George Birkbeck M.D.

President of the London Mechanics' Institution; Patron of the Glasgow & Spitalfields Mechanics Institutions; President of the Medical & Chirurgical Society of London and of the Meteorological & Chemical Societies; Member of the Astronomical & Geological Societies &c. &c. &c.

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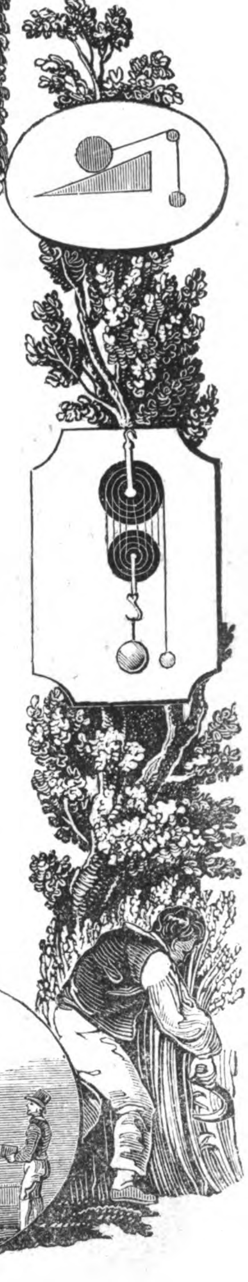


THE

LONDON MECHANICS' REGISTER.

Industry approached,
And roused him from his miserable sloth;
His faculties unfolded; pointed out
Where lavish Nature the directing hand
Of Art demanded; shewed him how to raise
His feeble force by the MECHANIC POWERS;
Set science, wisdom, glory in his view,
And bade him be the lord of all below.

THOMSON.

VOL. I.

London:
PUBLISHED BY COWIE AND STRANGE,
24, Fetter Lane.

1825.

Dedication.

TO

GEORGE BIRKBECK, M.D.

THE ORIGINAL PROJECTOR

OF

MECHANICS' INSTITUTIONS

BY WHOSE DISINTERESTED AND INDEFATIGABLE EXERTIONS TO PROMOTE

THEIR ESTABLISHMENT

THROUGHOUT THE UNITED KINGDOM,

A NEW AND BRILLIANT ERA IN THE PROGRESS OF SCIENCE

HAS BEEN AUSPICIOUSLY COMMENCED:

IN TESTIMONY OF GRATITUDE FOR

NUMEROUS KINDNESSES,

THIS HUMBLE ATTEMPT TO ASSIST HIS ENLIGHTENED VIEWS,

BY THE DIFFUSION OF

SCIENTIFIC KNOWLEDGE

AMONG THE

OPERATIVE CLASSES OF SOCIETY,

IS RESPECTFULLY DEDICATED

BY

THE PROPRIETORS.

April 30, 1825.

PREFACE.

Our FIRST VOLUME is now before the Public, and our first and most obvious duty is to offer our cordial thanks for the extensive patronage which our little work has received—a patronage almost, if not entirely unparalleled in this prolific age of periodicals. Opposed as we were, at the very commencement of our undertaking, by the dishonourable artifices of interested individuals;—and even menaced with the terrors of the law for a pretended infringement on the *titulary monopoly* of a *many-headed* contemporary, who "could bear no rival near his throne;" —our warmest gratitude is due to the numerous friends whose kind support has enabled us to overcome the obstacles which impeded our progress, and to construct our unassuming edifice on a secure and lasting foundation.

Among the various objects comprehended in the plan of the "MECHANICS' REGISTER," it cannot have escaped the observation of our readers, that one of the most prominent has been a faithful report of the able courses of Lectures delivered to the Members of the LONDON MECHANICS' INSTITUTION; and our friends may also have observed, for some time past, a very considerable improvement in this department of our labours. We may, however, avail ourselves of this opportunity of stating, that we have heard, though very rarely, some objections started against the insertion of the Lectures. We have been told that they communicate little information that may not be acquired by referring to an Encyclopedia, or to the various works devoted to the illustration of the different sciences. The futility of this objection is obvious; and we would ask in reply, how many among the thousands who can afford to pay three-pence a week for our publication, have an Encyclopedia in their possession, or have the means of consulting the scientific works alluded to? The fact is, that the purchasers of the REGISTER, at a very trifling expence, are supplied with treatises upon the whole circle of the sciences in succession; and we need only add, that the few instances in which objections have been advanced against the Lectures, are so greatly outweighed by a whole host of testimonials in their favour, that we are furnished with the strongest motives for persevering in the performance of this part of our duty.

To the numerous correspondents who have obliged us with communications, we return our sincere acknowledgments, and we invite the attention of MECHANICS in general to our miscellany, as an eligible medium for making known to the public any beneficial invention, the knowledge of which they may wish to disseminate as widely as possible. To the suggestions of the humblest Artisan, as well as to the more finished efforts of the man of scientific experience, our pages will always be open, and in the selection of those communications, which are best adapted to the design of the work, we shall endeavour to exercise a proper discrimination, and to encourage the efforts of incipient genius, by avoiding the appearance of unnecessary fastidiousness.

In conclusion, we would beg to apologize for the numerous defects, which criticism may discover in the present volume; but we hope to mitigate its severity in some degree by candidly confessing our faults, and promising future amendment. Some of these defects are attributable to the want of experience incident to a new publication, and others to the obstacles we have had to encounter; but as the conduct of our little bark has been recently entrusted to a more assiduous pilot, and arrangements have been made for the introduction of considerable improvements, we trust that the liberality of our readers will induce them to treat our inadvertent errors with leniency, and to accept our assurances that every exertion will be made to render the forthcoming volume more deserving of their patronage than the present.

BIOGRAPHICAL MEMOIR

OF

GEORGE BIRKBECK, M. D.

Conscious of our inability to do justice to the high character and extensive scientific attainments of the distinguished individual who is the subject of the present memoir, and apprehensive that, by those who have not the honour of being personally acquainted with him, we may be suspected of using the language of flattery, we approach, with considerable diffidence, the task of gratifying the laudable curiosity of our numerous subscribers, by presenting them with a biographical sketch, and tracing the steps by which he has reached his present eminence in the scientific world.

Dr. Birkbeck was born in the year 1776, at Settle, in Yorkshire; and was the youngest son of William Birkbeck, Esq., an eminent banker and merchant of that place. In his earliest years, he discovered a decided predilection for mechanical pursuits, and was fond of frequenting different workshops, and attempting to use the workmen's tools, whenever an opportunity presented itself. Even during his childhood, he was anxious to assist the children employed in a cotton-mill which had been erected in the neighbourhood, for the purpose of examining its complicated machinery, and endeavouring to discover the movements by which its operations were accomplished.

He was placed at a school, in the village of Newton, near Lancashire, at the age of eight years, and in this establishment he studied arithmetic, and obtained the rudiments of those classical acquirements which were subsequently enlarged by the assistance of competent tutors. After remaining here till he attained the age of fourteen, the development of his natural powers was entrusted to Mr. Dawson, of Sedbergh, a gentleman who, from the humble condition of a shepherd, had, by the persevering efforts of his own talents, attained considerable celebrity as a mathematician. Under the able tuition of Mr. Dawson, he continued his mathematical studies with indefatigable attention, and his improvement was such as might have been anticipated from the strength of his abilities and the zeal with which he devoted himself to their cultivation. At the same period, he studied the Greek and Latin languages, under the direction of Mr. Foster, of Hebblethwaite Hall, a scholastic relative, with whom he then resided, and besides acquiring a competent knowledge of the elementary branches of mathematical science, he extended his inquiries to fluxions, and the *principia* of Newton.

Having become acquainted with Dr. Garnett, who had also been one of Mr. Dawson's pupils, his own inclination, and the advice of the Doctor, determined him to devote his attention to the study of medicine, and after remaining some time with Dr. Garnett, he pursued his pharmaceutical inquiries, under the tuition of Mr. Logan, of Leeds; and at the age of eighteen, he quitted Leeds for Edinburgh, at which place he joined the Royal Medical Society. At Edinburgh he continued his medical studies during one winter, and passed the next in London, where, as a pupil of the late Dr. Baillie, he practised dissection, for the purpose of increasing his knowledge of anatomy. In the metropolis he also attended Dr. Fordyce's lectures on the practice of physic, and those of Dr. Pearson on the science of chemistry.

On his return to Edinburgh he joined the Society of Natural History, and at the commencement of the ensuing session, the members of that Society evinced their estimation of his talents by electing him to the chair; and a similar honour was conferred upon him, about the same time, by the Royal Medical Society.

The celebrated mathematician, Professor Robison, delivered a course of lectures on natural philosophy during the summer of the year 1797, and the deep interest which these lectures excited in the mind of Dr. Birkbeck led to an intimacy, which was of essential service to him in his philosophical researches. He was also fortunate enough to obtain the friendship of Dr. Thomson, professor of military surgery in the University of Edinburgh, and of John Allen, Esq., an able lecturer on the animal economy, and the present Master of Dulwich College. He subsequently acted as clinical clerk to the distinguished Professor, Dr. Rutherford, and eagerly availed himself of this important opportunity of extending his practical knowledge of the medical and other sciences, while his powerful talents were still further cultivated by his intimacy with many other individuals of eminent philosophical attainments, among whom may be enumerated Drs. Brown and Leyden, Mr. Horner, Professor Wallace, Mr. Reddie, and the distinguished ornament of his country, Henry Brougham, Esq., who was at that period, a student at Edinburgh.*

In the early part of the fourth winter which he passed in Edinburgh, he was a second time elected, by the spontaneous votes of his fellow students, as one of the Annual Presidents of the Royal Medical Society. This circumstance afforded a striking proof of the estimation in which his talents were held, as it was very unusual for one individual to be twice appointed to that distinguished office. Towards the termination of this session, he published a chimico-physiological dissertation on the blood; and after passing through the usual examinations in a manner highly honourable to himself, he was admitted to a degree in medicine.

Dr. Birkbeck was soon afterwards informed, in a communication which he received from his friend, Dr. Garnett, that the latter had been appointed Professor of Natural Philosophy in the Royal Institution of London, and that, as he was about to resign the situation of Professor to the Andersonian Institution at Glasgow, he had put Dr. B. in nomination as his successor in that office. As soon as it was known that he had consented to become a candidate, the high reputation which he had obtained by the commanding talents he was known to possess, secured his election by a triumphant majority; and in the month of November, 1799, being then about 22 years of age, he delivered an admirable course of Lectures on Natural and Experimental Philosophy, including an illustration of the science of Chemistry.

We are now approaching that important period in the Doctor's splendid career of usefulness, when he added to the laurels which had previously rewarded his distinguished merits the brightest wreath in the chaplet, by conceiving the grand and philanthropic idea of communicating the light of science to the untutored mind of the humble and laborious artisan, by the establishment of MECHANICS' INSTITUTIONS. There is something peculiarly interesting to the reflecting mind in the circumstances which gave rise to the formation and accomplishment of a plan so obviously calculated to confer upon society, advantages of which the extent and importance cannot as yet be adequately appreciated.

To illustrate the course of Lectures which Dr. Birkbeck had commenced at the Andersonian Institution, it was necessary to prepare many pieces of apparatus, which the Institution did not possess; and as no philosophical instrument maker competent to the task, was at that time resident in Glasgow, the Lecturer was himself obliged to have recourse to such workshops as appeared best adapted to his wishes, and to superintend in person the manufacture of the requisite apparatus. By this means he was brought into immediate communication with the operative artizans of Glasgow, and during this intercourse, his acute penetration discovered such evident indications of latent genius in the minds of the workmen, accompanied by a kind of intuitive anxiety for the acquisition of knowledge, that the spontaneous feeling of regret, excited by their want of scientific information, was instantly succeeded by a benevolent wish that the means of obtaining this information could be placed within their reach.

Among the various pieces of apparatus thus constructed under the personal direction of the Doctor, was a *model* of the *centrifugal pump*, and it was in the cellar of the tinman's shop, where this model was completed,—when surrounded by the workmen, who had constructed it, unconscious of its use, or the principle upon which it acted;—when contemplating the powerful expression of intelligent curiosity depicted in their looks, and replying to the numerous inquiries suggested by the novel construction of the apparatus;—it was in this place and at this moment, that the thought first darted across his mind, of delivering a course of gratuitous Lectures for the scientific instruction of the humble and unenlightened operative mechanics of Glasgow.

The plan which resulted from the Doctor's reflections on this interesting subject was soon matured, and in the month of March, 1800, he communicated his benevolent

* In the able speech delivered by Mr. Brougham, at the recent public dinner, which was given in Edinburgh in honour of his talents and his patriotism, previous to his installation as Lord Rector of the College of Glasgow, that gentleman alluded to the circumstance of his having been a student in the University of Edinburgh, and expressed his gratitude for the instruction he had received, in a strain of powerful eloquence, which elicited thunders of applause

scheme to the Trustees of the Andersonian Institution, with a hope of obtaining their concurrence with his views, and their co-operation in carrying them into effect. But in this hope he was disappointed, for the plan, however commendable was the motive in which it originated, was considered so visionary and impracticable, that amongst all the gentlemen to whose superintendence the management of the Institution was confided, scarcely one could be found who evinced the least disposition to countenance or encourage the design.

The apathy, and even derision, with which his propositions were received, would have extinguished the zeal of a less powerful mind; but the Doctor's conviction of the practicability of his plan daily acquired additional strength, and the obstacles by which its adoption was opposed, only operated as incentives to a renewal of his exertions for its accomplishment. Upon his return to Yorkshire, at the close of the session, he issued a prospectus of the different courses of Lectures to be delivered during the ensuing session, and his favourite plan of establishing a "Mechanics' Class" still predominating in his mind, he added to that prospectus the following able and appropriate observations on the design which he had conceived, and the means of carrying it into execution:—

"In the prosecution of this design, I shall deliver a series of lectures upon the *Mechanical Affections of solid and fluid Bodies*, abounding with experiments, and conducted with the greatest simplicity of expression and familiarity of illustration, solely for persons engaged in the practical exercise of the mechanic arts: men, whose situation in early life has precluded even the possibility of acquiring the smallest portion of scientific knowledge, and whose subsequent pursuits, not always affording more than is necessary for their own support and that of their dependent connexions, have not enabled them to *purchase* that information, which curiosity, too active for penury wholly to repress, or the prevailing bias of their natural genius, might prompt them to obtain. I am by no means sanguine in my expectation, that by a course of instruction, such as I have now proposed, one artist will be directed to the discovery of any thing which is essential or important in his particular department, how much soever it may be connected in principle with the subject to be discussed; I am too well aware that the best contrivances in every branch of the mechanic arts, have resulted, and must still continue to result, from the observation of practical defects, and from the gradual application of suitable means, dictated by practical maxims, to obviate or remove them. But whilst my slight acquaintance with the subject has afforded this information, I have become convinced that much pleasure would be communicated to the mechanic in the exercise of his art, and that the mental vacancy which follows a cessation from bodily toil, would often be agreeably occupied, by a few systematic philosophical ideas, upon which at his leisure he might meditate. It must be acknowledged too, that greater satisfaction in the execution of machinery must be experienced, when the uses to which it may be applied, and the principles upon which it operates, are well understood, than where the manual part alone is known, the artist remaining entirely ignorant of every thing besides; indeed, I have lately had frequent opportunities of observing, with how much additional alacrity a piece of work has been undertaken, when the circumstances were such as I have now stated.

"Perhaps to some it may appear that the advantages derivable from these lectures will be inconsiderable, or even that they will be disadvantageous, on account of the extent of the subjects which they embrace, and because those to whom they are addressed do not possess the means or enjoy the opportunities, calculated for engrafting upon the elementary truths which they learn, the extensive researches of the illustrious philosophers, by whom the boundaries of science have been enlarged.—Whatever the arrogance of learning may have advanced in condemnation of superficial knowledge, and however firmly I may be persuaded that the people cannot be profound, I have no hesitation in predicting, that vast benefit will accrue to the community by every successful endeavour to diffuse the substance of great works, which cannot be perused by the people at large; thereby making them reach the shop and the hamlet, and converting them from unproductive splendour, to useful though unobserved activity."

A printed invitation was circulated among the Glasgow manufactories, as soon as the usual business of the next session was commenced, containing an offer of tickets for the admission of the most intelligent operatives in each manufactory, into the Mechanics' Class. In reply to this invitation, a few lists of applicants for admission were received, and the promised tickets having been issued, Dr. Birkbeck delivered the first Lecture of his course to a class of *seventy-five* pupils. So powerful was the impression made upon this limited audience by the Lecturer's instructions, and so rapidly was this impression communicated to other workmen, that the next Lecture was attended by *two* *hundred.* At the third, the number was augmented to upwards of *three hundred;* and at the fourth, at least *five hundred* were present. This was a greater number than the Theatre would conveniently hold, and for this reason, it became necessary to refuse tickets to many other applicants, who were equally anxious to participate in the benefits offered to their acceptance.

The uniform propriety with which the workmen conducted themselves, during the course, and the deep interest which the Lecturer's remarks and experiments excited in their minds, more than realized the anticipations of their excellent instructor, and extinguished the doubts and fears of those gentlemen, who had predicted the failure of an attempt, which they attributed to the benevolent enthusiasm of a youthful imagination. But a short period elapsed before the Doctor received, from several of his hearers, various communications on scientific subjects, which afforded ample evidence of the existence of genuine talent; and at the close of the course of Lectures, their feelings of gratitude for the instructions they had received, were expressed by the presentation of a handsome silver cup, with an appropriate inscription and suitable emblematical devices, which was delivered to Dr. Birkbeck by Mr. Roberton, the mechanic deputed for that purpose by the subscribers.

Dr. Birkbeck continued these Lectures during the two succeeding sessions; the mechanics evincing throughout the same unmixed feelings of approbation and gratitude; and in the summer of the year 1804, circumstances induced him to relinquish the office of Professor in the Andersonian Institution, in which situation he was succeeded by Dr. Ure, who still continues to devote his distinguished abilities to the performance of its duties.

Subsequent to the above period, Dr. Birkbeck delivered courses of scientific Lectures at Birmingham, Liverpool, and Hull, upon all which occasions his celebrity as an ornament to the world of science was increased, and his connections were extended by the intimacy of many other eminent individuals.

In May, 1805, the Doctor was married to Miss Catherine Lloyd, an intelligent and accomplished young lady, who was the youngest daughter of Sampson Lloyd, Esq. of Farm, near Birmingham. He afterwards passed a few weeks in travelling, and according to his original intention, he then came to London, where he established himself as a physician; and from his extensive connections, and the unlimited confidence reposed in his medical skill, his practice rapidly increased, and his prospects of an honorable independence, as the merited reward of his labours, were in the highest degree flattering.

The worthy Doctor's domestic felicity was, however, soon destroyed by a calamity as unexpected as it was severe, and which required the exercise of all his fortitude to support. In the month of March, 1807, his amiable wife died within ten days after presenting him with a son; and by this afflicting bereavement he was plunged into the deepest distress; but by a persevering attention to the important duties of his profession, his mind gradually resumed its serenity, and for several years afterwards, he continued to advance rapidly towards that degree of eminence as a physician which, at the present time, he so deservedly enjoys.

Soon after he arrived in London, Dr Birkbeck was elected one of the Presidents of the Physical Society of Guy's Hospital, to which office he has ever since been annually re-elected. He was also, in the following year, appointed Physician to the General Dispensary in Aldersgate Street, and still continues to discharge the important duties of that situation.

Dr. Birkbeck entered a second time into the married state in July, 1817, when he was united to Miss Anna Margaret Gardner, the youngest daughter of Henry Gardner, Esq. of Liverpool, a lady whose many amiable qualities still shed their attractive influence on his hours of retirement.

In the midst of his successful professional career, Dr. Birkbeck still retained his attachment to those scientific pursuits in which he had formerly attained so much eminence, and the premises of the London Institution in Moorfields, of which he was one of the original projectors, being now completed, he offered to deliver a gratuitous course of Lectures on Natural and Experimental Philosophy, and this handsome offer being gratefully accepted by the Managers, he delivered, during the spring of 1820, seventeen Lectures to crowded and delighted audiences. He also delivered other courses of Lectures at the same place in the years 1823 and 1824.

Many years had elapsed since the early object of his ambition, the formation of a "Mechanics' Class" at Glasgow, had been carried into effect, and having had, during this long interval, but little communication with that city, he had not received much information of the progress of the class. In the supplement to the Encyclopædia Brittanica, Mr. Dugald Bannatyne had spoken of Dr. Birkbeck's plan in the highest terms of eulogy, and had expressed an anxious wish that it should be acted upon in all the principal manufacturing towns; and a letter on the subject of the proceedings of the Mechanics' Class at Glasgow, appeared in the Morning Chronicle in 1822, in which the writer alluded to the meritorious exertions of Dr. Birkbeck, as its original founder, in a manner which could not fail to convince him that the Mechanics of Glasgow had not forgotten the enlightened individual to whom they were indebted for the important advantages which had resulted from his efforts.

In the spring of 1823, the Doctor received a letter from Dr. Ure, his able successor in the professorship of the Andersonian Institution, communicating a series of resolutions entered into by the Mechanics of Glasgow, the perusal of which must have excited in his mind that pure feeling of gratification, with which philanthropy contemplates the accomplishment of its benevolent purposes. These resolutions contained a powerful expression of gratitude to Dr. Birkbeck, the "liberal-minded projector and founder" of the Mechanics' Class, and a wish that his portrait should be placed in their library, for which purpose a voluntary subscription was opened.

Upon receiving Dr. Birkbeck's grateful acquiescence with their proposition, the mechanics forwarded a letter to him, through the medium of their Secretary, Mr. Alexander Marshall, from which the following extract is given, as a specimen of the style in which it was written, and of the just sense entertained by the mechanics of the extent of their obligations to their benefactor:—

"Perhaps, when your philanthropic mind first suggested the idea of diffusing useful knowledge among Mechanics, it did not occur to you that your benevolent scheme would be crowned with such eminent success, as subsequent events have proved. But the oak springs from the acorn;—the triumphs of truth over prejudice, though slow, are nevertheless certain, and, if properly directed, permanently beneficial to mankind. You formed your scheme of improvement from an intimate acquaintance with human nature; and it must be gratifying to you to learn, that your philosophic foresight has not been disappointed. You judged that the apparent mental lethargy of the operatives towards science arose from no infirmity of their mental powers—and you judged right. You traced it either to a total neglect, or an improper direction of their faculties to objects unworthy of their notice. You undertook the generous task of giving *the first impulse*, and of directing their attention to studies worthy of their pursuit; and the experience of twenty years has proved, beyond a doubt, the beneficial effects resulting from your system of education."

Circumstances, which it is not necessary to particularise, soon afterwards led to the secession of the Mechanics' Class from the Andersonian Institution; and having formed themselves into an independent Mechanics' Institution, which still proceeds in the most prosperous manner, the members, with the same sentiments of grateful recollection which had dictated their previous resolutions, nominated Dr. Birkbeck as their Patron.

Early in 1823, the Doctor was revolving in his mind the practicability of carrying a similar plan into effect in the metropolis; for which purpose, as a preparatory step, he was preparing for publication an Essay on the Scientific Education of the Working Classes. From the variety of his occupations, this essay was still in an unfinished state, when his attention was again attracted to the subject by an address to the Mechanics of London, which appeared in a periodical publication, at that time possessing some claims to respectability, which it has since endangered, by the imbecile attempts of its present conductor to effect the destruction of the Institution which he was instrumental in forming. Of the promptitude with which Dr. Birkbeck immediately offered his able co-operation in the proposed plan for establishing the LONDON MECHANICS' INSTITUTION, the words of the gentleman to whom we have alluded will afford the most conclusive evidence:—

"It will, we feel assured," says he, "give peculiar satisfaction to every well-wisher to the scheme, to learn, that the *first gentleman* who responded to our invitation was the *public-spirited* and *philanthropic individual*, who, to adopt the language of a resolution of the Mechanics of Glasgow, of the 22nd of February last, had the honour 'of unfolding, first of all, with the commencement of the nineteenth century, the temple of science to the artisan'—we mean DR. GEORGE BIRKBECK, formerly Professor in Anderson's Institution, Glasgow, now physician in London."

"Who," says he again, "but a man of a *great and a generous mind*, flinging aside all the prejudices of education and habit, soaring above most of those around him in his views of human capability, could have been the first, in the long lapse of ages, to step forward and invite the humble artisan, 'however scanty his means, or obscure his condition,' to come and draw water from the same stream at which a Galileo, a Bacon, and a Newton, had drunk of immortality?"

Will it be believed, that the individual who could pay these just tributes of respect to Dr. Birkbeck, and who, in a hundred other instances, eulogised his extraordinary merits as they deserved, should, in the course of a few "little months," so far forget himself, as to unsay all his previous sayings, and use every effort to malign the character, and impugn the motives of the man he had appeared almost to idolize?—But, enough of this—The perversion of talent to mischievous purposes may afford a useful moral lesson, but it is a subject of painful regret.

At the public meetings which were subsequently held at the Crown and Anchor Tavern, on the 11th of November and the 2nd of December, 1823, Dr. Birkbeck was unanimously called to the chair, and to his important assistance, in conjunction with Mr. Place, of Charing Cross, and other gentlemen, the LONDON MECHANICS' INSTITUTION is chiefly indebted for its original establishment, and the success which has since marked its progress. When the first officers of the Institution were elected, on the 15th of December, 1823, Dr. Birkbeck was unanimously chosen as President, in which situation he has ever since devoted his great talents to the promotion of its interests, with a degree of zeal and perseverance, which has seldom been equalled, and never surpassed.

Having thus imperfectly performed the task of detailing the principal circumstances which have distinguished the progress of this truly-excellent individual, it would be in vain to attempt a further illustration of his character by any feeble praises which our own feelings might dictate. Of the high estimation in which his genuine worth and extensive philosophical attainments are held, by those who have had ample opportunity of appreciating them, some idea may be formed by the honours which have been conferred upon him by numerous scientific and other institutions. We have already stated that he is President of the London Mechanics' Institution, Patron of the Glasgow Mechanics' Institution, Physician to the General Dispensary, and one of the Presidents of the Physical Society of Guy's Hospital. He is also President of the Meteorological Society, of the London Chemical Society, and of the Medical and Chirurgical Society of London, Vice-President of the Surrey Literary Institution, and Patron of the Spitalfields Mechanics' Institution.

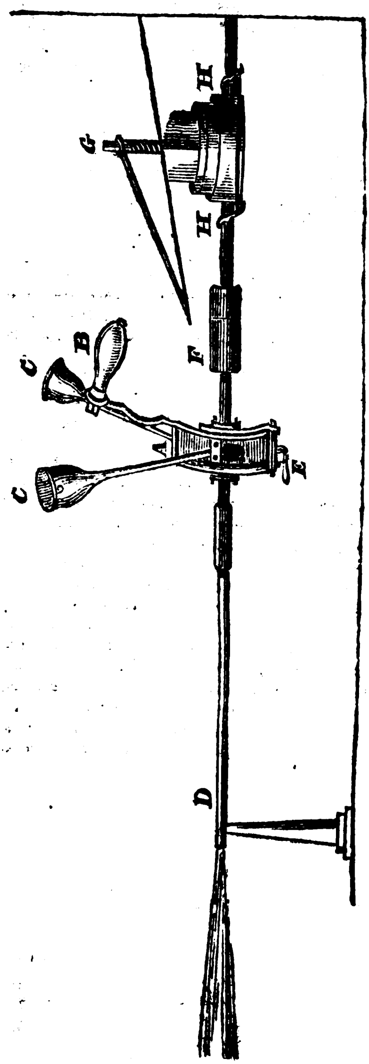
At the First Anniversary Dinner of the Patrons and Members of the London Mechanics' Institution, which was celebrated on the 2nd of December last, Mr. Brougham, the early friend and co-adjutor of Dr. Birkbeck, pourtrayed, with his usual eloquence, the incalculable benefits which must result from the general diffusion of scientific knowledge among the operative classes of the community; and congratulated the assembly on the number of Mechanics' Institutions which had, within the short space of twelve months from the establishment of the central Institution in London, under the learned President's auspices, sprung up, as if by magic, in most of the principal manufacturing districts in the kingdom. Since that period, the number has been considerably augmented, and in all human probability, the author of this "great and good work" will witness, for many years to come, the beneficial effects of his philanthropic exertions. But when the irrevocable decree shall be fulfilled, which mingles the dust of the enlightened philosopher with that of the untutored Indian, and confounds all distinction in the "cold obstruction" of the grave—when the heart that now glows with virtue and benevolence, shall cease its pulsations for ever, and the hand that is stretched forth to the assistance of unobtrusive merit shall be extended no more;—the name of DR. BIRKBECK will be remembered by countless multitudes with respect and veneration; —in ages yet unborn, it will be associated with those of the greatest benefactors of mankind; and the establishment of MECHANICS' INSTITUTIONS will be his passport to a glorious immortality!

The London MECHANICS' REGISTER.

" He that enlurges his curiosity after the works of nature, demonstrably multiplies his inlets to happiness.—JOHNSON.

No. I.] SATURDAY, NOVEMBER 6, 1824. [Price 3d.

Mr. PERKINS's EXTRAORDINARY STEAM GUN.



Description of Mr. Perkins's Steam Gun.

A.—The Chamber of the Gun, from which the Barrel is charged.

B.—The Handle which directs the piece working in the Chamber, and by means of which the Balls are conveyed from the Hoppers (C) into the Barrel.

C.—The Hoppers, into which the Balls are placed, and from which they drop one by one into the Chamber, when the Handle (B) is moved to its extent.

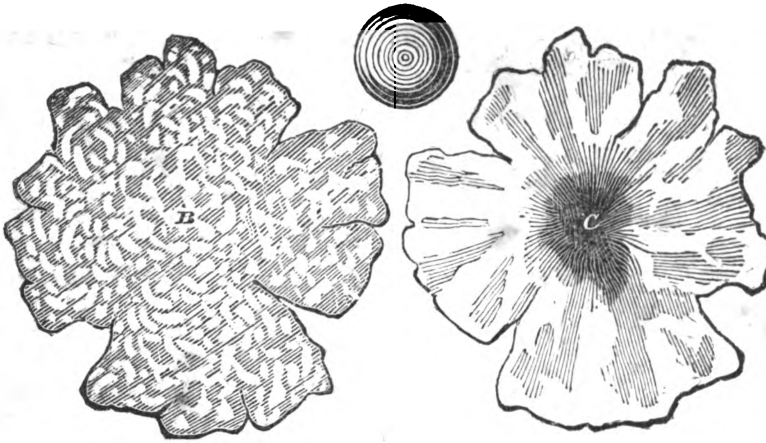
D.—The Barrel, which is about six feet in length.

E.—A Regulating Screw, by means of which the Handle is kept tight.

F.—A Swivel Joint, which allows of the Gun being elevated or lowered to any point, and by means of which the Barrel may be moved in almost any direction.

G.—A Throttle Valve, by which the Steam is admitted from the Generator of the Engine, and into which the Pipe, communicating with the Barrel, is introduced.

H. H.—Mr. PERKINS's admirable mode of uniting Pipes so as to resist any pressure. This represents the junction of the Pipe from the Generator with that from the Chamber.



Description of the Ball.

A.—The Ball before it is placed in the Barrel; the exact size is described.

B.—The appearance of the Ball on the side nearest to the Gun when discharged against an Iron Plate on the wall at a distance of 100 feet from the Barrel, and flattened by the force of the concussion.

C.—The appearance of the Ball on the side which strikes against the Plate.

ADDRESS.

It is usual, at the commencement of a work, to give an Address to the Public, and we shall not depart from established usage; but our's shall be very short, and particularly as to promises, for we would rather give a great deal in our future numbers, which we had never promised, than break a single pledge which we had made to our readers. The objects of this publication are, we think, evident even in this number, which, we confidently hope, is but a feeble specimen of what we shall produce, flattered as we are by the encouragement held out to us by scientific friends, and bold in the possession of some sources of information, which we consider exclusive. To encourage the first efforts of genius, and to give publicity to the labours of maturity, in all that respects the progress of science and its applicability to the useful pursuits of life, will be paramount considerations in the London Mechanics' Register. With this view, therefore, we invite Communications from all who are able, in any way, to contribute to the great work of science, which, in a country like Great Britain, is, at once, an individual accomplishment and a natural advantage: and we engage, that no pains shall be spared in arranging them for the public eye, with satisfaction to the reader and the contributor. It will, of course, be expected, that in this address we should say something of the Mechanics' Institution, *whose lectures and proceedings we intend to report, and from many of whose Officers and Members we have derived facilities, and experienced kind offices in commencing this undertaking. Of this Institution we can only say, that as it is at once honourable to its founders and to the character of the age in which we live, we cannot now do other than speak favourably; and we sincerely trust, that its own conduct will ever be such, that we may continue to report with pleasure all its proceedings. It has been often remarked, that the best institutions in the metropolis have risen into note through much difficulty and opposition. If this remark be true, as applied to any establishment, it is forcibly so as to the Mechanics' Institution. Never did a body encounter more obstacles, or have to contend with more calumny; but the mist has been dispelled by the patient perseverance of its managers, and the Institution is now a new feature in our national character, and one from which advantages may spring, of which, at the present moment, it is impossible to hazard a calculation.*

We have stated in our Prospectus, and we repeat the statement here, that we shall, in all our numbers, endeavour to render the London Mechanics' Register a light and agreeable companion for the fire side, as well as a vehicle of useful information.

ACCOUNT OF THE EXTRAORDINARY STEAM GUN.

Much as may have been said of the power and effects of steam, and great as have been the improvements in engines, and in the application of this powerful agent to the purposes of manufacture and the arts, it was reserved for Mr. Perkins to astonish us, even at a period when we imagined that the ingenuity of man had exerted itself to the utmost. We could fill several pages with an enumeration of the improvements introduced by Mr. Perkins, but the space which we must devote to the invention immediately before us, will not permit it. We will briefly observe, that to him we owe the invention of safety joints in steam pipes, which resist the pressure of a thousand pounds to the square inch, whereas formerly they were liable to explosion at a pressure of only forty pounds. To Mr. Perkins, also, we owe much of the knowledge which we now possess relative to high pressure steam engines, and which has given us so decided a superiority over our continental competitors; and we cannot help noticing as a powerful testimony to the skill and science of this gentleman in all his experiments, for ascertaining the powers of steam, and the modes of placing it under command, that he has never met with a single accident. Explosions, indeed, he has had without number, but they have been confined to parts of the engine in which no danger could arise to the persons near to it, because for the very purpose of ascertaining the amount of pressure which pipes would bear, and which was frequently two thousand pounds to the square inch, other pipes were placed in various parts, of such construction that they must burst at a pressure of only one thousand. Now, however, all danger of explosions in this way is at an end, as the pipes are constructed so that they will bear all the pressure which can be placed upon them. To come, however, more immediately to the subject of this article, we must observe, that we were enabled on Wednesday last, through the kindness of Mr. Perkins, to examine minutely, at his manufactory in the Regent's Park, the extraordinary piece of mechanism, called the *Steam Gun*. The engraving which we have given of it in the present number, will enable every person to form a correct idea of its nature, but it may not be amiss to give an abstraet here. The Gun is simply formed by introducing a barrel into the steam generator of any engine, and by the addition of two pipes towards the chamber of the gun, introducing a quantity of balls, which, by the action of a handle to the chamber, are dropped into the barrel, and fired one by one, at the rate of from four to five hundred in the minute. The explosive force of the steam which rushes from the generator and expels the balls is about 700 lbs. to the square inch: with this force a musket ball fired against an iron plate at the distance of 100 feet from the gun, is completely flattened, and when a force of 840 lbs. to the square inch is applied, the ball is actually driven to pieces in such a way that none of its fragments can be collected. As the gun is now fixed, having a direct communication through a wall with one of Mr. Perkins's engines, it cannot of course be removed from the spot, the barrel merely being susceptible of alteration; but in the event of the invention being applied to purposes of warfare, it would be easy to attach a portable steam engine of small dimensions, which could be removed with as much rapidity as any piece of ordnance now in use. The cost of such a machine altogether would be comparatively small, and as Mr. Perkins is about to construct a four-pounder, which can be moved about with great facility by two horses, the public will have a good opportunity of judging of its practical merits, of which, however, there cannot be a doubt, after the experiments already made at the manufactory. The most extraordinary part of the affair is the smallness of the expense in charging artillery of this nature compared with that of the present system. In Mr. Perkins's Steam Gum, one pound weight of coals is found to produce the same effect as 4 pounds weight of gunpowder in the ordinary way, viz. 1 pound of coals will generate sufficient steam to expel, with equal force, as many balls as four pounds of powder. Of the rapidity with which the discharges are made we say little, after what we have observed of the mode in which the balls are expelled, but there is another great advantage, which, on the score of humanity deserves commendation. An explosion from this gun is next to impossible: for the greater the rapidity of firing, the less is the danger, as the stream of vapour rushes forward without check, and finds a vent in the open air. How many lives, on the contrary, have been lost by the bursting of our common field-pieces, and how little reliance is to be placed upon the greatest care in cleansing them in the heat of battle. Ten guns, upon this principle, would, in a field of battle, be more than equal to 200 on the present system; and a vessel of only six guns would be rendered more than a match for a 74. We think we hear it said, "What a murderous instrument! What barbarians to recommend snch a mode of warfare!" Gently, good friends: if you will reflect for a mament, you will find that if Mr. Perkins's Steam Guns were introduced into general use, there would be but very short wars, since no fecundity could provide population for its attacks.—War is a very pretty pastime now a days. when it gives chances of promotion to many pretty fellows, and tends to remove any superabundance of the earth, if we are to believe what we should very much doubt, that any reasonable creatures were born to be sacrificed to the ambition or folly of a few individuals—but it would be a very different thing indeed if some fifty or sixty thousand men on either or both sides, were swept away by Perkins's exterminator.

If any two rulers of the earth were to know, that in the event of declaring war against each other, a plague or pestilence would blast both armies, and sweep them from the face of the earth, they would pause before they made such a declaration; but what plague, what pestilence would exceed, in its effects, those of the Steam Gun?—500 balls fired every minute, and one out of 20 to reach its mark—why, ten of such guns would destroy 150,000 daily. If we did not feel that the adoption of this mode of warfare, would end in producing universal peace, we should be far from recommending it, for we have some antiquated notions about christianity and ambition, and consider that it is not the pomp and pageantry of war, that removes its moral offence, and that the commission to kill of an earthly potentate, would by no means set aside the mandate of "love thy neighbours." Let us however turn from the consideration of the subject in the light of warfare, and consider what a vast field of information is opened to us, by the invention of this instrument, as a practical proof of the power of steam. After this who knows where the thing will end—thirty years ago, when we heard of steam boats in America, we laughed heartily at the joke; and even recently, what attempts have been made to deprecate the use of so powerful an agent; and yet te what does England owe its present greatness, but to its steam inventions?—Why are the manufacturers of Manchester busy, whilst those of Rouen in France are idle?—Because the former have more and better steam engines—Why are the facilities of coast and inland navigation greater. and therefore the chain of communication more regular here, than on the Continent? Because we have more steam boats. It has been with steam, as with gas—the interested in opposing its application to practical purposes, and the unenlightened, who could not understand it, have been alike its enemies. Ridicule, too, has been resorted to, to prevent its progress, but ridicule can avail nothing against facts. Such improvements must eventually triumph, and who knows where the perfection in them must find its acme. Mr. Perkins, than whom we know no better authority in these matters, would seem to consider steam discovery as in its infancy, for he says he is convinced that a steam engine might be made to throw a ball of a ton weight, from Dover to Calais—we had almost written from Calais to Dover, but God forbid such steam improvement as that would be, and enable us to keep our advantages to ourselves. We have heard, but we do not vouch for the fact, that the Emperor of Russia, who has more knowledge of the importance of steam than some of us Englishmen, has sent an agent here to procure a supply of Perkins's Steam Guns, which that gentleman's patriotism will not allow him to offer. We almost fear, however, that our description will enable the Autocrat to get cannons made upon this principle. If Alexander really has such an intention, let us hope that he will apply them to a good cause, and so secure the approbation of posterity.

LONDON MECHANICS' INSTITUTION.

A Course of Lectures on Electricity was commenced on Friday evening, Oct. 29, by Mr. Tatum, the Gentleman to whom the Members of the Institution are so much indebted for the liberal terms upon which he furnished them with his extensive and valuable philosophical apparatus. He introduced his subject by observing, that when, at the conclusion of his eighteenth Course of Lectures, he took leave of his scientific friends, in consequence of severe indisposition, he never expected again to appear before an audience in the capacity of a Public Lecturer, and that nothing but a request from so important an Institution as the present, could have drawn him from the retirement to which he had devoted himself. When the Secretary waited upon him about a fortnight since, and informed him that several courses of lectures had been delivered to the Members on Mechanics, Pneumatics, and Hydraulics, by Professor Millington and Dr. Birkbeck; but that the subject of Electricity had not yet been explained to them, he considered that they would feel interested by an illustration of that science, and readily acceded to the request of the Committee that he would introduce it to the notice of the Members. He begged to observe, however, that the temporary lecture-room in which they were assembled, was not so conveniently adapted to the purpose of giving Lectures, particularly on Electricity, as he hoped to have found it, for there was no science in which it was more difficult to succeed in the necessary illustrative experiments, the success of which depended, not only upon the state of the atmosphere, but very often upon locality of situation. He remembered, that when the gentleman, from whom he (Mr. T.) received his education, attended the Lectures of that self-taught Philosopher, Mr. Ferguson, the audience was sometimes render the necessity of going away without hearing any Lecture, in consequence of unfavourable circumstances operating against the success of the experiments. The Members were aware that the present had been a very unfavourable day, and although every effort had been exerted by his worthy assistant, Mr. Bluett, to obviate this disadvantage, and insure the successful perfor ance of the experiments, he trusted, that should any of them unfortunately fail, the liberality of his auditors would make every allowance.—*(Loud Applause.)*

Many of his hearers, who had consulted works on Electricity, might perhaps be startled at finding that his principles differed materially with those of the authors they had perused; but he did not like to travel in the beaten road when it might be avoided with advantage; and though he acknowledged the great value of the works written on Electricity, yet if he found that the theory *they recommended was not supported by facts*, he considered himself justified in adopting a different opinion, and raising his own theory on the foundation of direct experiments. Writers generally commence by stating, that all bodies are divided into *electrics* and *non-electrics*, and they place the metals at the head of the latter class. Metals, they say, are not electric, and those bodies which are non-electric are not capable of being excited. On the contrary, the Lecturer contended, that *all bodies in nature are electrics*. Let it not be supposed that because he differed with the authors to whom he had alluded, he did not hold them in respect, and view their writings with admiration; the scientific world was under great obligations to them for their works, but if he found that they contained errors, he had a right to reject them, and to separate the wheat from the chaff.

Mr. Tatum then gave a brief historical sketch of the origin and progress of the science of Electricity, which he traced from the period when Thales, the Milesian, 600 years before the Christian era, first noticed the attractive property of amber. Theophrastus afterwards observed, that several other bodies possessed a similar property of attracting light substances, and the number of electrics was considerably increased at a much later date by Dr. Gilbert. The next individual who made any material advances in the science was Mr. Hauksbee, who noticed the electric light and the crackling noise with which it is accompanied, and also discovered what he considered to be a principle of *repulsion*. Further improvements were subsequently made by the German Philosophers, and by Dr. Watson; but no means were discovered of accumulating the electric power excited till about the year 1745, when accident stept in to assist the progress of the science by the capital discovery of the *Leyden Jar*, for which the world was indebted to Von Kliest. From this period, the sphere of electrical experiments was greatly extended, and the knowledge of the science was rapidly improved by the assiduity of a great number of Electricians, whose discoveries time would not allow him to particularise.

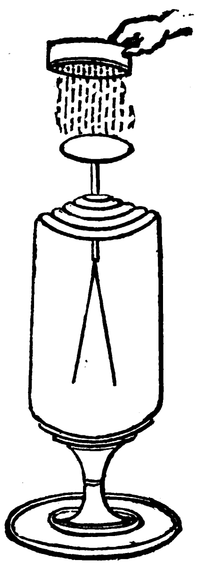
The first instruments worthy to be called Electrical Machines were globular; the next cylindrical; and, lastly, those which were called the Plate Machines. Mr. Tatum then directed the attention of his hearers to a machine of this kind on the lecture table, mounted on a plan peculiar to himself, the superior advantages of which he specified, and which chiefly depends on the reducing the size of the conductor; and also stated that, besides the convenience of placing the operator nearer to the conductor, and preventing the dissipation of the electric fluid, the effect of this machine was superior to that of others, in the proportion of 30 to 20, as 20 turns of the machine with the improved conductor would charge a Leyden Jar as effectually as 30 revolutions of the machine on the ordinary plan.

Electrical properties were not confined to the substances he had mentioned, as they existed also in certain animals—the torpedo, for instance, which communicated a shock equal to that of a large jar, and it was mentioned in Humbolt's Travels, that on passing through a country where a species of eels, nearly five feet long, inhabited the waters, the horses frequently fell down in consequence of the severe electrical shocks they received from the eels, which struck against their bodies during their combats, and he (Humboldt) was compelled to change the course of his journey to avoid the necessity of going through the waters where they abounded.

The Lecturer commenced his experiments by repeating those which first gave rise to the science of Electricity, and having excited a piece of amber by friction, it immediately attracted some bits of pith and other light substances in a direction contrary to that of gravitation. Little did Thales imagine that the fluid excited by rubbing this substance was the same as that which split the knotted oak, and rent the strongest rocks asunder. If glass was subjected to friction, a similar attractive effect was produced, but it should be observed, that in using amber, the body which was acted upon abstracted from the amber a portion of its electricity, but that glass abstracted the electricity from the substance employed. The glass would therefore be in a *redundant*, and the amber in a *deficient* state of electricity. These different states of electricity were distinguished by the terms *positive* and *negative*, and were found to attract each other. One of the Electricians to whom he had alluded, imagined that he had discovered a principle of *repulsion*, but the lecturer denied the existence of this principle, and after throwing a piece of gold leaf into the atmosphere, he shewed that, upon approaching it with the excited glass tube, the gold leaf continued to recede from it; but, he observed, that as both the substances were in the same state of electricity, the glass no longer attracted the leaf, which flew from it, owing to the attraction of the external part of the atmosphere, or that which was exterior to the electrical atmosphere surrounding the glass tube.

After shewing that *sealing wax* was also a good electric, by rubbing on a piece of fur, and which attracted light bodies in the same manner as amber, the Lecturer stated that, for the purpose of examining small portions of electricity, and determining whether bodies are or are not electrics, instruments called *electrometers* had been constructed, the most approved of which was the *gold leaf electrometer*. The effect of this delicate instrument was then shewn, and it was seen that the two gold leaves, suspended in the glass vessel, *diverged* or *collapsed* as a stick of excited sealing wax was held near the cap of the electrometer or withdrawn from it. Electricians had considered this instrument as affording true signs whether bodies are electric or not. If this was the case, and he could produce the same phenomenon with other bodies, besides those which had been exclusively conidered electrics, he thought it must be admitted that those bodies were also *electrics*. Mr. T. then made use of a plate of the metal called *zinc*, which was insulated, and after being rubbed on a piece of fur, the gold leaves diverged as soon as it approached the cap of the electrometer; from which experiment he inferred that zinc, though a metal, was decidedly an electric. He also explainod the method of ascertaining whether the leaves diverged with *positive* or *negative* electricity, and shewed that if their divergence was caused by positive electricity, they collapsed on the approach of a substance *negatively* electrified, such as sealing wax, but diverged still further, if the substance presented was similarly, or *positively* electrified, such as glass. It was thus proved that zinc and glass both produced signs of positive electricity, but it did not follow that all metals produced the same kind of electricity, for it was found by experiment that some metals produced positive, while others produced negative electricity, for a plate of silver, when excited by fur, produced negative electricity; and further, when the filings of zinc were passed through a silver *sieve*, produced positive electricity. But when filings of *silver* are passed through a *zinc* sieve, they produced negative electricity.

[We here present our readers with an Engraving of the Zinc being passed through the sieve, as just stated.]



Thus we see that metals are not only good electrics, but that they produce both positive and negative electricity, as well as glass and resinous bodies. From these and other interesting experiments, it appeared that there was no difference between the Electricity of Metals and that of *vitreous* or *resinous* bodies, and it must also be observed, that though the different effects of positive and negative electricity had been thus elucidated, it must not be concluded that there were two electrics in nature, for in reality there was only one; positive electricity merely implying a *redundancy* of the electric fluid, and negative electricity a *deficiency*.

The Lecturer then gave a minute and clear description of the *cylindrical* electrical machine, in which the cylinder was assimilated to the excited glass tube which he had used in the former part of his Lecture, and after particularly pointing out and explaining its various parts, he exemplified its effects in charging and discharging a Leyden Jar. He concluded by alluding to a previous experiment, in which he had shewn by means of the electrometer, that *zinc* and *silver* exhibited electric properties of opposite kinds, the former producing positive and the latter negative electricity, and stated, that having now demonstrated that *metals* as well as other substances, were *electrics*, he should, in his next Lecture, enter into a further explanation of the subject.

MR. COOPER'S LECTURE.

We had prepared a verbatim report of Mr. Cooper's lecture on chemistry, as applicable to the arts and manufactures on Wednesday evening, but the length to which our observations on Mr. Perkins's steam gun have extended, prevents us from doing entire justice to Mr. Cooper. In order, however, that our readers may not be deprived of the information, which Mr. Cooper's lecture supplies, we present such an abstract of it, as will we trust atone for the omission of a regular report.—The object of the lecture was to shew the power and effects of chlorine gas, as the supporter of combustion, and by its extraordinary influence as an agent in the process of bleaching. For the purpose of shewing the presence of chlorine, and enabling the manufacturer to ascertain its purity and precise quantity, Mr. Cooper made some pleasing experiments with pure water on the one hand, so as to demonstrate the quantity of chlorine absorbed; and by the addition of alkalies, more particularly to ascertain, by the greater or smaller quantity of residium, how far the chlorine was pure. But as we understand that this part of Mr. Cooper's subject will be more fully treated of in a future lecture, we shall proceed to the experiments on the power of chlorine, as a supporter of combustion. These were varied and pleasing, dividing those substances which admit of spontaneous combustion, and those to which the application of heat is necessary for that result. Mr. Cooper's mode of explaining these effects was so clear and perspicuous, that to mention one or two of them will be quite sufficient for our readers. By placing phosphorus in chlorine, we had a beautiful combustion, which produced a compound, the sublimation of which, upon the sides of the vessel, was very evident. The same wes done with sulphur, with bismuth, with copper, and with silver; such metals, however, being finely divided, so as to admit of the immediate action of the chlorine upon an extended surface. The compounds produced by these combustions formed the subject of the latter part of the lecture, which, from the nature of the experiments, and the very intelligible and forcible manner in which they were illustrated by the lecturer, excited great interest. Upon the addition of pure water to these compounds, we had a remarkable evidence of the advantages which are derived from chemical study. The compound produced by the combustion of phosphorus in chlorine, upon the addition of water, displayed a violent action, and a decomposition took place, which produced two acids. It is known that water is composed of 8 parts of oxygen, and one part of hydrogen; thus, when brought into action by the addition of the compound in question, the hydrogen being disengaged, passes over to the chlorine, to form one compound, which is muriatic acid; and the oxygen, from its affinity to the phosphorus, passes over to the phosphorus, producing phosphoric acid. The presence of these acids was very satisfactorily demonstrated by Mr. Cooper, and the decomposition prettily explained, by a diagram at the back of the lecturer.

A similar experiment was made with the compound produced by the combustion of sulphur in chlorine, and in this case the products were muriatic acid, and sulphuric acid. In the course of the lecture, Mr. Cooper stated that chlorine was found to exist in vast quantities throughout nature, but fortunately always in a state of combination, and that it required the science of chemistry to separate it. It was explained, that if chlorine were to exist in a pure state in nature, man could not exist; many of the bodies with which we are surrounded would burst ont into spontaneous combustion. and others, with the addition of the slightest heat, would undergo a similar fate. The Almighty Disposer of things has benevolently placed within the bowels of the earth, and in the vast regions of the air, properties, which may be rendered useful to man by the exercise of science, but which, in their natural state, are rendered inactive, lest their actions should be injurious to the human species. Mr. Cooper concluded his lecture at the usual hour—half-past nine o'clock, amidst the loud applause of an audience of about 800 persons, who, during the whole of the lecture, evinced an attention and an understanding of the subject, which would put to the blush many who pretend to knowledge in the upper classes of society. Indeed, we cannot dismiss this subject without expressing our astonishment at the change which has been effected in the very constitution of that vast body —the artizans of the British metropolis, by the establishment of the Mechanics' Institution.

To what an expansion of intellect do the lectures on philosophical and useful subjects, which are there delivered, tend! How changed are the habits of those who hear them! The artizan, whose industry has raised him to competence and ease, is delighted by the encouragement thus held out to others, who are rising in the world with no other prospects of success, than those which must spring from the exercise of their own reasoning faculties. The journeyman and the apprentice no longer spend their leisure hours in the improvident dissipation of their gains, but in drinking deeply from the fountain of human knowledge. The mind being thus expanded, not only the morals of this useful and influential body are improved, but their conduct in society, and their external appearance give evidence of the change that has been effected. In a national point of view, this change is most important.—What country can compete with England, where every operative mechanic is now become a man of science? What fear need we have from the manufactories of the continent, where only the heads understand the principles of their art, when we have here the very apprentices at their looms and at their working lathes reasoning on their occupation, and daily discovering new facilities? England has had long to boast of her institutions, but in a national point of view, her greatest boast, we hesitate not to say, ought to be "*The Mechanics' Institution.*"

ESSAY ON LIGHT.

From Penny's Scripture Philosophy, Part 1.

"Let there be light: and there was light."
GENESIS, i, 3.

It is not necessary to suppose that the Almighty uttered these express words; but, understanding them as an expression of his sovereign will, they may be considered as an instance of the truest sublimity. The celebrated critic, Longinus, has quoted them as such, and his decision has been acquiesced in by all succeeding critics and commentators, if we except M. Huitt, and a few more. This extraordinary expression, says Boileau, which marks so well the obedience of the creature to the commands of the Creator, is truly sublime, and has in it something divine. If, instead of those few words, (saye he) we were to substitute, "The Sovereign Lord of all things commanded that light should be formed, and, at the same time, this wonderful work, which we call light, was produced," what littleness should we not perceive in these pompous expressions, when opposed to, "God said, let there be light: and there was light."—*Réflex. Crit.* x.

The simplicity of the words, the brevity of the whole, and the rapidity with which this wonderful and glorious work, proceeding from the First Great Cause of all things, was accomplished, when taken collectively, are truly admirable. Besides, we cannot help adverting to the great benefit and blessing of the thing created; by means of which the beauties of creation are unveiled to our senses, and we enjoy, with the least possible exertion, the most innocent, varied, and extensive pleasures.

A difficulty has arisen, however, in the minds of some persons, to account for the production of light, before the creation of the sun, which has been considered as its source: and they have indulged various conjectures on the subject. Some have supposed that it was caused by an imperfect sun, in which the elements of light and fire were not yet collected in sufficient quantities to illuminate the earth. Others have imagined, that though the sun existed, his rays could not penetrate through the dense atmosphere, to render the surface of the terraqueous globe visible. A third conjecture is, that this first-created light was only a lucid cloud, of the same nature as the shechinah, which guided the Israelites by night in their journeyings through the wilderness. But this difficulty has arisen, from adopting, with implicit confidence, a mere hypothesis of modern philosophy; an hypothesis, which the recent improvements of science seem to render every day more questionable. Instead of the great elementary body of light emanating from the sun, there is reason to believe, that light itself is an inconceivably subtile fluid, pervading all space, and wholly independent of the sun, which may be considered as its principle exciter, or the great agent in nature, which gives it motion, and renders it the medium of vision. The late experiments in chemistry and galvanism have served to render such a fluid, or elementary principle, more familiar to us. Besides, we know that there are many substances capable of emitting light, independently of the sun. Among others may be mentioned, besides culinary fire, the different kinds of phosphori, the diamond, the glow-worm, the Bologna stone, the fire-fly, ignis-fatuus, putrescent fish, &c. and frequently the waters of the sea are seen to emit light; respecting which last, the reader may find some very curious observations in the *Philosophical Transactions*, vol. lix, p. 446, et seq.

But a new genus of molusca, called pyrasoma, seen and described by M. Peron, (*Voyage de Découvertes aux Terres Australes*, p. 488, tom. i.) presents one of the most singular phenomena of this kind. "On the 14th of December," he relates, "the horizon was loaded with heavy clouds, and the darkness was intense. We had discovered, at a little distance, a broad belt of phosphoric light spread upon the waves. We presently reached it, and found that the brilliancy was occasioned by an innumerable quantity of animals, which lifted by the waves, floated at different depths, appearing under a variety of shapes. The pieces that were more deeply immersed, presented the idea of masses of burning matter, or of enormous red hot balls, whilst those on the surface perfectly resembled large cylinders of iron heated to whiteness."

Bouguer, Hawksbee, and Bernoulli, instituted many curious experiments, by which they produced various kinds of artificial light. See, also, *Franklin's Works*, vol. ii, p. 88. The supposition that light is a subtile elementary fluid, or a substance independent of the sun, is at least as old as Aristotle, and supported by the opinion of many writers of eminence; among whom may be mentioned, the Abbé Pluche, the ingenious author of *Spectacle de la Nature*, Dr. J. Taylor, Dr. Franklin, and that profound mathematician, Euler.—Nor should it be forgotten, that the sentiments of Milton on this subject are conformable to the declaration of Moses. His invocation to light is one of the most poetical passages in his immortal work. He calls it—

"Bright effluence of bright essence increate!
Or hear'st thou rather pure ethereal stream,
Whose fountain who shall tell! *Before* the sun,
Before the heav'ns thou wert, and at the voice
Of God, as with a mantle, didst invest
The rising world of waters dark and deep,
Won from the void and formless infinite!"

"Universal space, as far as we know of it," says Dr. Franklin, vol. ii, p. 122, "seems to be filled with a subtile fluid, whose motion, or vibration, is called light; but I am not satisfied with the doctrine that supposes particles of matter called light, are continually driven off from the sun's surface, with a swiftness so prodigious as philosophers suppose. Must not the smallest particle conceivable have, with such a motion, a force exceeding that of a twenty-four pounder discharged from a cannon? Must not the sun diminish exceedingly by such a waste of matter? And the planets, instead of drawing near to him, as some have feared, recede to greater distances through the lessening attraction? Yet these particles, with this amazing motion, will not remove the least and slightest dust they meet with; and the sun, for aught we know, continues of his ancient dimensions, and his attendants move in their ancient orbits. May not all the phenomena of light be more conveniently solved, by supposing universal space filled with a subtile and elastic fluid, which, when at rest, is not visible; but whose vibrations affect that fine sense in the eye, as those of air do the grosser organs of the ear? We do not, in the case of sound, imagine, that any sonorous particles are thrown off from a bell, for instance, and fly in straight lines to the ear: why must we believe, that luminous particles leave the sun and proceed to the eye? Some diamonds, if rubbed, shine in the dark, without losing any part of their matter. I can make an electric spark as big as the flame of a candle much brighter; and therefore visible farther; yet this is without fuel; and I am persuaded, that no part of the electric fluid flies off in such a case to distant places; but that all goes directly, and is to be found in the place to which I destine it." Vol. i, p. 258.

"It appears," says Dr. J. Taylor, "from electrical experiments, that light is a distinct substance from all others, as much as air is from water: and that by being properly excited, it may be made to appear in midnight darkness: which shews, that it did exist in that darkness previously to its being excited, and that it was rendered visible by being excited. Consequently it may, and I doubt not doth, exist, expanded through the whole visible system of things at all times, by night as well as by day, and that the sun is in our system the great exciter, by which the substance of light is impelled and becomes visible."—*Taylor's Scheme of Scripture Divinity;* or *Bishop Watson's Tracts*, Vol. i, p. 20.

"By light," says the Abbé Pluche, "we do not mean that sensation which we experience in ourselves, on the presence of any illuminated body, but that inconceivably subtile matter, which makes an impression on the organ of sight, and paints on the optic nerve those objects, from the surface of which it was reflected to us." Vol. iii, p. 409.

Taken in this sense, light is a body quite different from the sun, and might have existed before it, seeing that it now exists in its absence, as well as when present. It is diffused from one end of the creation to the other, traverses the whole universe, forms a communication between the most remote spheres, penetrates into the inmost recesses of the earth, and only waits to be put in motion to make itself visible. Light is to the eye, what the air is to the ear; air cannot be called the body of sound, though it equally exists all around us, when there is no sonorous body to put it in motion: so likewise the light equally extends, at all times, from the most distant fixed stars to us, though it then only strikes our eyes when impelled by the sun, or some other mass of fire. The body of light, therefore, either exists independently of the luminous body, or we must suppose that every luminous body, whether it be the sun, a candle, or a spark, produces this light from itself, and projects it to a greater distance: but to assert the latter, is to assert a very great improbability; for if a spark, which is seen in every part of a large room fifty cubic feet in dimensions, emits from its own substance a quantity of light sufficient to fill the whole room, then there must issue from that spark, which is but a point, a body, the contents of which are fifty cubic feet. How incredible the supposition. On the contrary, how simple and natural is it to suppose, that as the air existed before the bell that put it in motion, and caused it to vibrate into sound; so in like manner the light existed in the room before the spark was struck, which excited its vibrations, and made it visible. By the same means, the sun and stars made themselves visible, without suffering any diminution of substance: God having placed between those luminous globes and us the body of that light which we see, and which is impressed on the organs of vision by their action and influence, but which does not proceed from them, nor owe its xistence to them. The account of Moses, therefore, is agreeable to truth, as well as a useful lesson of caution, when he imforms us that God, and not the sun, was the author of light: and that it was created by his Almighty fiat, before there was a sun to dart it on one part of the earth, and a moon to reflect it on the other. Dr. Young, in his Lectures on the Natural Philosophy and the Mechanical Arts, has maintained nearly the same theory, by reasoning and deductions, equal, at least, in force and depth of science, to any that have preceded him. A very remarkable property of light is the uniformity of its velocity in the same medium: now, there is no instance in nature, besides, he observes, of a simple projective moving with a velocity uniform in all cases, whatever be its cause. Light, therefore, if it consist not in the emission of very minute particles from luminous substances, which are actually projected, is probably an affection of a highly elastic ether, pervading the universe in a state so rare, that although it constitutes a continuous medium, it suffers all bodies to move through it without sensible resistance, and is admitted into their pores with perfect freedom. See vol. i, page 457—488.

OF MAN AS A MACHINE.

(From Bryan's Lectures.)

Let us turn from the mechanism effected by the art of man, to contemplate that of his Maker: the one feeble, and easily estimated; the other strong, and incalculable.

Behold that various and complicated machinery, which forms the graceful column of man! composed of bones, joints, and arteries; and clothed with muscles, veins, and teguments! How duly balanced! How aptly contrived for his various movements! As the summit of this column, the head appears, appointed to this highest station as containing the seat of sensation, the light of understanding, and the faculty of sight. To effect its most extensive purposes, it moves on an articulated fulcrum or prop, on which it can turn either backward or forward, up or down, horizontally to the right or to the left. The first two movements are effected by a hinge-joint fitted to the upper vertebra of the neck bone, but limited by ligaments, in its movements backward and forward, to prevent suffocation. The horizontal motion is effected by a particular auxiliary, placed on the bone below the first vertebra. It is a prong, or projection, similar in shape and size to a tooth, which fits into a pivot of the bone above it, and serves as an axle for the head to turn, but only to a limited distance, muscles on each side guarding it from excessive danger. The utility of the head moving on a hinge on the first vertebra, instead of the vertebra having the vibratory motion, has been discovered by anatomists; namely, that had that vertebra this motion, the spinal marrow at the beginning of its course would be impeded. The spine or backbone is a continuation of vertebræ: its various uses, and amazing powers, can never be wholly investigated; yet we can perceive enough of the design to compel us to adore and venerate the superior excellence of the work of God! Various and almost contrary are its properties, yet all are applied in the most efficacious manner possible. It is firm enough to bear the body in an erect posture, flexible enough to allow of various curvatures to relieve the body when fatigued: it is the grand conduct or pipe, through innumerable capillary tubes called nerves. This pipe affords support to all the muscles of the trunk of the body, which are attached to it: the ribs also are articulated into the vertebræ of the back. Were an artist to attempt to form a chain which would be capable of supporting a weight perpendicularly, and at the same time flexible, he would make it of strong and short links, and endeavour to combine flexibility and strength, so as to act in opposition to each other; but he would find it very difficult to effect his purpose, even for supporting a small weight in this manner.

There are twenty-four bones in the human spine, joined to each other by broad bases; in some parts these bases are shallower than in others, according as they are to serve more immediately either the purposes of flexibility or strength. In the back, where strength is most wanted, they are firmer than in the loins, whose flexibility is necessary; and still firmer in the neck, where the erect posture is chiefly required. Each of these bones is perforated through the middle, and so placed over and under those next to it, as to form a close channel for the medullary substance. To prevent this channel from being disturbed on change of posture, by the vertebræ shifting over one another, these bones are supplied with cartilages, which, being of an elastic and yielding nature, allow of these motions without any separation of the bones themselves.

On the various joints of the bones much of their different effects depend. Each is mechanical, and resolvable by human reason. There are two sorts of joints; namely, the ball and socket, and the hinge joint; and one or the other is used according to the motion required. At the knee, a hinge answers the purpose of moving the leg backwards and forwards: at the hip, a ball and socket serve to co-operate with the motion of the leg, and also to move the limb to the right and left in any required position. The shoulder joint is likwise a ball and socket, but the socket is shallow and has a cartilage set round its rim; while the cup of the thigh bone is very concave, and made of more solid materials. These differences agree with the situations of each of them, and the purposes they are separately to answer; for, as the one is a principal instrument of action, the shallowness of the socket, and flexibility of the cartilage, form its motion: while in the leg and thigh, which are to support the body, firmness is likewise necessary, which has been considered in the conformation and texture of the joints belonging to each of them. In all the joints of the body the ends of the bones are covered with gristle, to prevent injury by the friction of hard substances. The ball is tipped, and the cup lined, with this yielding substance; and the hip joint is protected by it. Each hinge and socket is also supplied with a mucilaginous ointment, which constantly softens and lubricates the parts. This juice, called synovia, is supplied by glands, so placed that on each motion of the joint, it is pressed out as from a sponge.

Having considered the joints on which animal motions depend, we may contemplate the mechanism by which these motions are generated and supported. The muscles and their tendons are not only constitutionally endowed to generate and regulate motion, but also differently constructed for these purposes, according to the movement required, and the instrument used. Thus, at the elbow and knee, where there is a huge joint, which serves only to move the limb in the same plane, the leaders, or muscular tendons, are placed parallel to them, and lengthen and shorten only in that direction; but in the shoulder and hip, where the ball and socket joint is found, the muscles are variously placed, and are capable of contracting and restoring themselves in each position. The muscles, also, by their different directions, support the bones, particularly the head; and all the limbs are regulated in their movements chiefly by their agency. Each muscle has what is called an antagonist muscle; namely, one that acts in a direction contrary to the other. For the muscles cannot expand beyond their natural state, though they can contract; therefore, to produce a contrary motion, a new muscle must be called into action. It is by this contrary motion of the muscles of the face, that the features are duly balanced in their places. The natural strength of the muscles may be either increased or diminished by exercise; for we perceive the legs of a porter, and the arms of an anchorsmith, are stronger by use. All the limbs of the body are levers of the third kind; for the resistance must be further from the prop than the power, the power being in the joint itself: yet all is easy, no difficulty arises—for it is the work of God!

Extract from Voltaire's Philosophical Dictionary.

We extract the following from Voltaire's Philosophical Dictionary—not because we would recommend that work, generally, to the perusal of our subscribers, but because the description, in this particular article, forms a striking contrast with that of man in a state of cultivation.

OF MAN IN THE STATE OF PURE NATURE.

What man would be in the state which we call that of pure nature? An animal much below the first Iroquois whom we found in the north of America.

He would be very inferior to those Iroquois, since they knew how to light fires and make arrows. He would require ages to arrive at these two arts.

Man, abandoned to pure nature, would have, for his language, only a few inarticulate sounds; the species would be reduced to a very small number, from the difficulty of getting nourishment, and the want of help, at least in our harsh climates. He would have no more knowledge of God and the soul, than of mathematics; these ideas would be lost in the care of procuring food. The race of beavers would be infinitely preferable.

Man would then be only precisely like a robust child; and we have seen many men who are not much above that state, as it is.

The Laplander, the Samoyeds, the inhabitants of Kamtschatka, the Caffrees, and Hottentots, are—with respect to man in a state of pure nature—that which the courts of Cyrus and Semiramis were in comparison with the inhabitants of the Cevennes. Yet the inhabitants of Kamtschatka and the Hottentots of our days, so superior to men entirely savage, are animals who live six months of the year in caverns, where they eat the vermin by which they are eaten.

In general, mankind is not above two or three degrees more civilized than the Kamtschatkans. The multitude of brute beasts called men, compared with the little number of those who think, is at least in the proportion of a hundred to one in many nations.

Between men of pure instinct, and men of genius, floats this immense number occupied solely with subsisting.

This subsistence costs us so much pains, that in the north of America, a man often runs five or six leagues to get a dinner; whilst among us, he bedews the ground with the sweat of his brow, in order to procure bread.

Add to this bread—or the equivalent—a hut, and a poor dress, and you will have man such as he is in general, from one end of the universe to the other; and it is only in a multitude of ages that he has been able to arrive at this high degree of attainment.

Finally, after other ages, things got to the point at which we see them. Here we represent a tragedy in music; there we kill one another on the high seas of another hemisphere, with a thousand pieces of cannon. The opera, and a ship of war of the first rank, always astonish my imagination. I doubt whether they can be much farther in any of the globes with which the heavens are studded. More than half the habitable world, however, is still peopled with two-footed animals, who live in the horrible state approaching to pure nature.

HISTORY OF ELECTRICITY.

Electricity is the sixth kind of attraction, which property was, by Thales the Milesian, first discovered in amber, six hundred years before the Christian era. The attractive power of electricity was supposed, by the learned, for many generations, to be peculiar to amber: but later philosophers have discovered, that this power may be excited in different substances.

Dr. Gilbert, in 1600, made the first considerable advancement in the knowledge of electricity: he discovered, that some bodies exhibited this property by friction, others by transmission only; and his communications on this subject served as a foundation to all the subsequent theories in the science of electricity. He discovered, that the electric effluvium possessed both an attractive and a repulsive power—was of a subtile nature—was brought into action by friction, and that stronger evidences of it were excited in warm and dry weather, than in a cold and wet state of the atmosphere.

Boyle and Otto Guericke extended their observations on the known principles of electricity: the former discovered, that excited electrics, which attracted other bodies, were attracted by them in the same proportion; that feathers and different light substances were attracted by animal bodies: that an accumulated quantity of electricity would exhibit flame, and produce sound, in passing into the air; and that a conducting substance, placed in an electric atmosphere, had its nature changed by that situation.

The great and comprehensive mind of Newton discovered, that the electric fluid acted through the substance of glass, by evidences of its attractive effect extending to the opposite side of an excited glass tube.

Mr. Hawksbee, in 1709, invented the electric machine on the known effects of excitation. After his death, no improvement was made in this science for many years; but it was revived with much energy by Mr. Stephen Grey, who introduced the method of retaining an accumulation of the excited power on substances, by means of insulation.

Dr. Watson tried various new experiments on the electrical fluid, and discovered that the electric spark would fire combustible substances.

In 1745 the Leyden phial was invented. In 1747, Dr. Franklin, in America, communicated his observations on the science; of which, that proving the identity of lightning and electricity was the most important; as by that discovery, he determined, also, the possibility of disarming the lightning of its terrors. under certain circumstances, and with certain restrictions.

MECHANICS' INSTITUTION.

The following are the different Committees appointed by the Managers to carry into effect any matter that may be referred to them.

BUILDING COMMITTEE.

Mr. WHITAKER.

