plus the distance between these two cylinders. By this arrangement the impressions made by the three impression cylinders are disposed in succession on the papers without covering each other.

If it was judged proper to print only one side of the newspaper at a time, the type should occupy only one-sixth of the circumference, and six impression cylinders would be fed by the same continuous sheet of paper. By such an arrangement, the press would be much reduced in length.

The rollers R and S (represented in Fig. 2 in a larger scale), which form the cutting apparatus, are constructed so that their circumference will be exactly equal to the length of a newspaper sheet, and their velocity at the circumference is just equal to that of the paper, so that when a length of paper equal to one printed sheet has come out, the knife has come again in the position indicated in Fig. 2, and cuts the paper by the action of the cam *e*. This cam is acted upon by the pin *f* fixed to the frame; it forces the levers *h* to push forward the knife through the paper.

The knife is indented in the form of a saw, with exceedingly acute teeth. When the cam escapes, the knife is instantly brought back by the spring *j*. During the action of the knife, the paper is kept at a proper tension to resist its pushing action, and forces it to enter by the elastic cushions *l* and *m*.

The folder K L, the function of which has already been described, is composed of two flat boards or plates, fastened together on each side at such a distance from each other that a sheet of paper may slide freely between them. They are suspended on the axis O, around which they have a pendulum motion. This motion is communicated to them by the printing cylinder shaft, on which is fixed, outside of the frame of the machine, a three-foil eccentric K′, which for each revolution of the printing cylinder will push the flat bar *a′ b′* three times one way and three times the other: on this bar are the pins *c′ d′* by which the required alternate vibrating motion is given to the folder.

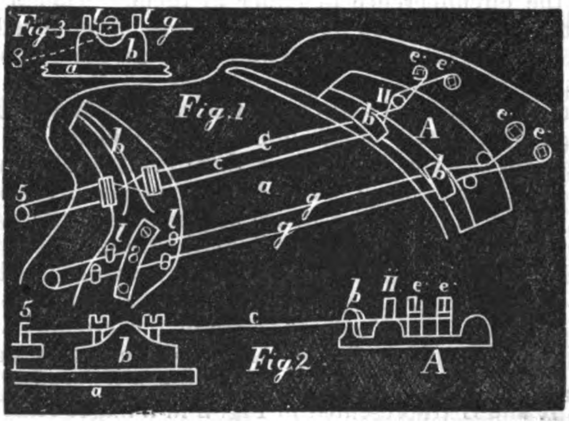
On the same bar is the stand *g′* which gives the fly T T the same number of motions, three forward and three backward, which are necessary in the present case to collect the six newspapers printed on each side of the machine each time the cylinder A A makes a revolution.

"I claim, 1st. The combination of two or more impression cylinders with a type cylinder, so arranged as to print all over on one side a continuous sheet of paper, in the manner described.

"2d. The combination of the eccentric *k'*, rod *a' b'*, and the folder K L, so arranged as to lay the continuous sheet in piles, after being printed on one side, as described.

"3d. The combination of the indented knife with the roller R and S, so arranged as to cut the sheet into proper length, as printed."

No. 9988. Wm. Compton, New York, N. Y.—*Improvement in Pianofortes.* Patented September 6th, 1853.



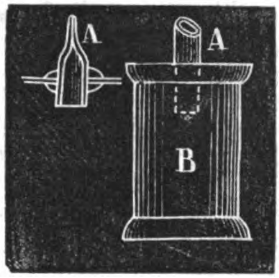
a, sounding-board.
A, rest plank.
c c, *g g*, strings.
6, T.
i i, pin.
g g, turning pins.
Fig. 1 is a top view of the apparatus.
Fig. 2 is a side view of the strings *c c*, etc.
Fig. 3 is a side view of the strings *g*.

The nature of this invention consists in the up-bearing bridge or rest used with the T, either at the rest-plank or bridge, combined with the crossing or drawing the strings together, thereby—as the inventor says—the string is held more securely into the angle of the T, making the sound clearer; and the up-bearing parts being connected to the down-bearing parts (the T's), relieves the sounding-board, or rest-plank, of any strain tending to disturb their continuous proper action.

"What I claim, is the means herein described and shown for securing the strings into the angles of the T's, by the combined operation of the up-bearing bridge or rest, to which the T's are connected, and crossing and drawing the strings together at said bridge or rest, for the purpose of relieving the sounding-board or rest-plank of vertical pressure, as specified."

No. 9989. Henry Hunt, of Brooklyn, N. Y.—*Improvement in Sealing Preserve Canisters.* Patented September 6th, 1853.

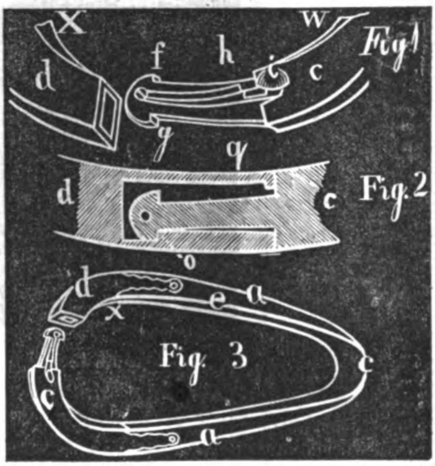
In the figure, A represents a metallic tube attached to a canister B.



After the air has been exhausted, the tube is pressed together air-tight, as shown in section A′.

"I claim excluding air from articles put up in closed canisters, or other vessels, by providing the canister, or other vessel, with a metallic tube, or its equivalent, attached thereto, and after the air has been exhausted through the said tube, pressing it together air-tight, that it may be soldered, or cemented, to render the joint permanently air-tight."

No. 9990. JOSEPH LINDNER, New York, N. Y—*Improvement in Horse-Collars.* Patented September 6th, 1853.



This invention consists in so forming the hame-plate that it shall add security to the collar by its spring, and also in combining with such spring hame-plate a lock with tripple fastenings, all of which are described as follows:

In the place of the common, is employed a flat piece of wrought-iron (see Fig. 3), *e e*, bent into the form of the collar, and springing a little, so that its ends when free would not meet, or would pass by each other when forced directly inwards, and this hame-plate is the *main-stay* or support of the whole collar. The collar part, or the padded and stuffed portion *a a*, is secured to this hame-plate, and the lower parts of the collar are firmly bound to the hame-plate by the lock-pieces *c d* (Figs. 1, 2, and 3). These lock-pieces are strong plates of iron, forming the base of the collar and the lock. They are shown in Fig. 1 as open or detached, and in Fig. 2 as closed. The upper parts of the lock-pieces are formed into sheaths, which receive and bind the lower portions of the collar at *w x* (see Figs. 1 and 3); the lower parts form the lock. The part *d* is that which contains the socket and catches; and the part *c* contains the bolt or tongue to be inserted into the socket. This bolt is provided with two notches on its extremity *f* and *g* (see Fig. 1), which lock with the catches in the socket. These catches in the socket are shown at *q* and *o* (Fig. 2). The notch *f* locks in the catch *q* when the collar is expanded to its limit, without opening, and the notch *g* locks in the catch *o* when the collar and lock are closed. As a source of additional security, the spring catch *h* is used, thus making a tripple fastening for the collar. When the collar is entirely closed, the spring *h* locks into the socket upon the catch, where the letter *s* stands in Fig. 1, and when the stud *i* attached to the spring *h* is pressed inward the spring is liberated, and from the outward spring of the hame-plate the collar opens slightly, but is still detained by notch *g* and catch *o*. In order to disengage this fastening, which depends upon the outward and downward spring of the longer bow of the hame-plate, this spring is counteracted by a reverse pressure, and the collar opens by an outward spring until it is arrested by the locking of notch *f* with the catch *g*. At this point of expansion of the collar the spring of the longer bow of the hame-plate is upward, outward, and backward, and is to be overcome by a reverse pressure, in order to open the collar entirely.

"I claim the union of the hame-plate and collar, in combination with the lock-plates, substantially as set forth.

"I also claim the tripple fastening of the lock-plates, in combination with the outward and backward spring of the hame-plates, substantially as above set forth."

No. 9991. J. Moyle, of Martinsburg, Va.—*Improvement in Straw-Cutters.* Patented September 6th, 1853.

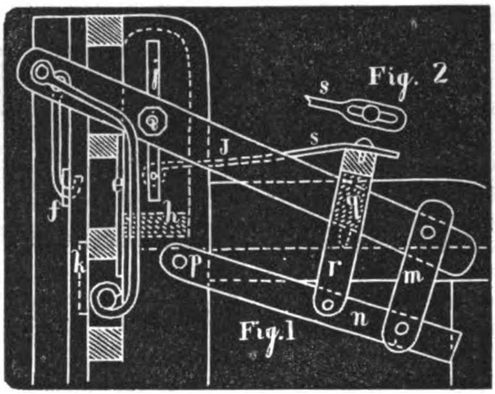


Fig. 1 is a section of the apparatus.

Fig. 2, a top view of spring *s*.

From lever *f* the motion is transmitted to two levers *l*, and consequently to the holder *h*, the bar *i* moving in the slot *j* to accommodate this motion.

e, knife.

k, plate, limiting the protrusion of the straw.

m, rods connecting the levers *l* and *n*.

p, fulcrum of lever *n*.

The connecting rods *m* are drawn forward by the upward motion of *l*, and striking the arms *r* of the rake *q*, pass forward the rake so as to move the straw. The straw passes under the holder *h*, and advances until its end strikes the plate *k*; then by depressing the lever *f* the cut is performed.

"I claim the combination of the rake *q* and holder *h*, constructed and operating substantially as described, for feeding the straw to be cut, and binding it to the box."

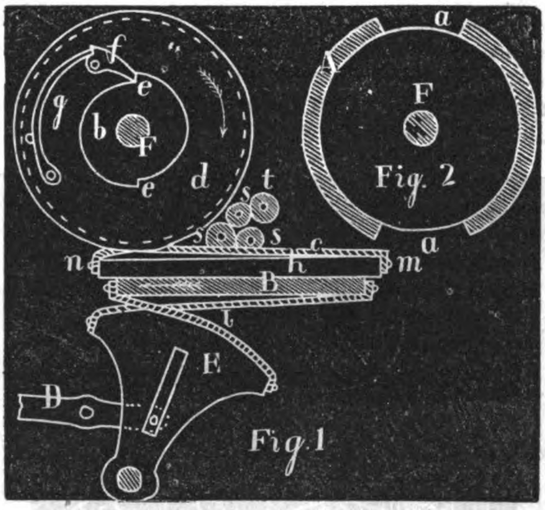
No. 9992. Charles Montague, of Pittsfield, Mass.—*Improvement in Printing Presses.* Patented September 6th, 1853.

B, Fig. 1, horizontal bed, to which a vibratory motion is imparted by the vibrating lever D, disk E, and cord *i*.

t, reciprocating ink-distributing roller.

s, *s*, *s*, ink-rollers.

A, Fig. 2, pressure cylinder, divided into two or more sections respectively, of suitable width to press upon the entire form, and separated by narrow openings *a a*. Cylinder A is firmly connected with axis F, and to the end of cylinder A is attached a wheel (see Fig. 1) J, the periphery of which is provided with notches *e e*, each of them opposite to the respective



openings *a a*. On the side of this wheel J is placed a pulley *d*, which plays freely on axis F, and carries with it a spring *g* and a click *f*. Round pulley *d* passes a cord *c*, the ends of which are attached to the ends *m* and *n* of a projecting bar *h* on bed B.

In the return stroke of the bed and pulley (opposite to the arrows, as shown in Fig. 1), the click *f* is drawn away from the notch *e*, and around J, until it falls into the next notch, so that the cylinder remains stationary during the said return movement of the bed, and a space *a* being at that time at the bottom of the cylinder, and of sufficient width for the purpose, the bed returns without bringing the form in contact with the cylinder.

The forward end of each sheet to be printed—after the first one—is brought down nearly to the bed by the movement of the cylinder in giving the impression to the preceding sheet.

"I claim such a combination and arrangement of the cylinder A and bed B, that whilst one sheet is receiving its impression, the sheet to receive the next impression will be carried forward upon the cylinder nearly to the bed, for the purpose of being in readiness to commence receiving its impression the moment after the bed starts upon its next forward movement."

No. 9993. Charles Montague, Pittsfield, Mass.—*Improvement in Printing Presses.* Patented September 6th, 1853.

w, form.

The ink-rollers *n n n* are supplied with ink from a large roller D, by means of travelling rollers *r r* turning in the ends of the vibratory arms *q q*. These arms *q q* are attached to vibratory rollers *p p*.

t t, cords, the ends of which are attached to the spring *s* in such a manner that one of the two rollers *p* is in rest during the motion of the other one.

a a a a, continuous sheet.

A, pressure cylinder.

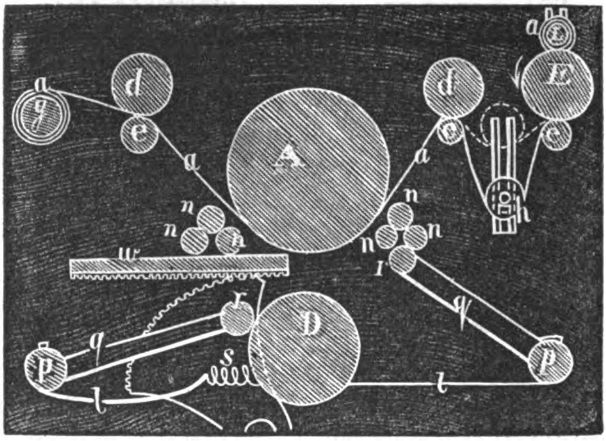
E, winding cylinder.

L, roller, which is movable up and down, according to the different sizes it assumes as the sheet is received thereon.

E moves twice as fast as A and rollers *d d*, which latter (*d* and *d*) have the same velocity.

E revolves by means of a coupling device only in the direction of the arrow, and remains stationary during the opposite movement of the rest of the press.

h, feed roller, which rests upon the sheet or web of paper, turning and moving up and down in slot *i*.



Roller *h* is of a suitable weight to enable the friction of the rollers *d d* and *e e*, and of the pressure cylinder and form, when in motion, with the paper, to raise said roller by straightening the sheet beneath it; but so that it will sink to the bottom of the slot, and draw down the paper with it, as soon as the rollers *d d* and pressure cylinder cease to turn, and the form leaves the paper at the end of each stroke of the bed.

When one side of the sheet has been printed, the roller L is put in the place of the roller *g*, and the other side of the sheet printed.

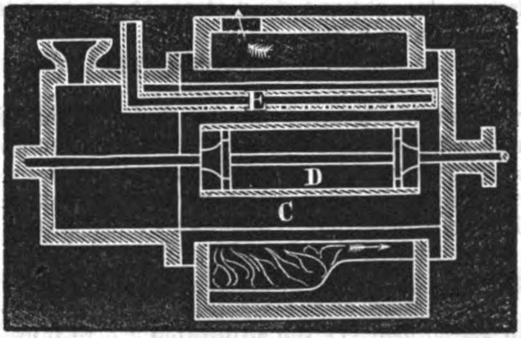
"I claim the combination of the intermittently winding cylinder E and feed roller *h*, or their equivalents, with the reciprocating pressure cylinder A, bed B, and roller *d d* and *e e e*, arranged and operating in such a manner as to successively make an impression on the continuous sheet at each movement of the bed.

"In combination with a double set of inking-rollers, I also claim the arrangement of the arms *q q* for inking both sets of rollers from a fountain placed vertically below the impression cylinder."

No. 9994. STEPHEN MEREDITH, of Erie, Pa.—*Improvement in Feed-Apparatus to Gas-Generators.* Patented September 6th, 1853.

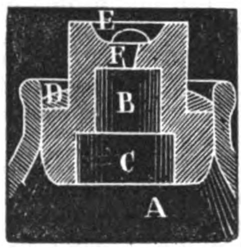
The nature of this invention consists in the construction of a retort by which a heated surface is constantly presented to the tar fluid. This is effected by placing within the retort C a revolving cylinder D, upon which the fluid drops from a perforated pipe E.

"I claim the peculiar construction of the retort as described; viz., having the retort C of the cylindrical shape, or of other suitable shape, and



placing within it a revolving cylinder D, which, as it rotates, constantly presents a heated surface to the fluid, and converts it into gas, preventing the fluid from cooling the retort, and also preventing the formation of any incrustation on the same."

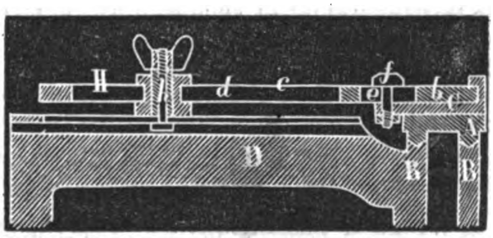
No. 9995. James Spratt, of Cincinnati, Ohio.—*Improvement in Bottle-Fastenings.* Patented September 6th, 1853.



A, bottle.
B, stopple, ground to fit the neck of said bottle.
D, cement.
At the moment of sealing, a few drops of wax, gum, or other suitable substance, are melted into the orifice F until it is filled, and the wax overflows slightly the bottom of the cup E, when said cup is filled with cold water, and the sealing material thereby consolidated. In this method—the inventor says—the small surface of the sealing material exposed to the action of the steam within the bottle precludes the possibility of its being forced outwards, while the conical form of the aperture as effectually prevents the pressing in at the seal by the atmosphere.

"I claim the application of the cup or cavity E, and aperture F, for sealing preserved edible substances."

No. 9996. W. W. Spafford, of Boston, Mass.—*Improvement in Machinery for Planing Metals.* Patented September 6th, 1853.



A, main carriage or bed of a planing-machine, sliding on frame B B, from which extends at right angles the brace D, through the top of which is a long dove-tail slot *a*.

C, metallic plate, fixed to the top of the planing table, on which rests the plate *b*.

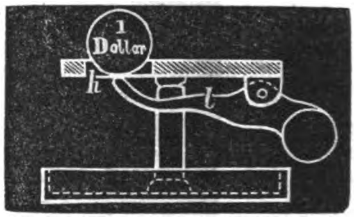
This plate *b* terminates in a radiating arm *c* H, which has a long slot *d*. The shorter slot *e* receives a pin *f*.

The thumb nut *n* serves to clamp the centre pin *h* to any part of the brace.

The screw pin *f* can be fastened in any desirable position in its slot. Thus the distance of the common centre of the two screw pins from the plate *b* of the radial arm may be regulated at pleasure, so as to cause the centre or any other point in such plate, when A is put in movement, to describe a circular arc of any required radius within certain limits. Thus if a piece of metal is affixed on the top surface of the plate *b*, it may be planed in curved lines.

"I claim the combination of the receiving-table or plate *b*, and its arm *c* (composing the radial arm H), the adjustable centre pins, or their equivalents, and the brace D, together with the main plaining-table A, and its supporting frame B; the same being made to operate substantially as specified, and for the purpose of adapting the planing-machine to planing in curved lines."

No. 9997. Gideon B. Smith, of Baltimore, Md. *Improvement in Counterfeit Coin-Detectors.* Patented September 6th, 1853.

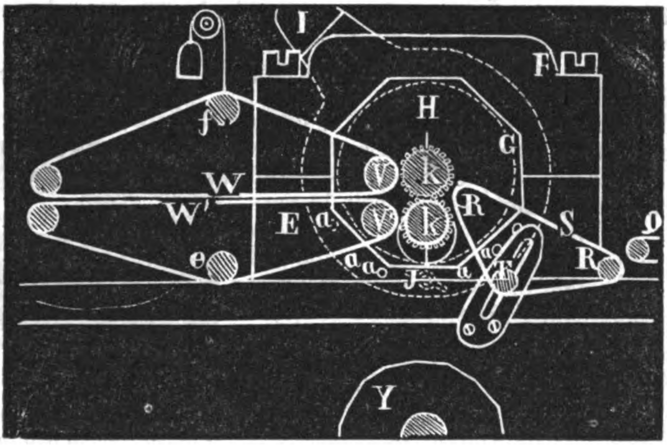


The nature of this invention consists in a gauge, or hole *h* (see figure), just large enough to permit the genuine coin to pass through, arranged in combination with a lever *l* acting below said gauge, balanced so that the weight of such coin will depress it so as to let said coin slip down through said gauge, which is too small to allow any spurious coin to pass, which is larger than the genuine; the lever being so balanced that any coin lighter than the genuine will not be heavy enough to depress it, so that all spurious coin, whether too large or too light, will stop in the gauge, while the genuine will slip through and fall out below. The coin having slipped through, the lever returns to its place. The inventor arranges five different gauges, with five correspondingly balanced levers, in one plate, so as to serve for testing coins of five different sizes. The figure represents one of these gauges and levers.

"I claim a gauge, or hole, just large enough to permit the genuine coin to pass through, arranged in combination with a lever acting below said gauge, balanced so that the weight of such coin will depress it so as to let said coin slip down through said gauge, which is too small to allow any spurious coin to pass, which is larger than the genuine; the lever being so balanced that any coin lighter than the genuine will not be heavy enough to depress it; so that all spurious coins, whether too large or too light, will stop in the gauge, while the genuine will slip through and fall out below."

No. 9998. Henry L. Weeks, of Hannahachee, Ga.—*Improvement in Cotton-Gins.* Patented September 6th, 1853.

The nature of this invention consists in arranging and securing the boxes in which the ginning-rollers operate in a revolving or adjusting frame or box, so as to adjust and fasten said box at such an angle as it may be necessary or desirable, so as to operate upon the cotton to the best advantage, whether it is dry or moist, so as to allow the seed, after the cotton is removed, to drop from the rollers, and thereby adapt the rollers to cotton with large or small seed, whether picked early or late. Also, in the use of one fluted metal roller, in conjunction with one or more rollers covered with prepared hide, leather, gutta-percha, or india-rubber; or instead of one fluted metal roller and one covered as above-mentioned, two rollers with longitudinal sections of metal fluted, alternating with sections of either of the materials above-mentioned, operated so that the sections of fluted metal act in conjunction with the sections of other materials above stated. And further, in the use of the two feeding-aprons, one moving faster than the other, so as to spread the cotton, and allow the sand, etc., to fall out between them through a space left for that purpose. And lastly, in arranging and operating two aprons so as to take the cotton from the ginning-rollers and condense it into thick sheets or parcels, so as to save the labor of one person in attending the machine.



The box E (see figure) contains a round hole, indicated by the dotted circle G. To this hole the box H is fitted so as to turn. The end of this box H (outside the box E) is made octagonal, and provided with a wrench I, so as to turn the boxes to set the ginning-rollers at the desired angle, and then fasten them by a pin J passing through one of the holes *a* of the wrench into a corresponding hole in the box E. The box H can be retained in its position by screwing fast the cap F. The box H is provided with holes to fit the journals of the ginning-rollers K K, and is made in two parts, so as to facilitate the taking out of these rollers. The centre of the box H is cut out so as to make room for the gears on the rollers K K, represented in the figure in dots. These gears make the rollers operate in concert as they draw the cotton from the seed.

T, roller of sufficient weight to keep the apron S always tight when the roller R is carried nearer or farther from roller R′, by alterations in the position of box H. The inventor says that the apron S should move about one-fifth as fast as the surface of the rollers K K, so as to allow the rollers to catch a lock of cotton and gin it, letting the seed fall before another lock is caught. The cotton feeding apron Q should move half as fast as S, so as to spread the cotton fed upon Q, and open the locks of cotton as they pass from Q to S, and allow the sand and dirt to drop down between Q and S. If the cotton is not sufficiently spread and opened by the use of these two aprons, a series of rollers may be introduced between the aprons, the one next to apron Q moving faster than the apron, and the one next to it faster than the first, and so on through the entire series.

The aprons W W′ surrounding the rollers V V′ (the pivots of which are also fitted in box A) serve to carry off the ginned cotton as it comes from the rollers K K.

f and *e* are tightening-rollers. These aprons should move one-fifth as fast as the surfaces of the rollers K K.

The seed falls on the wove wire cylinder Y. The figure represents a section of the apparatus, both sides of it being alike.

"I claim, 1st. Arranging and securing the boxes in which the ginning-rollers operate, in a revolving or adjustable frame or box, or its equivalent, so that the rollers can be adjusted or set at such an angle as may be requisite or desirable, as the condition of the cotton or other circumstances may require, so as to discharge the seed, or facilitate the falling from the rollers, after the cotton is drawn off by the roller.

"2d. Giving to the feeding-aprons, or equivalent feeding devices, different velocities, for the purpose of spreading, distributing, or drawing apart the balls of cotton, so that sand and dirt may fall out, and not be carried to the ginning-rollers.

"3d. Passing the cotton, after it is ginned, between double aprons or equivalent devices, when said apron or devices move with less velocity than the ginning-rollers, for the purpose of compressing and making more compact the cotton after it is ginned."

No. 9999. THOMAS WARNER, of Chicopee, Mass.—*Improved Process for Making Twisted Gun-Barrels.* Patented September 6th, 1853.

The object of this invention is to produce a barrel which for a given weight of metal shall present great strength to resist the explosive force of gunpowder, and which shall avoid the liability of imperfect seams along the entire length.

And to this end, the first part of the invention which relates to a new manufacture consists of twisted barrels for fire-arms, with the fibres of the metal twisted from the inside to the outer circumference by a gradually increased twist, the helices formed by all the fibres having the same pitch, and each successive fibre towards the outer circumference forming a greater angle with the axis, so that the successive layers of fibres cross each other, and thus tend to give tenacity to the mass.

And the second part of the invention which relates to the process of making twisted barrels, in accordance with the first part of the invention, consists in twisting a bar of metal of the required size while in a heated state, and then boring out the calibre.

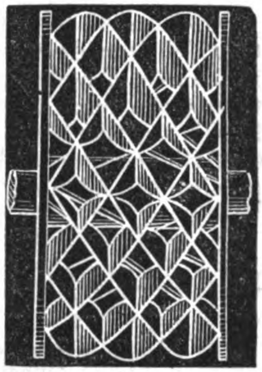
The mode of procedure, which the inventor, as he says, has tried with success, is to take a bar of iron of suitable quality and size, and after it has been sufficiently and equally heated, twisting it in the manner of twisting a strand of rope, until the required twist has been given. He then upsets it endwise, to compact the mass.

After being thus treated, it is bored out to the required calibre, and the outside properly shaped, and finished in any suitable manner.

In the making of large barrels, the bar may be heated and twisted in successive portions of the length, or in sections, and the sections afterwards welded together.

"I claim a new manufacture of gun-barrels, made out of a solid bar, with the fibres of the metal having a gradually increased twist from the inside to the outside, substantially as specified. And in the process, I claim making the twisted barrels by twisting a bar of metal of the required size, when in a heated state, and then boring out the calibre."

No. 10,000. BENJAMIN IRVING, of Green Point, N. Y.—*Improved Paddle-Wheel.* Patented September 6th, 1853.



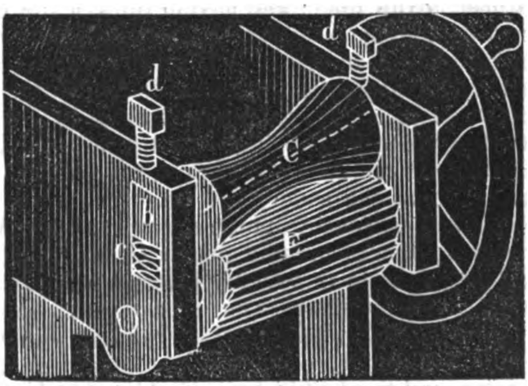
The object of this arrangement of the floats in such a manner as to form a continuous series of rhomb-shaped buckets all round the wheel, is to prevent violent concussions when they strike the water, and to hold the water upon which they act in an unbroken body, and thereby to render their action more effective than that of the floats as commonly arranged.

The floats are arranged with their outer edes in lines running spirally round the wheel in opposite directions at angles of about 75° to the axis, the crossing of said lines forming rhomb-shaped buckets, which have no openings except towards and from the centre of the wheel. The inner openings of the buckets are contracted endwise, for the purpose of giving the front angles such a form as to prevent backlift in rising from the water, which makes the said inner openings depart from the rhombic form, inasmuch as the side angles are cut off, and the figure is made six-sided. Close inside the rings a number of half-buckets of triangular form are formed.

The two front sides of the rhomb give, as the inventor says, a propulsive effect, while the two back sides prevent the breaking up of the water, and consequent loss of effect.

"I claim arranging and combining the floats so as to form a series of buckets of rhombic or substantially similar form."

No. 10,001. T. ALLISON, of Milton, N. Y.—*Improvement in Straw-Cutters.* Patented September 6th, 1853.

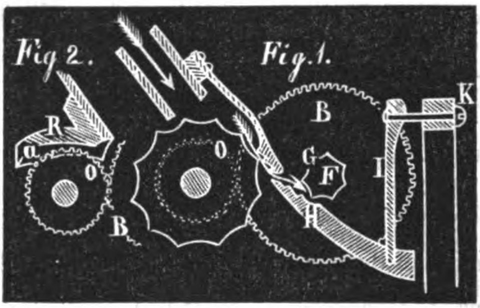


The nature of this invention consists in the employment of an adjustable and tapering roller C (see figure), which has its axis set at an angle to the axis of the feed-trough, in combination with a cylinder E of straight knives which are set longitudinally round its periphery, the said roller being intended by its position and shape, to facilitate greatly the feed of the straw, &c., in such a manner as to cause the knives to operate upon the straw as effectually as if they were made spiral, and set obliquely round the cylinder. Thus, the inventor says, the expense and trouble attending the use of spiral knives can be overcome, as well as the difficulty of sharpening them.

The movable boxes *b*, in which the journals of the roller C are set, rest on springs *c*, and can be adjusted by set-screws *d*.

"I claim the construction and arrangement of the adjustable feed-roller C, which is made gradually tapering from its ends to its centre or middle, in the line of a curve, and arranged at an angle to the axis of the feed trough, and made to operate in combination with the cylinder or straight knives, and thereby facilitate the operation of the machine, as herein fully set forth and described; this arrangement rendering the machine less expensive, and more easy to be managed and kept in order."

No. 10,002. L. H. Davis, of Kennett Square, Pa.—*Improvement in Corn-Shellers.* Patented September 6th, 1853.



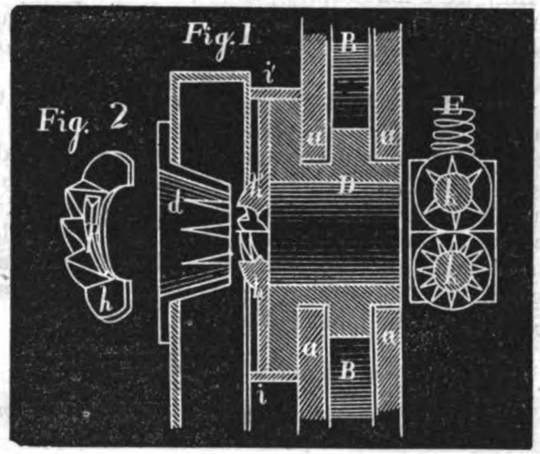
The object of this invention is to construct a corn-sheller in which the ear shall be entirely stripped of its grain, and the cob issue clean from the machine, instead of falling from it with numerous kernels adhering to its extremities, as is usually the case; and also to protect the cogged-gearing so that it shall not be deranged by grains of corn working in between the teeth. The invention consists in placing below the usual shelling apparatus another shelling-wheel G, upon the shaft F of the picker-wheel B, having in front a toothed arm H attached by a spring I to the frame of the machine, so that when the cob is issuing from the upper shelling arrangement its extremity is caught in the lower sheller, which removes the kernels remaining upon it, and at the same time prevents the ear from falling suddenly and imperfectly stripped from the upper sheller. Also, in adding to the covering of the cog-wheel B and pinion O, operating the machine, flanges *a* on each side, so as to thoroughly prevent the admission of grain to the gearing.

Fig. 2 shows the pinion O, which is dotted in Fig. 1, and cover R and flanges *a*.

"I claim the introduction of the wheels G and arms H attached to the springs I, and regulated by the screws K, as described, for the purpose of stripping the ear of the kernels, in the manner specified.

"I also claim the flanges *a* upon the gear-covering R, for protecting the gearing from the admission of shelled corn, as herein fully set forth."

No. 10,003. PORTER DICKINSON, of Amherst, Mass.—*Improvement in Corn-Shellers.* Patented September 6th, 1853.



This improvement consists in the addition of a pair of toothed-rollers, which seize the cob after the corn is shelled from it, and drag it entirely through the machine (see figure).

B, gearing; D, hollow tube, revolving in bearings *a*; *d*, two semi-guides, forming together a conical opening, through which the cob is passed to the revolving shellers, and pressed together by springs, thereby adapting the opening to the size of the ear; *h h'* toothed-shellers, pressed towards each other by springs *i' i*, and thereby adapting their distance from each other to the size of the corn. K K', toothed-rollers, the lower one revolving, and the upper one pressed down by springs E. These rollers *k k'* seize the cob after the grain has been torn from it by the action of the shellers *h h'*, each of which is furnished with a portion of a thread of a screw *p* which aids in drawing in the cob.

Fig. 2 shows the piece *h* detached.

"I claim the combination of the revolving spring shellers *h h'* with the toothed-rollers *k k'*, operating in manner substantially as described."

No. 10,004. STEPHEN MORSE, of Springfield, Mass.—*Improvement in iron Car-Brakes.* Patented September 6th, 1853.

This improvement consists in constructing a brake of cast metal, so that the friction surface A (see figure) of the same will be worn off before impairing other portions, caused by the great heat generated when in operation. Also, in constructing it in one solid mass, thereby dispensing with bolts and pins, or other contrivances, for holding the parts together. Also in placing the point of suspension C in such position that the brake when relieved of its pressure will disengage with the wheel by its own gravity, doing away thereby with springs, etc.

"I claim the spine B having the point of suspension C, and socket D, with the open spaces *c c*, and brace-plates *b b*, in combination with the rubber or friction surface-plate A."

No. 10,005. HIRAM SANDS, of Cambridge, Mass.—*Improvement in Brick-Machines.* Patented September 6th, 1853.

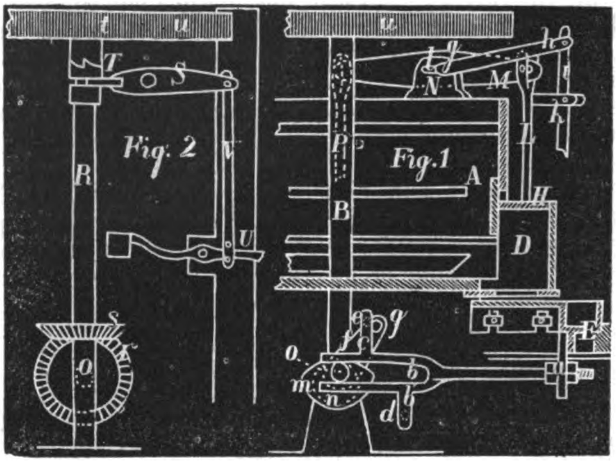


Fig. 1 is a section of the apparatus.

A, purg-mill.

E, mould-carriage.

D, mould-charger.

Within the mould-charger is a piston H, which is raised up and down in order to force the clay out of the bottom orifices of the charger and into the brick-mould. This piston is attached to a rod L which is jointed to the front end of lever M. This lever passes through a slotted bearing N, and has a movable fulcrum *g*, which is attached to a connecting-fork *h*, worked by a lever *i*, that turns on a fulcrum *k*. The fulcrum *g* slides in a slot *l* made through the bearing N, and a corresponding one made through the lever. By such means, the situation of the fulcrum of the lever can be changed so as to regulate the extent of the depression of the piston, for the purpose of causing it to act with more or less pressure on the clay in the mould.

Fig. 2 represents a front view of the apparatus.

Lever M is worked by cams *m* and *n*, which are in contact with connecting-rod P, this being jointed to the one end of said lever. Cams *m* and *n* are fixed on a horizontal shaft *o*, which connects with a vertical shaft R by means of bevel-wheels *r s*. The spur-gear *t*, on the upper part of this shaft, runs loosely on the shaft and works into a gear *a* fixed on the shaft B of the purg-mill. To the gear *t*, and the shaft R, and a lever S, a suitable clutch T is adapted, so as to enable to clutch the gear to the shaft by pulling downwards the front arm of lever S, which is effected by means of a connecting-rod V and hand-lever U.

To move the mould-carriage back and forth, so as to carry a mould laid on its surface underneath and out from the charger, and to suffer it to remain at rest long enough not only to permit the clay to be forced into the mould, but subsequently long enough to permit the mould to be removed from the carriage, emptied, and replaced thereon; and, moreover, to stop it when in its proper position, when entirely under the mould, or entirely out from underneath it; all this is to be effected by the following parts:

a, pitman fixed to the carriage; *b*, fork, that straddles, rests, and moves on shaft *o*; *b′ c′*, two arms, extending from said fork, and provided with studs *e d*. The stud *g* on crank *f*, which is fixed on shaft *o*, serves to set the carriage in an alternating motion by striking alternately the studs *e* and *d*, and leaving the carriage in rest in the intermediate time.

"We claim the modification of such arrangement by substituting for the shaft with reversing gear the shaft with continuous motion, operating the carriage, and producing the intervals of rest, by means of the crank-pin, acting alternately upon studs *d'* and *e'* connected with the mould-carriage, whereby we obtain greater certainty and precision of action in the machine, with greater simplicity and durability.

"Also, in combination with the piston and the lever M, we claim the slot in the lever, the slotted bearings and the movable fulcrum-pin, the connecting-fork, and hand-lever, the same being for the purpose of increasing or diminishing the amount of pressure of the piston on the clay in the mould."

No. 10,006. Samuel H. Turner, of Brooklyn, N. Y.—*Improvement in Printer's Ink.* Patented September 6th, 1853.

The improvement consists in the employment of colophonic tar, in connection with other ingredients, in the manufacture of printing-ink, and also in the employment of this material (colophonic tar) as a printing-ink varnish.

What the inventor denominates colophonic tar is the tarry residuum remaining in stills (or what is called the cucurbit) after the various stages of distillation commonly employed in obtaining colophonic oil. In the manufacture of colophonic oil, it is usual to subject colophony to three successive distillations, in which it is thoroughly decomposed, and its elements to a very great degree separated. After the completion of each separate distillation, a tarry residuum always remains in the still, which, after being partially cooled, is drawn out. The second residuum the inventor has found to be best adapted for making printing-ink.

The long and intense heat to which it is subjected (being in a close vessel some six hours, more or less, with a heat varying from five to seven hundred degrees) completely prepares it for the purpose, and dispels from it the injurious properties, which are separated and passed off with the oily vapors.

Colophonic tar, as the inventor prepares it, is, as he says, unlike all the oily preparations for printing-ink, in that it may be used without the admixture of rosin, and is of itself an excellent printing-ink varnish.

Printing-ink may be prepared with the following ingredients, in the following proportions, viz:

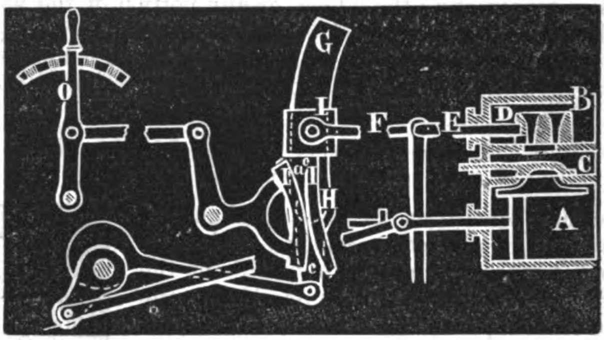
Colophonic tar, 14 pounds; fine lamp-black, 3 pounds; fine pulverized indigo-blue, 8 ounces; fine pulverized Indian-red, 4 ounces; yellow-rosin soap, 1 pound.

The inventor cuts the soap in thin slices, and dissolves it in the colophonic tar by the aid of heat. He then allows the mixture to cool down to a temperature of about one hundred degrees; the pigments are then carefully stirred in so as to produce a perfect incorporation of all the ingredients; this mixture is next ground in Bogardus' patent Eccentric Mill, or otherwise, after which the ink may be put up for use.

The inventor also uses this material (the colophonic tar) as a varnish to modify the condition of printing-ink to suit the temperature of the weather, and the kind of work to be executed.

"I claim the employment of colophonic tar, produced and combined substantially as herein stated, both in the manufacture of printing-ink and also as a varnish used by printers to modify the condition of their ink to suit the temperature of the weather, and the kind of work to be executed, all as herein specified."

No. 10,007. J. MATHIAS W. BALDWIN, of Philadelphia, Pa.—*Improvement in Cut-off Valves for Steam-Engines.* Patented September 13th, 1853.



The object of this improvement is to obviate the rubbing of the sliding-block upon the arm while the arm is vibrating, and the rapid wearing-out of that part of the arm on which the block is most used.

A, steam-cylinder; B, valve-chest; C, exhaust-valve; D, independent cut-off valve.

Stem E connects by a rod F with a vibrating arm G on a rock-shaft H. F is jointed to a block I that slides up and down upon the arm. Block I has a stem I′ which is connected by straps *a a* and *c c* to a quadrant J. O, hand-lever. The circumference of the quadrant is in such a position that if the centre line of shaft H were prolonged, it would intersect it, so that in whatever position the sector may be placed, it will act with the same radius to move block I.

"I claim the arrangement of the sliding pivot-block I, fitted with a stem I′, connected with the sector J by straps, chains, or cogs, the hand Q and the intermediate connecting mechanism, as herein described."

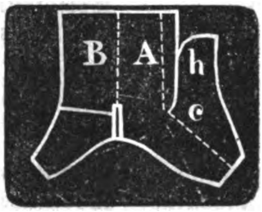
No. 10,008. JOHN CHILCOTT and ROBERT SNELL, of Brooklyn, N. Y.—*India-Rubber Soles for Boots and Shoes.* Patented September, 13th, 1853.

This improvement is intended to produce india-rubber soles which are capable to be united with uppers made of leather, or other usual material.

The nature of this invention consists in making the sole of three parts, viz., the india-rubber sole, a leather lining, and a leather border. The india-rubber sole is made smaller than the sole, or portion of the sole of the boot or shoe which it is intended to cover, and it has its edges beveled off thin all round. The leather lining is of the full size of the sole or piece required, and is united to the upper side of the india-rubber sole, all over, by water-proof adhesive material, leaving a margin extending all round beyond the edges of the india-rubber sole. The leather border consists of a strip of leather of about the same thickness as the india-rubber sole, and is of such width as to extend from the edges of the leather lining and overlap the beveled part of the india-rubber. That part which overlaps the india-rubber is beveled, so that its outer face will be level with the outer face of the india-rubber. This border extends all round the sole or piece, and is united by the same material as the leather lining and india-rubber with the margin of the leather lining, and with the beveled part of the india-rubber. The three parts thus make a solid sole, of uniform thickness, with an india-rubber centre and leather edges, which may be secured to a boot or shoe by sewing, cementing, or pegging, in the same way as a common leather sole; the edges being hard and stiff, protecting the india-rubber, and presenting the same appearance as the edges of an ordinary sole.

"We claim constructing the whole, or any portion of the sole, of a boot or shoe, substantially as described, of india-rubber, with its inside or edges covered and protected by leather, which is united with it by any water-proof cement, with or without stitching, and forms a hard, firm leather edge."

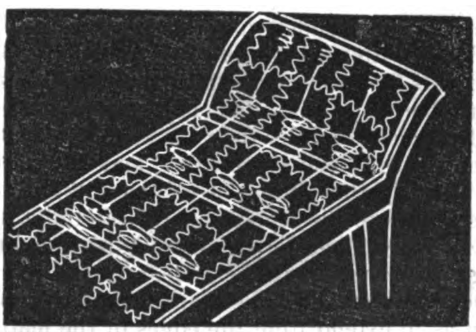
No. 10,009. John Chilcott and Robert Snell, of Brooklyn, N. Y.—*Improvement in Boots.* Patented September 13th, 1853.



This invention consists in the method of cutting out a piece of leather, or other material, so that it may be folded without crimping and without the addition of gussets, or other pieces, to take the required form for what is termed the "upper-leather" of a boot, to fit any foot, heel, and leg, not positively deformed, with the greatest accuracy.

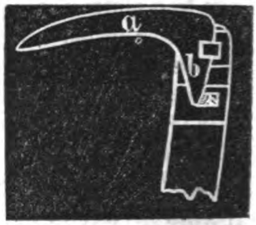
"We claim the form of the piece of leather, or other material, substantially as shown in figure, and herein described, by which we are enabled to make what is termed the "upper-leather" of a boot, to fit any leg, foot, and heel, not absolutely deformed, of one piece, without crimping or joining other pieces thereto; the distinguishing characteristics of this form being that one half or side of the boot is formed by a part A, without joint, and the other half or side by the junction of a part B, folded from the back of the side A, and a part C *h* which is partly cut from, or which, when flat, lays close or near to the front of A, above the instep, and partly folded over from the instep, the part C *h* being of such form as to form one side of the foot and extend round the heel to the other side A, and cover an opening made in the lower part of the back, to give the required form to the heel, and to also make part or all of the necessary stiffening."

No. 10,010. Pierre Demeure and Auguste Mauritz, of New York. N. Y.—*Bed-Bottoms.* Patented September 13th, 1853.



"We claim the manner of constructing the spring-mattress by combining the vertical-springs with an elastic or spring net-work of spiral metallic-springs, for supporting said vertical-springs, or for increasing the elasticity, so that a person lying upon the bed will be equally supported on all sides, as described."

No. 10,011. J. Wm. P. Greenleaf, of Washington, N. H.—*Improvement in Scythes.* Patented September 13th, 1853.

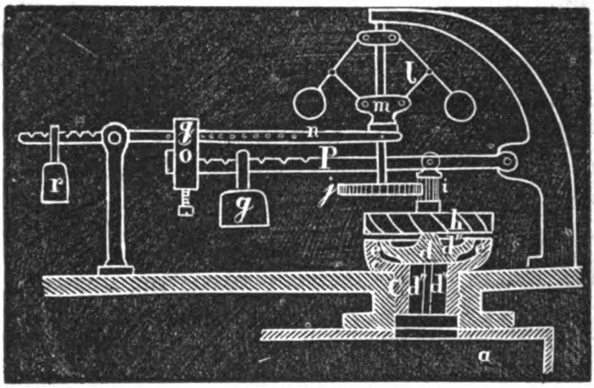


The cutting edge *b* of the scythe-blade *a* is curved and extended to near the end of the shank.

The inventor fastens the scythe in a way different from the one most commonly in use, in order to leave the shank entirely free along its inner-edge.

"I claim widening and curving the blade of the scythe at the shank, in the manner described, for the purpose of strengthening the same, and adapting it to cutting bushes as well as grass."

No. 10,012. Zadok H. Mann, of Cincinnati, Ohio.—*Safety-Valves.* Patented September 13th, 1853.