Mr. EMMENS,	Mr. COPE,
Mr. MC WILLIAM,	Mr. BLUETT,
Mr. HALL,	Mr. DOTCHEN,
Mr. THOMPSON,	Mr. HACKETT.

LIBRARY AND READING ROOM.

Mr. BLAKE,	Mr. WHITTAKER,
Mr. THOMPSON,	Mr. BLUETT.

Mr. COPE.

APPARATUS.

Mr. COPE,

Mr. APPLEBEE,	Mr. CHEESE,
Mr. BACON,	Mr. BARTON,
Mr. JOHNSON,	Mr. LEGROSE.
Mr. HALL,	Mr. HUME,

Mr. CLEMENTS.

ACCOUNTS.

F. PLACE Esq.,

Mr. J. F. BLAKE,	Mr. JOHNSON.

ELEMENTARY SCHOOLS.

Dr. GILCHRIST, L.L.D.

W. FREND, Esq.,	Mr. BLAKE,
Mr. REYNOLDS,	Mr. DOTCHEN.

NOTICES.

At the conclusion of the Lecture on Wednesday, the 27th of October, Dr. Birkbeck announced, that the Committee of Managers were anxious to receive the names of those who wished to belong to any of the Elementary Schools as soon as possible, as by that means the Committee could make arrangements accordingly.

Miscellanea.

REMARKABLE INSTANCES OF THE POWERFUL EFFECTS OF THE WIND OF A CANNON-BALL.

In the siege of Savanna, by Count D'Estaign, in the year 1779, Sir James Wright was walking along what is called the Bluff, a high sandy bank of the river, during a violent cannonade, when he was struck down insensible by a double-headed shot which passed near him. He soon recovered his senses, nor was the smallest hurt, bruise, or impression of any kind to be perceived on any part of his body. On his becoming sensible, the first object that struck him was a woman standing over the dead body of her daughter, which the same shot had divided quite in two, about fifty yards before it passed Sir James. The mother and daughter had been standing in the door, on the opposite side of their house from the French lines, the mother leaning on the daughter's shoulder, when the daughter dropped from under her arm, divided in two by the fatal shot. This was on the side of the town the most remote from the French lines; the shot must have passed through many objects, and was probably nearly exhausted when it passed Sir James Wright. Sir James was soon able to get under the Bluff, where he was safe till he could be conveyed home; and felt no lasting consequences from the accident.

Another accident of the same nature had not long before happened to Sir James Wright. In proceeding to resume his government of Georgia, he, with his family, was carried out in the Experiment frigate, with some other vessels of war under his command, which, in the Chops of the Channel, had an action with some French frigates. During the engagement, Sir James would assist the captain on deck: while there, a ball passed so near him, that, though it did not touch him, he felt it very sensibly, and said, "that ball must have come very near, for I felt it on my face."—A little after, the captain's eye happened to fix on Sir James, when he saw the blood running down his face and clothes, and it was found that his cheek was considerably scarified; but no further serious hurt appeared, nor any bad effects after the bleeding ceased.

The following instance was of more fatal event. In the battle of Camperdown, a young man named Balbirnie was appointed, in the sea phrase, to *cun* the ship into action; he was a kinsman of the writer's, as also of Dr. Duncan (the chaplain of the ship), from whom he had the narration.—The doctor literally "a tall fellow," above six feet high, with spirit proportional, wished to stand near his friend the admiral, during the action, to assist in giving orders, but was earnestly requested to go below and assist the surgeons, who soon had their hands full. The battle had not been long begun, when Balbirnie was brought down among the wounded, but announced not to be hurt, only stunned. The doctor, as soon as he could leave the case in hand, went to his kinsman, who still lay insensible. He took hold of the breast of his clothes, and shaking him, said, "Ho! Balbirnie, man! what's the matter with you?" But, alas! poor Balbirnie was gone for ever! On examining the body, there was not the least wound, bruise, or scar to be found upon it. I think those who were near him on the deck reported, that a large ball passed at some distance from his breast, and it is probable, with such an impetus as entirely to paralise the elasticity of the heart.

LONGEVITY IN YORKSHIRE.

The county of York has produced more instances of longevity than any county in England; the cause of which is probably to be ascribed to the salubrity of the air, and sobriety of the inhabitants. The following is a list of persons who resided in Yorkshire, and attained the age of a century and upwards:—

Alice Atkinson, of the city of York, aged 109; died 1749.—Jane Atkins, of the city of York, 100; died 1761.—Ann Armstrong, of Aldbrough, 114; died 1765.—Jane Blake, of North Leeds, 114; died 1763.—Margaret Bartlemer, of Leeds, 102; died 1765.—Robert Butterfield, of Halifax, 102; who from forty years' industry as a wool stapler, acquired a fortune of £40,000; he died 1781.—S. Brigg, of Hoober Hall, near Craven, 100; died 1782.—Wm, Birkhead, of Brork House, near Cleckheaton, 100; died 1797.—Francis Consit,* of Burythorpe, near Malton, 150; died 1768.—Ralph Coulson, of Grimstone, 107; died 1771.—Margaret Champney, of Carlton, 102; died 1782.—Mary Cousin, of Wakefield, 103; died 1790.—Peter Delme, Esq., of Leeds, 104; died 1773.—Mrs. Dawson, of Wakefield, 101; died 1798.—Mr. Frank, of Pontefract, 109; died 1782.—Mary Gummersell, near Wakefield. She was mother of 14 children; grandmother to 33; great grandmother to 85, and great great grandmother to 25—in all, 156 descendants; she died 1763.—Thomas Garbut, of Hurworth, 101; died 1773.—Wm. Gibson, farmer, of Hutton Bush, 102; died 1796.—Ann Hatfield,† of Tinsley

* He was very temperate in his living, and used great exercise, which, together with his occasionally eating a raw new-laid egg, enabled him to obtain so extraordinary an age.

† James Hatfield died the same year, at the same age. He was formerly a soldier; when on duty as a centinel at Windsor, one night, at the expiration of his guard, he heard St. Paul's clock in London strike thirteen strokes instead of twelve, and not being relieved as he expected, he fell asleep, in which situation he was found by the succeeding guard, who soon after came to relieve him: for such neglect he was tried by a court martial, but pleading that he was on duty his legal time, and asserting, as a proof, the singular circumstance of hearing St. Paul's clock strike thirteen strokes, which upon enquiry proving true, he was in consequence acquitted.

105; died 1770.—Mary Hall, of Bishop Hill, of which place she was sexton, 105; died 1759.—Eliz. Hodson, of Scampston, 110; died 1759.—Wm. Hughes, of Tadcaster, 127; died 1769.—William Harwick, of Leeds, 100; died 1772.—John Houseman, of Sessays, near Thrisk, 111; died 1777.—Jonathan Hartop,* of Aldborough, near Boroughbridge, 138; died 1791.—Mary Halmshaw,† of Wakefield, 102.—The celebrated Henry Jenkins, of Ellerton-upon-Swale, 169; died 1670.—Ann Johnson, of Aldborough, 102; died 1776.—Joan Jones, of Gisborough, 103; died 1772.—Samuel Johnson, of Bridlington, 104; died 1779.—Mary Jackson, of Cropton, 104; died 1789.—George Kirton, Esq.,‡ of Oxnop Hall, 125; died 1769.—Mary Kersham, of Pontefract, 103; died 1788.—Robert Lawrence, of Gisborough, 100; died 1761.—Daniel Legro, Esq. of Leeds, 103; died 1771.—Thomas Loveday, of Scrooby, 101; died 1789.—Richard Matherman, of Ripley, 102; died 1766.—Mrs. Moore, of Rigby, 107; died 1768.—Mrs. Mawhood, of Pontefract, 100; died 1792.—Mrs. Ogden, of Holbeck, near Leeds, 106; died 1795.—Robert Oglebie,* of Rippon, 115; died 1762.—Mrs. Pilkington, of Bicester, 107; died 1757.—John Phillips,† of Thorn, near Leeds, 117; died 1742.—Samuel Paudames, of Yeddington, 105; died 1792.—Martha Preston, of Barnstaple, 125; died 1769.—Eleanor Railston, of Jurrow Quay, 102; died 1785.—Bartholomew Rymer,‡ of Rippon, 100; died 1791.—John Shepherd, of Tadcaster, 109; died 1757.—James Simpson, near Knaresborough, aged 112; died 1766.—Margaret Scorral, of Honiton, 108; died 1784.—James Sampler, of Osbaldwick, 103; died 1791.—Mrs. Tate, of Malton, 106; died 1772.—Jos. Thompson, of Wallingate Bar, 108; died 1781.—Mrs. Todd, of Richmond, 105; died 1789.—Mr. Wright, of Hatton, 102; died 1776.—Mr. Wheatley, of Leeds, 106; died 1780.—Mr. Whip, of Bishop Whilton, 115; died 1784.—Mrs. Warton, of Thrisk, 103; died 1791.—Major Wilkins, of York, 100; died 1756.—Sarah Wight, of Breary, 106; died 1760.—Henry Wells, of Whitby, 109; died 1794.—Susannah Wood, of Newton-upon-the-Ouse, 109; died 1780.

* His father and mother died of the plague, in their house in the Minories, in 1706; and he perfectly well remembered the great fire of London. He was short in stature; had been married five times; and left 7 children, 26 grand-children, 74 great-grand-children, and 140 great-great-grand-children. He could read to the last without spectacles, and play at cribbage with the most perfect recollection. On Christmas day, 1789, he walked nine miles to dine with one of his great-grand-children. He remembered Charles II., and once travelled from London to York with the facetious Killigrew. He eat but little, and his only beverage was milk. He enjoyed an uninterrupted flow of spirits. The third wife of this very extraordinary man was an illegitimate daughter of Oliver Cromwell, who gave with her a portion amounting to about £500. He possessed a fine portrait of Cromwell, by Cooper, for which a Mr. Hollis offered £300., but was refused. Mr. Hartop lent the great Milton £50. soon after the Restoration, which the bard returned him with honour, though not without much difficulty, as his circumstances were very low: Mr. Hartop would have declined receiving it, but the pride of the poet was equal to his genius, and he sent the money, with an angry letter, which was found among the curious possessions of this venerable old man.

† She had been a widow upwards of fifty years, and her faculties were unimpaired to the last. Such was her health and activity, that when in her 77th year, she walked from Wakefield to London, a distance of 184 miles, and returned again on foot.

‡ He was a most remarkable fox-hunter, following the chace on horseback till he was 80 years of age; from that period to 100 years, he regularly attended the unkennelling the fox in his single chair.

* A travelling tinker; he was married 73 years, and had 12 sons and 13 daughters, had all his senses perfect, and could see to work a short time previous to his death.

† He lived under 8 crowned heads, and was able to walk till within a few days of his death. His teeth were good, and his sight and hearing tolerable. At about the age of 28, being constable of the parish, he upon some disorders, committed two of Oliver Cromwell's soldiers to the town stocks: the Protector, far from resenting it, wished that every one of his police officers had his courage

‡ He was a man of good health and activity. He was game-keeper to Sir Bellingham Graham, Bart. of Norton Conyers, and shot game flying in his 99th year.

PUNISHMENT FOR POISONING.

In the reign of Henry VIII. Rouse, the bishop of Rochester's cook, poisoned seventeen people: in consequence of which, poisoning was made treason, and the punishment *boiling to death!*

EXTRAORDINARY WORKMANSHIP.

At Dumferlin, in Fifeshire, there is preserved in the corporation chest, a man's shirt, wrought in the loom above a century ago (about 1700). by a weaver of the name of Ingles: the shirt was formed without a seam, and finished without any assistance from the needle; the only necessary part he could not accomplish was the neck button.

THE SILK TRADE.

We learn from a correspondent at Lyons, that considerable discontent has been excited in that city, by the preparations made by one of its wealthiest manufacturers to remove his establishment to London. The good people of Lyons have taken it into their heads, that this gentleman, who is a M. De Pouilly, or some such name, will carry with him a vast portton of knowledge and science, with which none of the English silk manufacturers are gifted. M. De Pouilly, himself, however, seems to entertain no such idea, for he has very candidly told the French ministry, in applying for permission to remove his machinery, that his object in coming to England is to *obtain* information, since there is nothing in the French mode of manufacturing silks, of which the English are ignorant. We are of the same opinion as M. De Pouilly, and really believe that if buyers of silk articles would be a little less parsimonious, and encourage the manufacturer to put weight, as well as appearance into his productions, there is no country in Europe which could excel us in this article of luxury and usefulness.

MEANS BY WHICH EAGLES ATTACK OXEN.

From Von Bruch's Travels through Norway and Lapland.

We learned with astonishment, that eagles were very much dreaded on these islands; for they are not contented with lambs and smaller animals, but even attack oxen, and not unfrequently master them. The manner of their attack is so singular, that we should have doubted the truth of the account, if we had not heard it so circumstantially confirmed to us in the same terms, in places a great distance from one another. The eagle plunges itself into the waves, and after being completely drenched, rolls itself among the sand on the shore, till its wings are quite covered with sand. It then rises into the air, and hovers over its unfortunate victim. When it is close to it, it shakes its wings, and throws stones and sand into the eyes of the ox, and completes the terror of the animal, by blows with its powerful wings. The blinded oxen run about quite raving, and at length fall down completely exhausted, or dash themselves to death from some cliff. The eagle then mangles, undisturbed, the fruits of his victory.

CURIOUS ACCUMULATION OF MONEY AT COMPOUND INTEREST.

It has been calculated, that a single penny put out at 5 per cent. compound interest, at the birth of Jesus Christ, would have produced, in the year 1806. the enormous sum of £290,991,000,000,000,000,000,000,000,000,000,000 sterling, which would make a bulk of solid gold of 110 million times the magnitude of the whole earth; whilst, at simple interest, the same sum, in the same space of time, would only have produced seven shillings and six-pence.

NAIVETÉ.

Soon after the celebrated Heylin had published his "Geography of the World," he accepted an invitation to spend a few weeks with a gentleman who lived on the New Forest, Hampshire, with directions where his servant should meet him to conduct him thither. As soon as he was joined by the gentleman's servant, they struck off into the thick of the forest, and after riding for a considerable time, Mr. Heylin asked if that was the right road; and to his great astonishment received for answer, that the conductor did not know, but he had heard there was a very near cut to his master's house through the thicket; and he certainly thought, as Mr. Heylin had written the "Geography of the World," that such a road could not have been unknown to him.

QUERY.

A correspondent who gives the signature of "Box," sends us the following query for insertion:—

"In what manner must four pin-heads, (or any round substance will do as well,) be placed so that *each* of the heads *shall* be of an *equal distance* from each other?"

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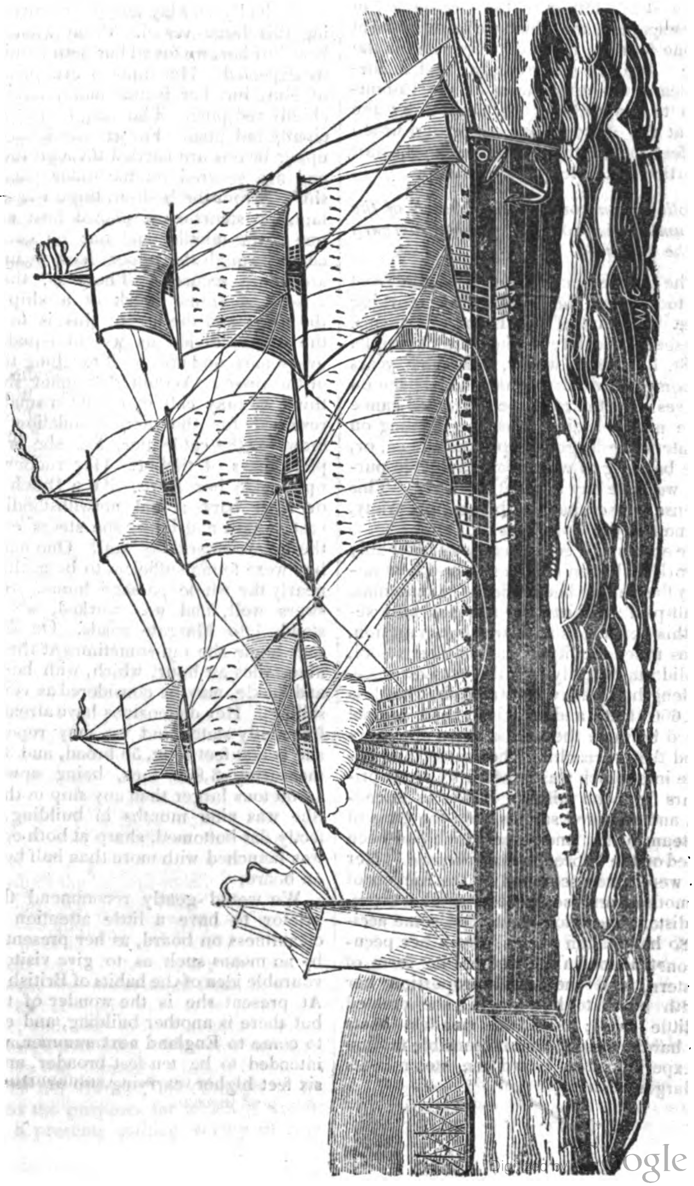
The London MECHANICS' REGISTER.

"He that enlarges his curiosity after the works of nature, demonstrably multiplies his inlets to happiness." JOHNSON.

No. 2.] SATURDAY, NOVEMBER 13, 1824. [Price 3*d.*

THE COLUMBUS.



THE COLUMBUS.

The arrival of this ship having created considerable interest, we sent a very excellent artist down to Blackwall to make a design of her, which, for correctness in all its parts, we can safely recommend to our readers. Our visit to the ship, however, has not enabled us to supply any particulars of interest in addition to those contained in the newspapers, and which we have brought into one focus as notes of reference for the public. We will only remark, that a correct idea of the appearance of the Columbus as to length, may be formed by the boat at the stern in our engraving, which is 25 feet in length, and is drawn in fair proportion to the length of the ship.

The following account of the launch of the Columbus, is from the Quebec Mercury of the 31st July.

"The long-expected launch of the great ship took place on Wednesday morning last, at the point of the island of Orleans, in presence of a large concourse of people. The St. Lawrence, which, but a few years ago, comparatively speaking, had borne on its waves only the rudely-constructed canoe of the native Indian, has now floating on its waters the largest ship in existence, or, of the building of which for navigable purposes we have any authentic record. This immense vessel has, with great propriety, been named the Columbus.

The events of Wednesday shewed how ably the work had been conducted, and how minutely the builder had made his calculations. At half-past, or thirty-five minutes past seven, this ponderous mass was put in motion, with as much facility as any smaller vessel, and slid majestically into the St. Lawrence. The length of the ways was somewhat less than 600 feet, and precisely one minute elapsed between the period when she moved and that of reaching the water, her entrance into which was greeted by appropriate airs from the military bands in attendance, and repeated salutes from the guns of the steam boats, and some which had been planted on the shore for that purpose. Her ways were much scorched by the friction of her motion, and so great a smoke arose, that distant spectators imagined some accident to have taken place. From her peculiar construction in the wedge-like form of her stern, and the small proportion her breadth bears to her length, she created but little swell; even the smallest boats were hardly tossed; and no sensible motion was experienced on board the steam-boats and larger vessels.

The day was remarkably fine, and the river presented an animated spectacle, no less than seven steam-boats, and an amazing number of rowing and sailing boats being upon the water.

(From the Morning Chronicle of Nov. 10.)

We had yesterday an opportunity of seeing this large vessel. From what we had heard of her, we found her better built than we expected. Her timbers are principally of elm, but her beams and planking are chiefly red pine. The casgo also is principally red pine. For greater security, the upper beams are carried through the sides, and are secured on the outer part of the ship. From the bottom, three rows of pillars, or stancheons, placed fore and aft, one in the middle, and one on each side, come through the upper deck beams, and are there secured. There is, therefore, a sort of frame work of a ship within the ship; and the use of this is to secure the cargo, divide its weight equally over every part, and prevent it touching the sides of the vessel. Within this inner ship, we think we may call it, except a small space reserved for the accommodation of the crew, for the cable tier, &c. she is a complete mass of timber. Her rudder passes up outside her stern, like a Dutch galliot, or river barge; and notwithstanding her vast length and bulk, she steers or obeys the helm remarkably well. One man and a boy were found sufficient to be at the wheel nearly the whole passage home. She answers well, and was worked, we understand, into Margate roads. On the passage home she ran sometimes at the rate of nine miles an hour, which, with her masts and tackle, may be considered as very good sailing. Her dimensions have already been frequently stated, but we may repeat, that she is 300 feet long, 50 broad, and 30 deep, measuring 3,800 tons, being upwards of 1,000 tons larger than any ship in the navy. She was nine months in building, is perfectly flat bottomed, sharp at both ends, and was launched with more than half her cargo on board.

We would gently recommend the proprietor to have a little attention paid to cleanliness on board, as her present state is by no means such as to give visitors a favourable idea of the habits of British sailors. At present she is the wonder of the day; but there is another building, and expected to come to England next summer, which is intended to be ten feet broader, and about six feet higher, carrying two or three ordinary ships' cargoes more than the present. Till her safe arrival, we must look on this as the most extraordinary vessel that ever crossed the ocean.

(From the New Times.)

We have been favoured with the following description of this vessel by a nautical correspondent. Of its perfect accuracy we have no doubt, and recommend it to the attention of all who are fortunate enough to be able to comprehend it.

At a broadside view from a distance, the Columbus looks a tremendous length, and though seemingly hog'd, or broken-back'd, and very much under-rigged, there is something sneaking and dangerous in her show. As you approach her, however, she looks as she is—an immense mass of timber, knocked together for the purposes of commerce, without any regard to beauty, and little attention to the principles of naval architecture. She has two sets of beams, the upper ones, which sustain the deck, project through the sides. She has also, we understand, an inner frame, for the better security of the cargo—to prevent any starting of the timber. Her blocks were laid in October, 1823; she is perfectly flat-bottomed; and her shell was completely built before a plank of her cargo was stowed. Previous to her being launched, however, 4000 tons of timber were run on board by horses, through the bow and stern-ports, and she drew about thirteen feet when she first sit on the water. Unlike large ships, her galley and bitts are above deck; and between the fore-mast and the first main-masts, there is a fore hatchway, and a cable tier and messing place for part of the crew, which look like a rude gap made in her cargo after it had been stowed. The height from the timber on which the cable is coiled, and where the men have two or three births, is about six feet, so that there must be even there about thirty feet deep of timber. But from the first main-mast to the second, the cargo runs from deck to kelson. And baft the latter mast, close to the wheel and mizen, or trey-sail mast, where the binnacles stand, is a place built for the accommodation of the officers and the rest of the crew. The provisions, we believe, are stowed abaft the treysail-mast. Her rudder is hung like that of any other ship, but its head comes above the taffrail, and the tiller is above deck as in small vessels.

A great deal of the timber she has on board was, we understand, fresh hewn—it now looks extremely wet—it is principally red pine, and, like most Canadian timber, it runs large and long. The rigging of the Columbus was naturally a minor consideration with her owners, and though it has answered the purposes for which it was intended, it presents nothing worthy of commendation to the eye of a seaman, and nothing striking to that of a landsman. The masts are ill-proportioned for beauty, and injudiciously so as far as the labour of the crew is concerned. The lower masts are too taunt—there is too much of them above deck, and this necessarily gives the courses a tremendous drop. One of the crew, an intelligent sailor-like man, said the fore-sail had 50 feet leech. The bowsprit and jib-boom are but one spar; they steeve little, and the hoist of the jibs is consequently great. The top masts and top-gallant masts are also in one. They are exceedingly short, and a royal can only be set on one of the mainmast. She is not more square-rigged than she is taunt; her fore-yard does not measure above 70 feet. The only studding sails she carried were topmasts ones on the first mainmasts. Her topmast rigging is rove through holes in the cross-trees, and is set up with lanyards to a grummet round the lower mast. There are, therefore, no cat-harpings; and the rest of the rigging is of the same temporary speculative description. Her hemp cable measures 26 inches in circumference, and the chain is in proportion. She crossed the Atlantic with a single bower anchor, and a kedge of between 6 and 7 cwt. It is said she worked easily and surely; that she was perfectly under the government of her rudder; that she was in general steered with facility by a man and a boy; that she went from nine to ten knots or miles an hour when sailing free, and that at six points and a half from the wind she went six knots, and made but little lee-way. In a sea-way she was of course heavy, and shipped much water, as she could not rise from her great length and want of beam. In fact she could have been but as a log of wood in a short chopping sea, one of which might have broken over her a midships almost without any body forward or aft knowing of the circumstance. We are however rather sceptical as to whether we should conclude that she is actually possessed of all the good qualities attributed to her. We cannot believe that she ever sailed at six points and a half, or at even seven points from the wind, or that she ever went nine or ten miles an hour. We do not think that a square-sail in her would stand at six points and a half, and she has no buttock for running. On the whole, however, she is an extraordinary piece of workmanship, and though vastly inferior to a first, second, third, or fourth-rate man of war in beauty and capacity, the Columbus is well worth visiting. We think however, the charge for admission may be reduced with advantage, and that a bear and swab, if not a holy stone, would improve the appearance of the deck extremely.

We may also mention, that some of the visitors are even more curious and amusing than the sight of the vessel. One of them, we suppose from its being the hunting season, sported his boots and spurs, and infinitely diverted some of the crew. He evidently had heard that there were such things on board of every ship as 'horses, bridles, stirrups, and martingales,' and that the Columbus was a complete forest, for he asked most anxiously what live animals they had on board; and was much chagrined on learning that they had only one fox and a cat, both of which had stowed themselves away. His astonishment, however, was indescribable, when he heard one of the crew speak tolerable English—'D—n it,' he exclaimed, 'how odd! they speak our language. Why, where did you learn English?' He then proceeded to interrogate the sailors as to where they came from, &c. and it palpably required the exercise of all his faith in man to believe that this was not their first trip from the Antipodes. Another visitor, a stout gentleman, who looked of too comfortable a rotundity and unruffled a temper, ever to have existed on salt junk, on being informed that the ship's pumps and pump-well, which are on the starboard side of the Columbus, were at midships in all other ships, began to commiserate the fate of the unhappy midshipmen, whom he concluded were condemned to serve six years in such a hole of bilge water and foul vapours.

(From the Morning Post.)

The above far famed vessel was safely moored of Blackwall on Monday afternoon about three o'clock. As soon as her arrival was made known, her sides were beset by a great concourse of visitors from town and country, anxious to witness this wonder of the transatlantic world. Great, however, was the falling off from the expectations of those who had derived their notions of this sea-monster from the accounts which had previously been circulated.—Like many other wonders of which so much has been said while at a distance, the Columbus loses much of her marvellous character on a nearer approach.

The vessel is unquestionably the longest ship ever seen in England, but her appearance in every other respect is far inferior to that of one of our large Indiamen: her construction is quite new for a very large vessel; she is flat-bottomed, and her bottom two feet wider than her deck; her planks and timbers throughout are on a scale of thickness proportioned to her great length, and fastened together with proportionate strength. It is not true, as was stated in some accounts of her, that her cargo (red and white pine) was fastened into her timbers in the building; it is stowed away in the same manner as on board other ships timber laden. In her masts, spars, and rigging, the Columbus presents an appearance not at all proportioned to her rate of tonnage; they are not larger than those used in a smaller frigate. On enquiry we learned that she sailed much better than was expected, tacked and wore extremely well (which is very rare with flat-bottomed vessels), and made but very little lee-way. In the course of her passage to Europe, she encountered very rough weather, and shipped seas so frequently, that the crew on deck could scarcely keep themselves dry. The greatest danger to which she was exposed was from this circumstance, and, in anticipation of it, and of the chance of her becoming water-logged, her round-house (under which were stowed her water and provisions) was made water-tight. About a month before her arrival on this coast, she sprang a leak, and made a foot of water per hour, and it required the constant exertions of the whole crew to keep her free. Nevertheless, on her arrival in the Downs she had eleven feet of water in her hold.

Two pumps were constantly worked night and day, to the great exhaustion of the crew, who were only 96 in number. To encourage them to maintain this harrassing labour a guinea extra upon the wages of each man was promised, and it is supposed but for this inducement the vessel would never have reached her destination. During the voyage the leak gained from eight to eleven feet water, and yesterday afternoon there was no less than eighteen feet water in the hold. In consequence of this she lay deep in the water, drawing twenty-three feet, and standing only fifteen feet above the water's edge. Yesterday evening she was towed on shore off the folly Point, Blackwall Reach, where she will lie imbeddied in the mud for about three weeks longer, the period it is calculated she will take to unload, after which she will be broken up, being totally unfit to make another voyage. In bringing over the stowage of timber which she contains, she has fully answered the purpose of her owners. She was built by a Scotchman from Port Glasgow, where her rigging was actually prepared, and her crew was principally Scotch. In every respect, her build is of the coarsest and most superficial character, presenting nothing either in general appearance, or in detail, worthy of attention. The crew complained of no want of accommodation, although the voyage was long (nine weeks), owing to contrary winds. It was reckoned a very comfortable sailing vessel, with the exception of the leak, which kept them so hard at the pumps. The only thing remarkable about her appearance is her length, which is greater by one third than that of the Prince Regent, the largest vessel in the British Navy, and her four masts, which have a singular effect to the eye. Her timbers are entirely of deal.

The crowds of persons who went to see her yesterday were very great. Some contented themselves with a view of her from the shore; those who chose to pay the high price of the boatmen got a nearer view; they who were content to pay two shillings additional, were allowed to go on board. (This last demand, it is but justice to the officers on board, was, we believe, without their knowledge; or if they were aware of it, it must have been demanded with the view of preventing the vessel from becoming inconveniently crowded, which it would be if all who sought admission were allowed on board.)

The account which has already appeared, of the size and tonnage of the Columbus, was correct. She is 300 feet in length, 50 feet 6 inches wide, and 30 feet deep in the hold; registers 3900 tons, and has on board 6300 tons of timber.

Another vessel, belonging to the same proprietors, who, as well as the builder, are Scotchmen, is now on the stocks at Quebec, which will be of the same length, but 10 feet wider, and 5 feet deeper in the hold.

THE ARRIVAL OF THE COLUMBUS.

(From the Globe and Traveller.)

A hoax, under this title, was played off upon the Courier of yesterday, by some person writing from Deal, and still more strange to say, the absurd announcement, which was in the following words, was copied into some of the papers of this morning:—

EXTRACT OF A PRIVATE LETTER.

"Deal, Wednesday Afternoon, Oct. 27, 1824.

"The post just going, only leaves me time to inform you that the American ship Columbus is this moment arrived in the Downs, and safely anchored near the Ramillies guard-ship, which, though a first-rate, appears alongside this Leviathan of the New World no larger than a cock-boat. When the Columbus first hove in sight, her hull resembled a floating island, and her masts church steeples. She is to be towed up to Deptford by steam-boats, and, to avoid the dangerous and circuitous passage round the North Foreland, it is proposed to take her through the new cut from Sandwich to Whitstable."

This certainly seems a strong experiment upon credulity and ignorance. That the hull of a ship first coming into sight should, in defiance of the laws of perpective, appear like a floating island, or that the masts (where were the sails?) should appear like steeples: that this floating island should be taken through the new cut from Whitstable Bay and Sandwich* (about as rational as if it had been said "through the New Cut in Lambeth Marsh.") All this, a loyal editor, who is accustomed to believe still greater absurdities on official authority, might readily swallow; but that our contemporary should pay greater attention to "authority" than to the laws of nature, and declare, in spite of Murray's list, the Ramillies to be a first-rate, does, we own, surprise us. The Ramillies is a 74. We have received the following letter from Basingstoke on the same subject, but we do not deem it entitled to as much credit as the account from Deal:—

"Basingstoke, Oct. 28.

"The ship Columbus has this instant arrived by canal from Guildford, and is safely anchored at Mr. ——'s wharf. Before she came in sight her masts were mistaken for Winchester cathedral, and excited considerable alarm from the supposed movement of that venerable fabric. As she lies to the south of the town, we are seriously darkened by her shadow, and all the outstanding grapes will be spoiled. To avoid the perils of a navigation down the Thames, and the trouble of the locks, this majestic floating mass, which has crossed the Atlantic in safety, will be conveyed to town in Russells van. The post is just going out, and I have no room for further details."

It is proper to state that this true and probable account (the Deal account we mean) was copied into the New Times, the Morning Herald, and the Morning Post, without the least apparent doubt of its correctness.

THE COLUMBUS AND THE SEA SERPENT.

(From the Globe and Traveller.)

As the ship Columbus is arrived safe, we have strong doubts as to the correctness of the following letter from the Courier's Deal correspondent, though his veracity is vouched for on his own respectable testimony:

"To the Editor of the Globe and Traveller.

"Deal, Oct. 31.

"Sir—As the Courier newspaper has thought proper, by insinuation at least, to stigmatise me as 'a fool,' I take leave to assure that journal, that in losing its tem-

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* Among other objections to her proposed course, is a fact which at first sight seems to offer a difficulty, viz. the non-existence at present of "the new cut from Sandwich to Whitstable," a part of the coast at present only *in posse*. We have, indeed, heard of a proposed canal in that part of Kent, for the admission of barges and such small craft; but even when completed, we should doubt its capability of accomodating "a floating island, with masts like church steeples!"

per, it has also lost a valuable correspondent. In communicating to the public, through its pages, the arrival of the good ship Columbus off this port, I averred nothing but what was strictly and indisputably true; and if that magnificent vessel is no longer riding at anchor in the Downs, it is owing to an ocurrence which, were it less strongly attested, sceptical persons might almost be inclined to doubt. The fact is, Sir, that on the very evening of its arrival, it had the misfortune to be swallowed by the great American sea serpent, which, circumstances induce me to suppose, has been narrowly watching its progress ever since it left the St. Lawrence. Thousands are ready to attest this fact, for the truth of which I appeal to the whole of Deal, and to the boatswain's mate of his Majesty's ship Ramillies, who witnessed the whole transaction through a port-hole in the after gun-room, the middle fin of the monster then bearing three leagues and a half N. N. W. on the vessel's weather bow. That no doubt may be for a moment entertained of the authenticity of this account, the latter gentleman has favoured me with his signature, in addition to my own, as an attestation. You, Sir, it seems, thought proper to receive my first account with hesitation; but as you expressed your doubts with urbanity, I shall condescend to reply to the reasons on which you grounded them. In the first place, then, the "difficulty" you allude to, of navigating a floating island through a canal, is permit me to say, a difficulty of your own creating, as the said canal might easily have been widened for the purpose—a circumstance which did not escape the Courier. As to the non-existence of the canal itself, between Sandwich and Whitstable, that, I believe, is more than you can prove, though the latest travellers in that part of Kent may make no mention of it. If its source be hidden, so is that of the Nile; if its mouth be not clearly ascertained, neither is that of the Niger. This interesting problem, however, it is likely, will be resolved in the course of a year or two, as a gentleman of considerable enterprise, supposed to be connected with a journal whose name I am now too angry to mention, passed through this town yesterday by the Regulator coach, with the avowed purpose of making discoveries in that direction. Your other objection, with respect to the appearance of the masts, carries more weight with it; but it has been since ascertained, that it was not the mast of the vessel, but the tail of the animal in pursuit, which, rising to an extraordinary elevation above the surface of the water, exhibited the remarkable resemblance to a church steeple alluded to in my letter. I have only to add, that most of the fishing-boats on this part of the coast are gone out in hopes of capturing this monster, (for as the process of digestion is slow, the prospect of salvage is great); and that an elderly gentleman, in a white hat with a green lining, who has been bobbing for him from the Pier Head at Dover, ever since six o'clock this morning, is reported to have had a fine nibble. I am, Sir, yours most truly,

FRANCIS FUDGE.

Witness Benjamin Bounce, his ⋈ mark.
His Majesty's cock-boat Ramillies.

LONDON MECHANICS' INSTITUTION.

MR. TATUM'S LECTURE ON ELECTRICITY

It will be readily allowed, that after the numerous lectures and the enormous volumes which have been written upon Electricity, any person who now undertakes to lecture on the subject, must bring with him not only the experience necessary for the elucidation of his doctrines, and the satisfactory performance of his experiments, but also a considerable portion of what we call *mind*, when we speak of a man's general talent, ideas, and ability. We went to Mr. Tatum's Lecture on Friday, prepared to do our duty to the public, by a faithful report of any thing that should strike us as interesting, but certainly not with an expectation that any thing new would be thrown out by way of philosophical illustration. We were, however, agreeably disappointed. Mr. Tatum, though not a young man, and therefore less open to the enthusiastic impressions of novelty and speculative science, has not limited his study to the dry details of his profession, as a lecturer, but, with a comprehensive mind, aimed at objects whose importance and interest would be general. This gentleman appears to have laid down for the principal of his course of lectures on electricity, an inquiry into the merits of a new system—we say *appears*, because we have had the pleasure of hearing only two lectures, it is impossible yet to speak with certainty on that subject. Mr. Tatum commenced his lecture on Friday, with some useful explanations of the difference between positive and negative electricity, which he proceeded to illustrate in the following manner. He charged two jars, one from the positive, and the other from the negative conductors of the machine, and then stated, that the jar charged from the negative conductor was called negative, because there was a deficiency of the electric fluid within it, and a redundancy on the outside, whilst that from the positive conductor had an internal redundancy.* On placing together the two jars, positive and negative, the natural tendency of the fluid to equilibrium was clearly demonstrated; for the redundancy of the fluid in the positive jar escaped to supply the deficiency of the negative, and the equality of the discharge, shewed that the contents were fairly balanced. A light electric body was then placed between the two jars, for the purpose of shewing that their contents would be gradually discharged by an electric conductor. Mr. Tatum's explanation of the use of a glass *stool* was very simple, and therefore perfectly intelligible. He merely demonstrated, that, in order to prevent the electric fluid and the surrounding air from escaping into the earth, a stool, with glass legs, is used, upon which the lecturer, or others, who desire to concentrate within themselves this fluid, stand; for the glass legs being non-conductors, the fluid cannot pass through them. The use of the foil with which the jars are coated, was also pointed out, as being merely for the purpose of conveying the fluid from the conductors to the surface.†

The most important part of the lecture was that in which Mr. Tatum endeavoured to make some experiments upon the electrometer, to illustrate the following doctrine. The lecturer commenced by observing, that in a state of nature the electric fluid was pretty generally, and, if we understood him rightly, equally diffused; but that in the summer, the heat of the sun acting upon the atmosphere by which this earth is more immediately surrounded, a considerable evaporation of electric fluid takes place, which, rising into the clouds, already possessing a considerable portion of electricity, they become surcharged, and explosions take place, which we call thunder and lightning; and hence the reason why these explosions are more frequent in summer than in winter, when the sun having less power does not effect the same evaporating influence.

Mr. Tatum endeavoured to demonstrate this positively by an evaporation of the electric fluid from the electrometer, but the experiment which had succeeded perfectly, previous to the commencement of the lecture, having failed, we are unable to gratify our readers with the demonstration of the doctrine; as the

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* "Franklin calls the electricity positive, in a substance possessing more, and negative, in one that possesses less than its natural share of the fluid. This theory supposes that electrics never contain more than their natural share of this fluid: and hence, that when a jar is charging, as much of the fluid is thrown of from one side, as is received on the other, when the jar communicates with a conductory substance, by which, one side possesses more than its natural share of the fluid, and the other less, and that in forming a union of two sides, the redundant quantity rushes to the deficient surface, to restore the equilibrium. Dr. Franklin considers the redundant power wholly as action, and the deficient side wholly inactive or negative." *Bryan's Lectures.*

† We thought Mr. Tatum was rather too brief in his observations upon this part of the subject, but it is probable that he had entered more fully into it, in preceding lectures. It may not be amiss, however, here to say a few words by way of illustration.—The jars are coated both exteriorly, and internally, with tin foil, which is a conducting substance, and serves, as Mr. Tatum very properly explained, to carry the electric fluid to the surface. This foil does not reach to the top of the jar, and it would, as stated by the lecturer, be perfectly useless, if it were possible, by means of the machine, so to get at once, at every part of the jar, as to convey the fluid in the manner now managed by means of the coating. But for this contrivance the fluid would be very partially diffused, and it would scarcely be possible to conduct any electrical experiment with certainty.—*Editor of the Mechanics' Register.*

The following observations upon lightning may be very properly introduced here, by way of note.—

"Lightning, or electricity, is conducted more readily by metals and fluids than by any other substances. The progress of lightning may be traced from the top of high steeples, where it first strikes; thence proceeding along the metal till it loses that conducting power, when it explodes. Wood, brick, and stone, being bad conductors of the electric fluid, are sometimes damaged by the lightning passing through them to the earth. But the most dreaded effect is that it sometimes exerts on animal nature; for should an animal body be near, or within the influence of, a flash of lightning, the fluid will leave the imperfect conducting lecturer will, however, in all probability, attempt it at a succeeding lecture, we shall reserve any thing that we have to observe on the subject to that period. The experiment on the electrometer having failed, Mr. Tatum, rather than weary his audience with ineffectual attempts to renew the success which had attended it, previous to the assembly of his audience, recurred to his illustrations of the machine, and the mode of charging the jars, and discharging them. He here explained, that upon turning the machine, and exciting the electric fluid to the conductors, the jar being placed near it, the fluid, by means of

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materials above mentioned, and pass into the animal body, which will be injured, or perhaps, deprived of life, by its power. It may be possible for a man holding a sword in his hand, with the point resting on the ground, to conduct the electric fluid, and remain unhurt; the steel being a better conductor than his body, and the point of the sword diminishing the power of lightning in passing through it.

Wood being a bad conductor of the electric fluid, we should avoid standing under a tree in a thunder storm; because the lightning will pass through our bodies in preference to the tree, they being better conductors of electricity. Though most liquids convey the electric matter, yet oil does not; for which reason nut-trees are particularly dangerous, as their oily sap wholly impedes the passage of the fluid. A vessel at sea is very liable to injury from a thunder storm, by its exposure, and some of its materials not readily affording a passage to the fluid.

Soldiers during a storm should unload their guns and set them upright on the ground, for then the lightning, striking the gun-barrel, is conducted by the metal into the earth. In a thunder storm, the safest mode, supposing a person exposed to the elements, is to suffer his whole apparel to become entirely wet with the rain, which may prevent the bad effects of the lightning, should it strike near him. In an apartment during a storm, it is safest to sit in a free current of air, and not against walls or chimneys; and all metallic substances should be discarded during a storm.

The facility with which metal conveys the electric fluid, produced Dr. Franklin's invention of rods to conduct the matter of lightning, and thereby to preserve houses and ships from destruction. He proposed this method in 1752, which was adopted in many places of North America, and particularly in those parts where lightning was most common. He conceived that if a metallic rod were fixed above the upper part of an edifice, and continued downwards by other connecting portions of metal, and the other end were sunk some feet in the earth, the matter of lightning, striking on the top, would be conducted to the other extremity, without injury to the surrounding substances. Perceiving also the silent effect of electricity, and the smallness of the stream from a pointed body, he terminated these rods by points. After repeated trials of conducting rods, in the provinces of Pennsylvania, Maryland and Virginia, he found them in general a preventive against the destructive effects of lightning; and where they did not absolutely effect that purpose, it was owing to the conductor not being within the circuit of the lightning's atmosphere. Some persons cavil about the use of pointed conductors, though they admit of those with round tops, from an opinion that the point attracts the electric fluid: but many experiments contradict this idea, and one in particular presents itself in the circumstance of the magazine at Purfleet, which was furnished with a pointed conductor, and yet the lightning struck on an iron cramp, at a distant corner of the building, in the side situated only a few yards below the conductor. This, I think, sufficiently evinces the fact, that the point does not considerably divert the lightning from its direction.

The conductors of lightning fixed to houses are doubtless uncertain security; yet as portions of metal always have place on the surface of large edifices, it becomes necessary to place a conductor communicating with these, in order to convey the electric matter to the ground. I conceive this to be a measure of consequence in all buildings; but, to render it a certain security, all the various portions of metal in an edifice ought to be connected in this manner, which is impossible; yet the larger portions of this material, which are situated in the roof of the building, may be so connected. It appears natural to suppose that pointed conductors are safer than knobbed ones, because they receive the fluid in a more gentle manner, and accordingly are not so liable to injure the edifice to which they are attached; for when the matter of lightning is received on large round surfaces, the violent percussion sometimes shakes the building, and thus destroys some of the advantages that might otherwise arise from its conducting power.

The different sensations produced in a person by the electricity received from a pointed and from a round surface, even from the brass wire and the inside coating of the jar, was conveyed equally to the inner surface; because, when the outside of the jar is made to communicate with the earth by any conducting substance, an accumulation of the fluid takes place.*

Mr. Tatum offered to communicate an electric shock to any of the audience who might be disposed to receive it, and in a moment he had about 200 candidates; the first shock was received by the persons in the body of the chapel. (We should here observe, that whilst the Mechanics' Institute is building, the lectures are delivered in a chapel in Monkwell Street, capable of holding more than 1000 persons, and which is generally pretty well filled by the members): and the second by a chain of more than 100 persons in the galleries: a wire was attached to the conductor, and its ends passed into the galleries, where the parties having their hands locked in each other, soon experienced the effect of this extraordinary property of nature. The scene was exceedingly curious, and would have afforded a fine field for the pencil of Hogarth, or of our own Cruikshanks. It need hardly be stated, that electric shocks are frequently used as auxiliaries in medicine. The opinions as to their efficacy are certainly very conflicting, but as they never produce injury when administered with caution, they are worth trying in cases of chronic affection, and in all complaints where the circulation or motion of any part of the human frame is obstructed. In cases of palsy electrical shocks have been frequently found to afford relief, when the regular course of medicine was found unavailing: and there have been instances of its being used with success, in rousing persons from the lethargic stupor, which is occasioned by a sluggish action of the blood and juices.

During the lecture, Mr. Tatum was listened to with great attention, and at its close was greeted with considerable applause.

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our weak accumulations of the electric fluid, naturally convey this idea; as does also the experiment of silently discharging a jar by means of points."

* "While the fluid is thrown on one side of the Jar, an equal quantity of it is either attracted to the outer surface of a different quality, or the same quantity is thrown from it, and thus the two surfaces are in different states."—*Bryan's Lectures.*

Mr. COOPER'S LECTURE.

We were unable to get to the Mechanics' Institution on Wednesday evening, in time for the commencement of Mr. Cooper's lecture, but from the hour at which we entered, we believe he could not have been long lecturing. We found him explaining the mode by which iodine is produced chemically, and also in a state of nature. There are various modes of obtaining iodine from chemical substances, in which case heat is used to produce the decomposition, and a sublimation takes place, which causes the iodine to rise in vapour to the top and sides of the vessel, from which it is subsequently reduced into a state of crystallization. We shall, however, in our next number, offer some remarks on iodine, which will embrace all that we might now give, and form an illustration of Mr. Cooper's Lecture. In a state of nature iodine is procured very abundantly from kelp, and particularly from that description of sea weed, which at the sea-side, persons are accustomed to hang up in their houses, to denote the variations of the atmosphere. The manner in which sea weed is treated for the production of iodine, was slightly touched upon by Mr. Cooper, but quite sufficiently, we think, for the time which could be properly bestowed upon that part of his subject. He then proceeded to describe its appearance, which resembles that of black lead, and stated, that it was very slightly soluble in water, but that such are its extraordinary properties, that although water imbibes only one ten thousandth part of the iodine which may be placed in it, it acquires not only the flavour of the iodine, but also a strong tinge of colour. Iodine was then explained to be considerably heavier than water, and the vapour of iodine to be one of the heaviest of the known gases. The specific gravity of iodine, when compared with hydrogen, is as 126 to 1: in its effects upon the human frame, it was described by the lecturer as differing materially from chlorine. The latter is found to affect the lungs and fauces, but the irritating effects of iodine are chiefly experienced in the eyes and nose. Yet tho' differing as it does in this respect from chlorine, it is found to unite intimately with that and with oxigen. Mr. Cooper then proceeded to state, that iodine, like chlorine, is a supporter of combustion, and that in connection with certain combustibles, a chemical action takes place as with chlorine, from which compounds result which are termed iodines, as those from chlororine are termed chloides, and those from oxygen oxides. Iodines, when treated with water, produce similar effect to chlorides, and the results are acids. In order to shew that iodine is a supporter of combustion, Mr. Cooper applied a small portion of it in its solid state to some phosphorus; a violent action immediately took place, producing a large and brilliant flame, and the vapour, rising to the top of the vessel, produced a compound which is called iodine of phosphorus, and which, upon being heated with water, undergoes the same chemical decomposition as that which we pointed out in our last Number, when treating of chlorine. In applying iodine to phosphorus, Mr. Cooper demonstrated that no heat was necessary to produce combustion, but that such was not the case with iodine and sulphur. Mr. Cooper here attempted an experiment with potasium and iodine, but from the rapid action of the vessel, an explosion took place, and the experiment was deferred until another lecture. It was explained in the course of the lecture, that iodine was not only formed in a state of nature in sea-weed and other substances, but also in shells, particularly the cockle and muscle, and in sea water. It is supposed also to exist in the Derbyshire spar, but the separation has not yet been attempted, at least, not upon any large scale, and the position that this spar is a supporter of combustion, remains, at present, almost speculative. The concluding part of Mr. Cooper's lecture was on hydrogen, which up to the present moment may, we think, be considered the most extraordinary property of nature. There are few persons who do not know that pure hydrogen gas is obtained from a mixture of zinc, water, and sulphuric acid, and when these three articles are placed together in a glass vessel, a violent action takes place, and upon the decomposition, the hydrogen gas rises, and is received in a pure state through water in an inverted jar. The hydrogen being so much lighter than water, it is not absorbed as it passes through, and when collected in the jar upon the pneumatic trough, may with great facility be transferred to other jars, and kept there closely stopped for the purpose of experiment. Mr. Cooper having procured a sufficient quantity of this gas in a jar, explained its property, by shewing that if the top of the jar was left open for an instant, the hydrogen being so much lighter than the air, escaped; whereas, if the jar was held downwards, the gas would be a much longer time escaping. The lecturer, for the more immediate illustration of his position, took a small balloon, which he filled with hydrogen gas, and having explained the principle of aerostation, by stating that where the quantity of hydrogen gas, and the vessel in which it is contained, are lighter than the same bulk of common air, they must rise, he sent off his balloon, which rose with great rapidity to the ceiling. It can hardly be necessary to state here, that all balloons are despatched in the same manner, but it may not be amiss to remark, that the gas with which balloons are generally charged, is supplied by the coal-gas companies, and is infinitely inferior to the pure hydrogen, as procured from zinc; but the vast expense of the latter mode deters most aeronauts from using it; and the time which is necessary for obtaining a sufficient quantity in this way, is also considerable. For the purposes of aerostation, the common coal gas does very well: with pure hydrogen a man might, however, rise in a balloon higher in the air, because the air, as we ascend, becomes specifically lighter, and the extent of a voyage upwards, must depend upon the purity of the gas contained in the balloon. It is supposed that beyond the immediate atmosphere by which our earth is surrounded, the air becomes purer and purer, until it ends in an atmosphere of pure ether. It will be easily seen, therefore, that until we can discover a gas, the specific gravity of which, with the balloon and appendages is lighter than ether, the extent of our aerial journeys must be very limited. Mr. Cooper, at the close of his lecture, which was much applauded, took occasion to notice an attack upon his reputation, in a periodical work, the editor of which had, with much self-satisfaction, undertaken to expose an error of Mr. Cooper, as to the specific gravity of the gases. Mr. Cooper explained the oversight most satisfactorily, and remarked upon the tone of the article in which the criticism was given. It was almost sufficient, he said, to deter him from prosecuting his lectures at the institution: but he would not allow such an attack to turn him aside from his duty to the public, and his great desire to promote, by all the means in his power, the welfare of the Institution, and the improvement of its members. This address was received with thunders of applause. We have only to add, that the reputation of Mr. Cooper, as a theoretical, practical, and experimental chemist, stands too high to be shaken by the calumny of a disappointed scribbler.

THE PERIODICAL PRESS.

We have frequently seen partial statements of the importance of the periodical press; but no general account of its nature and extent having been given, we do not consider that any apology is necessary from us in supplying it

There is no subject half so important as this. It embraces every interest, every motive, every action; and in considering it with the attention which it deserves, we are almost lost in wonder and amazement. If we are better, wealthier, more learned, or more skilful than the inhabitants of other countries; if we have valuable laws and institutions which they have not; if our intellectual faculties have had more expansion; if our aristocracy are less tyrannical than those of other nations, and our laborious classes more peaceable, well-disposed, and enlightened than those of countries with which we have direct relations; if, in short, there are blessings and advantages in Great Britain which are not to be found in France, Russia, Prussia, Germany, and other civilised dominions, to what is it all owing but to our periodical press? We might go on page after page with this inquiry. The probity of our judges—the virtue of our religious pastors—the science of our manufacturers—all arise from this tremendous engine — an engine, without which, we should resemble the savages of New Zealand, or what would be still more frightful, the ignorance and barbarism of Old Spain. But we have neither space nor inclination to enforce a position so self evident. Let us, then, enter into those details of the periodical press of Great Britain, which, whilst they raise our admiration, gratify our curiosity. We begin, of course, with the Newspaper Press, and here we must remark, that much undeserved calumny has been directed against its conductors. It is not astonishing that gentlemen possessed of an intellectual power, which makes royalty itself tremble, lest it outrage the bounds of public decency, and which shews the emptiness of wealth and distinctions when not founded upon a virtuous basis —which exposes fraud and chastises villainy —we say, it is not extraordinary, that gentlemen so situated, should be assailed in turns by all parties, and upbraided for doing that from mercenary inducements, which arises from a conviction of duty, and a proper sense of their own influence. No men are infallible, and we will not pretend to say, that Newspaper Editors are immaculate; but as times go, it is certainly rather extraordinary, that they who are so open to improper bias, swerve so rarely from the path of rectitude. They may err in their views; but with few exceptions, their motives are honest, and they proceed steadily to the attainment of their object.

There are, on the establishment of each respectable morning paper, an editor, an assistant editor, and from eight to twelve reporters; besides a considerable number of literary gentlemen, who derive emolument from their contributions, but who do not receive a permanent salary; and there are also a great many reporters who supply police cases, accounts of accidents, &c., and who are paid for their productions at so much per line (1¼d.), and who are called "Penny-line reporters," that having been for many years the scale upon which they were remunerated. Some of these persons are men of education and talent, but not many; and there are not a few who do not hesitate to cook you up a "murder," create a "monster," and invent "an afflicting accident;" each of which had no other origin than in the brain of the inventor. But against this the conductors have no regular check; and it is only justice to them to say, that upon the slightest cheat in this way, if discovered, the offender is dismissed from their service. Each paper has also its collectors of news, foreign and domestic correspondents, and a variety of expenditure which, although it comes under no regular head, makes a large item in the account at the end of every week. It is not an extreme calculation to state, that there are, upon the eight morning papers and the six evening papers published in London, at least 120 literary gentlemen, receiving weekly salaries to the amount of £600., exclusive of those who are paid for their communications. If to the daily papers we add about forty Sunday papers, and papers published twice or thrice during the week, we shall make a weekly sum total for literary services upon the establishments, exclusive of what is paid for in another way, of about £1000.; and if we add to this amount the sums paid by the whole of them, to printers, publishers, and others, in the way of regular salary, we shall have an increase of at least £1,500., making a weekly sum of £2,500., or £120,000. per annum paid by the London newspaper press in salaries only; and to this we may add, at leost £1,200. weekly, or £62,400. per annum for the remaining expenses, excqusive of stamps and paper, making altogether nearly £200,000. per annum. This calculation, large as it is, will, we imagine, be considered by gentlemen who perfectly understand the subject, to be much under-rated; for such is the competition in the profession, and the avidity to gratify the public, that many thousand pounds are expended annually for expresses, correspondence, &c.; which we do not include in our calculation. With respect to the number of persons employed upon the London newspapers directly and indirectly, taking in editors, reporters, publishersf printers, pressmen, and others, deriving from them their subsistence, we are quite able to state it, at the very lowest, at 1500, many of whom derive emoluments which enable them to live as gentlemen, whilst none are without a handsome competence; for it is a fact, that in no employment are persons paid more liberally than upon newspapers. The compositors have, upon morning papers, each, £2. 8s. weekly, and upon evening papers, £2. 3s. 6d.; and the pressmen are paid equally well, although their labour has been much diminished by the introduction of printing machines instead of presses. Of these machines we shall treat under a separate head in a future paper.* When we come to add to the list of London papers those which are printed in the country and in Ireland and Scotland, we shall find the account still more curious. The number of these may be taken broadly at 235, most of which appear once a-week, a few daily. and some twice or thrice a-week. Sometimes there are 240 provincial papers, at others 230; we take the average, therefore, at 235; but from the increasing intellectual wants of the people, we may safely expect that the number will be soon 250. Each of these papers has an editor or publisher, and from three to six men and boys, as compositors and pressmen. The weekly amount of salaries paid upon these establishments must be about £1,800., or £92,600. annually; and the other expenses of the establishments may be about £1,000. weekly, or £52,000. annually, all, of course, exclusive of stamps and paper.

We now come to the circulation of the newspapers. The daily morning and evening papers, with those published twice or three times in the week, amount to at least 40,000 daily, or 240,000 weekly; and the Sunday papers to between 50 and 60,000, making altogether about 300,000 weekly. If to this we add the circulation of the provincial press, we shall have a striking proof of the state of intellect in this country. Many of the country newspapers publish two or 3,000 copies, but others not more than four or 500: considering, however, that several appear more than once a week, we do not think we can be charged with exaggeration, if we say, that they throw off, weekly, 200,000 copies, making altogether, 500,000 copies. Let this number be compared with our population, and then say, whether England is not an intellectual country. Of this number, of course, some thousand copies go abroad, but they amount to little, compared with the gross circulation. 500,000 copies require 1,000 reams of paper, which, on an average of 35s. per ream, would make £1,750. weekly, or £91,000. per annum.

Thus we have

London press, annually, exclusive of stamps and paper	£.200,000	0	0
Provincial Press, ditto,	93,600	0	0
Paper	91,000	0	0
5 0,000 Stamps, at 4d. each, with £20. per cent. discount off .	336,666	13	4
Forming a total of	£.721,266	13	4*

We have here more than seven hundred thousand pounds sterling, exclusive of advertisements,† expended by the newspaper press annually, of which about 360,000 go to the government for stamps, and the excise duty upon paper.

We come lastly to speak of the charge made by the conductors of newspapers to the public, and which is less than that required in any enterprise with similar risk and exertion. A newspaper is sold to the public at 7d.; but the charge to the newsmen is only 13s. per quire of 27 papers.

The amount paid for paper by the proprietors of a morning paper is about £2. per ream. For 500 copies, thus:—

Paper	£. 2	0	0
Stamps	6	13	4
	£. 8	13	4
The amount received from the newsmen is	£.12	0	0

* Our engraver has now in hand a newly-invented machine by Mr. Miller, which is capable of printing 2000 sheets an hour.

* Since the above was written the official returns of 1821 have been put into our hands, by which we find that the total number of newspaper stamps issued in that year was 24,779,786, and the stamp duty £412,996. 8s. 8d.; but by taking off the discount of 20 per cent. as is done in our calculation, the difference between that and the official return is very trifling.

† The amount paid by the newspapers for advertisements is enormous: we shall give it in our next Register.

Leaving to the proprietor only £3. 6s. 8d. upon 500 papers, being considerably less than 2d per paper, and which, upon the large circulation of 4000 copies per day, would not yield sufficient by 20 or 25 per cent. to pay his expenses. It is quite true that the advertisements produce a large sum; but, on the other hand, it is as true, that before a newspaper gets into that circulation which will command advertisements, a fortune must be expended.

We shall in our next paper give an account of all the periodical works in Great Britain, exclusive of newspapers.

THE SILK TRADE.

We stated in our last number, that a gentleman named De Pouilly, one of the wealthiest Silk Manufacturers of Lyons, had made preparations for removing his establishment to this country, and that in consequence thereof considerable hostility had been shown towards him by the inhabitants of Lyons, and indeed, generally throughout France. We now find by a communication with which we have been favoured from Lyons, that this gentleman and his partners have really been forced, by a consideration for their own safety, to publish an address to their fellow-townsmen, in which they endeavour by some explanation of their motives, to remove the ill feeling which has been created against them, but at the same time much to their credit and honor, without abating one jot of their right as freemen, to carry their industry and science to any part of the world in which they may be rendered available. We are happy to see, also, that they pay a compliment to the intellect of the present rulers in France, by stating that no objection was made, on their part, to the removal. It is indeed high time that the ridiculous prejudices against the emigration of artisans, and the abominably-absurd but wickedly-oppressive laws, which press exclusively upon that vast body, should be removed. Why, as the *Journal de Commerce* very sensibly has it, should the artist and the man of letters, be permitted to carry their talents and industry where they please; and the capitalist be allowed to transfer his fortune to another country, whilst the artisan, whose industry is his fortune, is to be fixed like a wretched slave to the soil upon which he was born? We are glad to see this matter taken up so warmly by some of the French newspapers, because our own legislators may there read a lesson, which they would not take from the spirit of the times. Is it consistent with the interests of science, that this horrible system of blockade and prohibition should continue? and for what? merely because it is the remnant of a feudal system, of which we are to be forcibly reminded, lest we should, in the present age, begin to fancy that man is a free agent, bound by no laws but those of virtue and his country's good. Even in the worst of times, when men cut each others' throats for amusement, and the inhabitants of one country laboured to annihilate those of another, this blockade system was oppressive and unjust; but now that the inhabitants of Europe are as one family, let us have free competition. If a man, by the exercise of his genius and industry, can get more money in Paris than in London, let him go there, and if another of Lyons or Paris can do better in London, let him come here. Science and knowledge are confined to no soil, and the free exercise of a man's talents in whatever situation he may choose to exercise them, can but prove beneficial to society generally. And after all, to what do these absurd and wicked blockade laws tend? Do they deter from emigration? Quite the contrary—they disgrace the legislator, without even gratifying the vengeance which would destroy the delinquent. Men are not terrified now with old statutes, which neither reason, virtue, nor policy can sanction; and the emigration goes on in the very teeth of the laws. Thus, in Paris, there are flourishing establishments in many of the branches for which we are famous, Manby and Wilson have iron founderies, so have Procter and a company of French and English speculators; Edwards has a steam engine manufactory, and Powell has a gasometer, which furnishes light to a great part of Paris; then there is a quake,, in the Champs Elysées, who maker patent axle trees for coaches; and another Englishman who manufactures English needles: and yet, we are still where we were. Our iron founders still go on; Perkins still makes steam engines; the Gas companies still thrive; the coach makers still build coaches; and the Birmingham folks still make pins and needles. What an idle thing, then, it is to unite to rob an artisan of the right which God has given to him to take his talents to the best market. As well might we say to the swallow, "Thou shalt not migrate." Let English talent go to France, and French talent come to England. It is by this sort of competition that we become better friends, better men, and better artisans. It is by such competition that enlightened nations shew their superiority and feel their mutual interests.

Miscellanea.

EGYPTIAN SARCOPHAGUS.

We have examined the sarcophagus, composed of porphyry, which has been lately brought to Paris. It would be difficult to give an idea of the effect altogether produced by its colossal proportions, the richness of its beautiful materials, and the perfection of its workmanship; the execution of this latter is of so delicate a description, as to bear to the eye some resemblance to lace. What time, what labour, and expense must have been requisite to compose such a work out of so hard a substance! Some impressions which we have noticed amongst the innumerable hieroglyphics which cover it, would indicate that the individual to whom it was erected, belonged to the sacerdotal order. This splendid mausoleum has been undoubtedly that of a high priest. Its magnificence should not be a source of astonishment, when we think of the exalted rank possessed by this order amongst the hierarchy of the people inhabiting the banks of the Nile. If we compare the sarcophagus of Memphis with the two monuments of the same description discovered by the Italians, Belzoni and Drovetti, the comparison will be entirely in favour of the former. The antique found about three years since, by Drovetti, is granite, and is consequently to be included in the rank of those of the same substance which are scattered in such abundance through the grottos of the chain of Lybian mountains. That discovered by Belzoni is but a fragment; it is quite uncovered, and is composed of alabaster, a soft stone, which yields to the chisel of the artist with more facility than marble. The style of the workmanship is extremely coarse, as is in general all that of Thebes, where it has been found. It was in good time that Thebes descended from its rank of metropolis. More than two thousend years before our era, the Pharaohs transferred the seat of their government to Memphis, for the purpose of watching more narrowly the powerful monarchies established upon the borders of the Euphrates, whose rivalry they feared, and therefore the antiquities of Thebes belong, for the greater part, to the early period of the history of Egypt, when the arts were still in their infancy; and, for this reason, the style is almost invariably inferior to that of the antiquities of Memphis.

FULLING WOOLLEN STUFFS.

The process of fulling woollen stuffs is performed in Iceland in the following curious manner:—Both ends being knocked out of a barrel, it is filled with the articles to be fulled, when it is laid on the side, and two men lie down on their backs, one at either end, with their feet in the barrel, and literally *walk* the cloth, by kicking it against each other.

The use of mirrors for reflecting light-houses in England is of very recent date; and although the idea was not suggested by the falling of an apple, nor the dissection of a frog, it owes its origin to a circumstance almost as trivial, which was as follows:—At a meeting of a Society of Mathematicians at Liverpool, one of the members proposed to lay a wager that he would read a paragraph of a newspaper at ten yards' distance, with the light of a farthing candle. The wager was laid, and the proposer covered the inside of a wooden dish with pieces of looking-glass, fastened in with glazier's putty, placed this reflector behind his candle, and won the wager. One of the company viewed this experiment with a philosophic eye; this was Captain Hutchinson, the dock-master. With him originated those reflecting light-houses at Liverpool, which were erected in the year 1763. In his Treatise on Practical Seamanship, he says, "We have made and had in use here, at Liverpool, reflectors of one, two, and three feet focus, and 3, 5½, 7½, and 12 feet diameter, the three small ones made of tin, sodered together, and the largest of wood covered with looking-glass. The two large ones, called the sea-lights, leading through the channel from the sea, till the two Hoydale lights are brought in a line that leads into a very good road-sted to lie, till it is a proper time to proceed to Liverpool."—*Glasgow Mechanics' Magazine.*

A very extraordinary establishment was opened in Aldersgate-street, as a coffee-shop, on Wednesday. The ground floor is fitted up with great elegance, to accommodate about 200 persons; and the coffee-room on the first floor exceeds in elegance the most splendid café of the Palais Royal. Yet at this coffee-shop, which is a palace compared with our best regular coffee-houses at the West end of the town, a man may take his coffee or tea and toast for less than sixpence.—In the evening music attends as at the "café des Aveugles" in Paris.

WILLIAM BELL, THE INDIVIDUAL WHO FIRST INTRODUCED STEAM-BOATS AND LOCOMOTIVE MACHINES INTO THIS COUNTRY.

The editor of the Manchester Gazette (late Cowdroy's) has very laudably called the attention of the public to the claims which the veteran Henry Bell has upon the sympathy and gratitude of our countrymen.

Mr. Bell, it seems, is old, infirm, and indigent; having sustained a loss of three thousand pounds by the burning of two steam-boats, one of which, the Comet, was the first ever used in this country. There can be no question as to his claims to the merit of introducing steam-boats and locomotive land carriages into Great Britain. He also constructed a steam-carriage to ply upon a common road; but, as the high-pressure engine was indispensible, and as it was suppressed by act of Parliament, his invention was abandoned.

"In a letter which Mr. Bell has sent to a Manchester paper, we find the following affecting description of his present condition and prospects:

"But I have almost served my day and generation: as my supply of fuel is now getting small, my steam is getting weaker; and at last my capacity of making way must cease. I have been these six months laid up in dock, under repairs; but should the head carpenter give the order that all is right, I may once more be launched afloat."

The following extract from the report of the House of Commons will shew, that the Americans, as well as the British, are under very great obligations to this able and persevering mechanic:

"But the whole merit of constructing these steam boats is due to natives of Great Britain. Mr. Henry Bell, of Glasgow, gave the first model of them to Mr. Fulton, and went over to America to assist him in establishing them."

LONDON MECHANICS' INSTITUTION.

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Mr. WHITAKER.

Mr. EMMENS,	Mr. COPE,
Mr. MC'WILLIAM,	Mr. BLUETT,
Mr. HALL,	Mr. DOTCHEN,
Mr. THOMPSON,	Mr. HACKETT.

LIBRARY AND READING ROOM.

Mr. BLAKE,	Mr. WHITTAKER,
Mr. THOMPSON,	Mr. BLUETT.

Mr. COPE.

APPARATUS.

Mr. COPE,

Mr. APPLEBEE,	Mr. CHEESE,
Mr. BACON,	Mr. BARTON,
Mr. JOHNSON,	Mr. LEGROSE.
Mr. HALL,	Mr. HUME,

Mr. CLEMENTS.

ACCOUNTS.

F. PLACE Esq.,

Mr. J. F. BLAKE,	Mr. JOHNSON.

ELEMENTARY SCHOOLS.

Dr. GILCHRIST, L.L.D.

W. FREND, Esq.,	Mr. BLAKE,
Mr. REYNOLDS,	Mr. DOTCHEN.

Within the last few weeks, the library of this institution has been considerably augmented by very valuable presents and purchases.—Mr. Frend has presented eight very valuable volumes of the late Baron Maseres on historical and mathematical subjects.—Dr. Gilchrist, 16 volumes on Indian Affairs, and a very valuable Celestial Atlas, by Jamieson.—Joseph Hume, Esq., duplicate copies of very valuable Essays, by Mr. Mill, as published in the Britannicum.—Mr. Peter Thompson, twelve volumes on History and Science.

The Committee have also within the last week, purchased nearly 100 volumes of Sterling Works on History, Voyages and Travels, and the Scientific Arts, with a variety of useful maps and charts.

Preparations are making to give due effect to the Lectures of Mr. Harding, which will take place immediately after the Lectures of Mr. Tatum.

QUERIES.

To the Editor of the Mechanics' Register.

Sir,—If any of your readers would inform me, through the medium of your Register, how to construct an ALARUM, without the aid of a clock, and also say what the cost of the materials would be, they would be conferring a great favour on,

Sir, your Register's well-wisher,

J. B.

A Correspondent enquires—"Has not Mr. Perkins some place in the Strand where he exhibits his Steam Gun?"

[Mr. Perkins has an establishment in Fleet-street, but we believe the Gun is only exhibited at his manufactory in the Regent's Park.]—ED.

A Correspondent wishes to be informed of the nature of the process of crystallizing tin.

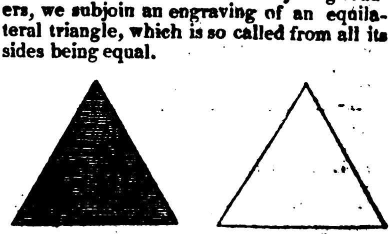
ANSWERS TO QUERY.

TO THE EDITOR OF THE LONDON MECHANICS' REGISTER.

SIR,

In answer to the Query of your correspondent, Box, (page 16 of your admirable work) I beg leave to state, that three of the pins' heads, or other balls, may be placed on a table, at the angles of an equilateral triangle;* and the fourth head or ball, suspended or supported over the middle of the triangle, at such a height, that its distance from each of the other three shall be the same as they are from each other. Or, what amounts to the same thing, the four

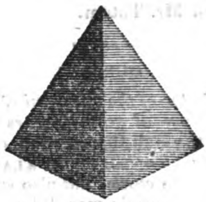
* For the information of our young readers, we subjoin an engraving of an equilateral triangle, which is so called from all its sides being equal.

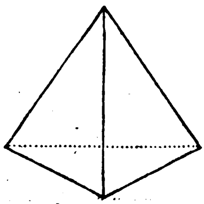


balls must be placed at the angles of a regular tetrahedron.*

No greater number than four balls can be placed equidistant from each other.

* The tetrahedron is thus described in the *Rudiments of Geometry*, by LARKIN, as follow:—





The tetrahedron has
- Four faces
- Four angular extremities or solid angles
- Six edges
- Twelve plain angles, and
- Four pyramidal axes:
- Its faces are all equal equilateral triangles
- Its edges are all equal
- Its axes are all equal.