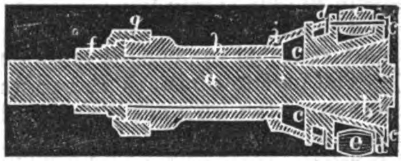
This invention has for its object an increase of sensibility of the safety-valve, so as to insure its opening at the desired maximum of pressure, and also so as to increase the size of opening in proportion to the force of steam, and thus insure an adequate vent for the steam under all circumstances.

a, boiler; the steam rushes at the slightest movement of the valve through the annular channel *e e*, formed by the cup-like rim *c'* and *d'* of the valve *d'' d* and its seat C.

The steam striking the oblique vanes of flutter-wheel *h* rotates said wheel, the spindle of which is connected with lever *p* in such a way as to communicate the pressure of weight *g* to the valve. Pinion *i* and spur-wheel *j* transfer the rotary motion to governor *l*, whose sleeve *m* is connected to lever *n*. Lever *n* is connected with main-lever *p* by a link *o*. Link *o* can be fastened to any one of the holes in lever *n* by the pin *q*, in order to regulate how much the play of the balls shall lift the valve. *r* balances the governor.

"I claim the construction and application to a safety-valve of flutter-wheel, governor, and supplementary lever, as described, or equivalent devices, in order to insure promptness of action and an increase of vent, according to the force of steam; and this I claim either with or without the adjustable-link and counter-weight, as described."

No. 10,013. GEORGE POTTS, of Cincinnati, Ohio.—*Lining Cast-Iron Cylinders with Copper.* Patented September 13th, 1853.



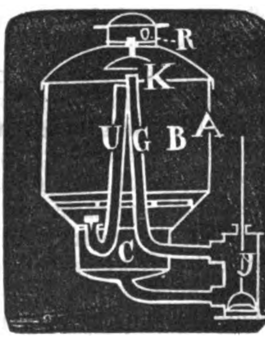
The object of this invention is to produce an interior lining or casing of cylinders in such a manner as to give to the interior of the barrel a smooth, dense, and truly cylindrical surface, to supersede the necessity of boring and grinding it.

a, mandril, terminating in a conical head *t*, which is provided with two or more grooves *c c* having the same obliquity with the axis of motion that the sides of the cone have. These grooves hold the stocks *d* of cast rollers *e*. The outer circle described by these rollers can be altered by moving them from and back on the conical head, which adjustment is effected by means of a nut *f*, this nut being connected with the stocks by means of a sleeve *g h i*.

The operation is as follows: a cylindrical sheet of copper having been placed within the iron barrel, the tool is advanced by a suitable mechanism until the rollers are just entered within the limits of the casing, the nut is screwed down so as to force the rollers apart as much as is requisite to initiate the lining process, and the tool is then rotated, and gradually advanced along the interior of the cylinder, until reaching the other end. If the lining is not sufficiently pressed against the concavity of the cylinder, the rollers are again slightly expanded, and the tool is drawn in the same manner back again, and so the process is continued until the work is complete.

"I claim the revolving mandrel, furnished with one or more rollers, whose distance from the axis of the mandrel can be increased or diminished by means of a nut, sleeve, and conical head, as described, or any equivalent device for the purpose, as herein explained, of lining with one metal the interior of a cylinder formed of another metal."

No. 10,014. ANDREW ROBESON, of New York, N. Y.—*Mode of Bowking and Bucking Cloth.* Patented September 13th, 1853.



In the use of this apparatus, the goods to be bowked or bucked are laid within the chamber B of the kier A, and around the pipes G and U, the said chamber B being packed with the goods nearly up to the level of the top of the pipe U. The scouring or bowking liquor is placed in the chamber C, and such chamber is to be heated or not, as occasion may require, by heat applied to its external surface.

By means of the force-pump the hot liquor from the chamber C will be drawn into the pump-cylinder *y*, forced up through the pipe G against the deflector K, by which it will be distributed upon the top surface of the cloth. Now if steam is let into the chamber B through the pipe R, it will pass closely upon the cloth and bowking liquor thrown upon it, and will aid in causing a rapid filtration of the bowking liquor through the goods or cloth, and into the chamber C. The bowking liquor thus not only descends by the power of gravity, as it does in the common process of using a kier, but it is forced downwards and through the cloth by the superincumbent pressure of the steam. If the pressure of the steam at any time exceeds the maximum pressure required for the operation of the kier, the safety-valve V will be forced open, and allow the steam to escape into the chamber C, where it will be condensed in the bowking liquor.

"I claim as my invention or improvement the employment of a *closed* kier or vessel, above described, and extracting the bowking liquor from the lower part of it and forcing it into the upper part of it *while* steam is being injected only into the upper part of the said vessel, and on the top of the goods, whereby while the bowking liquor is being thrown on the top of the goods, the steam is constantly and simultaneously made to press upon and pass into and through the goods, and facilitate the action of the bowking liquor, and its passing through the cloth, as stated."

No. 10,015. HENRY S. ROSS, of Cincinnati, Ohio.—*Improvement in Flood-Fences.* Patented September 13th, 1853.

The object of this invention is to construct a fence adapted to situations exposed to heavy floods, and easily removable from one place to another.

Fig. 1. Perspective view of an entire range of pannels, included between two consecutive posts.

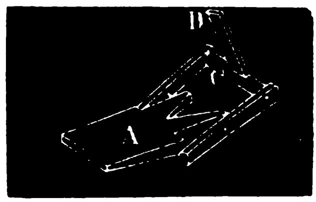
Fig. 2 shows the method of hanging the pannel to the first post.

Fig. 3. The device for hooking together the consecutive pannels, in all cases except the two middle ones.

Fig. 4. The mode of connection and provision for unshipping of the two middle pannels.

"I claim the zigzag and interlocked arrangement of pannels, supported by a swivel-joint to posts at suitable intervals, and having the joint between the two middle pannels furnished with inclined hook and eye, each of said middle pannels being provided with boards sloping in opposite directions, so that by the action of a flood each half of the intervening line of pannels may separate midway, and swing in direction of the current, or devices substantially equivalent."

No. 10,016. S. B. SUMMERS, of Grantville, Mass.—*Boot-Jack.* Patented September 13th, 1853.



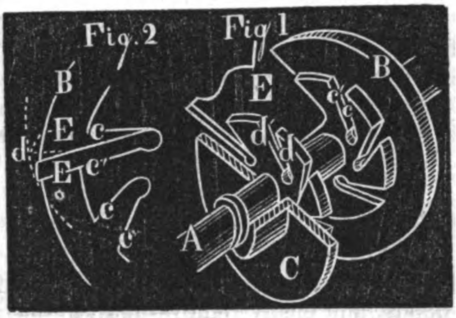
The foot being placed upon A, the heel of the other foot is placed between the jaws of A, and the bar D being grasped by the hand, the shaft C is pressed down upon the toe of the boot.

"I claim the application to an instrument for taking off boots of the side bars B, the shaft C, and the bar D, arranged and operating substantially as described."

No. 10,017. JOSIAH M. SMITH, of New York, N. Y.—*Cutter-heads of Moulding-Machines.* Patented September 13th, 1853.

The nature of this improvement consists in the ability to put and afterwards keep in order the cutting-edges of the series of chisels.

Instead of sharpening each chisel by itself, and detached from the spindle, the inventor, after bringing each chisel near to the required shape of edge to form the outline of the intended moulding, arranges it in its proper place in the head and the whole, and then grinds it to an exact equality by the revolution of the spindle in the reverse direction from that in which it is to revolve when cutting. During this grinding process the chisels rest in their slots against the sides *c′ d′* of said slots. But during the cutting process (the motion being in the opposite direction) the chisels rest against the sides *c d* of the slots, and consequently present cutting-edges *d*, as shown in figure 2 in dotted lines.



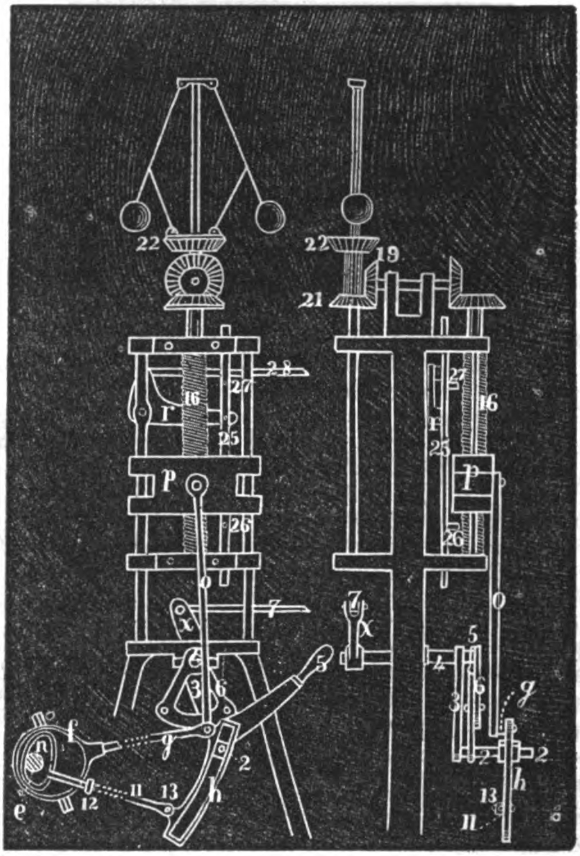
In Fig. 1 the upper half of disk C is cut off. A, spindle; B, disk, firmly connected to spindle A; E, chisel in its position during grinding; E′, chisel in its position during cutting.

"I claim the combination of the slotted supporting-flanges, or their equivalents, with the chisels, hinged and operated in the manner and for the purposes substantially as set forth herein."

No. 10,018. Richard H. Townsend, of New York, N. Y.—*Valves for Steam-Engines.* Patented September 13th, 1853.

The nature of this invention consists in the combination of the eccentric *f* and cam *n*, the eccentric working as usual when operating on the valve to give the engine steam nearly the entire stroke; the cam so shaped that when it is brought into operation the valve is moved in such a way as to cut-off at the smallest part of the stroke at which the engine is required to work. These motions are combined by means of a sector *h* operated on by the governor, that when the governor balls fall in consequence of the increased power required from the engine diminishing the speed, the eccentric is brought into operation on the valve, and when the engine is doing little work, the operation of the governor, by sliding the sector, brings the cam into operation to cut-off, and allow the engine but little steam; the regulation of the position of the sector by the governor thus, at any intermediate point, or at the extremes, supplying steam, and causing the valve to cut-off in proportion to the work to be performed. And by a peculiar apparatus, in case the valve does not supply the required steam to keep up the momentum, the throttle-valve is opened farther, or the reverse operation is performed if the work be thrown off the engine, so as to need little steam.

e, shaft of the main-crank; *g*, eccentric-rod; *h*, slotted sector, curved from the centre of the eccentric. In this slotted sector slides a block, through which is the crank-pin 2 of the rock-shaft 4. *o*, sling, suspending the end of rod *g* and the sector, so as to let them vibrate; 3, link, setting loose on the rock-shaft; 5, lever, attached firmly to the rock-shaft by means of arm 6, connects or disconnects the valves and eccentrics by a notch in the lever, as usual; *x*, crank on rock-shaft, connected by means of rod 7 with the valve in the steam-chest; 11, rod (sliding through guide 12), moved by cam *n*, cam *n* being of such a shape that by moving the sector, and bringing point 13 nearer or farther off the crank-pin 2, the steam will be cut off at any point of the stroke, and will work expansively. 16, screw, passing through block *p*, to which the upper end of sling *o* is jointed; the rotation of screw 16 will set block *p* in motion, and thereby raise or lower sector *h*. 21 and 22, miter-wheels, sliding on the governor-spindle, suf-



ficiently apart not to touch miter-wheel 19 at the same time, so that the rising or sinking of the governor's balls will alternately turn the screw 16 in opposite directions. By this means, the speed of the engine places the sector so as to cut-off by the valve in proportion to the work required of the engine. 25, vertical sliding-rod, with two points, 26 and 27, near the extremes of the motion of block *p*, at which points the block will raise or lower said rod 25. This motion is communicated by means of crank *r* and rod 28 to the spindle of the throttle-valve or stop-valve, which is suitably weighted down to let said valve return to its usual position at the proper time.

"First. I claim the combination of a cam and eccentric, by means of the sector h, or its equivalent, to operate on the valve, or parts that move the same, and cut-off or work with the full pressure by the eccentric, according to the position of said sector, as described and shown.

"Second. I claim adjusting the position of the sector h, by means of the governor, through the screw or other suitable means, whereby the governor regulates the position of the sector to communicate the desired motion to the valve of the engine from the eccentric or cam, or both, according to the power required from the engine, as specified.

"Third. I claim the rod 25, and points 26 and 27, to take motion from the block p at its extremes of motion, and communicate the same by means of the right-angle lever r to the throttle-valve, or stop-valves, as specified."

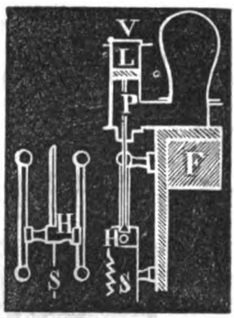
No. 10,019. F. W. Norton, of Lasswade, Great Britain.—*Manufacture of Plain and Figured Fabrics.* Patented September 13th, 1853.

"I claim, 1st. The manufacture of woven fabrics by cross-weaving, by carrying the cross-warp alternately over a stationary warp, and binding the cross-warp on each side of the stationary warp, by a shot of filling.

"2d. Carrying contiguous movable cross-warps over and across each other's path, and over one or more stationary warps, and binding said cross-warps to the stationary warps by shots of filling.

"3d. The manufacture of ornamental fabrics by cross-weaving elongated printed warps, as described."

No. 10,020. James Rankin, of Detroit, Mich.—*Improvement in Hanging Mill-Saws.* Patented September 13th, 1853.



The nature of this invention consists in providing mill and other saws at one or both ends with a cylinder and piston, said piston being coupled to the end of the saw by its rod, then by applying atmospheric, or other pressure with any elastic fluid on the side of the piston nearest the saw.

F, frame; S, saw; H, clutch; L, piston; P, piston-rod; V, valve, opening outwards, and allowing the contents of the cylinder to escape when the piston moves towards the valve, and preventing their return when the piston returns, consequently forming a partial vacuum, and thereby producing atmospheric pressure on the opposite side of the piston, and consequently tension on the saw.

"I claim the arrangement of an air-chamber cylinder and the valve, in the manner substantially described, for the purpose of straining saws in motion by the elastic pressure of compressed air, or its equivalent."

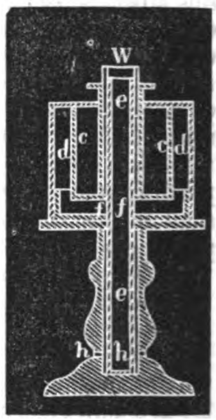
No. 10,021. John Chilcott and Robert Snell, of Brooklyn, N. Y.—*Screw-Fastenings for Boots and Shoes.* Patented September 13th, 1853.

The object of this invention is to make a screw-fastening that will hold the parts together with perfect security, and at the same time allow the inner and outer surfaces of the sole to be made as smooth and even as when other means of security are used.

The screw-fastening consists of a double metal screw, or two male-screws of different sizes, of which the larger is hollow, and contains a female-screw to receive the smaller. These screws are inserted through the sole from opposite sides, the smaller being inserted from the inside, and the larger being screwed in from the outside, the latter screwing into the sole and screwing on to the male-screw, and drawing the parts together like a screw and nut. The larger screw, which forms the nut for the smaller one, being screwed into the leather, will hold the smaller screw, and thus hold the parts together. The smaller screw is let in from the inside of the sole in such a way, by splitting the inner sole, that its head is entirely buried, and raises no inequality inside the boot.

"We claim the combination, as and for the purposes herein described, of the two screws *a* and *b*, of which one forms a nut for the other, and will hold it secure until all worn away."

No. 10,022. L. A. Stockwell, of Batavia, N. Y.—*Lard Lamp.* Patented September 13th, 1853.

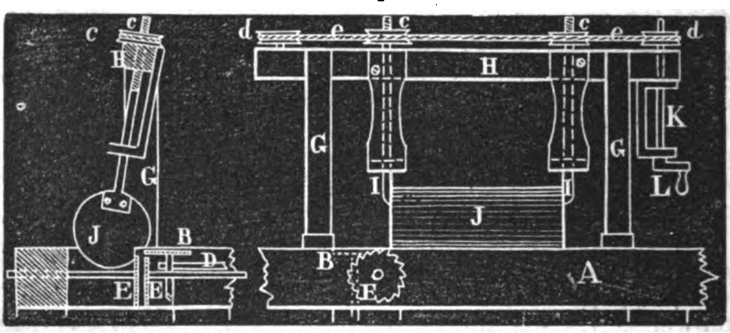


c c, cup which receives the lard; *e e*, tube, through which the air, heated by the combustion of wick W, passes down through holes *f f* and over the bottom and sides of cup *c c*, and serves to heat the air in the air-chamber *d d*, and to melt the lard in cup *c c*. As the heated air rises and passes from the chamber and to the flame, its place in the chamber is supplied by cooler air by means of the holes *h h*.

The inventor says that by means of his heater *c c* the lard will be melted with a rapidity superior to other lamps.

"I claim the combination of a reservoir of a lamp for burning lard or tallow with an outer covering, so arranged as to form an air-chamber, surrounding the reservoir, in the manner and for the purposes herein mentioned."

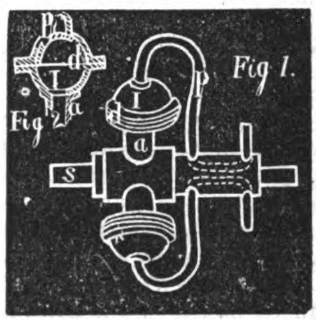
No. 10,023. T. J. Alexander, of Westerville, Ohio.—*Sawing Sticks for Broom-Handles.* Patented September 20th, 1853.



D, bed-piece; B, horizontal-saw; E E, two vertical-saws; G, frame, sliding on main-frame A; H, top cross-piece, swinging on the upright frame G; I I, screw-rods, and *c c* its circular nuts; J, log, held by I I; K, shaft; crank L, pulley *d*, and cord *e*, passing round *d* and *c c*, serve to elevate or depress log J.

"I claim the method, herein described, of handling and adjusting the log to its place, and to its various positions for the several cuts, by means of the radius-rods or clamping-screws, coupled and operated as specified, and suspended by a swinging frame from above, arranged and operating together as herein set forth; so that by bearing laterally on the screw-lever or handle, whilst turning it, the clamping-screws are swung laterally, and raised or lowered simultaneously, to approach the log on the table, and convey it with facility to the gauge, and to adjust the log expeditiously, when under operation, to its various sets laterally and vertically, as shown and described."

No. 10,024. James Black, of Philadelphia, Pa.—*Planetary Hydraulic Steam-Engine.* Patented September 20th, 1853.

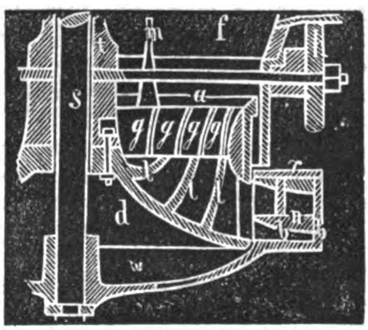


This invention consists in a revolving-shaft *s*, provided with four hollow arms *a* opening into four vessels I upon their ends, which vessels are furnished with flexible diaphragms *d* of vulcanized india-rubber; so that said vessels may be alternately filled with water and steam upon the opposite sides of the diaphragms, without letting the steam come in contact with the water, so as to condense it; the steam being supplied to the vessels through four pipes *p* extending from the hub on the shaft to the outer extremities of the vessels, a stationary collar being fitted to the hub, to which the supply and discharge pipes for the steam are connected, with openings in the collar, which correspond with openings from the steam-pipes in the hub, so as to alternately fill the vessels with steam in the lower part of their circuit, thereby forcing the water into the opposite vessels in the upper part of the circuit, so that the descending vessels are always full of water, and the ascending vessels always empty or full of steam, so that the power of the engine depends upon the capacity of the vessels and the difference between the specific gravity of water and steam, and the length of the arms of the vessels.

Fig. 1 is a side view of the apparatus; and Fig. 2 a section through one of the vessels.

"What I claim as my invention in the above-described Planetary Hydraulic Steam-Engine is the arrangement of the vessels, pipes, and diaphragms, or their equivalents, upon a shaft, so as to revolve with or upon said shaft, substantially as described, for the purposes set forth."

No. 10,025. U. A. Boyden, of Boston, Mass.—*Turbines.* Patented September 20th, 1853.



The turbine consists of *d*, disk; *l l l*, leading-curves; *a*, annular gate; *g g*, garniture or lining of gate *a*; *t*, tube; *w*, water-wheel; *i*, lower ring or rim; *r*, upper ring or rim; *b b*, its floats or buckets; *n*, diaphragm; *s*, shaft; *m*, rod, to raise gate *a*; *h*, frame; *f*, flume.

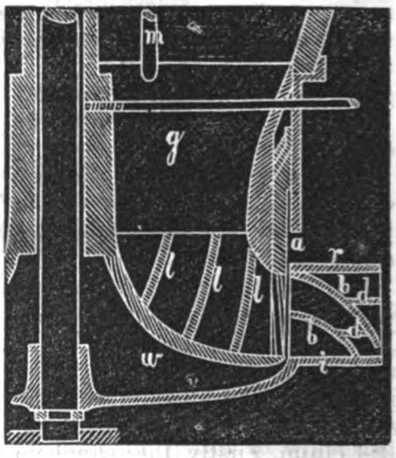
"I claim, firstly, the leaning or inclining of the leading curves or guides to the plane of the wheel, as above shown.

"Secondly, The making of the inside

of the garniture, or the part of the gate next to the disk, or both, of such a curvature or form that the water at the upper part of the stream or streams, where it leaves the garniture or gate, will have a downward motion, or direction inclining to the plane of the water-wheel, and making the upper sides of the passages for the water through the wheel descending or inclining to the plane of the wheel from the commencement of the passages next the gate to about half-way from the inner to the outer edge of the upper rim of the wheel, where they are nearly or quite horizontal, or nearly or quite parallel with the plane of the wheel, the inclination of that part of the lower surface of the upper rim of the wheel which is next the gate being the same or nearly the same as that of the lower surface of the gate next said upper rim, and the change from inclining to horizontal being gradual as by a curve, or making the upper surface of the disk next the lower rim of the wheel to incline up towards this rim, and making the lower sides of the parts of the passages through the wheel which are next the disk ascending or inclining to the plane of the wheel, so that the stream or streams will gradually diminish in height at the entrance or entrances into the wheel, so that the water which passes in the upper parts of the stream or streams will converge towards that which passes in the lower parts of the stream or streams before striking the floats, and continuing this converging into the wheel to about one-half the distance from the inner to the outer edges of the rims of the wheels.

"Thirdly, The forming of the lower part of the tube which sustains the disk, and the forming of the top of the disk on that part of it next the tube, and fastening these parts together as above described."

No. 10,026. U. A. Boyden, of Boston, Mass.—*Turbines*. Patented September 20th, 1853.



"This turbine consists of *w*, water-wheel, and its lower rim *i*; *r*, upper rim; *b b*, buckets or floats; *d d*, diaphragms; *l l*, leading curves; *a*, annular gate; *m*, one of three rods for moving the gate; *g*, garniture or lining.

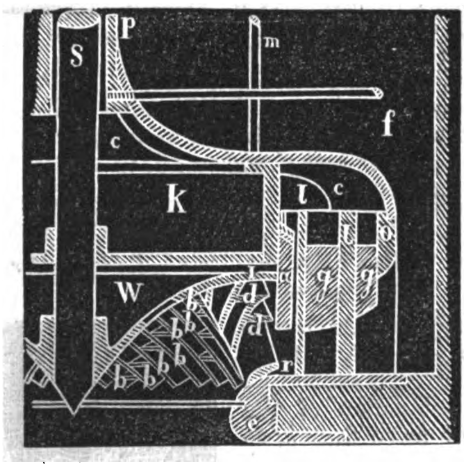
"I claim, Firstly. The arrangement of a gate at the entrance of the water into the wheel, with a part or all of the garniture or lining, and other parts of the turbine within, over and about the gate, such that the gate and a part of the garniture, if any be attached to it, may move freely, while the part of the garniture not attached to the gate, and other parts over and about the gate remain stationary, and so closely fitted that little or none of the water in the flume can run to the upper part of the gate, excepting by passing under the stationary garniture, and afterward upward, so as to diminish the liability of sediment, dirt, or other substances, being carried by the water to the upper part of the gate, or movable part of the garniture, if any be attached to the gate, so as to obstruct the motion of the gate or movable part of the garniture, essentially as above described.

"Secondly. The leaning or inclining of the floats or buckets of turbines to the rims of the wheels, so that when the wheel of a turbine is working with the gate next the wheel partially open, the parts of the float opposite the aperture formed by such partial opening of the gate will be forward of those parts next the other rim of the wheel, so that the leaning of the floats will diminish the spreading or deflecting of the streams into the part of the wheel opposite the gate, essentially as above described.

"Thirdly. The arrangement of the diaphragms or partitions in reacting wheels, and in the wheels of turbines, at different distances from the rims of the wheels in the several spaces between the floats, to facilitate regulating the motions of the wheels, essentially as above described.

"Fourthly. The combination of the device of making the gate at the entrance of the water into the wheel to move separately from the garniture, with leaning the guides or leading-curves which direct the water into the wheel, so that when the gate is partially open the part of the water which passes by or near the surface of the gate in flowing towards this passage into the wheel, made by such partial opening of the gate, has its motion directed the way the wheel turns, in consequence of the leaning of the said guides."

No. 10,027. U. A. Boyden, of Boston, Mass.—*Hydraulic Motors.* Patented September 20th, 1853.



Shaft *s* of this turbine is suspended. The turbine consists of *w*, water-wheel; *i*, upper rim; *r*, lower ring; *b b*, floats; *l l*, guides; *o g*, garniture; *a*, annular gate, and *m*, one of three rods for moving it; *k*, curb; *c*, covering fastened to pipe *p* and to curb *k*; *d d*, diaphragms or partitions for diminishing the spreading of the streams in the wheel when the gate is partially open; *e*, ring; *f*, flume.

"I claim, Firstly, the arrangement of the gates around and next outside of the peripheries of the water-wheels between the wheels and the guides, or other things, which causes the water to move obliquely towards the wheels in the way the wheels turn, when the water first strikes the floats or buckets, essentially as above described.

"Secondly. The device to cause the height of the wheel or the position of the parts which partially confine the water which presses the wheel upward to vary as the height of the water or fall varies, so that the width of the aperture which lets the water escape from the place where it presses the wheel upward varies proportionally to the quantities of water pressed into it, so that the force with which the water presses the wheel upwards will be nearly or quite constant, though the height of the fall varies greatly.

"Thirdly. The combination of a gate around and near the periphery of a water-wheel between the wheel and the guides or other things which direct the water the way the wheel turns into the wheel, with the parts of the float near the gate covered so that the water will strike their concave sides, as above described.

"Fourthly. The shape of the spaces between the rim of water-wheels which the floats are fastened to, in which they flare towards the axes of the wheels, as above described."

No. 10,028. A. F. Chatman, of New York, N. Y.—*Razor-Strops.* Patented September 20th, 1853.

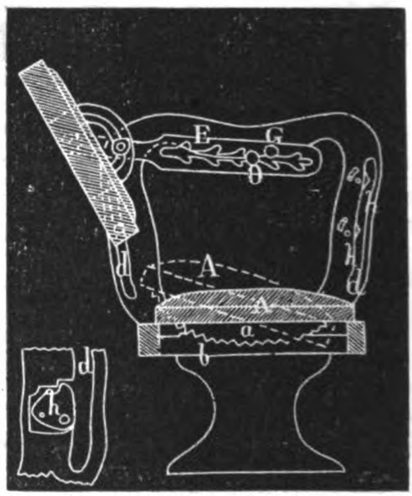
The object of this invention is to renovate the strop as often as it is pulled out by its being in contact with a piece of soft metal 7 (see figure), and to elevate the centre of the strop *e*, and take the razor evenly, by means of a concave end-piece *f*, and a convex rest 6. *s*, screw to fasten the instrument to a table.

Fig. 2 is a front view of the piece *f*.

"I claim the metallic renovator, in combination with the spring-barrel *d*, or its equivalent, to operate on the strop *e*, as specified.

"I also claim the convex end *f* and rest 6, to elevate the centre of the strop, as described and shown."

No. 10,029. J. Fay, of Cambridgeport, Mass.—*Railroad Car Seats.* Patented September 20th, 1853.



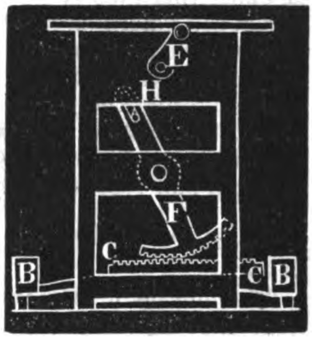
G, pin; O, sliding-bolt; A′ is one of the positions to which A may be changed.

"I claim the combination of the groove *d* and one or more dogs *h*, as applied thereto, and made to operate for the support of the back, and to enable it to be elevated, or its supporting-pin raised out of the groove *d*, as described.

"And in combination with the inclined notches and long slot of each bar, E or F, I claim the sliding-bolt or slides *o* as applied thereto, and used substantially in manner and for the purpose as specified.

"And I claim the convex and concave toothed racks *a* and *b*, in combination with the seat and the chair-frame, the same being for the purpose of enabling the seat to be set with such inclination, either forward or backward, as may be conducive to the ease and comfort of the sitter, whether he be in an upright or recumbent position."

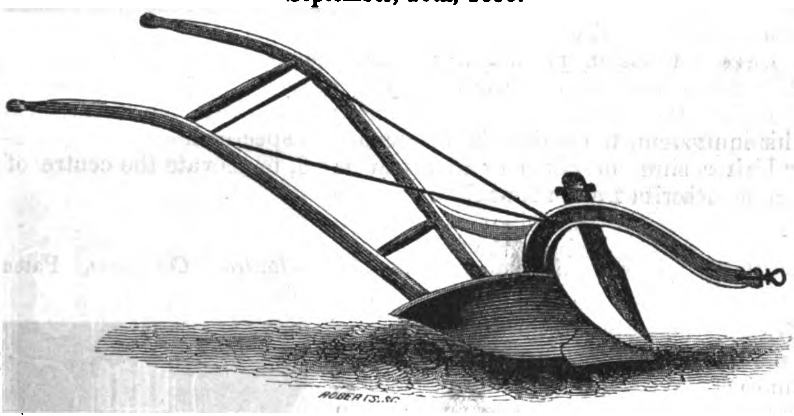
No. 10,030. DAVID FREED, of Huntingdon, Pa.—*Toilet Furniture.* Patented September 20th, 1853.



The object of this invention is to catch and hold the bottom of pantaloons between B and C, by means of turning crank E, for the purpose of drawing them off without stooping or sitting down.

"I claim the attaching or combining with a washstand, or any other toilet or chamber furniture, the brackets B and bolts C, when said bolt is thrown against the brackets by means of a crank or knob E at or underneath the top of the stand, through the levers H, F, or their equivalents, in the manner and for the purpose herein set forth."

No. 10,031. SAMUEL HULBERT, of Ogdensburgh, N. Y.—*Ploughs.* Patented September, 20th, 1853.

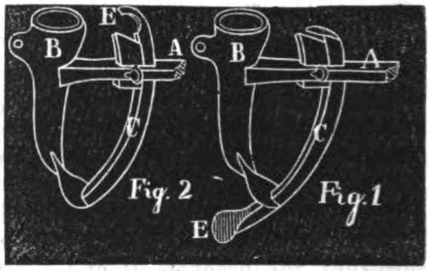


The nature of this invention consists in constructing the working side of the mould-board of a plough uniformly convex from front to rear, and also convex from top to bottom, so that a concave arc of a circle, when applied to the mould-board horizontally, will fit in every part, and a concave arc of a circle, when applied vertically to the line at the base, shall also adapt itself to every part of the said mould-board, the mould-board being so curved as to turn the furrow slice.

On applying a concave arc of a circle at A A, B B, C C, and so on, vertically or cross-sectionally to the base A A′, the arc will adapt itself in every part to the mould-board, and a concave arc when applied horizontally at *a a*, *b b*, *c c*, and so on, will also adapt itself to every part of the mould-board.

"I claim constructing a mould-board of a plough so that a horizontal line drawn at any height across its working side shall describe the convex arc of a given circle, and any line drawn across its working side at right-angles to the base shall also describe the convex arc of a circle, substantially as set forth."

No. 10,032. Samuel Jenkins, of Portsmouth, Pa.—*Seed-Planters*. Patented September 20th, 1853.



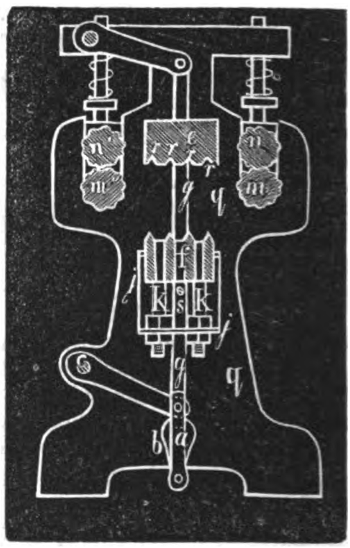
A, drag-bar, attached to the front part of the frame of a seed-planter; B, depositing tube or tooth; C, steel cutter, being adjustable by reversing the ends, for the purpose of regulating the depth of tooth B; E, runner.

Fig. 1. Position of cutter when necessary to regulate the depth in soft soil, and pass over any obstructions.

Fig. 2. Portion of the cutter when necessary to pass over any obstruction in hard soil.

"I claim the peculiar shape and construction of the adjustable cutter, its passing through the drag-bar and fitting in a dovetail in the point of the shovel, all in combination as herein described, for the purpose of allowing the tooth to pass easily over any obstructions, and especially to regulate the depth of furrow."

No. 10,033. Oliver S. Leavitt, of Marcellus, N. Y.—*Hemp-Breaker*. Patented September 20th, 1853.



This improvement consists in machinery by which a sheet of hemp or flax-straw is passed lengthwise from a feed-cloth or table placed before the machine, as desired, beneath a beam fluted on the lower side, first coarser, and growing gradually finer, while a beater composed of a number of blades corresponding with the number of flutes in the beam, resting on a spring, is made to strike rapidly into the grooves of the fluted beam, the blades standing upon their edges, and fastened together in such manner as to allow the shires to fall freely through the space between them.

q, frame; *a*, driving-shaft, with cranks *b*, which carry the upright pieces *g g* up and down; to these pieces *g g* is the spring *j j* bolted (see bolt *s*), and to this spring *j j* is the beater attached by bolts *k*; *e*, beam, fast on frame *q*, in whose grooves *r r* the beater *f* presses the hemp; *c*, rock-shaft; *n′ m′* and *n m*, fluted rollers, for the purpose of passing the hemp under the piece *e*.

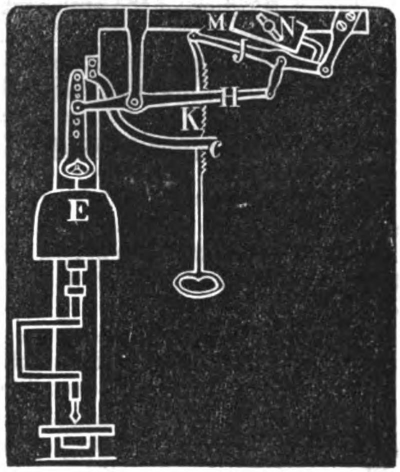
"I claim the combination of a reciprocating beater, with parallel blades set at decreasing distances from each other, with a fixed bar fluted or serrated to correspond with the blades and spaces of the beater."

No. 10,034. Oliver S. Leavitt, of Marcellus, N. Y.—*Drawing-Frames for Hemp and Flax.* Patented September 20th, 1853.

"I claim, 1st. The particular form of gill-bar described, in combination with the rocking-lever *m*, the dog *i*, and the cam or tappet *j*, for the purpose of withdrawing the gill-pins from the material, and directing the bar's backward movement, in the manner and for the purpose substantially as set forth.

"2d. The device by which the rods *a' a''* are pressed down for the purpose of making the gill-pins penetrate effectually the material to be drawn, being operated by the lever *p* in the manner set forth."

No. 10,035, Warren Lyon, of New York, N. Y—*Metal-Drills.* Patented September 20th, 1853.

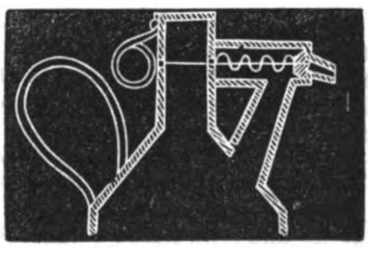


The nature of this invention consists in having a weight attached to the arbor of the drill for the purpose of giving the requisite pressure, and in having a system of levers and counterpoise connected to the upper part of the arbor, for the purpose of elevating the arbor and graduating the pressure which is given the drill by the weight upon the arbor.

When it is necessary to withdraw the drill from the hole, or the work, the pack-bar K is drawn downward and the rack is made to catch into the side of recess *c*, thereby keeping the drill suspended. By adjusting counterpoise N on rod M the pressure of E can be changed.

"I claim the combination of the weight E, levers H, J, and counterpoise N, constructed, arranged, and operating in the manner and for the purposes substantially as herein shown and described."

No. 10,036. J. R. Nichols, of Haverhill, Mass.—*Fluid-Cans.* Patented September 20th, 1853.



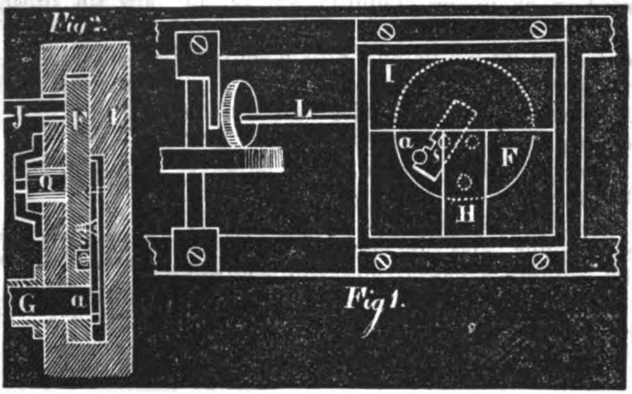
"I claim the application to the ordinary decanting vessel of a spring-valve or valves, easily and conveniently opened by the thumb or finger, while replenishing lamps, or decanting therefrom, whether said spring and valves be made and arranged in the manner as herein shown or other mode substantially the same, by which similar results shall be produced."

No. 10,037. H. Perrin and W. Ruddock, of Wilmington, Ohio.—*Seed-Planter.* Patented September 20th, 1853.

The object of this invention is to effect a uniformity in planting, and to prevent the clogging of the seed from obstructing the discharge.

Fig. 1 is a top view, and Fig. 2 a section through the centre of F, on a larger scale.

F, oscillating disk-valve, turning on a centre-pivot Q; F is perforated with an aperture *a* to receive seeds or kernels one at a time; G, receiving-tube; F is vibrated by means of a pin J sliding in an endless groove, which runs obliquely round a cylinder on the end of axis L.



"We claim the method of supplying the distributing-tube with grain or seed from the hopper by means of the reciprocating or vibratory-valve F in the hopper, in combination with the cap H and the discharging-plate S and receiving-chamber G, constructed, arranged, and operating as described."

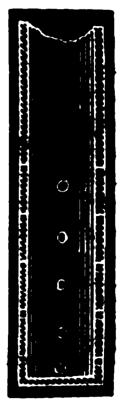
No. 10,038. Sylla & Adams, of Elgin, Ill.—*Grain and Grass Harvester.* Patented September 20th, 1853.

"We claim, 1st. The weighted levers K K′, or their equivalents, substantially as described, which carry the sickle-bar and sickle, and allow them to vibrate perpendicularly, and accommodate the sickle to uneven ground in cutting grass, which levers may be made permanent when cutting grain, substantially as described and represented.

"2d. The link or hinged brace J, or its equivalent, in combination with the weighted levers K K′, which brace J prevents the sickle-bar from being traversed longitudinally by the action of the sickle, but allows it to vibrate perpendicularly and accommodate it to uneven ground, substantially as described.

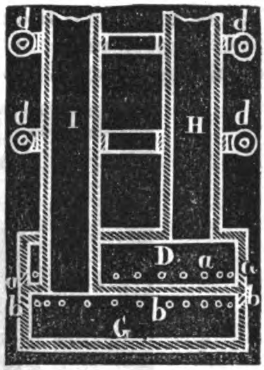
"3d. The stands of the binders, constructed so as to allow them to stand so much lower than the horizontal platform that they can bind the gavels into sheaves with greater facility, far less labor, and much faster than by any of the modes heretofore practised."

No. 10,039. Ancil Stickney, of Norwich, Vt.—*Blow-Pipes for Enlarging Blasting Cavities.* Patented September 20th, 1853.



"I claim my improved process of enlarging the drill-hole by means of an air-blast and charcoal, or other combustible fuel, placed in the hole—the same consisting in the employment of a blast-tube made with lateral perforations, and a closed or nearly closed bottom, substantially as described; the same enabling me to attain the enlargement of the hole, with a great saving of labor and time."

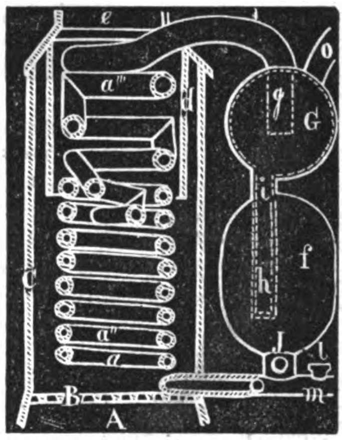
No. 10,040. ANCIL STICKNEY, of Norwich, Vt.—*Compound Blow-Pipe for Enlarging Blasting Cavities.* Patented September 20th, 1853.



A stream of hydrogen gas is forced down one of the pipes H I, and at the same time a stream of oxygen gas down the other one, said gases thereby being forced in chambers D and G, and out of the orifices *a* and *b*. On being inflamed, they will burn with an intense flame and decompose part of the rock. *d d*, guide friction-rollers.

"I claim the instrument for enlarging the drill-hole by the employment of gases, as specified; meaning to claim the combination of the two jet-chambers D G, the perforations or orifices *a a*, &c., *b b*, &c., and supply-tubes H I, as arranged, substantially in manner, and for commingling the gases and disseminating flame therefrom entirely around and against the sides of the drill-hole, whereby the enlargement of it into a suitable charge-chamber may be speedily effected."

No. 10,041. ABEL SHAWK, of Cincinnati, Ohio.—*Steam-Generators.* Patented September 20th, 1853.

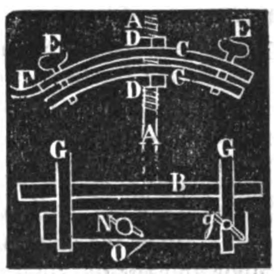


The diameter of the tubular generator a' a'' a''' extends gradually from a' up to a'''.

A, ash-pit; B, grate-bars; C, outside jacket; *d*, inside jacket; *e*, chimney; *f*, air-vessel; G, steam-chamber; *g*, end of the generator; *h*, blow-off pipe; *i*, cock in blow-off pipe; J, cock in supply-pipe; *l*, safety-valve; *m*, supply-pipe; *o*, steam-pipe from steam-receiver.

"I claim a tubular generator, which has a forced circulation, and which, while it lines the fire-box, and is expanded in its diameter from above the fire-box to its termination, is connected by a steam-chamber or receiver outside of, or exterior to it, arranged in the manner herein described."

No. 10,042. OSCAR WILLIS, of Burke County, N. C.—*Saw for Water-Wheels.* Patented September 20th, 1853.

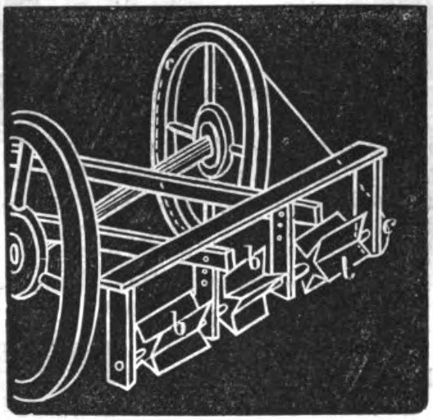


This apparatus has been invented for the purpose of cutting the grooves for inserting iron buckets in wooden water-wheels.

A two-edged saw is inserted between two circular pieces of wood C and C′, and fastened between them by screwing down screws E E. The distance of the saw from the centre of motion at N can be regulated by the two nuts D D. F is a handle by which the saw, when adjusted, is to be worked.

"I claim an adjustable apparatus for sawing out the grooves or fillets in water-wheels for the reception of the buckets, composed of a two-edged saw sprung between clamps, and connected by a screw-rod A to a sliding-bar B, when said sliding-bar is made adjustable upon a radius arm *o* hung to the centre of the wheel; the whole being combined and operating substantially as described."

No. 10,043. GEO. GORMAN, of Lemar, Miss.—*Cotton-stalk Cutters or Pulverizers.* Patented September 20th, 1853.



"I claim the construction and arrangement of the machine, consisting of rotary whippers *b*, or reels on bar B B, supported in a frame admitting of elevation and depression; said whippers being driven by band-wheels *c* on one or both supporting-wheels of said machine, in the manner set forth, for the purpose of effectually reducing the stalks of cotton, and thus rendering them useful as a manure, and in a condition to offer no obstruction to the plough in the after cultivation of the land."

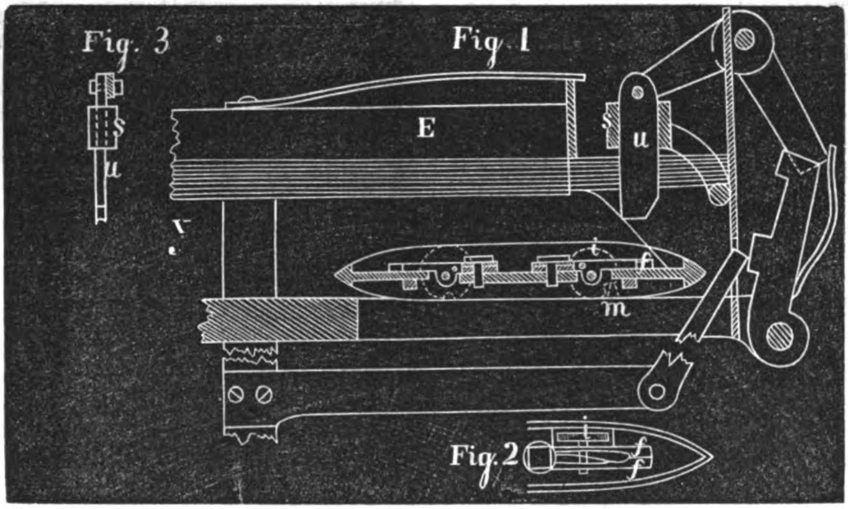
No. 10,044. HALVER HALVERSON, of Hartford, Conn.—*Loom for Weaving Hair-Cloth.* Patented September 27th, 1853.