The mutual inclination of its faces is 70° 31′ 43″ ½

The inclination of its edges on its faces is 54° 44′ 8″ ½.

The inclination of its faces to its axis is 19° 28′ 16″ ½

The inclination of its edges to its axes is 35° 15′ 51″ ¾.

The inclination of the axis to each other is 109° 28′ 16″ ½, and

Its plane angles are, each, 60°.

The tetrahedron may be considered as the most simple of solids, on account of its having the least number of faces. In other respects, however, it is not the most simple.

It differs from every other solid, whose faces are all equal, by having a solid angle opposite to each face.

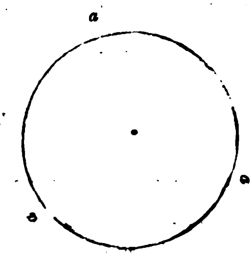
It contains the least solidity, under a given surface, of any of the natural or artificial solids.

The tetrahedron is the first of the regular or platonic bodies.

To the Editor.

SIR.—Reading your Magazine on Tuesday last, I observed a query, signed by Box, namely, at what position must four pins' heads be placed to be at equal distances—I propose the following plan:—Let twice the diameter of the pins to be employed be struck by a compass, and that circle divided into three equal parts; thus, where *a a a* are three of the pins' head, the fourth pin's head must stand up perpendicular in the centre, which you will find to be correct.

W. R. T.



NOTICE TO CORRESPONDENTS.

We have received a variety of communications, many of which stand over for consideration; others are, however, from their positive merit, in hand for the next number.

G. B. and R. S. will see that their answers to "Box" are rendered useless by those which appear in the Register.

A LOVER OF COFFEE is informed, that we have turned our thoughts to his suggestions, and will notice them in our next.

We thank T. W. for nis information, but do not choose to expose the conduct of our opponents; time will shew who is right. We did not start this work without expecting illiberal opposition; but we rest our claims to notice upon our merits and the indulgence of the Public.

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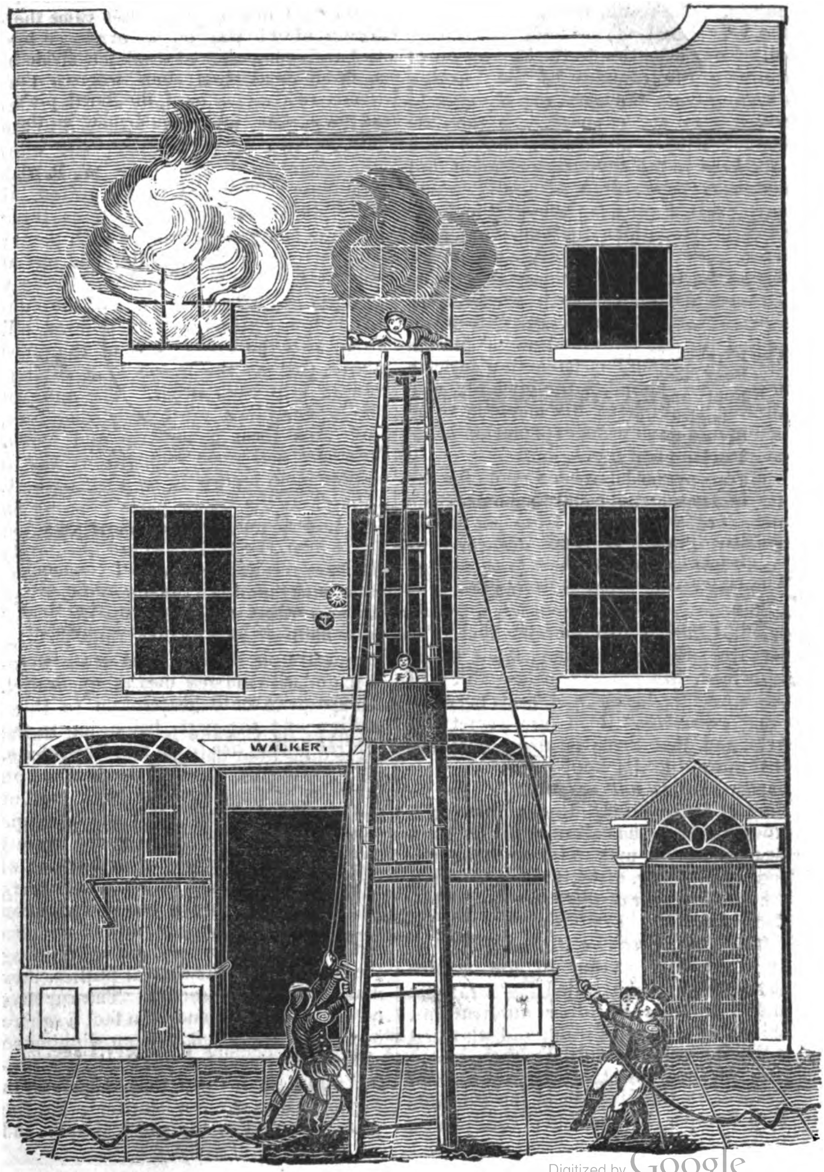
The London MECHANICS' REGISTER.

"What cannot Art and Industry perform,
" When Science plans the progress of their toil." BEATTIE.

No. 3.] SATURDAY, NOVEMBER 20, 1824. [Price 3*d*.

COBBIN'S PORTABLE FIRE ESCAPE.



COBBIN'S PORTABLE FIRE ESCAPE.

THE mind directed to schemes to alleviate human misery or save human life, is engaged in the noblest pursuits, and the inventor of a machine to rescue the horrified sufferer from the midnight flames, is deserving of the thanks of the public. The recent tremendous fires in the very heart of the metropolis, have called our attention to the best means of rescuing the inmates of the burning dwelling from the appalling dangers to which they are exposed. In the late conflagrations, no victims have been sacrificed to the devouring element, but instances have often occurred, which have excited our deepest regret and our sincere sympathies for surviving relatives, perhaps helpless orphans, or widows deprived of their only support.—To provide against such recurrences, a machine has very recently been invented for the preservation of human life from fire, on a construction entirely new. We applied to the inventor, who allowed a sketch of his machine to be taken, and gave us an explanation of its construction and use.

Many escapes have been made for the use of those who wish to possess the means of descending from an upper window, but inventions are rare, or rarely known, of machines *to be sent up from the street.* The common ladder is a dangerous vehicle for saving a female or child, and is also not portable. The inventor of the machine about to be described, has never seen any thing of the kind. He is told that there is something *resembling* it in the Society of Arts, and that there is also something still more like it, kept by St. Martin's parish, though *not so portable*, *nor so simply constructed.* Under these circumstances, he has allowed his name to be used, as he may possibly have the honour of being, at least the best, if not the sole inventor of the PORTABLE FIRE ESCAPE.

The Rev. INGRAM COBBIN, M. A. known as the author of the *French Preacher*, a poem called *Philanthropy*, and a number of other publications, chiefly of a smaller kind, and who first called the public attention to the persecution of the Protestants in the south of France, is the inventor of the Portable Fire Escape. It consists of four pieces, but may have any additional number. These pieces when put together, are somewhat like a ladder, wanting the proper number of rounds. They are each to be nine feet long, the length of a fire-engine, to the sides of which they are to be attached, two on each side. The mode of attaching them is by rings, to be fixed under one of the sides of each piece, and at each end, so that they may hang horizontally with the sides of the engine, on hooks attached to the engine, two on each side. The sides are square, and should be made with exactness. They are to be united, at equal distances, by bars or stems, three of these being sufficient for each piece; that is, one in the middle, and one at each end. The bars should be strongly wedged in. The upper ends of the sides of the lower piece must be pointed off, to go into the lower ends of the piece above, just as the pieces of a fishing-rod fit into each other. The tube of the upper piece must be strong iron, and thus form a mortise and tenon. The best and most expeditious way to render them secure is by a spring-bolt, though, as the upper parts pressing on the lower, must render their junction more firm, the locks are not absolutely necessary. The machine is, however safer with them. To the upper piece, and the part which would form the top round in a ladder, are attached four pullies, the centre ones being fixed close together, and with the side ones being parallel. Two ropes are to be hooked to these pullies, and the parts belonging to the central pullies are to be fixed by hooks, barely allowing room to be hitched on the eyes or staples of the back part of the car. One central pulley and one rope may be sufficient; but to guard against accident by the breaking or burning of a rope, or the failure of the men holding the one rope, a similar one is worked on the other side; the side pullies are also not absolutely necessary, but by relieving the weight from the central pullies, they make them more secure. The car may be made of wood, and is in fact a square box; and to prevent it from slipping on either side, the sides next the ladder project about six inches: they might run in a groove like window shutters, but the plan proposed is the most simple, and less liable to put the machine out of order.

When this machine arrives on the spot, it may be put together in less than three minutes, and may, in rapid succession, convey the car up and down. The top piece should be placed first on the pavement, and any of the others ought to fit it. Three pieces will exactly suit the height of the second-floor window of a second-rate house, which is about 26 feet. The four would suit a first-rate. The attics do not generally need their aid, as the trap-door is at hand; they may, however, be adapted to them, and if several engines on the spot had their machines of one size, they might raise them to any required height, by joining their apparatus together.

The inventor has suggested, that in cases of extremity, a temporary means may be successfully resorted to, to save *men;* that is, to tie a small piece of lead, or other heavy substance, to the end of a ball of string, and throw it up to a window, allowing length enough of string to reach the ground, and then let the other end of the string be fastened to a rope of sufficient length, which being hauled up by means of the string, may be fastened strongly to a bed-post, the bedstead being drawn to the window, to prevent it slipping, and with the end below held by several persons, the endangered person may escape. A few knots in the rope would be an improvement, as they would occasionally assist the grasp.

By the Portable Fire Escape, women, and even *infants*, may be rapidly and yet safely let down.

The machine has met with the approbation of an able engineer, and we believe the inventor purposes to submit it to the Society of Arts. It is hoped that the fire offices will adopt the Portable Fire Escape. Some years since a gentleman, of eminence as an engineer, invented another sort of machine to save persons by assistance from the street, and hoped that he should be countenanced by the fire offices, but on applying to the first, and one of eminence in London, he received for answer, that ***they did not undertake to save men's lives, but their property***, and this inhuman reply discouraged the inventor, who has ever since abandoned his scheme.

N. B. The bars should be about 18 inches in length, making the width of the pieces or ladder. The car need not be wider for ordinary-sized persons, but to suit larger ones it may be made a few inches wider, in which case the slides must be fastened behind, so as not to exceed the width of the machine. The front of the car may also project, and be rounded, to accommodate the knees, if it is designed the person should sit down. It may also have a back, to guard the head against any danger from the bars in the descent; but the cut is merely designed to shew the mode of operation.

Dimensions at one View.

Length of Machine Ladder, 36 feet.
Length of each piece, - - - 9 feet.
Length of the bars, and width of the pieces, - - - - 18 in.
Width of the Car, 20 inches or upwards.
Depth of the Car, 3 feet or upwards.
Length of both ropes, about 80 feet, but if they are made to allow for more pieces than four, the length must be increased.

THE LATE FIRES.

The dreadful fires which have recently taken place, necessarily lead the humane mind to consider whether any thing can be done to prevent their recurrence. It is really lamentable, that in a place like London, we should be compelled to suspect persons either of wilfully destroying property, for the purpose of robbing insurance offices, or of a gross neglect by which, not only their own lives and property, but also those of others, are endangered. It is highly important, in either case, that something should be done by Act of Parliament, for the security of the innocent. who now suffer from the neglect or villainy of others.—Many Acts of Parliament have indeed been passed to compel persons to erect party-walls in all new buildings; but whether from the negligence of surveyors, or defects in the Acts, themselves they are rendered completely useless by those builders who hastily run up houses, with a view of realizing a large and speedy profit. Besides, a party-wall at the best, is only a security against fire in an adjoining house; whilst, from the nature of the construction of houses under the present system, they no sooner take fire than they are burnt to the ground. If Parliament were to enact that no new buildings should be erected without the staircase and floors being of stone, brick, or cast iron, in the course of another century, a fire would be a rare occurrence in the metropolis: whereas, under the present system, there seems no probability that they will ever be less frequent. In Paris, where the floors and staircases are chiefly of brick or stone, a fire is of rare occurrence indeed; and where it does break out, it is generally confined by means of a very small hand-engine, to the room in which it makes its appearance. It is generally understood that the profits in many of the English insurance offices, amount to much more than could well be supposed, from the number of fines which take place; this, however, arises from the insurances in the country, where the number of fires is so very limited, chiefly owing to the more steady habits of the inhabitants, and their retiring to bed early; it is an extraordinary fact, that in the town of Brighton, insurances were returned during ten years, by the different agents to their employers in London, to the amount of, at least, £20,000. without one shilling deduction for damage by fire.

Many means have been adopted at different periods for extinguishing fires, but none of them, up to the present moment, appear to have answered the expectations of the projectors. There are various solutions, whose property is immediately opposed to the principle of caloric or combustion, and very beneficial effects may be produced by them; but the expense at which these are provided, is far too great for ordinary purposes. Solution of ammonia, of Epsom salts, of potass, and various other things. thrown upon fire, have been found to check the combustion with much greater effect and rapidity than the same quantity of pure water. Steam, also, when thrown in a large body upon a burning substance, is found to act most powerfully; but such are the ravages of fire, that none of these means is adequate to the humane wishes of the philosopher. It has been proposed to erect an engine of such capacity, that an immense quantity of water might be thrown upon a burning house at one time; but here the objection is, that the roof of the house is seldom touched until the lower part is burnt, so that the fire can only be got at through the doors and windows, consequently an engine so constructed would be completely useless. The ingenious Captain Manby has invented a portable engine, which is found to be exceedingly useful in buildings of large dimensions, where it can be moved about from room to room, but this would scarcely answer in so confined a place as London, particularly as fires break out in the night, and have made some progress before they are discovered.—Mr. Barton, the engineer, has recently constructed an extinguishing engine, which consists of his patent hydraulic engine, attached to a water cask, and mounted upon a carriage with wheels, which he recommends to be kept continually full of water ready for instant use; so that the moment the fire is discovered, a supply of water could be conveyed to it, before the regular fire engines could commence operations, from the delay which is always occasioned by turncocks and others. Mr. Barton very properly observes, that a small quantity of water, when judiciously and instantly applied, will have a far greater effect than a much larger quantity, when the fire has gained any ascendancy. Mr. Barton's engine certainly deserves a fair trial, but we cannot conceal from ourselves, that all these things are calculated to produce a very evil effect, inasmuch as they remove from consideration, the radical cause of the mischief, and, whilst we are looking for palliatives, induce us to neglect the salutary preventive, that is in our power. We cannot conclude this article, without expressing a fervent hope, that another session of parliament will not pass over, without some act to redeem it from the disgrace which so culpable a neglect of the safety of the public, must have brought upon that body.

ON CRUELTY TO ANIMALS.

We have observed in the papers lately, that in consequence of a flaw in Mr. Martin's Act against Cruelty to Animals, the most ferocious ruffians are likely to escape with impunity. We sincerely trust that this Act will be rendered powerful at the next meeting of Parliament, and at the same time, that our legislators will adopt some efficient mode of repressing cruelty to animals of every description, in the upper as well as the lower ranks of society. If the rich will but make an inquiry into the propriety of some of their own diversions, they will feel that they must do one of two things, abandon the propensities which they have acquired of tormenting certain creatures, whose only offence is their helplessness, and so set an example to their inferiors; or at once abolish all acts tending to repress cruelty in others; thus ending at once the mockery of legislation, which renders *that* a crime in one man on which another founds his pretensions to fame in good society. What, for instance, can be more cruel than some of the sports of the field?—The fine fleet, high-bounding stag is hunted until he cannot move another furlong, when he takes the water, and, if not too scarce, is never saved. When torn by the hounds to his last gasp, a murderous falchion knife is presented as a high compliment to the person in the field whom that day the noble owner of the pack delights to honour, who dismounts and cuts the throat of the far more noble animal. This mark of honour is now in many stag-hunts dispensed with, but the huntsman performs the bloody deed before their eyes, which they complacently witness, while in either case the cruelty is the same.

What, again, is hare-hunting but cruelty in every sense of the word? Nothing short of the want of scent upon the ground can save poor puss. Her remarkable speed serves only to stiffen her frame while she stops to listen or to foil; her foiling is never very sagacious, and at last, with her heart bursting with terror and fatigue, she is either worried by the dogs, or is induced to make some desperate effort to avoid it. "I once witnessed," says a cotemporary, "not as a hunter, but as a casual spectator, this climax of her distress. Chased down to the shore of the raging sea, she dashed into the roaring tide, and swam off without a point of land to make, or an atom of rock to rest upon. I saw a boat put off after this poor hunted drowning hare, which having overtaken, returned with her to the beach; this poor distressed and tortured animal, stiff with running, cold with swimming, was, cruelly indeed, turned up again before the dogs, and, after staggering less than a hundred yards, was killed outright for the diversion of the hunters."

One would suppose that foxes, stags, and hares, were sufficient for our lords and gentlemen, who cry cruel, savage, brutal, and cowardly, when the people, one day in a year, bait or run a bull: while their legitimate sports last day by day, and week by week throughout all time. Even summer is pressed into their service, and the water for the scene of it. Trolling for pike, and angling for perch, become the amusements of the easy or indolent, while the active country gentleman unkennels his harriers and hunts the otter. It would be loss of time, and waste of ink and paper, to describe minutely the destruction of this aquatic animal. Imagine the poor thing so exhausted in the endeavour to evade his pursuers, as to be unable any longer to dive, and scarcely to make a swim of it; imagine the poor animal to be at this point of time transfixed upon a trident, a dreadful three-tined spear, and held up writhing in agony, while the dogs below are loud in every ravenous tone raging for their prey,—yet denied it by their masters, who, to save the skin of our English beaver, and thereby turn a penny, thus hold the poor impaled creature up until he dies:—now what, my masters in cant and hypocrisy, is cruelty, if this be not cruelty?

But if the amusements, as they are called, of the field, and precious amusements those must be, which delight man at the expense of the agony of poor animals, capable of feeling, aye, and of reflection too, for aught we know to the contrary, although we choose to swagger about this world's empires, and boast of our superiority—we say, if these amusements be criminal, what shall we say to the horrible contrivances of man for pampering his luxurious appetite?—What say ye, masters, to your *foie gros de Strasbourg*, (fat livers of Strasbourg) which are obtained by roasting geese alive before a slow fire, and giving them water to increase their agony, until their livers swell, and are fit for putting into pies, which are sent round to all the sovereigns and rich sensualists of Europe?—What say you of the delight which many of ye have expressed in eating lobsters, which you knew to have been boiled alive, or roasted upon a wooden spit?—And how many of you—we say, how many of the very enacters of Dick Martin's Act, have amused yourselves with placing live oysters between the burning bars of the grate, and devouring them as soon as they became brown and savoury.* Sucking pigs, too, to gratify your unnatural palates, are whipt to death to make them yet more tender and delicious; while the poor boar, in feeding, is constrained to one position for many months, in order that the part of his neck, denominated the shield, may thicken and grow into what is called brawn; a standing dish, and never out of fashion at your side-tables.

Cod-fish and skate, alive from the water, are crimped, that is, cut into yawning gashes, to make them firm. Tench are thrown alive into the stew pan, and eels are skinned alive. All these delicacies, in their season, are served up at the tables of the luxurious wealthy and great. And even ladies are not exempt from the horrible propensity of cruelty, against which, in the lower classes, we properly raise such an outcry;—they are known to have added to the imprisonment for life of a poor bird, the sorrow of blindness, and have deliberately ordered the torture of a red-hot knitting needle as the means of operation, by putting out its eyes, to improve its song. Insects, by collectors of curiosities for museums, are impaled on corking pins, and aquafortis poured into their wounds to preserve their colour; their intestines have been pressed out behind, and the orifice has been filled up with hot wax to preserve their shape; and these are but a scantling of the manifold cruelties of those who cant against cruelty in the lower orders.

Then, again, what a sad thing is it to reflect, that some of our best orators against cruelty, and in favour of Martin's bill, are notorious horse-racers and travellers, who boast, that they have performed with their own horses, from 15 to 20 miles an hour. Behold, for instance, 'the gay licentious proud, 'transported from place to place in their cushioned chariots, by post horses, always too good for such usage.

'Could the poor post-horse tell you all his woes;
Shew you his bleeding shoulders, and unfold
The dreadful anguish he endures for gold,

* This is a favourite practice with single men who sup at home.

Hired at each call of business, lust, or
rage,
That prompts the traveller from stage to
stage.'

Could he do this? Why he does not;—and yet man, unfeeling man, beholds his woes, and heeds not.

Then there are the poor creatures which run in the mails night and day, and which, beyond fair travelling speed, have woes innumerable, unpitied, and untold; as have all the poor animals that are sooner or later jaded to death in the public stages: and do not gentlemen in their own esteem—do not the scarlet-coated fox-hunters most cruelly and not unfrequently kill their gallant horses, by shamefully riding them past their condition, strength, and capability?—while last, not least, if not worst of all, behold the poor miserable worn-down horses of the hackney-coaches in London!

And yet all these are used for the comfort and convenience of those who rail against cruelty and brutality in the inferior classes.—Dogs, too, faithful dogs! have been, by medical students and lecturers, nailed to a table, and opened alive, to benefit mankind by improving the science of anatomy! Hath the frame of a dog the least resemblance to that of a man? We wish, from the bottom of our hearts, that men in general possessed but one-half of the generous qualities of a dog! Beautiful, faithful, highly-valued, dogs, have been brained or poisoned, hanged or shot, by brutal slaves, who are screened from justice by tampering knaves, to gratify the pride and domination of titled game-preserving despots, who, flattered and eulogised by the sons of Belial that surround them, scarcely know whether they go upon their heads or their heels.

In London, in Charles the Second's reign, a horse was baited. Evelyn, who makes mention of it, was a most humane man, whose mind dwelt upon rural objects in the simple elegance of nature, and he consequently speaks of it as very revolting to his feelings. It requires not this refinement to be greatly shocked at the brutality and barbarity of it. "There was," he says, "a very gallant horse to be baited to death by doggs; but he fought them all, so as the fiercest of them could not fasten on him, till they run him through with their swords. This wicked and barbarous sport deserv'd to be punished in the cruel contrivers to get money, under pretence that the horse had killed a man, which was false: I would not be persuaded to be a spectator." Now here gentlemen must have been concerned, for swords were used against the noble animal; and none wore swords in Charles the Second's reign but gentlemen.

Evelyn, in his most entertaining Diary, tells another baiting story, and bonny sport there must have been. In 1659, he notes, that "the Old East India Company lost their business against the New Company by ten votes in Parliament, so many of their friends going to see a tiger baited by dogs." Rather than not have seen this exhibition, they would willingly have endured the reproaches of the Old East India Company, for neglecting their interests. Perhaps, if all the truth were told, some knowing ones of the New East India Company kicked up the row with the tiger on the same day, in order that the sporting senators, not in their interests, might be better employed than in voting against them. This is what a certain son of Mars of our time, with more spurs on his heels than brains in his head, calls creating a diversion against the enemy.

We have enumerated a portion of those cruelties which are an indelible disgrace to the commonest humanity, much less to an enlightened and refined description of men, who call themselves christians and gentlemen; whose continual boast is of a greater share of benevolence, charity, generosity, and humanity, than is possessed by others of their rank and station in other countries; and who wind up their self-complacency with an hypocritical sigh for the sorrows of a poor animal goaded by drovers. Fie on such cant!—it is disgraceful to nature, and an outrage upon humanity!

MECHANICS' INSTITUTION.

MR. TATUM'S LECTURE.

We were much gratified on Friday evening, with Mr. Tatum's further remarks upon Electricity, in which he fully bore out all that we had advanced of him as a public lecturer. Before Mr. Tatum commenced any new experiments, he took a brief review of what he had stated at the preceding lecture, on the subject of the mode of charging the Leyden jar with positive and negative electricity; and on the coatings with which the jars are lined. But as we gave a very full explanation of these in our last, we shall not now do more than notice the experiment which he exhibited for the purpose of shewing that the tin foil has no other use in the jar, than in serving as a conductor to convey the electric fluid to the surface. In order to shew that this fluid resides in the glass of the jar, and not in the coating, Mr. Tatum charged and discharged a jar which was furnished with a moveable coating, and clearly demonstrated, that when the coating was withdrawn, the fluid remained, as the interior of the jar preserved the power of attracting light substances, such as pith balls, &c. which were strongly agitated in the jar, until the lecturer had conveyed away the fluid, by the friction of his hands upon the outside. When Mr. Tatum had concluded this experiment, he proceeded to remark more fully upon the property of positive and negative electricity; for which purpose he particularly dwelt upon an experiment with two jars, as subversive of a too general opinion, that when two clouds, charged with electric fluid, meet together, and cause an explosion, one of them must be charged with positive, and the other with negative electricity.—Two jars were charged positively, by taking eight turns of the machine, and the other with negative, by taking only four turns. In this state, one of the jars possessed double the portion of electric fluid; and on bringing the balls into communication, a strong spark passed, but it was proved, on applying the discharging rod, that both were charged positively. "Now nothing could more satisfactorily demonstrate," said the lecturer, "that it does not follow, as matter of course, that two clouds, when they produce an electric explosion, must be in different states of electricity; for in this experiment, two jars charged positively, the one more intensely than the other, when brought into contact, produced a spark quite equal in force, considering the small quantity of fluid engaged, to the explosion of clouds in a state of nature. It would be quite possible, therefore, for 2 clouds, each in a positive state of electricity, to produce such a discharge, and the equilibrium would be restored, by the cloud which was overcharged conveying a portion of its intensity to the other." It may not be amiss to remark here, that the doctrine which Mr. Tatum so satisfactorily refuted, is very generally held by philosophers, but we cannot imagine that many persons will assert its infallibility, after so simple but conclusive an experiment; for it may very fairly be assumed, that what nature is, under the control of the lecturer, such it must be in a state where it exists with no other control than that of the Creator. The question is not in itself one of real importance, for it can matter but little to science, as far as the fact goes, whether the discharge from two clouds is positive, or positive and negative; but it is of consequence in the prosecution of every study, to have the principles upon which we set out correctly established, and therefore any experiment calculated to shake our faith in an established doctrine, will lead to inquiries which cannot prove other than beneficial. If we may be pardoned this digression from the immediate subject of the lecture, we may observe, that many very important discoveries have been either prevented or retarded by the silly plan of taking for granted that which has been laid down by authority. No authority in such matters ought to blind a man to the conviction, that enlightened as we are, we are still in our infancy, as it regards some pursuits of science, and the weakest among us may be able to throw out some suggestion, which may elicit explanation, and produce conviction. To proceed, however, to Mr. Tatum. This gentleman, having concluded his experiment with the two Leyden jars, proceeded to offer some remarks, on the mode in which they were charged with greater or lesser intensity. It was, of course, easily understood that of two jars that charged by the greater number of turns of the machine would be the more intense, but much depended upon the vessel itself,—not upon its capacity, but upon the comparative thickness of the glass of which it was composed. Taking two jars, one of thick glass, and the other of thin, although equally of the same size, it would be found that the thin jar would hold, or rather would receive twice as much fluid as the thick one. Mr. Tatum proceeded to demonstrate this position, by taking two pieces of flat glass, each coated with tin foil, but differing in substance, the one being of plate, and the other of common window glass. The two plates being thus prepared, were then connected in the proper manner with the machine, by means of the striking electrometer, and it was found, in order to charge the thick plate with electric fluid, it was necessary to take five turns of the machine, whereas the thin plate was charged by only half a turn; thus not only proving by demonstration, all that the lecturer had advanced, but actually going beyond his own position, in the proportion of five to one.

In a preceding lecture, Mr. Tatum had informed his hearers, that he would perform some experiments, for the purpose of shewing the prevalence of a common error, as to what are called negative electrics. We were much struck at the time, with the emphasis which Mr. Tatum placed upon his statement, and were therefore pleased to find him so prepared on the present occasion to redeem his pledge. Mr. Tatum had contended that the same bodies could be made to produce negative and positive electricity, consequently, there could be no propriety in applying to them the term, negative electrics. In order to prove this, the lecturer brought forward his electrometer—the portion of his apparatus, which had produced some disappointment, on a former occasion, when he attempted to shew that the evaporation from the earth, caused by the influence of the sun, produced a surcharge of electric fluids, in the clouds, and led to the phenomenon of lightning. In a former lecture, it would be recollected by his audience, that he had shewn that zinc produced palpable signs of positive electricity on the electrometer, when excited by friction upon silk, and he would now undertake to shew that the same metal, when rubbed upon fur, would produce upon the electrometer the very opposite effect, viz., that of negative electricity. It was impossible for an experiment to be more successfully performed than this: upon the approach of the zinc to the electrometer, when excited by the friction upon silk, the gold leaves in the electrometer *diverged* with positive electricity, and on the contrary, when the zinc, after having been excited upon fur, was made to approach the instrument, the leaves *collapsed;* thus establishing the fact, that the same body could be made to produce positive and negative electricity. Sealing-wax, a resinous body of great and frequent use, in electrical experiments, was generally considered a negative electric, but this substance would be shewn to produce symptoms of positive electricity, if excited upon tin foil, by taking from that body a portion of its electricity, and thus becoming possessed of the fluid in a redundant state, so as to lose its character of a negative electric. The same body was here shewn to be capable of both positive and negative electricity, and therefore the argument which went to prove that certain bodies are absolutely negative was much weakened by experiment.

Mr. Tatum further exemplified the principle which he had laid down, by describing the effect upon pieces of silk of different colours, when submitted to friction;—these experiments are exceedingly curious and interesting. When yellow and black silk are rubbed together, the yellow becomes positively, and the black negatively electric: if, however, two pieces of silk, the one white and the other yellow, are rubbed against each other, the white becomes endued with positive electricity, and the yellow with negative. These results strongly demonstrate that the colours of the articles are powerfully concerned in producing such contrary effects;—the proportions, too, of their affinity for the electric fluid are clearly marked. It results that white has a greater attraction for or sympathy with the electric fluid than yellow, and yellow than black. This philosophy of colours has excited, and will long continue to excite, the speculation of scientific men and of students. Up to the present hour, we are by no means convinced of the rationale of experiments in which they are concerned; although it is but fair to observe, that from the observations lately made on their properties, as connected with the rays of the sun and of the moon, and of the mode in which they are affected by the electric fluid, we are in possession of more knowledge on the subject than could have been anticipated upon so mysterious a subject. Mr. Tatum continued his illustration by means of an electrophorus, which is composed of a plate covered with a resinous substance, from which a metallic plate, in an insulated situation, is made to abstract the electricity. The pleasing experiment of inflaming a stream of hydrogen gas was then performed, and the mode of operation explained. The combustible nature of hydrogen gas, and the extraordinary power of the electric fluid when in a state of explosion, require but little demonstration. They are two of the most subtle principles of nature, and it is only surprising that among the number of our aeronauts, none should have been struck by the electric fluid, when in the act of discharging a portion of hydrogen from the balloon. If, at such a moment, a discharge of fluid were to take place in the vicinity of the balloon, immediate destruction would be inevitable. The succeeding experiment was to shew the passage of the electric fluid to the conductor, from the cylinder of the machine. This was done by placing a wax taper between the conductors, after the striking electrometer had been connected with the machine. Upon turning the cylinder, the flame of the taper was driven from the positive to the negative conductor. To illustrate the position laid down by Mr. Tatum, that bodies in a different state of electricity attract each other, he took two jars, which he charged, one positively, and the other negatively; and having done this, threw upon the balls a powder composed of red lead and sulphur: a very beautiful effect was here produced—one ball became yellow and the other red, because one had attracted only the red lead, and the other the sulphur. A similar experiment was then tried with the electrophorus, and with precisely the same result. Mr. Tatum's last experiment on Friday evening, was for the purpose of demonstrating the power of the electric fluid when passing through a conducting substance, but with an inefficient conductor:—a bottle of oil, with a steel point passing through the cork, was held to the conductor; the spark having passed, and the fluid being driven to the different parts of the phial, it was broken in several places, and the oil was seen to ooze from the fractures. This experiment excited much interest, and was loudly applauded. Mr. Tatum gave notice that his next lecture would be on electro-magnetism and medical electricity—subjects which cannot fail of insuring a full attendance, from their importance to society.

MR. COOPER'S LECTURE.

On Wednesday evening, Mr. Cooper delivered a lecture at the Mechanics' Institution, on hydrogen and oxygen gases, chiefly for the purpose of shewing their effects, in reference to one of the most important elements of nature—water. Mr. Cooper explained that water is composed of hydrogen and oxygen gases, in the proportion of two volumes of the former to one of the latter. By placing a quantity of these gases in such proportions in a tube, and causing them to explode, Mr. Cooper demonstrated, most satisfactorily, that water was the result, as several drops were seen in the tube, which had previously been perfectly dry;* thus, by the decomposition of the gases, water is produced, as, on the other hand, by the decomposition of water, by means of Voltaic electricity, the result is hydrogen and oxygen gases. In order to demonstrate this fact, Mr. Cooper placed a vessel over the communicating wires of the Voltaic pile, and the water was discovered in a state of decomposition, and rising in a gaseous state. As the decomposition of the water was proceeding slowly, Mr. Cooper continued his experiments upon the gases; he shewed, that there were certain metals which would produce upon them, when so mixed, precisely the same effect as the electric spark; he would, however, confine himself, in the present instance, to platinum, because, as it was almost a new discovery, considerable interest and importance was attached to it. By placing a portion of finely-granulated platinum, or what is called spongy platinum, and rolled up into a ball, in a vessel containing a mixture of hydrogen and oxygen gases, in the proportions in which they exist in a fluid state, a decomposition took place, the gases disappeared, and the residuum was pure water; this water being decomposed, would, as he had already observed, give back hydrogen and oxygen gases. Mr. Cooper here observed, that in conducting these experiments, it was highly essential that the atmospheric air should be carefully excluded; because, if the slightest portion should find its way into the vessels containing hydrogen and oxygen gases, a violent explosion would take place, when ignited, which would be more or less dangerous, according to the nature of the vessels in which it was contained. If it were of thin substance, such as a bladder, for instance, the explosion would not cause much, if any, mischief; because it would at once find its way into the atmospheric air, and become dispersed: but if it was contained in a metal or thick glass vessel, the momentary resistance, which would

* In 1781, Mr. Henry Cavendish burned 500,000 grain measures of hydrogen gas, with about $2\frac{1}{2}$ times the quantity of common air, and by causing the burned air to pass through a glass tube eight feet in length, 135 grains of pure water were condensed. He also exploded a mixture of 19,500 grain measures of oxygen gas, and 37,000 of hydrogen in a close vessel. The condensed liquor was found to contain a small portion of nitric acid, when the mixture of the air was such, that the burned air still contained a considerable proportion of oxygen. In this case it may be presumed, that some of the oxygen combines with a portion of nitrogen present.

be thus offered to it, would produce a violent and very dangerous explosion. That water is really produced by the decomposition of hydrogen and oxygen gases, either by heat or the sudden explosion caused by the electric sparks and the agency of certain metals, such as platinum,* was very clearly explained by Mr. Cooper. He desired the audience to notice, that in close rooms, where there are gas lights burning, the windows will, on the inside, be covered with moisture, and frequently with large drops of water: the hydrogen gas mixing with the oxygen of the air, in such a situation as to prevent the free admission of fresh atmospheric air from the outside, would, when acted upon by the heat, become decomposed, and produce the effect here stated; a similar effect would be witnessed, but on a much less scale, by holding an inverted vessel over a candle. Mr. Cooper then proceeded to explain, that by the combustion of hydrogen and oxygen gases it might be ascertained how much of the latter had been used, as compared with the former; for instance, he took 87 measures of atmospheric air, and 55 measures of hydrogen (in this experiment the hydrogen must always be in a larger proportion than the atmospheric air to be acted upon)and in a short time it was found, that the quantity decomposed by the platinum, which he had added to the mixture, was 21 measures, thus making the quantity absorbed and returned to water 14 of hydrogen and 7 of oxygen. Mr. Cooper here took occasion to notice, that hydrogen had one property which it was highly necessary to mention, lest any person might become a sufferer from the ignorance of it;—it was found, that by imbibing a small quantity of hydrogen, very severe pains were felt in the chest and lungs, and that the inspiration, by being continued, might become fatal; one inspiration, however, could do no harm, and would produce a comical effect, viz. the total change of the human voice; † as a proof of this, the lecturer made one inspiration, and then said, whilst under its effects, "You see what effect it produces on my voice" in a tone so truly comical and unlike any thing that could be imagined from a human being, that it was a long time before the applause, which had been elicited by the astonishment and amusement of the experiment, would

* Platina is one of the metals for the knowledge of which we are indebted to foreign discovery. Its ore has recently been found to contain, likewise, four new metals, palladium, iridium, osmium, and rhodium; beside iron and chrome.

Pure or refined platina is by much the heaviest body in nature. Its specific gravity is 21.5. It is very malleable, though considerably harder than either gold or silver, and it hardens much under the hammer. Its colour on the touch-stone is not distinguishable from that of silver. Pure platina requires a very strong heat to melt it; but when urged by a white heat, its parts will adhere together by hammering. This property, which is distinguished by the name of welding, is peculiar to platina and iron, which resemble each other likewise in their infusibility.

Platina is not altered by exposure to air; neither is it acted upon by the most concentrated simple acids, even when boiling or distilled from it.

Platinum unites with most other metals. Added in the proportion of one twelfth to gold, it forms a yellowish-white metal, highly ductile, and tolerably elastic, so that Mr. Hatchett supposed it might be used with advantage for watch springs, and other purposes. Its specific gravity was 19.013.

From its hardness, infusibility, and difficulty of being acted upon by most agents, platinum is of great value for making various chemical vessels. These have, it is true, the inconvenience of being liable to erosion, from the caustic alkalis and some of the neutral salts.

Platinum is now hammered in Paris into leaves of extreme thinness. By enclosing a wire of it in a little tube of silver, and drawing this through a steel plate in the usual way, Dr. Wollaston has succeeded in producing platinum wire not exceeding 1-3000th of an inch in diameter.

† This gas is colourless, and possessed of all the physical properties of air. It has usually a slight garlic odour, arising, probably, from arsenical particles derived from the zinc. When water is transmitted over pure iron in a state of ignition, it yields hydrogen free from smell. It is eminently combustible, and if pure burns with a yellowish-white flame; but, from accidental contamination, its flame has frequently a reddish tinge. If a narrow jar filled with hydrogen be lifted perpendicularly, with the bottom upwards, and a lighted taper be suddenly introduced, the taper will be extinguished, but the gas will burn at the surface, in contact with the air. Animal life is likewise speedily extinguished by the respiration of this gas, though Sir H. Davy has shewn, that if the lungs be not previously exhausted by a forced expiration, it may be breathed for a few seconds without much seeming inconvenience.

permit him to continue. It was highly necessary that persons making this experiment should be careful not to approach near a candle, whilst the hydrogen is in the mouth, for he had known a person, who, after such an inspiration, approached near a flame, when the hydrogen, uniting with the oxygen of the atmosphere, took fire and exploded in the mouth. After this explanation, Mr. Cooper made some further remarks upon the decomposition of the gases by platinum, which, (we had omitted to state) becomes red hot when placed in a mixture of hydrogen and oxygen gases.*

Towards the conclusion of the lecture, Mr. Cooper stated that the experiments with the pneumatic trough, when filled with quicksilver, which is had recourse to, instead of water, to prevent the absorption which would take place of certain gases in that liquid, seldom succeed thoroughly, upon a small scale. In order to ensure success, it was necessary to have a much larger quantity of quicksilver than that which was before them, and which was about a tea-cup full: this, however, was sufficient to explain the principles of the science, and to carry conviction of what could be obtained, by a process upon a larger scale. He took a syphon, and explained the mode of introducing the ball of spongy platinum:—one leg of the syphon was filled with quicksilver, and the other with the gaseous mixture,—the ball being passed through the quicksilver, entered in a state free from contamination of atmospheric air, and produced the decomposition of the gases, which he had previously noticed. Mr. Cooper then stated that he would, in his next lecture, treat upon the compound of hydrogen, with iodine and chlorine, and withdrew from the lecture table amid loud applause.

At the close of Mr. Cooper's lecture, Dr. Birkbeck rose to inform the institution, that on Thursday, the second of December, the first stone of a new lecture-room would be laid in Southampton Buildings. He stated that it was not the wish of the committee that any particular formality should attend this circumstance, but as it was an era of importance, in the moral and social habits of mankind, he trusted that it would insure the attendance of all who could conveniently spare time for the purpose, and not only of those who were members of the institution, but also of others, who had been members, and who had quitted it. He was also most anxious that the gentlemen, who, from mistaking the motives of the committee, had not only quitted the institution, but had even been induced to acts of hostility against it, should attend, and that those who were still wavering in their intentions, as to becoming members, should take this opportunity of attending at so important an epoch in the history of the institution, that they might become associates with its instructed and delighted members. The short but sensible address of Dr. Birkbeck was delivered with a feeling of candour and benevolence, which rendered it acceptable to all, and this excellent man sat down amid the cheers of the institution.

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* When five measures of atmospheric air are mixed with two of hydrogen, and a lighted taper, or an electric spark applied to the mixture, explosion takes place, three measures of gas disappear, and moisture is deposited on the inside of the glass. When two measures of hydrogen, mixed with one of oxygen, are detonated, the whole is condensed into water. Thus, therefore, we see the origin of the name hydrogen, a term derived from the Greek to denote the water-former. If a bottle containing the effervescing mixture of iron and dilute sulphuric acid, be shut with a cork, having a straight tube of narrow bore fixed upright in it, then the hydrogen will issue in a jet, which being kindled, forms the philosophical candle of Dr. Priestley. If a long glass tube be held over the flame, moisture will speedily bedew its sides, and harmonic tones will soon begin to sound. Mr. Faraday, in an ingenious paper inserted in the 10th number of the Journal of Science, states, that carbonic oxide produces, by the action of its flame, similar sounds, and that, therefore, the effect is not due to the affections of aqueous vapour, as had formerly been supposed. He shews, that the sound is nothing more than the report of a continued explosion, agreeably to Sir H. Davy's just theory of the constitution of flame. Vapour of ether made to burn from a small aperture, produces the same sonorous effect as the jet of hydrogen, of coal gas, or olefiant gas, on glass and other tubes. Globes from seven to two inches in diameter, with short necks, give very low tones; bottles, Florence flasks and phials, always succeeded; air jars, from four inches diameter to a very small size may be used. Some angular tubes were constructed of long narrow slips of glass and wood, placing three or four together, so as to form a triangular or square tube, tying them round with packthread. These held over the hydrogen jet gave distinct tones.—*Ure's Chemical Dic.*

NEW MILK COMPANY.

Among the new schemes for the investment of capital, we notice a Milk Company, which is brought forward in shares of £50. each, and is said to be already yielding a profit of more than 50 per cent. The shares, however, are selling in the Money Market, at from 10 to 12 each premium. The advantage offered to the public by this company is very striking; they undertake to supply genuine milk from Alderney cows, at the same price as is now paid for the "real London double skimmed sky blue", and they have guarded against all fraud, on the part of the persons who carry the milk round to their customers, by locking the pails; so that no water can be put into them, after they are taken from the establishment. This precaution is a very wise one, for if the managers of the company be not rogues themselves, we may be certain of having pure milk for our families. In the ordinary milk trade, there are not less than three waterings: first the cow-keeper puts a little water into the pails, then the retailer, and lastly the servant who carries it round, and who fancies that he cannot do better, than imitate the example of his betters. We wish well to this new company, taking it for granted that they deserve our good wishes, and shall only observe, in addition, that we deal with them, and up to this hour have found nothing to censure.

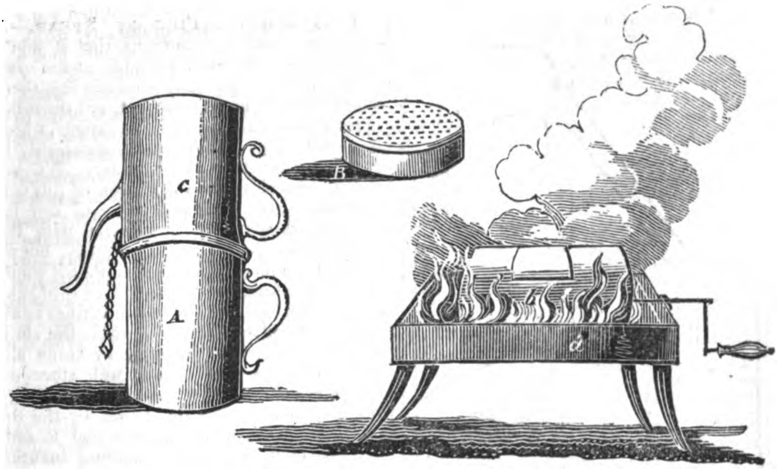
THE NEW WATER COMPANIES.

We understand that one of the new companies which has started, purposes to supply filtered water to the inhabitants of the metropolis, at the same price as the muddy stuff which now enters our cisterns. We do not profess to know upon what principle the proprietors propose to filter their water upon the large scale, but it may not be amiss to notice, that in Paris there is an establishment of this sort, in full activity, and which answers all the expectations of those who deal with it. The water in Paris passes over large beds of charcoal, through which it filtrates, and is conveyed to the reservoir completely pure. If something of this sort can be contrived, it will be desirable, and as charcoal soon loses a part of its purifying quality, when exposed to moisture, we recommend that its power should be renewed occasionally, by means of heating to a red heat the bed upon which the charcoal lies. This might be done easily, by a subterranean furnace, first discharging all the water in the reservoir. We have taken up this subject too late in the week to say much upon it, but we cannot refrain from observing, that at least one tenth part of the diseases with which the inhabitants of the metropolis are afflicted, arise from the impure water which they drink. We give but a poor chance to the physician or apothecary, in taking his physic which is made up with distilled water, whilst we, in the course of the day, drink several pints, perhaps, of that impure fluid which is supplied by the water companies. Until we can procure a supply of water whose purity will be guaranteed to us, it may not be amiss to give the following rules, for judging of the comparative purity of this fluid.

In the first place, pure water is considerably lighter than impure water, and it is also mere fluid; it has neither color, smell, nor taste, and wets more easily than the waters containing metallic and earthly salts; it is not rendered turbid by adding to it a solution of gold in aqua regia, or a solution of silver, or of lead, or of mercury, in nitre, and a solution of acetate of lead in water.

Mr. Perkins's Steam Gun.—It has been very generally, but not very correctly, said, that Mr. Perkins's Gun, although curious as demonstrating the power of steam, is inadequate to the purposes of warfare. Nothing, however, can be more unfounded than this assertion. A 36-pounder, with all its apparatus, steam boiler, generator, &c. may be drawn about a field of battle, by four or five horses, and discharged with fifty times the rapidity of an ordinary cannon. We have received seven or eight drawings of a cannon of this description, but as we expect to be favoured with some additional information on the subject from the ingenious inventor, we do not think it right just now to publish them.

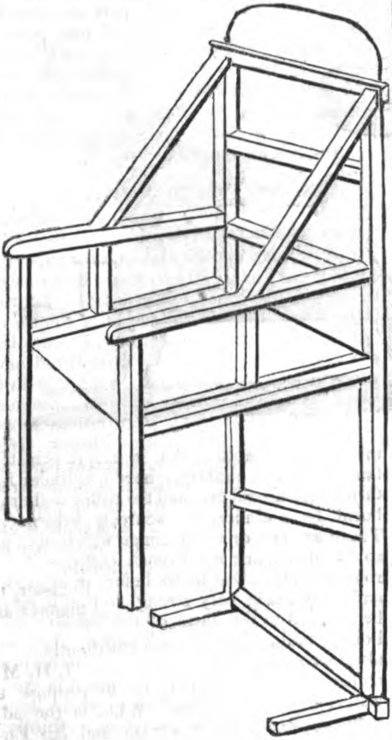
We understand that the Greek Committee were very anxious to obtain a few of Mr. Perkins's steam cannons, for the purpose of enabling the Greeks to hasten the surrender of Patras, and the other fortresses in Greece, which are held by the Turks; but that they were prevented from obtaining them by a treaty between Mr. Perkins and our ministry, for the exclusive right to these tremendous engines of destruction. It is now said, that Lord Gambier has reported of them most favourably to government, and that they will speedily be adopted. We are the more anxious for this, because we hear, from a Paris correspondent, that some person has submitted to the French ministry a plan of a steam cannon, for throwing, at each discharge, several tons of water, and which would, of course, be destructive at sea. We also find, that the French are making great efforts in their arsenals to prepare arms. One person has undertaken, by means of a new machine, to bore and finish cannon in 32 hours, which hitherto required three weeks or a month. We ought to have noticed, in our first article on the steam gun, that it will throw a ball with such force, that if a ship were to have a wadding of two feet thickness, the ball would still penetrate. We do not make these observations, because we wish for war—quite the contrary; we only desire, that if it should break out, it might be quickly finished.



ON COFFEE.

The above engraving represents a French patent coffee pot, and a coffee roaster. The pot is decidedly superior to any thing previously in use, in this country, as will be evident from a very slight inspection of it. A represents a tin coffee pot; B, a box pierced with holes, into which the coffee, ground rather coarsely, is placed; C, another pot, which fixes over B and A. A pint of cold water is placed in A, and about an ounce of coffee in the box, B, which opens in the middle, and fits into A as a snuff box. The pot, A, thus surmounted, is placed upon the fire, and when the water boils, which may be seen by the steam issuing from the spout, C, and which has previously passed through the box, and completely saturated the coffee, so as to prepare it for filtration, the apparatus is taken from the fire, and steadily turned upside down; the boiling water then drops through the box, and the coffee, beautifully clear, will be found in the pot, C, fit for use, by detaching it from A and B, and putting on an extra lid, kept for the purpose. The little chain has a plug to fit upon the spot when necessary to retain the heat. Boiled milk, in the proportion of at least half to the quantity of coffee, should be used with it, and it will be found excellent. The advantage of coffee made in this way is from the combination of superior quality with economy. In the ordinary filtering coffee pots, much of the virtue is left in the ground coffee. By the present plan, it is so saturated, that when the steam and water have passed through, it is utterly tasteless. The coffee roaster, D, is a large iron pan, in which wood is burned, and B, the cylinder, in which the berries are placed, is turned over the fire quickly; there is an opening in the cylinder, so that the operator may occasionally see the state of the coffee when burning. This mode is preferable to that in use, in private families in this country, where a cylinder is thrust into a coal fire, and the coffee is there burnt to a cinder, or scarcely browned. There are two or three things which obtain so great a name for French coffee;—it is roasted only a few hours before it is used, and it is made very strong, so that it may be reduced to the taste of the drinker by boiling milk. The French coffee, also, is always clear: the three modes of preparing coffee in France are, first, boiling it in cold water, with a little isinglass to clear it;—secondly, by the filtering machine;—thirdly, by infusion, viz., putting the coffee before a very slow fire, and allowing it to stew for several hours; when cold it is poured off clear, and made hot as wanted. This is a very prevalent mode in France, and a very bad one; for all the aromatic properties of the coffee are carried off by it. The best is to filter or to boil it in the simple way. In France, coffee is much adulterated with a powder called chicorée, the root of the cultivated dent de lion, dried, roasted, and pulverized. Some Englishmen imagine that it is this chicorée which gives the pure flavour to the French coffee; this is a mistake—no private family of respectability, or coffee-house keepers, use chicorée; it is only used by way of rigid economy: its properties are stimulating, and, when taken in quantities, dangerously so. It may here be remarked, that there is no beverage more wholesome than good strong coffee; none more pernicious than weak coffee.

Manufacture of Pins.—It is a fact, no less remarkable than correct, that a pin, trifling as it may be deemed to be, actually passes through eighteen hands in the completion of its manufacture. *Vide Smith on the Causes of the Wealth of Nations.*



SAFETY WINDOW CHAIR.

We have much pleasure in recommending to notice, a Safety Window Chair, the invention of Mr. J. C. Knight, surgeon, of Finsbury-place, to whose kindness we are indebted for the annexed drawing. So many accidents have occurred from the want of such an article, that we know not of terms sufficiently warm to mark our acknowledgment of the humane motive which led to the invention. Very little description, beyond the drawing itself, is necessary to explain its value. It will be conceived, that the fore legs hang within the window, and the others against the wall of the house, with the two projecting pieces to secure the balance, and fix it. A bedstead screw may be also passed through the stop at the bottom, to adapt it to different situations, and more effectually secure the chair. A female servant, or a boy, may sit in this chair and clean the windows with perfect safety. The iron rail at the back and the arms are contrived to give a greater appearance of safety, and completely to protect the back and body. The tenons at the different joints are so contrived that they cannot separate.

EXTINGUISHING FIRE BY STEAM.—A correspondent suggests to us, that it would be advisable to build portable steam engines, for the purpose of carrying them wherever fires may break out, and throwing upon the fire a stream of that vapour, which is found to be much more efficacious, in extinguishing fires, than water. We are much obliged by the suggestion of our correspondent, and trust that some of our ingenious friends will furnish us with the drawing of a plan for such purpose: but we must, at the same time, remark, that it would be much better to build houses fire proof, than to have the trouble of making machines to extinguish the fire. In Paris, where the staircases and floors are mostly of stone and brick, and the inside walls well stuccoed, fires occur very rarely: as a proof of this, it may be stated, that the losses by the fire offices in Paris, in 1823, amounted to only one 23-1000th part of the amount insured. We fear that the London offices can make no such boast.

GLASGOW MECHANICS' INSTITUTION.

This institution commenced its second winter session on the 8th instant. We feel happy to learn its continued success. The contributions for the purpose of obtaining apparatus, amount already to upwards of £150., and the library has also lately received very valuable additions, and consists now of nearly 1600 volumes. We have pleasure in recording a most valuable donation of no less than 60 volumes, in addition to former gifts, by J. Jamieson Craig, Esq. Mr. Northhouse, at the request of Joseph Hume, Esq. transmitted to the Library seven pamphlets, on various interesting subjects, from the pen of that able statesman, as a mark of his respect for the institution, and his wishes for its welfare. As to the new lecturer, Mr. Longstaff, report speaks most favourably. To an experience of twenty years, in scientific teaching, he superadds all the qualities of a philosophic mind. Such is his facility in prelection, that we are assured that he never has recourse to notes. In conclusion, we have to mention the most encouraging fact as connected with the objects of the institution, that the spirit of those for which the advantages are designed remains unabated. Their desire for useful knowledge has only received a keener edge from what they have already learned. Before the course was commenced, from between 400 to 500 students were enrolled, the great majority of whom are operative mechanics. One mechanic establishment has mustered upwards of 40, and another nearly 100 students. The mechanic who, with means of instruction so cheap and excellent, still remains ignorant, is culpable indeed.

Miscellanea.

New Instrument for Preventing the Escape of Urine after Operations on the Bladder.—M. Jules Cloquet has presented to the Royal Academy of Medicine, a syphon, which will exert a suction that can be graduated at pleasure, and is applicable "in all cases where there must be continual evacuation of liquids from the cavities or their proper reservoirs,"—and particularly in diseases of the urinary passages. It will also effect the evacuation of purulent matter from the thorax, &c., and of liquids from the stomach, in case of poison.—*Revue Médicale.*

A paper manufacturer in the country wishes to ascertain from any of our scientific readers, what course he should adopt to render the water which he uses in his avocation alike at all times, or in any other way preventing the serious evil which results from the difference of the water, from rain or other causes, when the pulp is made. He informs us, that if two parcels of rags of precisely the same quality, be made into pulp at different periods, it frequently happens, that one of them, from the state of the water, will turn out paper so inferior in color to the other, that the manufacturer is glad to dispose of it at two or three shillings per ream lower.

Origin of the Safety Valve.—A playful boy, whose business it was to open and close, alternately, the communication between the boiler and the cylinder of a steam engine, perceived that this trouble might readily be saved. Whenever, therefore, he wished to be at liberty, to divert himself with his companions, he tied a string from the handle of the valve, which formed the communication to another part of the machine that was in motion; and the valve then performed its office without assistance. The boy's idleness being remarked, his contrivance soon became known, and the improvement is now adopted in every steam engine.

Staples Inn, Nov. 13, 1824.

Mr. Editor,

Sir—The following fact, I conceive not unworthy of a space in your publication. Of course, I vouch for its accuracy, having received the statement from the gentleman who is the owner of the land on which they were produced, and at whose request I beg the favour of your inserting it.

I am, Sir, yours obediently,
W. POWNALL.

Extraordinary Production of a Potatoe.—The original potatoe, which was of an early kind, weighed one pound and a half; from this 85 setting parts were cut, whereof 84 grew; their produce amounted to 720, and their weight 267 pounds; their measure, 13 pecks, were grown upon 13 perches and a half of land, the property of a gentleman in Warwickshire.

ANSWER TO QUERY.

London Mechanics' Institute.

Gentlemen—Observing in your Register of the 13th instant the wish of a correspondent to be informed of the nature of the process of chrystallizing tin, I beg leave to inform him (through the medium of your Register) of the best I am at present acquainted with.

Heat the tin plate to be chrystallized, and place it on stone ware; then wash it with a weak solution of muriate of soda (common salt), upon which a chrystallization, more or less perfect, immediately ensues. If a stronger heat is applied to different parts of the plate, the chrystallization is made irregular, and a pleasing variety in the patterns is accordingly introduced. The plate is afterwards coloured at pleasure, by the use of a thin transparent coloured varnish.

Hoping every success to your Register, if carried on in the same impartial manner as at present, I remain,

Gentlemen, yours obediently,
Nov. 14*th*, 1824. J. H. M.

P. S. I also beg leave to propose a Query in your next, viz.—What is the advantage of Vaughan's Steam and Air Engine, in point of economy and power, over the present engines? the insertion of which will oblige J. H. M.

QUERIES.

To the Editor of the Mechanics' Register.

London, Nov. 14, 1824.

Sir,

As you have evinced, in your well-arranged Register, a desire to diffuse useful and amusing information, by means of question and answer, I am induced to hope you will insert the following, praying an answer from some of your many and able readers, " the safest and most efficient memethod of extracting the stain from cochineal?"

Simple as this query may appear to many, there are some to whom it is of paramount importance—those who, like myself, have often to regret the failure of their process, and the consequent loss of this costly and capricious commodity. C. Y.

To the Editor of the Mechanics' Register.

Sir.—Having lately witnessed several dangerous explosions of gas, I should be happy to learn through the medium of your Register, the best method of preventing their taking place.

Southwark. J. Atkins.

To the Editor of the Mechanics' Register.

MR. EDITOR.—Allow me, through the medium of your valuable and instructive work, to obtain from some of your well-informed readers, an answer to the following queries.

How does the gas smoke-consumer now used act upon the smoke?—and of what nature is the substance found in it after it has been in use some time?—Is the substance found therein at all like pure carbon?

Sir, I am yours,
An intended constant reader,
J. P.

To the Editor of the Mechanics' Register.

QUERY.—In what part of the world are buildings constructed with the least foundation, and why the cause?

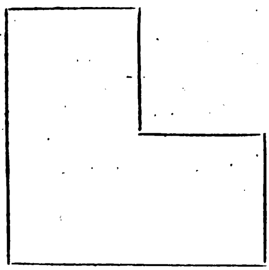
An answer to the above query from any of your numerous correspondents, will oblige, Yours, X. Y.

To the Editor of the Mechanics' Register.

SIR.—Being of opinion that Queries add greatly towards the improvement of the mind, I have sent you the following.

Who first introduced the Olympic Games;—for what cause were they instituted; for what purpose were they revived by the Greeks: and what were the number of years from their commencement to their conclusion?

PROBLEM.—Divide a field of the following form into four equal parts, each part to retain the *same form* as the original field:



NOTICE TO CORRESPONDENTS.

We feel much obliged to a *Member of the Committee* for his good wishes and his suggestions, which shall be attended to.

As many of our readers are perhaps unacquainted with the plan on which the London Mechanics' Institution is conducted, we shall, in our future numbers, give the Rules, Regulations, &c. of that excellent Institution.

Our numerous ingenious Correspondents who have favoured us with answers to the Query of *Box*, will, we are sure, accept our excuse for not inserting them, as they all correspond with the elucidations already given. To *Mr. Hollands*, for his very excellent drawing on the subject, we return our best thanks.

C. J. is respectfully informed, that the invention to which he alludes is not new.—It was exhibited in the "*Exposition de l'Industrie Française*," at the Louvre, five years ago. We do not, however, suspect him of plagiarism:—the same idea may occur to many minds.

Mercator's Observations on the causes and means of subduing fires, are very good, but having already devoted a considerable space to the subject in the present number, we fear that they would be considered superfluous by many of our readers.

Mr. Bernaud's suggestion about the engravings for the Mechanics' Register, have been attended to: he will find that expense will not form a consideration with the proprietors.

G.—*R. S.*—and *O. V.* are under consideration.

Viator will receive his M.S. on application to the publishers.

B. C. on Coffee Shops is exceedingly well written. They have, indeed, tended to improve the habits of the industrious classes, and merit an exclusive notice, which we will give to them.

We are compelled, by want of room, to postpone the promised articles on the Press, and on Iodine.

We are sincerely obliged to *Mr. Murray* for his communication relative to the attempts made to deface the bills of the Mechanics' Register—an unworthy opposition of this nature can only tend to injure its promoters.

We beg to recommend to our corresponding friends to send their communications as early in the week as possible, otherwise, from the accumulation, they must stand over.

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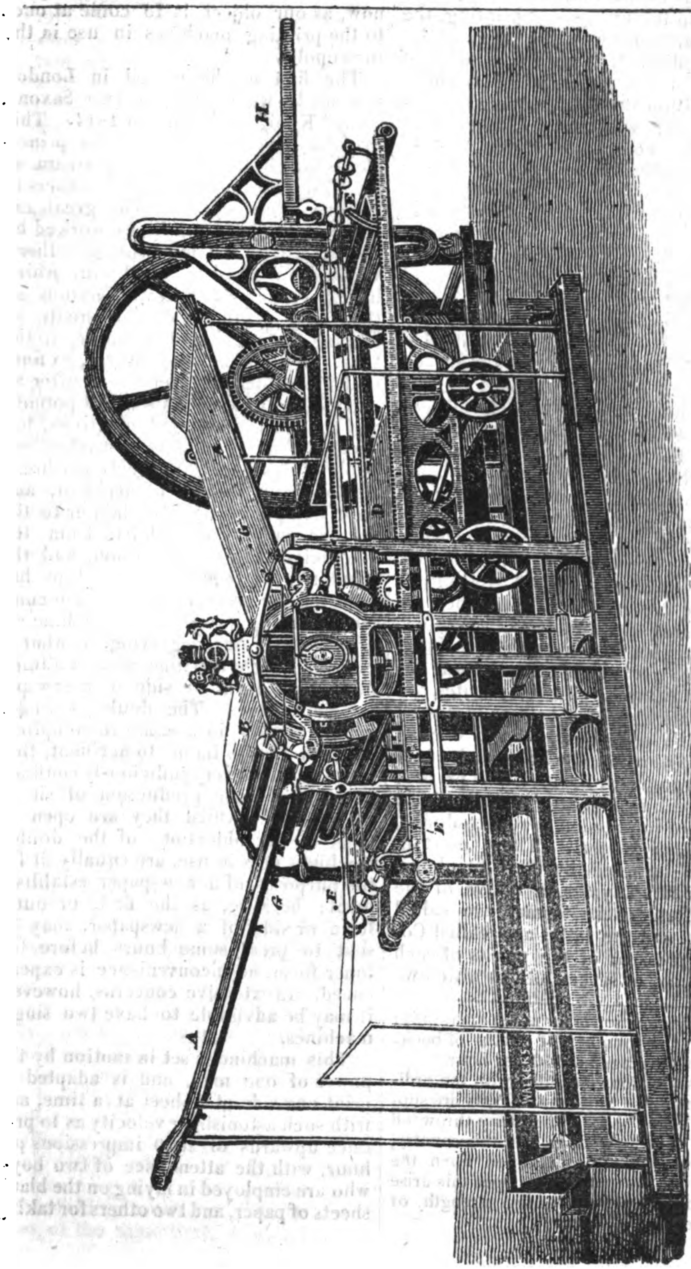
The London
MECHANICS' REGISTER.

No. 4.] SATURDAY, NOVEMBER 27, 1824. Price 3d.



MILLER'S PATENT PRINTING MACHINE.

MILLER'S PATENT PRINTING MACHINE.

Previous to the introduction of Machines into the business of printing, the press department was one of great labour and difficulty, and the number of copies of a newspaper, which could be printed within the hour, seldom exceeded 750,* even with extraordinary exertion. The consequence was, that in newspaper offices, where the circulation was extensive, it was found necessary, in order to get the paper published in time, to compose two or more copies, so that by going to press at the same time, the demands of the public might be complied with; thus occasioning an enormous increase of expenditure both in the compositors' and press departments. In a newspaper circulating seven or eight thousand copies, this expense, annually, could not have been less than £2,000.; all of which has been saved by the introduction of machines, which are worked by steam or hand. We are informed by one of the proprietors of the Constitutionnel Paris paper, that their annual saving, from the use of a machine, is more than 80,000 francs, (between three and £4,000. sterling) at which we are not surprised, when we consider that the number of the Constitutionnel is about 20,000 copies daily, and that to get it out in time, it was necessary to compose eight duplicates.†—A few years ago, the presses in use at most of the new-paper offices, were of wood, and were found wholly inadequate to the purpose; by degrees, iron presses, which combined greater rapidity with equality of impression were introduced, and became general. Those most in use were invented by Earl Stanhope, and by a Mr. Clymer, a native of the United States; the former are called Stanhope, and the latter are called Columbian presses: of the merits of each of these, and of several others which we have seen, we do not intend to speak now, as our object is to come at once to the printing machines in use in the metropolis.

The first machine used in London was made, we believe, by two Saxons, named Konig and Baur, in 1814. This machine, or one upon a similar principle, is now in use, worked by steam, at the Times office, and there are others in various other offices. The great expense of erecting machines worked by steam, led to the invention of others, which are worked by hand, but which have been liable to many objections on the score of the labour requisite in turning the wheel, and the injury to the type. We are happy, however, to find, that Mr. Miller, of Fleet Street, after an expenditure of several thousand pounds, and the most unwearied exertions, has succeeded in producing a machine capable of working 2000 sheets per hour, without any danger of accident, and with comparatively little labour to the persons employed; whilst, from the simplicity of the construction, and the regularity of the action, the type has not even the ordinary wear of the common printing press. The machine represented in our engraving, is what is called a single machine, viz., it admits of only one form or side of a newspaper at a time. The double cylinder machines now in use, are so complicated, and are so liable to accident, that Mr. Miller has very judiciously confined his views to the production of single ones; which, whilst they are open to none of the objections of the double machines now in use, are equally fit for the purposes of a newspaper establishment; because, as the first, or outer form or side of a newspaper, may be sent to press some hours before the inner form, no inconvenience is experienced. In extensive concerns, however, it may be advisable to have two single machines.

This machine is set in motion by the power of one man, and is adapted to print one side of a sheet at a time, and with such astonishing velocity as to produce upwards of 2000 impressions per hour, with the attendance of two boys, who are employed in laying on the blank sheets of paper, and two others for taking

* This estimation is for newspapers only;—the regular number of sheets of book-work being averaged at 250 per hour.

† It is a curious fact, that with the ordinary presses, the workmen in Paris are supposed to labour hard, when they throw off only 500 copies per hour. In this country, the same opinion is entertained when the pressmen do 750 per hour. Does this arise from the greater comparative strength, or industry of Englishmen?

off the printed sheets. The form of types is placed upon a carriage, which slides backwards and forwards along rails upon the fixed frame of the machine so as to pass beneath the surface of the large printing cylinder. The blank sheet of paper being first laid on the tympan, is carried down betwen rollers and tapes under the cylinder, which presses it upon the form of types, and prints it; from whence it is conducted forwards, and delivered on other tapes, where a boy is stationed to take it off The tapes which carry the sheet of paper along under the surface of the cylinder are narrow enough to lie in the spaces between the pages for printing. and do not therefore prevent the sheet from applying itself to the tapes, although they pass entirely across its surface, so as to keep it in place. These tapes are arranged over small pullies, which can be fixed at any required distance apart, so as to accord with the spaces between the pages for printing different kinds of work, such as folios. quartos, octavos, &c, The mode of procuring register is by points, which can be moved with every facility in any direction. The machine has two distinct sets of inking apparatus, one at each end, being so arranged as to furnish and distribute the ink by means of elastic composition rollers upon the form of types, as it moves backwards and forwards underneath them. The reservoirs of ink from which the rollers are supplied, are fixed on each end of the carriage, near which are also other rollers to distribute the ink uniformly over the surface of the inking rollers." The rollers being made to pass twice over the types before an impression is made from them, produce an effect in inking them equivalent to what would be afforded by passing the common inking roller four times over them, which is all that is usually deemed necessary to distribute the ink equally over the types, so as to render the impression clear and uniform. The feeding roller is supplied with ink by means of a trough and regulating scraper. While the impression is being produced, the receiving roller is brought in contact with the feeding roller while in motion, and receives a sufficient quantity of ink for the next impression, while the type carriage is returning to its first position. The distributing roller, whilst revolving, has, at the same time, a lateral motion given to it, in order to distribute the ink over the whole surface of the composition rollers. The mechanism, by which the moving power is communicated to the machine, is constructed on a principle entirely new, and the machine is worked with as much facility as a common printing press. The power of the pressing cylinder and of the inking roller can be regulated and adjusted with mathematical accuracy, so that a strong or a light impression, as the nature of the work may require, can be given with the utmost nicety. From the simplicity of the construction of the machine, and the very small degree of friction to which it is subjected, it is not liable to get out of order. When in full action, it can be stopped instantly, by one of the boys employed in laying on the sheet. The machines are so easily worked, that a steam engine, of the power of two horses only, would be sufficient to impel ten of them.

REFERENCES TO THE ENGRAVING.

AA. The tympans, on which the blank sheets re laid.

B. The printing cylinder.

CC. The inking rollers.

D. The form of types on the carriage.

EE. Reservoirs of ink, from which the rollers are supplied.

FF. Tapes which carry the sheet under the cylinder in the direction it has to travel.

GG. Register points.

H. The mechanism which communicates the moving power to the machine.

THE PERIODICAL PRESS.

In a former paper we stated the number of newspapers printed weekly in the united kingdom at 500,000; we shall now say something of the periodical press, exclusive of newspapers. Thirty years ago, the number of weekly publications in the metropolis did not exceed 40; we may now, without exaggeration, state them at 150. The monthly periodicals have not increased to the same extent, because the increase in the weekly ones would naturally prevent it; but they are very numerous. In addition to the periodical publications of the metropolis, we may notice several, and many of them of real talent, in the large towns, such as Edinburgh, Dublin, Glasgow, and Liverpool. It is not in our power to state their precise number, but it is certainly within bounds to estimate them at 50, so that the total of the weekly periodicals would be 200. The number of sheets printed must also, in some degree, be matter of doubt; but, from the accounts which have been delivered to us, and which we have every reason to consider authentic, we may strike an average of at least 2,000. Many of these works do not exceed 1,000; but there are several which exceed 5,000; consequently, our estimate will not be extravagant: we shall thus have a weekly account of 400,000 sheets of paper, used for literary, political, and scientific publications, in addition to the 300,000 newspapers already noticed, making a total of 700,000, to which may be added the weekly proportion of the magazines which are published monthly. The number of sheets thus used appears, from the accounts which we have been able to collect, to be about 280 000 monthly, which would be 70.000 weekly: this, added to 700,000, would make a total of 770,000 weekly, or 40,040,000 annually, without reference to books, pamphlets, or any productions not strictly periodical. This number, reduced into reams, would make 80,080, which, at an average of thirty shillings per ream, would be £120,000. expended for paper annually; to which may be added, at least £100,000. for the expense of editing and printing. Our sum total of expenditure by the periodical press, annually, will, therefore, be as follows:—

Paper, ...	120,120
Stamps for newspapers, . .	346,667
Expences of editing and printing newspapers	223,000
Ditto for other periodical publications	100,000
	£859,787

expended annually by the periodical press, exclusive of the duty paid to government, as duty upon advertisements. If we carry the statement further, by way of curiosity, we shall find that the number of sheets printed upon annually, in this kingdom, in periodical works, would, if laid together, cover a space of nearly 19,000 miles, taking the average size of the sheet at about two feet and a half. From all that we have stated, it will readily be conceived, that the present improved state of society, and the perfection which we witness in the various departments of life, are entirely to be ascribed to the mighty engine—the press. It must, of course, strike every one with wonder that so immense a number of periodical works should be published, when the population is considered; but as there is no such thing as setting up an opinion with success, against a fact, we can only observe, that our calculation proves at least, that we live in a reading and thinking country.