Fig. 1. Section of the apparatus.
Fig. 2. Top view of shuttle.
Fig. 3. Side view of depresser.

y, cloth-making part of the apparatus; E, trough; *f f*, pair of pincers. *u*, depresser which on its lower end has a groove just large enough to catch one hair; this hair is caught between the pincers, which at the same time are screwed together by the screw-head *i* striking against the projection *m*. After that, the shuttle returns to the other end of the table, and catches there another hair, and so on.

"I claim the combination of the trough or troughs, one or two depressers, one or two sets of pincers applied to the shuttle, and mechanism for opening and closing the pincers; the whole being applied to one or both ends of the lay, and to the shuttle, and made to operate together substantially in the manner and for the purpose of carrying hair, or hairs, or like matters, into the shed of warps, as specified.

"And I also claim the arrangement of each or both troughs with respect to the depresser or depressers thereof, and to the shuttle-boxes and the lay,



substantially as represented in the drawings; the trough in such arrangement being made to extend from the depresser towards the middle of the lay, substantially as specified."

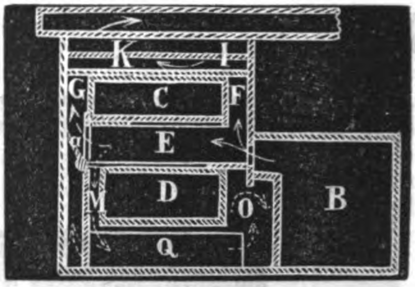
No. 10,045. Henry Hochstrasser, of Philadelphia, Pa. —*Sash-Fastener.* Patented September 27th, 1853.

m m, catches, either one of which is to be pressed in if the sash is to be raised or lowered; a spring detent *o* is secured to one of the lugs *e*, and presses constantly against the side of the upper end of the catch-bar *f*, which is fitted with a recess, or with a stump *s*, so that as the upper catch *m* is protruding through the plate *a* the spring detent will yield and allow the stump to pass behind it, where it will be held against the pressure of the spring *n* until force is applied to the catch to press the stump past the detent.

"I claim the self-acting catch, made and operating substantially as herein described."

No. 10,046. Nicholas Mason, of Roxbury, Mass.—*Improved Cooking-Range.* Patented September 27th, 1853.

B, fire-box; C, upper oven; D, lower oven; *a*, damper for managing the flues. When but one oven is to be used, *a* is to be opened, as seen in figure; the heat fills F, and passes through E G to a flue in the rear of C, thence to I, and round a partition to K, and thence escapes through the upper flues. When both ovens are to be used, *a* is shut, and the heat passes through M round Q into the space O, thence through Q into flue G, and thence the heat passes around the upper oven, as above described.



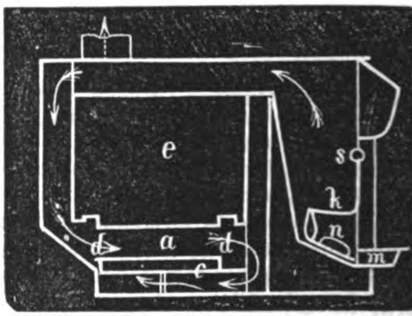
"I claim the employment of two ovens, in combination with the peculiar arrangement of the flues around their top, bottom, back, and sides, by which I am enabled to heat five sides of either one or both of them at a time, as set forth."

No. 10,047. HENRY M'CARTY, of Pittsburg, Pa.—*Manufacturing Sheet-Iron.* Patented September 27th, 1853.

"I claim imparting to the surface of sheet-iron the peculiar mottled appearance of Russia sheet-iron, by passing the sheet between a pair of planished or hammer-dressed rollers, in the manner substantially as herein fully set forth."

No. 10,048. JORDAN L. MOTT, of New York, N. Y.—*Improvement in Cooking-Stoves, Ranges, etc.* Patented September 27th, 1853.

a a a, series of parallel bottom flue-tubes, side by side, so that small spaces are left open between each two of them; these are held together by end-plates *d d*, so that they can be taken out through the door of the oven *e*; plate *c* constitutes the top-plate of the bottom flue *f*; *m*, ash-pan; *k*, grate, on its upper end, turning on journals *s*; its other end rests on the upright arm of lever *n*, the forward arm of which is weighted to make the whole lever act as a self-acting latch.

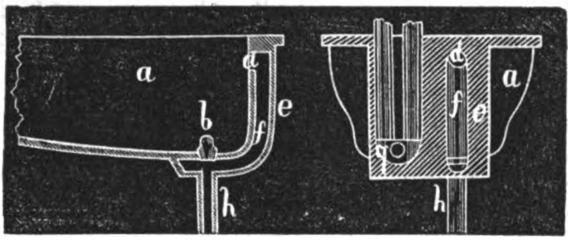


"I claim connecting the top-plate of the bottom flue with the lower part of the series of flue-tubes, so that in taking out the series of flue-tubes for cleaning the said top-plate of the flue below shall be removed at the same time, and thereby expose to view the lower flue space, greatly facilitating the operation of cleaning.

"I claim the combination of the swinging-grate, as described, with the self-acting weighted latch connected with the plate below the grate, as specified, whereby the contents of the grate can be readily discharged, and the grate readjusted, by a slight use of a poker."

No. 10,049. JORDAN L. MOTT, of New York, N. Y.—*Bathing-Tubs.* Patented September 27th, 1853.

a, tub; *b*, waste-hole; *c*, hole near the bottom, for the admission of cold and hot water, or either; *d*, overflow-hole, near the top; *e*, projection cast with the tub; *f*, channel connecting the overflow-hole and waste-hole; *h*, waste-pipe, coupled to the bottom of *e* below *b*; *g*, channel extending from the upper edge of the projection *e* to the supply-hole *c*, and of sufficient capacity for the insertion of the ends of the cold and hot water pipes *i* and *j*, which are to be provided with stop-cocks above the tub. By this means the inventor intends to supply the water near the bottom of the tub, and so that the hot and cold water mingle together in flowing in; further, to bring the pipes out of the way, and to avoid all fitting and attaching to the tub.

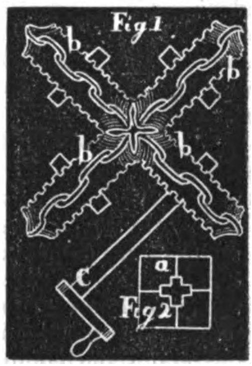


"I claim the mode of combining with a bathing-tub either one or both of the channel-ways, substantially as described, and making, when constructed, part of the tub, one of which channel-ways connects the overflow and the waste or discharge-holes with the waste-pipe, and the other channel-way is adapted to the insertion of the hot and cold water pipes, and discharging the hot and cold water together at or near the bottom of the tub, and in a horizontal or nearly horizontal position, substantially in the manner and for the purpose specified."

No. 10,050. Christian Heppy, of Wilkesbarre, Pa.—*Machine for Making Chains.* Patented September 27th, 1853.

The red-hot bar, after passing through a guide *a* (see Fig. 2), comes between four cog-wheels *b b b b* (see Fig. 1), to one of which the moving power is applied by means of a crank C; the cog-wheels are provided with steel dies on their edges of such a form as to make a chain of the rod as it passes through.

"I claim the forging and making chains out of a solid bar without the welding process, and which is done instantly as the bar passes between four rollers with dies on the edges of the same, moulding the links into form, and which may be done out of iron, brass, or any substance suitable to be used as a chain, from the size of a cable to a watch-guard."



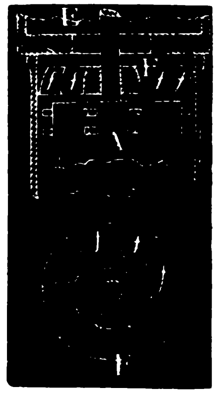
No. 10,051. David Stuart, of Philadelphia, Pa.—*Process of Annealing Hollow-Ware.* Patented September 27th, 1853.

The object of this process is to avoid the difficulties experienced in the process heretofore used, and save time and expense.

The nature of this invention consists in covering the inside of iron hollow-ware with a paste made of a composition to exclude the air, and which resists the influence of the heat. When the hollow-ware is properly prepared in this manner, it is placed in the oven and heated to cherry-red, whereby the chill is taken out of the surface, and rendered so soft that it can be turned bright in a turning-lathe, or otherwise, preparatory to tinning. Said composition may be soapstone-dust and carbon; the more carbon there is in the mixture for coating the better. This composition is mixed with water to about the thickness of rich cream, and poured in from half a pint to two quarts, according to the size of the article, then the compound is worked round the inside till this is completely covered, then it is placed mouth downwards on a wire shelf, to allow the compound to drain off. The pot thus coated is placed in the oven; the heating takes from 20 to 30 minutes.

"I claim the process substantially as described; the same consisting in coating the articles in the manner set forth with the same composition, that will resist heat and exclude air from the surface, and heating the articles so coated in an oven about the length of time specified."

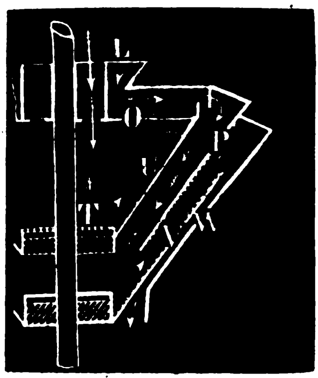
No. 10,052. Robert Waskey, of Mill Creek, Va.—*Smut-Machine.* Patented September 27th, 1853.



This invention consists in inserting between the head of the beating-cylinder A and the fan-chamber E a diaphragm F, with inclined openings *f f f*, etc., for the purpose of preventing the grain from being carried off with the smut by the action of the blast during the operation of cleaning.

"I claim the construction of the diaphragm F, the central part being solid, and that near the periphery made in several oblique valvular passages, to check or throw back the kernels of grain, as represented in the drawing."

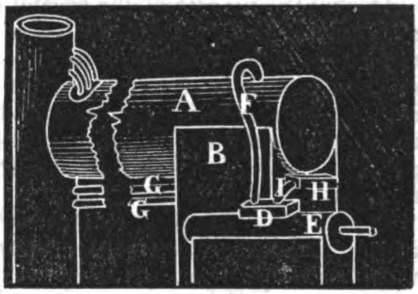
No. 10,053. William Zimmerman, of Quincy, Ill.—*Smut-Machine.* Patented September 27th, 1853.



W, P, stationary cones; L, hopper; O, rotating disk; T, perforating ventilating-box; U, V, revolving cones; the grain is carried up the roughened inside surface of U and V on account of the centrifugal force, and follows the direction of the arrows.

"I claim in the described machine for cleaning and scouring grain, hulling rice, pearling barley, hulling buckwheat, or otherwise operating upon grain, seed, etc., a series of two or more stationary cones, with one, two or three or more revolving cones placed and operated alternately between the stationary ones, the insides or outsides of part, or both sides of part, or all the cones being furnished with roughened surfaces, of such a form or kind as will perform the service required, substantially as described."

No. 10,054. C. E. John & Sam. Wethered, of Baltimore, Md. *Improvement in Application of Steam.* Patented September 27th, 1853.



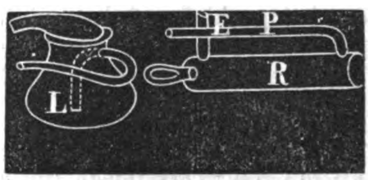
A, a common boiler; B, furnace; C, chimney; D, steam-chest; F, usual steam-pipe; E, cylinder; G, surcharging-pipes, passing into the chimney, thence into the flue beneath the boiler, and thence through the furnace into the box H, which receives the three surcharging-pipes; I, pipe connecting box H and steam-chest D.

The steam passing through the pipe or pipes, which in their turn pass through the furnace, and becoming dried and heated in its passage, is converted into what is known as superheated steam of a much higher temperature than that which passes directly to the steam-chest. As this apparatus unites the ordinary and the superheated steam, any water (says the inventor) in the first is at once converted into steam, which passes into the cylinder along with the steam that left the boiler, with an increased expansion in proportion to the heat of the superheated steam, the result being the working of dry steam at a greater pressure than if the steam had been permitted to pass into the cylinder in the usual way.

"We claim the combining steam and superheated or surcharged steam for actuating engines, when generated, the elasticity increased, and operated as herein set forth."

No. 10,055. Wm. Brown, of Glasgow, Scotland.—*Distilling Coal, etc.* Patented September 27th, 1853.

R, retort; P, steam-pipe; E, exit pipe; L, still.



The coal or other bituminous matter is distilled in conjunction with steam at a dull red-heat, for which purpose the coal is introduced into a retort (see figure) fitted with a steam-pipe so situated as to become red-hot by passing through the furnace; this steam-pipe terminates in the closed end of the retort, so that when the retort is charged with coal, and the furnace is in action, the steam-pipe becomes red-hot, and steam being passed along it, this also becomes red-hot, and in this state enters the end of the retort and rapidly expels the volatile matters arising from the coal, by which its decomposition into gas is wholly or in a great measure prevented, and the amount of oily or condensible products greatly increased.

These volatile products are again subjected to distillation in a still, with or without the aid of a steam-pipe. When steam is to be used (which is necessary if a large amount of paraffine is required) it is brought into the still in a superheated state by passing it through a red-hot steam-pipe, disposed in the furnace or flue of the furnace, which heats the still. The steam enters through the upper part of the side of the still, as shown in Fig. 2, and promotes as before the distillation of the volatile matters, whilst it retards their destruction or conversion into gaseous or other worthless compounds. By this means the paraffine and heavy hydro-carbonaceous oils are preserved.

During the process of the second distillation, it will be observed that the products vary at different periods of the distillation, and these are therefore to be kept separate or received into different vessels. At first a thin oil or eupione comes over to the extent of about one-eighth of the total fluid employed; after this a thicker and heavier oil, containing paraffine, makes its appearance to the extent of from 40 to 50 per cent. of the fluid employed; and lastly, a thick butyraceous matter is evolved consisting chiefly of paraffine, but mixed with heavy oil, and this continues to the end of the operation, and constitutes about one-fourth of the bulk of the fluid originally used. These three products are treated as follows: The eupione is mixed with 5 to 10 per cent. of its weight of oil of vitriol or sulphuric acid, to which an equal bulk of water is added before mixing; to these bichromate of potash is next thrown in equal in weight to one-half of the sulphuric acid employed; the whole is then heated in any convenient vessel of wood, or lead, or earthen-ware, and during the heating the materials are diligently stirred together. As soon as the temperature has reached 212° Fahrenheit, the fire may be withdrawn, and the whole permitted to cool and settle. The eupione is next decanted from the acid fluid and treated with a warm solution of caustic soda, the whole being well mixed, and afterwards left at rest for some time to settle. Lastly, the eupione is decanted from the alkaline fluid and distilled either alone or with water or steam, as is practised with respect to volatile oils generally.

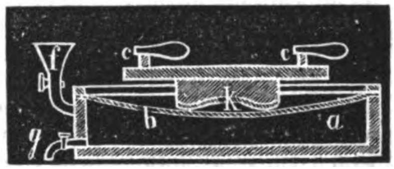
The heavy oil containing paraffine is next treated either with strong sulphuric acid and protoxide of manganese, in the proportion of 10 per cent. of acid and 5 per cent. of protoxide of manganese; or, what I prefer, it is subjected, like the eupione, to the action of sulphuric acid and bichromate of potash, in the same manner and proportion as indicated for the eupione, after which it is treated with soda-lye, and allowed to settle exactly as explained with regard to the eupione. The heavy oil is then decanted and distilled in the usual way, the first portions being added to the eupione, and consisting chiefly of that substance. The second, and by far the larger portion of the whole, is received apart under the name "lubricating oil," whilst the last portions, being thick and of the consistence of butter, are mixed with the impure paraffine which results from the third stage of the second distillation of the crude products, and which are treated as follows:

Having allowed the impure paraffine to remain for 24 hours or longer in a cool place to crystallize, the oily mixture is placed in a bag or filter similar to those in use for the separation of spermaceti from sperm-oil. When the oily fluid is drawn away, the paraffine must be removed to a press and subjected to severe pressure, as is practised with respect to stearic acid by the makers of that substance. It must then be melted, and when cold again pressed, the oil being in both cases added to the drainings, which are to be treated as explained, under the head, heavy or lubricating oil. The paraffine must now be melted and the heat raised to about 400° Fahrenheit, when strong sulphuric acid is to be carefully stirred into it in the proportion of one-twentieth to one-tenth of the weight of the paraffine operated upon. After boiling for a few minutes, the fire must be withdrawn, and the charred oil of the paraffine allowed to settle in the form of a black powder from the paraffine. This being separated, the paraffine must be boiled in water or in a weak solution of soda, after which it may be cooled, and is fit for the market.

"1st. I claim the use of superheated steam, as indicated, for the purpose indicated.

"2d. I claim the mode of separating and purifying eupione, lubricating oil, and paraffine, obtained by previous process."

No. 10,056. C. B. Burnap, of Hartford, Conn.—*Method of Veneering Surface.* Patented September 27th, 1853.



The object of this invention is to make a more perfect and equal pressure on the surface of veneers in glueing or cementing them, than can be obtained by the usual processes, and to make the pressure self-adapting to the surface of veneers in glueing them, or whatever may be the form of the surface, and at the same time to heat the veneers to facilitate the glueing or cementing.

The nature of this invention consists in pressing veneers on the surfaces to be veneered by means of a fluid acting on a flexible substance interposed and making part of a vessel containing water or other fluid.

The invention also consists in using this fluid in a heated state for keeping the glue warm. *a*, vessel filled with water. Vessel *a* is covered with a sheet of vulcanized india-rubber *b* firmly attached all around the edges; *g*, discharge-pipe with a stop-cock; *f*, pipe with a stop-cock for letting in the water; *k*, veneer; *c c*, screws to screw down the veneer against the india-rubber sheet.

"I claim the method of pressing veneers on to the surface to which they are to be glued or cemented by means of a fluid, hot or cold, acting on an interposed flexible substance, such as india-rubber cloth, or its equivalent, which will adapt itself to the surfaces, substantially as described."

No. 10,057. Daniel P. Fales, of West Poultney, Vt.—*Car-Wheels.* Patented September 27th, 1853.

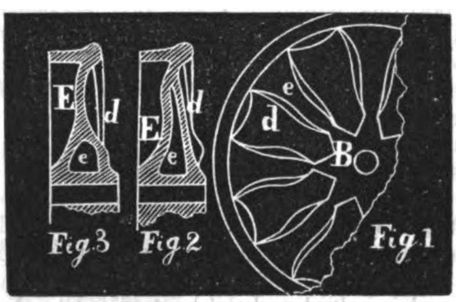
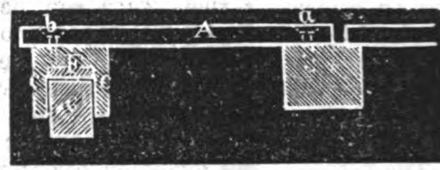


Fig. 1. Front view.
Fig. 2. Section through *d*.
Fig. 3. Section through *e*.

The object of this invention is to give a greater degree of strength to the rim. The undulation of the plate B by which it is united to alternate portions of the rim, and alternately to central portions of the face-plate E, by a series of outward, inward, and radial curves, are intended to enable it at the same time to support the rim and the face-plate in the most efficient manner when in use, and also to guard against injury during the process of cooling.

"I claim my improved car-wheel, composed of the face-plate E, which curves first inwards and then outwards and expands into the rim, and the rear-plate B, which by the series of curves represented in Figs. 2, 3, and 4 combines the inner end of the hub with the face-plate and with alternate portions of the inner edge of the rim, substantially as herein set forth."

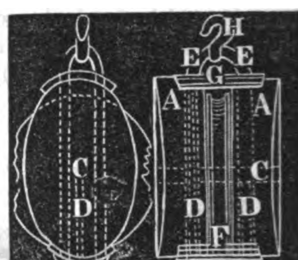
No. 10,058. JAMES M. DICK, of Buffalo, N. Y.—*Improvement in Railroad-Switch.* Patented September 27th, 1853.



The switch-rails A turn round pivots *a* and are attached by bolts *b* to a cross-piece F, which is provided with flanges *c c* and covers the whole length of the cross-piece G.

"I claim the construction of the slide F with the depending flanges or side-plates *c*, which inclose the slide and cross-piece upon which it works, and afford a certain and effective protection against gravel, dirt, snow, sleet, ice, and other foreign substances, which might otherwise enter between them, and derange the operation of the switch."

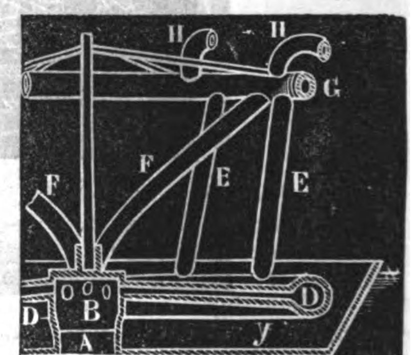
No. 10,059. CHARLES H. PLATT, New York, N. Y.—*Improvement in Ships' Blocks.* Patented September 27th, 1853.



"I claim the employment or use of the rods E passing through the cheeks A A in a direction transversely of their fibre, for the purpose of preventing the splitting of the cheeks, said rods also securing the plates F G to the cheeks and forming a staple for the hook H, as herein shown and described.

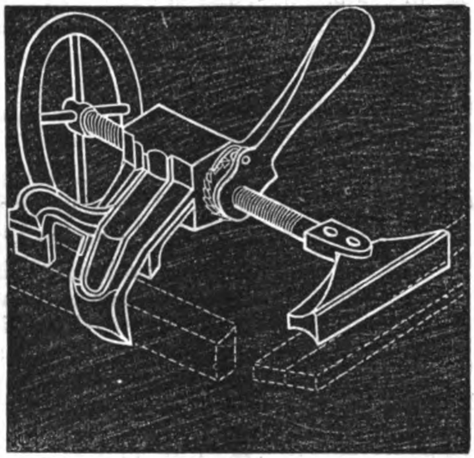
"I also claim the rods D D placed underneath the ends of the shaft C, for the purpose of preventing the wearing of the cheeks, and thereby forming durable bearings for the shaft, as set forth in the body of the specification."

No. 10,060. WM. RICHARDSON, of New Orleans, La.—*Centrifugal Draining-Machine.* Patented September 27th, 1853.



"I claim the arrangement in the tub *y* of the induction-tube A, supply-bulb B, and annular-tube or ring D D, placed below the water-line W, exterior to the tub, in combination with the ascending-tubes E E and F F and a second annular-tube G, having discharges H H for the purpose of self-priming, protecting the machine from the resistance of water exterior thereto, and giving steadiness to the ascending column of water discharged by the machine."

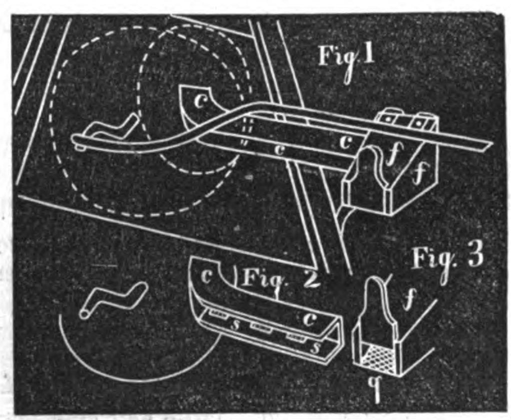
No. 10,061. STEPHEN E. PARRISH, of New York, N. Y.—*Machine for Laying Floors.* Patented September 27, 1853.



The nature of this invention consists in making a brace having a forked end with shoulder-pieces attached to the under side thereof, so as to straddle one of the flooring beams, in combination with a screw working at right-angles to the brace, and having on it a ratchet wheel and lever and pawls for working up the screw against the edge of the plank.

"I claim the use of the brace having clawed ends for acting at opposite sides of a beam, in combination with a screw working at right-angles to the same, substantially in principle of construction and operation as set forth."

No. 106. (Additional Improvement.) G. F. S. ZIMMERMAN, Charlestown, Va.—*Winnowing and Threshing Machine.* Patented September 13th, 1853.



"I claim the constructing the suction-pipe or tube *c c c* of any desired form, with a sliding hinged flap bottom *s s* (Fig. 2) attaching said tube to the side of the thresher or winnower in any position, and also attaching said pipe or tube to the grain-discharge or bagging-spout *f f*, having a sieve-like or reticulated bottom *q* (Fig. 3), and using said attachments in combination, for the purpose of cleaning and chaffing or double-winnowing grain of all kinds, with a blowing blast of air and a suction-draught or current of wind, also in combination, and in one operation, and at the same time, for the purpose specifically as herein before fully set forth."

RE-ISSUE.

No. 247. WILLIAM CROMPTON, of Worcester, Mass.—*Improvement in Looms.* Re-issued Sept. 13th, 1853. Patented Nov. 25, 1837.

"I claim, 1st. The jacks, with hooks or projections thereon, capable of being taken or passed by the lifter and depresser as required, in combination with the harness or heddles, for the purpose of opening the shed.

"2d. The combination of the jacks, constructed and arranged substantially as described, with the lifter and depresser, as described.

"3d. The combination of the pattern-chain or cylinder, with the jacks, constructed in the manner described.

"4th. Arranging and connecting the lifter and depresser, which operate the jacks in such a manner that they shall operate simultaneously, to elevate and depress the jacks and warps in forming the shed, substantially as described.

"5th. Giving motion to the pattern-chain or cylinder, substantially as described.

"6th. The combination of the pattern-chain or cylinder, with the jacks, lifter, and depresser, as described.

"7th. So constructing or arranging the lifter and depresser, and the hooks or projections on the jacks, with reference to each other, substantially as set forth, as to bring the upper warps all into the same plane, and the lower warp all into another, when the shed is opened.

"8th. Connecting the hook-jacks to the bottom treadles or levers, by inclined wires, or their equivalents, to hold the jack against the tubes or bars of the pattern-cylinder or chain, when not thrown out by the rollers, or other projections thereon."

DESIGNS.

No. 596. S. W. GIBBS.—*Design for a Stove.* Patented Sept. 6th, 1853.

"I claim the raised shield B *a*, the raised shield B′ *i*, the lance-border A *b c*, the scrolls *d e*, and the borders *f g h*, forming an ornamental design for a stove."

No. 597. W. P. GRAY.—*Design for a Stove.*

"I claim the design, configuration, and arrangement of the mouldings, panels, and ornaments on the front, back, and side plates of the stove called 'The Model Parlor Cook.'"

ON THE CHEMICAL CONSTITUTION OF WINES.

BY F. L. WINCKLER.

The author has already shown that the essential constituents of grape-wine are alcohol, œnanthic ether, tartrate of potash combined with a minute quantity of tartrate of lime, free tartaric acid and a kind of extractive substance very readily oxidizable; while cider, when it has not been kept in casks containing tartar, generally contains no tartrate of potash, but free lactic acid, a considerable quantityof lactate of lime, alcohol and vegetable mucilage, the latter substance being in larger quantity the younger the cider is. Moreover, it is known, with regard to the grape-wines, that they deposit the greater part of the tartrate of potash during the fermentation, the separation of the ferment, and the first period of the cellaring; while, on the contrary, older wines, which have lain for some time in casks containing tartar, take up again no inconsiderable quantity of tartar, and for that reason give a precipitate when mixed with alcohol; they generally yield less alcohol, and have a stronger acid reaction than new wines. The inferior wines generally produced in 1851, presented a great uniformity in their physical and chemical characters; they were very acid in November, afterwards pale yellow; the taste was strongly though not unpleasantly acid, and purely vinous; they all contained a somewhat large quantity of free carbonic acid.

For the first experiments, an inferior kind of wine, made from white grapes grown in the neighborhood of Bensheim in the Bergstrasse, was selected. The specific gravity was 1.0021 at 57°.2 F.; the percentage of alcohol, 4.8. Mixed with 2 vols. of alcohol, a little tartar separated. On the addition of neutral tartrate of potash, a considerable quantity of tartar was separated, and besides this a soluble salt was formed.

On distillation, a very pure alcohol was obtained, possessing a very agreeable odor of œnanthic æther. The residue contained 60 grs. of acetate of potash. From this residue, when evaporated to a brown syrup, about 14 drms. of tartar separated, besides the salt of an acid, which, from its resemblance to citric acid, the author calls paracitric acid. The acid liquid separated from the saline mass was saturated with carbonate of soda, 20 oz. of which were required. This solution could not be decolorized by means of animal charcoal; it was strongly acidulated with acetic acid, acetate of lead added as long as any precipitate was formed, this lead precipitate decomposed by sulphuric acid, the acid liquor saturated with carbonate of soda, treated with animal charcoal, and precipitated again with acetate of lead, by which means 15 oz. of a lead salt were obtained. This quantity of salt was again decomposed by sulphuric acid, the liquor treated with sulphuretted hydrogen and evaporated to dryness, by which means a pale yellowish transparent syrup was obtained, which after some time became crystalline. This acid is the one contained in the above-mentioned soluble salt. The paracitric acid crystallizes in most cases with difficulty from the concentrated aqueous solution, frequently requiring some months; the crystallization is more rapid at a moderately elevated temperature. The crystals are described as corresponding exactly in form with those of grape-sugar; they are colorless, transparent, rhomboidal prisms, with a remarkable vitreous lustre. When small quantities of the acid crystallize in cylindrical tubes, it forms arborescent masses. The acid is soluble in water in almost every proportion, very soluble in cold alcohol, slightly in ether. The sparing solubility in ether distinguishes it from citric acid; its behavior with lime-water and chloride of calcium distinguishes it from tartaric, racemic, and malic acids; when a solution of the acid (not too dilute) is supersaturated with lime-water, it remains clear until heated to near the boiling-point, when a white precipitate of paracitrate of lime is thrown down. The neutral paracitrates precipitate chloride of calcium only by the aid of heat. The author considers that paracitric acid possesses the physical characters of malic acid united with the chemical characters of citric acid.

Acid Paracitrate of Ammonia, prepared by saturating half of a solution of the acid, adding the remainder, and evaporating to the consistence of a syrup; after several days or weeks, crystals are formed having a vitreous lustre and the form of cane-sugar. By spontaneous evaporation, the salt crystallizes in bunches of prisms like mannite.

The Neutral Potash or Soda Salts can with difficulty be obtained in crystals; the acid potash salt readily forms four-sided prisms; it is readily soluble in water, slightly in alcohol; the solution has a strong acid taste.

Neutral Paracitrate of Magnesia was obtained by saturating the acid with carbonate of magnesia. It forms short prisms with many terminal planes, is slightly soluble in cold water, abundantly in hot, insoluble in alcohol. If the solution is rapidly evaporated to dryness, a transparent amorphous mass remains, which, when dissolved in water and slowly evaporated, again forms the usual crystals. The salt is unaltered by exposure to the air; it loses its water of crystallization between 300° and 392° F. Analysis gave the numbers under I. II. shows the composition of basic citrate of magnesia:

	I.	II.
Magnesia	17.00	17.52
Acid	53.70	46.88
Water	29.30	35.60

The principal difference is in the percentage of water.

Paracitrate of Lead, prepared by adding to a very dilute solution of the neutral soda salt, slightly acidulated with acetic acid, a sufficient quantity of oxide of lead, and then leaving the boiling filtered solution in a cold place. After some time the salt crystallizes in beautiful groups of crystals, similar to the sulphate of quinine; it has a considerable lustre, is almost insoluble in cold water, and sparingly soluble in boiling water. When prepared at the ordinary temperature from concentrated solutions, it has the form of a scaly caseous precipitate, which separates very quickly, and when dried is a pulverulent brilliant mass. Between 158° and 176° F. some of the salt frequently agglutinates to a viscous transparent mass, while the rest remains dry.

Paracitrate of Silver, prepared in the same way as the lead salt. It is white, pulverulent, and quite as sensitive to the influence of light as chloride or citrate of silver. It is distinguished from the latter by its decomposition at a high temperature, at first melting imperfectly, then inflaming and burning with a blue flame like alcohol; the silver remains as a porous, homogeneous, dull mass. For the sake of comparison, the author prepared in the same way the citrate, tartrate, and paracitrate of silver; dried at 158° F., they lost no water. Analysis gave for each—

	I.	II.	III.
Acid	36.60	37.630	36.60
Oxide of silver	63.40	62.370	63.40

Consequently the paracitrate contains the same constituents as the citrate.

Paracitrate of Zinc.—The physical characters of this salt vary with the mode of preparation. When carbonate of zinc is dissolved to saturation in a moderately concentrated solution of the acid, short four-sided prisms with a vitreous lustre are obtained. The salt is abundantly soluble in water, insoluble in alcohol, and tastes faintly metallic like lactate of zinc. Dried in the air at 158° F., it lost its water of crystallization, and gave an analysis—

Acid	63.00
Oxide of zinc	31.50
Water	5.50

When saturated solutions of paracitrate of soda and sulphate of zinc are mixed in quantities corresponding with the above analysis, and allowed to stand for a while in tall vessels, a gelatinous precipitate is deposited, which becomes crystalline when dried in the air, at the same time losing water; its composition is then the same as the above salt. Dried upon bibulous paper, it has the following composition: *

Acid	24.0
Oxide of zinc	12.5
Water	64.0

The author infers from these data that the difference between citric and paracitric acids consists in their relation to water, and that as paracitric acid is contained in the wine made from unripe grapes, while this acid is not present in the juice of thoroughly ripened grapes, it must be converted into sugar during the ripening.

Winckler likewise examined another wine of the same year, from the neighborhood of Monsheim, and not much unlike the above. Its specific gravity was higher, and the percentage of alcohol 4.4. The constituents of this wine proved to be different, and it was likewise found that the influence of the soil affected the composition of the wines of the same year. The examination was carried out in the same manner; the quantity of acetic acid was so small as to be scarcely recognizable; but the acid residue left on distilling 34 lbs. of wine contained a larger quantity of tartar (20½ drms.), and such a large quantity of a gummy substance, that Winckler thought it necessary, after separating the tartar, to mix it with alcohol before treating it with soda and a lead salt. By this means a considerable quantity of a thick magma of dark brown color was separated, which was insoluble in alcohol. It was washed with alcohol, and then dissolved in water, upon which a minute quantity of tartar and paracitrate of potash separated. By reprecipitation with alcohol, a gummy substance of dark color, but soluble in water, was obtained, which when dried in a water-bath weighed just 2 oz., and showed all the reactions of gum.

The acid liquid left after the first treatment with alcohol was then employed for the preparation of paracitric acid, of which however a smaller quantity was obtained than from the former wine.

The Bergstrasser wine which had lain eight months was then examined. It was found to have lost ½ per cent. of alcohol; acetic acid was altogether absent; the quantity of paracitric acid was quite unaltered, but the distillate of 72 lbs. of the wine yielded on rectification over carbonate of potash ½ an ounce of pure butyrate of potash.

The Bouquet of Wine.—Winckler states that the odor of wine depends upon the presence of a compound of a volatile organic acid with a volatile base; this compound always contains nitrogen†, and has a different smell in

* According to Held, tribasic citrate of zinc is anhydrous, and contains 39.42 per cent. of ZnO.

† In the acid or the base?

different wines. The following method of isolating these substances was adopted. From 2 to 4 lbs. of wine were evaporated in a water-bath to the consistence of syrup, in order to separate the alcohol, œnanthic ether, and greater part of the water; the residue was dissolved in 3 or 4 oz. of water, and poured over an equal weight of coarsely powdered caustic lime in a capacious tubulated retort, previously furnished with a condenser and a capacious receiver with a safety-tube, and the whole fitted air-tight. When fresh lime is used, the formation of hydrate takes place in a very short time without the application of heat, and meanwhile there distils over a volatile very limpid liquid, with a strong alkaline reaction, and a peculiar, very agreeable odor. This substance may be completely neutralized by acids, and the solution of the salt thus obtained possesses in a high degree the peculiar *bouquet* of the wine. The residue of the distillation was treated with water when cold, the filtered liquid evaporated, and distilled with the requisite quantity of bisulphate of potash. The distillate was an acid, which, when mixed with the volatile base, formed a neutral salt, and was in short the substance to which the bouquet of the wine was owing.

Winckler treated beer in a similar manner with caustic lime, and obtained a strongly basic ammoniacal distillate smelling of beer and hops. He also obtained a distillate exactly like it by distilling well-washed beer-yeast with lime: the yeast employed to set up the fermentation, on the contrary, yielded scarcely a trace of this nitrogenous compound when treated with lime, showing that it passes into the beer during the fermentation.

The formation of bases by the action of caustic lime upon vegetable juices was likewise attempted with aqueous extracts of ergotized corn, dandelion root, couch-grass root, corn poppy, chamomile, peppermint, the sap of fresh elder roots, aloe bitter free from resin, the aqueous solutions of extracts of dandelion, fumitory, couch root, and wormwood. All the bases formed from these substances by means of caustic lime were, in a hydrated state, volatile, colorless liquids, giving a strong alkaline reaction with litmus. Their origin is readily indicated by their smell. The acids formed simultaneously are analogous to the acetic, butyric, &c.; all possess a peculiar, and many a similar smell, in no way indicating their origin; they form with bases salts, whose chemical behavior distinguishes the greater number of these acids as peculiar. Combined with their corresponding bases, they form compounds possessing in a high degree the odor of the substances from which these products are obtained.

By distilling the dry substance of decayed potatoes with caustic lime, nicotine is obtained; and by distilling musk with lime, a volatile base is obtained, which, combined with the acid retained by the lime, yields a substance possessing exactly the smell of musk.—*Jahrb. fur Prakt. Pharmacie*, xxv. 65–84.

ANALYSIS OF DEAD-SEA WATER.

BY J. H. SALISBURY, M. D.

The traditions and history connected with this Sea, its situation, and the peculiar properties of its water, render it a subject worthy of accurate and extended examination. Its position and extent, together with the mineral and geological formations in and around it, have, by the arduous labors of Lieut. Lynch and others, been determined with a good degree of accuracy.

The water has been analyzed by Dr. Marcet, Klaproth, Gay Lussac, Lavoisier, Prof. Gmelin, Dr. Apjohn, and R. P. F. Marchaud, in Europe, and by Professors Booth and B. Silliman, Jr., in this country. Their analyses have been collected and arranged here in a tabular form for convenient reference.

In the older analyses, only those bodies which were present in the largest proportion were determined. It is by no means singular that the results obtained then should differ somewhat from those obtained more recently, from the fact that the methods of analysis at that time were much less perfect. Other important sources of difference must arise from the different seasons of the year when the water is procured for analysis, the part of the Sea from which it is taken, and whether it is obtained from the surface or some distance below it.

	Dr. Marcet. Ure's Dict., p. 1288.	Dr. Marcet. Thomp. Chem., 8, 170. (1807.)	Dr. Marcet. McCullock's Geogr. Dic.	Klaproth. Ure's Dict., p. 1288.	M. Gay Lussac. Ure's Dic., p. 1288. (1818.)	Lavoisier. Thomp. Chem., 8, 170.	Prof. Gmelin. Amer. Jour. Scien., xlviii. 444. (1896.)	Dr. Apjohn. Amer. Jour. Scien., xlviii. 444. (1839.)	Prof. Booth and A. Meckle, Report to Congress. Lt. Lynch, U. S. N. (1849.)	R. P. F. Marchaud. Amer. Jour. Scien. viii. (1849.)	Prof. B. Silliman, Jr. Amer. Jour. Scien. xlviii. (1845.)
Chloride of Sodium	10.676	10.360	13.360	7.8	6.95	6.25	7.0777	7.839	7.8554	6.578	
" of Calcium	8.800	8.920	0.920	10.6	4.00	} 38.15	8.2141	2.488	8.1075	2.894	
" of Magnesium	10.100	10.246	10.246	24.2	15.31		11.7734	7.370	14.5897	10.543	
" of Potassium							0.2117	0.201	0.6586	1.398	
" of Aluminum							0.0896	0.005		0.018	
" of Ammonium							0.0075				
Sulphate Lime		0.054	0.054				0.0527	0.075	0.0701	0.088	
Bromide Magnesium							0.4398			0.261	
Bromium Salt									0.1374		
Silica										0.003	
Chlorine											10.290
Bromine											0.684
Sulphuric Acid											Trace.
Soda and trace Potash											3.008
Magnesia											2.356
Lime											1.424
Solid matter in 100 parts of water	24.576	24.580	24.580	42.6	26.26	44.40	24.5498	18.780	26.4187	21.729	17.761
Water	75.424	75.420	75.420	57.4	73.74	55.60	75.4602	81.220	73.5813	78.271	82.189
	100	100	100	100	100	100	100	100	100	100	99.900
Specific gravity	1.211	1.211		1.245	1.2283		1.212	1.158	1.22742	1.18415	1.1509

The number of analyses which have already been made by others of this water would seem to indicate that to add another to the list would be almost if not quite superfluous. But since the results which have with great care been recently obtained, differ somewhat in several respects from those previously given, they are thought to be of sufficient interest to deserve a notice.

For the portion of water from which the subjoined results were obtained I am indebted to the kindness of Dr. Howard Townsend, of Albany, who has recently returned from a visit to this Sea.

Appearance of water as obtained, transparent, with a reddish floculent sediment consisting of organic matter and a trace of iron. Taste saline, pungent, bitter, nauseating.

One gallon contained of solid matter 43.323 ounces, or 2.7076 lbs.

	100 parts of water of Dead Sea gave of	One ton of water gave of	100 parts of the solid matter of the water gave of
Water	76.058	151.16	
Organic Matter	0.955	19.10	4.15
Sulphur	0.081	1.62	0.35
Nitric Acid	0.104	2.08	0.45
Silicic Acid	0.058	1.16	0.25
Carbonic Acid	0.024	0.48	0.11
Phosphoric Acid	0.050	1.00	0.22
Sulphuric Acid	0.147	2.94	0.64
Peroxide of Iron	0.023	0.46	0.10
Lime	0.104	2.08	0.45
Calcium	1.591	31.82	6.92
Aluminum	0.048	0.96	0.21
Magnesium	2.024	40.48	8.75
Sodium	3.412	68.24	14.85
Potassium	1.461	29.22	6.40
Chlorine	12.779	255.58	55.60
Bromine	0.141	2.82	0.61
Whole amount of solid matter	23.002	460.04	99.06
	99.060	1981.20	....
Specific gravity	1.1877	....	....

It is by no means singular that the water of this Sea contains so great a proportion of solid matter, when it is considered that it has no outlet to carry away its non-volatile bodies, and that hills of fossil salt are situated on its southwest coast, from which are continually running into it small streams saturated with their saline materials.

At the south end of the Sea is a bed of an indurated nitrous character. Hence the numerous springs of petroleum which occur along its shores. Large quantities of indurated bituminous matter invest the stones at its bottom and along its shores. Hence the small quantity of organic matter.

One gallon of pure water weighs, at 60° Fah.,	10	lbs.
" " Dead-Sea water " " "	11.877	"
One cubic foot of pure water " " "	62.32	"
" " Dead-Sea " " " "	74.1175	"

It is an interesting fact that there is less water and more solid matter in 100 lbs. of Dead-Sea water than there is in 100 lbs. of fresh animal flesh, beet, carrot, parsnip or turnip roots, apples, the fresh leaves of trees in May and June; and as much of each of these as there is in the fresh potato.

PATENT GRANTED IN ENGLAND TO T. SKINNER, FOR IMPROVEMENTS IN PRODUCING ORNAMENTAL SURFACES ON METAL, IVORY, OR BONE.

This invention relates, first, to certain means of producing ornamental surfaces on metal; and, secondly, to certain means of ornamenting ivory and bone.

The first part of the invention consists chiefly in the use of the combined processes of transferring impressions from engraved or printed surfaces on to metal, and electro-plating or electro-gilding them after biting out the metal, so as to leave the design either sunken or in relief. The metal surface to be ornamented is first well cleansed, which may be effected by rubbing with wash-leather and powdered lime. An impression, taken by preference on tissue-paper, is placed face downwards on the clean metal surface, and rubbed on the back with flannel or other suitable material, so as to transfer it to the metal surface; and when this has been done, the paper is washed or sponged off: if stronger paper is used for taking the impressions, the back of the paper is smeared over with black-lead, and rubbed with a smooth ivory or other hard surface; after which the paper may be stripped off from the metal. A ground or coating of dissolved gum (by preference gum guaiacum dissolved in spirits of wine) is laid with a camel's hair brush over the metal; and when the ground is dry, the impression is washed off by means of a little cotton or other suitable material; this may readily be done, as the gum does not fix itself to the impression. Those parts of the metal which were previously covered by the impression being thus left clean, are now bitten out with acid in the manner practised by engravers; and after this the ground is removed.

Or, in place of proceeding in the above manner, the process may be reversed, and the acid caused to act upon every part of the metallic surface which is not covered by the impression. For this purpose, when the impression has been obtained on the metal, it is sprinkled over with powdered resin, asphaltum, or other suitable matter, which will adhere to the impression, but not to the clean metal; and after the superfluous powder has been removed, the resinous matter is caused to melt and adhere to the impression by warming the metal. When the impression has been thus protected by a coating that will resist the action of the acid, the other parts of the surface are bitten out, and then the impression is removed by a suitable solvent.

The metal surfaces which have been treated according to either of the above methods, are to be prepared for electro-plating or electro-gilding by removing the effect of the acid; this is done by the use of hot water, in which a small quantity of potash or soda has been dissolved, and by scratching with a wire-brush. The metal surfaces are afterwards electro-plated or electro-gilded by any of the known processes.

Although this part of the invention consists chiefly in ornamenting metallic surfaces by the combined processes above described, the patentee likewise proposes to produce ornamental surfaces on Britannia metal and German silver, by simply transferring impressions and biting them out with acid, without subsequently electro-plating or electro-gilding the same.

The following are the means of ornamenting surfaces of ivory and bone, which form the second head of this invention:—An impression is first transferred on to ivory and bone in the manner above described; then the surface is covered with a coating of gum, and the impression removed with turpentine, as before; after which the pores of the ivory or bone are opened by the application of diluted acid, and by the aid of ink or dye the parts from which the impression has been removed are dyed; or the dyeing may be effected without the application of acid. Or the parts may be bitten out with acid, and the work filled in with sealing-wax, dissolved in spirits of wine, or other suitable solvent. Gum-lac, or other substances, may be used instead of sealing-wax, and the work may be buffed in order to give it a high-polish.—Sealed August 14, 1851.

ON THE CONDITIONS UNDER WHICH FRESH BREAD BECOMES TRANSFORMED INTO STALE.

BY M. BOUSSINGAULT.

It is generally supposed that fresh bread passes by loss of water into the state in which it is termed *stale*. The author shows that fresh bread also goes over into this state when it is kept in a damp place, such as a cellar, and that the hardest and most brittle crust becomes tough and flexible, in order to prove how improbable it is that the change in the bread depends upon a loss of water. Every one knows also that slices of bread toasted upon a hot plate over the open fire, although they may be heated to carbonization externally, always retain the characters of fresh bread internally.

The author took a loaf of 33 centims. diameter and 14 centims. in thickness, and at the moment of its being taken from the oven inserted into its middle a thermometer, which reached 7 centims. into its substance. In a few moments it was taken out, and showed a temperature of 207° F. That the temperature remained under 212° is readily understood; for even if the oven gave a heat of 482°–572° F., the mass within the crust cannot exceed 212° F., because water evaporates from it. The hot loaf weighed 3.760 kilogrms. It was hung up in a room where the thermometer stood at 66° F.

Near this loaf with the thermometer a second was laid, so as to enable the changes in its substance to be observed. It was shown now, by the observation of the two loaves, that the temperature ceased to change in twenty-four hours, and after the lapse of this time was the same as that of the room. The loaf was now, as usual, half stale, the crust no longer hard. At the same time the entire loss of water amounted to 30 grms., or 0.008 per cent. on the whole weight. On the sixth day the loaf was perfectly stale; the loss by drying now reached 0.01 per cent. According to this it is impossible that the loss of water is the cause of the well-known change in the bread.

The loaf, which now after six days' drying weighed 3.690 kilogrms., was again put into the oven. The thermometer stood in the middle of the crumb at 158° F. When the loaf was cut up, it was as fresh as at first, and weighed only 3.570 kilogrms. It had thus during the refreshing lost 120 grms., or or 3¼ per cent. of water.

The investigation was now carried on in another way. A slice of hot bread was laid in a dish under a bell-glass, the mouth of which was closed with water, so that the air in the bell-glass was consequently always saturated with watery vapor. The piece of bread was weighed daily, at the same hour:—

Weight of the slice of bread.........	32·05 grms.	Fresh bread.
Weight after 24 hours..................	31·81	Half stale.
Weight after 48 hours..................	31·75	Stale.
Weight after 72 hours..................	31·70	Stale.
Weight after 96 hours..................	31·69	Very stale.

From this, the bread became half stale through a loss of water of 0·007 per cent., and the change of the bread proceeded with a further loss of 0·002, 0·0016, 0·0003 on the original weight.

The slice of stale bread was now toasted. It then weighed 28·65 grms., whilst more than nine-tenths of it was restored to the state of fresh bread.

In a tin-plate cylinder closed with a stopper, the author completely restored stale bread to the fresh state in the course of an hour, by a temperature of 122°–140° F. produced by the water-bath.

The staleness of bread, therefore, results from a change in its molecular condition, and not from a loss of water.—*Comptes Rendus*, p. 588.

STABLES AND TREATMENT OF HORSES IN TURKEY.

[Translated for the American Polytechnic Journal, by Ch. L. Fleischmann, from the Repertorium der Thierheilkunde, Stuttgart, 1850.

The Turks build their stables generally of wood. They are dry and well aired. The floor is made of potter's clay; it makes a kind of cement, upon which the horses have a firm footing, and they never suffer from dry and brittle hoofs.

Stables with bad odor or unpleasant exhalation, so common in Europe, and in the new world, are not known there. This must be ascribed to the circumstance that the urine is instantly removed, and the stables always kept clean and dry.

The litter in that country consists generally of horse manure, which has been well dried in the sun and air. In the evening, when the litter is made up, a layer of 7 or 8 inches is carefully spread over the floor. This kind of litter is better than straw, because when a horse lies down or rolls itself it cannot so easily displace it, as is the case with straw. In the morning, after the horses are fed, the wet litter is removed, and the dry portion is pushed under the manger. Some is left between the hind and fore feet, to absorb the urine of the horse.

The hostlers and grooms sleep in the stable, and in the winter they are allowed to make fire in the stable. They have the permission to smoke their pipe unrestrained, which accounts for the pure air that exists in those stables. There is no danger from fire, because the litter is so short that, if in case even hot glowing ashes should fall amongst it, it would be extinguished.

The Turks keep their horses, in the winter, day and night, well protected with covers reaching over the neck and far over the tail. The Turks are very particular that the loins of their horses are always well protected. They say that horses easily get sick by having their loins exposed to cold, and suffer from colic, or inflammation of the chest and bladder, &c.

FRANKINCENSE A REMEDY FOR COUGH IN HORSES.

[Translated for the American Polytechnic Journal, by Ch. L. Fleischmann, from the Repertorium der Thierheilkunde, Stuttgart, 1850.]

Gliocho, a celebrated dealer in Oriental horses, employed frankincense (Gummi Olibani) for cough in horses with great success, especially when it becomes obstinate and is of long duration.

He gives the following account of its discovery:

In the year 1823, he says, I was at the island Pinos, in the Archipelago, where I amused myself for several days in hunting. The children of the farmer where I put up had the hooping-cough so violently that I could not sleep for two nights in succession. I appealed to the parents to apply some remedy, as for instance, a decoction of jalap: my prescription had, however, not much effect.

One day, after I had returned from a hunting excursion, I saw an old relation of the family, who prescribed an infallible remedy for the cough. I did not inquire what she prescribed, and left on the same day to make a visit in the neighborhood, which kept me for five or six days absent.

When I returned to the farm-house, my first inquiry was about the children's health, and the answer was, that the cough had left them entirely. In the same night I very seldom heard the children cough. I was much surprised at that sudden relief, and became curious to know what the old lady administered. I asked the parents for the remedy, and the wife of the landlord informed me that the same old lady whom I saw at her house the day I left prescribed 5 or 6 grains per dose of frankincense, which had to be put in a teacupful of hot water, and exposed during the night to the air; the next morning the frankincense had to be ground up with the finger, and the patient had to take a dose before breakfast. The children took this remedy regularly for five or six days, and after that time the cough left them entirely.

In the year 1827, I had a horse which had a very bad and tenacious cough, such as I never experienced. I used all kinds of remedies, bled it thrice, but every remedy and prescription seemed to be of no avail, and even all the advice of the veterinaries was in vain. The cough increased gradually during five months. I was at a loss what to do, when at once the remedy applied to the children of the farmer at Pinos came to my mind. I sent at once to the druggist, and ordered pulverized frankincense, and gave to my horse, the next morning, one quarter of an ounce, steeped in water, and mixed with the oats. The next and third day I repeated it, and on the fourth day I observed the horse coughed much less, and with less difficulty. I continued this remedy regularly, and in eight days my horse was perfectly cured, and the cough did not return. Since then I administer every time, when one of my horses coughs for two or three days, pulverized frankincense, and the patient at the end of the third or fourth day is perfectly cured. I have used this remedy for more than thirty horses, and succeeded always without experiencing a single failure.

AGRICULTURAL AND INDUSTRIAL EXHIBITION AT MOSCOW, RUSSIA, IN THE YEAR 1852.

The great Industrial Exhibition at London has not only stimulated the inhabitants of the new world to imitate that great world's fair, but even the Russians were aroused from their wintery sleep, and prompted to collect their few natural and artificial productions, and exhibit them at the old city of the czars.

Instead of a vast Crystal Palace, the Czar permitted the exhibitors to use the great Military Drilling Hall, which is 600 feet long, 170 wide, and 42 high, in which the riches of Siberia, Caucasus, Kamschatka, Crimea, Bessarabia, Archangel, and Lapland—of the eastern provinces and Poland, from the most remote parts of the provinces of the north, south, east, and west, from all parts of this great empire—were collected and exhibited to a collection of visitors more curious and interesting, perhaps, than the exhibited articles themselves.

The first place near the entrance of this monstrous building was allotted to a collection of samples of soil, with their sub-soil, from the various zones of the empire, with labels indicating the localities from which they were taken. It is surprising that even in a military despotic government, where the glory and power of the government are ascribed to the bayonet, that even there to the soil has been given the first place,—indicating that agriculture is even there considered the main-stay of power.

Russia is an agricultural country: therein lies its wealth and future greatness, and the beautiful samples of various grain prove not only the productiveness of its soil, but the fitness of the climate to the raising of grain; and the enormous extent of fertile soil prognosticates a large and cheap supply of food, when once railroads and canals penetrate into the distant but productive regions.

The writer of the article from which we make this extract says, very properly, the Crystal Palace may have contained much of the most splendid, costly, and rare of all parts of the world, but it was wanting in such a collection of grain, of which Russia may justly be proud.

The pupils of the agricultural school at Moscow, under the direction of their professor, who was educated at the Gorigorezc's Agricultural Institute, with the assistance of some engineers, decorated mostly this vast hall, and explained to the visitors the object of the exhibition.

The gardens of Moscow and its vicinity furnished trees and flowers for the embellishment of the hall, and garden fruits and vegetables were formed into tasteful groups.

A collection of agricultural plants and seeds, an interesting collection of the various specimens of wood grown in Russia, and various models of agricultural implements, were among the articles exhibited.

At the end of the first division, Prince Lwow exhibited a small, very light house, placed upon two wheels. The frame was covered with varnished linen. The house is used by the exhibitor to shelter the babies of women who are employed in the field, and protect them from cold, rain, and wind, whilst the mothers are at work. Our informant says: "Many visitors examined this contrivance with much curiosity, and determined to introduce it among their white slaves."

In the south, in that barbarous country where the savage negro is civilized, the children are kept at home in a nursery and properly taken care of, and not carried into the field, where they must suffer in a Russian atmosphere, even when protected by a canvas roof and walls. What a great philanthropist that Mr. Prince Lwow must be!

In the second section of this exhibition of the products of industry were to be seen plaited shoes of bass, the finest hats made of fibres from roots, summer and winter garments of the Russian nations, European and Asiatic woven articles, carpets and embroidered handkerchiefs, a rich collection of merino fleeces, showing the progress of the merino breeds in the empire, and specimens of beet sugar of home manufacture.

In this division was also exhibited Russian silk, which proved, like the fine wools, to have made great progress. Moscow gave the first impulse to the introduction of silk culture, and it has awakened much interest even in the remotest provinces of the empire. The samples exhibited show, however, much neglect in reeling. Specimens of morocco leather took up a considerable space.

This great northern exhibition began, according to the Russian custom, with prayer, and ended with salt and bread.

NEW PHYSICAL PHENOMENA.

F. Schwaerzler, of Bregenz Tyrol, who invented, some years ago a peculiar hydraulic motor, made lately some very interesting observations, which deserve the notice of scientific men.

The experiment is made with a glass vial partly filled with water, into which a glass tube of a small bore is introduced, reaching nearly down to the bottom of the vial; a tube is passed through a cork, and both hermetically fitted into the vial; the other end of the tube is passed into a funnel; the tube is also secured by a cork, and is allowed to reach above the cork. When this apparatus is placed in a vessel with boiling water, the air in the vial expands and drives the water into the funnel above, and a part of the expanded air. When the last air-bubbles have been forced through the water, it will be observed that not only the water returns again into the vial below, but also a quantity of atmospheric air is drawn down by the hot vial, which may be noticed by the air-bubbles and the noise which the air produces in rushing in. The vial below is now again in its normal state, and the boiling water produces the same effect just described, and continues as long as the vial is kept in the boiling water.

Mr. Schwaerzler employed this phenomenon as a motor, and works a small model with it. We have tried the experiment, and have succeeded admirably well.

The second consists in the condensation of air by means of wet sand. The experiment can be tested by filling a cylindrical vial with dry sand, and by wetting the surface of it, and to put a small quantity of water over it; immediately the wet portion of sand is raised by the compressed air to one half or three-fourths of an inch.

MISCELLANEOUS.

WHICH ARE THE BEST KINDS OF GRAIN AND POTATOES FOR FARMERS?

The following grain and potatoes obtained three times in succession the first prize at the Convention of the German Agriculturists:

1. Probsteier winter rye stands the severe winters of Northern Germany well, and is very productive.
2. Probsteier summer rye, productive, and weighs heavy to the bushel.
3. Marygold wheat, an English wheat, large ears, heavy grain, and productive.
4. Brown club wheat, with white ears, withstands the brand better, even when sown than some very late.
5. English white wheat.
6. Arnautic wheat, the grain is light yellow, heavy and very farinaceous. It is a bearded wheat, and stands well the northern climate.
7. Scotch annat, or heavy barley, surpasses all known sorts of barley in productiveness and weight of grain.
8. Scotch heavy Berwick oats, the grain is heavy, full, has a thin husk, and contains much farinaceous matter, and besides rich in straw.
9. Biewitz, an oil plant, similar to rape-seed, very highly recommended because it suffers less from cold and wet.
10. The red-blow marbled potato, among all the known sorts of potato the most farinaceous, heavy, easily cooked, and less liable to disease.

WOOL PRODUCTION AND WOOL TRADE OF SOUTHERN RUSSIA.

The best breeds of sheep which are raised in Southern Russia are Merinos, Figaja, and Donskoi. The first merino sheep were imported from Spain in that part of Russia, forty years ago. The Figaja breed was crossed with the merinos, and the offspring (metis) have been improved by careful breeding and crossing, and furnish now the greatest portion of fine wool produced in that part of Russia.

Encouraged by the results of these crosses, the proprietors of large estates procured from Silesia and Saxony electoral sheep; but in Southern Russia the original Spanish breed is yet predominant, whereas in Poland the Saxon breed has gained the supremacy. There are about 10,000,000 of improved Figaja, which yield an average 5¼ lbs. pr. head, 1,300,000 pud. The common Figaja are exclusively found in Bessarabia. Their wool is less fine and less soft than the metis, but much longer. The wool of the common Figaja ranges between the second-class metis and that of the Donskoi. The production of wool in Bessarabia is estimated at 100,000 pud, of which two-thirds are exported by land or the ports on the Danube, while the rest goes from Odessa to Marseilles, England, and Belgium. The Donskoi wool comes from the common sheep of Southern Russia, and is raised in large quantities in New Russia, Bessarabia, and Crimea. That raised in New Russia is long, fine, soft, and strong; that of Bessarabia, fine, but shorter and curled; that of the Crimea still more curled, short, and much felted. The difference in price between the Russian and Crimean

Donskoi wool is about 3 rubles pr. pud. Odessa exports on an average 70,000 to 80,000 pud of washed Donskoi wool to Marseilles, Trieste, Liverpool, and the United States of North America.

In the year 1852 were exported from Russia 220,000 pud; from the Asarisha 120,000 pud; from the Crimea 30,000 pud; by land to Austria and Germany, 70,000 pud; sum total 440,000 pud.

Although sheep-breeding is carried on at present on a very considerable scale in Southern Russia, the decrease can be foretold with much certainty. In the first place, the prices of fine wool have already much diminished. Secondly, the rents of land have risen at least threefold, and the value of horned cattle and grain has also considerably increased, consequently the estate owners will find it much more advantageous to pay more attention to breeding of cattle and agriculture in general, especially as the increase of population furnishes the necessary amount of labor. If there should not rise some more favorable circumstance for the wool producer of Southern Russia, its best period has passed.

Vereinighte Frauendorfer Blaette, March 1853. *N.* 13.

BOOK NOTICE.

THE AMERICAN HAND-BOOK OF THE DAGUERREOTYPE: by S. D. HUMPHREY.

GOOD works on Photography are very scarce, and we are gratified with this manual as embodying the whole practice of daguerreotyping, and much useful and interesting material relating to the art, of an experimental as well as of a practical character.

C. G. P., *Ed.*

THE AMERICAN

POLYTECHNIC JOURNAL.

ON THE WORKING OF WOOD. No. 5.

BY J. J. GREENOUGH.

A Historical Sketch of the Devices employed in working in Wood, including Sawing, Planing, Turning, Boring, Mortising, Carving, and other Ornamental Work.

In our last article we completed our general account of planing machines, giving types of each different system, and bringing them down to the present time. We of course omitted many individual machines, but no device, we believe, that has materially advanced the art.

TURNING.

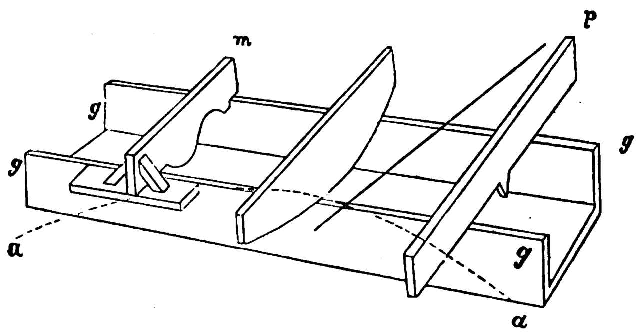
We now turn to a branch of the art of working in wood, more interesting to the general reader, which has attracted the attention of the tyro more than any other mechanical process. Turning is of very ancient date; and perhaps there is no machine of such general application as the lathe: it serves the roughest purposes, and can be used for the most finished work. The varied and elaborate ornaments that are wrought by it, and the puzzles of the most paradoxical character which have been performed by its aid, render it the most attractive to the mathematician and amateur. The highest problems in descriptive geometry have been practically wrought out by it, and figures of endless complication described in its works. It may be too far from our purpose to carry the reader through all the complicated and universal uses to which the lathe is applicable, as it would involve nearly a general history of the trades; yet the most important movements of the lathe will be given, even at the risk of passing out of our legitimate subject —the working of wood. We shall not attempt to trace its history far back, but some of the oldest works on mechanics describe the art of turning.

Bessoni, in his *Theatrum Instrumentorum*, published in 1582, figures two curious lathes for irregular turning, showing considerable advance in the art at that time. In 1680, Moxon's English pamphlets on turning appeared, in which oval turning and *swash-work* are described, as well as rose-turning. Seviere, in his *Recueil d'Ouvrages Curieux*, shows several exquisite specimens of irregular turning, involving irregular or "*hor-du-ronde*," swash, rose, and engine turning, together with that wonder of ingenuity first introduced from the Chinese, of turning a series of openwork, hollow spheres, or other figures, one within another, which has often been imitated in Europe, and is now as well known as most of the curiosities in turning.

To make what is afterwards said of the more complex turning machinery well understood, it may be proper here to commence with the rudimentary principles of action which prevail in all cutting, and in fact in most forming-tools. They consist of two elements: the form of the tool itself, and the motion employed, of which the work is the united copy. Or, in the words of a recent able writer, "We exactly put in practice the geometrical definitions employed to convey to us the primary ideas of lines, superficies, and solids; namely, that the line results from the motion of a point, the superficies from the motion of a line, and the solid from the motion of a superficies." Therefore, if a tool is but a single point, if put in motion over a stationary surface, or a surface be put in motion against it, a single line would be the result, of which it would require a great number of repetitions to form a superficies; but if the tool was broad, so as to represent a line, or one dimension of the superficies, then by a single motion perpendicular to its breadth, it will form a superficies, which will be straight or curved according to the form of the edge of the tool, or the direction of the motion.

The following is an ingenious and familiar illustration of these facts: if a trough *g* is formed and filled with plastic material, such as moist clay, and

Fig. 1.



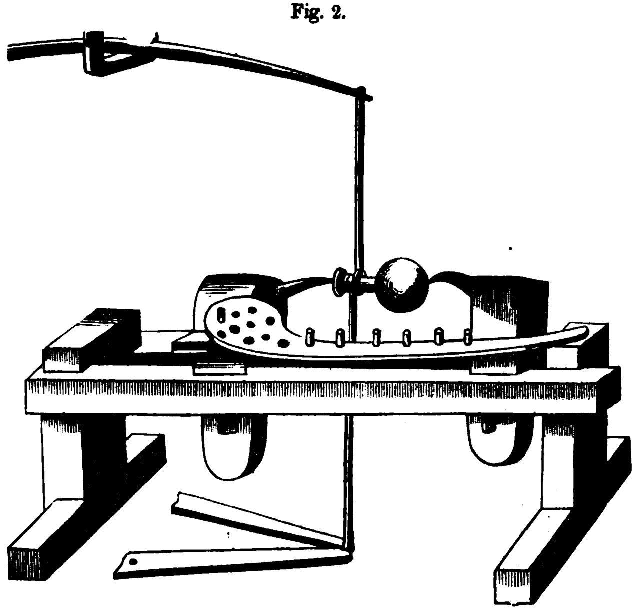
a straight edge, such as the line *l*, be drawn along the straight edges of the sides of the trough *g*, a plane will be formed level with the edges; if a straight-edged piece *p*, having a point projecting from its lower edge, be then drawn from end to end of the trough, the point will impress the surface with a single line, as deeply as the point projects. If the piece *p* is drawn straight forward, with a motion parallel to the sides of the trough, the line will be straight; but if the motion of *p* be compound, then the line made by its point will be the expression or record of these two motions. Again, if the single point be made to pass over every portion of the surface of the clay within the trough, the whole surface would be reduced below the sides, as deep as the point projected, which would of course require considerable time; but if we had designed the shape that the superficies was to assume in its cross-section, we could, with the edge of a piece formed to correspond therewith, by a single movement of it from end to end of the trough, impress the clay with the desired figure; this is shown by the curved piece *c*, or the more complex moulding *m*. It is obvious that any other than a rectangular motion given to these pieces would produce corresponding results, by which wavy, zig-zag, or other varieties of ornament might be effected. If the edges of the trough were curved instead of straight, as shown by the dotted line *a a*, the superficies would be formed to that curve which would describe a cylinder, if continued around the complete circle.

Upon these elements, the whole *Art of Turning* rests, with all its multiplex details; but it is confined, as its name indicates, to a rotary motion of the work or tool. If any material be made to rotate around a fixed axis, a stationary point at any given distance within reach of the material will describe a circle upon it; if this point be a cutter, it will separate all that portion of the material beyond the circle from the other part; and if the point is gradually moved along in a line parallel to the axis of motion from end to end of the material, so that it touches every part of the exterior, a cylinder will be formed; but if the point or cutting-tool be made to approach or recede from the axis of motion, the diameter of the material will be diminished or increased accordingly.

This is simple elementary work; its results are seen on the wooden columns, balusters of stairways, and balconies of houses; on bed-posts, chair and table legs in furniture, as well as in numerous ornaments or necessary comforts in domestic economy. It may be assumed that every article of a circular or cylindrical figure is the product of the lathe in some one of its modifications.

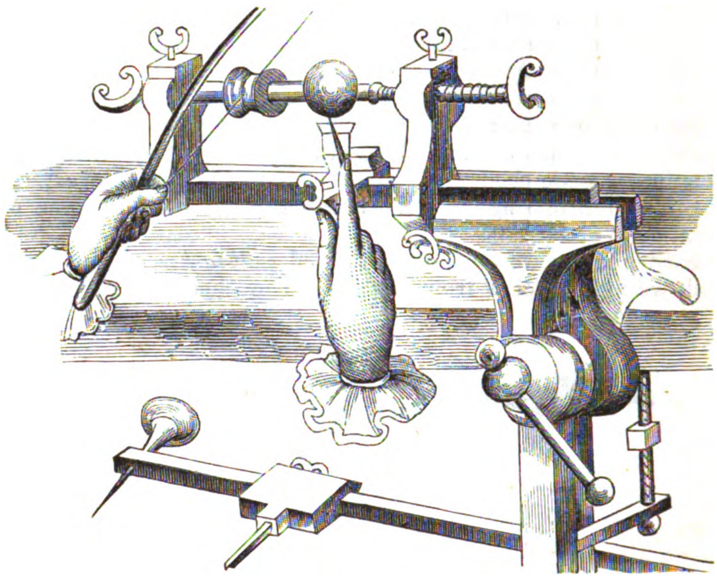
The earlier lathes were what are termed *poll-lathes* or *spring-lathes*, one of which we figure below from Moxon. The cheeks or rails of the lathe

Fig. 2.



were like the ordinary modern wooden ones, with puppet heads or stocks, mandrel, &c.; above this lathe there was a spring-pole, to the end of which a cord was fastened that passed down around a pulley on the mandrel, to which the article to be turned was fixed, or around the article itself, and thence extended down to the treadle below. By this contrivance it will be perceived that when the treadle is borne down, the cord passing around the pulley on the mandrel above named causes it to revolve, and at the same time the spring-pole is bent downward; as the treadle is relieved, and rises, the spring draws up the cord, and the mandrel is turned in the opposite direction; thus as the treadle and spring work up and down, the work makes a few revolutions in one direction, and then back again. This alternating motion is very detrimental to expeditious and regular execution; but by ingenuity, skill, and perseverance, some very beautiful works have been thus executed. In the same way, a bow has been used to turn a lathe, but this was generally for small articles; such a lathe is shown in the following figure from Moxon.

Fig. 3.

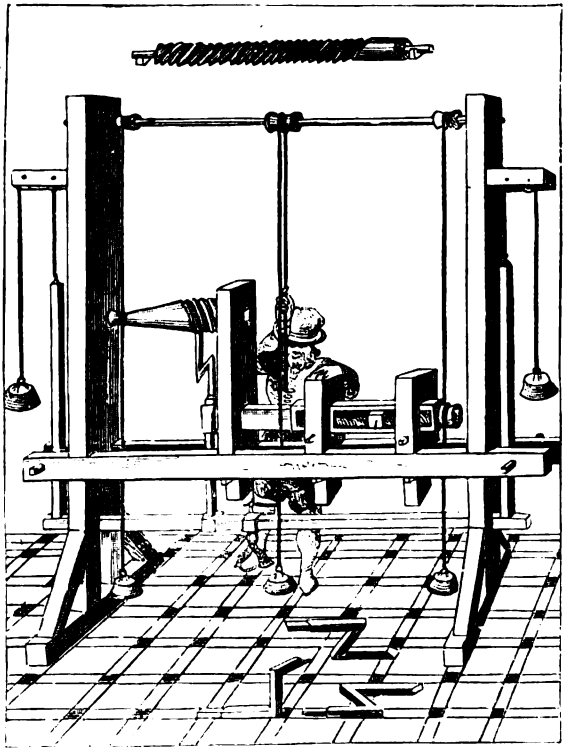


The next step in advance was to add a large wheel, with a band running from it to the mandrel pulley; and this is used to the present day in all lathes turned by manual labor. The large wheel is either turned by hand, or by the foot acting upon a treadle connected with a crank on its shaft.

To turn a spiral, it is necessary to move the cutting-tool along as the material turns around, faster or slower, according to the pitch we desire the spiral to take, but at least equal to the breadth of the cutter at each revolution of the work. For great accuracy, it is necessary that the tool should have an automatic motion, progressing in exact relative proportion to the rotation of the article to be wrought. The great difficulty encountered, and mechanical skill required, to effect this by hand, led very early to the invention of some automatic means to remedy the defect, and what is known as a slide-rest to hold and move the tool was devised: a screw was used as a sort of pattern to move the tool along, turned by the same device as the article to be wrought was revolved by. The earliest illustration of this kind with which we are acquainted is figured by Bessoni, Fig. 9 of his *Theatrum*, 1582, a copy of which is here given; but the modern tool will be hereafter shown in its more perfect forms.

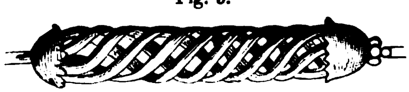
By spiral turning various kinds of reeding in figures were formed, and by cutting spirals on a hollow cylinder, and piercing it through a series of

Fig. 4.



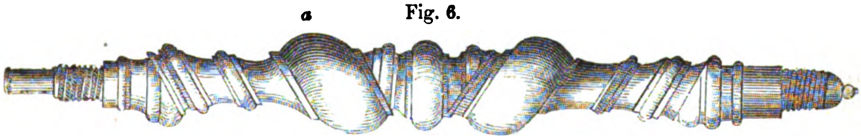
separate spiral rods, were formed out of the single piece, like the following, which we often see in ornamental turned work.

Fig. 5.



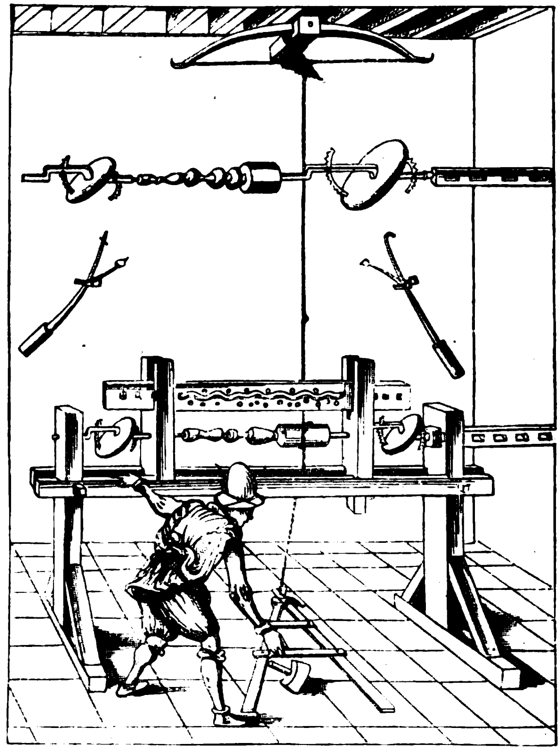
The next step we shall notice in turning is what by old English writers was called *swash-work;* it consisted in distorting the mouldings, &c., and causing them to run around the article in an inclined position, instead of

Fig. 6.



being made in a line perpendicular to the axis. We give a port-crayon formed in this way from Seviere, in which it will be seen that the mouldings are inclined two ways from the centre, on the line *a a*. This was a favorite mode of ornamenting in the lathe practised by the earlier workmen. A lathe for this kind of work is shown here, taken from Bessoni, 1569, in which the mode of operation is clearly shown. The two mandrels upon which the work is centred have upon them a disk of wood or metal *a*, which have two metal segment-bars extending out from them, one on each side, that pass down through holes in the mandrel; the disk is so attached that it can be inclined to any degree upon the mandrel, and fastened in that position, the two disks at each end being inclined alike. Above these is a slide-rest in

Fig. 7.



proper supports, which has an endways motion given to it by the disks as they revolve. Now, it will be perceived if a tool be attached to this rest, and brought into contact with the revolving work, a moulding will be cut upon it; but instead of running straight around, it will assume an inclined position like the guides. A modification of this was to cause the mandrels themselves to move endways by similar means, and hold the tool still, as in ordinary turning.

The next step in advance was to cause the revolving material to recede from, and advance towards, the stationary tool, by which oval and other and more complicated figures can be made. This was effected in early times by giving the mandrel a lateral movement, by causing the collar in which it turned to vibrate back and forth. On the same mandrel to which the work was affixed, was placed a wooden pattern of the same figure in its outline as that to be wrought, which bore against a roller on a stationary axis; a spring kept the pattern against the guide-roller, and thus a motion was given to the work suited to the figure to be cut, so that a cutting-tool, held opposite in a stationary position, would form it in accordance with the figure produced by this compound motion. A device for the purpose is figured in Moxon, and several varieties are to be found in the old *Encyclopædia des Ars*, and *Manuel du Tourneur*, French works of the last century. Engine-work, rose-turning, and other tracery in endless variety, have been made on the face of a plate revolving in a lathe, having the tool parallel to the mandrel, and also moving, the motions being compounded to produce any variety of figure; but as these machines have rarely been employed on wood, we shall not at present describe them.

In the famous patent before frequently referred to by us, of Bentham, in 1793, is described, among other things, a series of devices for turning in a lathe. The first noticeable device is a *presenting bed*, in which a piece can be properly and readily presented to the lathe. If the piece be square or cylindrical, the bed should be V-shaped, which will answer for all sizes, and in fact for most forms; it is affixed to the lathe so as to be raised or lowered at will. The second matter of importance is the tool-rest. "The turning a number of pieces exactly of the same figure, may be facilitated by enabling the tool to receive a more effectual guidance from the rest. If the length of the piece to be turned comes within the compass of the breadth that can be conveniently given to the tool, then, having any tool adapted to the figure required, let there be a channel for the rest, in which channel the tool may slide up towards the piece till the work is finished—a movable stop being adjusted on the tool, so as to prevent its being shoved too far. But, if the piece be so long as that the tool must, in order to enable it to complete its work, be movĕd along the piece, provide a rest extending the whole length of the piece; in which rest make along its whole length a channel, conformable to the general external figure which the piece is to be of when finished—no regard being had on this occasion (for reasons that will hereafter be seen) to small projections or indentures. Let there, moreover, be a block, with two equal round pins projecting from the under side of it, each of them fitted into the groove of the rest, so as to slide in it without shaking. In this block, let the tool slide up to the piece, through a groove or mortise, with a screw through the top of the mortise, to fix it at any part of its course, and with a stop or shoulder to prevent its being advanced too far. The tool may, in that part of its edge which is to be first presented to the piece, be adapted to cutting away the roughest part; in the other part to the smoothing of the work; and these two parts of the tool it may be convenient should be separable from each other. Apply, now, this tool to one end of the piece, and, as the piece turns, let the tool advance along the channel in the rest. The piece will thus receive its configuration according to that of the channel, supposing no sharp projection be included in its figure. If, on the other hand, any such projection is to be left, a stop must be provided for stopping the tool at that part of the rest. At this period, let the tool be drawn back through its mortise, and when it has passed the place of the projection, it may be advanced again up to its shoulder, and the operation continued as before. To finish any such projection, provide, as before, at that part of the rest a fixed block, with another tool on it sliding up to the work through a mortise or channel; and so in case of a cavity."

"For turning long and slender articles, besides the channel already described for the guidance of the tool, let there be on the other side a corresponding channel, in which moves a slider, similar to the one employed for the application of the tool; to this second slider fix a support, which is to be made to keep pace with the tool, keeping only so much behind as not to touch the piece, except when it has already received its figure. Instead of a simple cutting-tool sliding in a channel, as above, a circular cutter may be employed, turning upon its axis. If certain parts of the same piece, or the whole of it, be required, instead of being round to be of any number of sides, and yet of a figure corresponding to that of the channel in the rest, keep the piece stationary in the lathe instead of turning it, and the sides may be formed successively by a simple cutter, like a plane or chisel, guided as before, each side being formed by one or repeated strokes, according to the nature of the case. Or, instead of the cutter, of the sort just mentioned, may be employed a circular cutter, turning on a spindle which plays in a support, which support slides in the channel above spoken of. By the introduction of a dividing-plate and index, the number of sides may be determined at pleasure.

"Instead of guiding the tool in its motion along the piece, as above spoken of, by a fixed channel or otherwise, another mode is to make the lathe itself, with the piece suspended in it, to reciprocate or traverse, longitudinally, the tool remaining stationary; this longitudinal motion may be either straight, waved, or otherwise curved. A tool with a rotary motion may be equally applied to the cutting of screws, of all sorts and sizes. Adapt the edge of a circular cutter to the shape of the thread, and adjust the spindle of the cutter to the angle of the spiral, give then a quick motion to the cutter while the piece is turning gently round in the opposite direction, at such a rate as to give time for the cutter to clear its way, and the screw will be completely cut as the piece advances. For cutting taper screws of all sorts, and fuzees for watches, &c., circular cutters may very advantageously be employed; all you have to do is to make them advance to, and recede from, the piece, according as the taper or shape requires.

"If, while the piece rotates without advancing, you present to it at the proper angle a short, straight knife, guided along the channel rest, the combination of the two motions, the rotary with the longitudinal, will produce the drawing stroke necessary for cutting cork and other soft, elastic substances."

The same author also describes *Working by a Reciprocate Lathe*:

"From the reciprocate motion, as applied to sawing, it will be easy to conceive a new mode of working by means of an engine, which I call a reciprocate-lathe. I call it a lathe, because it is by the motion of the piece that the tool is made to act—the tool itself being supported on a rest." The difference between this lathe and an ordinary one is that it does not revolve, but has a reciprocating motion, either straight or in some curve. The wood is fixed in a frame like a saw-frame, and plays up and down while a tool like a turning-tool is presented to it, and cuts in a straight, longitudinal line, or on any curve given. "A man used to turning will thus make any straight moulding as easy as he does a circular one in a turning-lathe. So, most of the contrivances used in engine-lathes to vary the figure of the piece, may, whenever it may be thought worth while, be applied to this reciprocating lathe."

This device has also been used for reeding and fluting columns, &c., and forming polygonal legs for furniture, posts, and other articles; and several different machines have been made to effect this purpose. They were figured in the French Encyclopædia and other works, a specimen of which we may give hereafter. Instead of moving the work, as Bentham proposes, the tools have generally been moved; the article to be wrought being suspended so as to turn on its axis, with an index attached to one end, by which it could be easily turned to any number of equal divisions; and thus a hexagonal or other polygonal post has been made with any variety of outline and taper in its vertical section.

Such was the state of the art of turning at the commencement of the present century. We have since added nothing to its curiosities, but we have greatly improved its machinery, and adapted it to many useful purposes that at most were only before hinted at; and in our next we shall show how the elements here named have been employed for modern purposes.

PRACTICAL RESULTS FROM THE DISCOVERY AND STUDY OF POLARIZED LIGHT.

When an isolated principle or truth in any branch of science is discovered, the question is immediately asked, *cui bono? quid utile?* of what use is it? Franklin answered this question for all time, by asking another, viz., "What is the use of a new-born babe?" Of what use or importance to man was it that, in 1810, M. Malus discovered that the different sides of a ray of light are possessed of different properties in relation to the plane of its incidence? This is one of the most obscure of all scientific propositions, and yet we shall soon see how triumphantly the caviller is silenced, and how liberally even this little fountain has poured its treasures into the lap of art.

Without entering into the elucidation of the facts, we will briefly enumerate them as they occur to us.

When glass is properly annealed, and of a good quality, it exhibits no change of colors when examined by polarized light. If the glass has not been properly annealed, the polariscope instantly detects the defect by the display of colors. The annealing of glass is expensive, and the manufacturer often slights this part of his work. Glass tumblers, pitchers, decanters, tubes, &c., not well annealed, break often upon the slightest scratch, or upon the sudden application of heat or cold. Glass tumblers will often crack when a piece of ice is left in them, and frequently break when set away by themselves, owing to some slight scratch which they might have received a week previous.

Following the directions laid down in treatises on polarized light, a few little plates of glass, or what is better, a Nicol's prism and piece of glass blackened on one side, will show the purchaser whether he is buying annealed glass or not. The Nicol's prism or eye-piece is a simple apparatus costing from one to ten dollars, and so small that it may be carried in the vest-pocket without inconvenience.

If a piece of annealed glass be pressed or bent, the arrangement of its particles becomes disturbed, but this disturbance does not manifest itself to the eye, nor to the most powerful magnifier. But when viewed by polarized light, the whole internal commotion reveals itself in the most beautiful manner; and while the pressure is increasing, disruption seems inevitable, though all the while to the naked eye no sign of fracture or change is apparent. A beautiful feature in this experiment it is, that it shows exactly in what direction fracture would take place if the pressure were sufficiently increased. Taking advantage of this property, model bridges and other structures have been made of glass; and when submitted to strain or pressure, the polarized ray discloses to the architect what neither the unassisted eye nor calculation could ever discover.

The quality of gems for jewelry is determined by polarized light. The quality of sugars and of many articles of commerce, and of woven fabrics suspected of adulteration, may be proved by polarized light. When you enter a picture gallery, you are often cheated of a good view of some painting by the strong reflection of light from the varnish, and you may not be able to select a suitable position. Look at the picture through Nicol's eye-piece, and all this reflected light is at once obliterated, and you have a good position anywhere. It is the same when specular reflections interfere with the sight in viewing a landscape or any distant objects.

Last, and not least, the mariner often detects, even at a great distance, shoal-water or sunken rocks by the color of the water; but if the sun is shining, and the reflection from the waves is before him, he can see nothing to enable him to judge; and even a reef, under such circumstances, might be slightly above water without his being able to see it. The Nicol's eye-piece extinguishes all this reflected light, and gives him a clear view of what is before him. To hunters and anglers this property of the eye-piece is often very valuable.

For true splendor and variety, the phenomena of polarized light surpass all others in the whole range of science. Without enumerating all the advantages resulting from the discovery of Malus, we think we have answered *cui bono?* on this subject to his satisfaction.

C. G. P., *Ed.*

DECISIONS IN THE SUPREME COURT IN PATENT CASES.

1850. Wilson *vs.* Sanford & Another. 10 Howard R. p. 99.

Appeal from the decision of the Circuit Court of Louisiana. The bill was to set aside a contract authorizing the use of the Woodworth planing machine, and to enjoin against further use under it.

Held,—The matter in controversy arises under the contract and not under the patent law. The sum in dispute does not exceed two thousand dollars, and an appeal cannot therefore be taken, except in cases where the court below shall specially authorize it under the 17th section of the act of 1836.

Where that court deems it reasonable, under that section, it can authorize an appeal, or writ of error, however small the sum in dispute may be.

The object of that provision is to secure uniformity of decision in patent cases.

The dispute in this case does not arise under any act of Congress; nor does decision depend upon the construction of any law concerning patents, but arises upon a contract. The rights of the parties depend upon the principles of the common law and equity. Contracts concerning patents are to be disposed of like other contracts. The parties litigant stand upon the same ground as to appeals as other parties. This court, in such cases, when the matter in dispute is less than two thousand dollars, has no jurisdiction.

1850. Stimpson *vs.* The Baltimore & Susquehanna R. R. Co. 10 Howard R. 329.

Error to the Circuit Court of Maryland.

The cause was not tried, but submitted upon a statement of facts agreed upon.

"The combination claimed by the plaintiff, as his improvement, consists of the use of grooves on both sides of a railroad track, and either cast in iron plates, or made by the parallel position of double lines of flat rails, in which grooves the flanches only of car-wheels are to run." The whole of this combination is to be depressed to the plane of the street where used.

The defendants' machinery, complained of, consists of a double flat rail of cast-iron placed on the inner side of a curve intended to be passed; and the whole of this machinery is constructed on a plane with the general track of the railroad, without regard to the convenience of carriages.

Held, not to be identical in mode, design, or in result, but wholly dissimilar, and no infringement. Proutty *vs.* Ruggles, 16 Pet. 341, and Carver *vs.* Hyde, 16 Pet. 513, cited and confirmed.

In England, an appellate tribunal will not review an agreed case when there was no actual trial and rulings by the court.

But in 16 Peters, 291, this court held otherwise. It said,

"This court, therefore, has no hesitancy in declaring that the point of practice raised by the defendant's counsel presents no objection to the regularity in the mode of bringing this case before it.

"Regarding the above conclusion as promotive both of justice and convenience, we give it our entire concurrence; and upon the character, therefore, of the particular cause before us, as disclosed in the case agreed by the parties, we decide that the judgment of the court be, and the same is, hereby affirmed."

1850. GAYLOR & BROWN *vs.* WILDER. 10 Howard R. 477.

Error to the Circuit Court for the Southern District of New York. The validity of the patent for the Wilder Safe was in question.

"The inventor of a new and useful improvement has no exclusive right to it, until he obtains a patent. This right is created by the patent; and no suit can be maintained by an inventor against any one for using it before the patent is issued. But the discoverer of a new and useful improvement is vested by law with an inchoate right to its exclusive use, which he may perfect and make absolute by proceeding in the manner which the law requires."

By the act of 1836, every patent is assignable in law; the assignment must be in writing, and be recorded. The thing to be assigned is not the mere parchment on which it is written, but the monopoly it confers—the right of property it creates.

"And when a party has acquired an inchoate right to it, and the power to make that right perfect and absolute at his pleasure, the assignment of his whole interest, whether executed before or after the patent issued, is equally within the provisions of the act of Congress."

This is the construction which was given to the act of 1793, at the circuits; and there is no material difference on this point between that and the present act. To change this long-established rule would work great injury.

When the patent issued to the inventor, who had previously assigned it, the legal right to the monopoly and property created by it was, by operation of law, vested in the assignee.

The monopoly granted by a patent is for the entire thing—the exclusive right of making, using, and vending the improvement. It did not exist at common law; and the rights which may be exercised under it cannot be regulated by the rules of the common law.

"It is created by the act of Congress, and no rights can be acquired in it, unless authorized by statute, and in the manner the statute prescribes."

By the eleventh section of the act of 1836, the patentee may assign his whole interest, or an undivided part thereof. If he assigns a part under this section, it must be an undivided part of his entire interest under the patent, placing the assignee on equal footing with himself for the part assigned. Upon such an assignment, the patentee and his assignee become joint owners of the whole interest secured by the patent, according to the respective proportions which the assignment creates.

By the same section,* the patentee may assign his exclusive right within and throughout any specified part of the United States; and upon such assignment, the assignee may sue in his own name for an infringement of his rights.

But this assignment must be for the entire monopoly in the territory, excluding the patentee as well as others, otherwise it would be a mere license. Congress did not intend to allow several monopolies to be made out of one in the same territory; such a construction might lead to numerous suits for the same infringement, by the holders of different interests.

A contract for the purchase of any part interest of a patent may be good between the parties as a license, and enforced as such in the courts of justice. But the legal right to the monopoly remains in the patentee, and he alone can maintain an action for an infringement.

Blanchard *vs.* Eldridge, Wallace J. Rep. 337, cited and approved.

A patent can only be granted for a new and useful improvement "not known or used by others before his discovery or invention." If it is shown on a trial for an infringement that the patentee "was not the original and first inventor or discoverer of the thing patented," the verdict shall be for the defendant.

Upon the literal construction of these particular words, the patentee in this case was not the original or first inventor, if the Conner safe was the same with the patentee's, and preceded his discovery.

"But we do not think that this construction would carry into effect the intention of the legislature. It is not by detached words and phrases that a statute ought to be expounded. The whole act must be taken together, and a fair interpretation given to it, neither extending nor restricting it beyond the legitimate import of its language, and its obvious policy and object. And in the 15th section, after making the provision above mentioned, there is a further provision that, if it shall appear that the patentee, at the time of his application for the patent, believed himself to be the first inventor, the patent shall not be void on account of the invention or discovery having been known or used in a foreign country, it not appearing that it had been before patented or described in any printed publication.

"In the case thus provided for, the party who invents is not, strictly speaking, the first and original inventor. The law assumes that the improvement may have been known and used before his discovery. Yet his patent is valid if he discovered it by the efforts of his own genius, and believed himself to be the original inventor. The clause in question qualifies the words before used, and shows that by knowledge and use, the legislature meant knowledge and use existing in a manner accessible to the public. If the foreign invention had been printed, or patented, it was already given to the world, and open to the people of this country as well as to others, upon reasonable inquiry. They would therefore derive no advantage from the invention here. It would confer no benefit upon the community, and the inventor therefore is not entitled to the reward. But if the foreign dis-

* The Report incorrectly refers to the 14th section.

covery is not patented, nor described in any printed publication, it might be known and used in remote places for ages, and the people of this country be unable to profit by it. The means of obtaining knowledge would not be within their reach; and, as far as their interest is concerned, it would be the same thing as if the improvement had never been discovered. It is the inventor here that brings it to them, and places it in their possession; and as he does this by the effort of his own genius, the law regards him as the first and original inventor, and protects his patent, although the improvement had in fact been invented before, and used by others.