COFFEE SHOPS.

A strange revolution in the habits of the industrious classes has been caused by these establishments. Formerly, the mechanic and the labourer had no other mode of passing a leisure half hour than in a public-house, where pipe begat pipe, and glass begat glass, until the brain of the votary was turned, and he became by degrees a toper, neglecting his duties, and of course wasting the earnings of his industry.

Such is not now the case. The industrious man enters a coffee-shop, has his pint of tea or coffee and a round of toast for 5d. or 6d., reads the papers and magazines, and departs refreshed in mind and body. There is no calculating the extent of the change thus effected; but it may be fairly stated, that in the 500 coffee-shops of the metropolis, there are not less than from 15 to 20,000 daily customers, who formerly passed all their spare time, and much of what they could not well spare, in public-houses. There cannot be a reasonable doubt entertained, that the savings' banks owe much of their prosperity to the establishment of coffee shops, and that the wives and children of many persons, who previously had great difficulty in obtaining enough from them to purchase bread, are now living in comfort. It would be underrating the thing considerably to say, that from 40 to £50,000. less are spent annually in public houses, since these coffee-shops, against which so much has been foolishly said, raised their modest heads in the metropolis.

Soon after we had written the above, a subscriber obligingly directed our attention to a very excellent treatise in manuscript, on coffee and economical coffee-houses, by Mr. Whitaker, a gentleman who was mainly instrumental, by his well-timed representations in preventing the suppression of economical coffee-houses, or, as they are generally called, coffee-shops, with which they were threatened, merely because some few of them were found to receive improper characters at a late hour of the night We regret exceedingly that our limits will not permit us to give many extracts from the work this week: we shall, however, with permission, offer to our readers the first part of his very interesting history of coffee.

HISTORY OF COFFEE.

The best history of the coffee plant that I have yet met with, is that which was published by a Mr. John Ellis, F.R.S., agent for the island of Dominica, about the year 1774; in which work Mr. Ellis traces the earliest account of coffee from an Arabian manuscript in the French king's library, which states, that "about the 15th century, one Gemaleddin, a mufti of Aden, a city in Arabia Felix, having occasion to travel into Persia, saw some of his countrymen drinking coffee, which at that time he did not much attend to; but some time after this, being then in his own country, and feeling unwell, remembering what he had witnessed respecting coffee, when in Persia, he determined to try the experiment of drinking coffee, from which he not only recovered his health, but perceived many useful qualities in the liquor, such as relieving the head-ache, raising the spirits, and without injury to the constitution, preventing drowsiness. This last quality introduced its use among the religious Mahometans, as it enabled them to pass the night in the exercise of their religious duties with great zeal. Men of letters, and persons belonging to the law, next adopted the use of it; these were followed by the tradesman and the artizan who had occasion to work at night, or such as were obliged to travel after sun-set, and it shortly became the general beverage in the day-time.

Coffee having been thus received in Aden, it passed by degrees through many neighbouring towns, from whence it reached Mecca; here it was first used for the purposes of the religious; but the inhabitants of Mecca having become so fond of this liquor, it was drank publicly in houses opened for the purpose. In these houses, chess, and other games were played, and the people amused themselves with music, dancing, singing, &c., which being contrary to the manners of the rigid Mahometans, produced some disturbances; and it being declared that coffee much resembled wine in its exhilirating properties, the drinking of which is contrary to the Mahometan religion, the use of it was by the government restrained. However, coffee continued its progress through Syria, and was received at Damascus and Aleppo without opposition, and in the year 1554, about one hundred years after its introduction by the Mufti into Aden, it became known to the inhabitants of Constantinople; when two persons, one from Damascus, and the other from Aleppo, each oponed a coffee-house, in Constantinople, and sold coffee publicly in rooms elegantly fitted up. These houses soon became the resort of men of learning, particularly the poets. Here persons of all professions mixed, even the officers of the Seraglio, and persons of the first rank about the court; and to such an extent were these places frequented, that the Imans complained loudly of the mosques being deserted, when the coffee houses were full of company. At length a petition was presented by the devotees, to obtain the condemnation of coffee; in which petition it was advanced, that coffee roasted was a coal, and that what had any relation to coal was forbid by law. After much grave deliberation, the chief of the law pronounced, that drinking coffee was contrary to the law of Mahomet. Immediately all the coffee-houses were shut, and officers appointed to prevent any one from drinking coffee; but the habit had become so strong among the people, that notwithstanding the prohibition, it was manufactured and drank in private rooms with closed doors. Government finding that they could not suppress the drinking of coffee *in toto*, permitted it upon paying a tax. Under this plan coffee houses were by degrees re-established, when a new Mufti, more enlightened than his predecessor, having declared publicly that coffee had no relation to coal, and that the infusion of it was not contrary to the law of Mahomet, the number of coffee-houses became greater than ever. After this declaration, the religious orders, the lawyers, and even the Mufti drank coffee, and their example was followed by all classes. The Grand Visiers, having authority over the places in which it was drank, raised a considerable tax, obliging each master of a coffee-house to pay a sequin per day (which, according to Chambers, is equal to nine shillings sterling). This continued till the Ottoman affairs were in a critical situation, in consequence of the war in Candia, when a total suppression of the coffee-houses took places.

The liberty with which the politicians of those days took took in speaking of public affairs, was carried to such an extent, that the Grand Visier Kupruli, suppressed them all during the minority of Mahomet IV., notwithstanding the loss of so considerable a revenue. Kupruli visited the coffee-houses incog., where he observed sensible grave persons, discoursing seriously on the state of the empire, blaming the administration, and deciding with confidence on the most important concerns. At the taverns, and other places of public resort, he observed that the company were chiefly engaged in singing and talking of gallantry, feats of war, and other matters unconnected with state affairs; these places remained unnoticed. But such was the desire for this drink, that although the coffee-houses were shut, it became the custom at all private houses, to offer coffee to all private visitors, and all protestations of friendship made during the drinking of coffee, were remarked to be more attended to than those made under the influence of more intoxicating beverages."

(*To be continued.*)

LONDON MECHANICS' INSTITUTION.

MR. TATUM'S LECTURE ON ELECTRICITY.

Previous to Mr. Tatum's commencing his experiments on Friday evening, on Medical Electricity and Electro-Magnetism he very judiciously referred to what he had said at the preceding lecture on the subject of positive and negative electricity, for the purpose of pointing out the prevalent error of considering as negative electrics, bodies which are made to evince, under different circumstances, signs of positive and negative electricity.

He then proceeded to make some observations on electricity as applied to medical purposes, and which is therefore called medical electricity. In doing this, Mr. Tatum did not advance any particular opinion as to the efficacy of electricity in the cure of disease, but rather stated the position as one which had been generally entertained by the public. Mr. Tatum, however, in the course of his illustrations, noticed one case which had fallen under his own observation, and in which the application of electricity was found to be of decided utility. A gentleman who belonged to a scientific institution, which assembled at the house of the lecturer, had, in an excursion on the water, taken cold, and became sadly afflicted with pains; to remove which, he was advised to have recourse to electricity. Under these circumstances he applied to Mr. Tatum, who administered several shocks, which completely removed the affection. The patient, however, who appeared to have a great propensity for water excursions, in one of these recreations again took cold, and again was cured by electricity†.

Mr. Tatum in order to explain the mode in which the electric fluid is administered in cases of affliction, requested some gentleman present to walk towards the lecture table. It was not long before a young gentleman offered himself, and was accepted. The supposed patient was then placed upon a stool, which we have already described as having glass legs, so that the party may be insulated, and prevent the fluid from passing through the earth; and the shock was communicated by means of the striking electrometer, in any part of the body. Thus, for instance, supposing the seat of disease to be between the shoulders, the fluid could be passed through one shoulder, by means of one conductor, and drawn to the other shoulder by the other.

The modes of administering the shock are, however, various. It may be done by the striking electrometer, direct from the machine; or a jar may be charged, and the party on the stool receive it from that vessel; or a small jar may even be charged, and conveyed into another room, and the electric fluid be imparted with almost equal efficacy to the patient at that distance. The young gentleman who had been operated upon, having found himself, at the end of two or three experiments, rather too powerfully affected by the fluid, which in a person of his age, and in the immediate proximity of the machine, with the air all around heated to the utmost point of electricity, by means of

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* Without designing in the slightest degree to detract from Mr. Tatum's merits as a public lecturer, and which we really consider great, we must be allowed, for the information of a numerous class of readers, to say something on Medical Electricity; which, although such an illustration might have been very properly considered superfluous by Mr. Tatum, in addressing an audience to whom he had previously explained the principles of electricity, may be really useful in a publication which started after the lectures at the Institution had commenced, and which therefore could not communicate such explanation. Medical Electricity is only the action of fire upon the system, in which it rouses an immediate energy, calling into play at the same time, the inert electric fluid which we all possess, and giving a vitality to any particular part where the circulation of the blood, or the healthy action of the juices, may, by cold, or accident, have been impeded. There are few persons who know any thing of the properties of fire, who do not believe, that its benefits would be material, if its energies could be applied without danger to benumbed or diseased parts of the human frame, where the origin could be traced to causes over which such an element could produce an effect. The electric fluid, when introduced to any particular part, has all the reviving powers of fire, without any of its dangers, in addition to the effect which is known to be derived from the mere shock of the application. It is upon the muscular parts of the human body that the electric fluid chiefly exerts its power; and there are very many instances on record, of persons who had for months been deprived of the use of their limbs, recovering of it by repeated appli ations of the electric fluid to the parts affected. We do not, by any means insist upon its virtues beyond certain limits, as was the case with a few medical practitioners, some twenty or thirty years ago, who almost pretended that it was an universal remedy; but in all instances of obstructed motion and circulation, no person would be wise who refused to make trial of a few electric shocks particularly when it is considered that they can do no harm, and that the benefit may be incalculable.—*Editor of the Mechanics' Register.*

two fires and several gas lights, was not surprising, withdrew, and had his place filled by a gentleman, who evinced considerable hardihood in sustaining the shocks. In the experiments upon this gentleman, there was nothing, however, of peculiar interest to notice. When they were concluded, Mr. Tatum and his assistants placed several large jars on the table, which they connected with the machine, by means of tin foil and a chain, for the purpose of forming an electric battery.

With this formidable apparatus, he proposed to shew the power of the electric fluid in magnetism, having previously stated that this fluid was found in a state of nature frequently to cause the magnet to deviate from its proper course, and that in storms of thunder and lightning the deviation was at times considerable.

Electro-magnetism,* the science upon which Mr. Tatum was then about to lecture, was described as one of considerable interest and importance, and the audience were fully prepared for the experiments. Mr. Tatum's assistant having taken about a hundred turns of the machine, for the purpose of charging the battery, which was of great force, Mr. Tatum took some needles, and having ascertained their magnetic polarity, proceeded to

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* Electro-magnetism was first discovered by a philosophic Dane, a Mr. Oersted, of Copenhagen, early in the winter of 1819; but which has since attracted much attention from Sir Humphrey Davy, Dr. Wollaston, and other gentlemen of science.

The following account of it from Ure's Chemical Dictionary may not be considered uninteresting:

"Let the opposite poles of a voltaic battery be connected by a metallic wire, which may be left of such length as to suffer its being bent or turned in various directions. This is the conjunctive wire of Mr. Oersted.

"Let us suppose that the rectilinear portion of this wire is extended horizontally in the line of the magnetic meridian. If a freely-suspended compass needle be now introduced, with its centre under the conjunctive wire, the needle will instantly deviate from the magnetic meridian; and it will decline towards the west, under that part of the conjunctive wire which is nearest the negative electric pole, or the copper end of the voltaic apparatus. The amount of this declination depends on the strength of the electricity, and the sensibility of the needle. Its maximum is 90 degrees.

"We may change the direction of the conjunctive wire out of the magnetic meridian, towards the east or the west, provided it remains above the needle, and parallel to its plane, without any change in the above result, except that of its amount. Wires of platinum, gold, silver, brass, and iron, may be equally employed; nor does the effect cease though the electric circuit be partially formed by water. The effect of the conjunctive wire takes place across plates of glass, metal, wood, water, resin, pottery, and stone.

"If the conjunctive wire be disposed horizontally beneath the needle, the effects are of the same nature as those which occur when it is above it; but they operate in an inverse direction; that is to say, the pole of the needle under which is placed the portion of the conjunctive wire which receives the negative electricity of the apparatus, declines in that case towards the east.

"To remember these results more readily, we may employ the following proposition: The pole above which the negative electricity enters, declines towards the west; but if it enters beneath it, the needle inclines towards the east.

"If the conjunctive wire (always supposed horizontal) is slowly turned about, so as to form a gradually-increasing angle with the magnetic meridian, the declination of the needle increases, if the movement of the wire be towards the line of position of the disturbed needle; it diminishes, on the contrary, if it recede from its position.

"When the conjunctive wire is stretched along-side of the needle in the same horizontal plane, it occasions no declination either to the east or west; but it causes it merely to incline in a vertical line, so that the pole adjoining the negative influence of the pile on the wire, dips when the wire is on its west side, and rises when it is on the east.

"If we stretch the conjunctive wire, either above or beneath the needle, in a plane perpendicular to the magnetic meridian, it remains at rest, unless the wire be very near the pole of the needle, for, in this case, it rises when the entrance takes place by the west part of the wire, and sinks when it takes place by the east part.

"When we dispose the conjunctive wire in a vertical line opposite the pole of the needle, and make the upper extremity of the wire receive the electricity of the negative end of the battery, the pole of the needle moves towards the east; but if we place the wire opposite a point betwixt the pole and the middle of the needle, it moves to the west. The phenomena are presented in an inverse order, when the upper extremity of the conjunctive wire receives the electricity of the positive side of the apparatus.

"It appears from the preceding facts, says M. Oersted, that the electric conflict (ac-discharge, immediately over the spot where they lay, the magnetic fluid which had been so abundantly obtained from the machine.

The effect of the discharge was a very pretty illustration of thunder and lightning, and would, probably, have produced more than an ordinary shock upon any gentleman who might have chosen to receive it. We had forgotten to remark, that when Mr. Tatum had arranged the battery, he explained that the same effect would be produced by a voltaic discharge, as from an electrical machine. Preparatory to the first discharge, Mr Tatum placed a needle, whose polarity had been previously ascertained by the magnet,* in a left-handed helik,† and immediately after the discharge, it was found that the eye of the

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tion) is not enclosed within the conducting wire, but that it has a pretty extensive sphere of activity round it. We may also conclude from the observations, that this conflict acts by revolution; for without this supposition we could not comprehend how the same portion of the conjunctive wire, which, placed *beneath* the magnetic pole, carries the needle towards the east, when it is placed *above* this pole, should carry it towards the west. But such is the nature of the circular action, that the movements which it produces, takes place in directions precisely contrary to the two extremities of the same diameter. It appears, also, that the circular movement, combined with a progressive movement in the direction of the length of the conjunctive wire, ought to form a kind of action, which operates *spirally* round this wire as an axis.

* The mystery attached to the theory of the magnet has long been subject of deep and earnest discussion among philosophers. We are, of course, unable to throw the slightest light upon the inquiries which have been made concerning it; that it is a mystery, and that it is God's pleasure at present that it should be so, are, perhaps, the best answers that can be made on the subject. We quote, therefore, with pleasure, the following observations from Bryan's Lectures.

"The whole that can be inferred of the nature of the phenomena of the magnet, is briefly this;—that it attracts bodies in the earth; and that it has a directive power which is variable, arising perhaps from the unequal diffusion of the magnetic power in the earth and atmosphere; depending on the different constitutional circumstances of each of them; together with the effects of heat and cold on that power. Its attraction is evident on bodies on the earth; and we know that the earth contains bodies of this attractive nature, for from the earth they are procured; and we must suppose its direction depends on the inequality of attraction in the earth. The variation in that direction may also depend on the parts which contain the attractive power being more or less heated. These natural and hidden causes being incalculable by us, we never must expect to arrive at a perfect knowledge or estimation of them. The magnetic fluid may be either formed of two kinds of elements united by affinity, these elements having a greater tendency to each other than to themselves; or the phenomena perceived of attraction and repulsion, in the former case, may be produced by the endeavour of the disturbed effluvium to place itself in equilibrium, and in the latter from its natural repulsion to itself. The directive power of the needle, and the mode of constructing compasses, are so well known, that it would be superfluous to introduce them here.

"Let us therefore conclude our observations on the magnet by religious and moral inferences. We find the most evident effects of Infinite Wisdom cannot be traced to their first principles by finite reason: why, then, should we attempt to understand the nature of spiritual existences, or discredit the truths of revelation, the sublimity of which must and should be beyond our conception and comprehension? Purposely has God ordained them so, to exercise our faith, and excite our attention to the other duties of religion.

Let us, then, regard these holy mysteries as evidences of the love of God to his creatures, as well as heralds of his pure and perfect intelligence. Let the attractive graces of the Gospel impel us towards the goal of happiness; for unless our inherent excellence be corroded by the rust of scepticism, or evil deeds, the precepts of our holy religion cannot fail to have due influence on our nature, which they are formed to attract by their mild dictates, to direct by their genial influence, and to govern by their steady, harmonious, and undeviating laws—laws at once impressive, benevolent, and just."

† A helik is made in the following manner. Procure some clean copper wire, such as is usually employed by bell-hangers: cover the same with black floss silk: then take a small metal or wooden cylinder, of about a quarter of an inch diameter, and form the left-handed helik thus: hold the cylinder in the right hand, and twist the wire already covered from the right hand to the left. For the right handed helik, hold the cylinder in the left hand, and twist with the right from right to left. The helik must be about six inches long, and inserted in a piece of glass tubing separately, of the same length; a small portion of the wire to project from each end of the glass.

needle had acquired a north polarity. A needle was then placed in a right-handed helix, and the battery being again charged, and the fluid discharged in the same way, the needle was found to have acquired south polarity. This experiment was repeated several times, for the purpose of enabling some of the members of the institution to possess needles thus acted upon by the electric fluid, and the lecture was then concluded. Before Mr. Tatum withdrew from the lecture table, he stated that his next lecture would be upon atmospheric electricity, and we were informed by gentlemen in the room, that it was likely to prove the most interesting of the season, from the nature of the experiments which would be made. It seems that a very ingenious and clever man, a Lieutenant Green, of the Royal Navy, has made the model of a ship for the purpose of demonstrating that there is great danger to the navy, from the nature of the conductors now in use in the navy. We understand that such is the construction of these conductors, that in the event of a storm, in which the electric fluid should be discharged in abundance, an entire fleet, if in port, and the ships close to each other, might be destroyed, and thus not only several millions of public money be wasted, but much human life destroyed. We do not of course pretend to offer an opinion upon the subject now, as it is likely to be brought regularly before the institution on Friday next, but we cannot allow the opportunity to pass over, without expressing the pleasure which we feel at witnessing the progress of an institution, in which subjects of such vital importance to society are discussed with a skill and judgment calculated to produce the most advantageous results. We shall watch Mr. Tatum's next lecture with much attention, and communicate a faithful account of it to our readers.*

MR. COOPER'S LECTURE.

Mr. Cooper commenced his lecture on Wednesday evening, by describing the manner in which the muriatic acid of commerce, or, as it is usually called, spirits of salts, is prepared. Mr. Cooper took a small retort, into which he placed some common salt, and by the addition of a little sulphuric acid, a violent action ensued, in the course of which, a decomposition took place, the result of which was a vapour rising in the glass, and which was muriatic acid gas, the sulphuric acid having combined with the base, and set the gas at liberty.

Mr. Cooper explained, that in consequence of the great absorbability of this gas in water, it was necessary to collect it over quicksilver, and also, that all the apparatus employed in the production of it should be perfectly free from moisture. By the addition of heat to the mixture, it was shown that the quantity of gas evolved was very considerable, and the vessel, as it stood over the quicksilver, was filled with muriatic acid gas: by passing a small quantity of water into the vessel, it was found that the gas was speedily absorbed, and the water rendered extremely acid, by the mixture of the gas, which produced a violent action upon the water, and a great heat. This water thus acted upon became muriatic acid of commerce, or spirits of salts, and it was explained that the contamination of iron in the gas produced the yellow colour of the acid, as sold in the shops. The mode in which muriatic acid is procured in large quantities in manufactories, was thus described by Mr. Cooper:—

A generating vessel, in which the common salt and the sulphuric acid are placed, is connected with a line of bottles, also connected with each other by tubes. The sulphuric acid acting, as already stated, upon the salt, sets the muriatic acid gas at liberty, which rises into the tubes, and saturates the water with which the bottles are filled, and which then becomes muriatic acid. Muriatic acid gas was explained to be of the same nature as all gaseous bodies, as to its invisibility; but when exposed to the action of atmospheric air, a dense vapour was seen to arise, which was the gas rendered visible by the impure state of the atmosphere. The weight of this gas was much greater than that of common air, for by holding a vessel filled with it downwards, it would be shewn that the gas would be speedily displaced, and the vessel filled with common air. Muriatic acid was not a supporter of combustion;—on the contrary, any combustible body, when immersed in it in a state of combustion, would be immediately extinguished. Mr. Cooper then proceeded to make some experiments, for the purpose of more satisfactorily explaining the nature and component parts of this gas. Red oxide of mercury, heated in the gas, produced the following result:—the oxygen of the oxide of mercury passed over to the hydrogen of the muriatic acid gas, forming water, and the chlorine united with the mercury and

* We regret exceedingly, that by an error of the press, in our last number, Mr. Tatum's observations on the comparative electric properties of thick and thin glass, were misrepresented in part of our impression. By substituting the word *thick* for *thin*, the matter will be seen to have arisen certainly from the cause above stated.

formed chloride of mercury. It was here repeated, that muriatic acid gas was formed of chlorine and oxygen, the immediate properties of which had been demonstrated in the preceding experiment. To shew the action of mercury itself upon chlorine, a mixture was heated in a retort, and the white vapour which was seen to roll over the vessel, was stated to be corrosive sublimate. An equal quantity of hydrogen and chlorine being put into a vessel, the electric spark was passed through it, and a new compound was produced, which had the power of reddening litmus paper, whereas, in the previous state of the mixture, the chlorine being in its active state, uncontrolled by the hydrogen, which remained inert until the spark passed, bleached the paper, as was shewn in a former lecture upon chlorine.

It was particularly noticed here, that the two gasses, in becoming muriatic acid gas, underwent no remarkable condensation, and no vacuum could be discerned in the vessel which contained them. Mr. Cooper now explained to the audience the mode of ascertaining the specific gravity of fluids, but as this part of the subject was but slightly touched upon, and as we intend shortly to give a table on this subject, it may be merely sufficient to notice that it is done by a vessel containing distilled water, the specific gravity of which is first ascertained, and then in the same vessel weighing the fluid, whose specific gravity is required, first ascertaining its degree of purity. Mr. Cooper next proceeded to make some remarks upon hydriodic acid, the mode of obtaining which from phosphorus and iodine, had been fully pointed out in a former lecture, for the purpose of shewing that this acid had the power of decomposing certain bodies, and producing very beautiful colours, which would probably be much used, if it were not for the expense which would be required in procuring them. By placing a small quantity of the hydriodic acid in solutions of lead and corrosive sublimate, two colours, a bright scarlet, and a yellow orange, are produced, but for this purpose, it is necessary that the acid should be in a very pure state. Mr. Cooper, at the conclusion of the last experiment, stated that his next lecture would be on combustible bodies. Our report of this lecture is rather brief, but this is, perhaps, a real compliment to Mr. Cooper, who wasted none of the time of the audience by useless remarks, and proceeded regularly with his experiments, illustrating each in plain, but concise terms.

At the close of the lecture, Dr. Birkbeck gave notice, that the Elementary School of Arithmetic, would be opened on the evening of Thursday, the 2nd of December, when the pupils would be supplied, at their own expense, with books and slates by the Committee, at prime cost. He also gave notice, that on the same day, at three o'clock in the afternoon, the ceremony of laying the first stone of the new Mechanics' Theatre would take place, and that a dinner would be provided at the Crown and Anchor, at five o'clock, at six shillings each. Tickets may be had of the publishers of this Register.

MECHANICS' INSTITUTIONS.

We are happy to see that these valuable institutions are likely to become general. At Ipswich an institution has been organized, and was to hold its first meeting on Monday; and we understand that exertions are making in many parts of Lancashire to introduce the same system. The Stockport Advertiser of Thursday last, when speaking of the idea of forming a Mechanics' Library in that place, has the following very sensible observations.

"The time is now gone by when the policy of improving the mental condition of these classes was a matter of doubt; experience has furnished convincing testimony, that the safest bulwarks of a nation's prosperity is to be found in the intellectual energy of its people. The opposition which the efforts of those enlightened philanthropists, who have devoted their talents to this ennobling cause, met with on the first promulgation of the principle of universal education, has long since been overwhelmed by a mass of facts, all tending to prove, that knowledge is the best gift that can be bestowed upon a people. And although there are yet some few bigoted individuals in the world, who contend that knowledge only unfits a man for the duties of his station, amongst sensible people we are happy to say, there are not two opinions on the subject. Little argument, then, is necessary to prove, that those institutions which aim at thus improving the mental faculties of the labouring classes, by supplying them with such books alone as will tend to the accomplishment of that object, are of a highly-important nature, and well deserving of patronage. If proof be wanting, it will be found in the success attendant on similar institutions wherever they exist, and in the rapid increase of them in various parts."

BRISTOL INSTITUTION.

Mr. Estlin delivered the third and last lecture of his course at the Bristol Institution, on Friday, the 29th of October. After taking a review of the parts demonstrated in the preceding lecture, (the muscles of the eye and the lachrymal apparatus), and adverting to the principal points in optics explained at the same time, Mr. Estlin proceeded to the application of the subjects which had occupied the two former lectures in explanation of the functions of the eye and the phenomena of vision.

Mr. Estlin then went on to the third part of his subject, the disorders of the eyes. Speaking of the dreadful effects of that pestilential disorder, the small pox, upon the eyes, Mr. E. said it was quite appalling to him to think of the deplorable cases of this nature he had witnessed during the last few months at the Dispensary. The small pox had lately raged in this city; many children had been carried off by it; (in some respects they might be considered the most favoured;) others had their eyes entirely destroyed; some were left with imperfect sight, or with diseases which would incapacitate them from gaining a subsistence; and these unhappy consequences were from the culpable neglect of vaccination. Mr. Estlin said he felt it a duty, whenever an opportunity offered itself, to give his opinion on this point. Apprehension had been excited from the occasional occurrence of small pox after vaccination; but were every vaccinated individual certain of taking the small pox, (in the mitigated form in which it usually appears after vaccination), or, were the deaths from small pox after vaccination multiplied a thousand fold, he should still consider the cow pox as one of the greatest blessings conferred by medical skill upon mankind! and he regarded the neglect of vaccination, or the inoculation of small pox, as an unnecessary and an unwarrantable risk of human life.

Amongst the subjects upon which we hear that lectures are likely to be given during the ensuing season in Bristol, is one to shew the little fear that is to be apprehended from the contagious effects of the Yellow Fever being communicated to the cotton that is imported into Bristol.

Magnetic Stratum at Leeds.—Mr. Cawood, of Leeds, has drawn up a particular account of the observations and experiments which he has made relative to the magnetizing of the iron rods used in boring a well at his foundry. Having shewn his paper to one of the Secretaries of the Philosophical Society, he was requested to read it in their hall, after Mr. West's chemical lecture on Wednesday evening, the 10th instant, with which request he complied, and a short discussion ensued after the reading. As the magnetic stratum thus discovered forms a new and curious feature in the geology of Leeds, we are convinced that our readers will have pleasure in perusing Mr. Cawood's description:—

"We commenced boring," says that gentleman, "in the usual way, by sinking a well five yards deep, and at the bottom inserting a pipe of six inches bore, for cutting off the gravel water, and serving at the same time as a guide for the further progress of the rods. The following is the workman's account of the strata through which the rods have passed; viz. at eleven yards from the surface—Strong grey stone, 2 feet 2 inches—Blue bind, 1 foot 7 inches—Light stone, 1 yard 1 foot 7 inches—Stone bind, 3 yards—Grey stone, 1 yard 7 inches—Blue bind, 1 yard 6 inches—White stone, 8 yards 3 inches—Strong bind, 2 yards 6 inches—Dark grey stone, 2 yards 10 inches.

"This dark grey stone is therefore about 31 yards from the surface, and here the rods are the most powerfully magnetized. An experiment was made a few days ago upon the rod which was passing through this particular stratum; the boss of the rod end, which is an inch and a half in diameter, and one inch deep, placed vertically, supported a bar of soft iron weighing 14 ounces; but by frequently applying bars of iron to the rod, in about a quarter of an hour its magnetic powers were so far diminished, that it would barely sustain 5 ounces. Four rods were then placed horizontally, and so as to keep up the magnetic circle, with the ends north and south. In passing the mariner's needle across the ends, it gave a rotatory motion to it, at a considerable distance; when the needle was held between a north and south affected rod, it vibrated like the verge of a watch, so long as it was held there.

"It did not appear, that by uniting four or five rods, the increase was so powerful over the influence of a single boss as might have been expected; but when a north and a south boss were united, and a common magnet presented to the under part of them they supported the enormous weight of four pounds and a half. The bosses united were 3 inches long, and an inch and a half in diameter. I caused a rod free from magnetism to be screwed to the rod 30 yards from the surface, where the supposed magnetic stratum lies, and the borers to proceed in their regular work for about an hour and a half, when, on drawing up the rods, the one which had been thus placed was found to have received considerable magnetic powers.

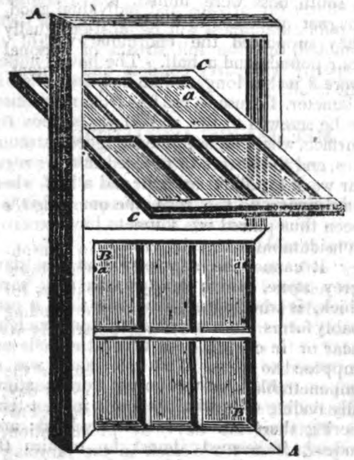
"It cannot be supposed that the dark grey stone, which is upwards of 2 yards thick, is wholly loadstone, but that it probably forms the crust of a loadstone nucleus, near or in contact with which the rods are supposed to pass. This grey stone was so impenetrable, that the borers were continually finding fault with the smith for not tempering their chisels sufficiently hard; and, indeed, it seemed almost to require the powers of a diamond to make any impression upon it. It may now be asked, why the magnetic power was not observed upon the rods at this time? To which it may be replied, that in all the accounts of boring in this neighbourhood and elsewhere, no similar phenomenon had been noticed, and it might have been altogether unknown in this instance, had not accident forcibly called attention to its predominating influence by a workman passing the rods with a piece of iron wire in his hand, which was immediately seized by them. From that time the magnetic power of all the rods has been on the increase, by their action (as I suppose) in passing through the two yards of dark grey stone before mentioned, so that now the whole of the rods, upwards of 90 yards, are to a considerable degree magnetized, but the rod which is always in contact with that stratum is the most powerfully so.

"Mr. Holdforth is boring in a similar way, at about 180 yards distance from us, where I went this morning to see the rods drawn, and found that about 20 yards from the surface the rods were slightly magnetized, and continued to be so to the bottom, 130 yards, so that it appears that the rods have there also passed through the outskirts of the magnetic stratum. Similar instances may, perhaps, have ocurred in other parts of the town, and escaped observation.

"If the cause which I have stated do not satisfactorily account for this phenomenon, I shall have great pleasure in finding the subject taken up in a more scientific way, and better and more fully elucidated.

"Leeds Foundry, 10th Nov. 1824."

IMPROVED WINDOW FRAME



AA represents the window frame; *BB* the lower, and *CC* the upper sash. The frame, *AA*, is fitted with grooves, weights, and pullies, in the usual manner; the fillets on the sash, which enter the grooves, are not made in the same piece with the sash frame, but fastened thereto by pivots, about the middle of the sash; upon these pivots the sash can be turned, as at *CC*, so as to get at the outside without disturbing the fillets or grooves. When the sash is placed vertically, as *BB*, two spring catches at *aa* shoot into and take hold of the sliding fillets, so that in this state the sash slides up or down in the usual manner, but can be immediately released, and turned inside out, by pushing back the springs, and at the same time pulling the sash inwards; this turns the outside towards the room, so that the sash may be easily painted, glazed, or cleaned, on the outside, by a person within the room, without removing the beads which confine the sash to slide up and down vertically. By inclining the sash on its pivot, so that the highest point may be within the room, it is obvious that the window may be left open in the most severe rain, without admitting a drop to enter the room, and that a person may look into the street without being wet.

HAND-LOOM COTTON WEAVING.

Much as the peculiar circumstances of the times have in years now past, pressed upon different classes of the community, and by causing reduction of wages have distressed some portions of the operative classes, none have been so much depressed, none have suffered so greatly, as the hand-loom weavers. Wages continually lessening, remuneration continually decreasing, and even when other classes of workmen received increased sums for labour, no such increase gladdened the lot of the weaver. As a body, no set of men have been more peaceable, none of more domestic habits, none of greater forbearance and quietness, than the hand-loom weavers; on these grounds they have always met with general sympathy; and their case has been pitied, though not relieved, by the whole public. Dispersed over the face of the country as the cotton-weavers are, one great cause of the original depression of their wages arose from the difficulty of acting in concert, as to the just price they ought to receive for their labour. Speculating and selfish master-manufacturers took advantage of this, and by gradually reducing the prices they would pay, ultimately produced a general reduction, which they again made still more. Did the weavers then turn out, or attempt to combine? they were terrified and taunted by the Combination laws, which, whilst they could not punish the masters for reducing to the lowest standard of the rate of wages, punished severely the poor weavers who met in order to try to raise them. Here was the injustice of these laws; here was their partiality; happily for all classes, this injustice and partiality no longer is legalized. Restrained by these laws from the just exercise of their rights, the weavers were unable to meet that spirit of competition among the manufacturers in the way which they would otherwise have done, and hence they were gradually reduced in wages. The introduction of machinery applied to weaving, took from the hand-loom weavers one portion of their accustomed employment, and necessarily, by throwing upon the other branches an extra supply of hands, reduced the wages still more. But the main cause of reduction of wages to the weavers, arose from a cause more sure and certain in its operation than either of the other two lesser causes, namely, the diminished demand for the produce of their labour. The demand for cambrics, jacconets, figured muslins, and other articles of cotton manufacture, which the hand-loom weaver produces, bears now no proportion to its former amount. The produce of the power-loom, in the variety of forms and colours in which by the aid of the printer it can be sent forth to the consumer, has superseded the produce of the hand-loom; the introduction of silk in the place of articles of cotton for dress has operated also; and never again can the hand-loom weaver of cotton hope for the same wages as formerly from his work. The Combination Laws, the introduction of machinery, and the decreased demand for cotton-goods, which must be wove by hand-looms, have thus, in our opinion, produced that depreciation upon the wages of the weavers, which in spite of general prosperity, still presses upon them. There is yet one other cause, which has been the creation of the weavers themselves, which has had a very material effect upon the prices of their labour, by throwing an extra number of hands upon the trade. Detached from all general sources of employment, as a great majority of the weavers are, and living in all parts of the country, a father of a family, as his children became capable of work, and anxious to have them under his own eye, put them all to the loom, and the whole family became weavers; thus, in the course of a few years, adding largely to the numbers. The additional number of hands thus employed caused additional competition, and most fearfully came in aid of the causes we have previously stated, to diminish the rate for labour. We think these will be found the true causes of a distress which no one can lament more than ourselves; a distress which we wish it were as easy to show ways of removal, as to point out the ways of its accumulation; there are, however, still bright shades in the picture, which may be the forerunners of a sunshine, as cheering as the present darkness is chilling. The repeal of the Combination Laws is to none of more importance than to the weavers; they can now legally meet, and take those measures, and make those agreements, which will ultimately benefit both their employers and themselves. The introduction of the silk manufacture, will supply the place of the cotton, and will amply provide employ for them all, while the prosperity of other branches of manufacture will induce a great proportion of their families to attend to them, instead of adhering to the employment of their fathers. The introduction of machinery into any trade, previously carried on by hand, must inevitably for the moment produce an effect of varied extent upon that trade; but its ultimate effects, by causing goods to be produced cheaper, and inducing greater purchases, and putting foreign competition at defiance; by causing a demand for artificers to make and keep in repair that machinery; by thus of necessity bringing into the country returns for exports, daily increasing, and adding to the capital and wealth of the nation, must be beneficial to all. In the mechanical arts, the same system must be pursued as in trade; if the merchant finds a demand for one article more than another he turns his attention to that; he invests his capital in the one most likely to make him a profitable return; so must the mechanic; if cotton-weaving does not pay, and he can get employment in other branches, let him do it, he will not only benefit himself, but all engaged in the same trade by so doing. To attempt to restrain by legislative enactments the use of machinery would be absurd, unless the law could be made all over the world;—take away all restraints;—make trade free;—let every individual engaged in it be at liberty to use his utmost efforts; by the efforts for private and individual good, the public happiness will be most effectually promoted, and the full stream of national prosperity will carry comfort and contentment to all.

MECHANICS' INSTITUTION.

REGULATIONS,

To be observed by Members frequenting the Reading Rooms.

The Committee of Managers, in compliance with the 100th section of the Rules, have adopted the following Regulations for the conduct and management of the Reading Rooms, which they trust will be strictly attended to by the members, viz.:—

I. That the rooms shall be open for the accommodation of the members every day, (Sundays, Christmas Day, Good-Friday, Fast and Thanksgiving days, by proclamation, excepted) from ten o'clock in the morning until ten o'clock at night.

II. That no member shall be admitted into the reading rooms without producing his card.

III. That written catalogues of the books contained in the library be placed in the reading rooms; and that, in order to afford increased facility of reference, the catalogues be arranged both alphabetically and scientifically.

IV. That each member shall fill up a printed book ticket with the title of the book required, signing it with his name, and affixing the date; and deliver it to the Secretary or his assistant, who shall immediately supply him with the book specified; and that the member shall return the book, and receive back the ticket before he leaves the room.

V. That no member be allowed to write in any of the books belonging to the library, or to deface, or to injure them in any other manner; but that every member shall be responsible for whatever damage any book may sustain while in his possession, or for its loss, if not returned agreeable to the fourth regulation.

VI. That for the general convenience and accommodation of the members, it is particularly requested, that they will avoid entering into any dispute or discussion whatever, as such conduct, on the part of any of the members, must necessarily interrupt and disturb the attention of others.

VII. That no member be allowed to partake of any refreshments in the reading room.

VIII. That a book be provided for the purpose of affording the members an opportunity of entering any remarks or suggestions which they may wish to submit to the consideration of the Committee, relative to the conduct and management of the Reading Rooms; and that this book be laid before the Committee every Monday evening.

JAMES FLATHER, *Secretary.*

NOTICE.—A Quarterly General Meeting of the members will be held at the Lecture Room, at Monkwell Street, on Wednesday, the 1st day of December, 1824, at eight o'clock in the evening precisely.

To the Editor of the Mechanics' Register.

SIR—I observe in the 3rd number of your work, that the French have a peculiarly-new mode of preparing Coffee, "by boiling it in *cold* water."

I shall feel much obliged by your informing me, through the medium of your interesting publication, the method of effecting it, not only for myself, but the community at large; as it must be a great saving in fuel, consequently, an economical and very desirable plan in these times?

You say—"it may here be remarked, that there is no beverage more wholesome than good strong coffee." I think, by applying to any medical man of the present day, you will find it is quite the reverse.

I am, Sir, your obedient servant,

C. H.

*** Our correspondent's WIT would have been better relished, if it had been called into play by a proper subject. What we meant by boiling the coffee in *cold* water, was in contradistinction to the practice of pouring hot water upon the coffee previous to boiling. We dare say we were perfectly understood, notwithstanding our correspondent's objection.—*Editor.*

To the Editor of the Mechanics Register.

MR. EDITOR—I beg leave to state that Mr. Cobbin's Portable Fire Escape is quite different from that used by the parish of St. Martin, the machinery of which is ingenious, but complicated, and which is not adapted for the use designed to be made of the Portable Fire Escape, namely, *to be fastened to an engine.* The St. Martin's machine shoots up several ladders, that, to the eye of the spectator, seem to rise one out of another, and all form one *undivided* piece of machinery. The model is, I believe, in the Society of Arts, and it represents it as fitted for a carriage solely devoted to its use. Of those in the Society of Arts there are none exhibited which are *portable* in the *compact* sense of the word, though there is one with a solid back, worked behind by one pulley and rope, and all in one piece, except the car, which runs in a groove, and that bears *a strong resemblance* to, while it wants the grand qualification of Mr. Cobbin's very convenient machine.

I am, Sir, your's, &c.—A READER

P.S. There is an evident mistake in stating the length of *both* ropes to be 80 feet; if the machine be 36 feet long, and each rope be twice the length of the machine, it must then be obvious, that the length of *each* rope is 80 feet.

QUERIES.

To the Editor of the Mechanics' Register.

SIR—Being in possession of a valuable piece of ancient silk tapestry, which in the course of years has become very dirty, I wish to ascertain, through the medium of your Register, the best means of cleaning the same, without destroying the silk, and also to restore the faded colours. W.

J. E. T. will thank any of the well-informed correspondents of the London Mechanics' Register, to inform him through the medium of that much-esteemed publication, the method of marbling the edges of leaves and leather, or binding of books.

SIR—I shall be obliged if any of your ingenious readers could supply me, through the means of the Register, with a varnish for playing cards, which should resist the heat of the hand, and admit of being washed, so as to cause a considerable economy in the use of that expensive article of amusement.

Yours, respectfully,

JACK OF TRUMPS.

SIR,—A coffee-house keeper wishes to obtain the method of curing sprats in imitation of anchovies.

SIR,—Allow me to submit the following Queries to the readers of the Mechanics' Register.

I. What are the best and simplest means of proving the purity of gold and silver, as sold by the refiner?

II. Is it by the same, or a similar method by which gold is beat in England by the gold-beater, that platinum is now hammered in Paris, into leaves of extreme thinness?

An insertion of the above in your respectable miscellany will much oblige

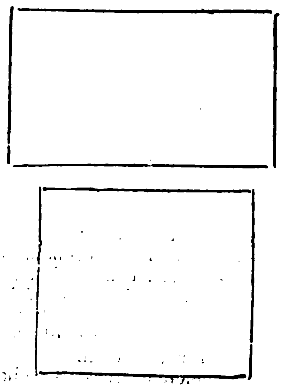
Your obedient servant,

A GOLD-BEATER.

SIR,—Having in my possession a very valuable engraving, which has been splashed with dirty water, I wish to know from some of your readers, if it is possible to restore it to its former state, and by what means.—L.

SIR,—I shall feel obliged by your inserting the following Problem.

There are two pieces of wood of the following form. It is required that either of the two pieces shall be cut into two parts, in such a manner that when laid on the other piece it may exactly cover it.



I am, Sir, your obedient servant,

H. P. R

ANSWERS.

To the Editor of the London Mechanics' Register.

SIR,—It may not be generally known, that when water is thick and discoloured, a solution of alum in boiling water, when poured into the thick or discoloured liquid, will, in the course of an hour, completely clear it, and render it fit for use. C.

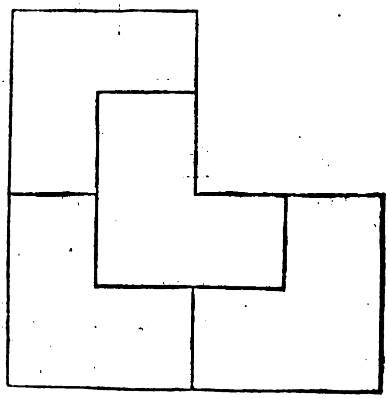
SIR,—In answer to the question proposed by "A Paper Manufacturer," in your last, permit me to state, that I have been informed Messrs. ——— and ——— dyers, Upper Clapton, were annually at an expense of 3 or 400*l*. to make water fit for use, which has now been saved, by employing Mr. Goode, of White Street, Finsbury, who upon boring, found water perfectly pure.

I remain, yours, &c.

J. C. K.

SIR,—Observing a problem in No. 3 of your esteemed work, I beg to offer you the following, and hope it will be found truly solved. Your obedient servant,

S. E. T.



We have to acknowledge similar solutions from W. R. T., Mr. Taylor, R, S., Juvenis Admirator, R. C. Emes, and several other correspondents.

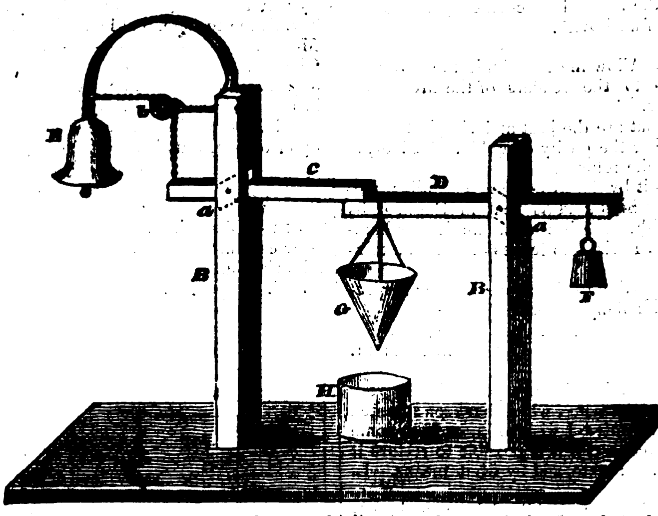
SIR,—For the information of your correspondent, who wishes to be informed of a cheap Alarum, and another, who requests to be informed of the method of Crystallizing Tin, I beg to forward the inclosed.

Yours, &c.

Southville. S. HOLLANDS.

MOIRE METALLIQUE.—This article in the Parisian manufacture, is produced with sulphuric acid, diluted in from seven to nine parts of water, and laid on the sheet of tin with a sponge or rag. The tin must be heated so as to form an incipient fusion on the surface, when the acid is applied, and the crystallization or moire ensues, the latter phrase being borrowed from the words used to designate watered silk, (soie moiree.) The citric acid is said to answer better than any other. By employing the blow-pipe before the acid, small and beautiful specks are formed on the tin, which may be afterwards varnished by any of the transparent varnishes, green, blue, crimson, &c.

A CHEAP ALARUM.



AA is a board, about two feet long and one foot wide, in which are inserted two upright pieces, *BB*, through which pass two beams, *C* and *D*, confined in their places by wire pins, but having the apertures through which they pass in the uprights cut, as described by the dotted lines at *aa*. *E* is a common spring bell, fixed to the top of one of the uprights, to which is attached a piece of whipcord, passing over a small pulley at *b*, and fastened to one end of the beam, *C*, whose other end must rest on that of *D*. *F* is a small weight, suspended from beam, *D*. *G* a tin funnel, having a very small hole at the bottom, also suspended from beam, *D*. *H* a tin vessel, similar to a saucepan, but without a handle, to receive the sand.

The method of using this alarum is by putting some very fine and dry white sand into the funnel, *G*, (the precise quantity of which must necessarily vary, according to the hour the party intends rising, but which, by a little experience, may be easily ascertained*); when a sufficient quantity of sand has passed through the funnel, *G*, the weight at the end of beam, *D*, will descend, causing the other end to rise, which also raising the end of beam, *C*, the bell will be thus put in motion. It may be placed on a chair, near the head of the person intending to use it; and the expense does not exceed a few shillings. Care must be taken to keep the sand free from dirt, and perfectly dry.

* This may be accomplished by observing how much sand passes through the funnel in one hour, and measuring it in a small vessel, to be kept for that purpose.

NOTICE TO CORRESPONDENTS.

We are much obliged to A Subscriber, for rectifying an error in our article on the Silk Trade in our second number. He states that the laws against the emigration of artizans were repealed in the last session of Parliament.

B. C. G. has been received,

W. B. is thanked for his communication.

A Constant Reader is assured that there was no delay in the publication of No. III. of the Register. His disappointment must have arisen from some neglect of the party through whom he ordered it.

The very numerous friends who have favoured us with communications this week, and to whom we cannot advert individually, are thanked for their favours, and informed that they are all under consideration.

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The London
MECHANICS' REGISTER.

"Be ye strong, therefore, and let not your hands be weak; for your work shall be rewarded."
II. Chron. xx. 7.

Nº. 5.] SATURDAY, DECEMBER 4, 1824. [Price 3*d*.

THIS STONE, THE FIRST OF THE LECTURE ROOM,
WAS LAID ON THE SECOND OF DECEMBER, 1824,
BEING THE FIRST ANNIVERSARY OF THE ESTABLISHMENT OF THE

LONDON MECHANICS' INSTITUTION,

BY

GEORGE BIRKBECK, M. D. PRESIDENT,

IN THE PRESENCE OF THE FOLLOWING OFFICERS OF THE INSTITUTION.

VICE-PRESIDENTS.	TRUSTEES.	AUDITORS.
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PROFESSOR MILLINGTON.	JOSHUA WALKER, ESQ. M. P.	WILLIAM ELLIS, ESQ.
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JOHN WHITAKER.	BENJAMIN TENNANT.	JOHN ETHELL.

CEREMONY OF LAYING THE FIRST STONE
Of the Mechanics' Theatre.

THE PROCESSION.

THE BUILDING COMMITTEE.

The Clerk of the Works, with Plans.

Chairman of the Building Committee. The Secretary, with the sealed bottle.*

TRUSTEES.

Henry Brougham, Esq. John Walker, Esq.

TREASURER, Mr. Sheriff Key.

SECRETARY, With the Book of the Laws, on a crimson velvet cushion.

SOLICITOR, William Tooke, Esq.

THE PRESIDENT.

Dr. Birkbeck.

THE VICE PRESIDENTS.

Professor Millington,—Dr. Gilchrist,—John Martineau, Esq.—Robert M'William, Esq.

THE APPARATUS COMMITTEE.

LIBRARY COMMITTEE.

GENERAL COMMITTEE.

* Contents of the bottle.—Rules and Orders of the Mechanics' Institution. An account of the first Public Meeting of the Institution. A copy of the Inscription on the first stone, beautifully embellished by Mr. Reynolds. Excellent Likeness of Dr. Birkbeck.

The ceremony of laying the first stone of any public building is always one of an interesting nature, but there has been no instance of equal interest and importance, bold as the assertion may appear, to that which it has fallen to our lot to record. It has been long acknowledged that the most influential class in society, ought to be that whose pursuits tend most to its happiness and improvement, but it has happened from various causes, to none of which upon an occasion so gratifying to our feelings, will we revert with acrimony, that this class, the Artisans and Mechanics of Great Britain, have, until the last twelvemonths, when the philanthropy and good sense of an individual roused them to a sense of their own value as men, and the public to a due appreciation of their importance—it has so happened, we say, that until that period they were kept from the rank to which they were entitled in society; first, by the refusal of what are called the superior classes to admit them to it, and secondly, from their own want of qualifications, generally speaking, as to their reasoning powers to seize and to maintain it. The last century produced many very able well-informed and well-behaved men, who did not blush at being styled mere mechanics; but the great body—we speak it without intending to offend the least fortunate of them, and we are sure that our meaning will not be misrepresented—the great body, we say, were comparatively ignorant of sciences beyond that to which they had in the way of industry turned their immediate attention, and the consequence was, that each mechanic was only skilful in his own pursuits, and that the mechanics as a body were neither learned nor scientific. It will not be denied, that the operative classes generally, from the comparative contempt with which they were regarded in society, did not devote their hours of relaxation from business to pursuits calculated to enlighten the understanding and to benefit society. It will not be denied, that many of them smarting under this contempt, which was disgraceful in fact only to those by whom it was bestowed, employed those hours in a way rather calculated to injure than to promote their own comfort. And we are sure that all our readers will allow, that there were few mechanics 20 years ago, who imagined that they were entitled to admission in certain classes of society, to which they now are not only admitted but eagerly invited. This revolution in their habits and feelings has been in a great measure produced by the general developement of mind within this period, but the astonishing improvement witnessed within the last year, can only be attributed to that excellent Institution of whose progress we this day give so gratifying a statement. The mode in which so important a change has been effected in the short space of one year, is so admirably stated in the Fourth Quarterly Report of the Institution, which will be found in the present number of the Register, that it would be useless and presumptuous in us to say more on the subject. We will therefore proceed at once to describe the ceremony of laying the first stone of the New Theatre, in Southampton Buildings, Chancery Lane.

The members, and others interested in the ceremony, began to drop in about two o'clock in considerable numbers. At half-past two the surface of the inclined plane of scaffolding was covered with a very genteelly-dressed and respectable multitude of persons. Arrangements had been made for the reception of ladies in one of the reading-rooms, but we regret that the disagreeable state of the weather deprived the occasion of the ornament of many female beauties. However, we were glad to perceive that some ladies, in their most laudable zeal for the success of the infant institution, had the resolution to brave the weather, and all the disagreeable consequences of dripping showers.

At three o'clock the committee, bearing a silver trowel and square, to which was appended a gold plumb, and other emblems, issued from the committee room in processional order, descended the grand staircase, passed through the hall, appeared on the temporary board-way, and mounted the scaffold, erected on a level with that part of the wall on which the commemorative stone was intended to be laid. The way was kept cleared by gentlemen, dressed in fashionable suits of black, bearing white wands. Having approached the stone in a very regular line, the several gentlemen successively declared the nature of the several memorials which they bore, and then deposited them beneath the stone. The stone was then, on a given signal, lowered, and thus the material practical part of the ceremony having been accomplished, Doctor Birkbeck turned round from the inscription stone to the spectators, and addressed them in a most able speech, of which we regret some interrupting noises allowed us to catch but the following portion:—

"My friends! we are about to erect a temple to the increase of knowledge, to the diffusion of the riches of mind, to the amelioration of the human intellect; we are proceeding to found an Institution for the improvement of the noblest faculties of man—we are about to prepare a feast of reason, to which the invitations shall be as universal as the dominion of knowledge—*(applause.)*—to the highest and the humblest, alike, and equal.—*(applause.)*—After the long lapse of partial experiments on the intellect of man, it remains for us to ascertain by the result of our present institution, whether the limits of practical knowledge can be effectively and successfully extended; whether the barren mind, which has hitherto marred the anticipations of the friends of intellectual advancement, is to be attributed to the imperfection of the culture, or the sterility of the soil. If we succeed in the effort we have undertaken—if we can enlarge the practical powers of the human judgment—if we throw a light over the gloom of mental listlessness—if we shall be so happy as to rouse to life the dormant energies of the mechanical capabilities of man, we shall have achieved the most glorious and useful work that a partial body of men can confer on the general community of their fellow men.—When laying the stone, let me remind you of a sentence uttered by Lord Bacon—"Knowledge is power."—Yes, gentlemen, and it is more; it is wealth, it is comfort, security, happiness; it gives a charm to social life, it makes morals more upright, it supports religion, and purifies politics; it is, to speak mechanically, an avenue and a road-way to the temple that is made without hands—to eternity in heaven!"

FOURTH QUARTERLY REPORT

OF THE

Committee of Managers of the London Mechanics' Institution.

The period being arrived for submitting to the consideration of the Members, the Fourth Quarterly Report of the progress of the Institution, your Committee, at the termination of the first year since its establishment, are happy to offer their sincere congratulations on the continuance of that cordial co-operation, on the part of the Mechanics of this Metropolis, which they confidently anticipate will enable them, at no very distant period, to carry into complete effect, all the important purposes contemplated by the establishment of the Institution.

In taking a retrospective view of the advances made towards the accomplishment of these objects, during the first year of the Society's existence, your Committee cannot but feel a conviction that its infancy has been as prosperous as its most sanguine supporters could have reasonably expected; and that the LONDON MECHANICS' INSTITUTION may, in this respect, fearlessly challenge a comparison with other incipient associations of a similar description. In the course of the first year since its formation, the Members have enjoyed the advantage of hearing valuable courses of Lectures on Mechanics, Pneumatics, Hydrostatics, Hydraulics, Chemistry, Astronomy, Electricity, and the Mathematics: they have been put in possession of extensive and commodious premises, situated in a central and advantageous part of the Metropolis, and admirably adapted to the various purposes of the Institution:—they have been enabled to obtain a considerable collection of Philosophical Apparatus, Minerals and Models, for the illustration of the scientific subjects so ably elucidated by the Lecturers:—they possess a Library containing a variety of estimable works on scientific and miscellaneous subjects, and which is rapidly increasing in extent:—they have constant opportunities of improving their minds by attending the Reading Rooms which have been opened for their accommodation:—and the preliminary arrangements are completed for commencing the establishment of Elementary Schools, and the erection of an excellent Theatre or Lecture Room, on their own premises in Southampton Buildings.

After this hasty sketch of the *past*, from which your Committee cannot avoid inferring a very cheering anticipation for the *future*, they beg to call your attention to a summary of their proceedings during the last Quarter; at the commencement of which, they took possession of the premises in Southampton Buildings, and immediately effected an insurance in the Imperial Fire Office for £1000., on the Furniture, Apparatus, and Books belonging to the Institution, the premises being already insured in the same office for £2500, up to Christmas next, agreeable to a covenant in the lease. The only obstacle to the admission of the Members to the use of the Library being removed by the occupation of the premises; your Committee, in a few days, opened a commodious Reading Room, and appointed a Sub-Committee to superintend the necessary arrangements for conducting it. These arrangements, they are happy to observe, have met with the uniform approbation of the numerous Members frequenting the Reading Rooms; and your Committee beg to add, that they have directed the appropriation of £50. from the funds of the Society, to the purchase of additional Books and Maps for the Library, only a part of which has yet been disbursed; and that the purchases already made, together with numerous donations of valuable works, have added 306 Volumes to the Library during the Quarter.

The erection of a Theatre or Lecture Room on the plot of ground adjoining the premises in Southampton Buildings, being an object of serious importance, your Committee procured several excellent plans, by the kind and gratuitous assistance of a number of gentlemen, to whose zeal and ability they feel deeply indebted, and appointed a Sub-Committee of Works to take the various plans into consideration; and to accomplish an object, which will concentrate in one spot, all the operations of the Institution. An excellent plan has accordingly been selected, and the necessary preparations having been made, the first stone of the new Building will be laid at three o'clock to-morrow; and the First Anniversary of the Institution will be thus distinguished by a ceremony, which your Committee trust, will long be remembered with feelings of sincere gratification.

With respect to the means of defraying the unavoidable expense which must be incurred for the erection of the Lecture Room, your Committee experience the highest satisfaction in stating, that every difficulty, which might have been apprehended from the want of adequate funds for this important purpose, has been removed by the handsome and liberal offer of your worthy President, to advance whatever sums may be required, in addition to subscriptions and other resources, at an interest of 4 per cent. Every impediment to the erection of the Theatre being thus removed, your Committee beg to add, that the most strenuous efforts will be exerted to complete the Building with the least possible delay, and they entertain no doubt, that its completion will not only conduce materially to the comfort and accommodation of the members as a Lecture Room, but that, from its central and convenient situation, it will become a source of considerable emolument to the Institution.

Your Committee have the satisfaction to state, that since taking possession of the premises, two institutions of the first respectability, viz. the Meteorological Society, and the Society of Associated Physicians, have commenced holding their monthly meetings at the Committee Room in Southampton Buildings, paying to this Institution a liberal recompense for the accommodation afforded them.

Your Committee have also to state, that the next subject of importance to which they directed their attention, was the establishment of Elementary Schools, for the instruction of the members in arithmetic, algebra, geometry, trigonometry, &c., and that a Sub-committee having been appointed for this purpose, the various applications received from members desirous of enrolling their names as pupils, were taken into consideration, when it appeared, that the applicants for arithmetical instruction were by far the most numerous, and it was accordingly determined, that the Elementary School of Arithmetic should be the first opened.

Your Committee having maturely examined the qualifications of more than thirty gentlemen, who offered themselves as candidates for the situation of Arithmetical Teacher, have engaged Mr. Collins, of Hatton Garden, in that capacity, under whose superintendence the School of Arithmetic will be opened to-morrow evening, at 8 o'clock, punctually, and will be continued every Tuesday, Thursday, and Saturday evening, from 8 till 10 o'clock.

Your Committee, in fixing the commencement of the first of the Elementary Schools for the evening of the day on which the first stone of the new Lecture Room will be laid, have been influenced by a wish to distinguish still more forcibly the First Anniversary of the Institution, and by a conviction that a number of the pupils, already enrolled, will not be precluded by the proceedings of the day from attending the school in the evening.

The various duties incumbent upon the Secretary, requiring his frequent absence from the premises in Southampton Buildings, and it being indispensably necessary that some person should be constantly in attendance, your Committee have engaged an assistant to the Secretary, for the protection of the property of the Institution, and the accommodation of the members frequenting the Reading Room, or attending at the office on business, and have taken proper security for the due performance of the duties attached to his situation.

The Report then notices the appointment of a Sub-committee, for the purpose of making arrangements for opening a new set of books, on a plan of systematic exactness, commensurate with the extent and importance of the Institution. From the hurry and confusion which were perhaps unavoidable, in the original formation of the Institution, and the absence of many documents which might elucidate the early payments of the members, as well as from the want of perspicuity in the subsequent arrangement of the accounts, the Sub-committee of Accounts have not yet been able to complete their arduous task, but as far as energy and perseverance can conduce to its accomplishment, they hope shortly to carry into effect their intention of presenting a clear, distinct, and systematic view of the pecuniary transactions of the Society, and a correct register of all the members who have contributed to its funds since its original establishment.

The financial affairs of the Institution were then alluded to, and a distinct statement of the receipts and disbursements for the last quarter was laid before the members, by which it appeared, that the finances were in a highly-satisfactory and flourishing state.

The number of members who had actually paid up their subscriptions to the present period, was stated to be about 750.

A Sub-Committee has also been appointed for the purpose of arranging the valuable collection of philosophical apparatus, models, minerals, &c., belonging to the Society, a considerable portion of which has been already deposited in suitable glass cases, and the Apparatus Committee expect that in a short time their arrangements will be completed for submitting the Museum to the general inspection of the members.

Your Committee have now to perform the pleasing duty of expressing their cordial feelings of gratitude to Mr. Newton, for his able course of Lectures on Astronomy; to Mr. Cooper, for his extensive and scientific course on Chemistry, as applied to the arts and manufactures of the country, now in progress; and to Mr. Tatum, for his admirable illustrations of the science of Electricity. To Mr. Fayerman, a member of the institution, your Committee are also happy to express their obligations, for the ability and perseverance with which he has arranged the whole contents of the Library in appropriate catalogues, both alphabetically and scientifically. They beg to announce, that at the termination of Mr. Tatum's Lectures on Electricity, which he has kindly consented to extend to Magnetism and Voltaic Magnetism, a course of Optics will be delivered, it is expected, by a gentleman of considerable philosophical attainments: thus completing the circle of sciences included under the head of natural and experimental philosophy, according to the order and arrangement of the celebrated Professor Vince, of Cambridge.

Your Committee have also to offer their warmest thanks to those gentleman who have so liberally contributed to the increase of the Library, and to announce to the members, the following numerous list of works presented to the Institution, since the last Quarterly Report, amounting to 165 volumes, exclusive of a number of periodical works which will be continued gratuitously by their respective proprietors.

Peckston on Coal Gas 1, Bompuss on the Nature of Heat, Light, and Electricity 1	2
Presented by Messrs. Underwood.	
Homer's Odyssey 2, Watts's Philosophical Essays 1, Eton's Survey of the Turkish Empire 1, Lock's Essay on the Human Understanding 2, Miscellanea Curiosa 3	9
Presented by Mr. Hardwick.	
Gren's Chemistry	2
Presented by Mr. Luckin.	
Long's Astronomy	2
Presented by Mr. Smythe.	
Young's Natural Philosophy	2
Presented by Robert Young, Esq.	
Beckett's Elements of Mensuration and Land Surveying 1, Moore's Navigation 1	2
Presented by Mr. John H. Marshall.	
Ferguson's Astronomy 1, Costard's History of ditto 1	2
Presented by Mr. Dotchen.	
Dryden's Poems 1, Collins's ditto 1, Phillips's ditto 1, Collins, Gray, Goldsmith, and Beattie's Poems 1, Pope's Poetical Works (4 vols. in 2) 4 . .	8
Presented by Mr. Tennant.	

Carey's Arithmetic 1
Presented by the Author.

Pasley's Complete Course of Practical Geometry 1
Presented by the Author.

Guy's Astronomy 1, G. Roberts's ditto Epitome of 1, Enfield's Scientific Amusements 1, Bonnycastle's Introduction to Algebra 1, Philosophical Survey of the Animal Creation 1 5
Presented by Mr. Fayerman.

Minutes of Evidence before Committees of both Houses of Parliament, on the West Middlesex Water Works Bill . 1
Presented by Mr. Millington.

Green's Natural Philosophy 1, Rowning's ditto 3, Hale's Statics 2, Rohault's Natural ditto 2, the Tatler 4, Heron's Elements of Chemistry 1 . 13
Presented by Mr. P. Thompson.

Beckett's Mensuration 1, Knox's Essays 3 4
Presented by Mr. Morland.

Worster's Natural Philosophy 1, Clare on Natural and Artificial Fluids 1, Chemical Characters 1, Fourcroy's Elements of Natural History and Chemistry 5 8
Presented by Mr. Daniel Ferguson.

Gordon's Geographical Grammar . . 1
Presented by Mr. Bacon.

Sheldrake on Wheels 1
Presented by

Brooks's Gazetteer 1
Presented by

Flavius Josephus 1
Presented by F. W. Daniel.

Boyle's Reflections 1, Milton's Poetical Works 1, Literary Register 1, Life of Sir Christopher Wren 1 . . . 4
Presented by Mr. Cope.

Humes Essays 2
Presented by Mr. Aumonier.

H. Wronski on the Reform of the Mathematics 1
Presented by Mr. Bluett.

The Article Government from the Supplement to the Encyclopedia Britannica 2 copies 2, ditto Colony ditto, ditto 2, ditto, Liberty of the Press, ditto 2, ditto Prisons and Prison Discipline, ditto 2, ditto, Jurisprudence, ditto, 2, ditto, Education, ditto 2, ditto, Laws of Nations, ditto 2 . . 14
Presented by Joseph Hume, Esq. M. P.

Parke's Chemical Catechism 1, Jamieson's Celestial Atlas 1, Asiatic Journal from 1816 to 1823 (inclusive 2 vols. in 1) 16, ditto Annual Register 7, Edinburgh Christian Instructor 5, 30
Presented by J. B. Gilchrist, Esq., L. L. D.

Ludlow's Letters, and May's Parliament of 1640, 1, Historiæ Anglicanæ 1, Tracts on Civil Wars 1, Bernaulli's Permutations and Combinations 1, Masere's Trigonometry 1, ditto Mathematical Tracts 2, Tracts on Political Subjects 1 8
Presented by Mr. Frend.

Mechanics' Gallery, 2 parts.
Presented by Mr. John Powell.

The Artisan, 5 parts.
Presented by Mr. Joseph Webb, 15, Clifford's Inn.

Hodson's Accomplished Tutor 2, Homer's Illiad 2, Elements of Natural Philosophy 1 5
Presented by Mr. D. Wheeler.

Adam's Essay on Electricity 1, Mackenzies Experiments in Chemistry 1 . 2
Presented by Mr. Thos. Burn.

Green on the Fixed Lightning Conductors to the Masts of his Majesty's Navy 1
Presented by the Author.

White's Digest of the Minutes of Evidence, taken before the Committee on Artizans and Machinery 1, White's Digest of all the Laws respecting Masters and Work People 1 . . . 2
Presented by the Author.

Butler's Introduction to the Mathematics 2, Robertson's Treatise on Conic Sections 1 3
Presented by

Moore's Navigation 1
Presented by Mr. Jack.

Dugald Stewart's Life of Robertson, 1
Presented by Mr. Thos. Pearsall.

The Glasgow Magazine 1
Presented by Messrs. Stuart and Panton.

Paley's Natural Theology . . . 1
Presented by Mr. John Gloyn.

Report from the Committee of the House of Commons, on the Employment of Boys in Sweeping Chimneys 1, Address from the Society for Superseding the necessity of Employing ditto 1, Proceedings of the Society for Superseding ditto 1, Hudson's Letter to the Mistresses of Families on the Cruelty of Employing Children as Chimney Sweeps 1 . . 4
Presented by Mr. Tooke, of Gray's Inn.

Hodgson on the Art of Preserving and defending the Foot of the Horse 1
Presented by the Author.

Squire's Astronomy 1
Presented by Mr. Reynolds

The Gentleman's Mathematical Companion, for 1824 1
Presented by the Editors.

Papers respecting the Pindarry and Mahratta Wars 1, ditto Nepaul ditto 1, ditto certain Pecuniary Transactions of Messrs. Palmer and Co. with the Government of His Highness the Nizam 1, Papers relating to the Finances of India, during the Administration of the Marquis of Hastings 1, Proceedings of the Court of Directors relative to a proposed Grant of an Annuity to the Marquis of Hastings 1, General List of the above Papers and List of Members of the East India Company 2, Papers relative to the Culture and Manufacture of Sugar in British India 1 8
Presented by Mr. Porter, 19, Regent-street, St. James's.

The Register of Arts and Sciences, 3 parts, 2 copies, 6 parts.
Presented by the Editor.

Tatum's Researches on Vegetation, 2 copies 2
Presented by the Author.

Treatise on the Ear, by J. H Curtis . 1
Presented by the Author.

The Popular Encyclopedia, 3 parts, 2 copies, 6 parts.
Presented by the Editors.

Buchanan's Journey from Madras, through the Countries of Mysore, Canara, and Malabar, with engravings 3, The Rudiments of Linear, Plane and Solid Geometry 1, and an Introduction to Solid Geometry, and to the Study of Crystallography, by N. J. Larkin 1, a Box of Solids, by ditto 5
Presented by the Proprietors of the Mechanics Register.

Total . . Parts 19 Vols. 165

In conclusion, your Committee beg leave strongly to impress upon the minds of their constituents the necessity of unanimous and persevering exertions to promote the interests of the Institution. They are sensible that though much has been done, much yet remains to be accomplished, and they are aware that the completion of all the important objects of the Society depends upon the continued cultivation of that spirit of general unanimity, which has hitherto characterized the proceedings of the members. Experience must have pointed out to them the great advantages resulting from the establishment of such an Institution as the present, and they will doubtless use every endeavonr to introduce others to a participation in the benefits it is calculated to confer. Conscious of the rectitude of their intentions, your Committee shrink not from a candid and liberal examination of their conduct, and while they regard the reiterated efforts of wanton hostility rather with pity than with anger, they will uniformly endeavour to *deserve* that success which your support will enable them to *command*.