"So, too, of the lost arts. It is well known that centuries ago discoveries were made in certain arts, the fruits of which have come down to us, but the means by which the work was accomplished are at this day unknown. The knowledge has been lost for ages. Yet it would hardly be doubted, if any one now discovered an art thus lost, and it was a useful improvement, that, upon a fair construction of the act of Congress, he would be entitled to a patent. Yet he would not literally be the first and original inventor; but he would be the first to confer on the public the benefit of the invention; he would discover what is unknown, and communicate knowledge which the public had not the means of obtaining without his invention.

"The court put it to the jury to say whether this safe [Conner's] had been finally forgotten or abandoned before Fitzgerald's invention, and whether he was the original and first inventor of the safe for which he obtained the patent—directing them, if they found these two facts, that their verdict must be for the plaintiff. We think there was no error in this instruction; for, if the Conner safe had passed away from the memory of Conner himself, and of others who had seen it, and the safe itself had disappeared, the knowledge of the improvement was as completely lost as if it had never been discovered. The public could derive no benefit from it until it was discovered by another inventor. And if Fitzgerald made his discovery by his own efforts, and without any knowledge of Conner's, he invented an improvement that was then new, and at that time unknown; and it was not the less new and unknown, because Conner's safe was recalled to his memory by the success of Fitzgerald's."

If the first invention is forgotten, and another invents it again, it is patentable as a lost art, or an unpatented and unpublished foreign invention.

NOTE.—In this case, Judges McLEAN and DANIELS gave written dissents upon several points. Judge GRIER also dissented.

R. H. G.

THE PATENT LAW.

INVENTORS are called "uneasy," "sensitive," and as regards laws regulating their rights, "refractory," "turbulent," and "wanting in purpose." Inventors *are* sensitive, and if uneasy, not without cause. If as a class they lack concentration and unity of purpose, they nevertheless have great cause for complaint, and may well be restive under either the present law or its administration, one of the two. If the basement story of the Patent Office—that HUGE SARCOPHAGUS OF INVENTORS' RIGHTS—could become vocal, the death knell of the present patent law would be rung out in all the hot haste of Judge Lynch's fiat. It is the dungeon of smothered princes, whose story will never be brought to light for the reason that those to whom belong rightfully paternity and primogenitorship have not the means to pay for investigation and *funeral expenses*. To be practical, we ask the question, What is the proportion of applications for patents that have been positively rejected by examiners in the Patent Office, that have been granted upon full representation, and appeals to the head of the office and the appellate judge? And we follow up with the inquiry, If every case rejected should be fully and *fairly considered*, how many of the present discarded claims would be upon the "*patent rolls?*" The present age, notwithstanding certain croakings which occasionally meet our ears, *is* alive to the high part which the inventor plays in the drama of "progress," and we believe that it is only necessary to *tell the truth* in the right quarter, to insure them all necessary countenance, protection, and legislation. How it happens is rather a problem, but it is too true that inventors seem to be appreciated everywhere except in the United States Patent Office. We do not mean this remark to apply to the present head of the office nor his predecessors, nor other officers in that bureau who take no part in deciding questions of patentability. But we maintain, and can make our assertion good, that there is a most extraordinary proclivity on the part of many of the examiners in the Patent Office, to regard inventors with suspicion, and to make themselves *parties* to every case brought before them. Read the daily correspondence of the examiners with inventors and their attorneys, and you can come to no other conclusion. The letter-book of the Patent Office is a record of the most *puerile stuff* to be found in the archives of this or any government under the sun. This is not so much the fault of the men as of the present system, which, of necessity, under the present law, and the excessive business of the office, which renders the *entire supervision* of the commissioner impossible, commits judicial functions to men who have not judicial qualifications. The present system will not answer for the present age; and whether the fault be in the times or the system is immaterial, it will not *do*, and must be reformed. We are thus positive, because such a result seems inevitable from the loud and incessant murmurs of inventors all over the land. The present patent law, especially in that feature which authorizes examination into the novelty of the invention, has been highly praised abroad and at home, and of itself would be well enough if the men could be found to administer it. Experience has amply and bitterly proved this to be impracticable. With such men as Commissioner Mason, inventors' rights are safe; but when we look at the rest of the present and past officers of the United States Patent Office, we are led to exclaim of him, "*Rara avis in terris!*" With but few exceptions the examiners in the Patent Office appear to be *entirely unfit* for their stations. There is a general lack of appreciation of their positions, and every day's experience not only brings fresh proof of this, but a down-hill progress is daily manifesting itself. We are not actuated in these remarks by any personal considerations, for so far as we are acquainted with the Examiners, we esteem them as intelligent and worthy men; but we have long since differed with those who think that men of science, professional engineers, artizans, or practical mechanics should be selected for the office of Examiners. *If all the Examiners were Judge Masons, the inventors' jubilee were here.* It is not enough that we are blessed with a Commissioner of Patents who understands the law, and administers it faithfully, for the Patent Office is so constituted, and the business so excessive, that Judge Mason cannot see one tithe of the mischief produced by the decisions or reports, rather of his Examiners, which go for final actions. It is impossible for the Commisioner of Patents to go over the work of six

Examiners, in addition to his own duties. We must take occasion to remark here, though episodically, that the worst of all inconsistencies about the Patent Office is the low salary of the Commissioner of Patents, and next to this the low salaries of the Examiners and their assistants, and next, the slight difference between the Commissioner's and Examiners' salary. In a former number of our remarks upon the Patent Office, we quoted the opinion of Mr. Webster upon this subject. "Let the Commissioner of Patents be a lawyer, and give him five thousand a year." Mr. Webster, when Secretary of State, became very familiar with the Patent Office, then under his direction, and he knew its wants. The office of the Commissioner is professional and judicial, and if we interpret the statute aright, it is made judicial, with a larger discretion than is given to any other officer under the government. We see no reason why the Commissioner of Patents should not have the same salary as the Chief of Coast Survey, and we deprecate most heartily all idea of government patronage in relation to this special office, and to the subordinate offices in the Patent bureau. The Commissionership has heretofore been most unfortunately alloyed and embarrassed with agriculture and statistics, and thus, to some extent, interwoven with national policy; but the time has, or soon will come, when divorcement will be enacted, and Commissioner of Patents will be COMMISSIONER OF PATENTS, and none other.

Seeing then the difficulties of the present system, what shall we do? Several years since, when we held the office of Examiner of patents, we were in company with Mr. Webster and an eminent jurist of this city, and in the course of the interview, the conversation turned upon the patent law. Both agreed that it needed reform. Mr. Webster said, "*I think it would be better to go back to the old system, and give every man his patent.*" We replied that such a system might please the lawyers, and would probably flood the courts with litigation. Mr. Webster replied, "It would make little or no difference: you Examiners have too much power! too much power!" The sagacity of the great statesman has bequeathed us this text upon which to frame our reform of the patent law. "You Examiners have too much power." Let this sentiment be echoed in the legislative hall, and the jealous eye of republicanism will soon see to it, that there is not *too much power with the Examiners.* Here is the whole secret of the wrongs of inventors, and here is the great pivot of reform. Take away this power, and the Patent Office will become the palladium of inventors' rights, and not before.

We have no plan of our own to suggest for reform, but we proclaim it with "lungs of brass," and the deepest convictions of right, that unless this power be wrested from the Examiners, the administration of our patent law will be forever a positive wrong.

If these remarks are unpalatable to the Examiners, we cannot help it. We are in for the cause and inventors' rights, and are merely promulgating truths that ought to have been told long ago. Personally we respect and esteem the Examiners, and though we are disconnected with the Patent Office, we are far from being disaffected. If we could be actuated by any personal considerations whatever in this matter, it would be that our regard for the interests and reputation of Examiners, would lead us to the very course we have recommended. Take away from them a power they cannot wield except to their own detriment, and injustice to inventors. Since we have become "*outsiders*" we have been pained to insufferable disgust with the continual cry against the Examiners of corruption, and not one of the whole corps has escaped the accusation. It is not strange that government officers should be suspected or charged with venality—especially when their decisions are adverse to claimants; but it is strange that this corps of gentlemen of the highest respectability, integrity, and standing in society, should ever be regarded as corrupt in the administration of public affairs. The solution, however, is simply this: the decisions of the Examiners upon the claims of inventors are so extraordinary and inconsistent with law, that men are driven to suspect the worst.

Relieve the Examiners of this power, and their duties as *investigators of facts* would become pleasant, and their pathway smooth. It has been long since proposed, and with extensive approbation, to make the examination of applications for patents advisory; that the Examiners investigate the novelty of the invention, and record their objections; that the applicant take his patent if he chooses, and that the objections be engrossed with the patent, and make a part of the document. This system appears to us to be the best ever proposed, and as promising as it is novel. There will be but few patents taken where there are valid objections, perhaps none, and should any such be taken, the only harm comes to the owner. No person would ever purchase such a patent with his eyes open, and there would be little or no opportunity for fraud. Examiners would be very cautious in thus submitting their opinions to the trial of public opinion and the censorship of legal proceeding, and our word for it, the whole tone of Examiners' decisions would be entirely changed. The *ingenuity* of Examiners would not then be arrayed against the simplicity of inventors, the Examiner would be *tried* in every litigated case, and the verdicts of judge and jury would soon decide his fitness for office. We hail the proposition with our warmest approval and hopes of success. It would seem to be necessary that the Commissioner of Patents, under any reform of the law, should be the arbiter of questions of reissue; additional letters patent (if that absurd provision of the law which authorizes the grant of additional letters patent for an improvement made after the patent is granted, should be retained); of all cases of interference, whether with caveats, applications, or patents; of all cases of extension; and in fact, should possess all the discretion and powers now committed to him by law, with the exception of judging of the patentability of inventions, and being forced *ex necessitate rei* to intrust this judgment to a corps of Examiners irresponsible under the law.

It would seem necessary that the fee should be raised under the advisory system to fifty dollars at least. There is a considerable amount of trash daily brought into the Patent Office, such as perpetual-motion schemes, devices for gaining power, etc., and an increase of the fee would exclude these to some extent. Better, however, that patents should be granted for all these (it can do no harm), than to sacrifice so many valuable rights as at present.

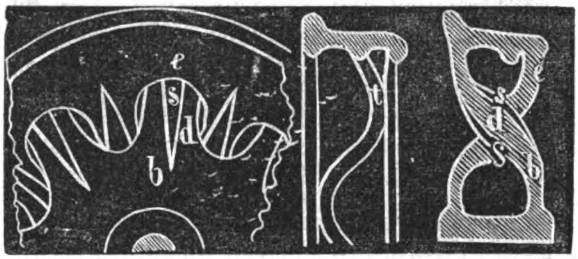
One point must be *well* guarded in this advisory system. If on examination it should be found that the thing claimed has been patented, or applied for before that, the party shall not take out a patent until he brings proof of priority of invention. In other words, in all cases where insisting upon a patent would bring about an interference, the powers of the office should remain the same as at present. Interferences of course extend to unexpired patents only, and pending applications.

C. G. P., *Ed.*

CLAIMS OF PATENTS,

Granted on the 4th, 5th, 6th, and 7th of October, 1853, with explanations and diagrams. Reported from the official records for the Polytechnic Journal.

No. 10,062. By JOEL BAKER, of Boston, Mass.—*R. R. Car-wheel.* Patented October 4th, 1853.



"What I claim, therefore, as my improvement in car-wheels, is the connection and intersection of the convex and rim-plates by independent and interlacing branches, substantially in the manner and for the purposes set forth."

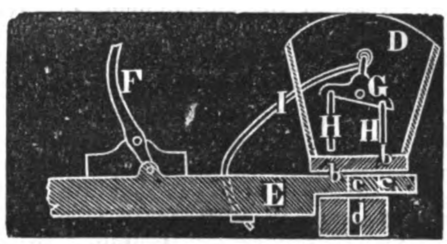
No. 10,063. By E. R. BENSON, of Warsaw, N. Y.—*Machine for making Slats for Window-Blinds.* Patented October 4th, 1853.

"I claim as my invention, 1st, the arrangement for moving the hollow augers I back and forth in performing the milling of both ends of the slats at once, combined with the slide G, operated substantially in the manner and for the purposes herein specified.

"2d. The manner of feeding the dressing and sticking portions of the machine by means of the slide Z, operated substantially as specified.

"3d. The method herein described, of sticking the wire by means of hooks and drivers, operated substantially as herein specified."

No. 10,064. By G. A. BRUCE, of Mechanicsburg, Ill. *Drills for Planting Corn.* Patented October 4th, 1853.



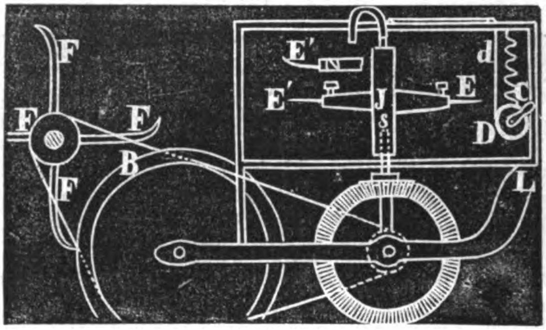
The invention consists in the manner of distributing the seed by means of a small balance-beam G placed in the hopper D—said beam having wires H H attached to each end, which, as the beam is operated, fit or work alternately in apertures *b b* in the bottom of the hopper, and properly adjust the seed in these apertures *c c* of the dropping-slide E, which extends entirely across the frame. The holes *c c* are one half the distance apart that the holes *b b* are.

Through the side-piece of the frame, there is a hole *d* underneath the hopper.

The balance-beam G is connected to E by rod I. E is worked forward and backward by means of lever F. The rods H H alternately force the seed into the holes.

"I claim the employment or use of the balance-beams G G with the rods H H attached to them, and operating as described, for the purpose of properly adjusting the seed in the holes of the dropping slide, and also to prevent the clogging of the same, as shown and described in the body of the specification."

No. 10,065. By A. A. Dickson, of Griffin, Ga.—*Machine for topping Cotton.* Patented October 4th, 1853

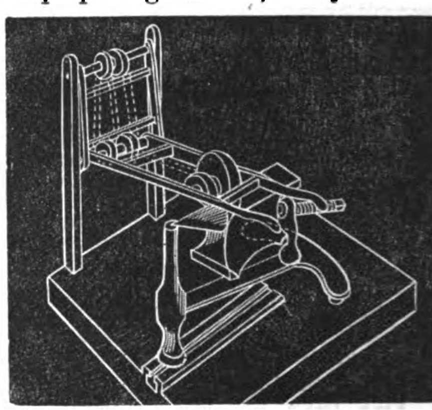


This invention consists in the employment of two sets of cutters, one set E E being secured horizontally on a vertical revolving shaft, over the centre of the machine, so as to cut off the tops of the cotton ; and the other set F F being arranged vertically on a horizontal revolving shaft, at the back end of the machine, or just behind the propelling wheel B, so as to lop off the ends of the branches which lap across the middle of the row. These two sets of cutters are made to revolve by the motion of the propelling wheel. The horizontal blades or cutters are made adjustable, both in height and length, so that they can be made to suit the different heights of the cotton plant, and also the different widths of the rows, by means of the screws O O, and by means of J being made to slide up and down on the square top part *s* of shaft K. This adjustment is effected by turning crank C, and thereby winding the cord *d* round the drum D.

E′ is a top view of E.

The apparatus is moved about like a wheel-barrow, there being a pair of handles at L.

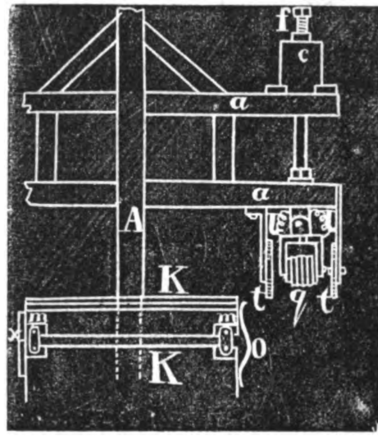
"I claim the employment of two sets of cutters E E and F F, one set being adjustable, and revolving in a horizontal direction, and the other being fixed and revolving in a vertical direction, and both sets being set in operation by the action of the driving or propelling wheel B, in any manner equivalent to that herein shown and described, and for the purpose herein specified."



No. 10,066. By M. Fisher & John H. Norris, of Trenton, N. J. *Apparatus for Polishing Anvils.* Patented October 4th, 1853.

"What we claim therein as new, and of our invention, is suspending the anvil in the sliding and vibrating frame, and arranging it in respect to the polishing part of the apparatus, and operating them as herein fully described."

No. 10,067. By Joseph Flanders, of Newburyport, Mass.—*Improvement in Rubbing and Polishing Leather.* Patented October 4th, 1853.



The cylinders *c* contain india-rubber springs and regulating-screws *f f*, the object of which is to press the tools *g g* on the leather. The object of the joint *j* on the clamp or tool-holder, is to allow the face of the tool to accommodate itself to any lack of uniformity in the thickness of the leather or imperfect adjustment of the table. *t t* are rollers, with their faces covered with india-rubber, the purpose of which is to confine the leather flat on the table. A portion of the table is a little raised from the rest, of such width as to support so much of the leather as is to be presented to the action of the tools; the rest of the table is to receive the pressure of the rollers. The table is made in two parts K and K′, the upper being connected with the lower one by means of links *m m*, which permit of an endwise and downward movement of the same. Spring *o* presses the table K towards the stop *x*, the object of which construction is to prevent the tools as they pass over and press on the leather from tearing it, when meeting with any unusual obstruction.

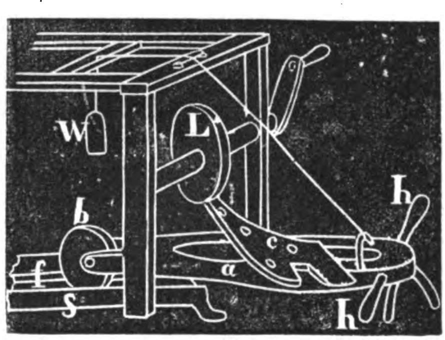
"I claim, 1st, the employment of a vertical shaft A with arms *a a* extending from its sides, for the purpose of carrying the tools and their accompanying mechanism, in combination with a plane surface horizontal table K, for the purpose herein described.

"2d. I claim the jointed tool-holder *j*, either with or without the springs *l l*, constructed substantially as herein described.

"I claim the arrangement of a movable table, permitting of an endwise, and at the same time downward motion, constructed in the manner described, or the equivalent thereof, for the purpose herein described.

"I do not claim to be the inventor of a rotating-shaft with arms extending from its sides, carrying tools for the purpose of dressing leather, only when used in a vertical position, and in combination with a plane surface horizontal table; nor do I claim the springs *d*, operating to produce the pressure on the leather, nor do I claim to be the inventor of the sliding-bolts."

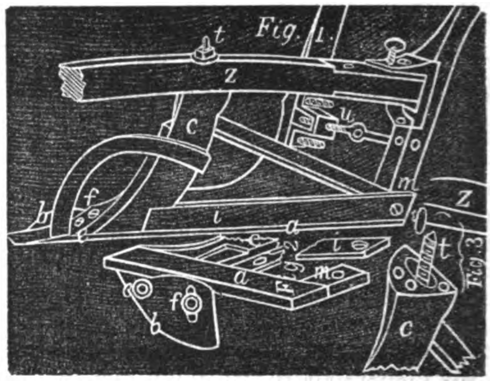
No. 10,068. By Joshua Gibbs, of Stark County, Ohio.—*Apparatus for grinding Plough-Castings.* Patented October 4th, 1853.



The operator takes hold of the handles *h h*, and moves the carriage *a* along under the stone L—the wheel *b* moving in groove *f* of stand *s*.

"I claim the carriage *a*, upon which the casting *c* is fastened with the weight W, and grooved stand *s* upon which the carriage is moved, arranged and operated as described."

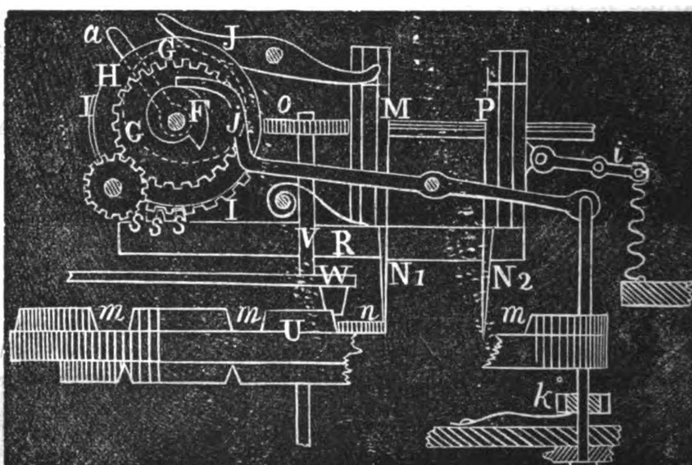
No. 10,069. By ROBERT A. GRAHAM, of New Paris, Ohio.—*Improvement in Ploughs.* Patented October 4th, 1853.



"I claim, first, the screw-bolt *u*, or its equivalent, for setting out or in the rear edge of the mould-board, with respect to the landside, acting in combination with the bolts *e* and *f*, which being tightened, attach to each other the mould-board, sheath, and lipped or flanged share, as described, and which bolts being temporarily relaxed, permit the vibration of the mould-board about the bolt *e*, without interrupting the continuity of ploughing surface, or disconnecting the several parts.

"Secondly, the shifting or adjustable socket attachment of the beam to the sheath, in combination with the dove-tail and adjustable connection of the rear end of the beam to the helve, or equivalent devices, so as to vary the direction of the draught of the plough, to suit the requirement of a change in the flare of the mould-board and other objects, as herein explained."

No. 10,070. By THOMAS HARGREAVES, of Schenectady, N. Y.—*Machine for husking Maize and Corn.* Patented October 4th, 1853.



The ears of corn with husks thereon are placed in the passage-ways *m* of the circular plate U, with the stalk-end towards the centre of the plate above the rim *n*, and the base of the ear against the rim *n*; and as the handle A is turned, the cam G acts on lever J, which causes the gates M and P, with cutters N_1 and N_2 to descend and pierce the ear; the chisel or cutters being about five-eighths of an inch broad, they partially sever some of the leaves on the upper side of the husk, and divide the cob at or through the first row of kernels, but do not cut any of the sides or under part of the husk. When thus cut, the cam-wheel I acts on the cogs *s s s* on the slide R, and forces the gate P with cutter N_2, and the ear of corn, free from any leaf or husk, to the outer edge of the circular plate U, into the receiving-trough. The chisels or cutters being made narrow, when the cutter N_2 carries out the ear of corn, the husk splits and divides before it, being held by N_1; and on N_2 reaching the outer edge of the plate, it springs up, as also N_1, thereby releasing the husk, which passes on with the movement of the plate U, and is removed by the elbow W at the husking of the next ear. When the cutters release the husk, the spring *i* returns gate P, ready to act in conjunction with gate M on the next ear.

The cam F acts on lever *j*, pressing down the spring and lever *k*, which releases the stud from one of the notches in the under side of the circular plate, where it was held whilst throwing out the ear and husk through separate compartments or grooves.

The cam H then moves one cog of the pinion *o* on top of shaft V, causing another ear and husk to move ready for the cutters.

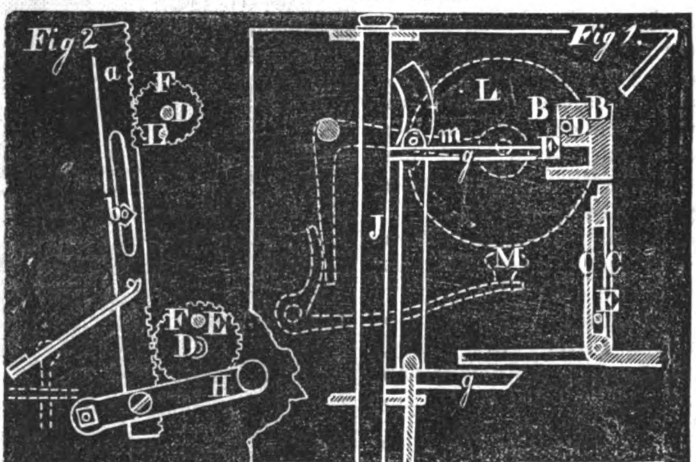
The ears of corn are not prepared for the machine other than by breaking them from the stalk in the usual manner. The stem, whether long or short, passes above the rim *n*, and does not interfere with the action of the machine.

"I claim, 1st. The application of the chisel N I, or chisels N_1 and N_2, cutter or cutters, in combination with the gate M, or gates M and P, operated by gearing or other means, substantially as herein described.

"2d. I claim the construction of the circular plate U, or its equivalent as herein described, in combination with the cutters for severing the cob, and the elbow lever for discharging the husks as set forth.

"3d. I claim the combination of cam F, lever *j*, and spring *k*, with stud *l* for holding the circular plate U stationary, whilst removing the ear and husk from the machine, or any other equivalent, as herein specified."

No. 10,071. Wm. Horsfall, of New York, N. Y.—*Annunciators for Hotels, etc.* Patented October 4th, 1853.



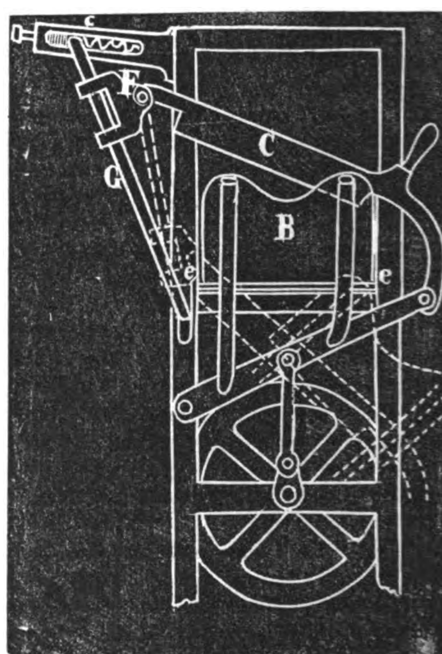
The inventor employs a vertical rod J having a horizontal lifting or tripping arm *g* which extends underneath each of the swinging index-plates B, the said rod and arm being arranged in such relation to the rocking-frame which carries the alarm-bell L that as either of the rods are raised for the purpose of tripping one of the index-plates, and exposing its number to view, the said frame and bell will also be raised, and the pendulous hammer M allowed to descend some distance, and consequently when the rod descends, which it does instantly after the index-plate has been tripped, the rocking-frame and its alarm-bell will descend also, and cause a short finger of the pendulous hammer to be operated upon by a lever connected to the arm *m*, which sustains the bell and the long arm or weighted end of the pendulous hammer to rise, strike the bell, and sound the alarm.

B vibrates on horizontal rod D; B is thrown back, after indicating its number, by means of the eccentric-rod E. D is secured in a cog-wheel F (see Fig. 2), which gears into the movable rack-bar *a*, and the rod E is also secured eccentrically in the same cog-wheel. The rack-bar has a slot for a pin *b* to work in as the rack moves up and down, which latter operation is performed by depressing lever H, by performing which operation the cog-wheel revolves a short distance, and causes the eccentric rod to perform the operation of throwing back the plate.

"I claim as my invention the constructing and arranging the index plates B B B or C C C in combination with the alarm and its necessary attachments, so that each plate can be operated, and its number exposed to view, and also the alarm sounded instantly after, by simply employing a rod J, having a tripping arm *g*, in the manner and for the purpose herein specified.

"I also claim the manner herein described and shown of throwing the index-plates back to their proper position by means of the eccentric-rod E, in combination with the peculiar construction and arrangement of the said index-plates, the eccentric being operated in any manner equivalent to that shown and described."

No. 10,072. R. KETCHAM, of Seneca Castle, N. Y.—*Straw-Cutter.* Patented October 4th, 1853.



The main object of this invention is to hang and operate the knife in such a manner that the "draw" of it may be readily increased or diminished to accommodate it to the varying resistance of the cut, which depends on the condition of the straw to be cut and on the sharpness of the knives; and this is to be achieved without the knife inclining to fly from the cut.

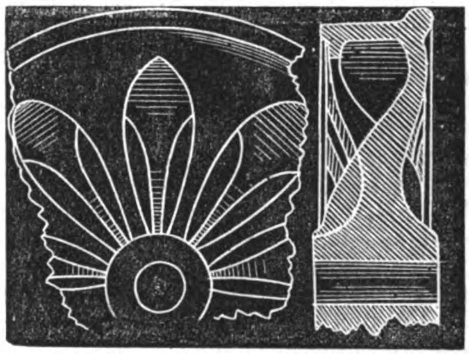
Another object of the invention is to prevent the usual clogging at the finishing end of the knife.

e e is the cutting edge of the table; C, the cutter; the dotted lines represent the position of the knife C and the gauge B, after the cut has been performed.

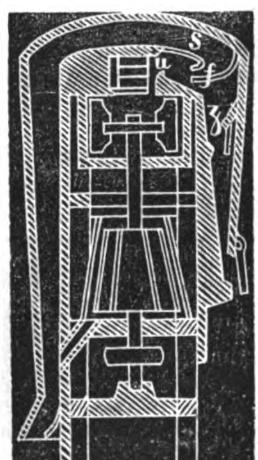
"I claim the method herein described of hanging and operating the cutter by means of its pivoted attachment to the slide F, in combination with guide-rod G, the latter being made adjustable by the helical-spring *c* at the top, or other equivalent device, substantially as and for the purposes set forth.

"I further claim, in combination with the inclined reciprocating knife, and simultaneously with the descent thereof, giving to the gauge B a lateral curvilinear or oblique downward action away from the rear end of the knife towards the front end thereof, and below the cutting edge of the table, substantially as shown and described, whereby the straw is restrained from being crowded towards the back end of the knife by the inclination of the cut, and a free escape is established for the cut particles to pass off, as specified."

No. 10,073. ZADOCK H. MANN, of Newport, Ohio.—*Cast-iron Car-wheel.* Patented October 20th, 1853.



"I claim the construction, as described, of a cast-iron railroad-car and locomotive wheel, whose web, or portion connecting the hub and rim, consists at the hub of broad radiating plates in the plane of the axis, whence turning alternately to the right and to the left, they contract in the direction parallel with the axis, and expand proportionally in the direction of revolution, those of each alternate set uniting as they approach their respective margins of the rim concave, so as to form flanges having openings left for each intermediate plate on the other side, forming a braced and counter-braced wheel, possessing the requisite lateral stability and continued support at the rim, together with adequate provision for the strain arising from shrinkage, &c. And this I claim whether the said web be formed in a cyma-reversa curve, as described, or in any way substantially equivalent."



No. 10,074. BENJ. BUTTER and HENRY ROUZER, of Piqua, Ohio.—*Machine for Cleaning and Separating Grain.* Patented October 4th, 1853.

"We claim the narrowing of the spout near the grain discharge *m*, in combination with the curved passages *s*, *t*, *u* and *z*, which receive and discharge at their respective apertures the light grain and trash taken from the grain discharge aperture *m*."

No. 10,075. J. C. F. SALOMON, of Washington, D. C.—*Rotary Steam-Engine.* Patented October 4th, 1853.

C is the cylinder; P is a piston of the same height as the cylinder. This piston has an elliptical form, its greatest diameter being equal to the inner diameter of the cylinder. On its bottom and top it has an annular

flange which fits an annular groove in the bottom and top of the cylinder, and is made to fit steam-tight by packings. Through four sides of the cylinder slide four abutments A A A A in packings. These abutments are of the same height as the inner height of the cylinder and piston. The annular space *s s* outside the cylinder always being filled with steam, the abutments are always pressed against the elliptical surface of the piston, thereby dividing the space between the elliptical surface of the piston and the inner side of the cylinder in spaces which have no communication with each other. By means of four valves these spaces are made to communicate with the supply-pipes 1 1 1 1 and the exhaust-pipes 2 2 2 2, and thereby, as an inspection of the diagram shows, the piston is made to revolve.

The valves are motioned from two cams, which sit on the axis of the piston, the one of them to be brought in connection with the pins of the valve-rods, when the motion is to be reversed.

"I claim the combination of the elliptic wheel and its cylinder with the sliding abutments or stops, arranged in such manner that a continuous propelling force may be communicated to the wheel without exposing it to the unequal pressure of the fluid on opposite sides of its axis, throughout the entire revolution in either direction, substantially as specified.

"I further claim, in combination with the revolving wheel or piston, the arrangement and operation of the valves herein described in such a manner that as the effective propelling area of the piston surface exposed to the impelling fluid between either two abutments diminishes, the wheel is assisted by an increasing area of piston surface, exposed to the action of the fluid on the opposite sides of the abutments, as specified, whereby the propelling fluid may be worked expansively without impairing the uniformity of the active power of the engine, as herein set forth."

No. 10,076. George S. G. Spence, of Boston, Mass.—*Improvement in Cooking-Ranges.* Patented October 4th, 1853.

Fig. 2. Fig. 1.

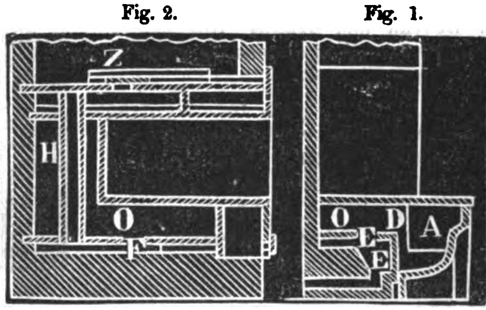


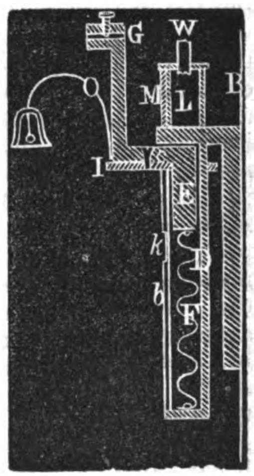
Fig. 1. Section through the fire-grate.

Fig. 2. Section through the middle of the oven.

"I claim the arrangement of the openings Y Y and damper Z, with respect to the arrangement of smoke-flues above and below them, substantially as above specified, by which combined arrangement I am enabled, when desirable, by the direct draft to cause the heat to pass under the back half of the bottom of the oven up alongside the entire back of the oven, and up the rear portion of the left side of the oven, and over the top of the oven into the chimney, instead of carrying it entirely around the oven, as set forth.

"I claim the arrangement of the fire-place A, boiling-chamber D, and smoke-flues leading under the oven and in rear of the back thereof, in combination with the peculiar arrangement of the hot-air chambers E, F, and H, whereby the fire-place and oven flues are not only made to heat the air-flues, but the bottom-plate of the boiling-chamber is also made to impart heat thereto, and the back as well as the front of the upright air-flue H is also heated by the smoke-flue, through which it passes, as specified."

10,077. EDWARD BROWN, of Rindge, N. H.—*Burglar Alarms.* Patented October 4th, 1853.



B, door-frame; *b*, slot in cylindrical-tube D; E, cylindrical slider, with tube D resting on spring F, and provided with a horizontal arm *c*; G, friction-match holder; I, arm projecting laterally, and passing a short distance over the door, and beyond its edge when the slider is depressed; *k*, notch, at the lowest position to which it is desired to depress the slider, the notch being large enough to receive the horizontal part of arm *c* when the slider is turned, so as to move it into the notch for the purpose of holding the slider down; L, spirit-lamp, to which is fixed a piece of sand-paper M, against which the match is to rub.

Plate I being forced downwards and laterally until it catches in the notch, the apparatus is set for sounding an alarm and lighting the wick W of the lamp. The door on being opened, is moved against arm I, and thereby *c* is released out of the notch.

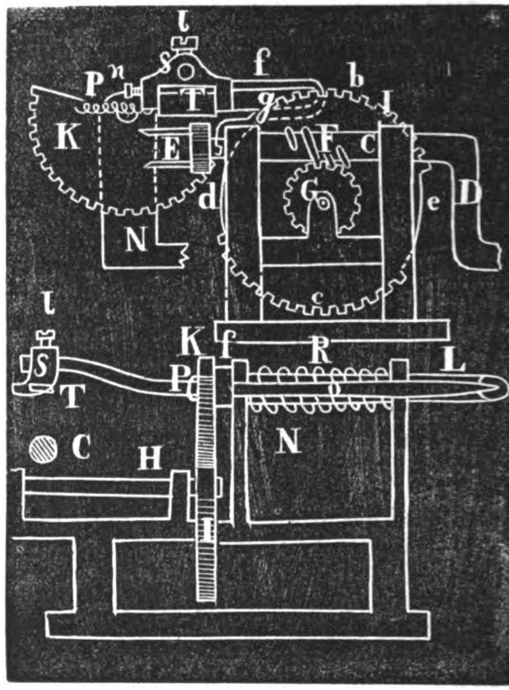
"I claim the improvement of so connecting the match-holder and the bell-spring *o* with the slide E, that the spring F of the slide, on being set free by the opening of the door, shall not only elevate the match-holder, but set the bell in motion, so as to cause the alarm to be sounded by it in manner as specified."

10,078. EPHRAIM L. PRATT (assignor to James Sargent and D. P. Foster), of Worcester, Mass.—*Machine for Paring Apples.* Patented October 4th, 1853.

Crank-shaft C has a crank D on one end of it, and a tri-pronged fork E on its opposite end, on which is put the apple or vegetable to be pared.

The worm F on shaft C engages with worm-gear G, that is affixed on shaft H, arranged at right-angles to and below the shaft C. On one end of the shaft H there is a wheel I that has on its circumference two arcs *b c* of teeth, and two arcs *d e* of blank spaces without teeth between the said arcs. This wheel engages with a sector-gear K that is affixed on one end of a horizontal shaft L, that rotates in bearings on the tops of posts M N.

From the sector-gear K an arm *f* is extended, having a long slot *g* made through it, in which the bent rod O vibrates. One end of the rod O is hinged to the shaft L, the end of the shaft L being bent at a right-angle, and scored for that purpose. One end of the spring P is fastened to the rod O, and the other to the sector-gear, so as to draw the rod O towards the shaft L, so as to press the cutting apparatus upon the end of the rod against the fruit upon the tri-pronged fork E.



The cutting apparatus consists of the pronged block *s*, and is perforated so as to receive the end of the rod O, which has a score across it for the end of the screw *l*, which is screwed through the block *s* into the score *k*, which is made so much larger than the point of the screw, and the hole in the block *s* is so much larger than the end of the rod that the block *s* will vibrate freely to a limited extent around the rod in a circular direction, and at right-angles to it, so as to adjust itself to any unevenness or irregular form in the article pared by the knife T, which is fitted into grooves in the prongs of the block *s*, and fastened by the set-screw *n*, the knife T being pressed against the fruit on the fork E by the spring P, which draws the rod O towards the shaft L. One end of the helical-spring R is fastened to the post N and the other to the shaft L, and is so adjusted as to turn the shaft L back and return the knife to its position to begin upon another apple, after it has pared the first, and at the same time removes it from the end of the fork, so that it is out of the way in removing the apple pared from the fork E, to put another in its place. The top of the post N is made in such a form as to prevent the rod O from carrying the knife T against the fork E when there is no article upon the fork.

When the machine is to be operated, an apple is placed upon the fork E, and the shaft C turned by the crank D, the worm F turns the gear G with the shaft H and gear I, which drives the sector-gear K, which carries the shaft L and rod O, so as to move the knife T over the surface of the apple as it is turned by the fork E, and pare it completely, except a small space between and around the fork E. By the time the apple is completely pared, except the portion above mentioned, the wheel I will have turned so that the blank space will be against the sector-gear K, so as to release it, and allow the spring R to turn the sector-gear back to place the knife T out of the way, when the apple pared may be removed, and another put in its place.

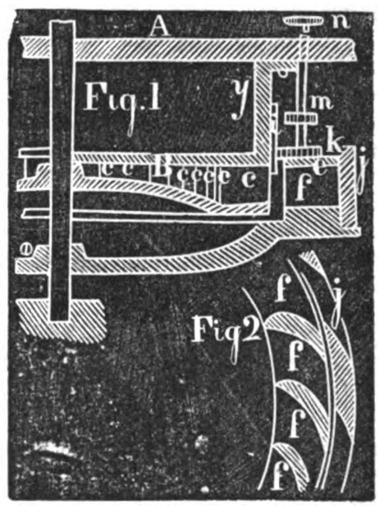
"I claim hanging or connecting the block *s* which carries the knife to the rod which carries said block, so that the block and knife can vibrate in one or either direction, by means substantially such as are herein described, or their equivalents, so as to allow the knife to vibrate and accommodate itself to any irregularity in the surface of the apple or vegetable pared, substantially as described."

No. 10,079. JOSEPH C. STRODE, of East Bradford, Pa.—*Hydraulic Ram.* Patented October 4th, 1853.

The invention consists in laying the driving-pipe which conveys the water from the head to the ram in the brachystochrone curve, which is that curve in which a body will descend from one point to another point not in the same vertical line in the shortest time, and therefore with the greatest mean velocity. This property of the above curve, the inventor says, will enable a greater quantity of water to be raised by a machine of a given size than can be raised with the driving-pipe laid in any other direction, and will cause a greater reaction of the water to take place after the closing of the valves leading to the air-chamber, and thus more perfectly insure the opening of the discharge valve.

"I claim the application of the brachystochrone curve to the conduit pipes of hydraulic rams, in the manner and for the purposes herein before set forth."

No. 10,080. HENRY VANDEWATER, of Albany, N. Y.—*Turbine, or Water-wheel.* Patented October 4th, 1853.



A, penstock; B, chute-chamber; *f f*, buckets of the turbine. The annular ring *b* which covers the chutes *c c* rises in a perpendicular cylinder *y*, which is fastened to the underside of the penstock; *e*, annular ring covering the buckets of the turbine; the circular band *i*, between the chutes and buckets, can be raised or lowered for the purpose of regulating the size of the openings of the chutes. The turbine is surrounded by a cylinder *j* which has a horizontal annular flanch *k*; *j* has openings all round corresponding to the discharging openings of the buckets, and similarly bevelled off, as shown in Fig. 2. The inside of ring *k* is provided with teeth, in which the little wheel *m* can be made to gear by lowering said wheel, and then by turning the hand-wheel *n* the cylinder *j* can be turned so as to shut more or less the discharge openings of the buckets.

"I claim the manner or method of regulating the discharge-openings of the buckets from the outside, in combination with the central-gate *i*, for adapting the wheel to varying heads of water, and to the nature and amount of work to be done by it, consisting of the circular-gate *j*, constructed, arranged, and operated with the wheel, substantially as in the manner herein fully set forth."

No. 10,081. J. A. WOODBURY, J. MERRILL, and G. PATTEN, of Boston, Mass.—*Improvement in Air-Engines.* Patented October 4th, 1853.

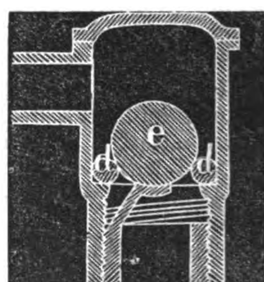
These improvements are made upon an engine for which letters-patent of the United States were granted, bearing date the 5th day of January, 1853.

In that mode of using the air as a motive power the natural atmosphere which exerts a force of 15 pounds to the square inch, is started with as a base, and is compressed to the required extent in a receiver, and then expanded to double its volume by the application of a certain degree of heat, the amount of pressure thus obtained depending upon the density of the compressed air.

"It will be evident," the inventors say, "that if instead of starting with air which exerts a pressure of 15 pounds per square inch, or that of the natural atmosphere, we commence with or take into the air-pump more dense or compressed air, which exerts a much greater pressure than the atmosphere, the extra pressure consequent upon the greater density of the air first employed will be increased in the same ratio as in the first instance by still further compressing this dense air in the air-pump, and then doubling its volume in the hot receiver.

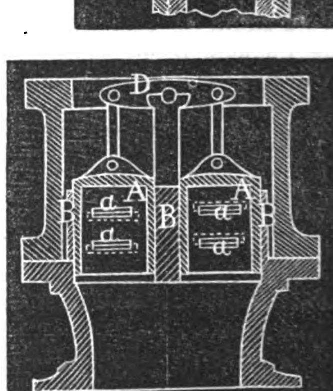
"As it is often desirable to work an engine at a very high pressure, especially in locomotives, we have effected this desideratum of using a denser medium to commence with, and the consequent high pressure exerted on the piston in the cylinder, which is the result of still further compressing the already compressed air, and then expanding it in the receiver, by supplying the air-pump from a reservoir or receiver of compressed air, instead of from the natural atmosphere.

"What we claim as our invention and improvement in atmospheric air-engines, is supplying the air-pump from a receiver into which air has been condensed by a hand-pump, auxiliary engine, or otherwise (the hand-pump or auxiliary engine being used for the purpose of charging and sustaining a uniform pressure in the receiver from which the air-pump is supplied), when the same is done in combination with a second receiver into which the air is to be still more compressed, and maintained at a uniform pressure, or nearly so, by the application of heat to the air on its passage to the working cylinder, all in the manner and for the purposes herein above set forth."



No. 10,082. Elizur Wright, of Boston, Mass.—*Stop-Cock.* Patented October 4th, 1853.

"I claim the combination of a ball *e* with an elastic cylindrical ring-seat *d d*, constructed with or without a wire, as described, for the purpose of forming a valve."

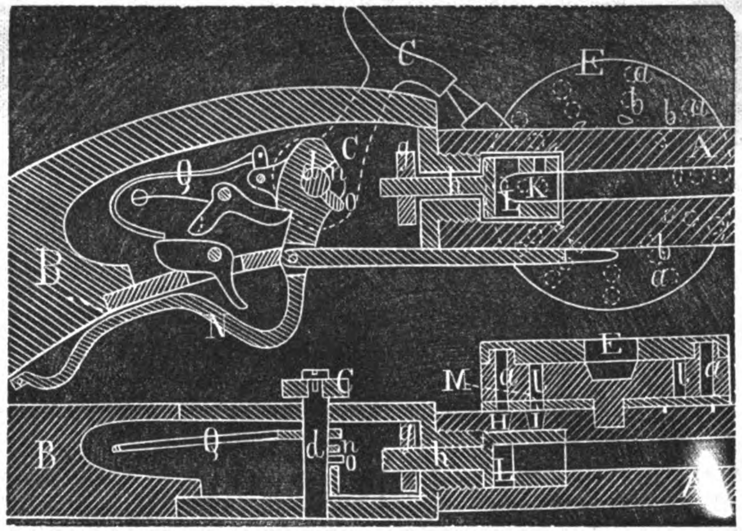


No. 10,083. J. E. Anderson, of New York, N. Y.—*Regulator-Valves for Steam-Engines.* Patented October 4th, 1853.

The object of this invention is to produce a valve which will work with very little friction, which will wear correctly for a long time, and which will be very sensitive to the slightest changes in the operation of the governor.

"I claim the combination, to serve the purpose of a throttle-valve or regulator, of two hollow cylindrical valves A A connected with a lever D on opposite sides of its fulcrum, and having slotted openings *a a* corresponding with similar openings in the cylindrical valve-seats B B, the several openings being arranged in the manner as substantially set forth."

No. 10,084. EDMUND H. GRAHAM, of Biddeford, Me.—*Magazine-Gun.* Patented October 4th, 1853.