The Fourth Quarterly Meeting of this Institution was held on Wednesday evening last, when the above Report was read by the honorary secretary, Mr. Blake, and cordially received by the members. But little business of interest beyond this Report was transacted. The kind offer of the president, Dr. Birkbeck, to furnish all the necessary funds for the building of the new theatre, at a rate of interest (4 per cent.) less than that which he could obtain by the investment of his capital on the most secure mortgages, was appreciated as it deserved to be by the meeting. One gentleman, however, made some enquiries as to the amount of the probable expense of this building, observing, that he could not subscribe to the Report, until he had received an answer on the subject, and was told by Mr. M'William, one of the vice-presidents, that it might amount to about £2,500.; but that no precise estimate could be given, because the committee had preferred a saving of 20 to £30. per cent. by employing men, and furnishing their own materials, to a contract which could only be binding upon themselves, and which would give the contractor abundant opportunities of evading their views. One of the members here observed, that he considered the annual charge of the theatre at the rate of interest fixed by the excellent president, by no means an object to the institution, as it would be strange indeed if the members should object to £100. per annum for a lecture-room; but he wished to ask, whether if even that sum might not be reduced, by occasionally letting out the theatre to other institutions? Dr. Birkbeck, in reply, stated, that such was the intention, and that the new building, so far from proving a burthen to the institution, would, in all probability, prove a source of great emolument. A long discussion ensued upon the subject of free admission tickets granted by members of the committee to strangers, to attend the philosophical lectures. It was contended that the committee had no right to grant such, and the absence of the right was allowed by the vice-president, Dr. Gilchrist, and by others of the Committee, who stated, however, that these admissions had been granted with a view of enabling strangers to judge of the nature of the institution, and deciding whether they would become members. The result of this discretionary exercise of power by the committee had been, that *three-fourths of the gentlemen receiving such admissions, had become members.* This triumphant answer to the objections which had been started, and which were near being adopted by too many persons present, some of whom might have been misled by the gross and malicious insinuations of an obscure publication, called the *Literary Chronicle,* produced further explanations highly honourable to the committee, amongst which we noticed one from Mr. Whitaker, and admired it for the high-spirited, candid, and open manner in which he pleaded guilty to the accusation of issuing tickets of admission for the purpose of strengthening the interests of the institution. Doctor Gilchrist then paid some well-merited compliments to the Committees and Sub-committees of the Institution, for the zeal which they gratuitously evinced for its welfare, frequently sacrificing their valuable time to the duties which they had taken upon themselves, and the result of the discussion was not only the overthrow of the objections started, but an unanimous vote of thanks to the Committee for every part of their conduct. The thanks of the Institution were voted with acclamation to Dr. Birkbeck, the President, who in acknowledging them, said that his services, such as they were, would always be at the command of the Institution. He would not deny that he had sometimes felt pain at having the motives by which he was actuated misinterpreted, but this was so over-balanced by the pleasure which he derived from his connection with the Institution, that it left no trace upon his mind, and never could tend to impede his exertions for its welfare and happiness. The meeting then separated.

Our attention has been called to a foul and malignant article in the Literary Chronicle of last week, in which the wanton attacks upon Dr. Birkbeck, (for which that publication has a notoriety, among the few persons who are aware of its existence,) are repeated; our only answer to the slanderers, is—Read the Report of the Institution, and then if ye have shame left, hide yourselves in the contempt which can alone protect you from exemplary indignation.

FIRST ANNIVERSARY DINNER.

At five o'clock the number of persons assembled at the Crown and Anchor, amounted to between 2 and 300.—At half-past five the stewards entered the room, followed by the president, Dr. Birkbeck; the vice-president, Dr. Gilchrist; R. Martineau, Esq. Professor Millington alone being absent. They were accompanied by Henry Brougham, Esq. M. P., Joseph Hume, Esq. M. P., Mr. Alderman Wood, M.P., Lieut. Col. Torrens, Mr. Perkins, the celebrated engineer, and several other gentlemen of rank and character. After the cloth was removed, the president of the social meeting, Dr. Birkbeck, rose, and addressing the assembly, said: "Gentlemen, it is a good old custom to begin with the most distinguished person in the state. At our last anniversary, we had to notice a mechanic of humble origin, splendid progress, and glorious conclusion — Mr. James Watts. At a meeting held to commemorate the services and talents of that gifted individual, the King himself sent a message, that he would feel most disappointed if he had not an opportunity to subscribe his share to such a glorious purpose; thus, gentlemen, if I may say so, did the monarch of the greatest nation on earth pay homage to the majesty of genius. I will now give you the health of—*The King!*

The King's health was then drank with three times three.

The Duke of York, three times three.

After this toast, the president rose, and in a very neat speech, proposed the health of *The Duke of Sussex*, whom he described as the friend of the Mechanical Society, and the patron of all that contributed to the dissolution of the distress and ignorance of mankind. —This toast was received with an enthusiasm which it would be impossible to describe.

Mr. Pettigrew, the surgeon to the Duke of Sussex, returned thanks for his Royal Highness, and stated, that he should feel great pleasure in informing His Royal Highness of the manner in which his name had been received; and added, that His Royal Highness had perceived with delight the progress of the Institution, for which he had, from the beginning, felt the greatest interest. —Toast.—*The rest of the Royal Family.*

The President then rose to propose, *Prosperity to the London Mechanics' Institution.* In prefacing this toast, Dr. Birkbeck said, that when he looked to the extent and respectability of the meeting to celebrate their first anniversary, he saw fully accomplished all that the toast was intended to embrace. The applause which followed this toast was tremendous.

Mr. Brougham then rose amidst the most tumultuous applause.

Mr. Brougham.—I cannot doubt, gentlemen, that after the manner in which you have been pleased to receive me, you anticipate the toast which I am about to propose; and that you will join me cordially in drinking the health of your worthy and excellent President, Dr. Birkbeck. It cannot be necessary, gentlemen, that on such an occasion, I should take up much of your time; but I may be permitted, after a thirty years' acquaintance with that excellent man, to pay my tribute to his singular exertions in all that relates to your welfare, and to the happiness of mankind. I think it is now upwards of twenty-four years ago, since our friend laid the foundation of the first Mechanics' Institution in the city of Glasgow—not only founding the Institution, but acting as its lecturer; and thus establishing a society second to none, except that which I have now the honor to address." Here Mr. Brougham took a review of the progress of Mechanical Institutions, and said,—" He would venture to assert, there would soon be an Institution in every town in the kingdom; whereas, twenty years ago, there was none, except at Glasgow. He was happy to say, that symptoms of such establishments were shown in different parts of Scotland; and if, as it must be admitted, this capital contained much of vice and misery, it was most cheering to see such an Institution as this, which must carry its influence through the remotest part of the kingdom. That in large towns like Manchester and Birmingham, there should be such Institutions, was not surprising; but when he saw that in small towns of 3 or 4000 inhabitants, such Institutions were formed, it was highly gratifying. It was not to be supposed, that in every place where the Mechanics were numerous enough to form an Institution, they should all at once be wealthy, and possess, as at London, lecturers duly qualified, and library and apparatus; but it was well to begin with what they could accomplish, and to have Mechanics' Institutions, with a library of useful books. This had been done in various places with such success, that after six months, notwithstanding such comparatively limited means, lectures have been introduced, and he would particularly notice Kendal, in Westmoreland, and another small place in Scotland. When he saw what had been thus done in a year and a half, he was sure he should not be considered an enthusiast for stating, that ere long there would not be a town without such an institution. Although (said Mr. Brougham) it is the Mechanics themselves to whom this is chiefly due, yet I think every man who has the means of assisting the institution, by contributions of books and apparatus, or gratuitous lectures, ought so to do, and I never will believe that a man possesses an enlightened mind, or a desire to serve his fellow-creatures, who allows a number of mechanics to exist in his neighbourhood, without coming forward with his advice, his exertion, and if needs be, with his purse, to establish a mechanics' institution, and I am happy to say, that men of every party, political or religious, and persons of every sex may conscientiously come forward to support establishments of this nature. Mr. B. here went into an ingenious and candid review of the question of Parliamentary Reform, for the purpose of shewing that those who imagined that the people had not power enough, and those who thought they had, must concur in opinion, that nothing would so contribute to the satisfaction of each, as giving more information to the people; because those who contended for their being admitted to a larger share in the choice of their representatives, must feel happy to see them rendered more fit for such power; and those who objected to their having such share—only upon the grounds of the people being unfit for it, would no longer be able to advance such an argument. He could not help thinking, that those who should live forty or fifty years hence, would witness such a change in the condition of mankind, from the existence of these institutions, as would be really astonishing; and he doubted not that those who were present, would, if spared only ten, or five years, see great improvement, of the same spirit, continued in the condition of mankind, arising from the diffusion of knowledge; and they would recollect that knowledge was power. Mr. Brougham concluded an admirable speech, of which our limits permit us only to give the outline, by entreating the meeting never to lose sight of the exertions of those great men who had done so much for them, and above all, those of his excellent friend at his right hand, Dr. Birkbeck.

Doctor Birkbeck rose amid general cheering, and after a complimentary allusion to Mr. Brougham, said, " It is enough for me to have witnessed the events of the last twelve months—it is enough for me to have heard what has been done in the course of intellectual improvement, what is doing, and what is to be done hereafter, as prophetically described by my eloquent friend; but it was far more valuable to have contributed to the extension of knowledge among a class, where there existed intelligence without education —intelligence without means—intelligence smothered in the difficulties of disorganization and distress; so feeble, that we could scarcely believe it could ever be able to throw open the door of science. This institution arose from an appeal, forcibly and ably made to the mechanics of the metropolis, and the appeal was instantly answered, and this gigantic fabric rose up with a suddenness, and size, and strength, such as are told of the fabulous existences of magic story, and such as bear the highest testimony of the powers of its authors." The respected gentleman concluded by stating, that he felt great happiness in seeing the members at the table on that occasion, and the highest pride in being honoured by their kind acknowledgements. The eloquent gentleman sat down amid most enthusiastic applause.

Joseph Hume, Esq. M. P. said he had great pleasure in submitting a toast which had been put into his hand, and in stating that, nothing would give him greater satisfaction than in supporting by all the means in his power, so excellent an institution; after what his friend Mr. Brougham had said so ably, he would add but little, but he must inform the meeting, that in Aberdeen, the town which he represented, a mechanics' institution had been formed, which had been taken up with warm interest by all classes. Mr. Brougham had stated, that he would consider no man a friend to society, who, having the means, should refuse to assist such institutions. What then must they think of that individual (Dr. Birkbeck) who had stept forward so nobly to offer funds to the London Mechanics' Institution, whilst individuals, gifted with immense property, had refused to foster the industrious classes as they merited. He was happy to hold up Dr. Birkbeck as an example to mankind for his energy and excellence. There was an old adage, that a work well begun, was half ended; this had begun well, and the President having enabled them to erect a theatre, he hoped they should all live to witness the prosperity which was in prospect. Much had been said of the wealth of this country, but it did not consist in its gold or silver, but in the industry of its mechanics, and by which it had been raised to the rank in society in which it stood, and he trusted that the example thus begun, would be cheerfully followed. Mr. Hume then proposed the healths of the Trustees of the London Mechanics' Institution.

Mr. Brougham as one of the trustees, returned thanks to the meeting and to his honourable friend Mr. Hume, who was well known to the country by his zealous and disinterested exertions in what he considered the conscientious discharge of his duties. Mr Brougham also paid a high compliment to the Aberdeen Mechanics' Institution, of which he had heard a most favourable account, and he hoped that those who owed to the industry and good conduct of the Mechanics of Great Britain the fortunes which they possessed, would come forward with their contributions as an act of gratitude to that body. Mr. Brougham concluded by proposing the healths of Sir Francis Burdett, and other friends of the Institution who were absent from indisposition or other unavoidable causes. The secretary here read three letters from gentlemen interested in the institution, expressing their regret at being unable to attend; these were Mr. Joshua Walker, M. P.; Mr. John Cam Hobhouse, M. P.; Mr. John Smith, M. P. The reading of those documents was received with great applause.

The healths of several friends of the institution were then drank with general cheering.

Mr. Alderman Wood then, after a humourous speech, which was warmly applauded, proposed the healths of the vice-presidents, Professor Millington, John Martineau, Esq. and R. M'William Esq. This toast was drunk with overwhelming plaudits.

Mr. Martineau returned thanks in a very proper speech; he expressed a conviction, that such institutions as the present would be more effectual in suppressing discontent in the manufacturing districts, than all the Acts of Parliament that could be passed.

Doctor Gilchrist next returned thanks for the honour of drinking his health—and dwelt with great ability and much humour on the prospect of a multiplication of Mechanical Institutions through all parts of the metropolis and of the kingdom. His worthy friend, Mr. Alderman Wood, complained that the institution had not chosen their house in the city, under the fostering protection of his sheltering wing; but his worthy friend would soon have mechanics' institutions, not only in the city, but in the eastern quarter, near his home.

Mr. M'William then returned thanks in a speech replete with proofs of the utility of the mechanical arts. This gentleman's address was received with mixed bursts of applause and laughter.

MECHANICS' INSTITUTION.

MR. TATUM'S LECTURE.

The expectation of a very interesting lecture on Atmospheric Electricity, attracted a very full attendance at the Institution on Friday last. Mr. Tatum commenced by stating, that several of the experiments which he intended to try, would be under unfavourable circumstances, as a jar which he had prepared for the purpose, had been broken, and some inconvenience had been occasioned by the apparatus not being in order when he arrived at the Institution.* Mr. Tatum then alluded in brief terms to the subjects upon which he had lectured on the preceding Friday, for the purpose of connecting the course more intimately in the minds of the audience, and proceeded to perform an experiment, which, on a former occasion, had failed, from some circumstances over which he had no controul. It will be remembered, that Mr. Tatum had stated, that the electric fluid which exists in the earth, being carried upwards, especially in summer, by the evaporation from the heat of the sun, increases the quantity in the atmosphere, which being thus surcharged, an explosion takes place, and hence the reason why thunder and lightning are more frequent in summer than in winter. He attempted at the time, to illustrate this doctrine, by producing evaporation in the vicinity of the electrometer, but the state of the air being unfavourable to the experiment, it failed. On Friday evening, evening, however, it was made with perfect success. A piece of iron heated was put into a flat metallic dish, placed upon the electrometer, and water being poured upon it, a large quantity of steam was generated, which, as it formed, abstracted the electric fluid from the inside of the electrometer, the gold leaves being seen to diverge, as they gave out their electricity. When this fluid has reached the atmosphere, and the vapour begins to be condensed, the surcharged condition of that part of the atmosphere will be shewn by an instant and spontaneous explosion; the electric fluid previously existing in the air, and the portion which had escaped from the earth being greater than is consistent with the equilibrium which ought to subsist in nature, and producing by the discharge a flash of lightning. In this way, the heat of the sun in summer evaporates the moisture from the earth, which moisture carries up with it the electric fluid, as the steam carries it from the electrometer. This experiment excited much applause, and appeared to convince all present, of the truth of the position which it was intended to illustrate. Mr. Tatum then proceeded to treat upon the conductors of buildings and ships, and made several experiments to shew, that pointed conductors are preferable to round ones, which are in use in many parts of the world, from a ridiculous idea, that the larger the surface we expose to the fluid, the less will be the danger. The machine being turned, a round conducting substance was placed to receive the fluid, which it did with a vivid spark; but when a pointed conductor was held at a much greater distance, the round one ceased to receive the fluid, because the point had the power of attracting with more speed, and at a greater distance: thus demonstrating, that in all public buildings, a pointed conductor is most safe, as it draws towards it the fluid with more certainty, and hastens to remove it from a situation in which explosion would be attended with danger. The succeeding experiment was one of less

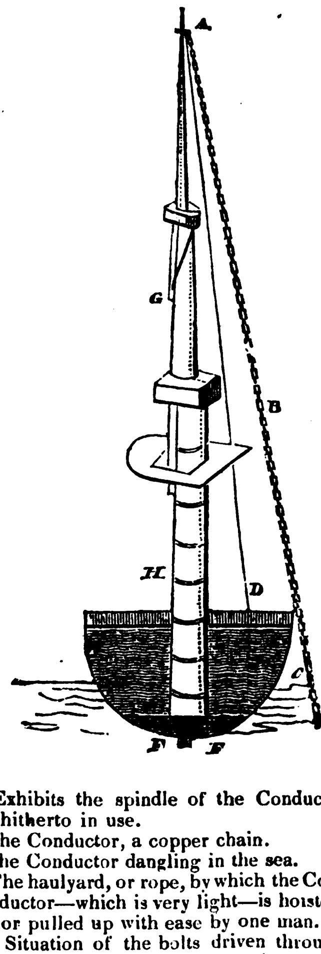
* This remark respecting the apparatus leads us to observe, that it is scarcely possible that there can be thorough order in a lecture room, which is only the property of the Institution *pro tempore*, and which, as we believe, is used for other purposes on some of the days in which it is not used for the lectures. Dr. Birkbeck, at the close of the lecture, expressed his regret that any thing of this nature had occurred to disturb the ingenious lecturer, Mr. Tatum, and observed, that in the new lecture room about to be built, with the necessary accommodation for apparatus, there could not be a recurrence of such inconvenience.

novelty or direct interest; it was merely bringing near the machine, when in action, a piece of cotton, which was first seen to approach, then to recede from it, shewing, that all light bodies, when they are charged with electricity, hasten to escape from the spot, and to proceed to another, where there is a deficiency of the fluid, and where they can give out that which they have received. As far as this experiment tends to shew that by the electric fluid clouds, or other light bodies in the disturbed state of nature, have a tendency to approech or recede, it is certainly interesting. Upon the whirlwind, and water-spout, which are electrical phenomena, as Mr. Tatum supposes, from some circumstances which have come under his consideration, he dwelt for a considerable time, and with peculiar interest, but without entering minutely into an investigation of some of their probable causes. To shew that the whirlwind is an electric phenomenon (and here it may be remarked, that what the whirlwind is on land, the water-spout is at sea), Mr. Tatum mentioned, that some years ago, as he was passing along the City Road, a whirlwind was seen, which carried every thing moveable before it, even a large glass frame of a cucumber or melon bed in a garden, and that at the same moment, the electric fluid set fire to the house of the gardener. This theory of whirlwinds, we should say, was by no means established by this accident, because the existence of the whirlwind, and the discharge of the electric fluid at the same time, might have been the effect of accident; but it is supported by other circumstances of a more conclusive nature, and can scarcely admit of a doubt from the philosopher. Proceeding to a consideration of the mode in which conductors of lightning should be placed upon houses and other buildings, Mr. Tatum expressed a decided, and, as we think, a very correct opinion, against the use of chain conductors, because, at every link, the electric fluid meets with an obstruction, and is conveyed with less rapidity than the safety of the building requires. A continued conductor he considered in every way preferable, as the fluid was discharged with rapidity and certainty; and he recommended, that on all occasions, the conductor should be so far imbedded in the earth, that the electric fluid might be conveyed completely below surface. To shew the great importance of having all conductors perfect, the lecturer having first charged his battery, subjected a pyramid of wood, having along it a conductor, with one portion imperfect, and it was seen, that at the precise spot, when the discharge occurred, the imperfect piece was driven out with force The same thing was shewn, at another part of the lecture, upon a small powder magazine, and the powder exploded; as well as upon the model of a church, producing the destruction of the steeple, &c. Upon the zig-zag appearance which the electric fluid, in a state of lightning, presents, Mr. Tatum made some interesting observations and experiments. He stated that this zig-zag appearance arises from the resistance which the fluid meets with in its discharge, from the atmosphere through which it passes, and which, as it proceeds, and meets with further opposition, alternately darts from point to point, until it has completely subdued the obstacles which are opposed to it. To illustrate this, he took a glass vessel, having within it two conductors at a distance from each other, and placing it before the machine, passed the fluid entirely through it; in this situation, as in passing through the body of the atmosphere, the fluid assumed the zig-zag, from the resistance of the air. The vessel was then placed upon an air-pump, and the air being exhausted, the fluid was again passed through it, but in this instance, there was a continued flame, and no zig-zag, because there was no air within to offer a resistance.

Upon the comparative merits of round conductors, and those of extended surfaces, the most conclusive evidence was shewn in favour of the former, for an extended surface of gold leaf placed placed between two plates of glass, was fused by a powerful discharge, whilst, through a small wire, the fluid was discharged without injury. The size of the conductor was also, hke lecturer said, of infinite importance, and he appeared to consider that those generally in use, are much too small for the purpose of conveying away any considerable portion of electricity. In the year 1772, St. Paul's cathedral was exposed to a large body of electric fluid, which was discharged by means of four conductors, each four inches wide, and half an inch thick. One of these conductors was made red hot by the fluid, and if it had been of smaller dimensions, would certainly have been melted. This led Mr. Tatum to treat of the conductors of ships, which are copper chains hoisted up to the top-mast, and hanging over the side, to convey the fluid into the water. These conductors, he considered too small for the purpose, particularly when it was considered that the lightning in tropical climates, where a great portion of the royal and commercial navies are so frequently, is so much more violent than in Europe. The model of a ship was then produced, having Mr. Harris's conductor, those generally used at sea, and such as are now fitted to all his majesty's fleet at Plymouth, which last, Mr. Tatum exposed to an ordinary discharge of the electric fluid from the battery, and the chain was fused in an instant. This experiment leads us immediately to the subject of Lieutenant Green's representations on this important subject. He had undertaken to shew that the conductor of ships would not resist an intense electric shock, and therefore that a portion of it must strike the copper spindles which our wise-acres have placed at the top of the masts, reaching a small distance within the wood. Now let us imagine for a moment, that a British fleet, with all these copper spindles, is lying closely packed in port, during a terrific thunder storm; the fluid is of course attracted by them, in large bodies, from the clouds, and the conducting chains being, as was clearly shewn in the experiments made by Mr. Tatum, inadequate to carry off the fluid, a portion of it must go down the spindle into the masts, and cause explosions which would involve the fleet in destruction.

The following sketch will exhibit the conductors now in use, each of which is liable to great objection. The danger from the spindles in the masts, we have already mentioned, and Mr. Harris's conductor is, we imagine, still more dangerous, because, if the strips of copper, which form the conductor through the mast into the sea, should be charged with a greater portion of fluid than they can convey, an explosion must ensue in the very body of the ship, probably in the powder magazine, and so destroy at once many valuable lives, and considerable property.

We have been led to this digression from the regular order of the lecture, but we trust that the importance of the subject will prove a sufficient apology. Mr. Tatum concluded his lecture, by passing a small electrical charge through a glass of water, containing some living fish, in order to shew its effects upon animal life,—they were dead in an instant. The suddenness of this death, which must be unattended with pain, takes away all unpleasant feeling at witnessing it, and we cannot help thinking, that the present horrible mode of executing criminals might, with much humanity and propriety, find a substitute in a discharge of electric fluid, from a powerful battery.



A. Exhibits the spindle of the Conductor hitherto in use.
B. The Conductor, a copper chain.
C. The Conductor dangling in the sea.
D. The haulyard, or rope, by which the Conductor—which is very light—is hoisted, or pulled up with ease by one man.
F.F. Situation of the bolts driven through the keelson, for the purpose of conducting the lightening into the sea.
G. The mast rope.
H. The iron hoops.

The spindle at the top of the mast, and the dotted line, represent Mr. Harris's Conductor.

At the present time, the stationary spindle at the mast head is used by fixing upon it the chain B. by a link—so that the ship is always exposed, the conducting chains being fixtures to all the Fleet at Plymouth.

The following notes on conductors, and on the effects of atmospheric electricity, are from a very clever little work, by Lieutenant Green, R. N., and will be read with interest.

"Professor Richman was in the act of making experiments: he had placed a conductor at the top of his house, to which he had fastened a chain: This he conducted to his chamber. The conductor was affected by the lightning, which crossed down to the Professor; a person near him saw a globe of blue fire as large as his fist, jump from one end of the rods affixed to his apparatus towards the head of the Professor, which killed him on the spot; he was at that instant a foot distant from the rod,—the metal chain was broken in pieces, the door of the chamber torn off the hinges, and much other damage done to the house; many persons outside declared they saw the lightning shoot from the cloud to the conductor at the top of the house. This surely bears me out in what has been asserted, that ships are better without conductors;—had there been no conductor to the Professor's house, the lightning would not have been attracted, and would have passed over his house, as it did others in the town, without exploding.

"His Majesty's ship Perseverance, Capt. J. Smith, while off the sand heads, Bengal-bay, was struck by lightning in the eye-bolt at the end of the fore-top-gallant-yard, burning part of the yard to a cinder: from the yard it shot to the iron about the fore-cap, entered the fore-mast-head, splintering the fore-mast (which was woulded by rope and not hooped with iron as is now the case) as far down as about six feet from the forecastle-deck; from thence it passed over the forecastle into the sea, killing one man who came in contact with it—he was burnt to a cinder; several other men were dreadfully scorched. At this time both conductors were up, neither of which appeared to convey any of the electric fluid into the sea.

"His Majesty's ship Kent, Captain Rodgers, in the Mediterranean, was struck, three men were killed and several wounded, the top-gallant-masts were splintered, the top-masts much injured, and the hoops of the masts twisted and broken. At this time the conductors were at the mast heads, and there were more than twenty sail of His Majesty's ships in company without conductors, none of which ships were injured.

"Heckingham poor-house, near Norwich, was set on fire by a stroke of lightning, notwithstanding it was armed with eight pointed conductors. This house had eight chimneys; to each chimney conductors were affixed, reaching four feet above the top of the chimney, and down to the earth.

The Perseverance coach, on its way from Boston on the 14th of July last, at 11 o'clock in the morning, was struck by lightning; three of the horses fell, and the coachman was much injured, as were also several gentlemen on the outside. All those who were behind and had up their umbrellas, were much injured by the electric fluid, while those not having them, and who were on the front part, escaped unhurt. It is evident in this case, that the metal points attracted the electric fluid, which was also drawn to the ornaments of the harness. This is not the first time that I have known umbrellas to occasion such fatality. Why not then use ivory or bone in mounting the tops of umbrellas or parasols? A very proper comparison may be made between the ferrule to the umbrellas and the spindles of the fleet at Plymouth. Some of the umbrellas were broken in pieces; thus proving, that it is dangerous to invite lightning. The gentleman who was the greatest sufferer informs me, that his umbrella was broken in pieces, and he threw it away; and that his hat was rendered useless, the buckle being carried off or melted: he did not examine the ferrule to see the effect the lightning had upon it. The coach at the time was on a hill."

"A most extraordinary phenomenon occurred at the island of Java, in 1772. On the 11th of August, at midnight, a bright cloud was observed covering a mountain in the district called Cheribau, and several reports, like those of a gun, were heard at the same time. The people who dwelt upon the upper parts of the mountain, not being able to fly fast enough, a great part of the cloud, about eight or nine miles in circumference, detached itself under them, and was seen at a distance, rising and falling like the waves of the sea, emitting globes of fire, so luminous, that the night became clear as day. The effects of it were astonishing; every thing was destroyed for twenty miles round: the houses were demolished; plantations were buried in the earth; and 2,140 people lost their lives; besides very many herds of cattle, goats, horses, and other animals."

"At Quesnay, the weather being very cloudy, a cloud, which seemed to touch the houses, emitted a globe of fire, which broke itself against the tower of a church, with a report like that of many cannon, and spread itself over the town like a shower of fire.

"In France, near Brest, were seen three globes of fire, of three foot or more diameter each, and they were united together. This large vortex of flame came rapidly down, and pierced through the church, two feet above its level with the ground, killing four persons who were ringing, and made the walls and roof of the church spring as a mine would have done; so that the stones were scattered round about, some of them being carried twenty-six fathoms, and others sunk more than two feet into the earth.

"At Hogue, in Lower Normandy, a fire was observed in the air having the shape of a tree, and seemed to fall and lose itself in the sea with a noise which made two large villages tremble.

"In Lower Bretany, in the evening, on that part of the coast which extends from Landemeau to St. Paul of Leon, twenty-four churches, in which the bells were ringing, were struck by lightning, while many churches near them, in which there was no ringing, were spared.

"In August, 1823, between twelve and one o'clock in the day, a most singular phenomen was witnessed by many of the inhabitants of Margate. The clouds, highly impregnated ith electric matter, commenced an awful discharge, about three miles from the harbour; the fluid descended in a serpentine manner, from the atmosphere to the sea, in regular streams of most vivid lightning, diffusing a light at once brilliant, awful, sublime, and interesting. The discharge continued for nearly half an hour before the generation of the rain, which subsequently descended in torrents."

"On August 19, 1824, a thunder storm burst over Fountains Town, in Ireland, near the residence of George Hadder, Esq. One peal was tremendous, and its effects were severely felt. Five labouring men had taken refuge in the house of a farmer; the electric fluid penetrated it, scorched the labourers in the most dreadful manner, and cut a dog across the back: a child, who lay in a cradle, escaped unhurt. The men were all speechless, but they recovered.

"AMERICA.—A New York Paper, of the beginning of July, has the following account of a storm which had just visited the town of Portsmouth:—On Wednesday, last week, a storm occurred at Portsmouth, New Hampshire, which, from all accounts, was one of unusual sublimity and grandeur. Two children were killed in a school-house at Rye. One young man was killed in the garret of a house, about a mile distant from the school-house. More than half of the children were knocked down, and many were stunned. On Saturday se'nnight there was a storm at Pittstown: The lightning struck the house of a Mr. Shea, broke the reach pole, came through the roof, and killed Mrs. Shea, who was walking the floor with her child in her arms. The child was not hurt. A scythe was hanging directly over her head when the lightning descended.

July 26, 1824.—On the night of the 14th inst. the lightning struck the cathedral of Strasbourgh, melted the lead which cemented several stones, and destroyed the sound of the largest bell.

An English brig, off the Isle of Wight, in December, 1823, was struck by lightning in the fore topmast head, which splintered the mast, knocked the four men off the topsail yard to the deck, killed one man; all the others were dreadfully burnt. The fluid passed through the boat, from thence to the taffrail, passed through it, burning the boat.

A paper from M. Nicholson, Esq., contains a very uncommon example, in an accident which occurred at Mr. Chadwick's house, about five miles from Manchester, on the 4th of September, 1809. A very loud explosion of thunder took place, and the front wall of the coal vault, containing about 7000 bricks, and weighing twenty-six tons, was gradually lifted up. Mr. Henry compares this to the thunder-storm at Coldstream, described by Mr. Brydone in the Philosophical Transactions for 1787, and explained by Lord Stanhope. He conceives it to have been a case of the returning stroke. The lightning he supposes to have issued out of the earth by the coal vault, to restore the equilibrium in the clouds over head."

"H. M. ship Hyperion, Captain Killi crop, off the Moro, with a convoy, experienced very boisterous weather, and it was so dark, accompanied by heavy thunder and lightning, with such torrents of rain, never before witnessed by any of the fleet, that it was only at short intervals the ships could get a glimpse of each other: and they were six successive days without an observation of any sort.

"Captain Dibdin, of a merchant ship, states the effect of lightning as follows:—At Martinico, a violent flash of lightning made an opening in the wall under which he and others took shelter, about four feet high, and three feet broad; he observed, on entering the hole, that a square bar of iron, one inch and a half thick, near the hole, which joined another bar an inch thick, had been struck by the lightning, and were wasted in their thickness in some places very considerably, insomuch that it looked like a burnt poker which had been long in use; the bar was broken into two pieces; parts of the bars were changed in colour to a grey or whitish hue, resembling iron after it had been exposed in a violent heat, and suffered to cool; one of the bars touching the wall, had undergone an extraordinary change, the end next the wall being reduced from one inch in diameter, to the size of a slender wire, but tapering towards the wall."

"At Cumbernauld, in Scotland, in July, 1761, there was a violent storm, attended with thunder and lightning, which did considerable damage to some plantations, and killed above 1000 cows. Upon examination, all their bones were found broken, their flesh quite black, and when offered to some hogs, they could not be prevailed upon to touch it.

"Professor Lapostolle, of Amiens, has discovered that straw possesses the quality of serving as a conductor to lightning and hail. Repeated experiments have convinced him that straws united together, serve equally well as the iron rods now fixed upon buildings, for the former purpose, at the same time that they are not attended with similar inconvenience. In consequence of this discovery, the common buildings may be secured from the effects of lightning in the most economical manner; and even crops on the land may be protected from the ravages which they sometimes suffer from hail."

EXTRAORDINARY SHIPS.—The arrival of the raft-ship Columbus has excited so much interest in this country, that the following brief account of other enormous floating masses may prove acceptable. With respect to the credit due to the account of the ship built for the King Hiero, we shall offer no opinion; but merely observe, that Archimedes, its reputed projector, is believed to have achieved mechanical wonders, which have no parallel since the period at which he lived. His discovery of the mode of ascertaining specific gravities, and his invention of the particular water screw which bears his name to the present day, are sufficient to immortalize any man.

The following is a description of the huge floating vessel said to have been constructed by him. It contained wood enough to make sixty gallies. It had all the variety of apartments of a palace,—banquetting-rooms, galleries, gardens, fishponds, stables, mills, baths, a temple of Venus, &c. It was encompassed with an iron rampart and eight towers, with walls and bulwarks, furnished with machines of war, particularly one which threw a stone of 300 pounds, or a dart twelve cubits long, the space of half a mile, &c.

The next vessel of which we are reminded by the American raft, is that described by Plutarch in the life of Demetrius, in the following terms:—"The galley of Ptolemy Philopatre was 280 cubits (about 420 feet) in length, and 28 cubits (72 feet) from head to the top of the poop. It carried 400 sailors, besides 4,000 rowers, and near 3,000 sailors who were disposed in the spaces between the rowers and the lower deck."

The last of the nautical prodigies which we shall notice was that built by King James IV. of Scotland, and which is thus minutely described:—"It was twelve score feet in length; 36 feet within the sides; 10 feet thick in the walls; outed jest in of oak: her walls and boards on every side so strong, that no cannon could go through her. From the time this great ship was afloat, and her masts and sails complete, with her tows and anchors appertaining thereto, she was counted to the King to be £30,000 expense. She bore many cannons, six on every side, with great bassils, two behind on her deck, and one before, with 300 shot of small artillery, that is to say, mayand and battert falcon, and quarter falcon, slings, destilent, serpents, and double-dogs, with haytor and culvering, cone-bows, and hand-bows. She had 300 mariners to sail her, six score of gunners to use her artillery, and had 1,000 men of war, besides her captains, shippers, and quarter-masters. This ship was sent to assist the French against King Harry the Eighth of England, notwithstanding he was brother-in-law to James the Fourth of Scotland. The Lord Hamilton, Earl of Arran, was made Captain and Great Admiral of the Fleet, and Lord Fleming Vice-admiral, accompanied with Earls, Lords, Barons, to the number of 1,000, who were well arrayed for battle. 'If you will not believe me,' says the narrator, 'gang to the gates of Tilebairn, and you will see her length and breadth planted in Hawthorn.'"

NOTICE TO CORRESPONDENTS.

To our numerous correspondents, we must reply generally, that in consequence of the great length of the report—the proceedings of the laying the first stone—and the dinner at the Crown and Anchor Tavern, we are of necessity compelled to defer many valuable communications, which we pledge ourselves to give next week.

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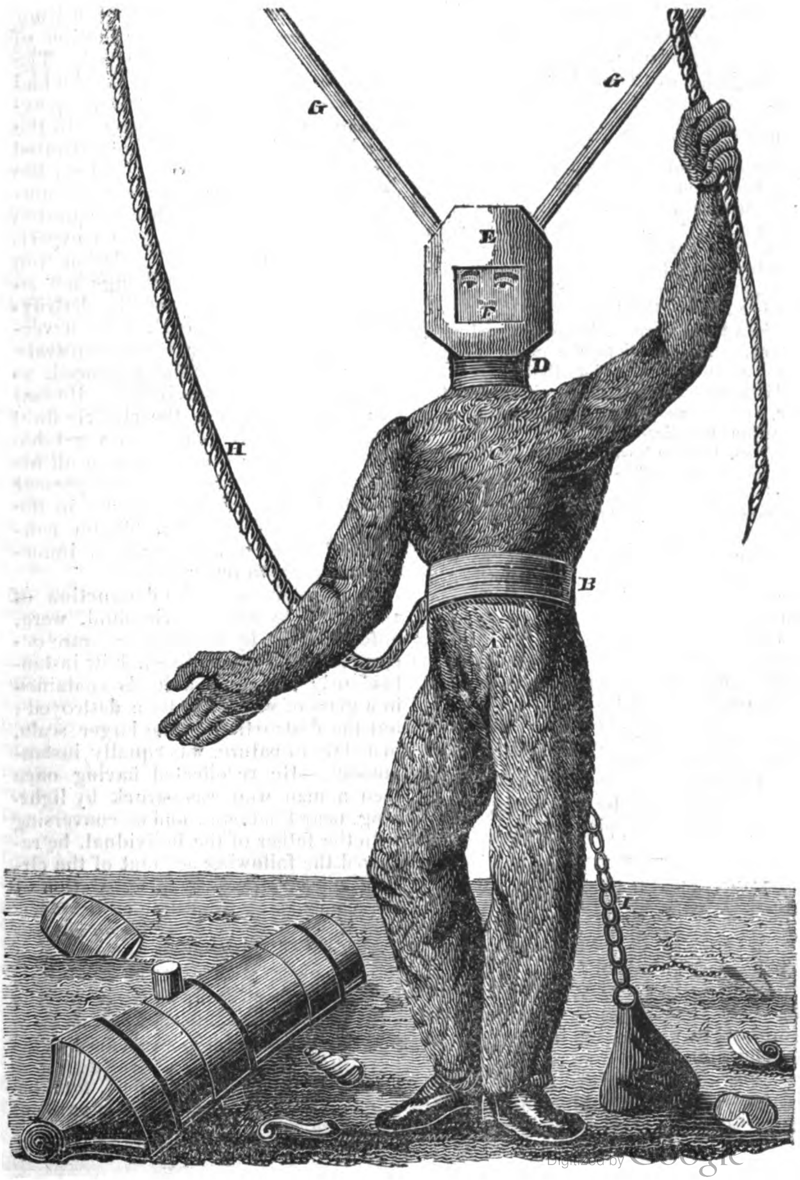
The London

MECHANICS' REGISTER.

How much better is it to get wisdom than gold.—Proverbs xvi. 16.

No. 6.] SATURDAY, DECEMBER 11, 1824. [Price 3d.

DIVING APPARATUS.



NEW DIVING APPARATUS.

We have been favoured by a member of the Mechanics' Institution with a drawing of a new diving apparatus, to supersede the necessity of the diving bell.—The engraving which we have given from it in our present number, represents a person, provided with this apparatus, at the bottom of the sea, about to attach a rope to a cannon. The following description will enable our readers to judge of the merits of the invention.

REFERENCES TO THE ENGRAVING.

A is a pair of trowsers of water-proof calf skin, taking in the feet up to the waist, where there is a brass belt, *B*.

C is a jacket of the same material, which fastens into the belt *B*, where it is made tight by waxed threads, and a water-proof composition of resinous matter.

D is a brass collar to the jacket.

E is a head-piece of brass, covered with leather, which fits into the collar of the jacket, as the jacket fits into the trowsers.

F is a piece of plate glass, six inches by four, serving as a window, by which the operations are directed,

GG are leather hose from the surface of the water, conveying away the foul, and supplying the fresh air, so that the operator may breathe freely. At the surface of the water the hose are mounted with brass, and run through two large cork floats, so that the progress of the operator may be distinctly marked, and his pursuits facilitated. Through these pipes, the person in the water can keep up a conversation with those in a boat on the surface.

H is a rope affixed to a ring at the back of the brass belt, by which the operator is raised or lowered. This rope should have a breast-band to balance the body.

I is a weight of 14 lbs., to enable the operator to sink more rapidly, and to counteract the buoyancy given by the water, which would prevent his stepping firmly.

MECHANICS' INSTITUTION.

MR. TATUM'S LECTURE.

The interest excited by the lecture on Atmospheric Electricity, on the preceding Friday, attracted a very numerous audience, to witness the further experiments promised on this interesting subject. Mr. Tatum opened the lecture in his usual way, by adverting to the principal points of the last, for the purpose of keeping up the connexion in the mind of the hearer, and then proceeded to give some further illustration of the statement which he had made on the subject of the atmospheric resistance offered to lightning, by which it was made to assume the zig-zag form. He had stated, that if the opposing medium were removed, the zig-zag motion of the fluid would be also removed. The audience would remember, that he had endeavoured to demonstrate this by experiment on a former occasion. In the last lecture he had also demonstrated the analogy which exists between the electric fluid, under its various circumstances, and the atmospheric explosion which we call lightning, by an experiment in the instantaneous destruction of some fish; which, although not so large as the animals usually destroyed by the electric fluid, were nevertheless quite sufficient to demonstrate the position which he had advanced, as they possessed animal vitality. He had now to observe, that the electric fluid produced a similar effect on vegetable life. This was a fact known to all his audience, and there were few present who had not read of instances in the newspapers. [Here Mr. Tatum enumerated some, which are not of immediate interest to our readers.]

The instances of the destruction of animal life by the electric fluid, were, unfortunately, by no means of rare occurrence.*—They had seen how instantaneously the small animals contained in a glass of water had been destroyed; but the destruction on the larger scale, in a state of nature, was equally instantaneous.—He recollected having once seen a man who was struck by lightning, near Chatham; and on conversing with the father of the individual, he received the following account of the circumstances attending this visitation of the elements. At the time of the accident, the young man, and two companions, were walking along the road, and the three were struck, at the same time, by the electric fluid, and lay on the

* The notes which we subjoined to the last lecture, enumerating a few of the known calamities from the electric fluid, form but too powerful an illustration of the positions laid down by the lecturer.—Ed.

ground senseless; the same portion of fluid having evidently produced the shock. The deceased, who lay in the middle, had, however, received a greater portion of fluid than his companions.—The latter, after lying a considerable time upon the ground, recovered their faculties of motion and perception; and, on looking round, were struck with horror at beholding their friend evidently deprived of vitality. Being but too well aware, from what themselves had suffered, of the cause of this appearance, they lost no time in deliberating on the course to be adopted, but raised the unhappy man upon their knees, and made every effort to revive him with which their ideas could supply them. Subsequently, when they were asked to describe the sensations which they had experienced under the effect of the shock, they said, that when they were lying on the ground, they had a confused feeling that something like a cannon ball was passing under their feet. The lecturer then stated, that being anxious to ascertain all the circumstances connected with this unfortunate occurrence, he visited the spot several days afterwards, and even then there was a strong smell of sulphur. In his examination of the body of the deceased, he found that the electric fluid had not injured the cranium, but had entered by the hat, which it had marked in five places; that it had then passed downwards through the back of his neck to his heel, and then returned up to the leg, and finally gone off by the calf. It was more than probable, therefore, that this fluid was that which, after having performed the work of death upon this individual, had passed under the feet of his companions, and had been described by them as something resembling a cannon ball. The head of the deceased, notwithstanding the dreadful shock which it must have experienced from the fluid, bore no particular marks of violence; a bloody liquid oozed from his nose, and the odour emitted from it was highly disagreeable.—The newspapers had stated at the time, that the young man's watch had been melted in his pocket by the lightning; but this was not correct; there was no more fusion of the watch than there was of his (Mr. Tatum's) watch, which was at that moment in his pocket.

Mr. Tatum then proceeded to observe, that when lightning strikes a dry tree, the explosion is great, when a moist one considerably less; from the simple fact, that water is a partial conductor of the electric fluid, and that a portion of it is carried off by the moisture, which is not the case with the dry tree. "I saw one at Epping, whose stem and trunk had been as much distorted by the stroke, as if they had actually been beaten with great power by a till hammer." [He here displayed a drawing of the tree, of which he had just spoken.] Dry bodies were not such good conductors of lightning as moist: this was exemplified by the fact, that near the oak tree which he had mentioned as so much shattered, there was a willow tree, which had received the fluid, and sustained but very trifling injury from the shock. He saw another tree near Holloway, which had been struck by lightning, yet bore but small marks; it was growing in a marshy spot. This proved that water was a partial conductor of lightning.—The celebrated phenomenon of the northern skies—the Aurora Borealis—proceeded from electric power operating within an extremely rarified atmosphere. This proposition he would attempt to illustrate by an experiment. Here Mr. Tatum expressed his regret, that the narrowness of the platform on which he then stood, precluded him from having all his apparatus at hand together; but this inconvenience, he was happy to say, would be removed in a short time, by the erection of the new theatre, the first stone of which had been laid yesterday. [Here he passed the electric fluid through exhausted glass tubes, and produced a light, which, both in colour and motion, resembled the splendid illuminations of the Boreal atmosphere. The success of the experiment was acknowledged by the plaudits of the audience. He next produced the representation of a ship at sea, which he illuminated momentarily by sparks of the electric fluid; then the picture of a ruined edifice, on which he performed a similar operation, to the great satisfaction of his hearers.] —He then proceeded to say, that his next experiment was intended to prove the materiality of the electric fluid. An upright little wire was placed on the table —on its point was placed another, so balanced by balls affixed to its ends, as to move horizontally on the perpendicular wire: the electric fluid was directed upon the little balls at the extremity of the horizontal wire, and succeeded in driving them round with a rapid motion. Mr.

Tatum deduced from this motive power of the fluid, the conclusio n that the fluid possessed materiality; "if it were not material, how could it propel the little globes?—if it were material, it then could not be a dependant property of another body; if it were but the property of a primary body, as transparency is of air, what was that primary body?" He considered it to be clear that electricity was in itself a material primary essence. He next alluded to the effect of a shock from the electric battery on a geranium. The tree shewed at first no immediate effect, but gradually put on signs of decay, and ultimately terminated in its dissolution—oxygen was as necessary to vegetable life as to animal—the vegetable economy was as liable to disease and death by the fluid as the animal;—the dead vegetable body produced a bad effect on the air, as a putrefied animal carcase did. He demonstrated in the last lecture, that the electric fluid could destroy vegetable as well as animal life—there was a much closer analogy between them than was commonly supposed.—[Here Mr. Tatum passed the electric fluid to a geranium by means of a brass chain and a glass tube.] He continued to remark, the tree would not then shew any effect of the shock, nor for a considerable time; but at the next lecture he would produce it, and the audience would then perceive a very important alteration in its appearance. When the shock was passed through water or moist bodies, the report was not so loud as when it operated on dry bodies: this they would remember was the case when he killed the fish by directing the fluid through the water. His next experiment would be to set fire to combustible matter lying in a little house; the conductor ran through it in a horizontal direction.—[The gentleman here transmitted the fluid to the combustibles, and set the house on fire.]—This, he continued, would illustrate the manner in which he saw a house, in the City Road, set on fire by lightning, two or three years ago. This experiment he rendered still clearer by another, setting fire to some tow by a shock from the battery. The next experiment shewed the means by which gunpowder is ignited by lightning. Some gunpowder had been put into a little brass cannon; a brass chain, fastened to the touch-hole, was connected at the other end to a glass tube; the discharging rod was then applied to the battery, the fluid passed through the tube, and the chain came into contact with the powder at the touch-hole, and produced its explosion. Mr. Tatum, in continuation, stated, that when the powder was compressed, it produced a louder report than a greater quantity uncompressed would produce. If hydrogen gas alone were exposed to the fluid, simple inflammation would follow. But if hydrogen and oxygen gases were mixed, then inflammation with explosion would take place. The reason was this; when the aeriform fluids or gases became liquids, the atmosphere rushing in, produced explosion—a single spark was sufficient to set fire to both, when transmitted into the pistol.—[The able lecturer here transmitted oxygen and hydrogen gases into a pistol, passed the electric fluid to the touch-hole, and produced an explosion of the gases. He next transmitted the electrical fluid through four glasses of water, by the medium of brass staples connecting the glasses together, which passed from first to the second, and to the third successively, and entering the fourth, ignited some ether, on the application of a brass ball, which had been poured upon the water. This experiment was particularly applauded.]—Mr. Tatum observed, that this experiment proved, that the electric fluid was not fire, as, if it were, it could not pass through the water. The gentleman then concluded his pleasing course of experiments, by producing an illumination like the light of the glow-worm, on a piece of lump sugar, and a beautiful purple light on a peeled orange.

The audience, which was crowded to excess, and very respectable, testified their pleasure and thanks by most hearty applause all through the evening, and by especially long and loud applause at the conclusion.

DR. BIRKBECK.

We have received several letters from correspondents, proposing that the members of the Mechanics' Institution should take some mode of marking their sense of the kindness and exertions of their esteemed President, Dr. Birkbeck. Some of these letters recommend, that a service of plate should be voted to him, others that a portrait of him should be placed in the New Mechanics' Theatre, and some that a statue should be placed in that situation. Without entering very deeply into the respective modes of expressing the sense which the Institution entertains of the valuable services of Dr. Birkbeck, we can most seriously state, that we heartily approve of the principle itself as one which will confer honour upon all who subscribe to it. Our first intention was, to publish all the letters addressed to us on this subject; but being anxious to promote the plan in a way still more direct and efficient, we requested a few members of the Institution to meet on Tuesday evening, at the house of our publishers, Mess. Cowie & Co. and those gentlemen being so assembled, the suggestions made by our correspondents to the Editor of the Register, were communicated to them,* and the following Resolutions were passed unanimously.

RESOLVED—That this meeting do testify its sense of the merits of Dr. Birkbeck, and of his exertions on behalf of the London Mechanics' Institution, by proposing, that a subscription be opened for a portrait of that excellent man, to be placed in the building of the Institution; or for any other token of respect which shall be determined by the members in a full meeting.

RESOLVED—That Mr. Whitaker do embrace the first opportunity that offers, of suggesting to the Mechanics' Institution, in the absence of Dr. Birkbeck, that a requisition is now ready to receive the names of such of its members as agree in the propriety of calling a General Meeting, for the purpose of considering the best mode of shewing their respect and esteem for his valuable exertions, in behalf of the London Mechanics' Institution.

At the close of the lecture on chemistry, on Wednesday evening, which was delivered by a pupil of Mr. Cooper, that gentleman being unavoidably absent, Mr. Whitaker proposed, that a requisition should be made according to the rules of the Institution, to the Committee, to call a Special General Meeting, for the purpose of taking into consideration, the propriety of adopting some mode of expressing the sense which the Institution entertains, of the valuable exertions of its President, Dr. Birkbeck. Mr. Whitaker suggested, that a full-length portrait of the Doctor, to be placed in the hall, or reading-room of the Institution, should be executed, but that this, of course, should be discussed in a General Meeting. Mr. Whitaker's proposal was received with loud acclamations, and the requisition was signed by 47 members in less than five minutes.

* We should not perform an act of justice, if we were to omit stating, that Mr. Whitaker, a Member of the Committee, proposed something similar to the mode now under discussion, three or four months ago.

Mr. Blake, the honorary secretary, then read a letter from Sir Francis Burdett, in answer to an invitation which had been made to him to the first Anniversary Dinner of the Institution, and expressing his regret that absence from town would prevent his attendance.

The following is a copy of the requisition:—

To the Committee of Managers of the London Mechanics' Institution.

We, the undersigned members of the London Mechanics' Institution, do respectfully request the Committee of Managers, to convene a Special General Meeting of the Institution, on Friday, December 17, 1824, for the purpose of taking into consideration, the best mode of shewing their respect for the valuable exertions of their President, Dr. Birkbeck.

George Cowie	J. L. Whitaker.
Thomas James Simpson	J. W. Botchen
	Andrew Pritchard
Thos. Robertson	G. W. Applegarth
W. Sykes	S. Straker
B. St. Leger	W. F. Griffith
Benj. Pavyer	John Straker
W. Smith	Robert Parry
W. Clarke	Edward Coulson
James Harris	P. Surtle
Richard V. Clarkson	John Lyns
Fran. Watts	W. Jones
Thos. Papps	John Holdup
Charles Parry	Benjamin Webber
Richard Phillips	John Bishop
John H. Marshall	William Field
John Criddle	William Kilner
Edward Fenton	George Stacy
Charles John Reader	W. Truman
Thomas M. Ball	William Hall
Benj. Burton	John Whitaker
John Ball	Thos. Collett
Henry Holdup	W. Strange
G. Thurnell	W. Molineux

Having been unable last week, from the press of matter, to give a full report of the address of Dr. Birkbeck, on laying the first stone of the New Mechanics' Theatre, we now hasten to supply the omission.

After the stone was laid, the President addressed the meeting in nearly the following words:—

"Now have we founded an edifice for the diffusion and advancement of human knowledge. Now have we begun to erect a temple, wherein man shall extend his acquaintance with the universe of mind, and shall acquire the means of enlarging his dominion over the universe of matter. In this spot, hereafter the charms of literature shall be displayed, and the powers of science shall be unfolded to the most humble en quirers; for, to "the feast of reason," which will be here prepared, the invitation shall be as unbounded as the region of intellect.

"For an undertaking so vast in its design, and so magnificent in its objects (nothing short, indeed, of the moral and intellectual amelioration and aggrandizement of the human race), the blessing of heaven, I humbly trust, will not be implored in vain. If, in this Institution, we seek to obey the mandate which has gone forth, that knowledge *shall be increased*; if we act in obedience to the injunction, that in all our gettings we should get understanding; if we succeed in proving, that for the existence of the mental wilderness, the continuance of which we all deeply deplore, we ought "to blame the culture, not the soil;" if by rendering man more percipient of the order, harmony, and benevolence, which pervade the universe, we more effectually "assert eternal Providence, and justify the ways of God to man;" and if thus we shall be the happy means of rendering it palpable, that the immortal essence within us, when freed from the deformity of ignorance and vice, has been created in the express image of God, then may we confidently hope, that Omniscience will favourably behold our rising structure, and that in its future progress, Omnipotence, without whose assistance all human endeavours are vain, will confer upon us a portion of his powers.

"Whilst I remind you that the illustrious Bacon, long ago, maintained that "knowledge is power," I may apprize you that it has, since his time, been established, that knowledge is wealth—is comfort—is security—is enjoyment—is happiness. It has been found so completely to mingle with human affairs, that it renders social life more endearing; has given to morality more uprightness; and, politically, has produced more consistent obedience—it takes from adversity some of its bitterness, and enlarges the sphere, as well as augments the sweetness of every laudable gratification; and, lastly, unquestionably one of its brightest influences—it becomes at once an avenue and a guide to that "temple which is not made with hands; eternal in the heavens."

DISCOVERY OF GALVANISM.

The discovery of the effects of electricity on animals took place at the time from something like an accident. The wife of Galvani, at that time professor of anatomy in the University of Bologna, being in a declining state of health, employed as a restorative, according to the custom of the country, a soup made of frogs. A number of these animals, ready skinned for the purpose of cooking, were lying with that comfortable negligence common to both French and Italians, which allows them, without repugnance, to do every thing in every place that is at the moment most convenient, in the professor's laboratory, near an electrical machine, it being, probably, the intention of the lady to cook them there. While the machine was in action, an attendant happened to touch with the point of the scalpel the crural nerve of one of the frogs, that was not far from the prime conductor, when the limbs were instantly thrown into strong convulsions. This experiment was performed in the absence of the professor, but it was noticed by the lady, who was much struck by the appearance, and communicated it to her husband. He repeated the experiment, varied it in different ways, and perceived that the convulsions only took place when a spark was drawn from the prime conductor, while the nerve was at the same time touched with a substance which was a conductor of electricity.—*Eloge de Galvani.*

The Natural History of the Salmon.—Various are the opinions of naturalists with regard to the mode of propagation, the increase, the growth, habits, and size of the salmon; some affirming that they continue to grow as long as they live, and others thinking differently. Upon many of these points, in all probability, we shall never be wiser than we are. Goldsmith says, that fishermen assure us that sea-fish must be six years old before they are fit for the table. According to Mr. Pennant, salmon have been taken weighing seventy-four pounds. Whether such rare productions of nature were the formation of a single year, or the accumulated growth of many years, it is not only not easy, but perhaps impossible to ascertain, as well as many other particulars relating to ichthyology, to salmon in particular, or fish in general.

The mode of impregnation is very singular; it has been so often seen that no doubt can be entertained of the fact. Yet Goldsmith says, that the manner in which the eggs of fish are impregnated is wholly unknown. Though the grand distinction of fish is between those which are cetaceous and those which are cartilaginous, yet there is no reasoning by analogy, or drawing conclusions from one animal to another, or even forming an opinion on probability, as to their increase. The fecundity of the salmon is very great, the roe of a single one amounting to about 600,000. This experiment was made in the usual way, namely, by first weighing and then counting a certain portion, and afterwards weighing the whole mass. Yet this increase bears no sort of proportion to the number of pea in many other fish. The sturgeon produces the greatest number ever read of, being no less, according to Leuwenhoek, than 150,000 millions,—an amount equal to that of all the inhabitants of the earth; the female cod-fish gives 9,340,000; and the common crab 4,334,000. The porpoise produces only one, and yet porpoises are more plentiful than sturgeons. There seems to be no positive general rule in nature upon this subject; such is the extent and the variety of exceptions, that we are forced to the necessity of considering every animal distinctly and individually. What analogy proves to us that if the claw of a crab be torn off another will supply its place; that the polypus may be cut in pieces, and yet the separated part shall produce a perfect animal; that superfœtation shall exist in some animals and not in others; and that a certain insect of the gnat genus shall repeatedly produce without any connection with the male; and a thousand other instances of exception operating against the general law of nature? All prove to us that we are to look for certainty to each animal individually, and that we shall seek in vain to elicit it from the similitude that one animal may bear to another. Nature seems upon all occasions as though she disdained shackles of rule, preferring to exhibit, in whatever view we contemplate her works, the unlimited and uncontrollable power of the Creator.

FRANCE AND AMERICA.

The tendency of freedom to develop, and of despotism to repress the energies and resources of mankind, may be well illustrated by the example of France and the United States.

Forty years ago the genius of Mr. Watt perfected the steam-engine. This important improvement might have travelled to France in a very little time; but it so happened, that while her men of science have explained its theory, and eulogised its usefulness, her manufacturers have been in no haste to avail themselves of its power; her artizans have remained ignorant of its construction, and France had not the means of supplying itself with one of the most common instruments of industry, till the secret was carried over by a colony of English workmen. America, we suspect, has not furnished a single memoir on the theory of the steam engine, but she has done better. The art was not long practised in England when it was transported to Philadelphia; and many years before the steam-engine was known in Paris, it was made in the highest perfection at Pittsburgh, a town which did not exist when Mr. Watt made his discoveries.

Nearly the same remarks will apply to steam navigation. England supplied the first hint of this great invention; America caught it up, improved upon it, and returned it to us in a new and perfect state of boundless utility and power. While England and America have thus been reciprocating improvements, the men of science who surrounded the French government have made steam navigation the subject of prize essays and ingenious speculations; but France was without a single steam-boat, at a time when nearly three hundred were plying on the coasts and rivers of America!

So far back as the reign of Louis XIV, experiments were made, and the resources of science applied to improve the form of ships; nay, schools, we believe, were established to teach the art of ship-building, and excellent works on the subject are still in the French language. Yet see how the natural development of talent in a free society supplied the place of scientific refinements; the American vessels, built by men who are strangers to theory and calculus, are the most complete in their construction and equipments of any that cross the ocean, and outsail those of every other nation, our own scarcely excepted.

Astonishing is the progress the Americans made at once, without experience, in sciences which France and England have each paid a thousand millions to learn — the science of naval war; many arts go to fit out a complete ship of war; and who did not imagine, that America would betray the awkwardness of a trader and a novice in these different arts, and pay dearly in discomfiture and blood for the skill she was supposed to want? What was, then, the surprise of Europe, to find, that these fishermen and shopkeepers, in their very first essay, grappled with the lords of the ocean on their own element, and took their place at once in the first rank of nations in the science of naval war!

THE COLUMBUS.

So much has been said against the appearance and capabilities of this ship, that our readers will be surprised to hear, that the Lords of the Admiralty have had their attention called in a very particular way to some parts of the architecture of this vessel, which, it is supposed, might be introduced with great effect in the British navy, and that they have seriously entertained the suggestion. The part of the Columbus from which it is desired to borrow, is, we understand, the square bottom; as it is considered, that the circumstance of this vessel having sailed at the rate of nine knots an hour, with such a bottom, notwithstanding her lading, is highly favourable to the idea of giving to the ships of the navy increased power of burthen, without detracting from the velocity of sailing. Sir Robert Seppings has examined the Columbus several times at Blackwall, and H. R. H. the Duke of Clarence was to visit Blackwall for the same purpose.

Sheep-ponds.—A retired farmer, who was a considerable number of years a large flock-master, informs us, that the claying and flinting, &c. of sheep-ponds, to prevent their leaking out their water in dry summers, having been, from time immemorial, not only attended with a heavy expence, but a very partial success, it has recently occurred to him, that much would be ultimately saved, especially on high and dry lands, by lining them with cast-iron, which, allowing the plates to be three quarters of an inch thickness, he finds upon inquiry would, even at the present price of the material, which has advanced full 40 per cent. within twelve months, cost no more than 5s. 6d. the superficial foot. Hence the lining of a pond (to last, with fair usage, for many years, always preserving its water and keeping it sweet) of 90 feet diameter, which are very large dimensions, would cost only £220. The iron for this purpose should be prepared in plates of an angular form, about three feet in depth and (at the upper end) width, fitted in to a round or crown plate in the centre of the pond, be clamped and cemented together, and be placed above each other in the same manner, "Round succeeding round," each wider than that beneath it.—The farmer, owing to his sheep-pond leaking, is not unfrequently, reckoning the cartage of water, labour, &c. put to the annual expence of from 30 to £40. for several years together.—The means of making sheep-ponds effectually hold their water appears, from our rustic writer, to have been sought after some hundreds of years.

NEWTON AND DESCARTES.—It must be acknowledged that these two great men were exceedingly different from each other in their conduct, their fortune, and their philosophy. Descartes was born with a brilliant imagination, which made him a singular man in his private life, as well as in his manner of reasoning. This imagination was apparent, even in his philosophical productions, which in every page abound in striking comparisons and illustrations. Nature had nearly made him a poet; and he actually composed for the Queen of Sweden a dramatic entertainment, which, to the advantage of his fame, was never printed. He engaged for a time in the profession of arms; and, even after he had devoted himself to philosophy, he did not think it unworthy of him to make love. The mistress of his affections was called Francine, who died young; and her loss he sincerely and tenderly regretted. He thus experienced all that appertains to humanity.

He for a long time deemed it expedient to seclude himself from mankind, and especially from his own country, in order to philosophize at perfect liberty. In this he acted wisely. The men of his own times were too ignorant to be able to communicate to him any knowledge, and were capable only of doing him injury. He quitted France, because he sought for truth, which was at that time persecuted by the wretched philosophy of the schools; but he did not find reason more prevalent in the universities of Holland, which he chose for his retreat; for at the very time when the only propositions of his philosophy that were true were condemned in France, he was also persecuted by the pretended philosophers of Holland, who understood him no better than those in his own country, and who, as they saw his glory more nearly, hated his person more bitterly. He was obliged to leave Utretcht; he even experienced the accusation of atheism, that last resource of calumniators; and the man who had devoted all the acuteness of his extraordinary intellect to the discovery of new proofs of the existence of a God, was most absurdly charged with denying him altogether. The various persecutions he sustained implied extraordinary merit, and distinguished reputation, both of which he actually possessed. Athwart the profound darkness of the schools, and the prejudices of popular superstition, a ray of reason pervaded the world. His name at length obtained such celebrity, that rewards were held out to him with a view to his residence in France. He was offered a pension of a thousand crowns. He returned in the expectation of this allowance; but after being at the expence of paying for the patent (for patents were at that time not given, but purchased) he never received his pension, and returned to philosophize in his solitude of North Holland, at the time when the great Galileo, at the age of eighty years, was languishing out his life in the prisons of the Inquisition, for having demonstrated the motion of the earth. He at length died prematurely at Stockholm, in consequence of an improper regimen, amidst a number of learned men, who were hostile to his opinions, or envious of his celebrity, and under the superintendence of a physician who hated him.

The career of Sir Isaac Newton was widely different. He lived to the great age of eighty-four years, always peaceful, happy, and honoured by his country. It was his great good fortune, not merely to be born in a free country, but at a period when the absurdities of the schools were banished, and reason alone was cultivated; the world could become only his scholar, and not his enemy.

One point in which he may be strikingly contrasted with Descartes is, that in the course of so prolonged a life, he felt neither passion nor weakness. He never once associated as man with women, which was expressly stated to me by the physician and surgeon in whose presence, if not in whose arms, he expired.* Newton may for this

* This proves Newton's physician not so good a natural philosopher as himself. There is no unequivocal proof of such ab-

excite our admiration, yet Descartes ought not to incur our censure.

The prevailing opinion in England respecting these two philosophers is, that Descartes was a visionary, and Newton a sage. Very few persons in London read Descartes, whose works have in fact become totally useless. Newton, also, has very few readers, because it requires great knowledge and sense to understand him. Every body, however, talks about them. No merit is allowed to the Frenchman, and every merit is ascribed to the Englishman. There are some who think that the destruction of the old and once universally received doctrine of nature's abhorring a "vacuum;" that our knowledge of the gravity of the atmosphere; that the discovery of telescopes;—are all to be attributed to Newton: he resembles, in this respect, Hercules in the fable, to whom the ignorant gave the glory of achievements actually performed by other heroes.

In a critical examination, written at London, of the discourse of M. de Fontenelle, the author ventures to assert, that Descartes was not a great geometrician. Those who use this language may well be reproached with ingratitude to their benefactor. Descartes constructed as noble a road of science, from the point at which he found geometry to that to which he carried it, as Newton himself did after him. He is the first who taught the way to find the algebraical equations of curves. His geometry, thanks to his powerful and inventive mind, although now become common and familiar, was in his own time so profound, that no professor ventured to undertake the task of explaining it, and there was not a man besides Schultens in Holland, and Fermat in France, who really comprehended it. He carried this spirit of geometry and invention into optics, which under him became a completely new art; and if, notwithstanding this, he was in some respects entirely mistaken, it is to be remembered that the discoverer of new lands cannot instantly become acquainted with all their various productions and qualities. Those who came after him owe him some obligation at least, simply for the discovery.—*Voltaire's Philosophical Dictionary.*

Iron Rail-way between Manchester and Liverpool.—It appears by an ably-drawn prospectus of this proposed iron rail-way, that by the proposed line the distance between Manchester and Liverpool will be 33 instead of 36 miles, and that the expense of the rail-way, and of the locomotive machines to travel upon it, will be £400,000., which sum it is proposed to raise in 4,000 shares of £100. each. The prospectus proceeds to state, that the total quantity of merchandise passing between the two towns is estimated at one thousand tons a day; that these goods are principally transported either by the Duke of Bridgewater's canal, or the Mersey and Irwell navigation; and that the average time consumed in the passage is thirty-six hours, and the average charge fifteen shillings a ton. By the projected rail-road, the passage will be effected in four or five hours, and the charge will be reduced one-third. This saving will, of course, afford a stimulus to the active industry of the country, and by a salutary competition, give a new impulse to the powers of accumulation. It may not be easy to conceive how the proprietors of a railway, requiring a capital of £400,000., can afford to convey goods at a lower rate than the water companies; but the problem is solved thus:—the water companies can carry them much lower than they do, but strong in the enjoyment of their monopoly, they do not choose it; and in support of this assertion, it is said, that the shares in the Old Quay navigation, which originally cost £70., have been sold for £1,250. The railway company do not, however, rest upon the mere point of economy in money; they think economy in time also of much importance; a saving of 5-6ths of the period of transit they hold to be no mean consideration, and this will be effected daily and every day; exclusive of which, great impediments and injurious delays arise at certain seasons of the year in the carriage by water, to which the railway will not be subject; in summer there is often a deficiency of water, and in winter the navigation is frequently locked up for weeks by the frost, so that merchandise is sometimes longer on its passage from Liverpool to Manchester, than from New York to Liverpool! On these and a variety of other grounds, the expediency of the proposed measure is strongly urged, and it is now fully determined to apply to Parliament for an act to enable the proprietors to carry this grand project into effect. It may be proper to add, that the conveyance of passengers, as well as of merchandise, enters into the scheme of the railway, and that suitable vehicles will be established for their accommodation.

Distilling.—Is there any law to prevent a man from distilling sufficient spirit for his own use; or must he purchase the poisonous stuff sold by the spirit-merchants? With a proper apparatus, we may obtain from potatoes, sugar, grain, or fruit, a very

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stinence in man; and a man who dies at the age of eighty-four, whose mind was calm and regulated, and who lived a retired and studious life, may possibly, nevertheless, have had his weaknesses, although there may be no living witnesses to attest them. Besides, even if Newton had in fact been perfectly unacquainted with the enjoyments in question, what benefit could possibly have resulted from it to mankind?

wholesome spirit, at about four shillings per gallon; and yet we pay twelve or fourteen for a liquid, which they call gin, and twenty-five or twenty-six for brandy. It is really scandalous that a poor man cannot, without the sacrifice of more than he can well spare, obtain a little spirit, to cheer him under fatigue or indisposition, and if there be a law, as we dare say there is, against distilling, although a small quantity for one's own consumption, we can only say that it is a most disgraceful one, and cannot be too soon abrogated.

Bone Gas.—It is not generally known that the olipant gas from bones gives a most beautiful flame, and without being expensive, as the bones from which it is made, when burnt to carbon in a close vessel, are excellent in cleaning all vegetable substances from impurities, particularly oils, which are entirely deprived of rancidity, by mixture of the powder from burnt bones. We have seen oil at two shillings per gallon rendered equally bright and pure with those at eight shillings, by this process. In a small experiment which we made a short time since, two pounds weight of beef bones emitted a gas, which burned with a fine flame, equal to the light of six candles for two hours, and the carbon was sufficient to purify two gallons of oil.

STEAM AND GUNPOWDER.

On the relative Effects of Steam and Gunpowder, as applied to purposes of warfare.

Since our account of Perkins' Steam Gun made its appearance, we have observed that the Mechanics' Magazine has been endeavouring, by publishing several papers on the subject, to expose, what they are pleased to consider, its fallacy and folly.

In No. 65 of that work, we find an article beaded the "Relative Effects of Steam and Gunpowder." It is not to be expected that a person whose occupation is that of a "gun spunger," as the writer of that article acknowledges himself to be, could be much pleased with a gun that requires no such personage, for among the advantages which the steam gun has over the common one is, that it requires neither spunging nor ramming. It is true, that in doing away with the necessity of spunging, you deprive Mr. Gun-Spunger of the pleasure of risking the loss of an arm or two by *false-spunging*.—But to be serious: this writer gives some very correct and important information respecting gunpowder; but at the same time, he evidently shews that he does not understand the difference between the action of gunpowder, and that of steam on the ball.—Let us now come to the facts, for facts are stubborn things. What has Mr. Perkins done with his gun? What we saw, together with many others, was this. Mr. P. was, in one of his recent experiments, questioned in a very kind manner by a military gentleman, as to the effect the heat of the steam might have in softening the ball. To settle that objection, which has been so much urged against this system, Mr. P. immediately placed before the iron target a very firm fir plank, 1¼ inch thick; and after he had raised the steam to sixty atmospheres, he perforated it with as clean a hole as ever was made with gunpowder. The balls, after having pierced the plank, were flattened larger than a crown piece. Is this equal to the force commonly used in battle? The military officers, (and there were many), who witnessed the experiment, all said the power was greater than common field-firing.—This is an indisputable fact; and we ask, if it does not speak volumes in favour of steam gunnery? If sixty atmospheres of steam pressure are equal to 1000 of powder pressure, which is evidently the case, if we are to believe what we see, we can easily understand why steam may supersede gunpowder, and that much heavier balls may be projected from a steam gun than from a common one. The reason why steam, at sixty atmospheres pressure, will project a ball as far as gunpowder at many hundred atmospheres pressure, is simply this. The steam acts with the same pressure when the ball leaves the gun, as when it began to move. It is not so with gunpowder; the impulse is more sudden, and its expansive power begins to diminish before the ball leaves the gun. It is found by experience, that the stronger the powder the shorter may be the gun. In fact, fulminating powder, which is infinitely stronger than gunpowder, is sure to burst any gun charged with it, although the ball be not propelled many yards from the gun, it being much too instantaneous for projectiles. The last number of the Mechanics' Magazine has a paper, headed "The Steam Gun Folly;"—but it would be folly indeed in us to attempt to answer this powerful writer, since he states such strong and overwhelming facts: for instance; he says, that "it now turns out, that the invention is not only useless, but it has been tried before, and failed."—Excellent!—Failed!—Now we do not believe that Mr. P. pretends to have any claim to a steam gun that has *failed*. We conceive all the difference that exists between what has been hitherto done in steam gunnery, and what is now doing by Mr. P. is, that all attempts of others have hitherto *failed*, while those of Mr. P. have succeeded!! In a recent conversation with Mr. P. on the subject of the steam gun, he distinctly stated, that the idea of using steam for projectiles was not new; that Messrs. Bolton and Watt, Mr. Murray in America, and some one in France, had tried experiments in steam gunnery, but without much effect, as the highest pressure used was not more than ten atmospheres. What he considered new, was that of being able, by his method of generating steam, to have it under perfect controul, thereby using it to an *effective* pressure without the least danger. Mr. P. has hitherto made his experiments with a generator constructed for his steam engine when not more than fifty or sixty atmospheres pressure were required. He has now a generator nearly completed, for the purpose of projectiles only, where his pressure may be, if necessary, carried to many hundred atmospheres. This furnace, we understand, is constructing for the purpose of demonstrating the safety and practicability of high steam to those immediately interested in its success, and to stop further cavilling on the subject. What if this discovery should prevent a few thousands from going into the pockets of powder makers and powder *re-makers;* will it not make us independent as to the article of saltpetre, and save us millions upon millions? What is the cause of the present unparalleled prosperity of this country but *peace* and *machinery?* But to insure peace we must be prepared for war.