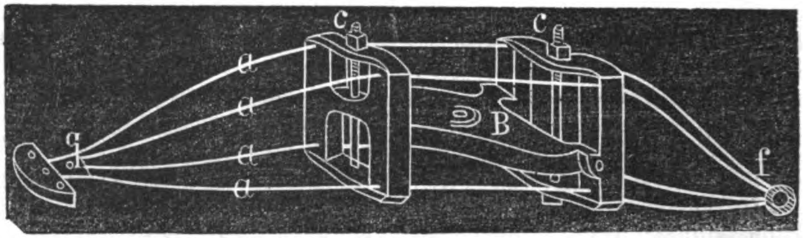
The operation of this gun is as follows:

By depressing the trigger-guard N, the charge-receiver K and magazine E are simultaneously rotated, the former far enough for the reception of the charges of powder and ball or shot, and the latter so as to carry a load of such powder and ball, or shot, directly into line with the connecting passages I and H of the barrel. By turning the gun a little, a load will pass from the magazine into the charge-receiver through passages L and M. This done, the trigger-guard is to be moved up to the stock B, and while this takes place, it rotates back the charge-receiver so as to close the passages that convey the load through the side of the barrel, and bring the nipple into communication with the powder in the charge-receiver. On pulling the trigger a discharge takes place.

"I claim the arrangement of the series of ball-chambers *b b b*, &c., and the series of powder-chambers *a a a*, &c., in concentric circles and on the side of the gun-barrel, and out of the sight-range, and so as not only to revolve and work against a common plate E affixed to the side of the gun, but to operate in conjunction with a rotary charge-receiver K placed within the barrel, as specified; such arrangement of the magazine of chambers not only causing the powder of the charges to be kept in separate chambers so as to lessen the danger of accidents, but causing the magazine to be so arranged as to be out of range of the sight in taking aim.

"And I also claim to so combine the percussion-hammer, or cock, the rotary charge-receiver, and the rotary magazine with the trigger-guard, that by the movement of the said guard away from the stock they may be simultaneously put in motion, and the hammer brought up to full cock, as specified."

No. 10,085. By Levi B. Griffith, of Honeybrook, Pa.—*Plough-Beams.* Patented October 4th, 1853.

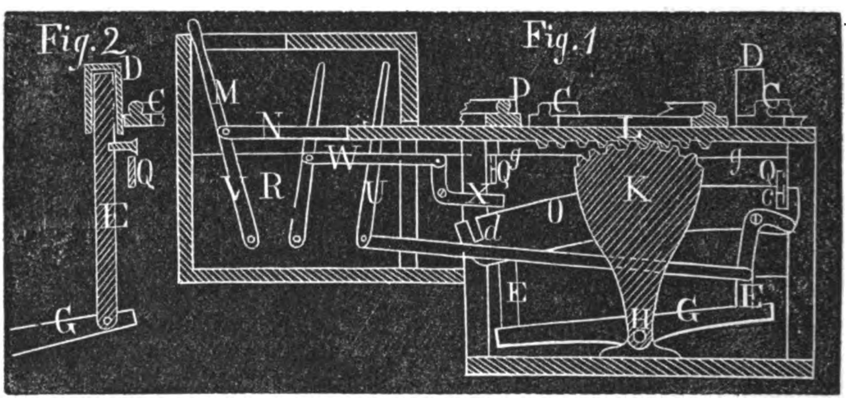


The rods *a a a a* are welded together at *f* and *g*.

"I claim the constructing a plough-beam of four round iron rods *a a a a*, centre-piece B, and clamps *c c*, in combination as described, the rods of uniform size from end to end, curved to the shape specified, and welded together at the places designated, the centre-piece and rods being held firmly in their position by the clamps, the whole being constructed as described."

No. 10,086. Archibald G. Littlefield, of Portland, Me.—*Safety-Switch for Railroads.* Patented October 4th, 1853.

A A′ the two switch rails; B B′ the main-track rails; C C′ the turn-out rails—the switch rails being applied to the main-track and turn-out rails, so as to be capable of having a movement into or out of alignment with one or the other, as the case may require.



Close by the side of one of the rails of the main-track, is arranged a flange lever or depression-bar D′, which turns vertically on a fulcrum at its rear end, and rests on its front end on the top of an upright bar E′, that is jointed to one end of a rocker-lever G, disposed transversely of the tracks. There is a similar lever D, applied to one of the turn-out tracks, and made to rest in a similar way on the top of an upright bar E, which is joined to the opposite end of the rocker-lever G. The rocker-shaft H has a vertical toothed sector K, attached to its front end, which sector works into a cogged-rack L, that supports the switch rails, they being pivoted on it so as to be moved with and by the rack when it is moved. This rack is supported so as to be capable of being freely moved in longitudinal directions. By means of rod N, it is connected with hand-lever M, by which it may be put in such movement. A locking-plate O is fastened to the cogged sector K, and provided with two deep notches *c d*.

Two latching-levers Q Q′ operate in connection with the locking-plate. They turn vertically. Each has its front arm pressed downwards by a spring, while to its rear arm a bar *g* is jointed, and extends up to the flange-lever or depresser-bar D or D′. While one depresser-bar is being depressed down into a horizontal position, the other will be correspondingly elevated. At the same time the two latching levers will be so moved, that the depresser D or D′ which is depressed, will have its front arm thrown up and out of its notch of the locking-plate O, while the other will have its front arm moved down into its notch of the locking-plate. This will lock the switch, or prevent its being moved by power applied to the hand-lever M.

Within the box R (which is provided with a door), there are two other hand-bars U V, each of which by means of rod W, is connected with one of two bent levers X, that are respectively so placed with regard to the two latching-levers Q Q′, as to enable a person by moving either of the hand-bars U V, to throw the latching-lever operated by it out of its notch in the locking-plate O. Thus it will be seen, that whenever it may be desirable to change or move the switch by means of the hand-lever M, it becomes necessary first to open the door of the box R, and move that one of the levers U V, which will cause to be elevated the latching-bar, which may be in action so as to retain or lock the switch. This movement of the switch by the hand-lever may be necessary in order to enable a train approaching a turn-out to pass from the switch, and either upon the turn-out or the main-track.

When the car or train is moving in the opposite direction, or from either the turn-out or main-track towards the switch, the flanges of its wheel on one side of it will roll over and depress *that* depresser-bar, or lever D or D′, which is directly applied to the track *on which such car or train may be running*, and should the switch not be in alignment or engagement with such track, the machinery will be so operated by such depression of the bar D or D′, as to move the switch into alignment with the track before the car or train can reach the switch.

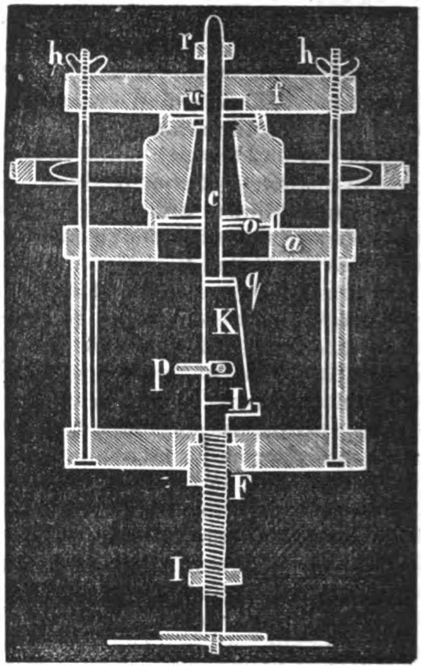
"I claim the combination of the transverse rocker-lever G, the shaft H, the toothed-sector K, and the rack L, as applied to the switch, and the main and turn-out tracks, and made to operate as specified.

"And in combination with the toothed-sector, I claim the locking-plate O provided with notches, as specified, the same being for the purpose of locking the switch, in manner as described."

No. 10,087. Leonard S. Maring, of Westport, Mass.—*Machine for boring Carriage-Hubs.* Patented October 4th, 1853.

The wheel is placed with one end of its hub on the middle of the bar *a* of the frame, the shaft C being inserted and fixed in a bench or floor, and made to stand vertically, and pass through the hole in the hub of the wheel, and the bar *f* brought down upon the other or upper end, and forced down upon it by setting down the screw-nuts *h h*.

The clamp-screw H is next unscrewed, so as to unclamp the screw-nut F from the frame, in order that the said frame may be put in revolution on the said nut. This done, the frame and the wheel is to be revolved in order to ascertain whether the periphery of the outside of the wheel-tire has its centre in the axis of the shaft *c*. If it has not, the wheel must be properly adjusted. The wheel being firmly confined in place by the screw-nuts *h h*, next the screw-nut F is to be clamped to the frame. This having been done, the distance from the lower end of the wood part of the wheel-hub down to the lower part of the cutter L is to be measured, and the gauge-nut I to be arranged on the shaft *c*, at the same distance from and below the nut F; next the frame is rotated, so as to cause the screw-nut F to descend on the shaft *c*. This will carry the wheel down against the cutters *q* and K, and cause them to form the tapering-hole for the reception of the wheel-box. When, and while the wheel descends upon the cutter L, such cutter will form the recess *o*, herein before mentioned.



After all this is accomplished, there is another and similar recess *t*, to be made in the other end of the hub for the reception of the nut. In order to enable this recess to be formed, the bar *f* is notched or recessed from its under side upwards, as seen at *n*. This enables us to remove the small or upper cutter *g* from the shaft *c*, and insert in its place a cutter that shall project beyond the cutting edge of the cutter R, and cut downwards into the hub, when the frame A is next rotated in a reverse direction, or so as to cause it to ascend on the shaft *c*. By adjusting the slide *r* on the shaft *c* to the proper position, the descent of the cutter into the top of the hub will be arrested, when the top of the bar *f* is brought up against the slide.

"I claim the combining the backer *p* with the shaft *c*, and the knife K, for the purpose above set forth."

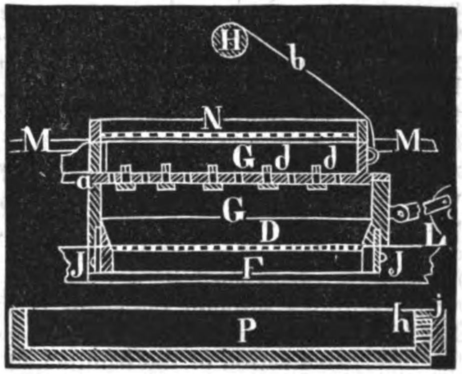
No. 10,088. Hiram Powers, of Florence, Italy.—*Improvement in making Files or Rasps.* Patented October 4th, 1853.

"I claim the forming of perforations or throats to the cutting edges of files or rasps, for allowing the particles cut away to pass through, and to prevent the instrument from clogging or choking, substantially as described."

No. 10,089. Philip P. Ruger, of New York, N. Y.—*Machine for turning Spiral Mouldings.* Patented October 4th, 1853.

"I claim, combining with a rotary progressive motion of the article to be cut, a series of cutters placed around the article to be cut of any desired configuration, or varieties of configuration, to form and complete the pattern upon the article, said cutters being made to revolve in a stationary frame perpendicular to the axis of motion of the article to be wrought, either in a radial line, or somewhat inclined thereto, so as to form the desired figure and under cut to any extent desired."

No. 10,090. JOHN K. WARD, of Sonora, Cal.—*Machine for Washing and Separating Gold.* Patented October 4th, 1853.



D, perforated bottom of box C; the frame F, to which D is attached, hinges on the two corners $l\ l$, and can be turned round its hinges by means of levers in front of the apparatus, in order to give it the required inclination to let the heavier material pass out over the apron F; G, washing-box, hinged at *a* to box C; box G, into which the material is thrown in bulk, can be brought in an inclined position and emptied by drawing cord *b* round the drum H.

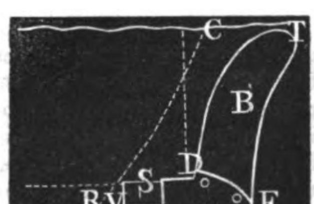
The bottom of box G is provided with holes through which the gold and finer particles of impure matter pass, to be acted upon again below. *d d*, studs, the sides of which are sharpened in the direction of the motion, for the purpose of separating the material by the friction on said studs, in combination with the action of the water. Wheel L gives a reciprocating motion to the boxes C and G.

On top of box G is a pan N, with a perforated bottom, through which the water enters. This pan N slides on ways M M, and can be run out if box G is to be filled or emptied, and serves during the operation to prevent the water from splashing out.

The very minute particles pass with the water down in a reservoir P, and settle there; the water passes off through holes in the side-board *h*, which can be gradually opened or shut up by a slide *i*.

"I claim as new and original the employment of the reciprocating perforated trough, armed with cutters or breakers, in combination with the sieve and decanting trough arranged beneath the reciprocating trough, and in combination with said reciprocating trough, I claim the percolating plate arranged above the same."

No. 10,091. CHARLES TREAT PAINE WARE, of New York, N. Y.—*Improvement in Propellers.* Patented October 4th, 1853.



The blades are constructed of India-rubber, or the like material, in combination with elastic ribs, or with inflexible parts.

Extract from the Specification.—"The dotted curves C R represent the vessel's counter. B represents a blade in a certain position relative to the shaft S, the blade decreasing in thickness from its point of junction with the shaft at D towards every point of its outer and inner boundaries F T, and D T has its inner boundary D T much stiffer than F T, so that it shall yield much less to the resistance of the water than the outer boundary F T. The shaft passing into the vessel at V is acted on by alternate partial revolutions; the point T, when not opposed by any resistance, describing an arc of a circle, the plane of which circle is perpendicular to the shaft S. The resistance of the water, however, causing the outer boundary F T, and all that portion of the blade more remote from the perpendicular D P than the inner boundary D T, to yield readily. While D T retains a stiffer bearing against such resistance, the blade presses upon the resistance obliquely like the blade of a screw, the angle accommodating itself to the amount of such resistance, which of course is greatest towards the tip T, so that the blade being forced round with great velocity, said tip, according to its degree of flexibility, will tend to be drawn through the water edgewise, exerting very little if any power of propulsion. But at the point where the blade commences its return sweep the checking of the momentum gained by the previous sweep causes the combined forces of such momentum and of the motive power applied to accumulate, as it were, at the extremity of the blade, and down along the outer boundary towards the shaft, whereby the said extremity is thrown backward in a direction parallel to the shaft, before it can again be drawn through the water by the succeeding sweep of the blade. The blade being constructed with this view, may thus be made to combine the propulsive action of the paddle and the screw.

"I claim a propeller having one or more blades, the front and rear edges of which are of unequal stiffness, the blade or blades thus constructed being arranged upon an oscillating shaft, and operating substantially as herein set forth."

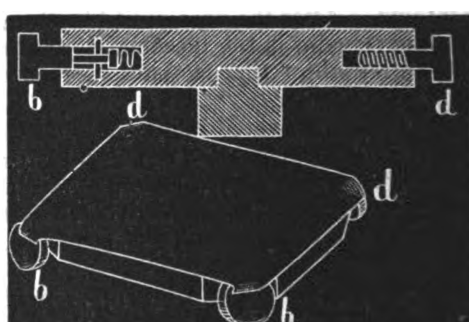
No. 10,092. W. C. Dean, of Jacksonville, N. Y.—*Guide for Dowelling Felloes for Wheels.* Patented October, 4th, 1853.

The object of this guide is to prevent the grain of the wood drawing the bit, as in the usual way of boring it is apt to do. It also does away with the necessity of striking a centre on the end of each felloe.

The end of the felloe is inserted at A; on each side of groove A is a guide B, and on one side a set-screw C to fasten the felloe with; in the centre of groove A is a metallic tube D running through to guide the bit when boring for the dowel.

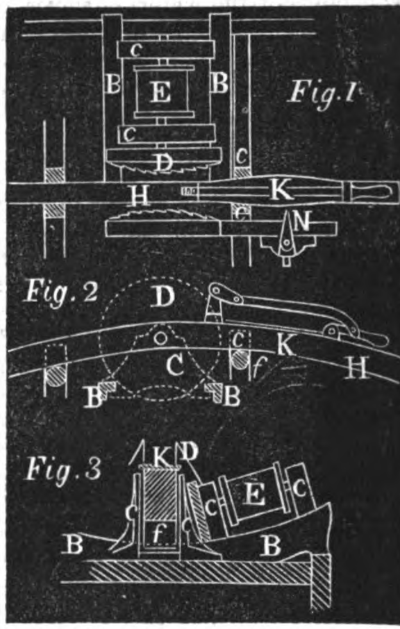
"I claim the combination and arrangement of the tube, guides, and set-screw for the purpose of holding the wood and guiding the bit, as herein described and set forth."

No. 10,093. Marshall Finley, of Canandaigua, N. Y.—*Daguerreotype Plate-Holder.* Patented October 4th, 1853.



"I claim constructing a solid daguerreotype plate-holder, or block, having fastenings at each corner made by spiral springs, in combination with tightening-bolts having concave heads, into which the bent or turned corners of the plate to be buffed are hooked, so as to admit of a uniform buffing, as herein set forth."

No. 10,094. C. B. Hutchinson, of Syracuse, N. Y.—*Machine for Jointing Staves.* Patented October 4th, 1853.



"First. I claim the use of the circular guide-ways in combination with the movable piers or bearings, and the cams, or levers, or other suitable means of moving the same simultaneously and equally along said circular guide-ways, so that the saws or other cutters may be instantaneously adjusted for any required width of stave without stopping their motion or changing their direction towards a constant central point.

"Second. I claim the use of the wing or leaf-gauge N in combination with the index moving over a graduated arc or dial, both moving in connection with the saws, so as to indicate at a glance the width between the saws, and to guide the operator in setting the stave on its bed-plate, and in adjusting the saws.

"Third. I claim the mode of jointing staves to any required bilge and bevel, without bending or springing them, by rotating them endwise in a plane perpendicular to their width, between saws, or other cutters, so inclined as to give the correct bevel, whether adjustable as above or not, said rotation being upon a circle or other proper curve, such as to present each part of the stave to the action of the inclined cutters at the precise point or height requisite to give it its exact proportionate width or bilge; the rotation being obtained by means of a central arch-piece moving over rollers about a constant centre of motion, substantially as described, or by other equivalent means."

No. 10,095. J. Augustus Roth, of Philadelphia, Pa.—*Removing Chlorine from Bleached Fabrics.* Patented October 4th, 1853.

Extract from the Specification.—"In the bleaching of linen, muslin, paper, and other fabrics in the arts, chloride of lime is employed. The effective agent in this process of bleaching is the chlorine which this salt contains. After the process of bleaching is completed, a portion of chloride of lime remains in the bleached fibres, the chemical action of which is found, after a length of time, to have weakened the fabric, and frequently to have changed its color.

"I have discovered that by removing the chlorine from the fabric after it has been bleached, the strength of the fabric and the permanence of its color are increased, in comparison with fabrics from which the chlorine has not been so removed. I have also discovered the mode of preparing and applying a solution which will practically and economically accomplish this result.

"The solution which I employ, I suppose, from the rationale of its preparation, to be a sulphite of soda; but for greater accuracy, I proceed to describe the mode of its preparation, and the process of its application, so that others skilled in the art may make and use my invention.

"I charge a glass retort A with three pounds of sulphuric acid, and half a pound of charcoal pulverized, or in that proportion. The retort is placed in a sand-bath B, and slowly heated in any convenient mode. The retort is connected by means of a bent tube E extending nearly to the bottom of a reservoir or receiver D.

"This reservoir or receiver D is filled with a solution of sal soda, which solution I prepare in the following proportion to the contents of the retort, viz:

"For every three pounds of sulphuric acid and half pound of charcoal, as above, I place in the reservoir two pounds of soda and one gallon of water. Heat is applied to the retort until all the sulphurous acid gas passes over through the tube E into the reservoir, and there unites with the sal soda, thus forming a solution which I believe to be sulphite of soda, and which I denominate 'anti-chlorine.'

"This solution is to be applied to bleaching fabrics at any time after the bleaching operation is completed, in the following manner: The solution or anti-chlorine, formed in the reservoir as above, is to be diluted in the proportion of about one part of the solution or anti-chlorine to twenty-five parts of water, and into this solution the bleached fabric is immersed until entirely saturated. The effect as herein before stated, is to remove the chlorine and chloride of lime remaining therein, and prevent the subsequent injurious effect therefrom upon the fabric.

"I claim the process of removing chlorine from fabrics by means of the solution herein described, and denominated anti-chlorine, or by means of any other solution substantially the same, in the manner and for the purpose as herein described."

No. 10,096. Jas. K. Murrill, of Richmond, Va.—*Loom for Weaving Coach-Laces.* Patented October 4th, 1853.

"I claim, 1st. The revolving pliers *q*, constructed as described, and operated by the spindle *n*, whirl *o*, connecting-rod *s*, lever W, and cams U and V, in combination with the finger *a*, constructed and operated as specified; wedge *m* and cylindrical-stand M, by which combination the needles upon which the pile is formed are seized, removed from the finished portion of the fabric, carried up, inserted under the colored warp selected by the jacquard for the figure, and released, substantially as specified.

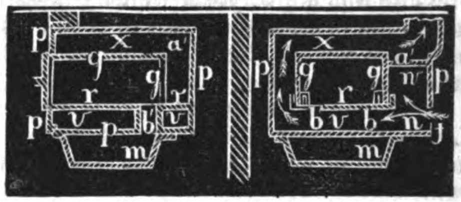
"2d. The construction of the stationary shuttle-box D, as described, having its front sustained by and movable about the projecting-rod *j*, so as to operate the ungearing apparatus upon a miss-throw of the shuttle, in the manner specified.

"3d. The combination of the sliding-reed E with the stationary shuttle-box D, when constructed and operating substantially as specified.

"4th. The combination of the notched-wheel W′, rock-shaft U′, and arms T′ and V′ with the lever N′, spring C″, shaft L′, rod R′, and bar S′, arranged substantially as described, for operating the ungearing apparatus in the manner specified, when a derangement occurs in the machinery operating the needles.

"5th. The springs K, as arranged upon, in combination with the rods *d*, by means of which the strain upon the eyes of the harness is diminished, substantially as specified."

No. 10,097. John P. Hayes, of Boston, Mass.—*Improvement in Cooking-Ranges.* Patented October 4th, 1853.



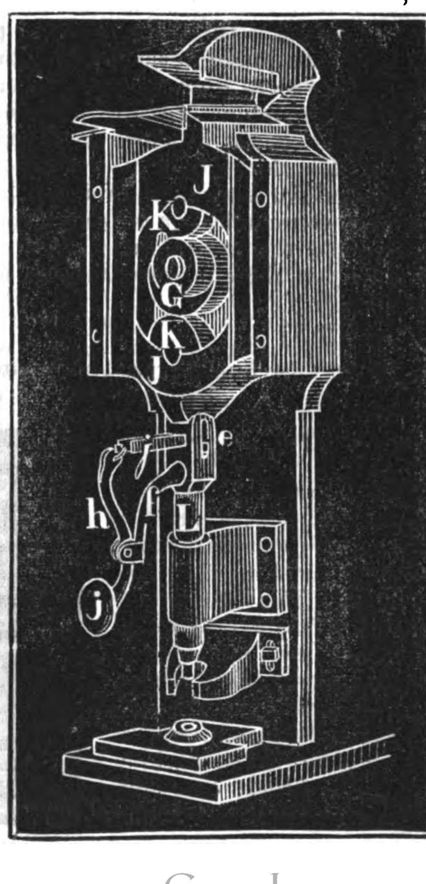
The object of this improvement is to prevent the smell of any thing which is being cooked in the oven from passing into the hot-air chamber, and penetrating into the apartments which are heated by the range. Any thing which is spilled in the open will be caught by the receiving-flue *m* which is attached to the bottom-plate *n* of the oven. *m* can readily be cleared out, and thereby the spreading of any offensive smell is to be prevented.

p p, outer casing of oven; *g g*, inner movable oven, composed of three sides and the top, the bottom being formed by the stationary-plate *r* attached to *p p*, on which plate the oven can be moved in or out.

The smoke, etc., from the fire-pot passes through aperture *t* and then follows the direction indicated by the arrows into *v w x x* into the smoke-pipes, the smoke, etc., being made to pass around the oven by the partition *a'*, which prevents it from passing directly into the smoke-pipe. The hot air is received from the chamber about the fire-pot into the receiving-flue *m*, and then passes through a box-flue *b' b'* into the oven.

"I claim, 1st. The receiving or box-flue *m m* formed under the oven, in the manner above described, and for the purpose specified.

"2d. I claim so combining a movable oven sliding upon a stationary bottom, through which the hot air is admitted, with the smoke-flues about the same as to cause the smoke, &c., to pass about and over the oven, and the hot air to pass into the same, as above described."



No 10,098. By O. J. Davie & T. W. Stephen, of Erie, Pa.—*Machine for Punching and Shearing Metal.* Patented October 4th, 1853.

The nature of this invention consists in disconnecting the punch or its stock L from the yoke *j* by an automatic movement at each operation of the machine, by means of a weight *i*, acting in connection with a wedge *j*, in which position the punch ceases to operate until the metal to be punched is properly in place, when by a slight touch of the operator upon the rising of the punch, the connection between them is again made, and the punch is thrown into operation, by this means allowing the machine to continue in motion, whilst the punch is only brought into action when required. G, eccentric, to the shaft of which a moving is power applied; K K, friction and pressing rollers; J, yoke, which is alternately raised and depressed by the revolution of G, the journals of K K having their bearings in said yoke; on top of the yoke is the adjustable blade of a pair of shears, and above it the other stationary one.

To the lower part of the yoke is attached by a slip-joint *e* the punch-stock L; on this stock L is a curved arm *f*, in which is hinged lever *h*, on the lower end of which a weight *i* is so arranged as to draw the wedge *j* out (which wedge connects the punch-stock to the yoke) as soon as the punching operation has been performed, and in consequence of the ascending of the yoke, the pressure of the yoke on the wedge ceases. When, then, the piece of metal has been properly arranged for the next operation, the operator presses the wedge *j* in.

"We claim disconnecting the punch-stock from the machine automatically, at each operation of the punch, by means of the weighted lever and key, or their equivalents, for the purpose of affording the operator time to place his sheets, without regard to the motions of the machine, when, by a slight movement of the ball or lever upon the rising of the punch, the connection can be again formed, substantially as described."

No. 10,099. By John Newell, of Boston, Mass.—*Improvement in Camphene Lamps.* Patented October 4th, 1853.

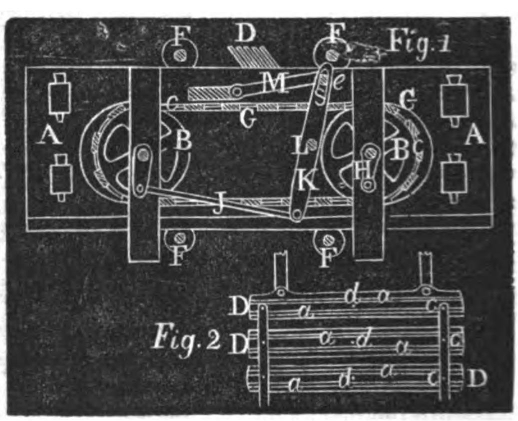
"I claim, 1st. The silvering of the perforated metal or brass, copper or iron wire gauze, used in safety-lamps and cans, or other vessels, designed to prevent explosions from the vapor of camphene, burning-fluid, &c., the silvering being applied for the purpose of preventing the corrosion of the metal or wire gauze, as above described, by the most economical process.

"2d. The introduction of perforations, as above described, in the caps of lamps used for burning camphene, burning-fluid, &c., so small as not to admit the communication of flame through them for the purpose of allowing the escape of the vapor formed within the lamp, from camphene, burning-fluid, &c., and thereby preventing the bursting of the lamps by the pressure of the vapor."

No. 10,100. By R. H. Pindell, of Fayette County, Ky.—*Improvement in Planing Machines.* Patented October 4th, 1853.

Extract from the *Description:*

"In frame A, two equal pairs of wheels B revolve, carrying the endless feeding and planing bed *c* by the planes D. This bed is constructed of bars or slats E, connected by hinge-joints, and has slight chisel projections, on which the plank is impressed by pressure-rollers F, as it is fed to the machine. The ends of these bars slide in grooves G, in the frame,



and are concave at their parts of contact with the wheels, to fit snugly thereon. The axle of one pair of wheels is adjustable, to regulate the tension of the travelling-bed. The power is applied to the crank H.

"Two equal cranks, one on each extremity of the axle I, operate two equal pitmans J, which rock two equal levers K on fulcrum L; and to their other extremities are attached two equal driving pitmans M, which operate the knives. A slot *s* is cut in each rocking-lever, so as to decrease at pleasure the *effective arms:* thus giving any *differential* velocity (compared with that of the bed) found to be best. Assuming the effective arms to be one-half the length of the motor crank H, and the stroke of planes 18 inches; then, on the *forward* motion of knives, they will cut 18 in. + 36 in. = 54 in.; and on the *backward* stroke, they will cut 18 + 0 = 18 in.; hence, at each revolution, there will be planed 54 in. + 18 = 72 = 6 feet. Thus the value of this machine is to consist in working at *low velocities*, and doing a larger amount of work than on the planing machines in use.

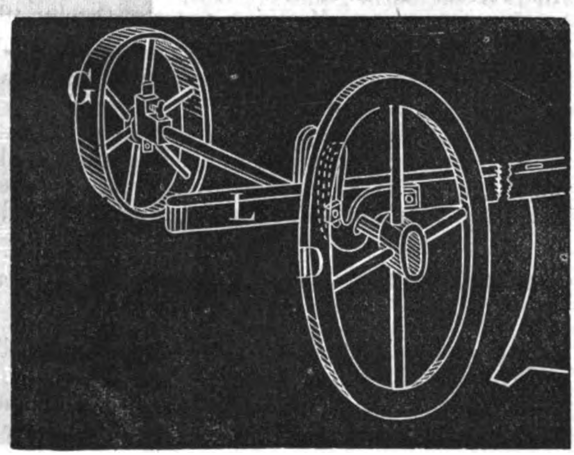
"Each stock (four in all) to contain two knives *a a*, &c.; the stocks to be separated by about three inches, and to be connected by two bars, and free to turn on the pins *c c*, &c.; each to have a partial reciprocating rotary motion about its own centre *d*, which is caused by simply giving (by means of slot pin *e* to *one* of the driving pitmans M) a more extended or longer stroke. For this purpose, each plane stock has its extremities circular—the circle having its centre in the centre of the stock. This will greatly facilitate the cutting: will keep the knife edges clear of the splinters, &c., and cut the knots and cross-grain, far better than *straight* moving knives. The stocks are adjustable to and from the bed in any well-known manner.

"Tongueing and grooving knives can be attached to the machine, on the side opposite the planes.

"I claim the combination of the differential velocities of feed motion, and the motion of the knives: that is, when their relative speed is such that the knives shall cut on their back as well as on their forward motion, in the manner and for the purpose substantially herein before set forth.

"Secondly. Giving the straight-edged planes for dressing lumber, a partial reciprocating rotary motion about their own centre, for the purposes of, and in any manner substantially the same, as herein before described and shown in the drawings.

"Thirdly. I claim a yielding pressure-roller placed in front of the stocks, in combination with an endless planing bed, for the purpose of feeding planks, &c., to the planes, operated in any manner substantially the same, as herein before set forth."



No. 10,101. By C. R. Brinckerhoff, of Batavia, N. Y.—*Improvement in Ploughs.* Patented October 11th, 1853.

By lengthening or shortening the distance of the axle, between the plough-beam L and wheel D, the width of the furrow is gauged to any desired width, and is kept of uniform width. Wheel G, which is on the landside, has a slip-collar, so that the axle may be taken out of the supporter when necessary.

This plough, the inventor says, does not require any person to hold it except at the turning, and can be attended by a small boy. The advantages of the sharp-bevelled rim and narrow tread of the large wheel are, that it runs lightly—pressing lightly against the land—gauging the width of the furrow slice, and casts aside any small stones that roll against the land.

"What I claim therein as new and valuable is, first: Combining with the plough-beam, between the plough and the clevis, two wheels, one on each side of the beam, and of different diameters; the one resting in the furrow, and the other on the land, for the purposes set forth and described.

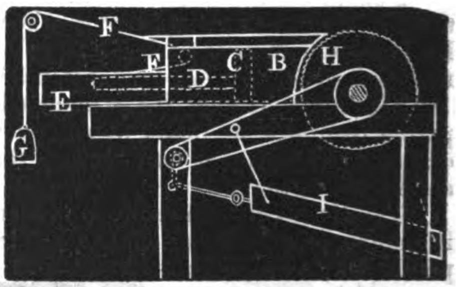
"Second. I also claim making the tread of the furrow-wheel narrow, for the purposes described.

"I also claim making the said wheels, especially the furrow-wheel, adjustable in the direction of its axis, for the purpose of adapting its position to furrows of different widths.

"I also claim making the furrow-wheel bevelling outward on the side which presses against the land, as above described, and for the purposes herein before set forth.

"I also claim making the small wheel adjustable vertically, with reference to the shaft B and the large wheel, as described."

No. 10,102. By H. P. Byram, of Louisville, Ky.—*Machine for cleaning Blue-grass and other Seeds.* Patented October 11th, 1853.



The nature of this invention consists in removing the chaff or hulls from the seed by pressing and holding it up against an emery or sand-wheel, by an unvarying pressure, whether the hopper be more or less full.

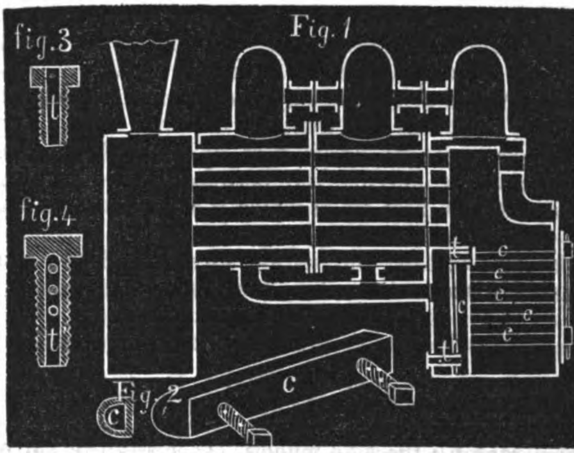
B horizontal hopper; follower C fits closed in said hopper, and its arm D is carried in guide E; cord F and weight G draw forward follower C, and thereby force up the seed to the sand-wheel H, with sufficient power for the scouring-wheel to cut away the chaff; the seed drops down into the screen I.

"What I claim therein as new is, in combination with the rubbing or scouring-wheel, the method of feeding up and holding against the said wheel, the seed to be cleaned, by a pressure which is unvarying, whether the hopper be full or not, substantially as herein described."

No. 10,103. By J. B. Collan, of Reading, Pa.—*Steam-Boiler.* Patented October 11th, 1853.

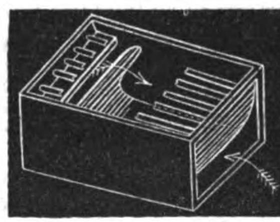
Figure 2 represents one of the D-shaped water linings *c*.

"What I claim as my invention is a detachable lining for the sides and ends of fire-boxes of steam-boilers, consisting of one or more tubes connected with the adjacent water space by means of hollow bolts or their equivalent,



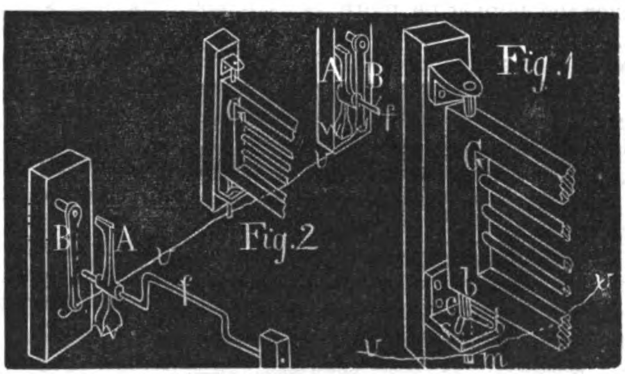
substantially as herein set forth, so as to admit of the ready removal and replacement of the tubes."

No. 10,104. Gilman Davis, of Roxbury, Mass.—*Ash-pans for Locomotive Engines.* Patented October 11th, 1853.



"What I claim therein as new, is the taking in of the air in front of the ash-pan, and introducing it into the fire-box in a direction opposite to the furnace doors, to protect the fireman from the back-lash of the fire, when said doors are opened, by means substantially such as herein described."

No. 10,105. S. G. Dugdale, of Richmond, Ia.—*Apparatus for opening and closing Gates.* Patented October 11th, 1853.



Pin *b* moves in groove *s t c*; when shut it rests in *c*, when open in *t* or *s*; cord *v* is firmly connected to the lower end *m* of pin *b*. The nature of the invention consists in attaching the ends of cord *v* on both sides of the gate G, and at some distance from it to a combination of levers in such a manner that the gate opens from itself, as soon as the carriage wheel strikes one of them, and stands open until the wheel strikes the one on the other side of the gate, consequently after having passed the gate. Fig. 2 shows the levers A and B on both sides of the gate, and *f* extends into the street, and the carriage wheel is to pass over it. If so, lever A (which is weighted down by weight *w*) is turned and strikes lever B, which pulls the cord *v*, and draws pin *b* towards *s* or *t*, thereby opening the gate until the lever *f* on the other side is struck by the wheel.

"What I claim as my invention is, first, opening, closing, fastening, and unfastening the gate, by moving the bottom of the gate in an oblique direction from and to the post, upon which it is hung, as above specified.

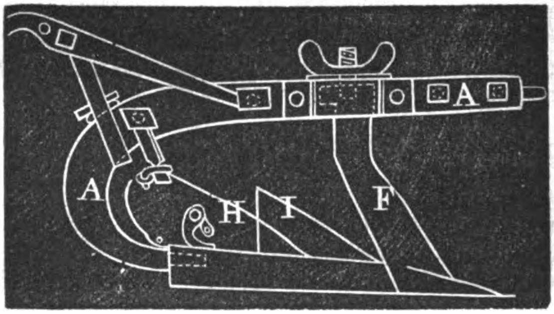
"2d. I also claim the use of the pendulous and vertical levers *f f* and *i i*, and arms *g g* and *h h*, in combination with the hinges of the gate, the whole being operated and arranged in the manner, and for the *purpose* as above set forth."

No. 10,106. Charles Goodyear, of New York, N. Y.—*Coating Metals with Gutta-Percha*, Patented October 11th, 1853.

The inventor mixes with the caoutchouc or gutta-percha, when it is desired to form a vulcanized hard or rigid compound, from six to eight ounces of finely divided sulphur with each pound of the gum. The caoutchouc is formed in sheets of the desired thickness, and cut in suitable pieces. These are then applied to the surface of the metal (which has been somewhat roughened beforehand), taking care to press the compound upon the article so as to expel all the air between. The so covered article is then subjected to a high degree of heat, from 260° to 300° Fahrenheit, from three to seven hours. The hard compound may then be polished and varnished. The inventor covers in this way the iron parts of fire-arms; iron pieces belonging to harnesses, carriages, etc., furniture articles, handles of knives, etc.

"What I claim and desire to secure is, the art or method of coating articles composed wholly or partly of metal, with compounds of caoutchouc or gutta-percha, and subjecting the same to a high degree of artificial heat, or the process of vulcanization, substantially as herein specified."

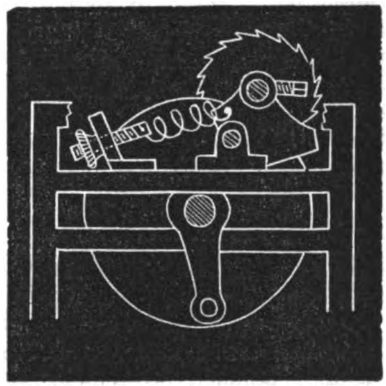
No. 10,107. Harrison & Metcalf, of Ridgeville, Vt.—*Hill-side Plough*. Patented October 11th, 1853.



A, beam; F, cutter; I, shear; H, mould-board. The nature of the improvement, say the inventors, consists in the superior strength, durability, and simplicity of the plough, it being less complicated, and not so liable to get out of order as other hill-side ploughs, and the construction being so simple, that any country smiths can make it, the entire plough being of wrought-iron, except the mould-board.

"We claim curving downward and inward the beam in the rear part, so as to cause it to support the rotary part of the plough, which it performs in combination with the standard, in the manner and for the purposes set forth."

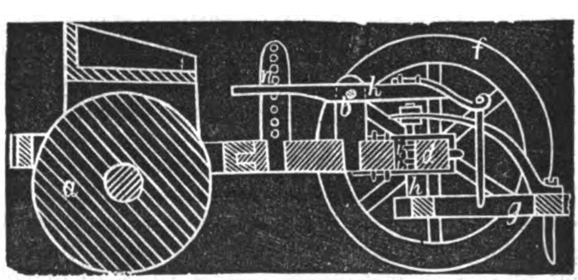
No. 10,108. I. HARRIS, of Boston, Mass.—*Machine for driving Circular Saws.* Patented October 11th, 1853.



"What I claim therein as new is, first, the method of hanging the arbor frame on journals, for its axis each side of the driving pulley brings the axes of the arbor frame within the circumference of the driving pulley, or on a line passing through the driving pulley, in such a manner, and at such an angle with a tangent to the driving pulley, that the act of feeding the stuff to the saw or cutter, will press the arbor pulley against the driving pulley in the manner and for the purpose herein described.

"Secondly, I claim hanging the arbor frame on such an angle, that the act of feeding the stuff to the cutter will press the arbor pulley against the driving pulley, in combination with a spiral spring, or its equivalent, for holding the arbor pulley firmly against the driving pulley as herein described."

No. 10,109. DANIEL HILL, of Bartonia, Ia.—*Combined Roller and Harrow.* Patented October 11th, 1853.

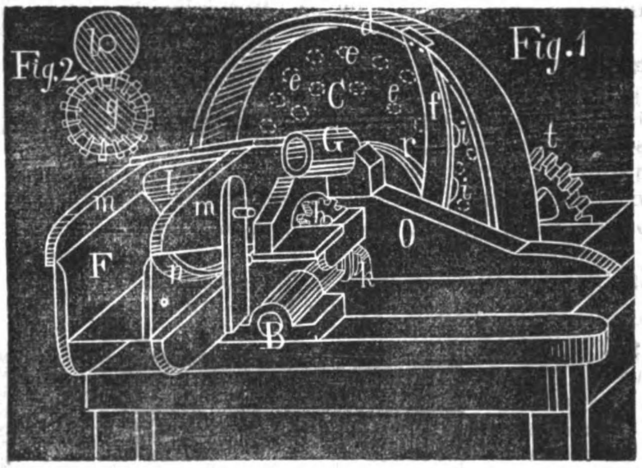


a, roller; *d*, axis of a pair of wheels *f f*; *g*, harrow; *h h*, rods carrying the harrow and sliding in staples *i i*. The object of this arrangement is to allow the harrow to accommodate itself to every inequality of ground; *k*, lever turning on pivot *b*, and adjustable by pin *n*.

"What I claim herein as new, and of my invention, is the arrangement and mode of attaching the harrow to the forward axle of a roller, in the manner and for the purpose set forth."

No. 10,110. T. B. JONES, of Carloville, Ala.—*Straw and Cob Cutter.* Patented October 11th, 1853.

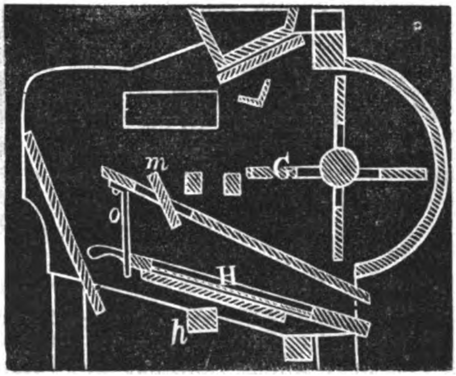
Shaft B supports the shelling and cutting wheel. This wheel consists of a metallic disk C, having a series of shelling teeth *e* cast fast to its face. The rim *d* of the disk projects beyond the face and back, thus increasing its stiffness, and furnishing a support for the knives *f*. The inner extremities of the knives are made fast to the hub of the wheel, which also projects beyond the face and back; their outer extremities are made fast to the raised rim, and they are supported at suitable intervals between their two extremities by raised bosses i i, cast to the disk A; feed tube E is constructed at the front of the machine for the reception of the ears of corn to be shelled. A feed trough F is secured to the back of the frame for the introduction of the straw or other similar articles. The bottom of this trough near its inner extremity is traversed by a feed roller g, whose barrel is toothed or fluted to enable it to seize the straw; the gudgeon of this roller projects through its box, and is fitted with a screw wheel h, whose teeth engage with the threads of a screw R, on the shaft of the cutting and shelling wheel. A second roller l is supported above the first by a frame m, whose side pieces are pivoted to the sides of the feed trough and are acted upon at their hinder extremities by springs n, which press the barrel of the upper feed roller upon that of the lower, thus holding the articles introduced between them firmly during the action of the cutters, and at the same time enabling the lower fluted roller to seize them and move them against the disk of the cutter wheel, which gauges the length of the pieces cut by each stroke of the knives. The feed trough F is supported at its



inner extremity by a beam o, which also supports an inclined feed tube G for the presentation of corn-cobs, or corn on the cob, to the action of the cutters. A ring gauge r is cast fast to the disk immediately opposite the inner end of this feed tube: this gauge limits the length of the piece cut by each stroke of the cutters, so as to make the pieces much shorter than the straw or stalks, as it prevents the cobs from being thrust too far beyond the inner end of the feed tube. The shaft B is fitted with a pinion, whose teeth engage with those of a wheel t on a short shaft to which the power is applied by means of a crank. Corn is shelled with this machine by dropping the ears into the feed tube E at the front of the machine, where they are acted upon by the shelling teeth protruding from the revolving wheel C; when straw or other similar substances are to be cut, they are introduced into the feed trough F at the back of the machine, and are entered between the feed rollers g l, by means of which they are moved forward to be acted upon by the revolving cutters f. Corn-cobs or similar substances are sliced by entering them in the feed tube G, and pressing them against the ring gauge r, which regulates the thickness of the slice removed by the cutters.

"I claim therein as new, the combination of the feeding trough F, its gauge disk C, the tube G, and its gauge ring r, with the knives f, whereby the same knife will at the same time cut fodder coarse, and cobs fine, and thereby improve the quality of the product as feed for animals."

No. 10,111. H. M. Keller, of Newark, Ohio.—*Fanning-Mill.* Patented October 11th, 1853.