THE NEW COMPANIES.

From what we have said in the Register, we do not imagine that we shall be accused of an aversion to public companies, on a general ground, but we must be permitted to except from our approbation, some of those infamous attempts to dupe the public, which we have witnessed, during the last month, upon the Stock Exchange, and which meet with success, merely because the persons who are at the head of them are rich, or in the city language, *highly respectable*. Formerly, the wealth and fame of a citizen were sure guarantees of the honour and propriety of any undertaking to which he might affix his name, but now there is no imposture too infamous, no act of swindling too gross, no trick too palpably vicious, to deter some from adding to their gains at the expence of a deluded public: among this public are many honest and industrious artizans, who have, by rigid economy, saved a few pounds, which these city speculators would deprive them of, by their fine schemes for the employment of capital. We shall endeavour to prevent this by an exposure of the cheat, and then, if any honest man, who reads this exposure, chooses to be humbugged, let him err with his eyes open. It would be impossible to enumerate one half of the bubbles which have burst during the last year, but we may particularly notice a thing called a pawnbroking society. This notable scheme, which was to enable gin-drinkers and habitual topers to get drunk at an easier rate than they were able to do, owing to the larger premium which they paid to the established pawnbrokers for the use of their money, burst six months ago; but we hear that it is to be revived with all the *eclat* which can be given to it. This humbug has the name of a duke or two affixed to it; and if any poor simpleton will be coaxed out of his money by ducal patronage, he has here an opportunity of parting with it. This precious job originated, it is said, but we are open to correction and shall be happy to make it, with a broken-down oilman, and a dandy brazier, and as the progress of it forms a very curious illustration of the mode of conducting all these impostures, we shall trace it. The oilman and the brazier having, with their worthy colleague, concerted their plan, and induced that well-meaning woman, Mrs. Fry, to take part in the scheme, sent a prospectus into the money-market, holding out the most brilliant prospects, and ensnaring applications for shares in this *two-to-one* enterprize. The prospectus was published at ten o'clock in the morning, and before one, all the shares were engaged. John Bull has a tremendous swallow, and will gulp down any thing. The fellow's fancy was tickled, and he would, if required, have swallowed the whole tribe, oilman, tinman, rocket-man, and the quaker-lady in the bargain. Well, the shares were all written for, they went up to a premium, and nothing was spoken of but Mrs. Fry's scheme, in the market. John Bull had taken the risk, and John ought to have had the benefit; but when the shares had been written for, and had reached a premium, there were directors to form, and auditors, and secretaries, and—God knows what else! and my lords, and baronets, and magistrates could not be asked to take the management of the concern without some feeling in it; and so, honest John's shares formed a pretty bait for them, and John was left with a very small portion of what he had expected. Now, we would not insinuate, for one moment, that a single share of what John had subscribed for, was given to any of these lords and baronets, and M. P.'s, and magistrates, *after* John had engaged them. Quite the contrary. These were all honourable men, and far be it from us, to suspect honourable men of dishonourable acts, in any country, much less in England, where such infinite pains are taken to protect honest John in the enjoyment of the fruits of his industry. There was a mistake somewhere, and the bubble burst; but not before many hundreds of pounds had been realized by some of its promoters; and now it is to be brought forward again, as honest John has so much unemployed capital. This was not the only bubble that burst last year. There were a Beer Company, a Thames and Isis Navigation Company, and a great many others, but the bubbles of the end of the last year, and of the beginning of this, were as nothing compared with those which are now in the market. It would take half an hour to enumerate them, but we may just mention a few of the most notable:—a Colombian Pearl Fishery—a Colombian Mining Company—another Mexican Mining Company—a Brazil Mining Company—a Peruvian Mining Company—two Public Bath Companies—Rothschild's Marine Insurance Company. The first of these bubbles has been got up by some men of wealth, (character, as the citizens say) who modestly give the public a portion of the advantages of the pearl fishery, for 10 per cent. premium to them, for the trouble which they have taken in the negociation of the contract. This is a precious concern, indeed! We are to have pearls, say they, as plentiful as red herrings, and the poor *niggers*, as Charles Matthews calls them, who are to bring them up from the bottom of the sea, are to be taken under our gracious protection, and are to have bibles sent out to them, in exchange for oysters.

The Colombian mining concern disputes the palm with the pearl fishery; one is to give us pearls by the bushel, the other gold by the cart-load, but the contractors of the latter, unwilling (amiable men) to deprive the shareholders of any part of the enormous gains which they are to derive, have taken their modest commission beforehand. How very generous of them! and then the amount of that commission is so small, only five per cent. upon one million—£50,000, to cover all the enormous expences to which they have been subjected, and which may amount to something like the following.

Printed forms as letters for applications for shares - - - - - -	£5
Ditto, for answers to applications -	5
Postages of letters to and from Colombia - - - - - - - -	5
Douceurs to clerks in office at Bogota. (These are poor devils, though living in the midst of gold mines, and a large douceur is not expected) - - -	500
	£515
Commission - - -	50,000
Net profit, *only* - - -	49,875

But to make up for the smallness of this profit, the contractors have a decent number of shares on hand, which they can turn out, at ten or twelve per cent, premium, each, and so realize another £50,000. Honest John thus takes the shares at nearly £20, premium; but his gold mines—aye, there's the temptation,—gold mines are such snug concerns,—so productive, so—John has hit the nail this time, he will have the laugh at the contractors, poor simpletons as they are, to part with a privilege, which cost them £515, for only £99,875, which is to give John a bushel of gold for every £50! Oh, Mr. Powles, John has done you at last!—Oh, Mr. Goldschmid, cunning little Isaac! John has outwitted you, too!—Sagacious John! Who, after this, will say John is a fool, since he has bought a gold mine in Colombia?

(To be continued.)

We give the following interesting article, as promised; an overflow of matter having prevented it appearing before.

Iodine.—Iodine was accidentally discovered, in 1812, by M. de Courtois, a manufacturer of saltpetre at Paris. In his processes for procuring soda from the ashes of sea-weeds, he found the metallic vessels much corroded; and in searching for the cause of the corrosion, he made this important discovery. But for this circumstance, nearly accidental, one of the most curious of substances might have remained for ages unknown, since nature has not distributed it, in either a simple or compound state, through her different kingdoms, but has confined it to what the Roman satirist considers as the most worthless of things—the vile sea-weed.

Iodine derived its first illustration from MM. Clement and Desormes, names associated always with sound research. In their memoir, read at a meeting of the Institute, these able chemists described its principal properties. They stated its specific gravity to be about 4; that it becomes a violet-coloured gas at a temperature below that of boiling water; whence its name, Ἰώδης, *like a violet*, was derived; that it combines with the metals, and with phosphorus and sulphur, and likewise with the alkalis and metallic oxides; that it forms a detonating compound with ammonia; that it is soluble in alcohol, and still more soluble in ether; and that by its action upon phosphorus, and upon hydrogen, a substance having the characters of muriatic acid is formed. In this communication they offered no decided opinion respecting its nature.

Iodine has been found in the following sea-weeds, the algæ aquaticæ of Linnæus:—

Fucus cartilagineus,	Fucus palmatus,
membranaceus,	filum,
filamentosus,	digitatus,
rubens,	saccharimus,
nodosus,	Ulva umbilicalis,
serratus,	pavonia,
siliquosus,	linza, and in sponge.

But it is from the incinerated sea-weed, or kelp, that Iodine in quantities is to be obtained. Dr. Wollaston first communicated a precise formula for extracting it. Dissolve the soluble part of kelp in water. Concentrate the liquid by evaporation, and separate all the crystals that can be obtained. Pour the remaining liquid into a clean vessel, and mix with it an excess of sulphuric acid. Boil this liquid for some time. Sulphur is precipitated, and muriatic acid driven off. Decant off the clear liquid, and strain it through wool. Put it into a small flask, and mix it with as much black oxide of manganese as we used before of sulphuric acid. Apply to the top of the flask a glass tube, shut at one end; then heat the mixture in the flask. The Iodine sublimes into the glass tube.

As several of the Scotch soap manufacturers use scarcely any other alkaline matter for their hard soaps except kelp, it occurred to me that in some of their residuums a substance might be found rich in Iodine. Accordingly, after some investigation, I found a brown liquid, of an oily consistence, from which I expected to procure what I wanted; and I therefore instituted a series of experiments on the best mode of extraction.

Iodine is a solid, of a greyish-black color and metallic lustre. It is often in scales similar to those of micaceous iron ore, sometimes in rhomboidal plates, very large and very brilliant. It has been obtained in elongated octohedrons, nearly half an inch in length; the axes of which were shewn by Dr. Wollaston to be to each other, as the numbers 2, 3, and 4, at least so nearly, that in a body so volatile, it is scarcely possible to detect an error in this estimate, by the reflective goniometer. Its fracture is lamellated, and it is soft and friable to the touch. Its taste is very acrid, though it be very sparingly soluble in water. It is a deadly poison. It gives a deep brown stain to the skin, which soon vanishes by evaporation. In odour, and power of destroying vegetable colours, it resembles very dilute aqueous chlorine. The specific gravity of iodine at $62\frac{1}{2}^{0}$ is 4.948. It dissolves in 7000 parts of water. The solution is of an orange-yellow colour, and in small quantity tinges raw starch of a purple hue.

It melts, according to M. Gay Lussac, at 227° F. and is volatilized under the common pressure of the atmosphere, at the temperature of 350°. It evaporates pretty quickly at ordinary temperatures. Boiling water aids its sublimation. The specific gravity of its violet vapour is 8.678. It is a non-conductor of electricity. When the voltaic chain is interrupted by a small fragment of it, the decomposition of water instantly ceases.

From all the known facts, we are warranted in concluding iodine to be *an undecompounded body*. In its specific gravity, lustre, and magnitude of its prime equivalent, it resembles the metals; but in all its chemical agencies, it is analogous to oxygen and chlorine. It is a non-conductor of electricity, and possesses, like these two bodies, the negative electrical energy with regard to metals, inflammable and alkaline substances; and hence, when combined with these substances in aqueous solution, and electrized in the voltaic circuit, it separates at the positive surface. But it has a positive energy with respect to chlorine; for when united to chlorine, in the chloriodic acid, it separates at the negative surface. This likewise corresponds with their relative attractive energy, since chlorine expels iodine from all its combinations. Iodine dissolves in carburet of sulphur, giving, in very minute quantities, a fine amethystine tint to the liquid.

Iodine of mercury has been proposed for a pigment. M. Orfila swallowed 6 grains of iodine; and was immediately affected with heat, constriction of the throat, nausea, eructation, salivation, and cardialgia. In ten minutes he had copious bilious vomitings, and slight colic pains. His pulse rose from 70 to about 90 beats in the minute. By swallowing large quantities of mucilage, and emollient clysters, he recovered, and felt nothing next day but slight fatigue. About 70 or 80 grains proved a fatal dose to dogs. They usually died on the fourth or fifth day.

Dr. Coindet of Geneva has recommended the use of iodine in the form of tincture, and also hydriodate of potash or soda, as an efficacious remedy for the cure of glandular swellings, of the goitrous and scrophulous kind. An ointment composed of 1 oz. hog's lard, and 1 drachm of iodide of zinc, a powerful external application in such cases. About a drachm of this ointment should be used in friction on the swelling once or twice a-day.

A correspondent informs us, that he has made experiments with carbonic acid gas, for extinguishing fires, and that it was found fully to answer the purpose. We wish he had enumerated the experiments, because then we should have been better able to pronounce a decided opinion upon the subject. As it is, we can only say, that although there can be little doubt of the efficacy of carbonic acid gas in extinguishing combustion, we fear the difficulty and expence of procuring it would be more than commensurate with its utility.

The Mechanics' Institution at Ipswich is proceeding with great success and energy, notwithstanding a base attempt of some busy fools to decry it, on the ground of its having a political tendency. Every body knows that there are fools in Ipswich, but we never imagined to have found any so completely lost, as to object to the formation of a society, which, from its nature has nothing to do with politics, merely because it might become political. We will tell these Ipswich fools, and the observation will hold good every where else, that the first rule of the Mechanics' Institutions is, to supply the members with good books,—good books make good men, and good men make good politicians. If, therefore, the members of Mechanics' Institutions ever dabble with politics, it will be on the side of the king and the constitution, and we do not see that the possibility of snch a circumstance can justify a resistance to their formation.

A correspondent desires, through the medium of the Register, to obtain an account of the best and least expensive mode of making gas from oil, upon a small scale, for private use. There is now no medium betwen paying £4. per annum, besides laying the gas on fiom the main, for a single burner, which is dearer than the light of two candles, and the portable gas, which is only supplied in quantities larger than suits the consumption of a small family. We can only say, in reference to our correspondent's request, that we shall feel very happy to receive any communication on this subject.

MANUFACTORIES IN FRANCE. — The French are going to take off all the antique restrictions upon trade, and thus to throw open the field for fair competition. In anticipating this event, several foreigners have established themselves in France, and are gaining fortunes in the construction of machinery. In Paris, there are four or five English manufacturers of iron and steam engines, who employ together, more than 1000 men; and in Liege, there is a person named Cockrane, who has 500. It is time, therefore, for John Bull to look sharp. The French are not such fools as we imagined: they go on slowly but surely to the point, and if another ten years of peace should bless them, they will be in the high road to perfection.

To the Editor of the London Mechanics' Register.

SIR—Having read in No. III. of the Mechanics' Register, a considerable mis-statement in the article on coffee, and believing you would not knowingly render your valuable work the vehicle of error, I am induced to trouble you with a few observations and facts within my own personal knowledge.

Chicorée, chicorium of the botanists, endive or succory in England, so given in the dictionaries, and not '*dent de lion*,' is a well known vegetable, the wholesome properties of which are admitted by all writers from Culpepper to the professor of botany of the present time, Dr. Thornton. In Rousseau's "Lettres sur la Botanique," folio, there is a large and highly-finished engraving of the plant. It is in the deep rich soil between Antwerp and Brussels that it is cultivated to a considerable extent, and is prepared for use, and distributed in all the western parts of the continent, where it has been in use during the last century, and amongst the common people is used *alone*, boiled with *milk*, which it could not be, if it possessed those dangerous stimulating qualities you have attributed to it.

The wars with France, however, brought it into more extensive use, as it is well known the French were compelled to have recourse to substitutes at home for those articles of colonial produce, which modern habits have rendered necessaries of life, but which they could not attain; and the government gave considerable rewards for such discoveries as would supply the deficiency. Amongst these, the prepared chicorée was the substitute for coffee; and as it was found to impart an agreeable rough flavour, and better colour, to the ordinary coffee, and was approved by the Facultés des Medecins of Paris, Brussels, and Leyden, which gave confidence in the use of it, in the proportion they recommended, (one part chicorée to three of coffee) it naturally became an article of very general demand, and is used, not only from rigid economy, but from its possessing considerable medicinal virtues; amongst others, its correcting the astringent properties of good coffee, for which purpose I use it myself.

The following anecdote relative to it, was related to me a few months since, by the Cafetier himself. The conductor of one of the numerous Cafés in Paris, was requested by the steward of an English family, with whom he was acquainted, to undertake the management of the coffee department on a certain day of entertainment. The Frenchman attended, and fulfilled his engagement to the fullest satisfaction of my lords and ladies, and the unsuspected steward, after abstracting a fourth part of the "genuine Turkey," substituted the same quantity of Flemish chicorée.

With respect to fresh made coffee, different opinions and different parties are prevalent.—The late Mr. Angerstein, whose collection of paintings form the present National Gallery in Pall Mall, who was accustomed to take a great deal, and that very strong, always had made at one time, a quantity sufficient to serve him a week, and preserved it, air-tight, in stone jars.

A FLEMING.

*** We are much obliged to a Fleming for this communication, which will probably produce a good medical opinion, which shall decide between us.

QUERIES.

Man in inquisitiveness should be strong,
From curiosity doth wisdom flow:
For 'tis a maxim I've adopted long,
The more a man *inquires* the more he'll *know*.
PETER PINDAR

MATHEMATICAL QUESTION. — Draw a right line through the focus of an eclipse, terminating in the periphery, so that the rectangle, under the parts thereof intercepted by the focus and the periphery, shall be the least possible. Y.

To the Editor of the Mechanics' Register.

SIR—Having understood that there are persons, who have in their possession a receipt for making blacking, without vitriol, or any other spirit, and which will quickly polish, and retain a jet black, without destroying the leather; should any of your readers be in possession of such a recipe, and have no objection to give the information required, they will oblige

A CONSTANT READER.

SIR—Observing on Friday week, at Mr. Tatum's lecture, the instantaneous deprivation of life, by means of electricity, on some fish, in a vessel of water, I beg to enquire, through your excellent work, if any of your correspondents know, or will ascertain, if the same effect would result on *every* shrimp, prawn, crab, or lobster, that might be so immersed in a larger vessel? and if the fish, being thus killed previously to cooking, would eat with the same firmness and flavour, as when boiled to death by the present inhuman and unfeeling practice?

Yours, &c.
H. JENNISON.

SIR—I will feel obliged to any of your numerous correspondents, by their informing me, through the medium of your Register, the mode of purifying muriatic acid, as it is generally purchased in an impure state.

Yours very respectfully, S. E. T.

A Correspondent wishes to be informed by some of the readers of the London Mechanics' Register, the reason why the third, fourth, fifth, and sixth parts of a pound sterling, when added together, does not amount to that sum. Thus, if a person has to pay a sovereign to four men in the above proportions, each will be satisfied with his share, and the payer have a shilling for his trouble.

SIR—Through your useful miscellany, I have no doubt I shall obtain an answer to the following:—the best method of making court-plaister. By giving this insertion, you will oblige, Sir,

The Register's well-wisher. T.

ANSWERS TO QUERIES.

To the Editor of the London Mechanics' Register.

SIR—In No. 4 of your highly amusing and instructive work, is inserted an excellent problem, the solution of which I feel much gratification in submitting to the approval of you, and your numerous readers.

To form the longer square, place the two pieces together, in such a manner as to produce the greatest length they are capable of extending; and to form the shorter square, place them in the manner in which they make the greatest depth.

Trusting you will find it perfectly correct,
I am a constant Reader of yours,

A LADY.

Please, Mr. Editor, to excuse the slovenly manner in which I send my solution.

*** This apology from our fair correspondent was perfectly unnecessary, as the solution is exceedingly well expressed.

MR. EDITOR—In reply to several of your correspondents' queries in the 4th number of the Mechanics' Register, I beg to forward the undermentioned information.

Southville. S. HOLLANDS.

Pickled Sprats, resembling Anchovies.—After taking the heads off a quantity of the freshest and largest sprats, salt them a little with common salt, and let them stand till next morning: then take a small barrel, or earthen pot, and put in it a layer of bay salt, with a little pounded lemon-peel and bay-leaves, and a layer of sprats, alternately placing a layer of bay salt and sprats, until the vessel is filled. It is then to be closely covered up, so that no air can get in. This, if it be a barrel, is usually effected by closing it with pitch. Being placed in a cellar, or other cool place, and the vessel turned upside down once a week, they will, in three months, be fit for use.—Though the flesh of these sprats is certainly not quite so delicious as that of the actual anchovy, the liquor is, for many purposes, almost equally good. In truth, both fish and liquor are very generally sold at most oil shops for the real anchovy.

To marble the Edges of Paper, or Books.—Provide a wood trough, two inches deep and six wide, the length of a demy sheet; pour hot water into it until nearly full, and put therein three ounces of gum-dragon, which must be dissolved before marbling. Grind the following colours on a marble slab, with old ox-gall, very smooth and fine, and procure a small cup and brush for each.

Prussian blue; king's yellow; rose-pink or lake; flax white; lamp black. Green, blue and yellow; orange, red and yellow; purple, blue and red; brown, black and yellow.

To prevent the water entering the leaves of the book, tie it tight between cutting-boards of an equal size. Place the trough in a steady situation, and throw on the colours with their respective brushes, beginning with the blue or any dark colour, and so on till the surface of the water is covered.

The colours may remain in this situation, or be waved with a small iron pin. Hold the book with the edges downward, and press it evenly and lightly on the colours, and it will immediately be marbled. Two or three colours only may be used, or as many as the marbler may think fit. Should any of the colours not swim well, a few drops of spirits of wine may be added.

Process of bleaching old Books and copper-plate Prints, which have become discoloured by age, smoke, &c.—If a book, take off the binding, unsew the leaves, and separate them; place them in a shallow leaden vessel, with slips of common window glass interposed between them; so that the leaves or prints lie horizontally, without touching each other; or a still better method is the following:—Make a wooden frame of about the size of the leaves or prints to be bleached, and having placed upon it the slips of glass, let the leaves or prints be placed on the glass perpendicularly, about a line distant from each other. This being done, pour into the vessel the bleaching liquid, which is made by dissolving one part by weight of oxmuriate of lime, in four parts of warm water, and suffer the articles to be immersed in it for twenty-four hours; they may then be rinced in soft water. By this process the paper will acquire a whiteness superior to what it originally possessed. All ink spots, if any, will be removed; but oil or grease spots are not effaced by it.—Copper-plate prints bleach more easily than letter-press.

Cleaning of Engravings.—Put the engraving on a smooth board, cover it thinly with common salt finely pounded; pour, or squeeze lemon-juice upon the salt, so as to dissolve a considerable portion of it; elevate one end of the board, so that it may form an angle of about forty-five or fifty degrees with the horizon. Pour on the engraving boiling water from a tea-kettle, until the salt and lemon juice be all washed off; the engraving will then be perfectly clean, and free from stains. It must be dried on the board, or on some smooth surface gradually. If dried by the fire or the sun, it will be tinged with a yellow colour. Any one may satisfy himself of the perfect efficacy of this method, by trying it on an engraving of small value. F.

SIR—I should be happy to learn, through the medium of your valuable work, the most effectual remedy against chilblains. C.

The following Queries arrived too late for insertion in their proper places.

SIR—As colds, at this time of the year, are generally very prevalent, and as I now labour under a most severe one, shall feel obliged by any of your readers informing me, through the medium of your valuable Register, the best method of curing the same at a trifling expense.

Yours, a constant reader,
VERAX.

*** We wish *Verax* would forward his correspondence more early.

NOTICE TO CORRESPONDENTS.

The answer of *R. I.* to the attack of the Mechanics' Magazine, is very well written, but a publication of it in the Register, would, we think, be superfluous, as the motives which prompted the attack are duly appreciated.

Mr. Collett's communication, and a drawing of a bridge, by which an army can be passed over a river in much less than the usual time, have been received. We think highly of his plan, and will put the drawing into the hands of our engraver for the next number.

Cymro's exposure of a gross fraud by coal-merchants, requires substantiation, and a real name. We are most happy, upon proper testimony, to expose fraud, but for the sake of truth, and of our character, we must be cautious.

Mr. Hammond's questions respecting railways, will be answered if he looks to the last number of the Scotsman newspaper.—There cannot be a doubt that increased velocity requires more additional power on the water than on railways.

Verax only does justice to Mr. Place, of Charing Cross. No person has exerted himself more on behalf of the mechanics of Great Britain than that gentleman.

R. O's suggestions relative to steam-packets to India, came too late. The company is already formed, and the capital for the undertaking nearly subscribed.

We have received numerous other articles from correspondents, which are under consideration.

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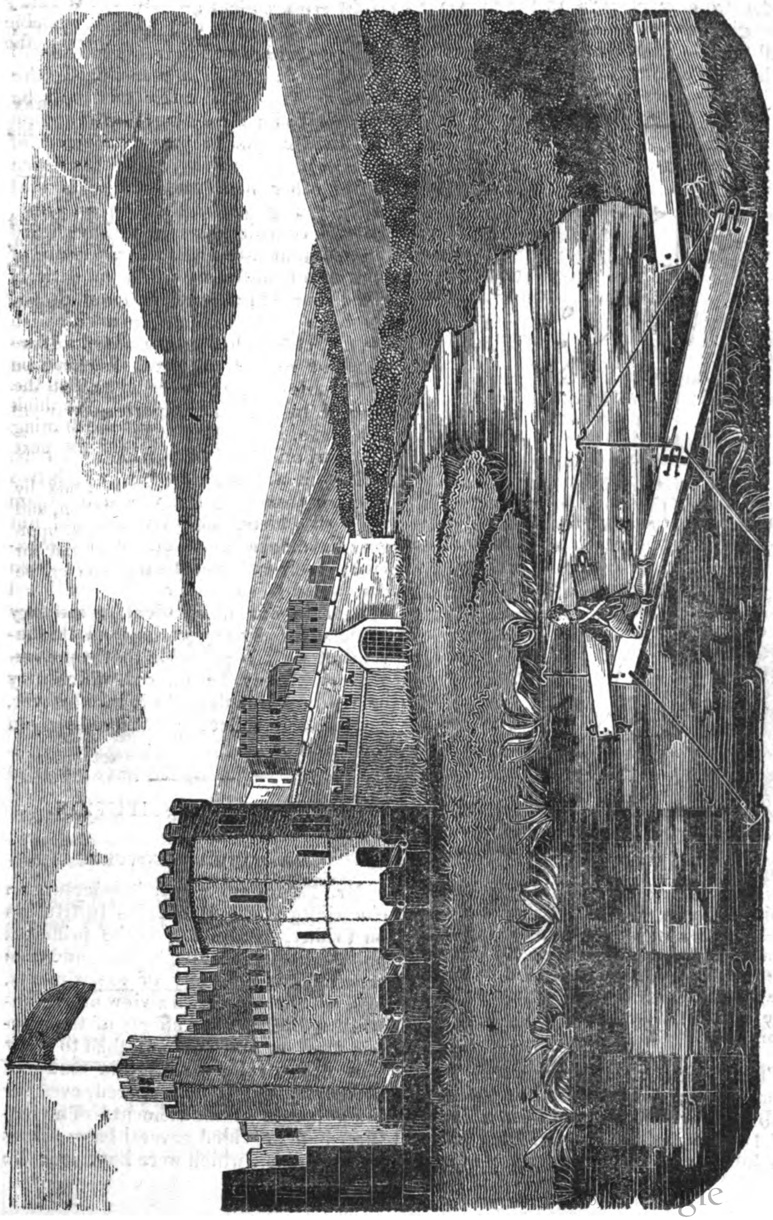
The London
MECHANICS' REGISTER.

"The worst condition of social and civilized man, is better than the best condition of the untutored savage. BLAIR.

No. 7.] SATURDAY, DECEMBER 18, 1824. [Price 3*d*.



THE FLYING BRIDGE.

THE FLYING BRIDGE.

We have this day given an engraving from a drawing with which we were favoured by a Mr. Collett, representing an improvement in the mode of passing rivers, moats, &c.—In order to give our readers a correct idea of the plan, we also give an outline here, which we shall explain, and then proceed to offer such observations as the nature of the subject suggests to us.

A represents a deal board of the ordinary width, ten feet in length, attached by a strap to another board of the same size and length.

B is a hollow case of air-tight leather, which is blown up by means of a mouth-piece, with a stop-cock, so as to make the board which rests upon it perfectly buoyant.

C is a grapple, which is used to secure the bridge against the current, and to fasten one plank whilst a man is fixing it to another.

The weight of this apparatus is so small, that an ordinary military waggon will convey sufficient to form a bridge of 100 feet, which may be fixed in half an hour, and enable an army of 2000 men to pass over in twice that time.—By placing cross pieces, so as to render the bridge more firm, three or more rows of planks might be laid, so that in less than half an hour, 3 or 4000 men might cross a moat or a river. We sincerely trust that it will be long ere the invention which we here recommend will be required; but if a war should take place, we trust that a fair trial will be given to it; for the destruction of human life, in attempts to pass over pieces of water, with the ordinary apparatus, which to its other disadvantages, adds that of being a great burthen to an army, has been considerable; and we have heard of particular instances, where the use of such an apparatus would have entirely saved our brave soldiers from death, and have enabled them to accomplish the object they had undertaken. If we recollect rightly, General Packenham and his detachment were nearly all destroyed in the last American war, at Louisiana, in an attempt to ford a piece of water, only thirty feet wide; whereas, with such a bridge as this, which two or three men might have carried upon their shoulders, their lives would not only have been saved, but in all probability their enemies would have been compelled to surrender. We shall feel obliged to our mechanical or military readers, for any suggestions on this invention, as it is probable that some improvement may be offered, which may be really valuable. As it is, however, we think it reflects great credit upon the inventor.

MECHANICS' INSTITUTION.

MR. TATUM'S LECTURE.

Mr. Tatum commenced his lecture on electricity at the Mechanics' Institution on Friday, by alluding to the principal points of the preceding lecture, and then proceeded to a variety of experiments, less, we conceive, with a view of demonstrating the peculiar effects of the electric fluid on any subject, than to shew how delightful a science the study of electricity might be rendered, even for the purposes of amusement. The lecturer had provided several large pieces of plate glass, which were kept near the fire in the stove, for the purpose of removing any moisture, which is so prejudicial to electrical experiments, and which he used at different parts of the evening. He explained, that if a plate of glass be covered with tin foil, and here and there it be removed, the electric fluid, in passing over the surface, will be rendered brilliantly visible, in a dark room, at the parts where the foil has been removed, and over which it hastens to pass, so as to reach the opposite part of the conductor. The lecture room being darkened as much as possible, by lowering the gas lights, Mr. Tatum took one of the pieces of plate glass. covered with foil, upon which he had marked the word "Science," by scraping away the foil to form the letters, and placing it to the machine, he passed the electric fluid over it; as the fluid passed, the word "Science"—(a word, by the bye, particularly applicable to the subject of the lecture and to the Institution)—was seen as one body of beautiful fire: the experiment was then repeated to the gratification of the audience, and several similar exhibitions were made with pieces of plate glass, upon which various devices had been marked. The lecturer then took a stand, in which he had placed two eggs, for the purpose of shewing, that the electric fluid might be passed through them. This experiment succeeded perfectly, and the fluid was seen to pass through the eggs, which assumed a pale blood colour. The next experiment was very simple, but pleasing: the lecturer took a large tumbler, the internal part of which he electrified, by placing it before the machine, and driving in several electric sparks; and with this tumbler he covered a considerable number of pith balls, which he had previously placed upon a stool on the lecture table; the balls being excited, continued in motion, jumping about under the glass, until he applied his hand to the outside of the glass, which acted as a discharger, the fluid leaving the glass, and the balls becoming motionless. He next took a large jar, from which he discharged the electric spark upon three pieces of paper, which were instantly perforated, the fluid leaving behind it a sulphureous smell, similar to that of which he had spoken in a former lecture, as having been perceived upon the spot where a young man had been struck dead by lightning. A small quantity of fulminating mercury, enveloped in paper, was then exposed to the electric spark, and exploded with a loud report. After this experiment, which he repeated, Mr. Tatum observed that the large jar upon the table, although intensely charged with the electric fluid, might be very safely handled if the operator would take care to afford no passage for the fluid to extend itself and inflict a shock upon the operator. The jar was then intensely charged, and placed upon a stool with glass legs, whilst the lecturer stood upon a similar stool at a shorr distance from the table. so that the fluid might not extend; and cleaned out the inside of the jar without the slightest inconvenience, taking care however not to touch the table and so counteract the isolated effect produced by the precaution of placing the jar upon the glass stool, and standing upon one also himself. After having done this, he replaced the cover of the jar, and by means of the discharging-rod, convinced the audience that by his operation no part of the fluid had been wasted; the jar remaining as intensely charged as before, there having been no conducting substance to convey away the fluid. Mr. Tatum next undertook to shew that a doctrine which had been maintained by some electricians, and which had also been laid down in books, was false, viz. that the employment of a small with a large jar reduced the latter to the same degree of power as the former. It was, he said, highly important to set this question at rest; for many persons who had the misfortune to break a jar, and who might not have at hand one of the same size to replace it, would be deterred from prosecuting their experiments by the idea that a smaller jar would prove much worse than unavailing. Mr. Tatum charged a large jar with the electric fluid, taking care to ascertain the number of turns of the machine that were required for this purpose, which were twenty. He then put a jar of considerable less capacity by the side of the larger, and it was found that to charge the two, twenty-three turns of the machine were necessary. "Now," said Mr. Tatum, "if the writer who has laid down the position, that by employing a small jar with a large one, the capacity of the latter is reduced to that of the former, had been correct, it would require only six turns to charge the two; for three additional turns of the machine having served to charge the smaller jar, it is evident, that if the position had been correct, six would have charged both." In this way it was clearly demonstrated, that large and small jars might be used together in the construction of an electrical battery without disadvantage. The lecturer then produced a long glass tube, coated internally with tin foil, with parts detached in a spiral form; and passing the electric fluid through it, the effect of a spiral flame of fire was prettily shown in all the parts where the conducting medium had been broken off. This experiment was upon precisely the same principle as those which had been made upon flat surfaces of glass, but had a prettier effect from passing through a hollow substance. An electrical battery consisting of several large jars was then placed upon the lecture table, connected with the machine in the same way as that which we formerly described, and several pleasing figures were made upon paper by melting leaf gold in the following manner. The form of a bird or a head being cut out upon paper, the paper so cut is laid upon a leaf of gold between glass, and the electric fluid being passed through them, the gold leaf is melted, and the oxide of gold falling upon the vacant space, gives a correct representation in gold of the object which had been traced upon the paper. The lecturer here recurred to what he had said in a former lecture on the necessity of having stout conductors to buildings and ships, to prevent their being fired by an intense discharge of the electric fluid; and for the purpose of demonstrating his arguments on this subject, exposed about three feet of steel wire to a discharge from the battery, by which it was fused in an instant. Such would be the case in a state of nature upon a larger scale; and he particularly instanced a discharge of electricity from the clouds, by which one of the four conductors of St. Pauls, of considerable thickness, had been made red hot. "Had the conductor," said Mr. Tatum, "been less solid, it would of course have been entirely fused, and the destruction of part of the building would have been the consequence. Four feet of silver wire were exposed, in a similar manner, to a discharge from the battery, and partially fused. The last experiment was to show the appearance of the fluid upon a long conducting substance, and to demonstrate, that in a chain conductor, the breaks at each link were of great disadvantage as compared with a rod, along which the fluid could pass without opposition. A chain was hung from one side of the lecture-room to the other, and being connected with the machine, the fluid was passed along it in the dark, and had a very pleasing effect; but it was quite easy to see that there were slight checks on the transmission of it from the links. Mr. Tatum then stated that he had concluded his lectures on electricity, and that his next lecture would be on electro-magnetism.

At the close of the lecture, the president, Dr. Birkbeck, read to the meeting a proposal of a Mr Black to give twelve gratuitous lectures on the French language to about fifty or sixty members of the Institution, who would merely have to pay 6s. 6d. each for the books necessary for the course of lectures. Dr. Birkbeck read a paper which had been sent to the Institution by Mr. Black, in which that gentleman declares that by his system, twelve lectures will do more towards enabling the student to acquire a knowledge of the French language, than twelve years (we think he said twelve years) by the ordinary method. Dr. Birkbeck said a few words, and very aptly, on the advantages of a knowledge of French to the mechanic and the man of science, as it would enable them to read the valuable scientific works which are published in that language; and so far we cordially unite with him; but we have had so many instances of gross quackery in these quick-teaching gentlemen, that we fear the pompous promises made to the ear, will not be realized to the brain: the thing however is worth trying upon the terms mentioned by Mr. Black, who, be his merits what they may, is certainly entitled to the thanks of the Institution for his offer.

Mr. Cooper's lecture on Wednesday evening, was on sulphur, sulphurous acid gas, and sulphuric acid. In order to afford time for doing justice to the lecturer, we postpone our report of it until the next week.

We understand that Mr. Flather, the secretary to the Institution, has been dismissed.

COMBINATIONS OF WORKMEN.

It has been to us subject of surprise and regret, that in a country boasting the excellence of its laws, there should exist, illegal combinations of workmen against their masters, and of masters against their workmen, which are not only an outrage of these laws, but also, of the British character. In the character of these combinations, whether of masters or journeymen, there is not a shade difference. Nothing can be more atrocious, than an agreement made between persons, so to fix their profits, that the workman is to participate in none of the advantages of their prosperity, whilst, with the first turn of the trade, his wages are to be lowered, to meet their cupidity: but on the other hand, it is equally atrocious, for men, who live under the protection of good laws, and who have fair and equitable modes open to them to seek redress, to assemble in outrageous clamour, to destroy the property of their masters, and, with the ferocity of brutes, attack individuals in their service, who, from various causes, are unwilling, or unable to join in the strike for higher wages. We should hope that, as Mechanics' Institutions increase, there will be nothing of this sort, in any of the towns where they are established. If masters act unkindly, or unjustly, (and, from what we have seen of many of the Lancashire masters, we must say that there are too many, who regard their men with less kind feelings than the mere machinery which aids them,) the aggrieved parties should quietly and deliberately remonstrate with their employers, and, if needs be, petition the legislature for a removal of the grievances uuder which they labour. It is not by tumultuous meetings, and daring outrages upon society, that they excite sympathy or increase their claim for redress,—the very contrary: their assumption of power does but injure their cause, and give to their employers right to protection, which they could not derive from the justice of their own cause. The removal of these combinations must, we think, excite the attention of the legislature, in the double view of the impropriety of allowing men, whether from real or supposed cause of injury, to abandon their industrious pursuits, and throw a vast additional burthen upon their parishes, adding at the same time, much crime to the frightful catalogue which is furnished to the harsh and sanguinary vengeance of some of those laws, whose very cruelty increases crime, and prevents repentance, and also of the danger which would arise from a combination, a legal and a silent one of the workmen, to provide funds, by which those who strike for higher wages, might be enabled to expatriate themselves, and carry their talents and industry to rival markets. With or without the observations which we have thought it our duty to make, the following account from the Blackburn Mail of last week will be read with interest.

"COMBINATION OF WORKMEN.—*New Bailey Court House. Salford, Dec.* 2.—This was a complaint on the part of masters against their workmen, under the late act of repealing the Combination Laws, which renders any one who uses violence, threats or intimidation to any master, or any one in his employ, in order to obtain an advance of wages, or to controul the management of the master's trade, upon being convicted before two magistrates, liable to imprisonment for two months. The offence is, however, by the Act, to be proved by two witnesses. Jas. Barnes and Felix O'Neil were brought up, charged with a most savage and unmanly assault on an unprotected female. Mr. Owen stated, on the part of Messrs. John Latham & Co., cotton spinners, in Oxford Road, that these gentlemen employed, at their mill, about two hundred people, amongst whom were thirty-five spinners. Some weeks ago, the spinners had turned out, in consequence of not approving of certain regulations made by Messrs. Latham, as to the conduct of the work-people employed by them. These regulations had, however, been altered by them to the spinners' satisfaction, and the spinners had again returned to their work. On Saturday, the 13th inst., the spinners, including the two defendants, who were both of them employed by Messrs. Latham, again turned out for an advance of wages, and had not since returned to work. Above two hundred persons had, in consequence, been thrown out of work. On the following Monday, Messrs Latham & Co. engaged in their service Ellen Jefferson (the wife of their engineer,) as a spinner, to take one of the pairs of wheels quitted by the men. This had made her obnoxious to the turn-outs, who had surrounded the mill in bodies, to annoy those who came to work. On the day after she came, she saw ten or twelve of them together, and heard O'Neil, one of them, say, in Barnes's presence, 'They had got the Engineer's wife to work; but they (the workmen) would kill her.'—On the 23d of November, she left her work at about a quarter past eight in the evening; she was followed by four men, who said 'They would kill her.' One of them, O'Neil, struck her violently over the forehead with a stone. She screamed for assistance. Another then struck her at the back of the head with a stone. She fell, and was then kicked violently several times, and became senseless. —Assistance came from the mill, upon her screams being heard, and a surgeon was sent for.—Ellen Jefferson was sworn to prove the case. She was still very ill, owing to the blows, and bandages were applied to her temples. She distinctly proved the facts of the threats, and of the assault, but could only identify O'Neil as one of the parties striking her, though she swore that Barnes was present. Her daughter, a little girl, swore to Barnes striking her mother.—Mr. Foulkes, jun.. said that no person would regret more than his clients did, the violence which had been used upon this occasion, but he shoul prove that they were not the parties. He had no less than seven or eight witnesses to prove an *alibi*. Mr. Foulkes was proceeding to examine his first witness, but the magistrates, after a short consultation, said he had no occasion to proceed in his examination, for that as the complainants had not been able fully to prove, by two witnesses, according to the Act, that the defendants were the persons who had used the violence, they must be discharged.—[A number of journeymen spinners were present, and upon the defendants leaving the court, they gave several loud cheers in front of the New Bailey.]—Mr. Owen subsequently applied for a warrant against O'Neil, charging him with an assault at common law, upon the injured woman Jefferson, which was issued.

"*Dec.* 3.—Before James Norris, Esq.—Felix O'Neil, a turn-out spinner, against whom a warrant was yesterday issued for assaulting Ellen Jefferson, in the employ of Messrs. Latham & Co., cotton-spinners, was, after a very patient hearing of the case, required to find bail, to answer at the sessions for the assault, and not being prepared with bail, was committed to prison, to take his trial."

The Stockport Advertiser contains the following observations on the above case.

"We have always held out to the operative classes in this neighbourhood, the language of caution not to be led by unprincipled and designing men, into acts of an illegal nature. That there are among the working classes, as among every other class, scheming and wicked plotters, against the very men they profess to serve, we have been well aware, and we have seen, that since the repeal of the Combination Laws, these villains have seized the opportunity which a temporary excitement offered, to bring their plans into effect. We regret to see, that in our own neighbourhood, the cotton spinners of Manchester have been led so far, as in one instance to throw vitriol over the person of an individual, who merely asserted the rights of every one in this country, to work how and for whom he chooses, and in another instance, to maltreat a female whose offence was the same. The secretary of the spinners' club at Manchester, has disowned the former of these proceedings; (brutal, indeed, must be the man who would vindicate the act:) but it is in vain to deny a participation in the guilt of an outrage, which, though not actually committed, is caused to be committed, by the conduct of those who would now disown it. For whether openly incited, or silently approved, the guilt is the same to them. It is disgraceful to the character of Britons, to the character of a civilized nation, that when two men positively sworn to by one party, as having committed a most ferocious outrage upon a female, (we allude to the case of Ellen Jefferson, before the Manchester bench on Thursday week last,) were discharged, because there was no second witness to support the charge, as the Act of parliament requires, three cheers were given by the assembled crowd of cotton spinners, as if to rejoice that brutality passed unpunished. Shame to every one of them; were not those shouts shouts of approval, and incitement to commit fresh outrage, secure in the approbation of the men, who, though they dare not openly employ, secretly excite others to commit such deeds. The cotton spinners are the last body of men who have reason to complain:—if they have grievances, let them seek to redress them by lawful means,—if they try any but lawful means, they will hurt their own cause;—the whole feeling of society will be joined against them, as against men, who would become a public pest; and they will find themselves farther from the attainment of their object than ever. But we are satisfied that the body of spinners are inimical to all such proceedings; a few turbulent spirits lead them: and only let them act for themselves, and think coolly, and they will deprecate all such acts, as we ourselves do."

Uses of Salt in Manufactures and Agriculture.—Important advantages are now derived from salt, the duty having ceased on the 5th January last. In a work published at New York, by Dr. Rensselear, some of the purposes to which salt may be applied, are thus described:—

"Sal ammoniac or muriate of ammonia is made in abundance from common salt. The manufacture of this article was abandoned in England, in consequence of the heavy duty of £30. per ton being laid on salt. In consequence, however, of bittern from the salt works being allowed in Scotland for the manufacture, the price has been reduced nearly one half.

"In the manufacture of glass, salt is largely employed; soda, which is procured from common salt, is used for plate glass; potash for flint glass; and common salt, with kelp, for crown glass. In England, the heavy duty on salt is almost a prohibition to its use for these purposes.

"Oxymuriate of lime, and other oxymuriatic salts employed in bleaching, are made from salt, and consume a large quantity of it in the manufacture.

"Spirit of salt, or muriatic acid, requires large quantities of salt; at least 1000 tons are used for this purpose, in England, every year, notwithstanding the enormous duty. It is used in a variety of processes, in dyeing and calico printing.

"Glauber's salt is made from what remains in the stills, after the distillation of muriatic acid. This residuum was formerly thrown away, until a person employed it in making

Glauber's salt, when a duty of £30. per ton was laid on the article manufactured, since, however, remitted.

"Epsom salt is produced entirely from salt, or the evaporation of sea water. The brine, which yields 100 tons of salt, gives from four to five tons of this valuable article. Dr. Henry, the celebrated chemist of Manchester, has discovered a process of preparing it from magnesian lime-stone, and has reduced the price one half. It can be made still cheaper from sea-water, for the employment of which a duty is laid.

"Magnesia is made from salt brine, or sea-water. The English duties are so high, as to render it probable that both this and the preceding article will, in future, be obtained by Henry's process in magnesian limestone.

"Chrystallized soda is also made from common salt; and if the latter, or sea-water, could be obtained free of duty in England, it would supersede the importation of American and Russian pot and pearl ashes, and 10,000 tons would be used annually, several hundred tons in washing alone.

"Barylla, of an excellent quality, is made from salt. In the manufacture of hard soap, salt is a necessary ingredient.

"Corrosive sublimate is made from common salt.

"Patent yellow is also prepared from common salt.

"In the fisheries, in salting provisions for the sea service, and for exportation, salt is largely employed. Butchers, morocco-dressers, and skinners, employ it in large quantities.

"Farmers use great quantities in making butter and cheese, and for steeping wheat, to prevent smut.

"Salt is likewise employed by iron-founders, in metallic cements, and in rendering bar iron very malleable. It is used by white-smiths and cutlers, in case-hardening, in tempering files, and some other edge-tools; mixed with other substances, for reducing metallic ores, assaying minerals, and rendering metals fusible, by the refiners of silver, and to prevent the oxidizement of some metals. It is used to moderate the flame of combustible bodies; and is extensively employed by the philosophical and manufacturing chemist, and by the druggist, for a variety of pharmaceutical purposes.

"In horticulture, salt is much used, particularly in England, where its merits are better appreciated than with us. It prevents the depredations of insects on fruit trees, and, when properly applied, protects them from the honey dew. Persons ambitious of having good cider orchards, should dig a small trench a few yards from each tree, and place within it a few pounds of salt, which, by the rains, is gradually conveyed to the roots, and produces most desirable effects."

Philosophical Attention and Sagacity.—An attentive and inquisitive mind often derives very important instruction from appearances and events, which the generality of mankind regard as trivial and insignificant. A philosopher, of uncommon genius, was once struck with the phenomenon of the volubility and lustre of the globules of rain, that lie upon the leaves of colewort, and other vegetables, and applied his attention to the investigation of it. He discovered that the lustre of the drop is owing to a copious reflection of light, from the flattened part of its surface, contiguous to the plant; and that when the drop rolls over a part which has been wetted, it instantly loses all its brightness, the green leaf being seen through it. From these two observations, he concluded, that the drop does not really *touch* the plant, whilst it retains a mercurial appearance, but is suspended by the force of a repulsive power. For there could not be any copious reflection of white light from its under surface, unless there was a real interval between it and the plant; and if no contact be supposed, it is easy to account for the wonderful volubility of the drop, and why no traces of moisture are left wherever it rolls.

From this reasoning, we may conclude, that when a polished needle is made to swim on water, it does not touch the water, but forms around it, by a repulsive power, a bed, whose concavity is much larger than the bulk of the needle. And this affords a much better explanation of the fact than the common one deduced from the tenacity of the water: for the needle may be well conceived to swim upon a fluid lighter than itself, since the quantity of water thus displaced by repulsion, must be equal to the weight of it. And this instance leads us to a just and necessary correction of the old hydrostatical law that the whole swimming body is equal in weight to a quantity of the fluid, whose bulk is equal to that of the part immersed; for it should be expressed, that the weight of the swimming body is equal to that of the weight of the quantity of fluid displaced by it.

A Sketch from the Staffordshire Iron Works.—Imagine yourself on a dark night, floundering over the rugged region of the collieries, nearly suffocated with smoke, and winding your way with eel-like dexterity, between heaps of coals, ashes, and yawning pit mouths, till you arrive at a deep hollow, in which are two lofty kilns or furnaces, vomiting fire and smoke, and surrounded at short distances with hills of burning coal. Descending cautiously, for danger lurks in every step, to the foot of the building, you are introduced to a huge shed, resembling a cavern, the entrance to which is faintly illuminated by a quantity of burning coals in an open grate, raised high in air, while all within is darkness visible. The ground is covered with a deep bed of sand, in which is formed a channel, for the melted ore to run into, extending from the base of the furnace to the mouth of the cavern, and three or four feet in width. At the appointed time, whilst all around is dark and dismal, a communication with the bottom of the furnace is opened, and the liquid fire flows slowly and majestically into the channel prepared for it. No sketch of fancy, no fervour of imagination, can depict the brilliancy of the scene that now presents itself. The glowing metal, remaining in its fluid state, for nearly an hour, appears an undulating lake of fire, of inconceivable brightness, and kindling as it rolls along considerable portions of the sand, which, rising from either side of the channel, hover over it with playful and rapid motion, in sparks of vivid blue.

The iron thus produced, is termed pig-iron, which after passing through another and similar process, in the fining furnace, becomes plate-iron, in which state, it is conveyed to the mill. Here it is again heated to nearly a fluid state, and welded in large masses, beneath a hammer of three tons weight: it is then, while red hot, formed into bars or hoops of various dimensions, by being drawn between a succession of revolving cylinders, and returned with surprising dexterity by the workmen, from the larger to the smaller rollers. This part of the process is so rapid, that it has the appearance of magic, the whole of the immense machinery being impelled by steam. Thick bars of iron are thus rolled in a few seconds, into thin plates of six times their original length; which, twisting themselves into various foldings, as they issue from the rollers, appear at a distance like red hot snakes.

Glasgow Mechanics' Institution.—The winter courses at that establishment are now begun, and we are happy to understand that the attendance is very numerous. Lectures are now delivered every lawful night. Last week, Mr. M'Fadyen, who acquitted himself so much to the satisfaction of his class last season, concluded his introductory lectures on natural history. The attendance was both numerous and respectable, and the utmost attention was displayed, while the lecturer very ably traced the progress of the vegetable kingdom from germination to decay, with all the variations produced by temperature, soil, climate, light and darkness, altitude, latitude, and longitude.

Oil Gas Apparatus.—"We have inspected," says the Hull Advertiser, "the oil gas apparatus, invented by Mr. Elliott, an ingenious mechanic of Sheffield, and can truly say, that we were astonished at its compactness and simplicity, which render all chance of accident or explosion almost impossible.

"With the exception of the gasometer, (which is about six feet in length, by four feet broad, and three feet and a half deep, and consequently contains about 84 cubic feet, the other part of the apparatus may be comprised in a cubic space of little more than two feet. Sufficient gas to supply about three fourteen-hole argand lamps, for twenty-four hours, can be obtained in four hours, at a very trivial expense, from oil of the most ordinary description. It may easily be erected, at a trifling cost, in any gentleman's house; and in the country, or where a supply of oil gas cannot be obtained from any public establishments, or where other circumstances render such an apparatus desirable, this invention promises to be highly advantageous."

Origin of the Term Nob-stick.—The term Nob-stick originated towards the beginning of the 19th century, through the following circumstance, namely;—a superannuated block printer being out of employ, made application to the master of the Chadkirk print works, near Manchester; the bargain was struck, and the man was to begin his work, on the following day, but in the interval, a younger man proffered himself at an inferior price, and the master thought fit to employ him in the old man's stead. The old man came according to agreement on the following day, but the master gave him to understand he had engaged another person in his place, for less wages. The old man, on hearing this, was greatly enraged, and heaving up the walking stick which he had in his hand, said in an emphatical manner, "see you, mester, he's no better nor this nob-stick," which being overheard by some of the workmen, was by them, for a time, used in way of joke, but at length it became a word in earnest, and is now understood in a literal sense, as applicable to those persons in any trade, who work for inferior wages.

Organic Remains in Dorsetshire.—We are informed, by a correspondent at Bridport, that during the late gale, a considerable portion of the Burton cliff was washed down, and a mass was exposed, which, on being detached, proved to be a vertebræ of some animal, whose size, judging from this bone, must have been enormous. The discovery has excited the attention of most of the learned in the neighbourhood, but hitherto, no one has correctly ascertained the name of the animal, to which it belonged. It is in most excellent preservation, every process and part being perfect. Its figure would determine it to be the atlas, or first bone, of which, most probably, there were forty others in successive attachment, from the cervical to the caudal extremity. There is a body, spinous and transverse processes; upon and within the body, anteriorly, are two considerable articulating surfaces, as if for the rotatory motion of the condyles of occiput. Posteriorly is evidently the part to which was attached the intervertebral substance, slightly excavated. There are numerous foraminæ, spinous and vertebral, which must have admitted blood-vessels of immense caliber. The perfect body is full twelve inches in diameter. The foramen magnum, for the passage of the medulla oblongata, is eight inches in diameter; and the distance across the bone, exclusive of the transverse, is nearly thirty inches; the whole circumference is six feet, and the weight sixty-two pounds. It was deeply imbedded in the oolite strata, and must have lain there, from the diluvian or ante-diluvian period, as the whole of the diluvial remains found in the range of cliffs from Bridport to Devonshire, are situated inferiorly to the different strata, and which are chiefly blue liais, green sand, white liais, red marl, sandstone, and chalk. Many are the conjectures, with respect to the animal; some imagine it to be the gigantic buffalo, or the rhinoceros, and others the elephant. An intelligent osteologist, Miss Anning, of Lyme, surmises it to belong either to the behemoth, or the hippopotamus, yet admits that it far exceeds their acknowledged dimensions. In consulting the celebrated dissertations of Pallas, in the "Nova Commentaria Petropolitana," entitled "De Ossibus Siberiæ Fossilibus," we imagine the animal must have been that which is now known to the world (designated by the Baron Cuvier,) as the "fossil mammoth." Although not having an admitted existence since the flood, recent bones have been found in many parts of Russia, corresponding with the fossil remains, which has induced the inhabitants to consider the animal still to exist under ground. This work also speaks of the mehemoth of the Arabians, an epithet they affixed to the elephant, which was very large.

Bone Gas.—A subscriber, who read our observations on bone gas, wishes to be informed how he is to prepare it. We beg to inform him, that if he merely wishes to produce this gas, by way of experiment, he has only to take a large crucible, covered air-tight with a luting, which will resist the action of the fire, and in the centre of the cover, place a hollow tube of the eighth of an inch diameter. Into this crucible, the bones (broken) are to be placed, and the crucible then put into the fire. In a short time, the gas will be seen rising from the tube, and being set on fire, will burn brilliantly. When the gas is all consumed, the mouth of the tube should be closed up, and a red heat continued to the crucible, for half an hour, at the end of which time, the bones will be reduced to charcoal or carbon. This carbon is of great value, for all purposes, where common charcoal is used, to which it is superior, in the proportion of 20 to 1, but it is highly necessary that it should be kept from the air, as it is greedy of moisture, which it takes up rapidly, from the atmosphere, and is so spoiled; but it may be rendered perfect again, by passing it through a red heat, in a closed crucible, or any vessel which is fire-proof. The powdered charcoal from bones is, as we have before stated, very valuable in purifying oil, and it is also excellent as a dentifrice, as a preserver of meat from putridity, it has also marked qualities, and it purifies the most filthy water, in a very short time. In France, it is used in distilling spirits, which are to be highly rectified, and freed from empyreumatic odour. This is done by simply passing the matter to be distilled over the charcoal. If the gas from bones be required in a large quantity, we can only recommend that precisely the same process should be adopted, as in obtaining gas from coals. Perhaps a portable gasometer might be contrived, for family use, which would be very economical, and in its process, entirely free from danger. We have only to add, that the smell from this gas is quite as offensive as that from coals; it is necessary, therefore, that the apparatus used in producing it, be air-tight.

Steam Guns.—A Paris correspondent disputes with Mr. Perkins and other Englishmen, the credit of this invention. He informs us, that more than 20 years ago, a Mr. Jairy delivered to the French minister of marines, the model of a steam cannon, to discharge, not only balls, but several tons of water, so that in a broadside, a ship provided with these cannons, would be able to sweep the deck of the enemy, and prevent the working of the guns. We are ready to admit the truth of our correspondent's statement, as to this invention, having, six years ago, been favoured with a sight of the model, but we do not think it at all interferes with that of Mr. Perkins. Mr. Jairy's cannon would certainly prove a most destructive instrument, and we heartily desire to see it employed, in the event of a war, as well as the steam cannon of Mr. Perkins, upon the principle of our thorough detestation of that evil, which some of our heroes call necessary. This pastime, for it is a pastime with many, would be of short duration, if Mr. Jairy's cannon at sea, and Mr. Perkins's by sea and land, were employed; a few weeks would lower the tone of all war-making bullies, for, to use a school phrase, they would soon "bowl away all their marbles."

Mechanics' Institutions in France.—We are happy to state, that the present enlightened ruler of the French nation, has not only granted permission for the establishment of a Mechanics' Institute in Paris, but that he has also proposed that similar institutions should be opened in Lyons, and at Rouen. Now as these are the most turbulent cities in France, we cannot help feeling that Charles X. pays a very high compliment to science, in proposing that two temples should be therein erected to it. This is a proof, at least, that he does not dread the diffusion of science and information; and we doubt not, that ere long, the despotic monarchs of Russia, Prussia, and Austria, will also yield to the conviction that a state can only be permanent, when its supporters are science and wisdom.

ARGUMENTS IN PROOF OF A LUNAR ATMOSPHERE.—[*By Mr. M. Holden, of Hull.*]—Huygens, and many other astronomers, have asserted that the moon has no atmosphere. Without entering into the particulars which induced them to think so, I shall offer a few arguments, which, in my opinion, are sufficient to prove that the moon actually has an atmosphere.

When our atmosphere has been equally clear, the spots on the moon, observed with a good telescope, have not appeared so well defined at one time as another. The small telescopic stars near the moon appearing equally clear and distinct at the same time, prove, that the cause is not in our atmosphere: consequently, the various appearances of the moon, seen through the same instrument, prove, that some dew, or thin vapour, must rest on the surface of the moon; and that the variation observed, results from the condensation and rarefaction of that vaporous matter.

Though the spots on the surface of the moon vary, yet they never disappear whenever our atmosphere is clear. From this I infer, that the moon's atmosphere differs from ours in this particular; namely, that it is not mixed with such dense clouds; for, if it was, several of the lunar spots would occasionally disappear, which is not the case. If, however, the moon has no atmosphere, such variations could not possibly take place, when our air is the same, as may be easily proved by the small telescopic stars.*

2. Several eminently scientific men have distinctly seen fire on the unenlightened surface of the moon. It is sufficient to name Dr. Herschell. He informs us that —"on the 19th of April, 1787, he discovered three volcanoes in the dark part of the moon; two of them seemed to be almost extinct, but the third shewed an actual eruption of fire, or luminous matter, resembling a small piece of burning charcoal, covered by a very thin coat of white ashes: it had a degree of brightness about as strong as that with which such a coal would be seen to glow in faint day-light. The adjacent parts of the volcanic mountain seemed faintly illuminated." See Vince's Astronomy, Vol. I. p. 208.

Now, it is a well-known fact, that fire cannot burn without air, and air is an atmosphere. But fire has been seen in the moon, consequently the moon has an atmosphere.

The first argument appears to me perfectly satisfactory, and proves what was intended, viz. that the moon has an atmosphere. As for the second, I rely on observations made by others, but am no less doubtful on that account. The respectability of the names, the known and acknowledged ability of the observers, and the excellency of the instruments by which the observations were made, give such an authority to their assertions, as no scientific man would discredit.

Independent, however, of the foregoing observations, I have one more argument to offer, which, in my opinion, places the subject beyond the possibility of a dispute.

3. I observed an occultation of a small star by the moon, marked "No. 10, Mo. 2d, 5th magnitude, of Cancer," in the British Catalogue; and "321" of Mayer's Zodiacal Catalogue. This occultation I saw on Friday evening, May 24, 1822, at Ashby-de-la-Zouch, in Leicestershire, lat. N. 52° 45′ 20″, and long. W. 1° 22′ 30″. The evening was fine, and the air very clear: the dark edge of the moon was well defined, and the whole of the orb perfectly visible. By an excellent telescope, with a power of 125 applied, made by J. Watson, London, I saw the dark edge of the moon meet the star at eighteen minutes past nine, p. m. at which time the star should have instantly disappeared. But, instead of disappearing, it seemed to come before the moon, and appeared like a brilliant spot on the dark part of the lunar disk.

I could distinctly see it on the unenlightened part of the moon, the edge of which apparently projected beyond the star for two seconds of time, and then it immediately vanished out of sight.

Now this appearance of the star on the face of the moon could be effected by no other cause at present known, but that of refraction. But what could thus refract the was star if there no lunar atmosphere?

It is necessary to remark, that a star larger than the fifth magnitude, is an unfit object for a purpose of this kind, because the refraction of the moon's atmosphere would not be sufficient to cause it to appear distinctly encompassed by the lunar periphery.

Now the three foregoing arguments are sufficient to prove, that there is an atmosphere in the moon; and if an atmosphere, then we may rationally suppose there are plants, and animals;—yea, and intelligent

* Hevelius, that celebrated lunar observer, noticed that the moon and her spots, under the same circumstances, do not appear equally lucid, clear, and conspicuous at all times.

beings, capable of contemplating the works of their creator. The same, with propriety, may be said of all the secondary, and especially the primary planets of our system, and every other system in the universe.*

An Account of the Method of making Salt, in the Great Loo-Choo Island.—Near the sea, large level fields are rolled or beat, so as to have a hard surface. Over this is strewn a sort of sandy black earth, forming a coat, about a quarter of an inch thick. Rakes and other implements are used to make it of an uniform thickness, but it is not pressed down. During the heat of the day, men are employed to bring water, in tubs, from the sea, which is sprinkled over these fields, by means of a short scoop. The heat of the sun, in a short time, evaporates the water, and the salt is left on the sand, which is scraped up, and put into raised receivers, of masonry, about six feet by four, and five deep. When the receiver is full of the sand, sea-water is poured on the top, and this, in its way down, carries with it the salt left by evaporation. When it runs out, below, at a small hole, it is a very strong brine; this is reduced to salt, by being boiled in vessels, about three feet wide, and one deep. The cakes resulting from this operation, are an inch and a half in thickness.—*Vide Voyage of Discovery to the West Coast of Corea, and the Great Loo-Choo Island, by Captain Basil Hall.*

A very ingenious student at the University, undertook a course of experiments, to ascertain the heat or cold produced by the solution of certain substances in spirits of wine. Whenever he withdrew the thermometer from the spirit, and suspended it in the air, he uniformly observed, that the mercury sunk two or three degrees, although the spirits of wine in which the instrument had been immersed, was even colder than the surrounding atmosphere. This tact he communicated to the professor of chemistry, who immediately suspected, that fluids, by evaporation, generate cold; an hypothesis which he afterwards verified by a variety of beautiful and decisive trials.

The editor of a periodical, work published at the office of the Mechanics' Magazine, has requested some correspondent to inform him, how India-rubber is to be dissolved, observing, that he is not aware that it can be dissolved. Such avowed ignorance in a man who pretends to scientific knowledge, is really abominable. India-rubber may be dissolved in ether, in spirits of turpentine with heat, and readily and cheaply in mineral oil. Thus dissolved, it is the most effectual, perhaps, the only real water-proof composition, yet discovered.

* M. Schroeter, of Lilienthan, in the duchy of Bremen, has endeavoured to establish the existence of a lunar atmosphere, from observations which he made on the prolongation of the moon's cuspo, beyond the semicircle, &c. He computes the greatest height of the moon's atmosphere, capable of refracting the solar rays, to be 5376 Paris feet. *See Phil. Trans.* 1792.

To the Editor of the Mechanics' Register.

Sir.—Permit me through the medium of your valuable Register to propose for the consideration of your readers, the following queries for solution.

I have myself attempted the solution of the first problem, but not being much acquainted with geometry, I cannot as yet proceed very far in obtaining the solution. As a small remuneration to your readers who may give their attention to these queries, as well as for the promotion of useful knowledge, I am ready to give the following prizes to any members of the London Mechanics' Institution, who shall forward to the Editor of this Register, on or before the 15th of January next, the best solutions to these queries. The decision I leave to you, if you think proper to undertake it, on satisfactory proof being given that the successful candidates are members of the London Mechanics' Institution. Whether there is any truth as to the prizes, I will leave you to state in any way you may think best.

To the member who shall construct the whole or the greatest number of the figures in the first query, by means of geometry only —*Squire's Astronomy*.

To the member who shall, by means of algebra, arithmetic, &c. independent of geometry, furnish the requisite rules and materials, by which the construction of the whole, or of the greatest number of the figures can be accomplished—*Bird's Astronomical Lectures*.

To the member who shall, by the united aid of geometry, arithmetic, algebra, &c. construct the whole or greatest number of the figures—*Cowper's Poems*.

To the member who shall furnish the shortest and neatest method of working the second query by arithmetic, and finding the answer thereto—*Sharp's Algebra*.

To the member for the like method by algebra—*De Lolme's Essay on the Constitution of England*.

Although only two queries, such answers are, however, required, as may afford members, who have a knowledge of only one or two branches of the mathematics, an opportunity of exercising their abilities.

Query 1. From a given circle to form the following figures, whose areas or contents shall be all equal to each other.

1 Circle
2 Semicircle
3 Quadrant or quarter of a circle
4 Equilateral triangle
5 Right angled triangle
6 Isosceles triangle
7 Scalene triangle
8 Square
9 Parallellogram
10 Rhombus
11 Rhomboid
12 Trapezium of four sides
13 Pentagon
14 Hexagon
15 Heptagon
16 Octagon
17 Nonagon
18 Decagon
19 Hendecagon
20 Dodecagon

It might perhaps not be useless to put a faint guide-post in the way. The diameter of a circle to its circumference being as 7 to 22 nearly, it will be found that a right-angled triangle (as in the figure below), whose perpendicular is equal to half the diameter, and whose base is equal to the circumference, or three times and one-seventh of the whole diameter, will be sufficiently near the true area of the circle, for the purpose of obtaining the other figures.

It is not intended that the circle shall be the only ground-work for finding the other figures separately; but that the figures and results which may be obtained from the circle, may be used as the foundation for any others.

Query 2. A schoolmaster gave to some of his scholars, whom we shall call A, B, C, D, and E, a bag of nuts for distribution among them; but some of them being more greedy than the rest, a scramble ensued.—A first of all obtained out of the bag two-thirds of the whole; B got three-eighths of what A acquired; and C three-tenths of it. D procured six-sevenths of the remainder of A's stock; and E got one-seventh of it. After this division, a scuffle took place, in which B lost half of his share, which D and E divided equally among themselves. C's stock was then fell upon by the rest, when A got one-fourth, B one-third, D two sevenths. and C and E divided the remainder in equal shares. A and B were then beset by the rest, whereupon they lost three-fourths of what they last obtained, which divided in the following manner. A got one-fourth, B two-fourths, and the remainder was equally divided by C, D, and E. The master now finding that some shared better than others, directed that D should give C one-third of his present stock; and that the one-third of the stock which was left in the bag, should be distributed as follows: to A one-half, to C one-fifth of what remained, and the residue divided between B and E equally. What number did each scholar have at the end of this division?

P.S. Since writing this communication, it has occurred to me, that it migit not be an unwise plan, nor an improvident expenditure, if the London Mechanics' Institution were to propose occasionally, for the consideration of its members, (and I am sure, if it be necessary, you would willingly assist them, by opening a small portion of your pages for that purpose) queries in the various branches of philosophy and mathematics; and as an inducement for the members to bestow their attention on what might be offered to their notice, and for the promotion of the sciences in general, the Institution surely would not refuse to hold out some kind of reward, however small it might be, for the best answers that might be given by its members. As the benefit would be derived from the Institution, it should, I think, be confined to its own members.—The several matters, of course, to be under proper regulations. It is not, Mr. Editor, so much the value of the prize, as the honour and merit of obtaining it, which is the stimulus to exertion. F. R. E.

SIR—I beg to return you my thanks, for the favourable notice you have taken of my Extinguishing engine, in your third number, and beg to say, that I will, at an early period, forward to you, plans and description thereof, which you will, no doubt, be so good as to lay before your numerous readers.

It would be useless for me, at this moment, to enter into a detail of the many and great advantages the apparatus in question possesses, as several of them are now before the public, through your valuable Register, and others will form a further communication, which, with the plans and description, shall be forwarded to you, with the least possible delay,

I beg to enclose a prospectus, for the formation of a company for carrying this invention into execution, as well as for supplying the metropolis, or any other places, with pure water, and if not altogether inconsistent with the nature of your work, shall feel extremely obliged by your giving it publicity.

Your obedient servant, JOHN BARTON.

Prospectus for establishing a Company, to be called the Effectual Water Supply and Fire Preventive Company, for furnishing London and other Places with Water, and proper Means for effectually remedying the present bad Supply thereof, in case of Fire.

By the plans now proposed, water will always be at hand for domestic use, and also for extinguishing fires, without depending on such ineffectual means, as are resorted to by the present fire offices. The price will be diminished, above 20 per cent., and the profits will then be 20 per cent. more than any other water or fire insurance company at present established; in addition to which, part of the necessary apparatus can be converted, instantly, into a most complete fire escape.

In the first place, it is intended to sink wells, or bore for water in all situations, where it can be obtained at a moderate expense and of good quality, and

Secondly—To erect engines in every parish, ward, or district, on J. Barton's patent principle, at such convenient distances and situations, as can supply any intermediate houses with water, by pipes connected to the engine, in any quantity, and carried to what elevation the parties may require; and it is proposed to agree with the present water companies, to furnish water to a certain extent, if it can be done on equitable terms, and where they will always guarantee a sufficient supply to be at hand, as the chief object of this company is to have at command, in all situations, a sufficient quantity of water, as well as an effectual apparatus, for extinguishing almost any fire, within five minutes after it breaks out.

Various districts and parishes may be united in carrying this plan into execution, by which, confidence will be placed in each other, and their interests connected, and above half the expences of the fire insurance will be saved, viz.:—duty, expensive establishments, &c.

Parish officers, and respectable persons capable of superintending the concern, are to direct the watchmen and other subordinate persons, in working the engines, in the event of a fire taking place.

Further particulars may be known, on application to Mr. John Barton, engineer, 38, Seward Street, Goswell Street.

It is considered the plan can be put into effectual operation for the sum of £.2,500, so as perfectly to prove its advantage and utility; it is therefore proposed to raise that sum by 100 shares of £.25 each—two pounds of which are to be paid on subscribing; a further three pounds within one month; and the remainder at five psunds per month, if required, till the whole amount is advanced. And it is further proposed, that each person completing the said subscription, shall, on the return being extended (which is expected to be the case in less than six months from its formation), have the privilege of receiving one share iu five for all future shares they may wish to subscribe for, in preference to other subscribers.

SIR—The following are extracted from "Captain H. Light's Travels in Egypt, Nubia, Holy Land, Mount Lebanon, and Cyprus, in 1814," and feeling convinced that a few short extracts interspersed with more weighty matter, give the Register that lightness you anticipated in your prospectus, I have therefore sent you the following, hoping they may be found acceptable, from

The Register's well-wisher, W. H.

The Cultivation of Sugar, and Process of extracting the Juice, in Egypt.—In the district of Minict, the sugar-cane is chiefly cultivated: it appeared (says Captain Light,) the season for reaping and planting it, both of which, as well as the process of expressing the juice, I saw on the same day, the 12th of April. The canes were cut in my presence part used for the juice, and part for planting, the latter was performed by digging furrows, five or six inches deep, in which were placed horizontally, portions of the sugar-cane, consisting of six or seven joints; they were then covered with earth, and constantly watered by the water of the Nile, communicated by means of channels, into which it was raised by wheels or by buckets, and in a short time, each joint sends forth a shoot, which becomes a sugar-cane, and during the inundation of the Nile, remains covered with water.

I found, from one of the overseers, that the same ground cannot be planted every year. Each feddan* of earth, thus planted, ought to produce five cantars† of sugar.

The method of expressing the juice is very simple. The mill is composed of two rollers, serving as axle-trees to two vertical wheels, moved by a horizontal one on the top, supported by two upright posts, having a transverse one, on the centre of which, the horizontal wheel moves; this is set in motion, by one or more buffaloes, yoked at the end of a long lever, connected with the centre of the horizontal wheel. Under the rollers is a reservoir, to receive the juice: a man sits between the two upright posts, within reach of a load of sugar canes, which he places by seven or eight at a time, between the rollers. The juice thus expressed is a sweet yellowish water, which being boiled, the sugar is extracted, in the shape of molasses. This is again refined coarsely, and made into small loaves of about three pounds weight, of a sparkling open grain, very sweet, inclined to the colour of Lisbon sugar.

The Manner of making Chaff in Egypt.—A frame of four feet wide, and as many high, consisting of three sides, was placed on wooden rollers, serving as axles to a number of thin circular iron plates, put in motion by a couple of oxen, driven by a boy, who sat on a cross bar above the rollers, and moved over the straw, as it lay in heaps on the ground, after the grain had been trodden out. In a short time, the straw was cut into small portions, which served to feed the cattle of the natives.

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* About an acre and a half.

† Nearly one hundred-weight.

Coptish Accountants.—The Copts still appear to be the chief accountants in Egypt, according to their former custom, under the Mamelouks. They have been restrained from their system of peculation, by the most terrible punishments, even to roasting alive. I saw, (says Captain Light,) upwards of one hundred, in the service of Ibrahim Pacha, employed in one room, which they never quitted during the day, their meals being brought to them. Their accounts were superintended by a Turkish Tefterdar, whose threat of instant death, on a trembling Copt, for some mistake or neglect of accounts, I heard myself.

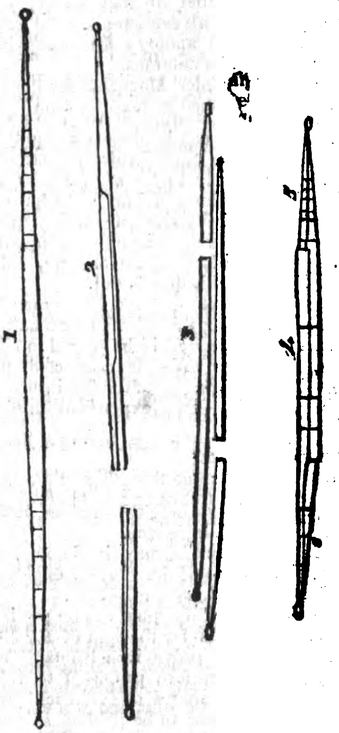
Sir—Having read in No. 6 of the Register under the head of The Columbus, that the attention of the Lords Commissioners of the Admiralty has been called to some parts of the architecture of that vessel which might be introduced with good effect in the British Navy, I therefore beg to make some remarks on the advantages and disadvantages this nation has already derived, by having, in His Majesty's dock yards, improved models of every denomination of vessels. It is a well-known fact that two ships may be built by the same builder, on the same spot, after the same plan—and every human exertion used to make them in every way the same, the one has every desirable quality, while the other is a mere floating raft.

It is also well known, notwithstanding the advantages our builders have of so many foreign fast-sailing, and in every way superior vessels, that during the last American war, several large corvets were built for the express purpose of capturing those of America; but when these ships went to sea, they were found not to sail or steer well, were so crank, that it was with difficulty they were got into port, and were then obliged to be double sided, which prevented them from being of any service.

Now Mr. Editor, before we adopt any of the stated improved parts of the Columbus, let us first remove the water-way piece* from our men of war which prevents the guns from being fought. Let us remember how many superior models to this Columbus are to be found in His Majesty's dock yards and in the London river. The length, breadth, and weight also should be taken into consideration, because a long massive body cannot be so speedily agitated by the sea as a lighter vessel, because she passes over three seas at once; nor will the Columbus therefore plunge into every sea that would impede the progress of a shorter and lighter vessel, and therefore may, on various points, sail faster then one of smaller dimensions.

I have my doubts whether such a vessel as the Columbus would not be more speedily destroyed in such a gale as we have lately experienced, than any other kind of ship; because she must lay too, and then would become no other than a break-water, and like the stone of Plymouth, be torn in pieces by the breaking sea, while on the other hand the more buoyant vessels would ride out the gale. W. P. G.

* See model at Society of Arts of improved method of working guns.



To the Editor of the Mechanics' Register.

Sir—As I am certain this mode of converting broken yards and masts of ships, or other spars, is not generally known; and that a more important communication cannot be made to those unacquainted with it, I beg to send drawings, that you may, through the medium of the Register, give publicity to the plan.

No. 1. A perfect topsail yard.

No. 2. A yard, with a part of it broken off.

No. 3. Represents the parts of No. 2 when cut through by a saw, and placed ready for being connected together, as shewn in No. 4. The longest part of No. 2 is cut through and reversed; the short part cut through, and placed to fill up the vacant spaces. The parts of the yard are then secured together by nails, and bound round with rope or iron hoop. W. P. G.

To the Editor of the London Mechanics' Register.

SIR—Permit me, through the medium of your journal, to make a few remarks upon some observations which appeared in a late number of the Mechanics' Magazine. As the plan of your work embraces, as a principal object, the affairs of the London Mechanics' Institution, being the oracle through which any member of that society is at liberty to convey his sentiments to the public, I shall make no apology for occupying a short space in its columns.

In the Mechanics' Magazine for the 11th instant, is published a report of the quarterly meeting and dinner at the Crown and Anchor, with a comment on them annexed; it is to this comment I refer. I pass by the first part, about "fine speaking," "Mr. Brougham," &c., and attend to the concluding remarks, relating to Doctor Birkbeck's having advanced the money for building the theatre, at 4 per cent. interest. This munificent offer of Dr. B., is censured by the writer, as the most calamitous event that ever happened to the society. This is, indeed, somewhat startling. So, then, after having overcome all its professed enemies, it is doomed, it appears, to perish by the hand of its pretended friends! The Institute is likely to fall into the Doctor's hands! Alas, poor patient!

But let us examine this affair a little more minutely. The following are, I believe, the circumstances attending it. The chapel in Monkwell Street having been found totally incompatible for carrying into effect the objects of the society, it was found necessary to obtain more eligible premises. The funds on hand, however, being by no means sufficient for this purpose, cash must be obtained, or the design abandoned. Taking into consideration the security to be afforded, money was not likely to be obtained at a very low rate of interest.

Here, then, the president steps forward, and offers as much money as might be wanted, at 4 per cent., although he might, no doubt, have disposed of it to much greater advantage, on the most ample security. But this is the arrangement so much complained of by the Mechanics' Magazine. It is interpreted as an attempt, on the part of Dr. Birkbeck, to obtain an undue influence over the society. Henceforth, let no man ever imagine, that any action, however generous, will be able to escape malicious aspersions, or envious misconstructions.

It is further asked, why Dr. B. did not make it a more public matter, instead of monopolizing all the generosity to himself? I would beg leave to suggest to the writer, that the Doctor might, possibly, have a little more modesty than himself, and that, when performing a benevolent action, it is not his custom to "sound a trumpet before him."

Perceiving, with regret, that those who were foremost in rearing the edifice, are the first to deface it,

I am, sir, your's respectfully,

A Member of the Mechanics' Institute.

QUERIES.

Man in inquisitiveness should be strong,
From curiosity doth wisdom flow:
For 'tis a maxim I've adopted long,
The more a man *inquires* the more he'll *know*.
PETER PINDAR.

SIR—I should be glad if any of your correspondents would inform me of the manner of staining glass of different colours.

G. G.

We have received several communications from our very valuable correspondent, S. HOLLANDS:—

Problem.—Eight spots being placed in the following order, it is required that they should be enclosed in separate compartments, by one continued motion of the pen, without taking it off, or retracting any part.

o o o
o o
o o o

ANSWERS TO QUERIES.

Remedy for Chilblains, or rather, Preventive for Chilblains.—Keep the feet clean. Most persons will say, this is superfluous advice, but I say, no, it is not; very few do keep their own, or their children's feet clean. Well, now they are cleaned,—keep them so. Then, as soon as any itching, the first symptom of chilblains, is felt, rub the feet, night and morning, with lemon, or lemon juice: continue this for about a week, and the feet will generally be fortified sufficiently against the attack of chilblains for the winter. If, however, the symptom should return, rub again.

Excellent Blacking.—Ivory black ground fine, 4 ounces; treacle, 4 ounces; vinegar, ½ pint; spermaceti oil, 2 drachms. If the ingredients are of the best qualities, this blacking will be found exceedingly good. Mix the oil with the black first, then add the treacle, and lastly the vinegar.

Infallible Remedy for a recent Cold or Cough.—Put a large tea-cup-full of linseed with 2 penny-worth of stick liquorice, and a quarter of a pound of sun raisins, into 2 quarts of soft water, and let it simmer over a slow fire, until it is reduced to 1 quart; then add to it a quarter of a pound of pounded sugar candy, a table-spoonful of old rum, and a table-spoonful of the best white wine vinegar, or lemon juice. The rum and vinegar are to be added, only as the decoction is taken, for if they are put in at first, the whole soon becomes flat and less efficacious. The dose is half a pint, made warm, on going to bed, and a little may also be drank, when the cough is troublesome. The worst cold is generally cured by this remedy, in two or three days, and if taken in time, may be considered as infallible. It is a most sovereign and balsamic cordial for the lungs, without possessing those opening qualities, which endanger fresh colds, on going out, and has in several families been known to cure colds, which had nearly settled in consumption.

Cough, and Soreness of the Chest.—Mix together, an ounce of boiling water, or barley water, an ounce of gum arabic powdered, and half an ounce of honey. Take a tea-spoonful now and then.

Shining German Blacking.—Break in pieces a cake of white wax, and put it in a tin tube, or any earthen vessel: pour over it as much oil of turpentine, as will quite cover it, and leave it for 24 hours, closely covered up. In this time, the wax will be found dissolved to a paste, which is then to be mixed with as much real ivory black in fine powder, as is necessary to give the entire composition a very black colour. When it is wanted for use, take a little of it out, on the point of a knife, and rub it into the leather of the boots, shoes, &c., with a brush, which will cause the ethereal spirit of the oil to evaporate, leaving the wax on the surface of the leather, quite firm, black, and glossy. Should the composition get dry, stir in a little fresh oil of turpentine.

SIR—Reading in your last, S. Hollands's directions for book-edge marbling, and feeling unwilling that I. E. T. (the querist) should be put to the unnecessary expense of procuring the several articles enumerated, which cannot, after all, but fail, as I do assure him there is scarcely one colour mentioned, which is right, and the method, taken all in all, is most inaccurate. He will find a much more perfect statement in Rees's Cyclopedia, article—paper marbling. Thus far to I. E. T. direct, but he may, if he pleases, glance at the following, and perhaps with advantage.—I am, sir, a friend to the diffusion of knowledge, and, perhaps, as liberal in contributing my mite, as many others, on general points, but when a man comes forward requesting information in the wholesale manner in which this correspondent has done, I hope I may be excused answering, though competent to it, without being stigmatized as illiberal or uncharitable, as my subsistence, and that of many others, depends upon certain little secrets which the trade has hitherto kept as inviolate as the rights of masonry. However, I will direct I. E. T. how he may acquire this marbling knowledge;—merely by articling himself for a few years, and backing his services by the payment of a handsome premium.—Really, sir, I am surprised at such lack of modesty! What is it he requests? Only to be taught the art and mystery of book-binding and book-edgemarbling; two entire and distinct professions. However, he is highly commendable in this one point,—for his steady adherence, in its most extended sense, to the maxim, "in all thy gettings, get knowledge."

Yours, &c., G. B. C., *Paper-Marbler*.

NOTICE TO CORRESPONDENTS.

Mr. T. Straker's article has come to hand, but too late for insertion in this number;—we will, however, take an early opportunity of introducing it to our readers.

The communication of *T. D. R.* shall certainly be attended to next week. His former communication has not been mislaid.

A correspondent, signing himself *A Member*, on the subject of Mr. Black's proposition, is informed, that his letter is too strongly couched in personality to be accepted by us, as we protest against language which may be injurious to the feelings.

We cordially thank *F. R. F.* for his valuable prizes, and are sure the competition, which must be very extensive, will interest our readers, and particularly the members of the Mechanics' Institution.

A Fleming will be noticed next week.

We feel greatly obliged to Mr. S. Hollands for his liberal offer, and shall be happy to accept of it.

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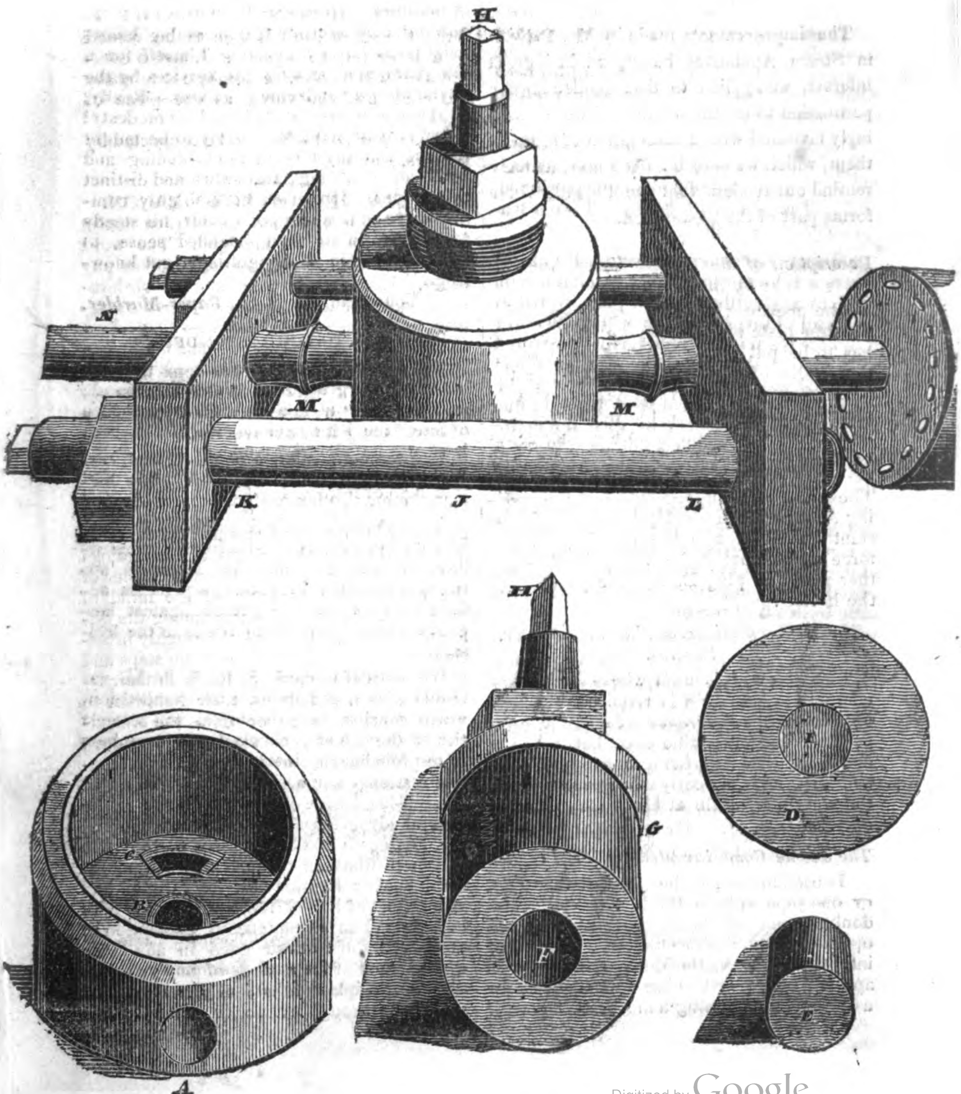
The London

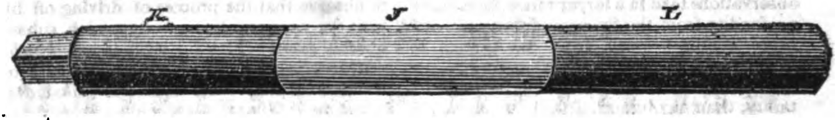
MECHANICS' REGISTER.

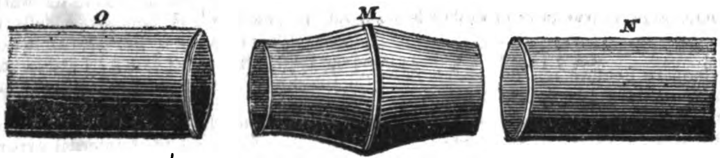
The price of wisdom is above rubies.—JOB xxviii, 18.

N°. 8.] SATURDAY, DECEMBER 25, 1824. [Price 3d.

MR. PERKINS's STEAM APPARATUS.







The improvements made by Mr. Perkins in Steam Apparatus having excited great interest, we applied to that gentleman for permission to inspect them, and were obligingly favoured with a description of some of them, which we subjoin. We need scarcely remind our readers that the Throttle Valve forms part of the Steam Gun.

Description of the Throttle Valve, invented by Mr. Perkins.

The apertures B and C are covered with the thin plate of steel, D; the steel plug E has to be put into the hole F, then screw the whole of the part G down upon the plate of steel D, which has been previously placed in the bottom of the valve; in order to prevent the steam from escaping generally. The steel plug E is forced down by the screw H to secure the hole B particularly. The steam being supplied through the opening A, raise the screw H, the steam will instantly rise through the opening B, and force up the part of the steel plate I, together with the plug E, and escape through the hole C.

The Differential Screw, invented by Mr. Perkins.

This screw J is used where the greatest compression possible is required which is obtained by the *difference* between the worm at either end; the difference between the end K and the end L being in the proportion of 5 to 4, or, (as nearly as possible) 16½ to the inch at K, while at L the inch contains only 13¼.

The double Cone, invented by Mr. Perkins,

Is used to connect the pipe with the valve, or one pipe with another. One end of the double cone M being inserted into the opening A of the throttle valve the other into the pipe N, the differential screw is applied, and after turning up the nut as far as it will go, and using a moderate degree of force, the screw itself is then to be turned by a lever on the square end, and a compression will be obtained, sufficient to make the cone and the valve as one piece of metal.

Two pipes, as O—N, may be connected by the same means.

CHARACTER OF LORD BACON.

Lord Bacon has been called (and justly) one of the wisest of mankind. The word *wisdom* characterises him more than any other. It was not that he did so much himself to advance the knowledge of man or nature, as that he saw what others had done to advance it, and what was still wanting to its full accomplishment. He stood upon the high 'vantage ground of genius and learning; and traced, "as in a map the voyager his course," the long devious march of human intellect, its elevations and depressions, its windings and its errors. He had a "large discourse of reason, looking before and after." He had made an exact and extensive survey of human acquirements: he took the gauge and meter, the depths and soundings of the human capacity. He was master of the comparative anatomy of the mind of man, of the balance of power among the different faculties. He had thoroughly investigated and carefully registered the steps and processes of his own thoughts, with their irregularities and failures, their liabilities to wrong conclusions, either from the difficulties of the subject, or from moral causes, from prejudice, indolence, vanity, from conscious strength or weakness; and he applied this self-knowledge on a mighty scale to the general advances or retrogade movements of the aggregate intellect of the world. He knew well what the goal and crown of moral and intellectual power was, how far men had fallen short of it, and how they came to miss it. He had an instantaneous perception of the quantity of truth or good in any given system; and of the analogy of any given result or principle to others of the same kind scattered through nature or history. His observations take in a larger range, have more profundity from the fineness of his tact, and more comprehension from the extent of his knowledge, along the line of which his imagination ran with equal celerity and certainty, than any other person's, whose writings I know.—*Hazlitt's Lectures.*

LONDON MECHANICS' INSTITUTE.

MR. COOPER'S LECTURE.

Mr. Cooper's Lecture on Wednesday the 15th instant, at the Mechanics' Institution, was on sulphur, sulphureous acid gas, and sulphuric acid. Sulphur, as it is commonly called, is found in a state of nature mixed with other substances. It abounds in all volcanic countries, and is also found in countries which are not volcanic, mixed with metallic bodies, and in this state the substances so mixed are called sulphurets.* Sulphur is divested of the bodies with which it is combined, by a process which is called roasting, and which is thus conducted: It is exposed to the heat of a furnace, and the vapours which are driven off are the pure sulphur, which condenses into a solid state, and is then prepared for the purposes of commerce in any form that may be required. The metallic or other bodies with which it was combined, are of course left behind by this process. In order to ascertain the purity of sulphur, it is only necessary to expose it to the action of heat, by which all that is pure will be carried off in vapour, and the residuum will be the substance or substances with which it previously existed in a state of combination. Sulphur before it undergoes the purifying process is called sulphur vivum, which to be rendered fit for the purposes of commerce, is put into an oven, and the vapours driven off in the way already stated. [Here Mr. Cooper placed a small quantity of sulphur in a bottle, over an argand lamp, in order to demonstrate that it is volatile at a heat below the boiling point, and that it passes off in vapour.] Flour of sulphur is in its nature and qualities the same as roll sulphur, but it is prepared differently. The sulphur is exposed to the action of heat, and the vapour passes into a chamber sufficiently large to admit of its condensing into the solid form, without coming in contact with the sides of the chamber. Here it may be necessary to observe that the process of driving off by heat the vapours of any body which subsequently assume the solid state is called *sublimation*, whereas the same process to substances, which become liquid, is called *distillation*. There is a peculiar property in sulphur, which will be now demonstrated. When a roll of sulphur is held in the warm hand, it crackles and sometimes falls in pieces. This is owing to the unequal action of the heat; the surface being heated before the interior undergoes any alteration, from which it must be evident that sulphur is a bad conductor of heat, as it does not pass quickly enough to allow of internal expansion. It may be presumed that there is not a worse conductor of electricity than sulphur, and if the legs of the stool used for electrical experiments could be made of sulphur they would probably be better than glass, which is also a non-conductor. Like other non-conducting substances, however, sulphur becomes electric by friction, as glass and sealing-wax, experiments on which have been made in Mr. Tatum's lecture. It can scarcely be necessary to explain that sulphur is only combustible by its combining with the oxygen of the air; without this it would extinguish as if in water. The mode in which sulphur burns is exemplified by the lighting of a common match, which upon being applied to fire, bursts into a flame as soon as it comes in contact with the oxygen of the atmosphere. It is worthy of remark that when sulphur is burned in oxygen, the product is sulphurous acid gas, but that if another substance be present, it is sulphuric acid, an article which, I may be permitted to say, is as important to the chemist and the manufacturer, as the steam engine is to the mechanic, and which may well be called our *primum mobile.* (Here Mr. Cooper burnt some sulphur in a jar of oxygen. The effect of this experiment was pleasing and beautiful, particularly from the burning of the wire upon which the sulphur was suspended. This was completely fused, and fell in drops of fire to the bottom of the vessel. The colour of the flame from the sulphur at the commencement of the experiment was nearly blue, but it then changed to yellow, which the lecturer explained to proceed from an increased temperature,) Sulphur when burnt in oxygen produces, as I have already stated, sulphurous acid gas, which is used with great effect for all purposes of bleaching. Wool is thus bleached, and also silk which is to receive a fine dye. It is also used for bleaching bonnets, which is done by simply enclosing the articles to be bleached in a box where the sulphur is burning in atmospheric air. In these cases it is usual and necessary, however, that the articles to be bleached should be previously moistened. The sulphurous acid gas acts upon the moist fibres of the straw, and bleaches them; but upon a large

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* Sulphur is very abundant in all the primitive mountains, where it exists, as stated by Mr. Cooper, in a state of combination with metals, forming glause, blend, and pyrites. According to Ure's Chemical Dictionary, it is found in a much more pure state in the secondary mountains, and in the island of Iceland, associated with gypsum; and it occurs abundantly in Sicily, in the Papal States, in Spain, and in Hanover.—Editor.

scale, for the bleaching of wool, proper stoves are used, and the vapour is forced through all the fibres of the wool in such a way that none of it can escape, and the process is thus rendered certain. (Mr. Cooper here exhibited the bleaching effects of this gas by litmus paper. He next exposed sulphur and quicksilver to the action of heat in a retort, and showed that by liberating the oxygen of the quicksilver, sulphurous acid gas was produced which was entirely absorbed by admitting a small portion of water.) Sulphuric acid is obtained by burning one part of sulphur with six or seven of nitre, and causing the vapour to pass into a chamber of considerable size lined with lead, and covered at the bottom with a shallow stratum of water. The oxygen which is given out by the nitre, supports the combustion for a considerable time, and the water being impregnated with the vapour becomes sulphuric acid, which is rendered pure by distillation. There is an improved process by which sulphuric acid is obtained very cheaply, and sold at so low a price as three pence per pound. (Mr. Cooper here took a glass vessel, and having partly exhausted it of atmospheric air, introduced a mixture of nitrous gas and sulphurous acid gas, and a small quantity of water, which condensed into a crystalline solid, and being decomposed by admitting a larger quantity of water, sulphuric acid was formed, and nitrous gas being given off, became in contact with air, nitrous acid gas; and the same process being from time to time renewed, the water contained in the vessel was strongly impregnated with the acid. With respect to the mode of ascertaining the purity of sulphuric acid, Mr. Cooper stated, that it is only necessary to put it into a retort and distil it, as the quantity of residuum in the retort will show the extent of the adulteration. In order, however, to avoid the great agitation of the vessel, which the acid would occasion in a state of ebullition, it is necessary to place some pieces of broken glass at the bottom of the retort, which then remains perfectly steady.

The following account of the old and new mode of preparing sulphuric acid may enable the student to appreciate the merits of the subject upon which Mr. Cooper has lectured :—

"The sulphuric acid made in Great Britain is produced by the combustion of sulphur. There are three conditions requisite in this operation. Oxygen must be present to maintain the combustion; the vessel must be so close as to prevent the escape of the volatile matter which rises, and water must be present to imbibe it. For these purposes, a mixture of eight parts of sulphur with one of nitre is placed in a proper vessel, enclosed within a chamber of considerable size, lined on all sides with lead, and covered at bottom with a shallow stratum of water. The mixture being set on fire, will burn for a considerable time by virtue of the supply of oxygen which nitre gives out when heated, and the water imbibing the sulphurous vapours, becomes gradually more and more acid after repeated combustions, and the acid is afterward concentrated by distillation.

A new process, however, has been introduced with good effect by Messrs. Clement and Desormes, modified by Sir H. Davy. They have shewn that 100 parts of nitre, judiciously managed, will produce, with the requisite quantity of sulphur, 2000 parts of concentrated sulphuric acid. Now these contain 1200 parts of oxygen, while the hundred parts of nitre contain only 39½ of oxygen; being not 1-30th part of what is afterwards found in the resulting sulphuric acid. But after the combustion of the sulphur, the nitre is converted into sulphate and bisulphate of potash, which mingled residuary salts contain nearly as much oxygen as the nitre originally did. Hence the origin of the 1200 parts of the oxygen in the sulphuric acid is still to be sought for. The following ingenious theory was first given by MM. Clement and Desormes. The burning sulphur or sulphurous acid, taking from the nitre a portion of its oxygen, forms sulphuric acid, which unites with the potash, and displaces a little nitrous and nitric acids in vapour. These vapours are decomposed by the sulphurous acid, into nitrous gas, or deutoxide of azote. This gas, naturally little denser than air, and now expanded by the heat, suddenly rises to the roof of the chamber; and might be expected to escape at the aperture there, which manufacturers were always obliged to leave open, otherwise they found the acidification would not proceed. But the instant that nitrous gas comes in contact with atmospherical oxygen, nitrous acid vapour is formed, which being a very heavy aeriform body, immediately precipitates on the sulphurous flame, and converts it into sulphuric acid; while itself resuming the state of nitrous gas, reascends for a new charge of oxygen, again to re-descend, and transfer it to the flaming sulphur. Thus we see, that a small volume of nitrous vapour, by its alternate metamorphoses into the states of oxide and acid, and its consequent interchanges, may be capable of acidifying a great quantity of sulphur.

This beautiful theory received a modification from Sir H. Davy. He found that nitrous gas had no action on sulphurous gas, to convert it into sulphuric acid, unless water be present. With a *small* proportion of water, 4 volumes of sulphurous acid gas, and 3 of nitrous gas, are condensed into a crystalline solid, which is instantly decomposed by *abundance* of water; oil of vitriol is formed, and nitrous gas given off, which with contact of air becomes nitrous acid gas, as above described. The process continues, according to the same principle of combination and decomposition, till the water at the bottom of the chamber is become strongly acid. It is first concentrated in large leaden pans, and afterwards in glass retorts heated in a sand bath. Platinum alembics, placed within pots of cast-iron of a corresponding shape and capacity, have been lately substituted in many manufactories for glass, and have been found to save fuel, and quicken the process of concentration.

The proper mode of burning the sulphur with the nitre, so as to produce the greatest quantity of oil of vitriol, is a problem, concerning which chemists hold a variety of opinions. M. Thenard describes the following as the best. Near one of the sides of the leaden chamber, and about a foot above its bottom, an iron plate, furnished with an upright border, is placed horizontally over a furnace, whose chimney passes across, under the bottom of the chamber, without having any connexion with it. On this plate, which is enclosed in a little chamber, the mixture of sulphur and nitre is laid. The whole being shut up, and the bottom of the large chamber covered with water a gentle fire is kindled in the furnace. The sulphur soon takes fire, and gives birth to the products described. When the combustion is finished, which is seen through a little pane adapted to the trap-door of the chamber, this is opened, the sulphate of potash is withdrawn, and is replaced by a mixture of sulphur and nitre. The air in the great chamber is meanwhile renewed by opening its lateral door, and a valve in its opposite side. Then, after closing these openings, the furnace is lighted anew. Successive mixtures are thus burned till the acid acquires a specific gravity of about 1.390, taking care never to put at once on the plate more sulphur than the air of the chamber can acidify. The acid is then withdrawn by stop-cocks, and concentrated."

MR. TATUM'S LECTURE.

Before he proceeded to the subject of the present lecture, Mr. Tatum adverted to a portion he had laid down in a preceding—namely, that electricity produced the same destructive effect on vegetable as on the animal matter. This was proved by the withered geranium now before the meeting. In treating of a new subject, it would be necessary to say something of its particular history. The discovery of the magnet was made at a very remote period, it was mentioned by the most distant historians. Some accounts stated that it was found on Mount Ida, by a shepherd named Magnus, from whom it took its name. He is said to have discovered it by its power of attraction on his musical instruments, and the nails of his shoes. However this may be, the knowledge of its properties was a fact of considerable antiquity, as appeared from the allusions to it in the old Greek writers. Anaxagoras even went so far as to attribute a soul to it. Some said it was used in navigating the ships of Solomon. Portugal claimed the first application of its powers, so did France, and even England contended for the honor. The history of its original use in navigation, would be a very curious though difficult subject of speculation for the antiquarian, but it was consolatory to think that the difficulty, in ascertaining its original discovery, was no obstacle to the illustration or application of its properties. The effects of the magnet in the tricks of conjurors, were beneath notice. Its medicinal qualities were not deserving of more than its magical, both were the pure effect of the powers of the imagination rather than of magnetic power. The opinion that the wounds inflicted by the magnet were mortal, was of the same quality as the former. He (Mr. Tatum) remembered a story told to him by a physician; a patient fancied himself ill and requested some particular medicine, the doctor, wishing to satisfy him, made up some crumbs of bread into the form and colour of pills; the patient swallowed them, and felt or fancied himself so much improved in health by them, that he continued to take them long after with great avidity. Now this was the work of mere fancy: however, there was no harm in giving that man a few crumbs of bread in addition to the larger quantities which he swallowed at his meals; they operated well upon his mind and spirits; and so if any person were weak enough to fancy that he could be cured by the properties of the magnet, let him by all means be allowed the application of them. Before he (Mr. T.) would proceed to the properties of the magnet, he would explain a few technical terms relative to it; the declination of the needle meant its position, neither exactly due north nor due south. If a piece of steel be supported by a centre of gravity, it will remain in the same position in which it was at first placed; if it be magnetized and then placed on the centre again, it will lose its horizontal position and decline to about 70 degrees; the magnetic meridian. The poles of the needle are the parts in which the properties of the magnet were most prominent. It was necessary to keep a piece of iron affixed to the magnet in order to preserve its properties, and even to make them stronger. The variation of the needle was found to be very considerable in the course of a given share of time. In the 16th century it was 11 degrees 15 minutes east, and now it is in London 24 degrees west. The seasons had an effect upon its variation. In summer it differed from its winter position; it varied according to the time of the day even, it was different in the evening from what it had been in the morning. The learned lecturer here detailed the discordant opinions of several able men on the degrees of variation, and closed it by saying that he would pass from those speculations, too refined and complex for the hearers of an elementary dissertation, to the more useful illustration of the laws of magnetic power, of a body attracted by a magnet, the part attracted was a pole different from the pole of the magnet to which it was drawn. Magnetic bodies must have two poles, however some bodies possessed magnetic powers and yet had but one pole. Pieces of iron standing perpendicular for two or three years, acquired by continuance in that position, a magnetic quality, files, fire-irons, and such. Every mechanic must have found that a blow of a hammer on one end of a piece of iron would make it magnetic; if a body attracted one point of a needle and repelled another, that body was a magnet. [The lecturer proved this principle by an experiment before the meeting.] Electricity would give a magnetic power. [Here he magnetized a piece of wire by juxta position to a bar magnet, and a second piece by bringing it into contact with the first.] Ferruginous bodies may be made magnetic by common electricity, and by voltaic electricity; this he had proved by experiment at a former lecture. If a magnet possessing two poles were broken, the parts into which it was divided would also possess each two poles, one end of each part would repel, and the other end of each part would attract, and that sufficiently to support a piece of wire. [This the lecturer demonstrated by experiment.] A complete magnet placed on a cork would turn as though it were suspended on a point. If a magnet were placed on paper, and particles of iron thrown irregularly around it, they would be brought by the magnetic power to move into a sort of connected circle, or circular string round it. [This he also shewed experimentally] The use of the magnet in the compass needle was extremely important. The mariner out of sight of land could scarcely find his port without it. Even to persons travelling over large continents of desert land it was useful; in mining operations, for instance tunnelling, the compass directed the operators to strike into the proper line, and to follow it; and even in dials when no sun shines, (which may be the case for many days) the compass would serve to ascertain the point required. The dip of the needle was about 70 degrees, the lower part was commonly called the north pole. The particular degree of its depression or dip could be found by placing near it a circle divided into degrees. Near the equator, a dipping needle would be horizontal, if it were moved towards the south, it would dip or sink more and more according as it proceeded, until it would at last become quite perpendicular. Perhaps this last was the position of the needle in the Regent's Inlet. If it were moved back from the south, it would gradually return to its horizontal position, and on proceeding to the north, the other end would decline, and at last become perpendicular. [The experiment, demonstrative of this, was quite successful.] When it was wished to preserve the magnet in its full strength, a weight ought to be attached to it, and increased by degrees; every increase of weight increased the powers of the magnet. He (the learned lecturer) had attached a weight of seven pounds to a magnet just before he commenced the lecture. [The magnet, with the weight affixed, was here produced, and the learned lecturer proceeded to add still more weight gradually, until the entire collective weight amounted to thirteen pounds, on which the magnet lost its hold on the weight in consequence of the agitation of the floor. This experiment was honored with loud applause.] Mr. Tatum continued—A few observations on the making of a magnet may be useful. When a body was magnetized, it was found that the body magnetizing had lost some of its magnetic power, but in magnetizing a body by electricity, the magnetism not passing from a body, no body could in that case be said to have lost a part of its magnetic power. He (Mr. T.) was of opinion therefore, that it was not possible by human science to create or originate a magnetic power in a body not possessing it before; every body (he conceived) possessed a magnetic fluid in some degree in itself; and all that science could do, was to call it into action by the means before mentioned. The learned lecturer concluded, amid universal and hearty plaudits, by stating that the subject of his next lecture would be electric magnetism.

PROCEEDINGS OF THE MEETING.

The lecturer having retired, Dr. Gilchrist took the chair as president of the meeting. Mr. Mac William sat on his left, and Mr. Blake, the honorary secretary, on his right. The chairman begged leave before he proceeded to the business of the meeting, to mention an advertisement by the committee, for a person to repair the apparatus belonging to the institution, who must of course be a member. He then proceeded to state that was a special meeting of the institution called together according to a new law, in pursuance of a requisition signed by 40 members, the object was to consider the propriety of presenting to Dr. Birkbeck a testimonial of their gratitude for his valuable exertions. Many others, as well as their worthy President, had cause to say, if you protect me from the indiscretion of my friends, my own head and my heart will defend me against my enemies. (*applause.*) The committee highly approved the spirit though not the letter of the requisition; they sincerely wished to second the general members in shewing marks of kindness to their worthy President; but felt that what may be seasonable at one period, may be unseasonable at another. The Institution was, doubtlessly, indebted to him for his kind feelings towards it; but it was indebted to him for a large pecuniary sum, without which, they would be unable to go into their new lecture-room; here was a solid debt staring them in the face, and it was but common sense in them, and even common honesty, to be just before they were generous. When the principal and interest of that debt should have been paid to Dr. Birkbeck, then let members talk of rewards, and not till then. No doubt pictures were good things; but the Institution had not a proper room in which they could hang up a picture. If members still would persist in their wish to present a reward, let them do as the mechanics of Glasgow did on a similar occasion, club their three-pences and buy a snuff box, or ring, or vase, for about ten pounds; by this manner of subscribing every man would pay the same sum, they would be all equal. He hoped the funds of the Institution were not expected to defray the expenses of the proposed testimonial, it was not able, the worthy President himself was very sorry that this proposal had been mentioned at this particular season, lest it might afford an opportunityfor calumny and envy. One of the committee had offered a bust at his own expence, this would cost something less than 300*l.* which would be the price of a good picture. After these observations he would sit down, trusting that the meeting would hear every one who wished to deliver his sentiments, with indulgence and favour. (*applause.*)

Mr. Whitaker then rose and said, that having handed in the requisition to the Committee, he felt himself bound to explain the reason; if he had committed a fault, he trusted it was a fault on the right side; a fault more of his head than of his heart. He was not used to address public meetings, nor accustomed to deliver speeches; he would therefore read his sentiments from a written paper. His proposal had, however, one good effect, namely, that of having elicited offers of several sorts of presents to their President. This was the first meeting under the new law. He attributed the success, if not the origin of the Institution to Dr. Birkbeck. The object of the requisitionists was to mark their sense of gratitude to the worthy Doctor, by presenting to him a piece of plate, or a statue, or in his (Mr. W.'s) opinion a picture, a handsome likeness. This may be done by a subscription among the Members of sixpence each; one thousand subscribers would make up 25l. for which sum a good painting might be procured. He (Mr. W.) was inclined to bring forward this measure several months ago, but was induced to relinquish it in compliance with the request of other persons. He should be sorry if he should be considered too early now also. He would now read his resolution:

"Resolved, that the members of the London Mechanics' Institution feel indebted to Dr. Birkbeck, for his valuable exertions in establishing schools of science for the working classes, and are desirous of expressing their feelings of gratitude to him by some lasting memorial."

A young Member under the gallery (who stated himself to be a manufacturer of picture frames), said that 25*l.* would not be enough for a good picture, it would cost a much larger sum; he would rather there were none, than a mere daub, he should be very sorry to see the worthy President gibbeted in a daub like a Saracen's head upon a sign board. (*applause.*) No—there should be no mediocrity in it; the ablest head ought to be painted by the most eminent hand. (*applause.*) This proposal of a reward was premature for the state of the Institution, it was worthy of its vigorous manhood not of struggling infancy. The best way to reward the worthy president, would be to imitate him in works of solid utility, this would be the most pleasing homage to him.

Mr. Stacey was inclined to think that the meeting, however willing, was unable to carry the resolution into effect, inasmuch as Dr. Birkbeck had declared that he would not receive or permit any such testimony. Dr. Birkbeck's words were these, "I have advanced money to you for the building of your new lecture room; if you can raise 100*l.*, or even 50*l.*, to gratify my personal vanity, or to testify your kind opinion of me, is it not better that you should rather apply it to the liquidation of part of the debt. I will not accept of any such present until the Institution shall have been independent, and all our designs accomplished; but as to resolutions, you may resolve and vote as you please, while you confine yourselves to mere declarations of your opinion of me." This was the President's opinion and desire on the subject. The proposal was clearly premature, however he, (Mr. Stacey) should support Mr. Whitaker's resolution as an expression of their feelings, with an understanding that the practical adoption of it should be deferred to another time.

Here Mr. Whitaker read Dr. Birkbeck's letter, and the substance of his own resolutions.

Dr. Gilchrist said, that he had added a few words to Mr. Whitaker's resolution, which he trusted would secure its unanimous adoption. The addition was this: "when it shall be in their power so to do with propriety."

Mr. Stacey proposed an amendment of the following tenor:

"Resolved, that Dr. Birkbeck, having expressed his reluctance to accept any memorial, we therefore defer it for the present."

The reason of deferring it, Mr. Stacey explained to be an additional compliment to the President.

The Picture-frame Maker opposed this amendment. The feelings of the President ought not to be taken into consideration at all. As the Meeting would not give him a mark of respect merely on the ground of his expressing a wish to get it, so they ought not to be dissuaded from presenting it to him, even though he was averse to it.

Dr. Gilchrist observed, the Doctor's letter not having been addressed to the Meeting, was not fairly before them as a subject to discuss or act on. He (Dr. G.) thought the few words added by himself to Mr. Whitaker's resolution, were a sufficient explanation of their reason for deferring the presentation of a reward.

A Young Gentleman under the gallery suggested the presentation of a diamond ring, by a subscription of three-pence each. He was induced to propose this by his deep sense of the benefits which he derived from his attendance at the lectures of the Institution, and a proportional sense of gratitude to their excellent founder and patron. (*applause.*)

Mr. Whitaker said he would cut short the debate by withdrawing his resolutions altogether, as he saw that the meeting felt grateful to the President, and was inclined to present a reward hereafter.

Dr. Gilchrist thought, that withdrawing the resolution would convey no compliment to Dr. Birkbeck. The withdrawing may appear to some persons to proceed from unanswerable objections to the measure, on the ground of its merits. Now that was not the case; all agreed in thinking the reward to have been richly deserved; they differed only as to the time of conferring it.

Mr. Stacey's amendment was then put from the chair, and rejected by a shew of hands.

The original resolution, with the addition, by Dr. Gilchrist, was then put and carried unanimously, with applause.

Mr. Whitaker.—This applause proves to me that I was not wrong.

The following resolution was then put and passed in the affirmative.

"Resolved that this meeting approves the motives of the requisitionists in bringing forward the business of this meeting."

Professor Mac William was then moved into the chair; and the thanks of the meeting voted to Dr. Gilchrist for his conduct in the chair.

This resolution met enthusiastic applause.

Dr. Gilchrist returned thanks in a few words, and added, that his head, and heart, and hands, should be ever devoted to their service.

learned doctor stated to the meeting, that there would be no selection made of those members who wished to learn French.

The meeting then dispersed at half-past ten o'clock.

MR. JOHN WHITAKER'S HISTORY OF COFFEE.

(Continued from No. IV.)

It has not been determined at what time coffee passed from Constantinople to the Western parts of Europe, but it appears, that in 1644, some gentlemen, who accompanied Monsieur De la Haye to Constantinople, on their return to Marseilles, brought back with them not only some coffee, but the proper apparatus for preparing it; and costly and magnificent vessels for drinking it from; but it was only in use by these persons, who had been accustomed to it in the Levant. In the year 1671, a public coffee-house was opened at Marseilles, near the Exchange, which was found to be so convenient to persons connected with commerce, that coffee-houses increased amazingly; before the year 1669, coffee had not been seen at Paris; that year was distinguished by the arrival (at Paris), of Soliman Aga, ambassador from Sultan Mahomet the Fourth; this may be looked upon as the true period of the introduction of coffee into the French capital; this minister and his suite having brought a considerable quantity with them; and staying at Paris from July 1669, to May 1670, fully established coffee drinking at Paris.

In the year 1672, an Armenian of the name of Pascal, set up a public coffee-house in Paris, but met with little encouragement; he was succeeded by other Armenians, and some Persians, but not with success, for want of address and suitable places to dispose of it. Shortly after these failures, a Frenchman fitted up an elegant and spacious apartment which soon became frequented by men of letters, and people of fashion, so that in a very short time the number of coffee-houses in Paris was 300; since that period, coffee has been an article of very great consumption in France among all classes. Mercier, in a work entitled the picture of Paris, published in 1783, in speaking of the coffee-houses, says the consumption of this article has become considerable ever since the people (not knowing what to drink on account of the imposts and adulterations) have conceived an unbounded relish for coffee; it has now become the daily drink in three-fourths of the houses in the city. It has now become a favourite beverage with the robust workmen of Paris; at the corner of the streets, by the light of a dim lantern, women, who convey on their backs fountains of tin, serve out the coffee in earthen pots for two sous. The use of coffee has become so prevalent, and is now so widely spread among the people, that it is become the constant breakfast of the working classes; they find more economy, more resources, and a higher relish for this species of aliment, than in any other, consequently they drink a prodigious quantity of it; they state that it supports them better through the fatigues of labour than strong spirits, or wine.

In another part of the same work is a note, which runs thus, "On the mountains of Switzerland, on the steep rocks, where, with this exception, the most ordinary luxury has not yet penetrated, we find the use of coffee carried to a very great extent; with what astonishment was I struck, on perceiving at the houses of the herdsmen, the coffee-pot, the coffee-mill, and the sugar bowl, amidst utensils of the first necessity. Whence is it that the relish for this beverage has been so generally adopted, and almost at the same time and in climates so different; no longer do I perceive at Paris any person breakfasting on a glass of wine."

It appears from Anderson's Chronological History of Commerce, that the use of coffee was introduced into London some years earlier than into Paris. For in the year 1652, Mr. Edward, a Turkey merchant, brought home with him a Greek servant, whose name was Pasqua, this man understood the roasting and making of coffee, and was the first who sold coffee in England. He opened a house for that purpose in George-yard, Lombard-street, and from that time the consumption of coffee increased daily. The first mention of coffee on our statute books, is in 1660, (12th Charles II.) when a duty of four-pence was laid on every gallon of coffee made and sold, to be paid by the makers.

In the year 1663 (15 Charles II.), an Act passed for the licensing of retail coffee-houses, in these words:—"And be it further enacted, by the authority aforesaid, that from and after the first day of September, no person or persons shall be permitted to sell or retail coffee, sherbet or tea, without license, and giving security for the payment of the dues to the King, for which licence and recognizance, and security, twelve-pence shall be given;" to sell this liquor without said license subjected the party to a fine of five pounds per month.

It appears that coffee excites a spirit of inquiry, and promotes political conversation among Englishmen as well as among the Turks, for in the year 1675, coffee-houses having become very numerous, they were declared by the government of that day, to be seminaries of sedition, and in consequence of this, the king, Charles the second, issued a proclamation to shut them up, but this proclamation was a short time afterwards suspended by a second. From that period, coffee has generally been sold at the higher class of houses, which have united the character of coffee-house and tavern, and until lately, was only drank by the superior classes of society, in consequence of the very high price at which it was sold, till about the year 1811, however, the government having reduced the duty on colonial coffee to fourpence in the pound, a vast quantity was brought into the market, and a number of shops were opened, and called coffee marts, at which shops roasted coffee and West Indiia sugar only, were sold. It was this low price of coffee that induced a person to open a shop for the sale of liquid coffee at a small charge, by the pint and half pint. This house was situated in High-street, St Giles, and facing the end of Oxford-road, being fitted up with seats and tables, in a plain but convenient manner; it very soon obtained a celebrity among the working classes, in that neighbourhood, and it was an accommodation highly approved of by the labouring poor. Shortly after this was established, a person named Deacon opened extensive premises at the north end of Fleet-market, as a coffee merchant, and at the same time fitted up the lower part of the house (the Cellar) as a coffee drinking-room for the market people; here a vast trade was carried on, nothing but coffee and bread and butter being sold. At this time, (1824) there are five coffee houses in Fleet-market. The success of the houses already opened, induced a number of persons to embark in this business, and in a very short time about forty houses were carrying on business in the ready-made coffee trade, and at this moment we may reckon nearly five hundred.

(*To be continued.*)

STEAM NAVIGATION TO INDIA.

Several attempts have been made recently to form a Company for Steam Navigation to India, but they have failed on account of the objections started by some practical men, against whose opinion it was dangerous to proceed. The leading objections, as far as we have been able to ascertain them, are that no steam vessel can live in the sea off the Cape of Good Hope, and that the quantity of fuel necessary for the voyage would be of greater burthen than a trading vessel ought to carry, in addition to its mercantile commodities. We have heard these objections answered, and ably too, we imagine, by gentlemen who have made the voyage frequently, and who understand the relative advantages and disadvantages of steam and ordinary navigation, as follows: They say, that well-constructed steam vessels would have a decided advantage in the long running seas off the Cape, on account of the ease with which the head could be put to them, and that the use of the recently invented ballast keel, which is raised or lowered according to circumstances, would always enable the navigator to change the position of his vessel, and adapt it to the most violent gale or to the greatest calm. With respect to the quantity of fuel necessary for the voyage, it is said that the last invented Steam Engines require but little, and that a supply could easily be taken in at all the places where ships usually touch in going to or returning from the East Indies. We are not skilled enough in this subject to pronounce an opinion upon the merits of the objections which have been brought forward, but we think there can be little difference of opinion as to the value of steam navigation to India, if it could be accomplished. We repeat therefore, that the Company has not been formed, but it is pleasing to see that a steam vessel has been advertised as about to sail speedily for those distant shores. The failure of the project of establishing a regular India Steam Packet Company, has led to another, which is not destitute of merit. It is now proposed to station several well built vessels at Portsmouth, one of which is to sail punctually on the first day of every month for India. If the wind should prove contrary, the vessel is to be towed down Channel by a powerful steam boat, so that no uncertainty or inconvenience may be sustained by the passengers, and every vessel is to have on board a boat, or tug, with a steam engine, which is to be fitted up and put out to tow the vessel, in case of calm or contrary winds. It is calculated that this improvement will shorten the passage about a month or six weeks. When we have seen the prospectus we shall probably enter more fully upon this subject.

RAILWAYS.

The laying down of iron railways in Europe was a great triumph of mechanical genius; and we are happy to see that with few exceptions, these public improvements have proved highly profitable to the projectors. Our readers have heard of a Company at Liverpool, who are about to lay down an iron railway from that place to Manchester, a distance of about 36 miles, and of another similar project from Bath to Bristol. The shares of the former are already at 40 guineas each premium, and bargains have been made for shares at 150 guineas premium, if the Bill should pass the two Houses of Parliament. We have now to notice a project for a railway to Gravesend, and through several parts of Kent, with steam carriages to convey goods and passengers. These shares are also at a premium, and very properly so, we think, for in this plan there is a double triumph of science, which must redound to the honour of the mechanics of Great Britain. We cannot perform a more pleasing duty than in recommending this scheme to the notice of our readers, and we think many of them might safely invest any spare capital which they may possess, in the purchase of shares, as they are likely to become a valuable property for themselves and their posterity.

ANIMAL ECONOMY.

We have great pleasure in publishing the following interesting remarks, from Lectures on Digestion and Diet, by Mr. Thackrah.

"The *periods of eating* deserve some attention. The habit, which leaves the great bulk of the day without a meal, and then crowds two or three together in the evening, is manifestly bad. Heavy suppers are generally improper; they cannot be digested before bed-time, and the operation of the stomach must be imperfect, when the nervous functions are reduced or abolished. The number of meals which generally suits the digestive organs is three or four, at regular divided intervals during the day.

The subject of *drinks* is the next for our examination. When we consider how large a proportion of the body is fluid, and how this is thrown off continually by the secretions, we see the necessity of some considerable supply. Of simple drinks, that which Nature has so liberally provided, is undoubtedly the best; but the varieties in its quality deserve some attention. *Cocoa* and *chocolate* have not, I believe, been sufficiently examined; in nutriment they are probably much inferior to *milk*, whilst the oil with which they abound, often renders them oppressive to the stomach. When this effect is not produced, they are preferable to tea. *Malt* liquor, containing a quantity of sugar, is very nutritious, and is very proper for persons of active employment. To some delicate individuals it forms a valuable aliment. To the plethoric and indolent it is decidedly injurious. It oppresses the stomach, induces heaviness of the head, and a diminution of mental and corporeal activity.

Tea is a narcotic, and hence naturally injurious; but experience scarcely warrants our attaching to it a high degree of evil agency,—at least, in the common way, and to the ordinary extent in which it is taken. I know not what the citizen could advantageously substitute. It appears well calculated to obviate the effects which arise from the excess of food, and the inordinate stimulus of spirituous potation. Black tea, drank in moderation, produces, in most persons, effects rather useful than prejudicial. It evidently gives a mild impulse to the circulation, and excites a general moisture on the skin.

Most of the highly flavoured teas excite the nervous system; and when taken in large quantity, or at an improper time, produce great disorder. The green seems to have most of the narcotic property. Its sedative effect on the heart is sometimes alarming.

The properties of *coffee* have been disputed. We need not examine all that has been written on its beneficial and baneful effects. Daily experience is our guide. Coffee is a narcotic stimulant. It removes the sense of fatigue and exhaustion, and it gives vigour and hilarity to the mind. The wearied student, the brain-racked inquirer, hails it as his comforter and support. Voltaire almost lived upon coffee; the great Harvey took it constantly and freely. This was the habit, too, of Horace Walpole. Indeed, to many scientific and literary men, the coffee-cup is the regular companion of the inkstand. These coffee-drinkers, however, sometimes suffer serious disorders of the stomach or the head, as indigestion, nervous irritability, head-ache, or palsy. But the proportion of evil, which results from the coffee, cannot be accurately compared with that which results from the study. Nor does the ardent student care to inquire. He knows that strong coffee assists his intellect. He is not the servant of his stomach, nor will he consult its likings at the expense of a more noble organ. Here he is in error. He forgets the sympathy between the stomach and the brain. But ere long he will be taught it, in a way not the most agreeable, either to his intellectual powers, or his corporeal feelings. Fretting of the stomach, and consequent irritability of nerve and of temper, will soon be as troublesome as impertinent visitors, and equally disarrange his ideas and break the catenation of thought.

The importance of the subject of diet, and its immediate application to the health and comfort of every individual, have led me into a considerable length and labour of detail. Errors in diet are the great source of disease: amendment of diet is the basis of recovery. The majority of our maladies medicine may relieve or suspend; but, without the aid of regimen, can never cure."

HYDROPHOBIA.

We copy the following interesting case of hydrophobia from a late number of the *Lancet*, as our extensive circulation in the country may render it more generally known, and guard many from the fatal effects of this horrible malady:

REMARKABLE CASE OF HYDROPHOBIA, FOLLOWED BY CURE; WITH REMARKS BY DR. EMILIANI.

"The following case appears to possess some interest, and serves to show, that the matter which ultimately produces the horrible symptoms of this disease remains for a certain time inactive in the wound, and that therefore the treatment to be adopted should be that of removing the bitten part without hesitation, even some time after the bite has been received. This is Dr. Emiliani's opinion, in which, we believe, most will coincide.

Domenico Brezzi, a bleacher, father of a large family, kept, as a protection for his house during the night, a large dog, which in the day time was chained. A strange dog strolled one day into the yard, and bit the dog which was chained. About thirty days after, the symptoms of disease showed themselves, but no one suspected what would happen; when loosed from his chain one morning, he bit Brezzi, his son Benedetto, and a domestic named Marie Ospitali. Soon afterwards the animal refused all kinds of food and drink; the progress of the madness was surprising; he was continually biting what came in his way, and bit a piece of wood with such force, that was thrown into his cabin, that his teeth were broken off, and remained fixed in the wood; he soon afterwards died. The manner in which the dog died caused great inquietude in the minds of the persons bitten, as might be expected. They took a small quantity of powdered cantharides internally, and thought they had done all they could do to prevent any evil consequence. We visited Brezzi and his family six days after the bites had been made, and being made acquainted with the circumstances, pointed out the necessity of having the parts immediately cauterised, notwithstanding that they had healed. Brezzi and his son consented, but the servant would not, because she had been bitten just above the pubis. Professor Atti cauterised freely the wounds of the two former, and afterwards applied a blister, which was kept discharging for some days. Since that time Brezzi and his son have had no bad symptom; whilst the unfortunate servant was seized, on the 27th day, with symptoms of the disease, and died in a short time, in the most deplorable condition. The cure of the two others has remained firm, although it is now more than two years since the accident.

ON THE DIVISION OF THE FOOT INTO INCHES.

The division of the foot into twelve inches (or uniciæ) was not fortuitous, but had its origin from the division of the *As* or Libra into *twelve* parts. The Roman *Pes*, or foot, was divided into four palmi or hand-breadths, twelve pollices, or thumb-breadths, and sixteen digiti, or finger-breadths; each digitus was supposed equal to *four* barleycorns (*hordei grana*) consequently their foot was to ours as four to three, or sixteen of our inches; but having a popular division into twelve parts, or unciæ, which had reference to the *As*, I am of opinion we have retained the same in the division of our foot to the present day; and as the *As* was applied *to any thing* divided into *twelve* parts, as an inheritance, an acre, liquid measure, or interest of money, it may not perhaps be thought too bold, to hazard a conjecture that the word assize is also derived from the same term, and not from *Assis*, the participle of the French verb *Asseoir*, signifying a *sitting* of the Judges to *hear* and determine causes,—but from *Assize*, signifying *mensu-*

ra, or the apportioning to every man throughout their circuits equal justice in equal scales, according to the standard *As*.

From this word likewise comes the assize of bread, the assize of weights and measures, "Celui qui regle les Poids et les Mesures." See Miege's Dictionary. Hence, perhaps, and with great deference to better authority, the appointment of *twelve Judge* and twelve jurymen may have had the same origin; for among the Romans an inheritance was commonly divided into twelve parts, called Unciæ: the whole was called As. Hence, *Hæres ex asse*, Heir to the whole; *Hæres ex semisse, ex triente, dodrante*, Heirs to the half-third, three-fourths, &c. Insignificant as the subject may appear to the incurious, it is, however, evident, that our division of the common foot is not fortuitous, but derived from the Roman Pes, whilst masters of this island, at least 1800 years ago; and that to their division of the As or Libra into Unciæ, we owe both our avoirdupois ounce and inch, both of which being now established by Parliament on scientific principles, may be considered as perpetuated and doubly "Imperial."

Blackstone says, "Our ancient historians inform us, that a standard of longitudinal measure was ascertained by King Henry I. who commanded that the *Ulna*, or ancient ell, which answers to our modern yard, should be made of the exact length of his own arm; and one standard of measure of length being gained, all others are easily derived from thence; superficial measures are derived by squaring those of length, and measures of capacity by cubing them;—that under King Richard I. in his parliament holden at Westminster, A. D. 1197, it was ordained, that the custody of the *Assize* or *Standard* of weights and measures, should be committed to certain persons in every city and borough. These original standards were called *Pondus Regis* and *Mensura Domini Regis*, and are by a variety of subsequent statutes to be kept in the exchequer, and all weights and measures to be made conformable thereto; but, as Sir Edward Coke observes, though this hath so often by authority of parliament been enacted, yet it could never be effected, so forcible is *custom* with the multitude." The yard being now determined by the present act of parliament on mathematical principles, and a *strict uniformity* of weights and measures throughout the kingdom established, it is anticipated that great and increased advantage to the public must be the consequence of its adoption.

THE DISTRIBUTION OF POPULATION.

The natural manufacture of cotton, woollen, linen, and silk goods in Great Britain, and the importation of raw produce from other countries, arise solely from the relations of climate, and the facilities of industry. Birmingham has long been famous for its hardwares, &c. Sheffield for its cutlery, Manchester for cotton manufactures, and Leeds for its woollens. Each of these draws together a numerous population, and sets to work other branches of petty manufactures and industry. But were any of these towns divested of its principal source of income, by a legislative prohibition of its chief manufacture, the convenience of fuel, excellent carriage roads, inland navigation, and a good supply of provisions, would speedily draw thither some branch of industry, and in a great measure supply the loss which had so occurred.

Sea port towns have seldom proved favourable to manufactures; because, though they may, like Newcastle and Whitehaven, have the provisions necessary for a great body of miners in abundance, and the population collected together by maritime and mercantile affairs, yet they may render living too dear to admit of a numerous manufacturing population.

Liverpool is the second port in the kingdom. It is not unfrequent to hear ignorant men observe that the spirit of the people of this town will most probably enable them in time to rival even London, as a maritime and mercantile town. Liverpool, like London, does not owe its prosperity so much to the enterprise of its inhabitants as to its local advantages. The Mersey admits vessels of great burden a considerable way into the country; and as an immense chain of inland navigation has connected it with an extensive population in Lancashire, Cheshire, Derbyshire, Staffordshire, Warwickshire, and Yorkshire, which require an extra supply of provisions, West India produce, and the raw produce of manufactures, salt from the works of Northwich, &c. we need not wonder at the flourishing circumstances of the port of Liverpool, which in a great measure owes its prosperity to its not interfering so immediately with the port of London.

Greenock owes its prosperity to the general port it offers for the manufacturing dis tricts of Scotland, the various ramnifications which connect it with the interior of the country, and by means of the Forth and Clyde canal, with the whole range of the eastern coast of Great Britain.

It would then appear, that commerce, the local facilities of labour, the means of procuring provisions, the state of knowledge, and accumulation of capital, distribute population according to regular principles of cause and effect, and that these depend upon cheap means of production.

The seat of empire and commerce has given to England the city of London, to France the city of Paris, and to Holland the town of Amsterdam. These flourishing towns have arisen from the divisions of la bour, and the concentration of capital, caused by the difference of the products of industry in the various parts of the habitable globe, and the principles of wealth by which a great mass of population is drawn together. When Alexander the Great fixed the seat of commerce at Alexandria, and when Constantine the Great marked out the future bounds of Constantinople, they were guided wholly by the maritime advantages naturally presented by these famous places. The operations by which they rose into consideration were by no means forced, but the regular consequence of the natural distribution of population and industry in an improved state of society. Foreign commerce, after having created the basis of capital, by drawing industry into a species of confederacy, a co-operation and division of labour, and of the economical application of capital, breaks up the natural or squandering distribution of population and industry, elevates villages to the highest rank of opulence, and gradually infuses wealth into the remotest corners of the body politic; until at length, by the repeated action and re-action between the foreign and the home trade, the circumstances peculiar to a people are completely changed, they acquire new wants and new desires, together with the means of gratifying them, much more completely than could have been previously anticipated.

To the Editor of the Mechanics Register.

Sir.—As a member of the London Mechanics' Institution, I am very glad to see that we have at last got a publication, which performs that which its title professes—namely, the registry of the proceedings of the London Mechanics' Institution, as well as all other matters connected therewith. I beg leave to hand to you for insertion, a copy of the number of members of the Edinburgh School of Arts, with their different trades. I should like to see such a list of the London Mechanics' Institution, made up to the close of the present year.

An original member, J. W.

THE EDINBURGH SCHOOL OF ARTS WAS ESTABLISHED IN ONE THOUSAND EIGHT HUNDRED AND TWENTY-ONE. TERMS OF ADMISSION TO THE LECTURES, AND THE USE OF BOOKS, FIFTEEN SHILLINGS PER ANNUM. UPON THESE TERMS FOUR HUNDRED AND FIFTY-TWO WERE ENTERED IN THE FIRST YEAR.—THE FOLLOWING LIST SHEWS THE NUMBER OF THE TRADES.

Cabinet-makers and Joiners	111
Smiths and Iron Machine Makers	38
Millwrights	15
Masons and Marble Cutters	27
Watch and Clock Makers	11
Opticians	7
Silversmiths and Jewellers	19
Tinmen and Pewterers	12
Brass Founders	12
Die Cutters	5
Plumbers	9
Painters	7
Dyers	6
Printers	10
Bookbinders	7
Weavers	12
Shoemakers	8
Lapidaries	5
Engravers	5
Brewers	4
Millers	3
Baker	1
Iron Founders	3
Turners	5
Glaziers	3
Upholsterers	9
Farriers	17
Saddlers	3
Tanners	3
Tailors	5
Gun Makers	5
Gardeners	4
Musical Instrument Makers	2
Grocers	3
Spirit Dealers	2
Tobacconists	2
Surveyors	3
Fishing Rod Maker	1
Last Maker	1
Glass Blower	1
Glass Cutter	1
Modeller	1
Plasterer	1
Hatter	1
Distiller	1
Perfumer	1
Tide-Waiter	1
Cutler	1
Merchants' Clerks	27
Pupils of the Blind Asylum	5
No Trade, entered	9
Total	452

To the Editor of the Mechanics' Register

Sir.—Wishing to become a member of the Mechanics' Institution a few evenings ago, I was surprised to find a regulation of a most impolitic kind, and which must be, and *is*, the cause of precluding many respectable persons. It is the obligation of obtaining a recommendation from two members of six months standing. Now, I am acquainted with very few mechanics, and with no member of the Institution; many others are in a similar situation, and are therefore inadmissible. I conceive this regulation is in order to confine the members to the operative classes; if not, many more effectual methods might be adopted to secure a peaceable and orderly audience.

Yours truly, I. W.

To the Editor of the Mechanics' Register.

Sir,—I beg to send you an extract of a letter from Plymouth, stating a singular phenomenon which occurred there.

"On Saturday, the 4th instant, a great fall of rain took place here; the streets were deluged with water. Towards the evening the torrents increased accompanied with flashes of lightning of the most appalling description; the rolling of the thunder—the quick and sudden glare of the electric fluid, as it passed across the heavens, and the violent rushing of the waters, produced altogether a scene of astonishing and awful grandeur. About half past nine o'clock, the inhabitants were alarmed by a violent shock, so sudden, loud, and dreadful, that every house in the town was shaken to its foundation; and the next morning, it was discovered, that the conductor of Charles's Church had attracted the electric fluid; the slate roof was knocked to pieces; the conductor, from about two feet off the window of the tower nearly to the ground, was broken into short lengths, much blackened and bent; the door was burst off its hinges, the fluid passed through two or three graves through the church-yard wall, which was two feet thick, two or three large stones of which was thrown into the street with great violence; it entered the pavement of the street, tearing up the stones, and exhausted itself in a gutter of water."

Now, Mr. Editor, two years only have elapsed, since Lieut. W. P. Green, R. N., who you have mentioned in your Register, opposed at a public lecture at Plymouth the use of these conductors, and to the fitting H. M. fleet with such; and stated, that this church, owing to its having conductors, would one day be knocked down about the ears of those who might be in it. Mr. Tatum, in his lectures at the Mechanics' Institution, has fully demonstrated by experiment, previous to this catastrophe, all Lieut. Green had advanced. The public attention should, therefore, surely be drawn to the last part of Lieut. Green's remarks, in his book on fixed lightning conductors, which he makes appear evident to all who read his book on this important subject; it is, "that the whole of our fleet at Plymouth, and our naval arsenals (the importance of which, to this nation, is incalculable) with the lives of all on board the ships, are tottering on the brink of destruction; as a cloud fully charged with electric fluid may destroy them all."

I have the honour to remain,
Your most obedient servant,
20, Gt. Queen-street. Charles Lloyd.

Sir,—I feel much indebted to your correspondent G. B. C. for the trouble he has taken in rectifying an answer to my query in No. 4. of your work, respecting the marbling of books.

I am sorry he has taken offence at the request I made, which was done not with a wish to dive into the secrets of a business, but merely that I might form some idea of the process.

I can assure him he has formed a wrong opinion of me if he thinks I wish to learn a trade at so trifling an expense, and I have too good an opinion of the readers of the Mechanics' Register, to think they would make ill-use of the communications made through that work. Does he suppose that a person who does not make it his business, would take the trouble to manufacture for himself, when he can get it done at such low prices as at present? as a pastime he may, otherwise it would not be worth his while. Does G. B. C. suppose perhaps, that a person in the trade made the request? that person must have received but poor instruction from his master to have been obliged to ask such a question.

In whatever situation the applicant might be, G. B. C. could have answered, by a reference to a work which treats on the subject, and told him, that secrets in business could not be disclosed to the public at large.

If G. B. C. will take the trouble to refer to J. E. T's query, he will find the request was for "the process of marbling the edges of leaves and leather, or binding of books," and not for "the art of bookbinding," so far J. E. T. acquits himself of one of the charges brought against him by G. B. C.

Had an inexperienced person wished to have practised the art, I think he would have found it difficult without the aid of an able practitioner; that was not my intention. I can assure you, such interested motives as G. B. C. has imputed to me were not entertained, my request was made with the purest intentions. Hoping he will now forgive the wish to encroach (as he has thought it) upon his business, I remain, Sir,

Yours very respectfully, J. E. T

QUERIES.

Man in inquisitiveness should be strong,
From curiosity doth wisdom flow:
For 'tis a maxim I've adopted long,
The more a man *inquires* the more he'll *know*.
Peter Pindar.

To the Editor of the Mechanics' Register.

Mr. Editor,—You will oblige me by ascertaining, through the medium of your instructive and amusing publication, the manner of manufacturing percussion caps for guns. The price of them is so small, I should conceive the process to be very simple; but, perhaps, some of your intelligent correspondents, will in that respect undeceive me.

Your's, obediently,
Staple Inn. W. P.

SIR,—I shall feel obliged if you will insert under the head queries, the following:

The present method of varnishing prints and maps, and the method of making the varnish? Yours, &c.

A FLEMING.

SIR,—It is well known that if a spot of grease gets upon boot-tops they are in general spoiled. I wish to know, through the medium of the Register, the means of extracting it, and the process of so doing?

It being generally reported in case of a building being on fire, and rain descending upon it, the rain instead of assisting to quench the fire, only increases the flame, I wish to know if such be the fact, and if so, the rationale? I perfectly understand that water is composed of oxygen and hydrogen, but how the water is decomposed merely by passing into flame, I am at a loss to imagine.

What is the reason of the outside of a decanter being covered with steam when cold spring water is poured into it?

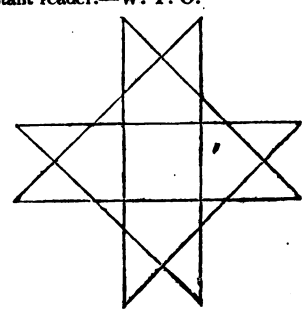
Your well-wisher, G. L.

SIR,—For the amusement of the readers of your interesting miscellany, I send you the following query, by inserting which you will oblige your obedient servant, T.

In what manner must five squares, each consisting of two parts, cut from the centre of one side to the opposite corner, be placed so as to form one square?

ANSWERS TO QUERIES.

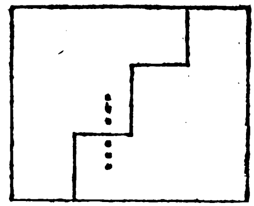
SIR.—As the following query took me some time to make, and perhaps may be amusing to some of the readers of your excellent Register, the insertion of which should it prove worthy a place, will much oblige a constant reader.—W. T. O.