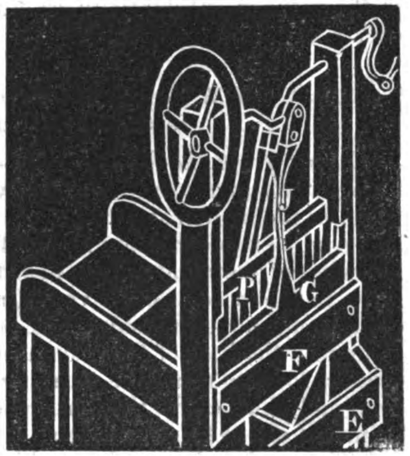


The front end of screen H can be raised or lowered by straps *o* to let the grain pass off more or less rapidly.

The revolutions of fan-wheel G sets *h* and thereby screen H in an oscillating motion. When no screening is wanted, the trap-door *m* is shut.

"What I claim therein as new is the trap-door *m* in combination with the screen H, arranged and operated in the manner and for the purpose herein set forth."

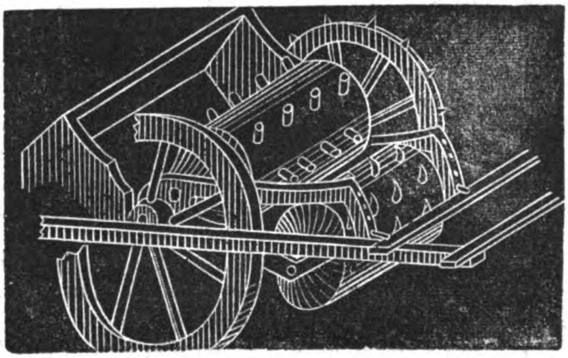
No. 10,112. J. J. Parker, of Manilla, Ohio.—*Straw-Cutter.* Patented October 11th, 1853.



E, board to gauge the length of the straw cut; G, reciprocating-gate, to which is attached an iron or steel plate H, extending up the sides of the gate as far as the gate moves on the knife; J, pitman, of elastic wood or metal; P, rake; F, knife, against which gate G is pressed on account of the elasticity of pitman J.

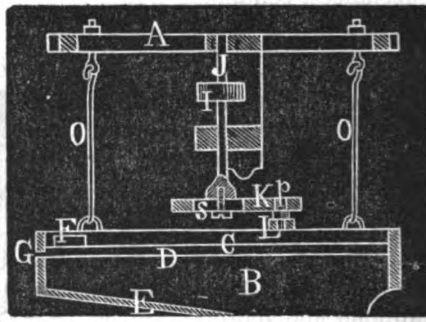
"What I claim as my invention is operating both the reciprocating-gate and the feeding-rake by means of the compound-spring pitman, substantially as herein set forth."

No. 10,113. Samuel Snow and Alexander Hine, of La Fayette, N. Y.—*Improvement in Cultivators.* Patented October 11th, 1853.



"What we claim as our invention is the combination of the two toothed cylinders with the receiving-box, all being arranged and suspended on an adjustable frame, in the manner and for the purpose set forth."

No. 10,114. J. L. VAN VALKENBURGH, of Ogdensburgh, N. Y.—*Machine for Separating Cockle, etc., from Wheat.* Patented October 11th, 1853.



A, frame; B, receiver, adjustably supported by rods O from the frame; C, coarse sieve, with holes large enough to permit the grain to pass through freely; D, sieve, fine enough to retain the grain; E, bottom of receiver; F, opening for letting pass off the coarse dirt; G, opening for letting pass out the grain; I, driving-pulley on shaft J; K, crank, with slot *s* for the reception of shaft J; the end pivot P of crank K turns in the centre of a bar L, which is firmly attached to the two sides of the receiver. By this arrangement the rotation of I will set the receiver in rotating motion.

"What I claim as my invention, and desire to secure, is not the use of sieves in cleaning grain, but the communication of a reciprocating rotating motion to the sieves or separators, and also the construction of the machine in the manner substantially as above set forth, for separating grain from cockle and other impurities."

No. 10,115. H. W. WOODRUFF, of Jefferson County, N. Y.—*Treatment of Metals in Casting.* Patented October 11th, 1853.

Extract from the Specification.—"The object of my invention is to expel foreign substances or impurities which are mechanically mixed with the metal in the molten state.

"And to this end, the nature of my invention consists in introducing in the mass of metal, and at or near the bottom thereof, whilst in the molten state, in the ladle or other vessel, and before it is cast, some porous or cellular non-conducting substance containing liquid matters, so that when immersed the heat of the molten metal shall gradually evaporate the liquid matter, so as to cause the escaping vapor to agitate the mass from the bottom, and thus carry the impurities up to the surface, where they can be skimmed off, to leave the metal in a pure state.

"The mode of procedure which I have practiced with success, is as follows:

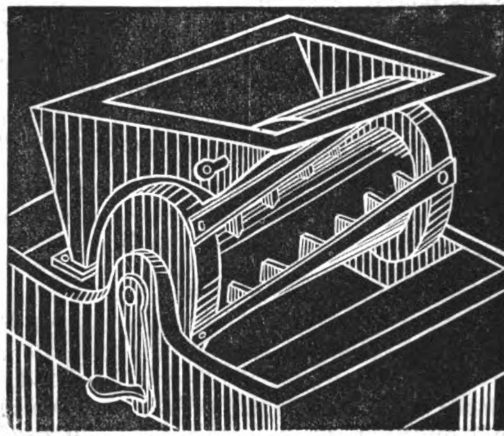
"After the iron has been run from the furnace into the ladle in front in the usual manner, I take a large potato secured on the end of an iron rod, and plunge it into the molten iron, and keep it at the bottom as long as may be desired.

"The mass of molten iron soon becomes violently agitated, very much in the manner of water boiling at a very high temperature, but more violently, by which all foreign substances are thrown up to the surface, from which they can be skimmed off, or otherwise removed.

"When the agitation ceases to throw up any more impurities, the potato, or the remnant thereof, is taken out, and the iron is then in a pure state to be cast.

"The castings made from iron thus treated, I have found to be invariably sound, and of much greater strength than when made of iron under any other mode of treatment known to me.

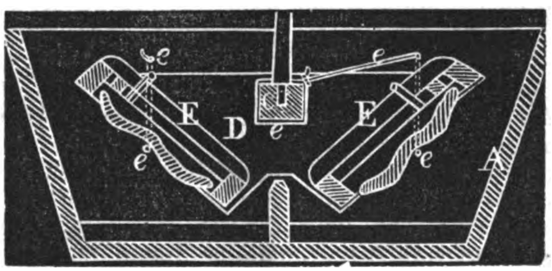
"What I claim as my invention, and desire to secure by letters-patent, is treating metals while in the molten state, to expel impurities therefrom, by immersing therein some porous or cellular non conducting substance or substances, containing liquid matter, substantially as specified."



No. 10,116. D. H. Whittemore, of Chicopee Falls, Mass.—*Machine for Cutting Vegetables for Fodder.* Patented October 11th, 1853.

"What I claim as my invention is the combination of the long and short knives on the periphery of the cylinder with the hopper, arranged as described and represented."

No. 10,117. H. G. Robertson, of Greenville, Tenn.—*Washing-Machine.* Patented October 11th, 1853.



The nature of this invention consists in constructing the machine with a rocking-frame D on a rocking-shaft C, having hinged slatted washing-boards E arranged inclining, and having suitable cords *e e* for holding the clothes under its bottom while being washed; A, tub, is divided into two compartments, so that white and brown clothes may be washed at the same time and separately; and the bottom of the tub being slatted so as to work in combination with the slatted wash-boards, and effectually operate upon the clothes, and remove the dirt from them. The rocking of frame D causes the clothes alternately to descend and strike parallely the horizontal bottom and the hot suds, which latter are forced through the pores of the clothes by the two slatted surfaces coming together.

"What I claim as my invention is the employment of the double-chambered slatted-bottom tub A in combination with the vibrating or rocking-frame D, constructed with two hinged slatted wash-boards E E, which have cords *e e* passing under the bottom of them, for holding the clothes against the bottoms while washing; the said boards E E being made movable or swinging, so that the clothes can be easily laid on the cords, and they also being set in such a position that they and the clothes will always be caused to strike parallely the slatted-bottom and the hot suds in the tub, and force the latter through the pores of the clothes, and cause them to be washed clean; the whole being constructed and arranged and operated in the manner described."

No. 10,118. BANFORD GILBERT, of Pittsburg, Pa.—*Improvement in Griddles.* Patented October 11th, 1853.

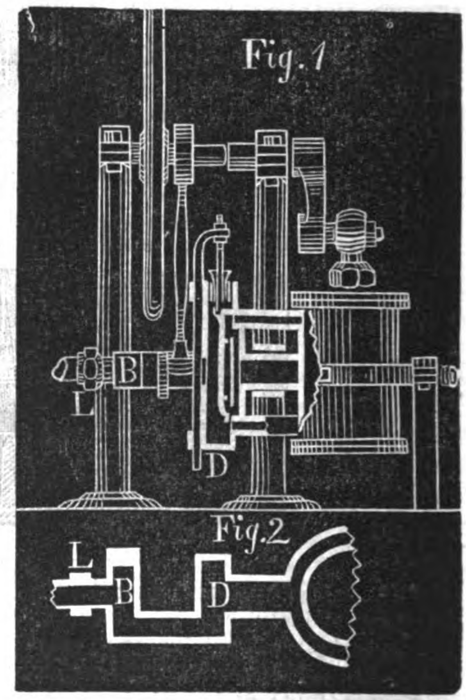
"What I claim as my invention is the constructing of griddles of two pieces, separated by flanges furnished with openings to admit of the passage of cool air between the upper and lower pieces of the griddle, which openings may be closed at pleasure, substantially as herein described."

No. 10,119. A. B. LATTA, of Cincinnati, Ohio.—*Valve-Motion of Oscillating-Engines.* Patented October 11th, 1853.

"What I claim as my invention is the mode of arranging the valve-chambers outside of the barring or trunnion, on which the cylinder oscillates, in such manner as to allow the wrist-pin of the eccentric-rod to move equally across the centre of the trunnion, and moving equally above and below, and thereby giving motion to the valve or valves by said eccentric independently of the oscillating of the cylinder.

"I also claim the sliding-bar or bars to which the eccentric is attached, and passing up the whole length of the valve-chambers to the end or ends, as the case may be, and attached to the valve-rods, thereby giving motion to the valves.

"I claim this arrangement as set forth by drawings, or their mechanical equivalents."



No. 10,120. YELLAND FOREMAN, of New York, N. Y.—*Metallic Boats.* Patented October 11th, 1853.

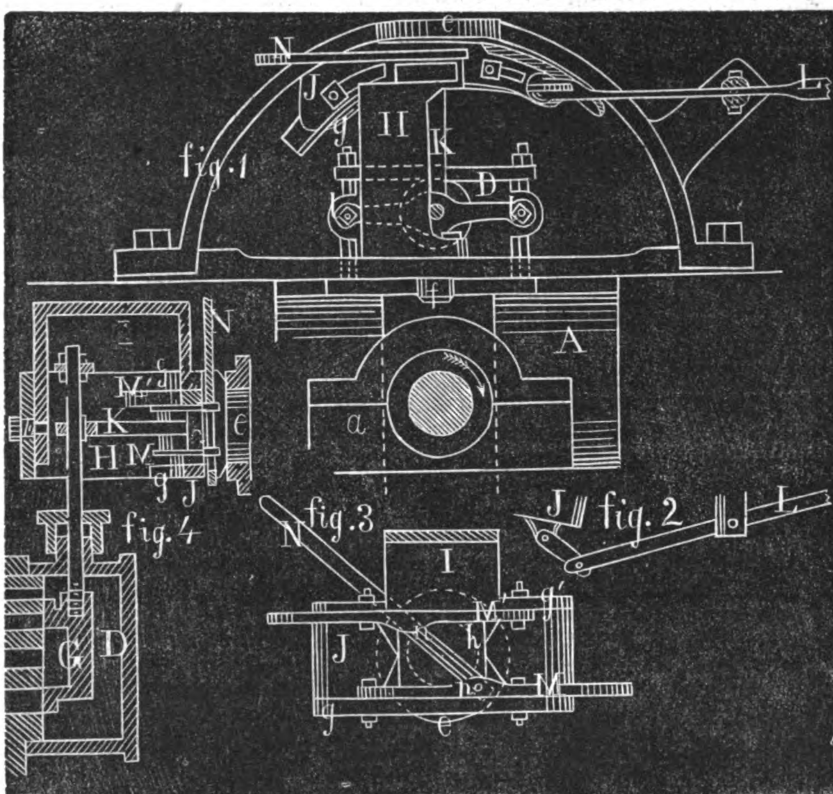
The object of this invention is to give to the boat a large amount of safely-distributed or insulated buoyant power, and at the same time obtain the utmost amount of interior space, greater strength, stiffness, etc.

"What I claim is constructing the body of my life-boat wholly of metallic tubes, braced or similarly united throughout, thus affording a water-tight and solid metallic connection and mutual bracing of every part, as shown, whereby are attained the objects explained in a compact and generally advantageous manner.

"I further claim, in combination with such boat, the detachable tubular seat, as described."

No. 10,121. W. STEPHEN, of Pittston, Pa.—*Improvement in Oscillating Engines.* Patented October 11th, 1853.

The valve motion which forms the subject of this invention produces the necessary movement of the slide-valve by means of a fixed groove or guide attached to some part of the engine-frame, in a convenient position to receive a stud attached to the valve-rod, the said stud receiving a proper motion by being carried along the groove or guide by the oscillation of the cylinder. A, cylinder, oscillating in bearings *a*; D, valve-box; G, slide-valve; H, frame of a segmental form; this frame has a hole on its top to receive a hollow journal *e* at the top of way-frame I, which is an adjustable frame, containing the groove or guide; screw-stud *f* on the lower part of frame I forms a pivot for said way-frame; journal *e* and pivot *f* thus



forming an axis which is radial to the axis of oscillation of the cylinder. The part J of said way-frame forms an axis described from the axis of the cylinder motion. This arc contains the groove or guide formed by strips *g g* projecting on its under side for the reception of friction-roller *h*, which turns on a pivot on cross-head K, secured to the valve-rod; the two eyes *k k* of this rod K fit to two guide-rods *l l*, which are so secured to the valve-box as to preserve the rectilinear motion of the rod.

Frame I is under the control of lever L, having its fulcrum in the engine-frame, and said frame is adjustable on its axis *ef* so as to bring arc J at an inclination to the axis of the cylinder's motion, as shown in Fig. 2, or at right-angles to the axis, as in Fig. 3. The arc being in this latter position, the engine is stopped; but when in an inclined position, as in Fig. 2, the groove is similar to the recess in the thread of a screw, and as the cylinder oscillates gives motion to the valve. If turned to an inclination the other way, the engine will run in the opposite direction.

The position of the arc is regulated by stops on the frame H, into contact with one of which the arc is moved.

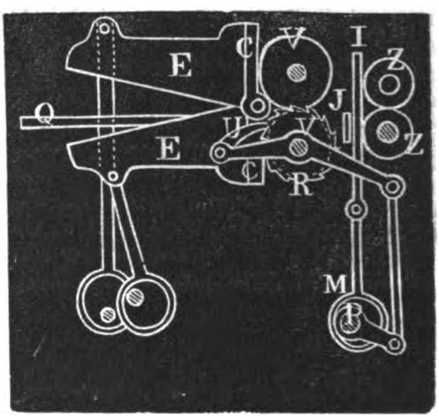
M M′ are adjustable sliding lining-pieces of the guide in the arc J, longitudinally adjustable on the strips *g g* by means of bolts and slots. The strips have a rise *n* on their face, and are connected and worked by lever N to either side of roller *h*; rise *n* causes the "lead" of the valve, the roller working against it. The roller arriving at the foot of this rise just before the engine is on the centre, gives a suddenly increased speed to the valve at that point, so that it is slightly open before the termination of the stroke. In oscillating in the other direction, the roller works against the other lining-piece M′ and the valve receives a "lead" on the opposite side.

"What I claim as my invention is:

"1st. The combined arrangement of the slide-valve and the guide J, which assists the oscillation of the engine in producing, and directs the motion of the said valve, substantially as described; to wit, the valve being arranged to work transversely to the cylinder, and the guide being in the form part of a helix or screw, concentric to the axis of the cylinder's oscillation, and receiving an arm or cross-head attached directly to the rod or stem of the valve, whereby the intermediate mechanism employed is dispensed with.

"2d. Giving the valve the necessary or desired 'lead' by means of the adjustable sliding lining-pieces M M′ which line the sides of the guide, and are furnished with projecting or rising parts *n n*, which will give the necessary 'lead' in working the engine in either direction, as herein set forth."

No. 10,122. JOHN A. ELDER, assignor to J. E. COFFIN, of Westbrook, Me.—*Machine for Cutting Pasteboard, etc.* Patented October 11th, 1853.



To operate this machine, power is communicated to shaft P and the pasteboard laid on the table or arm Q, and then moved into the series of shears E E, which close and cut into the pasteboard; then the board is moved to the rolls V V, which take the board and move it to the shears I J; the shear-blade I, which moves in a vertical slot, is drawn down by the eccentric M, and at the same time the series of shears E E cut into the pasteboard, and when they are opening V turns the ratchet-wheel R, and this wheel turns the rollers V and Z, carrying along the pasteboard, then the shears E E and I close and cut the pasteboard, and so on until the whole sheet of pasteboard is cut up.

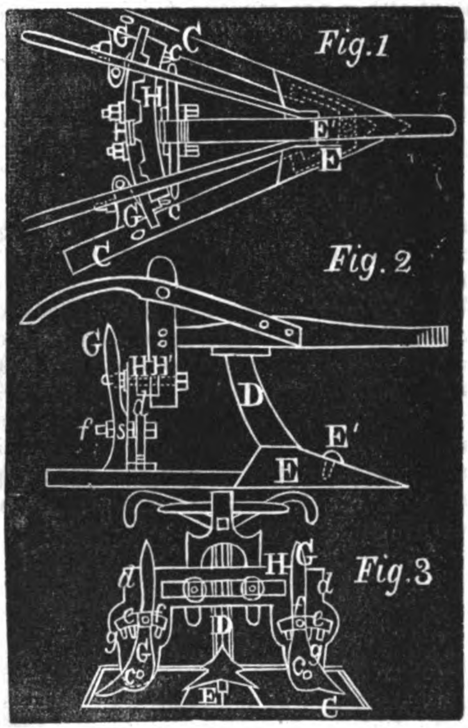
"What I claim to have invented is a follows:

"1st. The arrangement of machinery for cutting pasteboard into strips, and those strips a given length at the same time.

"2d. The arrangement of the rocker-shaft C, rolls V V Z Z, and shears I J, for the purpose above described.

"3d. I also claim the series of shears E E, or its equivalent, for the purpose herein described."

No. 10,123. L. M. Whitman, of Weedsport, N. Y., assignor to S. G. Wise.—*Improvement in Cultivators.* Patented October 11th, 1853.



C C are long inclined adjustable blades, which are set more or less steep, and are to cut up the weeds and soil.

The share E and lower part of standard D and the front ends of the inclined blades are united together by the bolt E′.

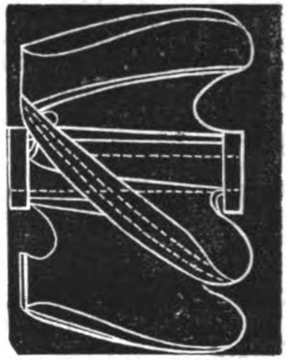
G G, levers which serve to adjust the blades more or less perpendicular; these levers carry fulcrum-pins *c c*, about which they turn, these pins serving to correct the vertical standards *d d* of the notched adjusting cross-racks H H′, which serve to move the blades farther apart or nearer together; *e e*, segmental slots, and *f f* set-screws; and *g g*, notches, into either one of which a cog *s* on the front of each lever G fits, and thereby keeps the blades in their position while ploughing.

"What I claim is the employment of the long inclined spring-wings C C, secured at their front ends to the share and main standard, and turning upon the pin E′, in combination with the mechanical contrivances herein shown and described for expanding and contracting the wings or setting them more perpendicular and nearer together, for the purpose of throwing more pulverized soil against or up to the hills, or setting them less inclined to the horizontal plane and further apart, for the purpose of allowing the pulverized soil, weeds, &c., to pass over them into the broad open spaces in the centre, the said wings in either case cutting up the weeds and pulverizing the soil, the same as herein fully set forth."

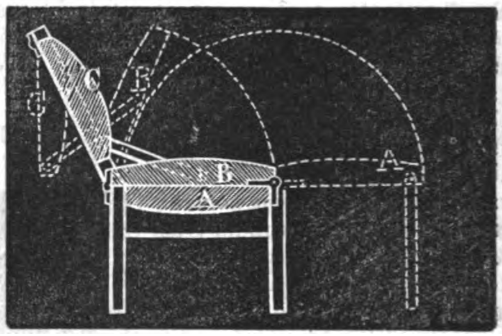
No. 10,124. Ebenezer Beard, of New Sharon, Me.—*Screw Propellers.* Patented October 18th, 1853.

The improvement, says the inventor, is founded on the well-known fact that the effect of a current of water impinging on a plate placed at a right angle to its direction, or *vice versa*, of a plate moving through the fluid, is much increased by surrounding its border by a rim or flange, which prevents the water from escaping freely from its edge. The improvement consists in placing flanges circumferentially upon the propelling blades at their outer margin, and also at their inner margin, when the blades are made much broader than their arms. They are also placed upon the back sides of the blades at their circumference, to render them more efficient in working backward.

"What I claim as my invention is the use of one or more flanges or rims, placed circumferentially upon the blades of a screw propeller, substantially in the manner and for the purposes described."



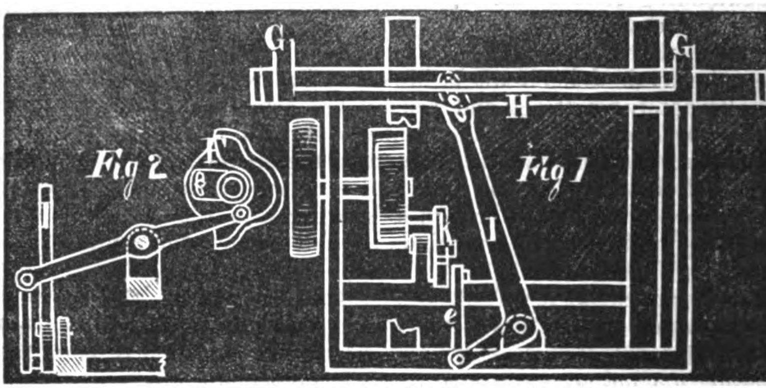
No. 10,125. Edwin B. Bowditch, of New Haven, Conn.—*Sofa-Bed.* Patented October 18th, 1853.



"What I claim as my invention is the arrangement of hinging the ordinary sofa seat to the back rail of the sofa frame, in combination with the arrangement of hinging an under seat, with the upholstered side down, to the front rail of the sofa, so that said under seat, by lifting the ordinary seat back, can be turned out of the front of and on a level with the ordinary seat, thus forming a bed.

"I also claim the arrangement of hinging the stuffed back to the top rail of the sofa, and attaching the back at the bottom to the top seat by strips of iron, in combination with the arrangement of hinging the top seat at the back lower corner."

No. 10,126. Wm. Crighton, of Fall River, Mass.—*Shuttle-motion of Looms.* Patented October 18, 1853.



This invention consists in connecting the two pickers G G by means of a rigid rod H passing through the lay, and giving motion to the same, by a picker lever I, which is operated upon to throw the shuttle in both directions by a single cam on a short shaft at one side of the loom. The object of this arrangement is the giving of the pickers a perfectly parallel motion by simpler mechanism than that commonly employed for the purpose.

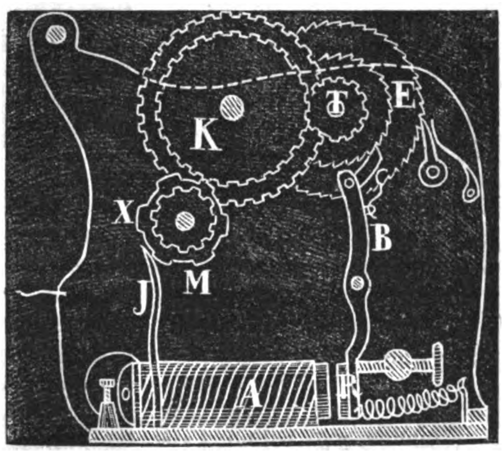
Fig. 1 is a front view of the apparatus, and Fig. 2 shows parts of it in a side view.

"What I claim as my invention is connecting the two pickers with a rod or rigid connection H, which receives motion from a single lever I and one cam F, whereby both pickers are operated as herein set forth."

No. 10,127. H. L. CRIDER and DAVID WILLIAMS, of Lancaster, Ohio.—*Mechanical Dentistry.* Patented October 18th, 1853.

"What we claim as our invention is securing the artificial teeth to a plate *m* by the usual method, and afterwards fastening said plate on the alveolar ridge of the plate having the impression of the mouth, either by riveting or the employment of soft solder, so as to prevent the application to the plate (having the impression) of the intense heat required to receive the teeth, as and for the purpose herein fully set forth."

No. 10,128. JAMES J. CLARK, of Philadelphia, Pa.—*Self-winding Telegraph Register.* Patented October 18th, 1853.



The operation of the several parts of this improvement is as follows:

When the spring unwinds and propels the train of register wheels, it also rotates the break-circuit wheel M; as the wheel M revolves, the spring J alternately strikes the face of the teeth X X, and falls into the cavities between them. Each time J (the spring) presses on the teeth X X it by so doing closes a galvanic circuit extending from the battery around the winding magnet. When the spring falls between the teeth this circuit is broken. The winding magnet A, thus caused alternately to attract and release the armature R, and the lever B attached thereto, moves the ratchet-wheel E through the space of one tooth at each vibration. The number of teeth on the break-circuit wheel M is so proportioned that the lever B is caused to vibrate with sufficient rapidity to revolve the spring-shaft (through its gearing with the shaft T) with the same velocity that the spring unwinds itself to revolve the train of register wheels.

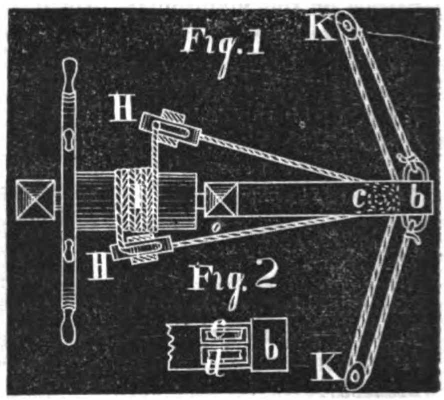
By this arrangement it will be seen that the unwinding is itself made to start and regulate the action of the winding magnet. When the train of register-wheels are stopped, the break-circuit wheel ceases to revolve and the winding magnet ceases to vibrate the armature and lever.

To start the train of register-wheels, the wheel K is turned, which winds up the spring, which is fastened to the same shaft. The break-circuit wheel

M revolving with the train breaks and closes the galvanic circuit, and thus effects the winding magnet A, and causes the lever B to vibrate with sufficient rapidity to wind up the spring as fast as its own action would unwind it. If the spring has too great a tension, and the train of wheels revolve too rapidly, by raising the straight spring J from the teeth of the break-circuit wheel, and holding it, the spring will unwind without the winding operation going on. When it gets to the speed required, then the spring J is suffered to descend again, and the winding operation commences, as above described. Hence it will appear that the degree of tension to which the spring is wound up determines the velocity of the movement of the train, as well as the velocity of the winding apparatus, and thus the register will always be wound up with the same rapidity that it unwinds.

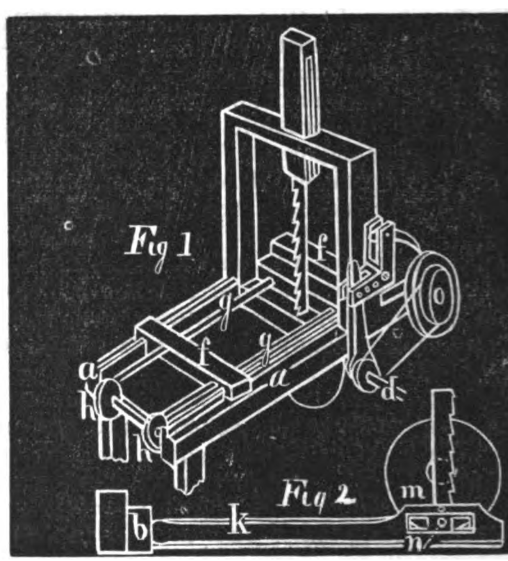
"What I claim is the combination of the winding magnet, the break-circuit wheel, and spring, with the train of wheels of an ordinary telegraph register, in the manner and for the purpose substantially as herebefore described."

No. 10,129. CHARLES FLANDERS, of Boston, Mass.—*Steering Apparatus for Vessels.* Patented October 18th, 1853.



"What I claim is my combination and arrangement of the rope I, the two sets of leading-blocks H H′ K K′, the sheaves *c d*, in the after end of the tiller, with one another, the tiller and windlass, so as to operate together and move the rudder, substantially in manner as specified."

No. 10,130. BENJ. FRAZER, of Durhamville, N. Y.—*Portable Mully Saw-Mills.* Patented October 18th, 1853.

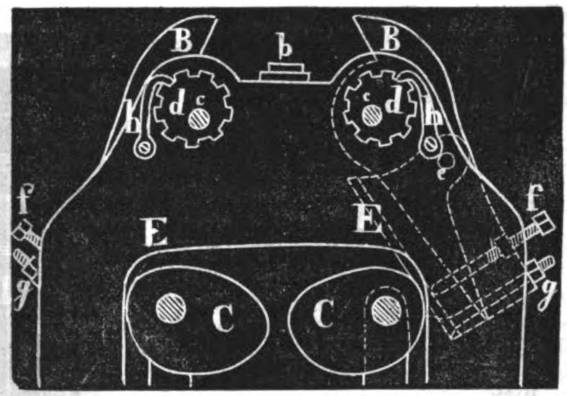


a a, horizontal sides of the main frame; *d*, main shaft; *f f*, the two head-blocks, connected together by the endless chains *g g* which pass over pullies *h h* at each end of the frame, and have one turn round the pullies on the feeding-shaft, which is operated by the ratchet-wheel and pawl, connected to the main shaft by an eccentric, as usual.

Lever *k* (see Fig. 2) is fulcrumed at *b*; the slot on its other end works over the crank-pin *n* of the balance-wheel of the main shaft, and the lower end of the saw-blade is connected to the lever at *m*; thereby the saw-blade will be set in a reciprocating motion. Lever *k* is to be so adjusted in its fulcrum as when the saw is at the end of its downward stroke it must assume a horizontal position, so that when it carries the saw upwards the saw will be drawn out, and when it carries the saw downwards the saw will be drawn in, thus causing the saw not to reciprocate in a straight line, but in such a manner as to cause it to clear itself when in the upward stroke, and drawn in to the action of the log when in its downward or cutting stroke.

"What I claim is attaching a reciprocating saw-blade to the main-shaft by means of a slotted lever and crank-pin, operating in the manner and for the purposes herein before substantially set forth."

No. 10,131. R. Griffiths and G. Shield, of Newport, Ky., and Cincinnati, Ohio, assignors to R. Griffiths.—*Machinery for Making Wrought-iron Railroad-Chairs.* Patented October 18th, 1853.



The heated plate is placed on the mandrel *j*; the clipping-levers B (and in the same manner the bending-levers) have their fulcra *c* in eccentrics *d* inserted in the head stocks, and being made to operate upon the plate by the action of the revolving cams C against their tail end, their own weight serving to throw them back or open after the operation has been performed.

To adjust the levers to suit different thicknesses of plates, and to vary the angular formation of the lip of the chair, the tail end of each of the levers is pivoted by a joint pin *e* to a box lever E, and affixed therein, to act any required set, by adjusting screws *f* and *g*. Further adjustability to suit different distances between the lips is given by the fulcra *c* being hung eccentrically in the boxes *d*, which are held when set by pawls *h* affixed to the head stocks, and fitting in teeth on the outside of said boxes *d*.

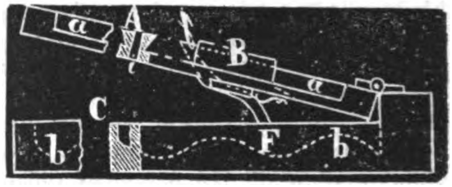
"What we claim therein as new is:

"1st. Hanging the fulcra of the clipping and bending levers eccentrically in boxes made capable of circular movement, for the purpose of adjusting the said levers to their work with facility and accuracy, substantially as specified.

"2d. The method herein described of adjusting the angular set of the clipping and bending levers by pivoting and adjustably connecting them to outer operative levers, essentially as set forth, and whereby a varied inclination may be given to the cutting and bending of the clip, to suit different thicknesses of blanks or forms of chair required."

No. 10,132. George W. Griswold, of Carbondale, Pa.—*Cutting Apparatus for Tailors, etc.* Patented October 18th, 1853.

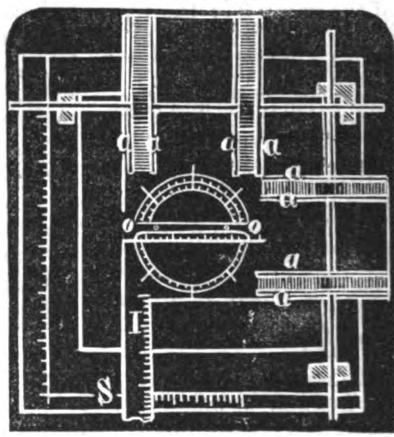
The cloth is pressed between the jaws A and C; the jaw A has through nearly its whole length a slot *i* to make room for the knife *j* as it passes



along. The knife is hinged to the piece B which slides on dovetail nuts *a a* outside the jaw A. The jaw B has through nearly its whole length a slot B with a waved bottom *b b*. The foot F of the knife passing along the waved bottom line, the knife *j* moves up and down during the cutting operation. By this arrangement the knife is prevented from always cutting in one part of the blade, whereby it would soon grow dull.

"What I claim therein as new is stretching the cloth or other material to be cut over the two jaws of the stock, and holding it firmly in place by the clamp, whilst the knife divides it with a draw cut, substantially as described."

No. 10,133. THOMAS HINKLEY, of Hallowell, Me.—*Machine for Finding Distance and Difference of Latitude, etc.* Patented October 18th, 1853.



The arcs of the wheels B B and B′ B′ are made to turn and slide longitudinally in boxes A A A. These wheels gear into racks R R and R′ R′.

Extract from the Specification.—"To illustrate the use and operation of the instrument, I will take a simple case: suppose a vessel has sailed three courses, viz., N.W. 18 miles, W. N.W. 15 miles, N. 25 miles, and we desire to find its course, distance, departures, and difference of latitude.

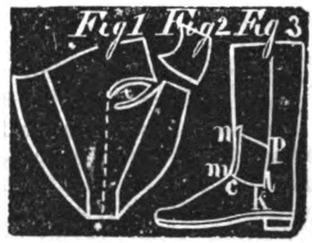
"Lay the machine on the paper, place the compass-plate in the south-east corner of the frame N N N, that is the corner between the scales of the frame, turn the protractor till it points N. W., draw a line by its edge, lay off on the line eighteen equal parts, and make a point; set the protractor in the direction of the second course, viz., W. N. W., and move the plate till the edge of the protractor falls on this point; from this point draw a line and set off, as before, fifteen equal parts; proceed in like manner with the remaining course. Now set the protractor so that its edge will fall on the first point of the first course, and on the last point of the last course, and draw a line. This will represent the course which will be indicated on the plate by the bar *o o* attached to the protractor. The length of this line is the distance, and is read from the edge of the protractor. Now draw the plate into the corner, as at first, without changing the protractor, and then by moving the plate cause the protractor to traverse the length of the course on a line drawn by its edge, so that the last point of the course (or the parallel line representing it) shall coincide with the first point of the protractor.

"Now the protractor and the whole plate have moved over the hypotenuse of a right-angled triangle, of which the perpendicular will be measured on the index I (which will indicate the difference of latitude), and the base on the marginal scale S, which latter will show the departure in miles, which can be reduced to degrees by the table on the margin.

"By means of the sunken racks (or the racks provided with parallel edges or bars *a a*), the pinions and the shafts are made to rotate and slide in these supports, and thereby a compound or resultant parallel motion of the compass-plate can readily be obtained.

"What I claim as original, and my own invention, is the method or means of obtaining in the above-described machine a compound or resultant parallel motion, the same consisting in a combination of pinions, or gears, and sunken racks (racks provided with parallel bars, as specified), two sliding and rotary shafts, as arranged, connected, and supported so as to operate together, substantially as herein before described."

No. 10,134. By DANIEL LYNAHON, of Buffalo, N. Y.—*Improvement in Boot-making.* Patented October 18th, 1853.

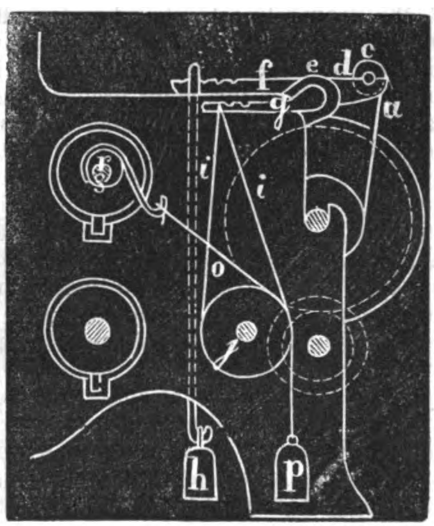


Extract from the specification:

"I first cut the vamp according to Fig. 1, and fold it together, as is done in all cases. Secondly, I cut the piece Fig. 2, and sew it on the side *c* of the vamp *k j*; the opposite half of the same size being a substantial part of the vamp. I then sew up the centre of the front, which forms the seams *l m* and *m n*. Then I add to them the top *o* which joins them at *p n*. Next, I cover the seams *m n* with the tongue *i*, which is also a part of the vamp, by striking it at each side of the seam *m n*; then I bring the same tongue across the seam *p n* to the top.

"What I claim as new in this mode is the *tongue i*, which first gives to the vamp a more exact crimped turn; secondly, covers the seam *m n* from being seen, and prevents it from ripping; and thirdly, keeps the seams *l m* and *p n* permanent, by receiving the strain that comes on them when drawing on the boot."

No. 10,135. By WM. MASON, of Taunton, Mass.—*Power-Looms.* Patented October 18th, 1853.



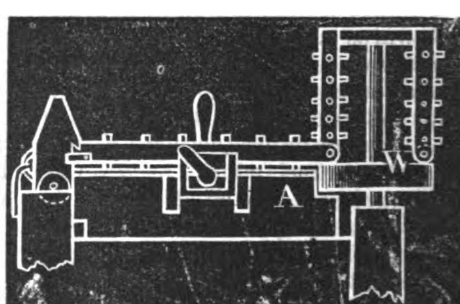
This invention relates to an arrangement for regulating the delivery of the warps by their tension, so as to insure the weaving of fabrics of regular and uniform texture, specially intended for the finer and more delicate fabrics.

The invention consists in the employment of a whip-roll, over which the warps pass from a warp-beam to the breast-beam, which roll is forced up by adjustable weights, when the said roll is combined by means of a friction-strap or bore, with the periphery of a wheel which, by gearing, communicates the let-off motion to the warp-beam, and which receives motion from a crank or eccentric from the lay or crank shaft, by a weighted cord wrapped around it, so that when the whip-roll is up, and the friction-band or strap is loose, the weighted cord, actuated by the crank or eccentric, will turn the friction-wheel in both directions, and therefore will not let off the warps; but when the whip-roll is drawn down, by progress of weaving, until the friction-strap or band is drawn tight, the weighted cord slips in one direction on the friction-wheel, and on the return motion turns it to give out the warps. In this way, the delivery of the warps is regulated by the tension of the warps.

a warps; *c* whip-roll, hung on arms *d d*, which sit on a rock-shaft *e*, provided on the other side with two other arms *f f* within the frame, and one *g* outside the frame; *h* weights which force the whip-roller up against the warps; *i* friction-strap suspended to arm *g*; *i* presses around one of the two grooves in the periphery of wheel *j*; the other groove receives cord *o*, which is wrapped around it with a weight *p*; the other end of this cord is connected to an eccentric *r* on the end of the lay-shaft *s*. The eccentric is so set relatively to the lay-cranks, as to pull the weighted cord to give the let-off motion at the end of the beating-up motion. When the friction-strap *i* is not drawn tight, the weight *p* keeps the cord *o* so tight, that the friction induced will cause the wheel to be turned back and forth at each turn of the eccentric, thus causing the warp-beam to yield and draw back the warps, to correspond with the opening and closing of the shade; in the mean time the weights *h h* forcing the warp-roller up against the warps, to keep them under an uniform pressure. When, however, the warps have been so far taken up by the process of weaving as to draw down the whip-roller until the friction-strap makes friction on the wheel *j*, this will prevent it from being turned by the weighted cord as the eccentric moves towards it—this cord sliding on the periphery of the wheel; and then as the eccentric moves in the opposite direction, the cord being drawn tight by the weight at its other end, the wheel will be turned to give out the warps: which operation will be continued until the whip-roller again rises sufficiently to liberate or loosen the friction-strap.

"What I claim as my invention is the method of operating the warp-beam to let off the warps, and ease them in the opening of the shed, by means of the weighted cord acting on the periphery of a wheel geared to the warp-beam, and receiving motion from an eccentric, or its equivalent, substantially as specified, in combination with the mode of regulating the delivery motion by the action of the warps on a weighted whip-roller, acting by a friction-strap on the friction-wheel of the let-off apparatus, substantially as and for the purpose specified."

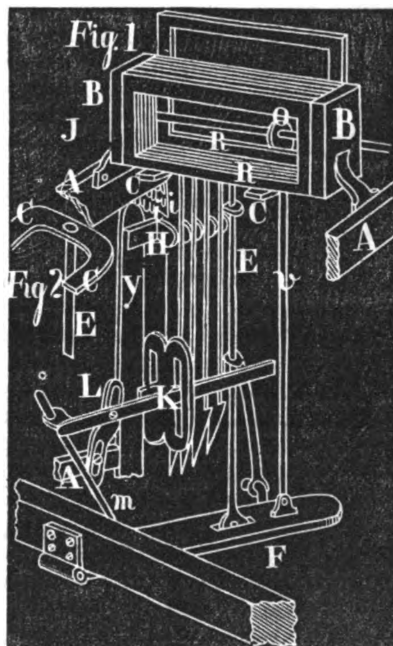
No. 10,136. By N. Millington & D. J. George, of South Shaftsbury, Vt.—*Machine for figuring Carpenters' Squares.* Patented October 18th, 1853.



The improvement consists in providing the requisite number of chases, set with the proper disks or figures for the several lines of figures to be stamped on the different sides of the bar and tongues of the squares, and placing them perpendicularly on the rim of the wheel, to which they are connected by a joint at the bottom, in the proper order for stamping, and then placing the square in a horizontal position on the face of an anvil, arranged to move laterally on ways, so as to bring the end of the line or space to be figured directly opposite to the end of the chase, which is turned down upon the face of the line for which the line of figures was arranged, where it is confined by clasps; and the disks or figures standing perpendicularly are struck in quick succession by a hammer, giving a perfect impression. When the chase is raised to its perpendicular position, and the next in order brought down on to the next space on the square, which is brought to the proper position by the lateral movement of the anvil.

"What we claim as our invention is, the combination of the revolving chase-wheel W, with the lateral moving anvil A, by which the relative position of the square to be stamped, and the required chase is so regulated, that the line of the square to receive the impression is brought under the chase containing figures, substantially as herein set forth."

No. 10,137. By John Pender, of Worcester, Mass.—*Operating Heddles of Power-Looms.* Patented October 18th, 1853.



The nature of this invention consists in so arranging the harness or heddles of the loom, that they will play up and down in a guide, and rest on a positive foundation, and be moved up and down, as indicated by a pattern, by means of jacks with hooks.

A is the frame of the loom; B B are the standard guides, in which slide the harness frames R R; and C C is the rest, supported on the pillar E. The harness shafts fall upon this rest whenever they are let down. The pillar E is supported on lever F, which lever is moved up and down by means of eccentric *o* and pitman V.

The jacks are attached to the harness frames, and hang downward to the lever K through the rack H, which is fixed on the part *y* of the frame A. This rack has a set of pins *i i* which slip freely through its bars. These pins are to enable the card to bring the jack forward so as to be taken up by lever K. Each jack has a small spiral spring I attached, so as to bring back the jack and its pin into place when the card recedes, so that all the jacks and heddles remain at rest until the pattern requires to be raised, and then by the card pressing the pin against the jack, it is taken up by the lever K, which has its fulcrum at the stud L, which is attached to frame A. Lever K is moved by rod *m* connected to lever F. The arm of lever K which lifts the jack, vibrates downward when the lever F rises, and *vice versa*. Each jack being attached to one frame or leaf of harness, independent of each other, it follows, that when the pattern requires to be raised, the jacquard pushes the jack forward at the proper time by the pin *i*, and is taken up by lever K.

"What I claim as my invention is the rest C C, in combination with the guides B B, when constructed substantially as above described."

No. 10,138. By BENJ. F. RICE, of Clinton, Mass.—*Improvement in Looms for weaving Fancy Goods.* Patented October 18th, 1853.

Extract from the specification:

"The nature of my invention consists, *first*, in employing levers formed of two or more parts; one part of said levers being so constructed as to oscillate within the other part by the action of hooks and pins set in the grooves of a figuring chain, said hooks and pins acting upon the upper portion of the oscillating part of said levers, thereby causing the lower portion of the aforesaid oscillating part to move to and fro within the outer and larger part of said levers, thus forming a groove in which a vibrating roller is made to act upon the outer and larger part of said levers; which operation raises and depresses the harnesses in the manner hereafter to be described, whereby I am enabled to give a more positive action to the levers which act upon the harnesses when run at an unusual speed, and also to produce a uniform shed.

"The *second* part of my invention consists in giving motion to the figuring chain by the use of a crown-wheel turned by the action of a finger projecting from a vibrating lever, and working in the openings of the crown-wheel, said vibrating lever receiving its motion from a crank connected to a disk-wheel on the outer end of the main or crank shaft, thereby giving a positive motion to the figuring chain, which carries the hooks and pins, and also to reverse the motion of the chain without the loss of the figure, when the main or crank shaft is reversed.

"The *third* part of my invention consists in constructing the bars which connect the links of the figuring chain, in such a manner as to admit of the insertion of hooks or pins, the lower part of which are made in the form of an inverted wedge; said bars are also provided with a slot or opening at one end, large enough to admit easily the insertion of the hooks or pins. The advantage thereby obtained is, that the hooks or pins are more easily adjusted, and also held more firmly in their position when placed.

"What I claim as new is the application of compound levers constructed substantially as herein described, to the raising and depressing of harnesses or heddles, in the manner substantially as set forth.

"I also claim employing a finger attached to the vibrating lever *f*, operating substantially as described, in combination with the crown-wheel to move the figuring chain, substantially as specified.

"I also claim forming a groove in the bars of the figuring chain, for the insertion of hooks or pins, or their equivalents, in the manner substantially as specified."

No. 10,139. By JOHN SCOTT, of Philadelphia, Pa.—*Air-Beds.* Patented October 18th, 1853.

"What I claim as my invention is forming a bed of an air-tight india-rubber cloth sack, inclosed or enveloped in a pouch-formed mattress, composed of two thicknesses of ticking, or other suitable material, between which is interposed feathers, hair, cotton, or other soft substance, retained by proper quilting, said mattress to the shape and size of the air-sack, when extended with air by flexible pipes."

No. 10,140. NATHAN THOMPSON, Jr., of Williamsburgh, N. Y.—*Life-Bucket.* Patented October 18th, 1853.

c c, cork filling the space the sides of the double vessel *b b b′ b′*.

"I claim as my invention, first, a double vessel, the space between the outer and inner side thereof being filled with cork, or its equivalent, by which it is in a great measure secured against leakage, and retains sufficient buoyancy when punctured, and serves as a reliable bucket and life preserver.

"Second, I claim attaching the handle thereto by means of the tubes, the nicks in the handles, and the bending of the ends of the tubes therein, substantially in the manner herein described."

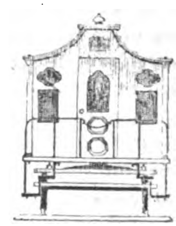
No. 10,141. NATHAN THOMPSON, of Williamsburgh, N. Y.—*Life-Preserving Seat.* Patented October 18th, 1853.

When this stool is to be used in the water, then it is to be open as shown in Fig. 2. It incloses then the body in such a manner, that the arms come to rest on the buoyant parts *a a* of it.

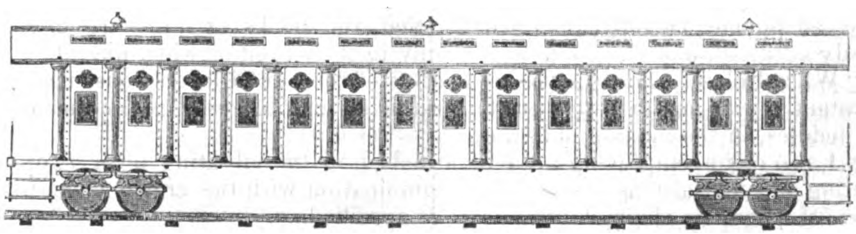
"I claim as of my own invention, first, the folding life-preserving seat, with a buoyant divided top, constructed substantially in the manner herein described.

"Second, the clasp in combination with the surfaces on which it slides, constructed substantially as described, and operating to hold the stool either shut or open, substantially as described."

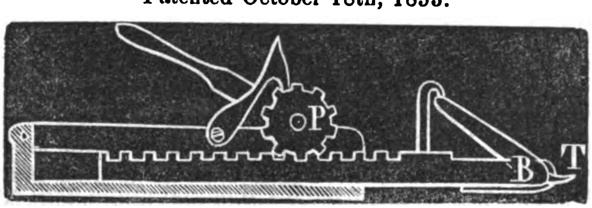
No. 10,142. T. E. WARREN, of Troy, N. Y.—*Railroad and other Carriage Bodies of Iron.** Patented October 18th, 1853.



"What I claim therein as new is the combination of hollow sheet-metal columns and panels as described, with the through bolts holding the top, bottom, and sides all firmly together in the manner and for the purpose set forth."



No. 10,143. J. W. WEATHERBY, of Kingsville, Ohio.—*Machine for laying Carpets.* Patented October 18th, 1853.



When this apparatus is to be used, having fastened one corner of the

* We shall hereafter notice *in extenso* this valuable invention, together with some experiments with it now in progress.—J. J. G., *Ed.*

carpet in its place, the teeth T (which project from a long horizontal bar B) are inserted in the opposite end of the carpet, and the end of the stock A is placed against a board reaching the opposite side of the room; by turning the pinion P, the rack is pushed out, and thereby the carpet may be held to any desired tension until one whole side and one end is secured; and then taking another breadth, the operation is to be repeated in like manner.

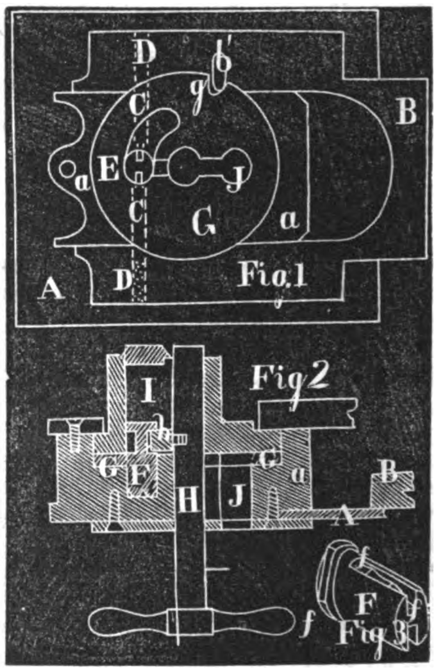
"What I claim as my invention is the general construction and arrangement of the carpet-stretcher, made and operated as above described."

No. 10,144. G. YALE, of Newport, N. Y.—*Improvement in Locks.* Patented October 18th, 1853.

The object of this invention is to apply the key to simple and effectual stops, so situated that they cannot be approached with an instrument subject to the control of the burglar.

Extract from the specification:

"On the front plate A is a projection a' a', astride of which is fitted to slide a crotched bolt B, running close at the sides, making an easy movement to stop or lock by divided pins c c, driven across the joint by spiral springs D D, and projected into the keyhole E, there to be adjusted by the planes f' f', on the key F.



"To move the bolt is a wheel G, sunken into the projection a' a', having a notch g' to catch a pin b' on the bolt B, said wheel being turned by a permanent wrench H, and a cog-arm h'' to catch into the cut in the wheel.

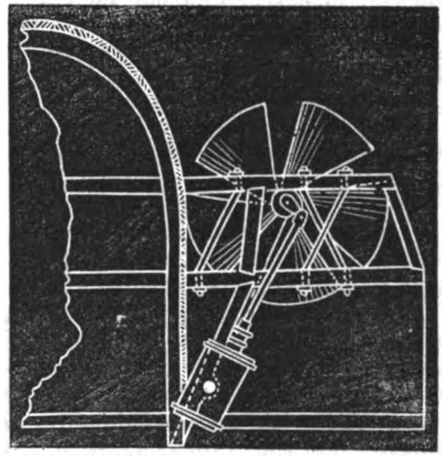
"Behind the wheel G is a revolving key-chamber I, through which the wrench H also passes. The wrench in revolving moves first the key-chamber, and then the wheel G, and in its end movement carries the key into the chamber, and then draws it from the chamber into the keyhole, and arranges the stops for the passage of the bolt.

"By being drawn fully forward, the arm of the wrench H comes against the front plate of the lock, and hooks into the notch f'' in the head of the key E; pushing back the wrench, now carries the key through the passage J into the chamber I. Turning to the right, now revolves the key-chamber, changing the key from a position opposite the passage J, to one opposite the keyhole E, at the same time closing up the rear of the former by bringing a blank part of the key-chamber opposite it. By pulling the wrench forward, now draws the key between the stops, and arranges them on a line with the joint between the the bolt and projection a' a', and being now turned, the arm h'' catching in the wheel turns it, and by it the bolt is moved into its unlocked position.

"It is evident that a counter movement would lock the bolt, out-carry the key into the chamber, change it to the passage J, draw it forward and deliver it into the hand again.

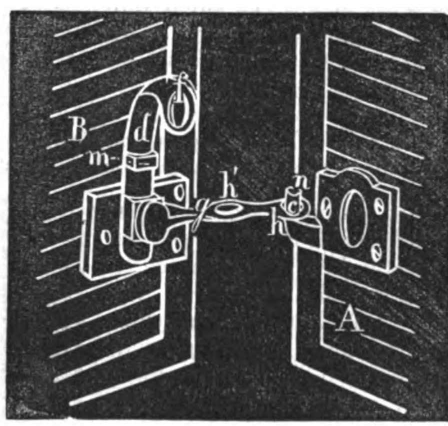
"What I claim as new, and of my own invention, is introducing and applying the key from behind instead of in front, as is usual by means of a permanent wrench, revolving key-chamber, and the passage J, in the manner and for the purpose substantially the same as described."

No. 10,145. H. WHITTAKER, of Buffalo, N. Y.—*Improvement in Propellers.* Patented October 18th, 1853.



"What I claim therefore as my invention is the direct application of the crank outside of the hull to side-screw propellers, when such application is combined with, or effected by a high-pressure engine, arranged also outside of the hull, substantially as herein above set forth."

No, 10,146. CALVIN ADAMS, of Pitsburgh, Pa.—*Improvement of Window-Shutter Fastener and Holder.* Patented October 25, 1853.

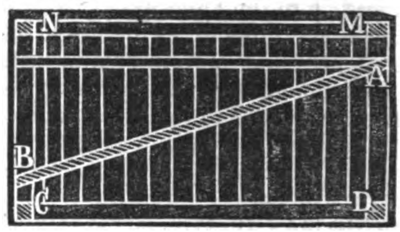


Arm g is firmly attached to arm d; A and B the two shutters in a half-opened position: when they are to be entirely shut, f is drawn a little back, so as to lift h above c; shutter A is opened a little further, so as to let arm g pass below n, by drawing f forward; then the shutters are shut and latched by turning f entirely down, until the back part of d comes to rest on plate v and m, on the back part n of pin c.

"What I claim as my invention is the combining with the latch or bolt of an inside shutter-fastener, a contrivance for securing the shutters in a partially opened position, by means of the rings $f\ h\ h'$, and the arm g, in combination with the latch d and pin c, substantially in the manner and for the purpose herein before set forth."

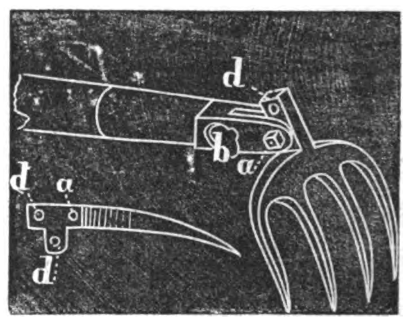
No. 10,147. G. T. BEAUREGARD, of New Orleans, La.—*Improvement in Self-acting Bar Excavators.* Patented October 25th, 1853.

A frame-work M N C D, of the width of the required channel, contains an inclined bottom A B across its whole width. When to be used, it is anchored at the inner edge of the bar in the thread of the strongest current, at about the depth which it is desired to obtain; the top of the frame is then weighted down. The current entering at A D, will force its way out of the smaller opening B C, with an increased velocity, and thereby excavate the bottom in front. After having excavated to the desired depth, the anchors are a little eased, whereby the current will gradually force forward the frame, and remove the bar to the desired depth, and so on.



"What I claim as my invention is the bar excavator, in which the surface current, by means of the inclined plane, is deflected downward, and made to act upon the bar, the whole being arranged and operated substantially as herein described."

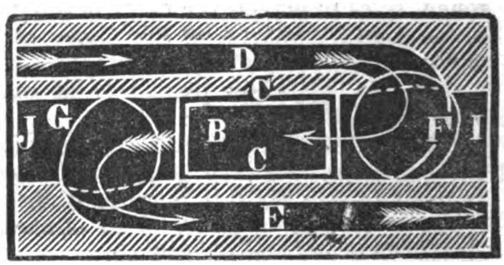
No. 10,148. EZRA H. DAWES, of Litchfield, Me. — *Convertible Dung-Fork.* Patented October 25th, 1853.



The object of this invention is to make the instrument serve either as an ordinary dung-fork, or as a garden cultivator, or pronged hoe.

"What I claim as my invention is making the tines of ordinary dung or hay forks to revolve upon the handle, in the manner and for the purpose herein set forth."

No. 10,149. F. P. DIMPFEL, of New York, N. Y.—*Improvement in Propelling Vessels.* Patented October 25th, 1853.



This propeller works below the surface of the water, either below the keel or at the sides of the vessel.

A piston B is set in a reciprocating motion by being connected with a steam-engine, which is placed above it.

Extract from the Specification.—"Piston B works parallel to the keel, and during both its forward and backward stroke acts upon the water outside the vessel in the same direction. This propelling-piston B is placed within an oblong chamber C that communicates on its opposite sides and at or near its opposite ends with water passages D and E, which also run parallel to the keel, and one pipe or passage D is open at its end next to the bow of the ship, while the open end of the other pipe E faces the stern of the vessel.

"These water passages connect with the chamber C beyond or outside of the range of motion of the piston, and the ends I and J of the chamber

C which extend beyond the connection of the water passages are open at either end to the outside water. Valves F and G are situated near either end of the reciprocating piston-chamber at the points of connection of the water passages D and E with the said chamber. These valves are so constructed and arranged as to close or open, as may be required, the open ends of the piston-chamber C, or the communications of the said chamber with the side water passages D and E. The two valves thus arranged are connected by a coupling-rod and arms attached to the valve-stems, for the purpose of producing a simultaneous action of the valves.

"The reciprocating piston B is supported on running wheels pivoted to a braced frame connected with the piston; these wheels run on rails projecting along and above the bottom of the piston-chamber C, whereby the piston is relieved from friction.

"The chamber C extends up through the vessel's bottom above the keel, and the propelling-piston B is of corresponding form to the transverse section of the chamber; a rod is attached to the propelling-piston at or near its top; this rod projects through either end of the piston-chamber above the keel, inside the vessel, and is connected by an arm with the piston-rod of a steam-engine, which serves to give to the propelling-piston B the requisite reciprocating motion within the chamber C.

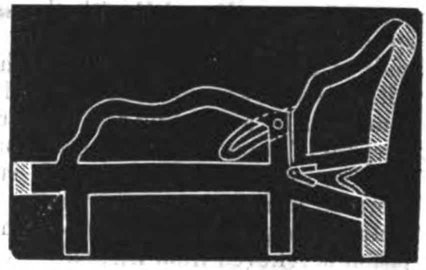
"When the propelling-piston B is travelling towards the vessel's bow, the valves F and G are turned or set so as to close the ends of the piston-chamber, and to open the communication between it and the two side water passages, whereby the water will be drawn from the forward end of the vessel through the passage D into the piston-chamber behind the piston, while the water in the chamber on the opposite side of the piston will be forcibly ejected through the other passage E out towards the stern of the ship, and thereby produce the requisite propelling action or effect on the travel of the piston B in the opposite direction, or during its back stroke, by the changed position of the valves that are then made to close the lateral openings communicating with the water passages, and to open the ends of the piston-chamber, so that water will be drawn into the chamber in front of the piston at the same time that the water behind the piston is expelled directly out of the chamber towards the vessel's stern.

"To reverse the vessel's motion, the valves F and G are turned partly round, so as to reverse the order in which they close the orifices, in relation to the course or travel of the piston, so that during its forward stroke it will expel the water through the open end of the chamber towards the bow, and through the water passage D, in the same direction, during its back stroke.

"The toes which cause the valves to open and close the several inlets and outlets, as described, are made to act suddenly upon the valves at the proper intervals for this purpose, so that when the propelling-piston is arriving at the end of either of its strokes, or is being reversed, the proper channels for the ingress and egress of the water will be promptly opened, and thus a steady continuous propelling effect by one piston be obtained, and the power employed economically.

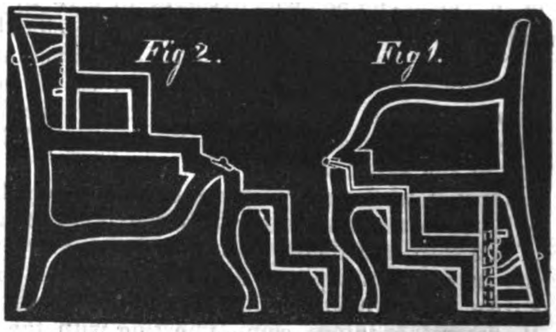
"What I claim as my invention is the arrangement of the water passages, apertures, and valves, in combination with a reciprocating piston and its chamber, substantially in the manner and for the purposes herein set forth."

No. 10,150. Aug. Eliaer, of Boston, Mass.—*Improvement in Lounges.* Patented October 25th, 1853.



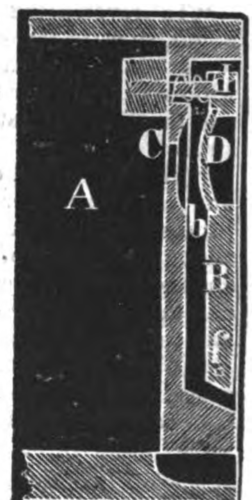
"What I claim as my invention is resting the part which forms the support to the upper part of the body in lounges, or other similar articles of furniture, upon springs and hinges, as above described, so as to vary its inclination at the pleasure of the occupant, the support being fastened and held in any desired position by a set-screw and curved arm, as above set forth."

No. 10,151. Aug. Eliaer, of Boston, Mass.—*Library Step-Chair.* Patented October 25th, 1853.



"What I claim as my invention is a library step-chair, or a chair which may be changed at pleasure into a flight of steps, in which the fold or hinge of the two parts is formed in the top or an extension of the front leg of the chair, thereby permitting the seat to be so stuffed as to form an ornamental and comfortable chair, and when opened to form a flight of five steps, as herein above set forth."

No. 10,152. W. A. Flanders, of Sharon, Vt.—*Improvement in Bee-Hives.* Patented October 25th, 1853.

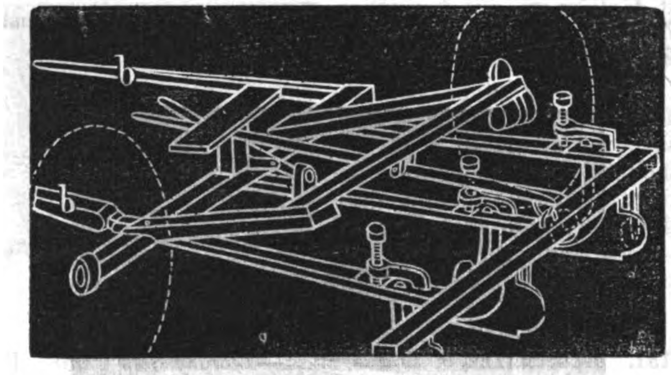


An extra passage *b* is adapted to the hive, which is capable of being gauged so that while the working bees are permitted to pass and repass without hindrance, the passage way is not sufficiently large to permit the queen to leave the hive, she being larger than the other bees.

A, inside of the hive. The passage *b* is adjustable by loosening or tightening the screw *d*, and thereby bringing the upper end of plate B, which contains the glass D, nearer to or farther from the aperture C. Plate B is hinged to the hive at *f*.

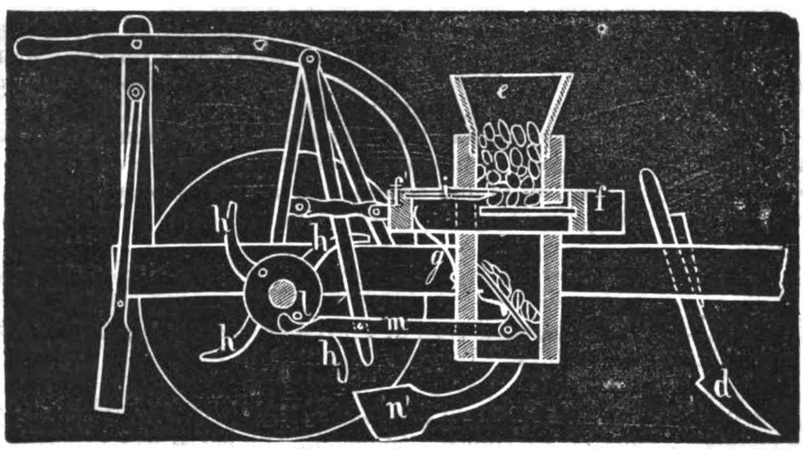
"What I claim as my invention is the adjustable passage *b*, by which the entrance to the hive may be enlarged or diminished, in manner and for the purpose substantially as set forth."

No. 10,153. J. D. Filkin and W. H. De Puy, of Lima, Ia.—*Improvement in Attaching Horses to Ploughs.* Patented October 25th, 1853.



"What we claim as our invention is the combination of the limber tongue *b'* and stiff tongue *b* with the running-gear, to adapt it to being drawn by two teams abreast, as described."

No. 10,154. Samuel Hutchinson, of Rockport, Ia.—*Improvement in Cutting and Planting Potatoes.* Patented October 25th, 1853.

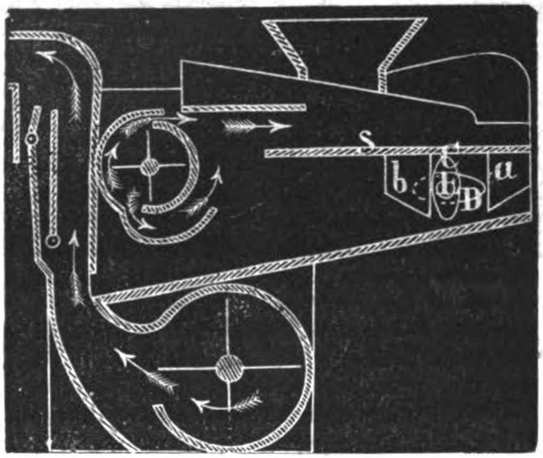


d, shear, which makes the furrow to receive the potatoes; box *e* is traversed by a sliding-floor *ff*, which carries the knives *i*; this sliding-floor is pressed back by spring *g*, and alternately pressed forward by cams *h* on the axle of the wheels; K, trap-door, which is set in a reciprocating motion by the pin *l* striking against the rod *m*; blades *n'* scrape the earth back over the potatoes after they have been dropped, and cover them. There is also a pin to hold the trap door permanently back, if desired. A ratchet and pawl prevents the return movement of the wheels.

"I claim herein as new the construction and combination, as herein described, of cam, sliding-platform, cutting-blade, and trap-doors, with the furrowing-share and covering-blade, for the purpose of cutting, dropping, distancing, and covering potatoes."

No. 10,155. D. S. Mackey & J. R. Smith, of Batavia, N. Y.—*Improvement in Winnowers.* Patented October 25th, 1853.

The eccentrics C and D sit both on shaft E; C works against block *b* and D against block *a*, which blocks support the screens.



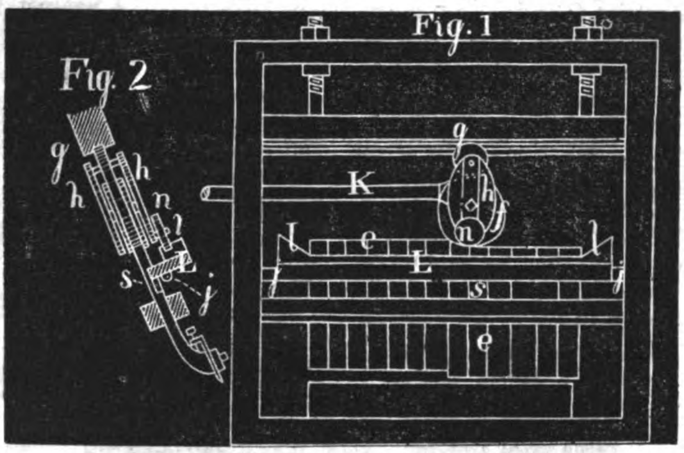
"What we claim as new is, 1st, the peculiar manner of operating the screen, viz., by means of the eccentrics C D, placed in a reversed manner upon the shaft E, said eccentrics working between the blocks *a b* attached to the under side of the screen, as shown and described.

"2d, we claim producing two blasts from a single fan, as shown, and having the two blasts cross or intersect each other, by which a blast passes horizontally over the top of the screen, and a blast also passes upward through the screen, preventing the screen from being clogged or choked by the chaff."

No. 10,156. E. G. Matthews, of Troy, N. Y.—*Improvement in Machines for Dressing Stone.* Patented October 25th, 1853.

The rocking-bar L is hung in journals *j*, and when the roller *n* strikes the inclined-plane *l* on its end, the front edge of bar L will be depressed, and consequently the rear edge will be raised, and as this rear edge fits into the shoulders *s* of the cutter-stocks *e e*, these will be raised.

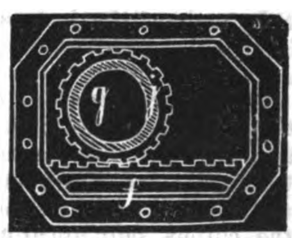
"What I claim as new is, first, the driving apparatus for driving the cutters, said apparatus being formed or constructed of the driving-wheel *f*, and friction-wheel *g*, arranged substantially as herein specified in the frame *h h*, attached to the driving-rod K, by means of which rod a reciprocating motion is given to the said frame, which causes the driving-wheel to roll back and forth, on and over the heads of the cutter-stocks, thereby causing the cutters to make the desired cut in the stone, the friction-wheel meanwhile rolling on the periphery of the driving-wheel, and also in a groove in the cross-bar, as before described. I do not intend to confine or limit myself in this claim exclusively to the use of one friction-wheel; but hold myself at liberty to use one or more, and to vary the arrangement of them, while the principle of driving the cutters, as herein described and shown, is substantially adhered to.



"Secondly, I claim the rocking-bar L, with inclined-planes *l* at each end, in combination with the cutter-stocks *e*, and the roller *n*, or its mechanical equivalent, attached to the frame *h* of the driving apparatus, for the purpose of rolling or striking on the inclined-planes of the bar, as the driving apparatus reaches the end of its stroke, so as to rock or tip the bar, thereby causing the inner edge of the bar to catch or strike under the shoulders in the cutter-stocks, and raise them up in position for the driving-wheel to act upon them in its return stroke, substantially as herein specified."

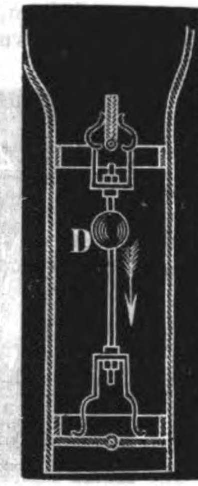
No. 10,157. Charles Perley, of New York, N. Y.—*Ships' Side-Lights.* Patented October 25th, 1853.

The nature of this invention consists in the use of a circular-glass *g*, or light inclosed by a circular frame, on which are teeth gearing into a fixed rack on the inside of a metal box that is let into the side of the vessel. To open the light, it is rolled to one side within the box, and when it is to be closed, the light is rolled back again, and a screw-ring forced into an elastic packing *j* in the frame of the glass. Any water that by accident may run into the box can escape by a small hole *f*.



"What I claim is, first, the means herein described and shown for preventing any leakage from a side-light passing into a vessel by inclosing the side-light in a metallic box, let into the side of the vessel, and provided with a small hole or holes, to pass out said leakage, as specified."

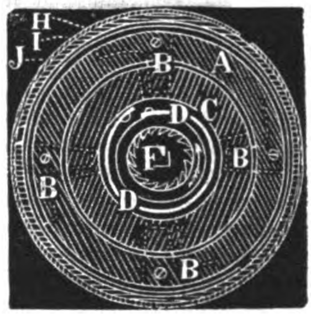
No. 10,158. J. A. QUANTIN, of Philadelphia, Pa.—*Valve-Gauge for Bottles.* Patented October 25th, 1853.



As is apparent from the figure, the upper valve will open and the lower close as soon as the bottle is reversed, or put in an inclined position, so as to move the weight D in the direction of the arrow.

"What I claim as my invention is the above described machine or gauge, with the arrangement of the valves as herein before described; one opening by the act of closing the other, so as to pour out of the vessel to which the gauge is attached, only the quantity of liquid contained in the space between the two valves."

No. 10,159. H. L. RUSSELL, of Hudson, Mich.—*Metalic Piston Packing.* Patented October 25th, 1853.



"What I claim as new is expanding the metallic bands H I J, which encompass the drum A, by means of the levers B placed in the periphery of the drum A, and operated by means of the ring *c* within the drum, as herein shown and described, the ring *c* being prevented from moving casually by means of the coil-spring D, and ratchet F, and pawl *g*, or their equivalent."

No. 10,160. W. W. RICHARDS, of Philadelphia, Pa.—*Improvement in Making Shovels, Spades, etc.* Patented October 25th, 1853.

In making the instruments of composite parallel laminæ of steel and iron welded together, the inventor intends to give rigidity, maintain a sharp edge, and also the requisite toughness and strength.

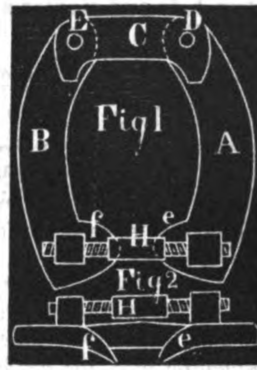
On one or both sides of a slab of steel, is placed a slab of iron; this "pile" is first heated to a welding heat, and is then hammered or rolled into sheets.

"I claim as a new manufacture, shovels, spades, and other implements made of a composite sheet of metal, whose constituents are parallel laminæ of unequal hardness, as herein set forth.

"But I make no claim to such implements made of the hard lamina extending for a short distance only above the edge, but only where it extends up beneath the strap to support the back."

No. 10,161. BENJAMIN PERRY SARGENT, of Sutton, N. H.—*Expanding Horse-Shoe.* Patented October 25th, 1853.

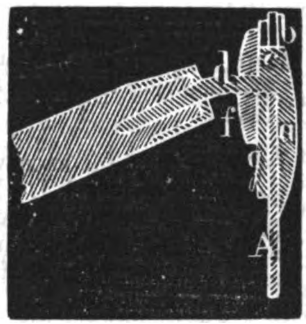
This invention is intended to prevent the contraction of the frog or heel part of the hoof of a horse.



The quarters of the shoe are separate from each other, and connected together by joints D E, and may be expanded or contracted by means of screw H.

"What I claim is the combination of the bearers or ears *e f*, with the jointed quarters or bars A B jointed together, or to a common toe-piece or cork C, and operated by an expansion screw or contrivance, as specified."

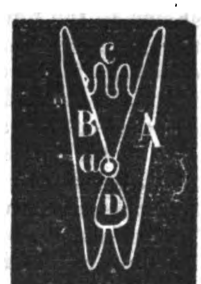
No. 10,162. JACOB T. SARGENT, of Sutton, N. H.—*Improvement in Garden and other Hoes.* Patented October 25th, 1853.



The recess *b* is formed in the upper portion of the hoe-blade A, with parallel sides for the reception of a corresponding extension *c*, from the bearer *a*.

"What I claim is my improved attachment of the blade and shank, whereby the blade not only can be readily removed from, or as readily confined to the shank, but when affixed to it is prevented from breakage, where the greatest leverage or strain is brought upon it, meaning to claim the bearing head *a*, fixed firmly to, and making part of the shank; the *movable plate* or stiffener *g*, or its equivalents (applied to the back of the blade, and made separate from the shank), the screw *d* on the shank, the screw-nut *f*, and the recess *b* in the hoe-blade, as combined together, and with the shank of the handle, and made to operate substantially as specified."

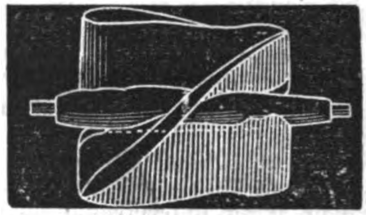
No. 10,163. DAVID M. SMITH, of Springfield, Vt.—*Improved Clothes-Pin.* Patented October 25th, 1853.



"What I claim as my invention is the above-described improved clothes-pin; that is, to say, I claim the arrangement of the line-opening D, and the spring *c*, on opposite sides of the hinge *a*, of the two levers A B, all substantially as herein before specified, whereby by pressure of the longer legs of the levers between the thumb and fingers of the hand of a person, the instrument is rendered very convenient of application without danger during the same of tearing the clothes secured by it on a line."

No. 10,164. By JAMES TREES, of Salem, Penn.—*Submerged Propeller.* Patented October 25th, 1853.

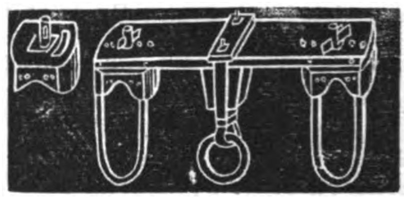
This is an improvement on a patent granted for giving the shell of a submerged propeller the form of a section cut from the open extremity of sea-shells (of a certain class), the mouth of the helical tube at which the water enters being of greater area than its hinder extremity, at which the water is discharged.



The nature of this improvement consists in the application to submerged propellers—whose area where the water enters is greater than the hinder extremity, where the water escapes—of blades or vanes, and a shaft to which they are attached, all tapering from front to rear; assuming as the front of said blades and shaft that part where the blades first impinge upon the water, and where the propulsion commences.

"What I claim therein as new, is the combination with submerged propellers—whose area where the water enters is greater than the hinder extremity, where the water escapes—of helical blades or vanes, and a tapering shaft to which they are attached; both the blades and shafts tapering from point to rear, substantially in the manner and for the purpose set forth."

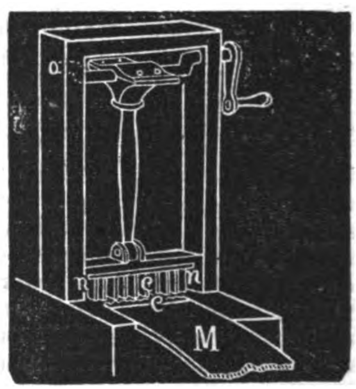
No. 10,165. By ALBERT VOSE, of Pittsfield, Vt.—*Improvement in Ox-Yokes.* Patented October 25th, 1853.



"What I claim as my invention is, 1st, the construction of the semi-revolving neck-blocks, each having a curved groove and pin fitting into it, for enabling the neck-block to always adjust itself at right angles to the direction of the neck of the animal.

"2d. I claim, in combination with the groove in the neck-block, the use of the pin, subserving the double purpose of controlling the movement of the neck-block, and adjusting the length of the yoke, substantially as described."

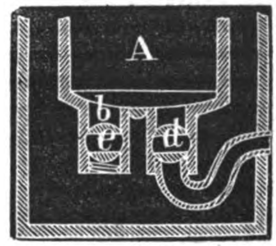
No. 10,166.—BY WILLIAM WHEELER, assignor to CHAS. H. KELLOG, of West Poultney, Vt.—*Cutting Bars and Teeth of Curry-combs.* Patented October 25th, 1853.



A strip of metal M of the width of the serrated portion *e* of the dies and the margins *n*, and of the thickness of the bar of a curry-comb, is inserted between the dies, as shown in the figure, until the inner end of the plate is stopped by a gauge behind the dies *e e*. The jaw now descends and severs the piece beneath it from the plate to form the bar, cutting a row of teeth both on the end of the plate, and on the piece or bar cut therefrom to form the comb. The jaw now rises, when the plate must be again pushed in until it strikes the gauge, and then the jaw again descends and repeats the operation of cutting.

"What I claim as my invention, and desire to secure by letters patent, is the method of forming the bars of curry-combs by punching them out of plates, so that at a single operation a strip of the proper width for the bar is severed from the plate, and one row of teeth cut thereon, and another row upon the end of the plate for the next bar, substantially as herein set forth."

No. 10,167. By WILLIAM COUGHLAN, of Baltimore, Md.—*Mineral Water Fount and Refrigerator.* Patented October 25th, 1853.

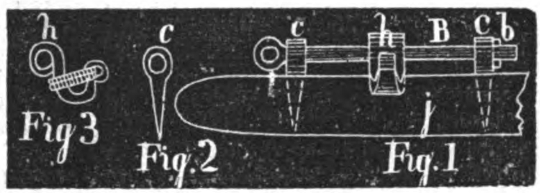


The nature of this invention consists in adding to the fount A a valve *b* for the purpose to quickly fill the fount with mineral water already prepared in a stationary apparatus.

The spigot *d* is provided on its outer end with a female screw, to receive the end of the pipe whereby it is filled or emptied; the spigot *e* serves to give vent to the superabundant gas when filling with the mineral water and gas combined, and thereby is avoided the necessity of repeatedly unscrewing the filling-tube to allow the gas to escape, as is done with the ordinary fount. When filled, the fount is inverted, and the water will be forced out by the pressure of the gas in the usual manner.

"What I claim is the auxiliary or valve *b*, for the purpose of enabling the fount to be filled with *prepared* mineral water, substantially as herein described."

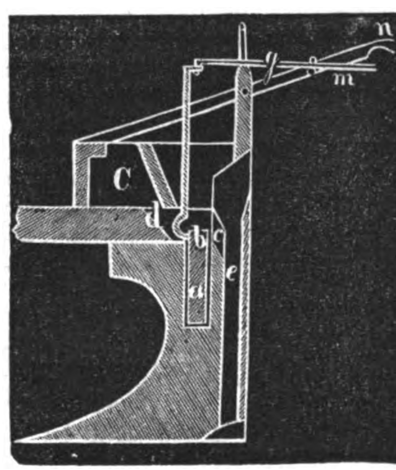
No. 10,168. By NELSON CROCKER, of Sandwich, Mass.—*Improvement in Rigging Vessels.* Patented October 25th, 1853.



On the end of yard *j* is a bolt B, secured by means of two eye-bolts *c c* (which are driven into the yard) and a pin *b*. On this bolt are one or more hooks *h*, which are to receive the head cringles. The head cringles are made in the usual way, but have an iron thimble worked into them. This thimble comes into contact with the hook, and prevents the chafing of the rope. To prevent the slipping off of the cringle, a mouseing of spun yarn is passed round the hook, as shown in Fig. 3.

"What I claim is the cringle-hooks and their fixtures, constructed and combined with rigging of a vessel, substantially in the manner and for the purpose set forth."

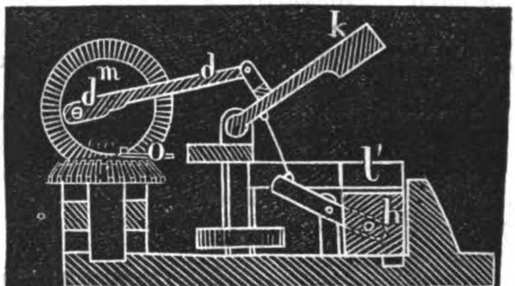
No. 10,169. By N. C. DAVIS, of West Jefferson, Ohio.—*Seed-Planter.* Patented October 25th, 1853.



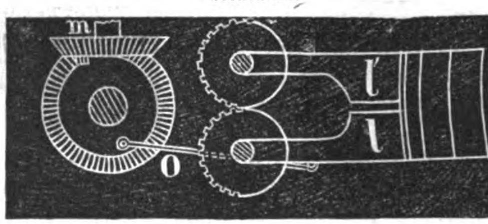
The corn to be planted is placed in the drill-box C, where it falls into the depression *d*, which is thus kept full. While the machine is being drawn forward, the operator presses with his thumb down the end *m* of the lever *g* at certain intervals. To this purpose, the lever *m* is bent towards the handle *n*, on which the hand rests; thereby the piston *a* is lifted up through the grain in the depression *d*, so that the kernels in the hollow *b* will fall out over the partition *c*, into the aperture *e*, and be conveyed to the furrow. By lifting the thumb, the lever and piston fall back again, and the hollow *b* again becomes filled with grain from the depression *d*, ready for the next hill.

"What I claim is the piston *a* provided with a notch or hollow *b* in its upper end, and so arranged, in combination with the partition *c* and the depression *d*, that it will bring up and discharge through the aperture *e* the desired number of grains of corn, every time it is raised by the operator, substantially in the manner herein set forth."

No. 10,170. By Daniel Noyes, of Abington, Mass.—*Machine for hammering Iron.* Patented October 25th, 1853.



Section *a b.*



k, *l*, *l'*, are three hammers; *h* is the anvil, and *m* is the wheel from which the motion is transferred to the machine.

Extract from the specification:

"One of the most essential features of this machine consists in the relative position of the ends of the connecting-rods *d d*, *o o*, and the fulcra or journals of the hammer-beams at the time of giving the blow, as the journals or fulcra of all the hammers are so placed as to be in nearly a straight line at the time of giving the blow, with the connecting-rods from which they derive their motion. Just before giving the blow, in consequence of the relative position of the ends of the connecting-rods and the fulcra of the hammer-beams, one end of the connecting-rod is travelling in one direction, while the opposite end attached to the hammer-beam is moving in the opposite direction, which necessarily gives a rapid motion to the hammer just before striking. When the hammers are rising or opening, the ends of each connecting-rod are moving in nearly the same direction, which thus gives a slow motion to the hammers while opening or rising. The connecting-rods also, when in a straight line with the fulcra of the hammer-beams, allow the hammer-beams to turn freely forward or back on their journals at the time of giving the blow, which is essential, in order to give a swinging, elastic blow, whereas, when the journals of the hammer-beams are not in a line with the connecting-rods, the said hammer-beams are necessarily rigidly held.

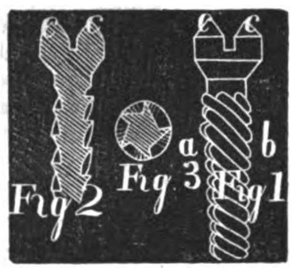
"From the above description it will be seen that, as the iron to be shaped is first struck by the upper hammer, and then simultaneously by the side-hammers, the process of forging is much facilitated, and as the faces of any or of all the hammers can be furnished with dies, that any desired shape can be given to the iron, rendering the machine of great service in making various kinds of nails, spikes, &c. It will also be seen that in some kinds of forging or hammering, that the upper hammer may be dispensed with, the two side hammers being used alone; or, in some cases, the side hammers may be dispensed with, and the upper hammer used alone. The peculiar swinging, elastic blow which the hammers give, as above described, being much preferable to the blow of an ordinary trip-hammer.

"What I claim as my invention is, 1st, a machine for hammering iron, &c., having the distinguishing features herein above enumerated, viz., a hammer for giving the blow upon the upper surface of the iron, acting in conjunction with two hammers which simultaneously strike the sides of the iron, substantially as above set forth; and I further claim, in a machine for hammering iron, the use of these two side hammers, operating as specified, whether used in connection with the upper hammer or without it.

"2d. I claim so arranging the relative position of the fulcra of the hammer-beams, and the ends of the connecting-rods attached to said beams, and to the crank-shaft and gears from which they derive their motion, as to bring the said fulcra and connecting-rods in nearly a straight line at the time of giving the blow, for the purpose above specified; the opposite ends of the connecting-rods, just before giving the blow, moving in opposite directions, so as to give a rapid and powerful blow.

"3d. I claim causing the anvil to descend from the iron, just before the blow of the side-hammers, and to ascend just before the blow of the upper hammer, by means of a rod attached at one end to the under side of the upper hammer-beam, and at the other end to a tilting arm which embraces the anvil, substantially as above described."

No. 10,171. By Samuel Pratt, of Boston, Mass.—*Screw Nails.* Patented October 25th, 1853.



The object of this invention is to construct a spike or nail in such a manner that it may be turned into the wood by driving, and out by means of a turn-screw, without having its head bruised by the driving, so as to prevent the proper application of the turn-screw, and without breaking the wood by the driving, so as to prevent it from forming a good and compact counter-screw for the threads of the nail to turn in. The bruising of the head is prevented by elevating the head of the screw at *c c*, as shown in the figure.

The inclination of the thread is very oblique—so much so that it requires several threads to cover the shank. The outline of the upper face of the thread, in its radial cross-section, is a straight line, and at right angles to the axis of the shank; but the under side of the thread forms a very oblique angle with the axis, and it is curved so as to leave a large space between the threads of the nail.

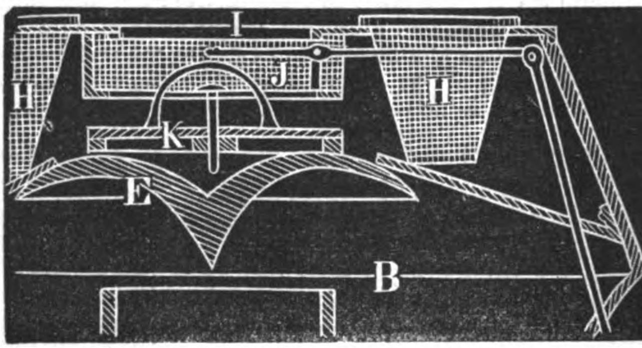
Fig. 3 is a section through *a b*.

"What I claim as my invention, and desire to secure by letters patent, is a screw-nail, constructed with a thread shaped substantially as herein described.

"I also claim shaping the head substantially as herein set forth, so that the battering caused by the driving will not obstruct the application of the turn-screw."

No. 10,172. Samuel Sweet, of New York, N. Y.—*Spark-Arresters for Locomotives.* Patented October 25th, 1853.

Extract from the Specification.—"The invention consists in placing a deflector of novel construction within and near the top of the outer case, and directly over the top of the smoke-pipe, so as to deflect the sparks as they rise, and give them a direction downwards into the chamber forme[d] between the outer sloping case and the smoke-pipe, and in combinatio[n] with the said deflector, employing a metallic top-plate or cover, which ha[s] a series of inverted hollow conical wire-cloth sieves, or curved segments o[f] a hollow sphere, set in and around it, and their lower tapering ends extend ing down some distance into the hood or outer chamber; the said funnel shaped sieves rendering the escape surface for draft very large, and admit ting of said deflector being employed without the necessity of increasing the size of said hood; for it will be evident that each one presents almost as much draft surface as the entire top of the ordinary spark-arresters, and at the same time their shape and arrangement serve to aid in deflecting the sparks, for as they come against the surface of the funnel-sieves they are caused instantly to glide or slide up and strike the solid portion of the metal top, and as there is not draft to operate upon them, they have a downward direction given to them, and they fall upon an inclined partition, which guides them into the spark-chamber; thus it will be seen that these sieves



not only present more draft surface, but that their shape preserves them from being burnt or injured by heat, and from being clogged; and, further, that their meshes can be more easily kept clean and free from obstruction, for the steam in passing out acts with force on the entire surface of each sieve, owing to its tapering shape, and opens the meshes of the same, and consequently there is not much liability of the draft being stopped; and if it should be, the said arrangement of sieves and deflector admits of a sunken valve composed of wire-gauze being employed to supply an extra draft in case of such an emergency, the said valve being arrang[ed] direct-ly over the top of the deflector, and closing a large draft pass[age] in the centre of the top plate, and at the bottom of a short wire-gauze tube or pipe secured on the under surface of the top plate, and surrounding the said large central opening; this valve rises and falls on a rod like an ordinary pump-valve, as it is opened and closed by the engineer. By making the valve and its seat of perforated metal or wire-gauze, I also obtain a large amount of draft surface without increasing the size of the outer case.

"What I claim as new, and of my invention, is the combination of the reticulated inverted frustums of cones H, constructed and situated as described, with the trumpet-shaped deflector and guard E, the reticulated cylinder J under the opening I, provided with the reticulated valve K, when these parts are arranged in the upper portion of an enlarged or expanded external pipe, such as that represented at B in the drawing; the whole operating in the manner and for the purpose set forth in the foregoing specification."

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