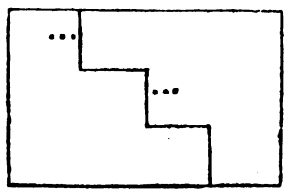


A piece is marked out as the above figure, and a person requested to roll seven stones, or balls, to seven of the points, to begin at the bottom of either of the lines leading to the point he's going to, but every stone so placed will prevent that being a starting place or any of the other points.

CURE FOR CHILBLAINS.—One ounce of white copperas, dissolved in half a pint of spring water.—2. A saturated solution of alum, in either case apply where the part affected is inflamed, a few applications in general effect a cure.

Sir,—Comparing the solution of your fair correspondent, with the problem in No. 4. of your pleasing Register, I conclude there is some mistake, or the problem admits of another solution. I have sent you the following, which if you think worth inserting, you will gratify your well wisher,—T. D. R.





Place the dots in a line, and you form the shorter square, by which means each square may form the other.

STEAM CANNON.

Here is one invention at least of our ingenious countryman, the practicability of which has not yet been questioned, and seems unquestionable; although we have occasion to know that a certain gentleman, of no mean estimation in the scientific world, has been accustomed to fulminate *ex cathedra* against our modern man-of-steam, pronouncing his successive inventions at once puerile, fantastic, and profitless. The Greeks, who by the by appear quite at home, in the very heart and element of destruction, are exceedingly anxious to procure one or two of Mr. Perkins's twenty-fours for the special purpose of knocking the Turks out of Patras—we most heartily wish them to have half-a-dozen. The Russian Autocrat also has been negotiating, vainly, however, it is said, for a park of them. We presume he merely meant to make presents of them to his brethren of the Holy Alliance. Our own government have, in the meantime, judiciously monopolised the manufacture, and thereby left us a little leisure to speculate upon the probable change which these tremendous engines are destined to effect on the feature of modern warfare. An inquiry of the same kind has been agitated with respect to steam-ships, but until means are contrived for lessening the consumption of fuel used on board vessels propelled by steam, the consequences of this application of the mighty power to warlike purposes, appear too remote to engage our present attention. We may however, *en passant* observe, that we have been greatly animated by the view which the gentleman before alluded to has been pleased to take of steam-ships, and their employments in the contests of maritime belligerents, the same not being a discovery of Mr. Perkins, and having therefore been honoured with our philosopher's patent investigation. He conceives that steam-ships must possess such a decided superiority over those moving on the old fashioned principle of wind and tide, that every naval power will adopt them. But mark the consequences. No fleet will then put to sea with the intention of invading a distant land; for by what means could a first-rate, or even a 74, be supplied with fuel necessary to its consumption in crossing the Atlantic? While, on the other hand, the fleet of the invaded, receiving a plentiful d regular supply of fuel from land, would always be prepared, as well to attack that of the invaders with agility, as to resist it obstinately. What a cheering consideration to us Britons; Come steam-ships, with steam-cannon too, against our sea-girt and coal-yielding land, we shall be prepared to treat them as our forefathers did the no less portentous Armada of their days. But, to proceed with Mr. Perkins's invention: it seems admitted by all who have considered the subject, that the use of cannon, acting upon his principle, will shorten every future war:—whether it will soften its horrors, and contribute to rid society of the monstrous folly it has engrafted upon itself, is another and difficult question. Military tactics and national character will henceforth have little to do in deciding the superiority of States. The contest, supposing arms to be resorted to, will, in the main, be that of numbers, and resistance, in cases of great inequality, hopeless on one side from the beginning of the struggle. All who are engaged in the combat will find themselves on a footing of perfect equality with each other as warriors. The brave man and the coward—the veteran and the recruit of yesterday—the skilful and the unskilful—he between whom and a less irresistible stroke a thousand breasts would be interposed, and he who has not won a single friend to himself among his companions in arms, will fight and fall alike, undistinguished together. There will be no room for the exercise of those sympathies which have yet been found to raise man in his most deadly moods above the other warring tribes of nature. The victor, or we should rather say, the survivor, will march forward over the bodies of the slain, unconscious of having wrought an heroic deed, and unrestrained by any self-appeal to his own honour from gratifying the most brutal propensities of his nature. All this is certainly very alarming in anticipation, but we trust that society is not destined to undergo such a fearful revulsion of its principles.

*** We have copied the foregoing observations from the *Edinburgh Star* of last week, merely for the purpose of shewing the interest which is taken in that invention of Mr. Perkins, which we have described as calculated to put an end to war and bloodshed. It is gratifying to us to observe that our own observations on the subject have been quoted in nearly all the papers of this kingdom, and in several of those of the continent.

NOTICE TO CORRESPONDENTS.

We feel much obliged to Mr. Hollands for the plate of the Horizontorium, with which he has favoured us, but owing to a press of matter we must defer giving it until the week after next.

Mr. J. Straker's new invention is also unavoidably postponed.

Mr. Collett's extinguishing Chimney Pot is a very clever invention, and appears to us to be an effectual remedy for chimnies which take fire. Our Engraver has prepared a block to illustrate this subject, which we shall give next week.

S. I., W. P. G. and others are under consideration.

Juvenis Admirator is informed that we shall be happy to insert any communications he may be inclined to favour us with, provided they are sent early in the week.

The article on Captain Manby's Life Preserver, with an Engraving, will appear next week.

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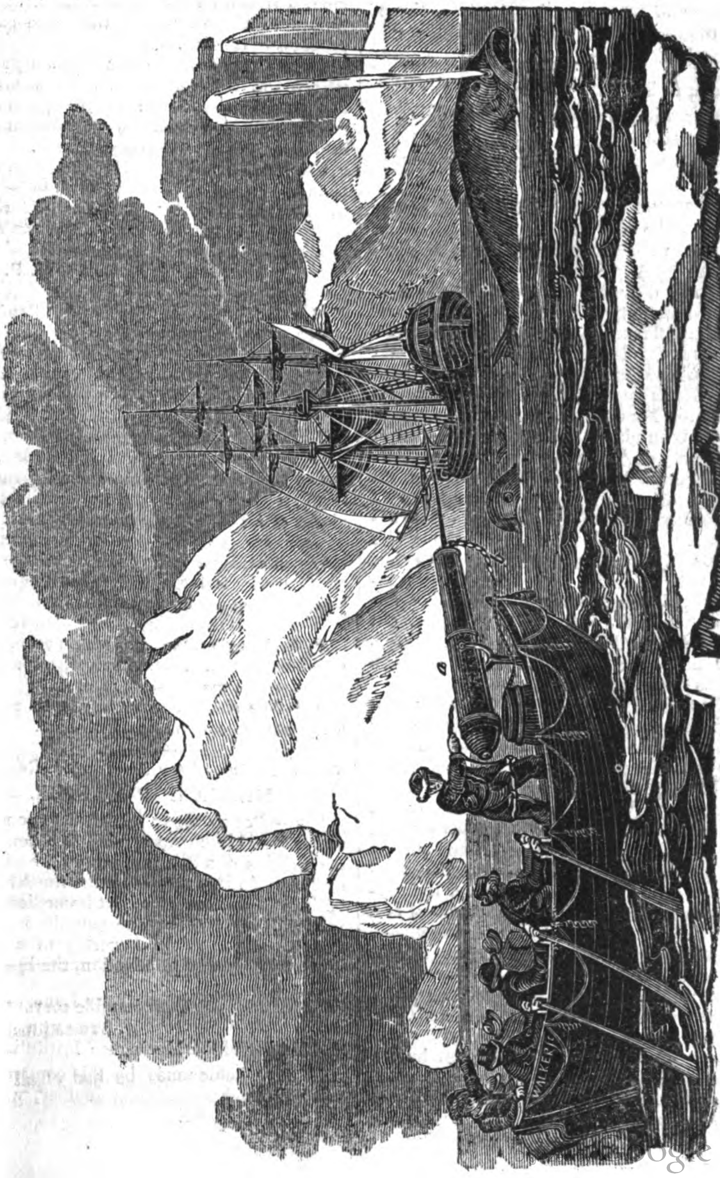
The London MECHANICS' REGISTER

—— To know
That which before us lies in daily life,
Is the prime wisdom.—MILTON.

No. 9.] SATURDAY, JANUARY 1, 1825. [Price 3d.

GIBSON's METHOD OF HARPOONING WHALES.



We insert the following communication from a valued Nautical Correspondent, on the subject of Captain Manby's Life-Saving Apparatus, but we beg our readers to understand, that we do not wish to detract from the credit due to that gentleman, who, if not the inventor of the plan, is deserving of much praise for his humane exertions in putting it into practice. We take this opportunity of recommending to the notice of the Public, Mr. Walker, the young Artist, who has given an engraving in the present Number to illustrate this subject. His work however, will speak for itself, and do more for him, probably, than any thing which we might say in his praise.

To the Editor of the Mechanics' Register.

SIR,—The late gales have again brought into use what is called Captain Manby's Life-Saving Apparatus; now, Sir, the public have paid dear enough for the neglect of those whose duty it is to reward merit, and bring useful inventions into notice; and such persons as should protect the original inventor of plans also deserve much censure. Lieutenant Bell's apparatus, in every way similar to Captain Manby's, has lain before the public, and been placed open to its inspection at the Society of Arts, ever since the year 1791, and although he made public trial of his plans at Woolwich before a Committee of the Society of Arts in that year, (a full account of which is given in the Second Series of Arts, Manufactures, and Agriculture, No. LXXVIII. published in October, 1808, together with drawings of the mortar, shell, grapnel, escape-raft, &c. &c.) yet it was not put in practice until Captain Manby came forward and obtained two or three thousand pounds from Parliament.

Mr. Cobb had also placed a life-preserving jacket at the Society of Arts in the year 1764, and Mr. Daniel's floating belt has also been there for many years.

The merit of throwing a line from a ship to the land, is neither due to Bell or Manby, because the idea was first suggested by Mr. Richard Gibson, who had performed this by a swivel mounted on a boat, on the bow-quarter, or centre of a ship, and for the purpose of throwing a harpoon into a whale at a great distance; a model of the swivel, &c. has been deposited at the Society of Arts ever since the year 1775, being sixteen years before Bell's experiments. A Drawing of this may be acceptable to your readers. [*See first page.*]

a the Swivel gun; *b* Harpoon, having a line attached to it by a ring and small chain; the line is coiled in a tub, which prevents the motion of the ship, or boat, from entangling it; and this original plan is in every way the best, because a swivel can be transported with ease and facility, and placed as a fixture at any part of a ship; while on the other hand it is not possible to place a mortar and its appendages in a position to act on board a stranded ship; and again, firing from the ship to the land is more certain to succeed than if firing from the land to the ship; because, in the first instance, the wind aids in forcing the shot and line to the land. If firing from the land (as a ship is always to windward), the wind impedes the progress of the line.

I was a spectator at Captain Manby's first experiment in Hyde Park, when a mortar and jacket were tried; having previously read my book, I explained to those around me all they afterwards saw exhibited.

Captain Danzie's kite for sending a rope from a stranded ship to the land, to be seen at the Society of Arts, I consider of much importance to the nautical part of the community.

Your humble servant, W. P. G.

To the Editor of the Mechanics' Register.

SIR,—Being engaged for some time past with making observations on the weather, we find great embarrassment from the insufficiency of the instruments in present use, for the purposes of the Meteorologist. We have endeavoured to improve some of them, but have not succeeded to our satisfaction. If any of your scientific readers can inform us, through the medium of your excellent Register, of a correct ombrometer, hygrometer, dioscometer, electrometer, or anemometer, they will confer a lasting favour on the scientific world at large, and in particular on your constant reader and sincere well-wisher,

MEDICUS.

P. S. If agreeable, we will, perhaps, at some future time, trouble you with some observations on meteorology, &c.

*** We shall be most happy to receive the promised communication.—ED.

To the Editor of the Mechanics' Register.

MECHANICS' KETTLE.

SIR,—Permit me to submit to your notice an improved boiler, as applied to a kettle, by the addition of a flue running up the middle, so that when it is placed on the fire all parts of the water will receive heat immediately, as you will perceive by the subjoined rough sketch. If you think it worthy of a place in your interesting publication, the insertion of it will oblige

Your humble servant,
J. STRAKER, jun.
Member of the Mechanics' Institution.

N. B. A kettle made by this construction will boil much sooner than another, without the additional tube.

ON THE MANUFACTURES AND MECHANICAL ESTABLISHMENTS OF EGYPT.

It has been stated in the public prints, that an Envoy from the Pacha of Egypt has reached this country, for the purpose of obtaining information relative to our Manufactures, which may enable the Pacha to establish cotton manufactories in his own dominions. Having been favoured with the perusal of letters from Alexandria of a very recent date, in which the real objects of the mission of Ali Effendi are detailed, we can assure our readers that he is provided with more extensive powers than it would either suit the interest or the wishes of his master to make known at the present moment—as the Pacha feels it to be necessary that the Grand Sultan should not take alarm at the improving spirit of civilization which is going forward in Egypt, or the natives of Turkey, who are in the service of the Pacha, imagine that the Viceroy of their Sovereign is taking such rapid strides towards a declaration of independence. The truth is, that not only has the Pacha of Egypt opened a correspondence through his Agent with some of the first houses in London and Liverpool, for the sale of the Macho cotton, the culture of which it is intended by all possible means to promote, and for the establishment of a few cotton manufactories in Egypt, for the supply of the inhabitants, but he has also desired that information may be obtained as to the expense of procuring more than two hundred first-rate mechanics in the various branches in which the Egyptians are necessarily deficient. He has also written for an estimate of the cost and charges of erection of two Steam Engines of eighty horse power for Cairo and Alexandria, to be employed in the distribution of water to the remote parts of those cities; and as if he had been aware of the mining mania which has seized the English, has instructed one of the first merchants of the City to offer for sale the exclusive privilege of working a mine, at a distance of fifty leagues from Alexandria, in which emeralds, and other precious stones, and native gold, are said to abound. It must not be denied that the grand object of the Pacha is to open a better market for the sale of his cotton, of which he has the exclusive monopoly.

One of the letters from Alexandria fixes the number of bales annually produced as follows: 190 to 230,000 of Macho cotton, and about 20,000 of common short stapled, but it is estimated that by adopting a better mode of culture, the number of the former may be increased 70 or 80,000. Besides cotton, the Pacha monopolizes all the wheat, linseed, beans, barley, flax, lentiles (a sort of pea), indigo, safflorea, opium, and buffalo and other hides. The productions which he does not monopolise are Mocca coffee, silk gums, ostrich feathers, &c. The following observations upon the trade and views of the Pacha are by a contemporary, who has derived them from Alexandria, and will be read with interest. We must, however, caution our readers against the mere opinions of the writer as to the character of the Pacha, whom our letters describe to be a very enlightened and liberal man. It will be readily imagined that with the best intentions, he dare not, in the present state of the Egyptian population, openly evince those principles of free commerce which an Englishman justly considers the foundation of national grandeur.

"The import trade of British manufactures is looked upon by the Pacha as an intrusion. He also manufactures at Cairo and Rosetta, and extensively, too, having got hold of British machinery, and German, French, Swiss, and Italian artisans; his manufactures are linen, silks, and cottons; he has printing and dyeing houses, and the notion generally pervades, that the time cannot be far distant, when not a single piece of printed cottons will be wanted in Egypt from either England or France. However as yet, tangibs, plain and figured cambrics, imitation India goods, Scotch lappet muslins, and Turkey-red handkerchiefs, find always vent; and the whole catalogue of British manufactures is not likely to be expelled for consumption in Egypt, although this may be the case some time hence, the population being literally so poor, they cannot afford to purchase at even the present low prices; the cause is, the Pacha's system of monopoly of every commodity of the soil, the mode of paying the peasant for them, in Treasury Assignments, and dealing out to him every article, forcibly taken from him, at an immense profit—for even the mats in general use for household purposes by the natives are a monopoly of his Highness.

Of the quality of Macho cotton it may briefly be said, that when it shall become properly assorted, it will be a useful cotton; at present it is so mixed, foul and tender, no opinion can be formed until the adventures of the Pacha reduce the prices to so low a figure in England that it can be put to general purposes and use; the cotton plant is suffered to grow into a tree of six feet high and more; hence, four qualities; these are indiscriminately mixed, and under the denomination of Macho, this is one and the best quality. The Government takes this from the peasant to export or to sell; whoever buys must take what it chooses to give and to deliver; no examination is permitted, although, by bribery, it sometimes is connived at when the lots happen to be small. The idea, therefore, of an intelligent person who knows cotton, and understands it, having any advantage, is quite erroneous, not to use terms and draw ridicule on persons who have been resident very long in Egypt, and fully know the nefarious system of the Government having cajoled their friends in England into immense transactions, by holding out the lure, that if a person be sent to select the cotton from the Government Stores, it would all be of the primest sort; that this is not the fact, nor can, nor will it ever be under the present system, the cotton trade in England must, ere this, be quite aware of; the agents of the Pacha can have no inducement to pay attention to quality, as quantity with them must reasonably be the main and only object.

It is true, better packages are now made by the cotton being compressed, but such are only accessible to the agents of his Highness, who ships them exclusively on his own account; probably some alteration may be made in the qualities, but a liberal and enlightened mind shrinks from the contemplation, that this would only be possible, in order to enrich the more an illiterate Turk, and the more effectually to exclude British capital, talent, and industry, from the participation in a legitimate trade.

Proposals have already been made to the Pacha, to permit some Levantines to appropriate ground for the cultivation of Macho cotton upon an improved plan—namely, the first year, to pick the cotton from newly planted shrubs, and the gathering being finished, to prune these also, to plant for the second year fresh shrubs, and so to go on, at the end of the third year, whenever a shrub has lasted so long, to eradicate it in toto. From experiment, it would appear, that in the first year the shrub produces excellent cotton; being pruned, it produces the second year a much finer cotton. Its product, in the third year is like that of the first, and in quality, if any thing, a shade coarser. If the yearling shrub is suffered to grow into a tree, it runs up to six feet, and more, and produces the variety of quality which goes under the name of Macho, without any distinction.

To induce the Government to permit the Levantines' scheme, they proposed to pay his Highness the difference between his price and their own cost, merely to retain the privilege of shipping what they grew under their own especial inspection—for instance, his is fifteen dollars, cost ten dollars; they pay him five dollars; it would be useless to comment upon such a Government, and tiresome to detail the continual, studied, and flagrant impediments, that business, and especially English business, is subject to.

It ought to be remarked, that the Pacha's agents, on the occasion of the exporting of the dollars, offered to give up their bills for the amount, and an advance to cover charges. This may be left to the consideration of the British merchants, who have, or may feel inclined to send specie to a country, governed as Egypt is at present. During the period of embarking an expedition against the Greeks, the exportation of dollars was prohibited, and they are not the coin of the country. The capitulations with the Ottoman Porte are the regulations by which the trade of England and Egypt ought to be carried on. These capitulations, however, are a dead letter, only that the duties are levied by a Turkish Tariff promulgated at Constantinople, which furnishes the solitary instance, that an Egyptian ruler recognises his master, the Grand Seignor. But, even the Tariff is set aside without ceremony, where it suits his Highness, and the infringements of the capitulations are as numerous as the inability, incapacity, or unwillingness of the Counsels to enforce the same."

RAILWAYS.

A great deal has been said and written on the comparative excellencies of railways and canals, and the discussion has elicited much useful information. An Edinburgh Paper, the *Scotsman*, has entered very fully into the subject, and published several very valuable articles in favour of railways and loco-motive engines, which, we think, must carry conviction to the most prejudiced in favour of the old system. As it is a subject of deep interest, and one which will probably occupy a great portion of the attention of the Legislature, during the ensuing Session, we copy with great pleasure the following observations from the *Scotsman* of the 22d inst. It will also be seen that the article refers to some theoretical statement which had been made, but which it is not necessary to repeat here.

"Having developed the theory of the motion of carriages on horizontal railways, we shall have little more to do with mathematical discussions, and shall now turn our attention to points of a practical nature, better adapted to the taste of ordinary readers. But first, we shall bring under the eye again, the effect of a given quantity of power on a railway, and on a canal, in a calm atmosphere—for it is only in a calm atmosphere that the results can be properly compared.

We have found that a *boat* weighing with its load 15 *tons and a waggon of the same weight*, the one on a canal, and the other on a railway, would be impelled at the following rates, by the following quantities of power—which we have stated both in pounds and in horse power—reckoning one horse power equal to 180 pounds.

	Boat on a Canal.			Waggon on a Railway.	
Miles per hour.	power in pounds.	Horse power.		power in pounds.	Horse power.
2 - -	33	1-5th	-	100	½
4 - -	133	2-3ds	-	102	½
6 - -	300	1⅔	-	105	½
8 - -	533	3	-	109	½
12 - -	1200	7	-	120	2-3ds
16 - -	2133	12	-	137	¾
20 - -	3325	18	-	158	1

We have not taken into account the time lost in overcoming the *inertia* of the waggon where a small power is applied, because in point of fact, the casual resistance of the wind would render it necessary to provide double or triple the power above stated. But if necessary, the time lost by the slow motion at first might be saved. Suppose there are a certain number of places where the steam-coach or waggon was to stop, to take in or put out passengers or goods; and farther, that the waggon, by travelling a few miles, has acquired an uniform velocity of 20 miles an hour. Then, if it is made to ascend an inclined plane of ten feet perpendicular height, this velocity will be extinguished, and the vehicle will stop at the head of the plane. When it is to proceed again on its journey its descent along an inclined plain of the same height on the other side, will enable it to recommence its career in a few seconds with the full velocity of 20 miles an hour. By raised platforms of this kind, at the two extremities of the journey, and at the intermediate stages, the velocity thus generated, might be treasured up for permanent use. The platforms should be of different heights, corresponding to the various velocities of the vehicles plying on the railway. But, in point of fact, the terminal velocity is attained so soon from a state of rest, that this contrivance would probably be found unnecessary.

Where locks or *lifts* occur, the stationary steam engine should drag up the vehicle (supposing it to be along an inclined plane), not simply from the one level to the other, but to a platform some feet above the higher level, that the vehicle, by its descent, might recover the lost velocity. It is plain, however, that when the difference of level did not exceed eight or ten feet, the momentum of the vehicle would carry it up without any assistance from a stationary engine, and with merely a small temporary loss of velocity.

Some persons imagine erroneously that teethed wheels and rackwork would be necessary where the railway was not perfectly level. But the friction of iron on iron being 25 per cent. of the weight, if the whole load was upon the wheels to which the moving power was applied, and if the quantity of power was sufficient, the waggon would ascend without slipping though the plane rose 1 foot in 4—while even cart roads scarcely ever rise more than 1 foot in 18 or 20. If four-fifths of the load, however, were placed on separate cars, and only one-tenth of the whole pressure, for instance, was upon the axle to which the moving force was applied, the power of ascent by friction would only be one-tenth of one foot in 4, or one foot in 40.

The steam engine as we commonly see it, is so bulky, and with the addition of its fuel and supply of water, so ponderous, as to create an impression on a first view, that its whole power would scarcely, under the most favourable circumstances, transport its own weight. The steam-boat, however, which cuts its way through the ocean, in defiance of tide and tempest, shews that this is a mistake. For all velocities above four miles an hour, the locomotive engine will be found superior to the steam-boat; that is to say, it will afford a greater amount of *free* power, above what is required to move its own weight.

We have seen various statements respecting the locomotive engine, few of them so detailed as could be desired—from which we subjoin the following particulars.

TREVITHICK and VIVIAN's high pressure locomotive engine, with a cylinder of eight inches diameter, and a pressure of 65 pounds per square inch (apparently about eight horse power), drew carriages containing ten and a half tons of iron, at five and a half miles per hour, for a distance of nine miles. (Stuart's History of Steam Engine, p. 164.) Whether on a road or railway is not mentioned.

We find it stated in a Liverpool paper, as the result of inquiries made respecting the locomotive engines, that one of these, of ten horse power, conveys fifty tons of goods at the rate of six miles an hour on a level railway. But was the road an edge or tram road?

Mr. BLENKINSOP states, in replies to queries put by SIR JOHN SINCLAIR, that his patent locomotive engine, with two eight inch cylinders, weighs five tons, consumes 2-3d cwt. of coal, and fifty gallons of water per hour, draws twenty-seven waggons weighing ninety-four tons on a dead level at three and a half miles per hour, or fifteen tons up an ascent of two inches in the yard; when "lightly loaded" travels ten miles an hour, does the work of sixteen horses in twelve hours, and costs 400*l.* Another person says, that the weight of this engine with its water and coals is six tons, and that it draws forty or fifty tons (waggons included) at four miles an hour on a level railway. (Repository of Arts, 1818, p. 19-21.) This seems to have been a high pressure engine of about eight or ten horse power. But we are not informed what sort of railway it worked on, how long its journies were, or what is meant by "lightly loaded."

We shall take for granted then that an eight horse power high pressure engine, with its charge of water and coal, and with the car which bears it, weighs six tons, and that it requires an additional supply of one hundred weight of coal, and four hundred weight of water for each hour it works. This is very consistent with other ascertained facts. We find for instance in the parliamentary report on steam navigation, that the low pressure engines used in vessels, which are made twice as strong as stationary engines, weigh about one ton and one-fifth for each horse power, including their charge of water and coal. Now the high-pressure engines want the condensing apparatus which must diminish the weight probably by one-fourth part. The estimate for coal we have increased one-half, because we think it rather below the truth. It is only about nine pounds per hour for each horse power, while Mr. Watt allows twelve pounds for his low pressure engines.

It follows, therefore, that an eight-horse power locomotive engine, with coal and water for eight hours, would weigh eight tons. Hence, bulky and ponderous as the steam-engine appears, we find that a locomotive engine, weighing eight tons, moves fifty tons besides itself, (taking the more moderate estimate), that is, it consumes only one-seventh part of the power it creates, when travelling at four miles an hour; or ***the free power applicable to other purposes, is seven-eighths of the whole.*** This is the result of an early experiment, made probably upon a rail-road not of the best kind, and with vehicles much less perfect than they may yet be rendered. Though it falls much under the effect calculated theoretically, it does not strike us as being inconsistent with the truth of the principles on which the calculation was founded.

The high pressure engine, on account of its smaller weight and bulk, is evidently best adapted for railways; and it can be used with perfect safety, because it may be easily placed in a car by itself, a few feet before the vehicle in which the passengers are. The vehicle itself, by its regular and steady motion on the railway, would answer the purpose of a *fly-wheel* in the most perfect manner. The engine might run upon six wheels, which should be locked together by teeth pinions, that the tendency to slip might be resisted by the friction of the whole mass of eight tons.

The best form of a steam coach for the conveyance of passengers would probably be the following:—A gallery seven feet high, eight wide, and one hundred feet in length, formed into ten separate galleries ten feet long each; connected with each other by joints working horizontally, to allow the train to bend where the road turned. A narrow covered footway, suspended on the outside over the wheels on one side, would serve as a common means of communication for the whole. On the other side might be outside seats, to be used in fine weather. The top, surrounded with a rail, might also be a sitting place or promenade; like the deck of a track boat. Two of the ten rooms might be set apart for cooking, stores, and various accommodations; the other eight would lodge one hundred passengers, whose weight, with that of their luggage, might be twelve tons. The coach itself might be twelve tons more; and that of the locomotive machine, eight tons, added to these, would make the whole thirty-two tons. Each of the short galleries might have four wheels; but to lessen the friction, the two first wheels only should be grooved, the two last cylindrical, and three or four times as broad as the thick ness of the rail. The conveyance of goods would be effected by a train of small waggons loosely attached to each other.

It will be observed from the table we have given above, that it would require seven horse power to impel a steam-boat weighing fifteen tons at twelve miles an hour. This gives a load of two tons upon each horse power. Of the two tons so moved, however, the engine, if a low pressure one, with water and eight hours coals, would weigh nearly ten tons, and the vessel would weigh at least five; so that the whole power of the engine would be expended in impelling itself and the ship containing it, at the rate supposed, and no *free* power would remain for freight. Facts show that the resistance is actually rather greater in water than theory in this case represents it. We have calculated from data furnished by the Parliamentary report on steam navigation, that the entire burden on the engine in vessels going only eight or nine miles an hour in calm weather, rarely exceeds three tons for each horse power, while, according to the table, it should be five tons. Indeed, in our common steam-vessels for passengers, going eight or nine miles an hour, the ship and engine may be considered as constituting the whole burden. For fifty passengers, weighing perhaps with their luggage six or eight tons, placed on board a ship weighing, with her engine of sixty or seventy horse power, a hundred and fifty or a hundred and eighty tons, form but an addition of one-twentieth or one-thirtieth to the mass—a quantity of no importance in a practical point of view. If we convert the steam-engine power into real horse power, and figure to ourselves a hundred horses employed to draw fifty persons, we see what an enormous waste of power there is in the mode of conveyance. We may remark farther, that the tenor of the evidence given before the Parliamentary Committee renders it extremely doubtful, whether any vessel could be constructed, that would bear an engine capable of impelling her at the rate of two miles an hour, without the help of wind or tide.

When the steam coach is brought fully into use, practice will teach us many things respecting it, of which theory leaves us ignorant. With the facilities for rapid motion which it will afford, however, we think we are not too sanguine, in expecting to see the present extreme rate of travelling doubled. We shall then be carried at the rate of 400 miles a day, with all the ease we now enjoy in a steam boat, but without the annoyance of sea sickness, or the danger of being burned or drowned. It is impossible to anticipate the effects of such an extraordinary facility of communication, when generally introduced. From Calais to Petersburg or Constantinople, for instance, would be but a journey of five days; and the tour of Europe might be accomplished in a shorter time than our grandfathers took to travel to London and home again. The Americans, with their characteristic ardour for improvement, are now collecting information about railways and locomotive machines in England.* And to them these inventions will prove of inestimable value. Some persons doubt, for instance, whether it is possible to keep so vast a territory as theirs united under one government. But it is forgot, that extent of territory is a bar to political union, only as it renders communication slow and difficult; and that with the rapid and easy means of intercourse which the railway affords, New York, New Orleans, and Columbia river, though distant respectively from 2000 to 3000 miles, will be politically and morally nearer to one another than London and Edinburgh were a century ago. Free governments in ancient times were necessarily small, because they depend on union of sentiment in the mass of the people; and one citizen would not then know the opinion of another at thirty miles distance. But the post, the press, and the stage coach, have made it easier to unite twenty millions of men in a common cause in our days, than it was to unite the fiftieth part of the number in the days of Philip of Macedon. And with the means of communication we are likely soon to possess, we think the hundred and fifty millions who will inhabit North America next century, will be more completely *one people* than the inhabitants of France or Britain at this day. It is pleasing indeed to think, that at the moment when the gigantic republics of the new world are starting into existence, the inventive genius of man is creating new moral and mechanical powers to cement and bind their vast and distant members together, and to give the human race the benefits of a more extended and perfect civilization. But we ought not to overlook the additional security which an opulent and highly improved country will in future derive from the facility of its internal means of communication. Were a foreign enemy, for instance, to invade England, 500 steam waggons could convey 50,000 armed men in one day to the point assailed; and within one week, it would be easy by the same means to collect two or three hundred thousand men at one spot, all quite fresh and fit for action.

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* This is mentioned by Mr. Sandars of Liverpool, in his pamphlet on the projected railway between Liverpool and Manchester. The French are employing themselves in the same way; and we have now before us a work by M. Cordier, a French engineer, on Railways. It is merely an abstract of various tracts published on the subject in England.

As we have no object in view but public improvement, we feel it right to notice all the objections which may be brought forward against any particular measure, as well as the arguments in favour of it; for in this way only can truth be elicited, and real improvement be effected. With these sentiments we copy the following from a respectable Morning Paper (the *New Times*), of Wednesday last:—

"The Railway scheme is of high importance to any uncivilised nation, not very mountainous, nor very much stocked with cattle; nor yet accustomed to seek the air of hills or mountains for their towns; nor very generally blessed with navigable rivers, over which this iron course would necessarily cross!

It will be very satisfactory to the public eye, while they are called upon to patronise such an extensive alteration, to consider fairly the estimate of expense, and also the loss in any given district; for during a time of profound peace, when money is not so much called for to fit out letters of marque and reprisal, and to afford all the supplies which are to give vigour to national glory, mankind are too ready to embrace every plausible proposal which seems to promise a good return for capital sunk, without even considering the time or practicability of their accomplishment. This is not said to discourage, but to secure attempts to enlighten and improve our own country; for the chief praise of this and numerous other schemes consists in their advanced capital being all to be spent amongst ourselves.

Now, if it will cost one million of money to erect an Iron Railroad from London to Dover, which is 73 miles, we may compute as many miles East, West, and North, and this will make very little way to the places to which it is intended to extend them, forming an aggregate of not less than ten millions of money, not to say a word of the time which they would necessarily occupy before any one of them can be completed. This estimate is to comprehend the long and perhaps greater difficulty of compensating all the parties interested in the lands through which they are to pass, and the loss of comfortable and favorite establishments which have been chosen for the investment of fortune—many ancient houses, castles, and grounds of pleasure, and many valuable farms and acres of land fertilised by a long course of labour, are to yield to the iron hand of this new speculation.

Next in the train of contributions are to be reckoned the numerous vehicles and horses which run every road—their drivers—their owners—the growth or importation of provender for their support, and all the numerous manufacturers of carriages and harness, whose skill and perfection in their work, and whose maintenance likewise will be at a stand if not utterly lost; for the calculation seems to be made upon the superseding them, and upon the average view of one half of them being supposed to be daily filled with passengers; and to these must be added all the numerous horsekeepers and other attendants upon every well-appointed public vehicle, who must be consequently thrown out of employ. Now, as these are paid by daily gifts or weekly wages, and many of them have families to subsist upon their unrelaxing activity, it will be just to consider what is to become of so very large a body of healthy laborious men, with their wives and children, who, it may be feared, would not possess forbearance and honesty enough to keep them from seeking irregular support, if they could find it; and hence the work-house and enormous poor rates, must result from that department of this great concern. If there was no moral consideration in this, yet a prudent attention to this point is very necessary.

The immense capitals invested in canals, which have greatly facilitated the carriage of goods and commercial intercourse between most towns of England, now just brought to perfection, with their wharfs and staiths, deserve—nay, even the speculators in shares who have also invested their floating capital to a vast amount, also deserve the deepest consideration—who have done all this upon the confidence of a permanent subsistence, and have calculated this property as part of their responsible assets for embarking and supporting the public as well as the private good, and to whom scarcely any compensation that could be suggested in a Committee could equal their subversion of their interests and fair expectations whether invested or purchased. Reference now may be made to those already erected upon the banks of the Regent's Canal, near London—where property to an immense value has been invested, and where business to a very extensive importance is daily conducted.

It may be admitted, that 'if the employment of loco-motive steam engines for promoting the vehicles to be employed shall be found practicable, it will be a great triumph of science; but unless all or some of these objections can be well answered, and the public mind be well secured to give them the preference, it is very questionable whether 'the benefit to society at large will be proportionate.' But, first of all, the Legislature must be found wise enough in Pneumatology and Mechanics to deliver their fellow-subjects conscientiously into the hands of a Railway Manager, and to compute their velocity and safety from London to Dover against the present velocity of eight hours, seven changes of horses, three changes of guards and drivers, fourteen ostlers, three book-keepers, six or eight under assistants and helpers, and, the houses and stables fit for their reception and accommodation along the road, and at both its extents—and the revenue arising from them all. These must find their proper share in this great calculation before it can be passed."

THE PROPOSED SHIP CANAL.

We have noticed the mania for public Companies, and have marked with merited censure, some of the numerous attempts of unprincipled projectors to deceive the public. At this moment there are not less than ten new schemes, requiring an investment of 15 millions of capital, which were not projected so long ago as a fortnight, and many of the shares are at a premium. On one Mining Company, the Coronas we think it is called, of which nobody knows the merits; the shares are actually at a premium of 300 guineas each, even before they are allotted to the subscribers, and of all the new plans, not one came out at a discount or at par, except the very best in the market—the Ship Canal. Now it is a shameful thing, that so national and humane an undertaking as a canal for ships to pass through, between the English and Bristol Channels, without going round the Land's End, should be treated with disdain, whilst so many humbug contrivances to enrich a few adventurers are allowed to succeed. This ship canal would be not only a public benefit, but certainly a lucrative investment of money; yet the shares are not sought after, because the projectors are honest men, and do not impose upon the public by telling them that they will find large lumps of gold in the mud when they dig their canal. What are all the Mexican Mines, compared with the mine of industry and commerce? What will gold and silver, dug out in masses from the earth, avail us, if we possess not commerce and industry. Let the precious metals become too plentiful, and the rulers of the earth will cordially unite to tax its production, for if they do not, there will be no proper circulating medium. The mines and wealth of an Englishman are, and ought to be, commerce; and we therefore trust that all the ridiculous schemes for becoming suddenly rich will be soon exploded. The ship canal is an object dear to us as natives of a country which owes its dignity to the brave adventurers of the ocean; we would save their lives, and the property of those who embark in a pursuit so honourable but perilous. "For the last three months," says a sailor, who writes in support of this undertaking, "there have been almost uninterrupted gales from the Westward, many of them very fatal in their effects; and during that time our Western ports, from Portsmouth downwards, have been crowded by vessels waiting for a change of wind to get round the land. Now if this great ship canal was made, all the vessels bound for Ireland, the West Coast of England, and the Bristol Channel, would pass through it to the Northward free from delays or danger, and vessels would also come along it to the Southward in their passage from thence. The detention in these Ports is to the full as great as what Captain Nicholls has estimated to be, at the ports in the Bristol Channel, where vessels are sometimes wind-bound for thirteen weeks together, while the danger to life and property is greater; and the ship canal will alike remedy the evils of each."

LONDON MECHANICS' INSTITUTE.

MR. COOPER'S LECTURE.

Mr. Cooper's Lecture on Wednesday, the 22d of December, was upon Sulphur.—He commenced by some experiments on this production combined with iodine, from which resulted iodine of sulphur, which decomposes water and produces sulphuric and hydryodic acid; by admitting water, in the retort used for the purpose of the experiment, the retort which had been cold, became so hot, that it was scarcely possible to hold it in the hand, and two new compounds were formed, sulphuric and muriatic acid. Mr. Cooper then proceeded to lecture upon the sulphuret of hydrogen, to produce which in a pure state it was necessary that there should be metallic bases; iron or antimony were found best, to unite with sulphur, and produce sulphuretted hydrogen gas. The sulphuret of iron is produced by heating iron to a red heat and then touching it with a roll of sulphur, when the iron melts and drops in a fluid state, which is the sulphuret. By putting this sulphuret into a retort and heating it with diluted sulphuric acid, the oxygen is transferred to the iron, and the hydrogen being liberated comes into contact with the sulphur and forms the gas. The mechanical properties of sulphuretted hydrogen gas, are the same as those of other gaseous bodies. (Here Mr. Cooper explained the mode of combustion, similar to that which we have already noticed, when treating of the other gases, and stated, that when exposed with potash in a retort, it decomposed without increasing or diminishing the volume.) Mr. Cooper concluded his lecture by observing, that almost all the coal gas used for purposes of light, is more or less contaminated with sulphuretted hydrogen gas, although the improvements recently introduced in the production of this gas, have very materially changed its quality for the better.

We sincerely trust that Mr. Cooper and our subscribers will not feel offended at the very unusual brevity, with which we have dismissed the above lecture of that really able chemist, but we must be allowed a latitude of discretion, as to the subjects with which we fill the Register. To Mr. Cooper, as a lecturer, it must be highly important that every subject should be illustrated; but it must not be denied, that in a science like chemistry, there are some subjects of immediate interest only to few. Such appeared to us to be the case at Mr. Cooper's last lecture. If we were wrong, we heartily beg his pardon and that of his admirers.

MR. TATUM'S LECTURE.

Mr. Tatum commenced by saying, that in the present lecture he would take a more comprehensive view of the subject,—viz. electric-magnetism; he had shewn in a former one, how pieces of steel became magnetic, after they had received an electric shock and acquired the capacity of attracting and repelling, by an exposure to that shock. In voltaic-magnetism, many high names would be found as contributors to its improvement, by partial discoveries; but it was Professor Chislen, who first discovered and announced the fact, that if a magnetic needle be placed above or below a wire exposed to a voltaic battery, the wire, no matter of what metal, will become magnetic also. The moment this was known, it was followed up by the philosophers with a zeal and perseverance highly creditable to them; new apparatus were introduced, in order to facilitate the enquiries into the principles of the electro-magnetic science. Several instruments were invented by persons, each of which contributed to conduct to certainty of results, and the matter was pursued so far, that there is now left as little doubt as to the principles and powers of electro-magnetism, as there is of those of common electricity. It was a pleasing consideration also, that the discoveries in voltaic-magnetism were not mere matter of accident, as those of electricity, magnetism, and galvanism were; no, they were the result of a regular and gradual series of enquiries, and were therefore more creditable to the discoverers. Mr. Tatum considered, that the best way to explain the first principles of the science, would be to shew the experiments which first gave rise to it. Here the lecturer produced an apparatus formed of plates of zinc and copper, the former placed below a piece of wire, the latter above it, a liquor having been introduced into the intermediate vessel, the magnetic needle was applied to a wire attached to the apparatus, and plainly deviated from the magnetic meridian. A dipping needle was then placed above the wire, and was forced round by the repelling power of the apparatus; when placed below the wire, it was propelled in an ascending direction by the attractive force. This the lecturer explained to have proceeded from a tendency in the needle to rotate round the wire, and not from a tangent*ile* force (quære tangent*al*) in the wire. This latter principle was not sufficient to account for the various phenomena of electric-magnetism. Here Mr. Tatum displayed another apparatus made of plates of copper outside, and plates of zinc inside, and a piece of wire attached to both. He said that if an acid liquor were poured into a vessel lying between both, a galvanic effect would be produced, one end of the apparatus would retire from the bar magnet, and the other would advance to it, the tangentile force could not account for these two phenomena, this he demonstrated by experiment. Mr. Tatum proceeded to state, that he had discovered by experiment, that there were eight points of attraction and repulsion in the needle. The several parts of the needle, in which the powers resided, he explained by the aid of a drawing on paper; the progressive rotatory motion of the needle when applied to a voltaic apparatus, he illustrated by a drawing of the worm of a fly-jack. Here an apparatus was produced, of two cylinders of copper containing one of zinc. Acid was poured into it, and a rotatory motion of the needle was produced;—for an account of this and other of Mr. Tatum's experiments, he referred his hearers to the Philosophical Magazine. Another apparatus, consisting but of one cylinder, effected a rotation in an opposite direction to that produced by a double cylinder. The next experiment would be made by attaching one end of a wire to copper, the other to zinc, and fastening all to a piece of cork; if the entire apparatus were placed in a liquid and the atmosphere of the room remained still, the apparatus would turn until it would settle in the magnetic meridian. This he demonstrated by experiment—an elex, or worm, affixed to the apparatus, would turn according to the direction in which the elex was wound; its magnetic pole would be accordingly; this he proved experimentally. The next experiment was made by a pendant case of copper, containing a plate of zinc with wire attached—when filled with acid, one end of the wire was found to have become a north pole, the other a south; thus becoming a magnet itself, and acquiring the capacity of being attracted by a bar magnet. The following experiment, Mr. Tatum said, would be a more powerful one—if an elex wire connected with a certain part of the apparatus, and placed in water, so contrived, that it may be raised or sunk, when acid would be dropped in, the needle would be attracted to the elex in the water by means of the wires connecting it to the apparatus; this would make a magnet of the elex by the voltaic action of the acid—Mr. Tatum demonstrated this by experiment. After a few more experiments, tending to the same principle, Mr. Tatum referred to certain opinions and experiments given by him in a former lecture, on the subject of conductors of lightning, and explained the construction of the conductors commonly used on board of ships. It was erroneously thought, that conductors could not be fused by the lightning;

but he, Mr. Tatum, had declared the contrary opinion, in the lecture alluded to; and it was a singular fact, that when he retired from the lecture-room, the next evening he was met by a gentleman, who informed him of a fact, proving the correctness of his (Mr. Tatum's) opinions. The circumstance communicated to him, by the gentleman, was this:—A terrible storm occurred by night at Plymouth—the town felt a strong and universal shock at one moment; next morning the conductor of Charles' church was found to have attracted the lightning; it was more than an inch in diameter, yet it was broken, bent and blackened—the fluid having so injured the conductor, broke through the roof, burst open the church door, pierced through the church-yard wall, which was two feet thick, tore up the pavement, threw the stones to a considerable distance, and at last lost itself in a pool of water. The conductor of the church was stronger than those used in ships; and it was probable, that the lightning at sea was stronger than on land. The common method of making the ship conductors taper to a thinner diameter towards the mast-head, was proved by this fact to be wrong: for here was a proof that conductors could be fused, and the thinner and weaker conductors, would of course, be fused most easily. He (Mr. T.) had delivered his opinions on the conductors on a Friday, and it was singular that the very following day, Saturday, brought an occurrence (this at Plymouth) which proved the correctness of his opinions on the danger of conductors as now formed. The hand of Providence would appear to have interfered in order to convince the incredulous. He had now come to his concluding lecture on the subject. Yet the subject was by no means exhausted. It would afford matter for twelve lectures more. Yet, in the course of those which he had given, if he had been fortunate enough to have removed any preconceived erroneous opinions, if he had communicated a store of solid and useful information, if his lectures on conductors should succeed in calling the attention of the British Nation to the means of saving the lives of thousands of British seamen, he would consider that they were not given in vain, either to his hearers or the public. He was glad to learn that they would remain in a permanent shape before them, as he understood they were reported in one of the periodical publications;* and that a number of the work, containing his observations on conductors, had been sent to the Admiralty. If, moreover, his auditors had any doubt or distrust of any of the principles or opinions delivered by him, he would candidly advise them to search for themselves until they should be satisfied.

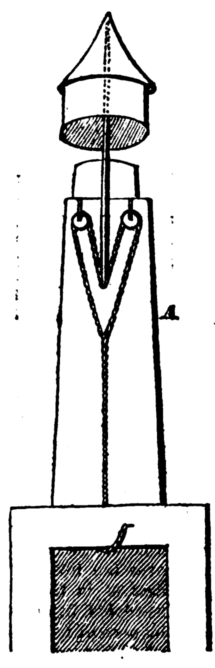
* The Mechanics' Register.

Here Mr. Tatum bowed and retired, amid the warmest applause..

Doctor Birkbeck then came forward, and stated that a lecture on chemistry would be delivered on Wednesday next, as usual. That there would be none next Friday. A lecture (the subject not yet determined) would be given on the Friday after; and that Mr. Partington, of the London Institution, would commence a course of lectures on optics, on the second Friday in January. The worthy President and his announcement were greeted with universal plaudits.

The lecture was but thinly attended, in consequence of the festive nature of the evening (Christmas Eve.)

THE SAFETY CHIMNEY POT.

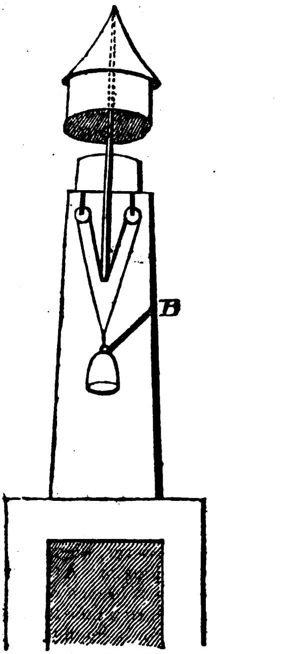


Letter A.

The upper pot to be supported by an iron rod, which is to be raised by a chain passing over two pullies fixed in the chimney, and descending to the middle of the chimney, is joined by a single chain, which is brought down and secured in the front of the fire-place.

When the chimney is discovered to be on fire, any person present may let the chain loose, when the upper pot will instantly fall and cover the lower pot. The current of air being stopped by these means, the fire must be extinguished.

THE SELF-ACTING SAFETY CHIMNEY POT.



Letter B.

The upper pot to be supported by an iron rod, as before, but in the place of the chain, a pitched rope is to be used, to which is suspended a weight to keep the upper pot raised above the lower one.

When the fire takes place, it will communicate itself to the pitched rope, which being burned through, the weight will fall, and the upper pot will cover the lower one, producing the same effect as in the former case. The weight is prevented from falling lower than necessary, by a short iron chain, fastened to the brick work.

After the fire is extinguished, a sweep must be sent up to replace the pitched line, and attach the weight as before.

The ingenious projector of plans for increasing the comforts of his fellow-creatures, will ever be an ornament to the society in which he moves; for should his invention fail, he has the satisfaction of having attempted an improvement, and should it succeed, he enjoys the inward exultation of having performed a lasting service to the public, which by the bye is sometimes all that he does enjoy; for the fame and the profit are too often swallowed up by the wealthy dealer in mind and imagination.

It frequently happens that men of invention have neither time nor inclination, and caring little about the profit or the fame, send forth their ideas to the world, without having properly reflected upon their practicability: this, however, merits praise; for it sets invention to work, and is in fact a kind of "a tub for a whale," under which title we feel bound to place our present subject.

In the first place, it is intended by the plan A, that the upper pot being caused to descend (by a person letting loose the chain which is fastened in the front of the fireplace), will stop the current of air, and extinguish the fire: that this would be the effect there can be no doubt, but the inventor has forgotten to provide means for keeping the pot upright, which must be done, for it certainly cannot balance itself; and when he has found the means, will not those very means make the descent of the upper pot a matter of great uncertainty? in its present state, supposing for a moment it would stand erect, would not a moderate wind occasion much noise in the chimney, and would not a high wind, acting upon the upper pot, cause it to dash the lower pot to pieces.

With respect to the Self-Acting Safety Chimney Pot, we think it very uncertain whether the fire will communicate on all occasions to the pitched rope. At all events a great length of time may elapse before this can take place. However, with these remarks we feel no hesitation in laying the plans before our intelligent readers, hoping we shall be favoured by some *practicable* improvements. We shall submit one of our own next week, feeling it to be a subject of much importance.

DANGEROUS CASE OF POISONING SUCCESSFULLY TREATED BY THE POISON PUMP.

On Friday last, in Anderson's Institution (Glasgow) during the absence of Dr. Ure, a young man, in rummaging through some private drawers, enclosed within a press, in which various curious specimens and pieces of apparatus are kept, happened to cast his eyes on some small covered pots of porcelain; and, opening one of them, swallowed thoughtlessly a morsel of its contents, which must from its effects have been the extract either of aconite or of hemlock, made by the improved process *in vacuo*. Such preparations are extremely efficacious medicines in small quantities, but become very energetic poisons when taken in an undue dose. He had no sooner swallowed the morsel than he became nearly speechless, and soon thereafter lost also the faculty of deglutition. Fortunately Dr. Ure's chemical assistant was at hand, who immediately administered hot water and solution of sulphate of zinc (a quick emetic) in large quantities. It was, however, found to be impossible to excite vomitting. A flexible tube of caoutchouc, attached to a syringe, (commonly called Juke's apparatus), was speedily procured, and the extremity of the smooth tube being put down into the stomach, the contents of this cavity were thoroughly pumped out. A quantity of warm water was next injected, (for by this time the patient could not swallow) and then withdrawn. After the stomach had been thus washed with about six syringe-fuls, equivalent to nearly six pints of liquid, the young man felt himself almost well. As he still complained of an icy coldness over his body, a dose of sulphuric ether was administered, which relieved this unpleasant symptom, and he soon became able to walk home without assistance, in a convalescent state. It deserves to be stated, that in the year 1821, Dr. Ure brought over with him from Paris, two of the above flexible caoutchouc tubes, for evacuating the stomach in the above manner; and that he has annually since, described minutely, in his public lectures, this mechanical plan of removing poison from the stomach. Mr. Jukes is no doubt entitled to the praise of having first made a public experiment with this apparatus, on healthy individuals in London. The method, however, has been long known to the Parisian surgeons. The present case shows its efficacy and importance; for there can be little doubt that the patient would have fallen a victim to his imprudence but for its seasonable application. When the stomach is oppressed with a collection of acescent, bilious, or viscid matter, as happens in dyspepsia, and many other maladies, the above instrument may be beneficially employed for evacuating the morbid contents, in the place of emetics; which, from peculiar circumstances, may become either totally inadmissible, or very hazardous.

EXPERIMENTS MADE UPON SIX DECAPITATED ROBBERS BY PROFESSOR BARTELS.

On the 14th October, 1811, six highway robbers were beheaded near Marburg; one of them was sixty years of age, the other five from twenty to thirty. At the instant when the head of the first fell, the trunk got up again as if the individual had been about to rise upon his feet, while the bodies of the others fell down flat at the very moment. When a little after the heads were thrown at the foot of the scaffold, we saw all the muscles of the face of the last executed completely relax, while those of the old man presented a general contraction, which lasted for a considerable time. These opposite effects took place without the occurrence of any difference in the mode of decapitation to which they could be attributed: with respect to this, it will not be useless to remark, that there remained at least two vertebræ attached to each of the heads. It was observed, that, at the moment of decapitation, the muscles of the face of the greater number of the heads contracted in a convulsive manner. As the head of the first decapitated had not been brought with the rest, no other observations were made with regard to it. The second, which fell ten minutes after it, was observed without loss of time. It was tried at first to excite a contraction of the iris, by pricking that organ, but no apparent motion was obtained. The same operation having been made upon the iris of the third head, the pupil dilated a little, and again quickly contracted; while, at the same time, the pupil of the other eye (which had not been pricked) contracted, and again immediately dilated; an effect which Professor Trenderoth, as well as Messrs. Bunger and Herold, who were also present, saw in the most evident manner. Some minutes after decapitation, the bodies were opened; the heart contracted and dilated alternately with much force, in such a manner as to produce regular pulsations. At the end of ten minutes, these motions had, it is true, abated a little; but they were always incessant, and the alternate contraction aud dilatation preserved their regularity. Five minutes later, these motions had become unequal and very weak; they revived, however, when the heart was irritated by pinching it. A mechanical irritation made upon a branch of the great sympathetic, accelerated a little the motion of the heart, but only for a minute at most; the motion itself, however, continued for a long time, only decreasing in intensity. A puncture made in the transverse muscle of the abdomen of the same body occasioned strong convulsions, especially in the lower extremities, and yet the nerves had not been immediately irritated. A mechanical irritation made at the lower part of the spinal marrow caused violent contractions in the muscles of the trunk, as well as in those of the neck, particularly those of the upper part, at the place of the section (which had already been frequently remarked.) On irritating the upper part of the spinal marrow of another of these heads, convulsive motions were produced in the muscles of the face, and there resulted a movement of the tongue and surrounding muscles. In the third body, a motion was remarked in the lower part of the trachea which remained attached to the trunk; this motion was accompanied with a sort of hissing, an effect caused, without doubt, by the convulsive contractions of the muscles which had been cut. Similar motions took place in all the others. The head of the last decapitated was transported to the theatre, which, on account of the distance, occasioned the loss of an hour. Here the first care was to try the duration of the galvanic irritation upon the different muscles of the head. The elevator-muscle of the upper eyelid, and the superior oblique muscle no longer contracted; but the frontal muscles, the orbicularis palpebrarum, masseter, digastric, &c. still continued to contract. The contractions ceased first in the masseter muscle; they were prolonged in the buccinator. Two hours after execution, it had entirely ceased in all the muscles, and it could not be excited on moistening them anew. In another head, cut off twenty minutes before the preceding, the galvanic irritation caused the depressor commissuræ labiarum, the orbicularis palpebrarum, and masseter, to contract; this latter always much longer than the others. Two hours and three quarters after decapitation, the muscles of this head appeared to have lost all irritability.

THE UNITED STATES.

(*From the National Calendar, for* 1824.)

The United States contain, 9,654,415 inhabitants, of which, 1,543,689 are slaves. Agriculture employs 2,175,065 persons, and commorce only 72,558; manufactures 349,663. In the years 1821 and 1822, there arrived in different ships 20,201 passengers, of whom 2969 were citizens of the United States. Of the other 16,232 emigrant foreigners, 8824 were English, 685 French, 386 Germans, 400 Spaniards, 112 Hollanders. The emigrants are divided into four classes:—The first is the *usefully productive*, and comprises 4964 individuals, all engaged in some sort of trade or profession. The other classes are *unproductive but useful*, 5069; *unproductive*, 459; and all other sorts of *unproductive* (as old men, women, children, &c.), 9721; the patents granted for 1822, amount to 194; the new works or new editions deposited in the Secretary of State's Office in the same year, amount to ninety-five, twenty of which are dictionaries, grammars, or elementary books; nine theological and moral; fourteen of physical and mathematical science; eight of law; eleven of statistics and geography, &c.

To the Editor of the Mechanics' Register,

SIR,—In answer to I. W. inserted in your last, I beg to inform him, that the rule he complains of, is, in my opinion, absolutely essential to the well-being of the Institution. If he considers for a moment the state of crime in this vast metropolis, he will regard it as a salutary precaution against the admission of improper persons to the property of the Institution, to which every member has easy access. Should he still wish to become a member, I have left my address with the Publishers of the Register, and will readily sign his form of admission.

Your obedient servant,

BARRY ST. LEGER,

Member of the London Mechanics' Institution.

A Correspondent at Berlin informs us that there have arrived there from Baffin's Bay two young Esquimaux, who are the wonder of the Berlinians. The man, who is 23 years old, was a person of some consequence in his own country, which he quitted to obtain a knowledge of civilized life. These persons have an Esquimaux dog with them, and a sledge, on which they exhibit at Berlin. The man is supposed to be the best marksman ever known; as, with an arrow five feet in length, he will pierce through the smallest gold coin at a distance of twenty paces.

The *Inverness Courier* states that an ingenious operative weaver of that town, has constrncted with a knife and a pair of tweezers, a curious piece of machinery. consisting of a weaver at work on his loom, with lay and treddles working—a corn-mill—a sucking and a spiral pump, both of which throw water—two sawyers at work—a horse race—windmill—ship at sea—regiment of military passing the General, &c.; the whole of which is set in motion and driven by a mouse.

Several of the manufacturers of Bolton and Blackburn have advanced their wages 3d. per cent. on 6-4ths calico pieces.

We find the following in a Leeds Paper, on an Improved Steam Engine, invented by a Mr. Vaughan, of Sheffield. "This engine," says the Journalist, "is now brought to perfection, and is likely to surpass every other engine in the kingdom. There is one put up at the iron foundry of Mr. Samuel Kirk, of Rotherham, one at Sheffield, in the patentee's premises, and a third at the iron foundry of Messrs. Bird and Co. at Cardiff, in South Wales; and they are found to perform better than any other engine in speed, power, and saving of fuel; and more particularly as the engine is very much simplified, and friction reduced, it is likely to be one of the greatest improvements ever made in the steam engine, particularly as to the saving of fuel and gaining of power, as the engine only consumes half the coals of other engines, and the power is gained by steam and atmosphere being brought to act at one and the same time, in conjunction with each other. The cylinder is only half the size of cylinders used in other engines, and is not half so weighty or bulky as other engines, and only takes half so much room, makes double the number of strokes; and any engine may be altered to increase its power by taking away the cylinder, and having a smaller one on the improved principle, as the improvement is principally in the cylinder. There are 12lbs. of steam, and 14lbs. of atmosphere, both acting on the pistons in the cylinder at one and the same instant, that makes a pressure of 26lbs. on the inch on the pistons; deduct 6lbs. for friction, there is then left a working power of 20lbs. on the inch on the pistons."

QUERIES.

Man in inquisitiveness should be strong,
From curiosity doth wisdom flow:
For 'tis a maxim I've adopted long,
The more a man *inquires* the more he'll *know*.
PETER PINDAR.

To the Editor of the Mechanics' Register.

SIR.—You will oblige me by ascertaing through the medium of your interesting miscellany, the best method of curing smoky chimnies.—W. G. C.

PROBLEM.—I want to divide a square into eight equal parts, (each part the same shape) that by joining them together four and four, they shall produce *two equal* squares, exactly half the size of the original.

JUVENIS ADMIRATOR.

SIR.—An old lady an aunt of mine, desired me to say she should feel very much obliged if you or your correspondents could inform her of a way to prevent the bad effects of tea on the nerves, in preventing one from sleeping at night.—JUVENIS ADMIRATOR.

SIR.—Having obtained from the Mechanics' Register of the 11th instant, an excellent method for cleaning engravings, I should be glad through the same medium, to be informed the best means of taking off the varnish from dirty old paintings, and the method of cleaning them generally. This information will oblige a constant reader.—C. S.

SIR.—An aged mother of mine being frequently troubled with bile, I should feel obliged to any of your intelligent readers if they would furnish me with a receipt to cure the same, or to afford her some relief. Your insertion of this will oblige your well-wisher,

York, Dec. 14 J. MAWBERY.

SIR.—I should feel happy in obtaining through the medium of the Register, the most efficient means of destroying that destructive insect the *Moth*.—X. X.

A constant reader wishes to be informed of the best means of curing chapped hands and lips.

SIR.—I should feel great pleasure in receiving through your instructive Register, an answer to the following,—What air or gas do vegetables generate.—W. M.

ANSWERS TO QUERIES.

Sir,—In one of your former numbers (No. 6.) your correspondent T. wishes to be informed of the best mode of making court plaister; now, Sir, the following is the way it is made:—stretch tight upon a frame, any quantity of black sarsenet, then give it three or four coats of a solution of isinglass, (one oz. of isinglass dissolved in a pint of water) one coat being dry before the other is laid on, then when it is quite dry, varnish it with a tincture of the Balsam of Peru, then carefully dry it free from dust. And also, your other correspondent C, wishes to be informed of the best method of curing chilblains; when any itching or redness, take some vinenegar, brandy, or any spirit, and rub them well with it, which will prevent them breaking; but if they are broke, dress them with the soap cerate, which will almost always heal them. If you think this worthy of insertion, you will oblige your obedient and humble servant. H. W. DEWHURST.
21, Francis-street, Tottenham-court-road.

SIR,—Your Correspondent G. L., No. 8. p. 127, wishes to know the reason why the outside of a decanter becomes covered with steam, upon cold spring water being poured into it.

In answer to this, I would inform him, that the water poured into the vessel being colder than the atmosphere in which it is, condenses the atmosphere into steam. But no steam would appear if the experiment were performed in a place in which the atmosphere was colder than the water. Hoping this may prove satisfactory to G. L.,

I remain, Sir, your sincere admirer,
J. L. B.

SIR,—In your last Number, a Correspondent wishes to be informed how to make a varnish for engravings, water-colours, &c. Now, Sir, I think he will find the following answer his purpose; let him give the drawing a coat of the following preparation varnish.

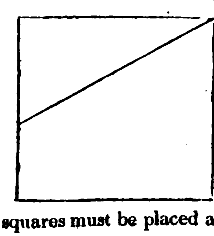
Take of Isinglass, one ounce; water one pint; dissolve the Isinglass in the water, then strain, and always use it warm; and when the print is dry, give it a coat of one of the two following varnishes.

Take of Canada or Copaiva Balsam, two drams; Oil of Turpentine, one ounce; mix them together in a water bath. Or,

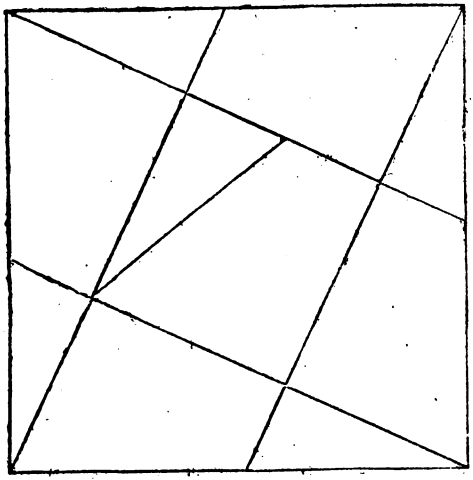
Take of purified Gum Mastic, half an ounce; rectified Oil of Turpentine, two ounces; dissolve the mastic in a water-bath, and then the varnish, when cold, is fit for use.

I am, Sir, yours, &c. EMMA R.

Sir,—In answer to a query from T. in No. 8. of your work, I beg to offer the following: suppose a square to be cut thus;



the five squares must be placed as follows



MR. EDITOR,—In answer to the query of W. T. O. in your last number of the Register (No. 8.), I beg to send you the following solution:

Commence at either point of the figure, and fill up the opposite point; and, by taking care always to cover the point you start from, you will be able to roll the seven balls to seven points, without commencing at any point that is previously occupied.

In answer, also, to G. L. in the same number of the Register, and to all other of your readers, who, like myself, occasionally wear top boots, I beg to send you the following recipe for cleaning the tops, and at the same time generally extracting spots of grease; the efficacy of which I am satisfied, after one trial, the operator will have no reason to doubt.

First with cold water, clean with a sponge, afterwards rub them with the followiug mixture until all the stains are removed, when wash the mixture off with clean water.

Half an ounce of oxalic acid; half an ounce of cream of tartar; quarter of an ounce of lemon acid; one dram of burnt alum; half an ounce of pumice-stone, very finely pounded. Mix the whole in a quart of warm water.

I request that you will alter the language of this, as well as any future communication, as it may seem fit to you; as we are all liable occasionally to make mistakes, particularly when hurried, both in orthography and language. Yours, &c. W. P.

We are much obliged to our Correspondent W. P. for his communications. His request to us to alter his language was quite unnecessary. We do not see that it can be improved.—ED.

NOTICE TO CORRESPONDENTS.

The two succeeding Numbers of the Register will contain highly executed Copper-plate Engravings, of an improved mode of Sailing in the British Navy. We give this notice to our subscribers, in order that they may apprise their nautical friends of the circumstance, as it is one of much interest to them and to the public.

Viator's request shall be attended to.

X., T. S., J. C., R., and M. A., are under consideration.

Mr. Gray is informed, that although our circulation is very considerable, our charge for Advertisemenls on the Wrapper is particularly moderate. He may have a Scale of the Charges on application to our Publishers.

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The London MECHANICS' REGISTER.

By huge quadrangle, slender stays oppress'd;
Its baneful lee-way powers appear confess'd;
Obstructive too, it spoils the sturdier sail,
Whose favour'd posture courts the growing gale:
To foil the squall, in vain's the sheet eased off;
Still doth the noxious plane our labour scoff:
With lateral force still groans th' endanger'd pine,
As slowly downward dragg'd, the sails decline:
At length, relieved of the o'erwhelming load,
By dint of force the cumbrous mass is stow'd.—H. H.

(See Plate annexed.)

No. 10.] SATURDAY, JANUARY 8, 1825. [Price 3d.

THE PATENT STAY-SAIL, INVENTED BY SIR HENRY HEATHCOTE, R.N.

Every attempted improvement of navigation, however relatively trifling, assumes an adventitious importance from the main object of the science, viz. a safer, more rapid, and more frequent communication between the several parts of the earth. The vast increase of commerce, the almost equally widespread of travelling, and the general growth of intellectual and literary information have arisen from a communication between sea-divided lands, through the medium of navigation; and in their turn have, by a sort of reciprocal operation served to improve the science itself, and so to facilitate the grand design, viz. a frequency of social intercourse between distant communities.

Of the nautical inventions of modern times navigation by steam stands proudly pre-eminent. It is the most important improvement of science since the discovery of the magnet, and would alone be sufficient to mark the age of its invention as an era in philosophical speculation, as well as in practical improvement. After it every alteration, however ingenious or useful, in the management of sails, must sink into insignificance, when compared to an invention which bids fair, in the course of time, to supersede the use of sails in toto. But till that period of the perfection of the discovery, and while navigation by sails continues to be so universally acted on as it is, and in ships of war must be, so long every suggested improvement in the shape, size, or management of them must continue to demand that attention and deserve that praise, which is due to every attempt to increase the frequency and facility of social intercourse between the separated masses of the human race.

With these sentiments of the general utility of navigation, we took up Sir Henry Heathcote's Treatise on Stay-sails, from which we shall quote a few extracts to illustrate our subject. It may be necessary to premise, for the information of our dry-land readers, that Stay-sails are those sails situated principally between the masts, for the purpose of intercepting such wind as may escape the square sails affixed to the masts; the form of them is quadrilateral. Sir Henry Heathcote has considered that trilateral stay-sails would be less injurious, and bring more positive advantages than the old quadrilateral ones. His conviction of this position has been so strong that he has reduced it to practice by designing stay-sails of the trilateral shape, and even by taking out a patent for "his invention of the improvement of the stay-sails generally in use." The form of each species of stay-sail is illustrated by two plates; one representing a frigate under the old stay-sails, (see plate to the present Number) the other a royal yacht under the new patent ones (a copper-plate engraving ot which will accompany our next Number).

The gallant Captain remarks:

"The object I have in view in the organization of my patent sails is, to abolish quadrilateral stay-sails. 1. On account of the injurious lateral pressure of the upper triangle thereof, destitute of any direct impulse; an action which can only tend to increase the ships lee-way, and distress the masts and rigging. 2. Of its perniciously obstructing a large quantity of wind from the square-sails, and thereby proportionably depriving them of their power, 3. Because sails thus constructed do not (generally speaking) intercept so much of the wind passing between the square sails as might be intercepted; 4. Because, on account of their superfluous magnitude, their weight, together with the simply lateral pressure of the wind on their upper triangle before alluded to, contribute to prevent their being carried with that degree of safety, they otherwise might, particularly in squally weather, when it is extremely difficult to haul down and stow them."

After thus stating his objections to the old Stay-sails, he adds:

"I have been favoured with the opinions of old seamen of every class, among whom I might enumerate some of the most distinguished officers in the navy, and of the highest respectability in the Honourable East India Company's service, all of whom agree in reprobating the old stay-sails, 'as of no use except a few points of the wind,' and many of them declare 'they never allow them to be bent in the ships they command; and an old naval officer informs me that the upper stay-sails on the mizen-mast are generally discontinued through the navy."

On the utility of properly formed stay-sails, Sir Henry observes:

"Stay-sails between the masts are more useful by the wind, than on any other point of sailing, provided they are shaped and placed on scientific principles, and this from three causes; first, when by the wind, and only then, they trim at a better angle than the square sails; secondly, on that point of sailing, their useful or clear interception bears the greatest proportion to that of the square sails; thirdly, the direct or longitudinal impulse of stay-sails, when trimmed at 25 degrees with the keel (as should be the case when the ship is close hauled) is more horizontal than when the sheet is flowing; but the old stay-sails, with their immense proportion of simply lateral pressure on the upper triangle, its great obstruction of wind from the square sails, and, in some instances, the disproportionate weight of them, certainly do more harm than good, except a few points of the wind when the hauling the tack over to windward, in a great measure relieves the ship from the simply lateral pressure of the upper triangle, or that it thereby becomes nearly innoxious, and no longer operates materially as a deduction from the useful impulse afforded by the lower triangle; still, however, the upper triangle does no good beyond the interruption of a small quantity of wind under the feet of the square sails, which is not more than equivalent to the loss of direct impulse, arising from the impossibility of trimming the said triangle, even with the wind at large, at quite so favourable an angle as the square sail immediately, which suffers therefrom an obstruction of wind proportioned to the magnitude of all that part of the said upper triangle which is before the line of interception by the square sail; but the new sails, inasmuch as they never exhibit any decidedly pernicious obstruction of wind from the square sails, and produce more useful interruption of wind than the old ones, are superior to them, even with the wind large, and by the wind, infinitely so, as the upper triangle of the old sail is on that point infinitely mischievous.',

On the utility of stay-sails in general, Sir Henry continues:

"It is evident that a great deal of wind passes between the square sails (particularly the upper ones), both of the fore and mizen-masts, and of the main and mizen masts, which might be rendered highly conducive to the velocity, steerage, and manœuvre of the ship, could it be intercepted by sails, every part of which trims at a proper angle, and which do not in any way deteriorate the square sails. It will therefore be my care to prove incontrovertibly that such are the transcendant qualities of the new ones I have invented, which are divested of the objectionable part of the old ones, and are made to trim on the same principle as jibs, which are found to be very drawing sails."

Of the importance of light sails in giving increased velocity to the rate of sailing, we have the following practical instance from a naval officer, an acquaintance of the Author.

"It happened to him, when employed in the Mediterranean, to witness the capture of great part of an English convoy by a French squadron, when several of the Smyrna traders escaped, entirely from being better found in light sails than the vessels which were taken."

The arguments on the importance of stay-sails in intercepting light breezes, which would otherwise escape between the square sails, are wound up in the following:

"In a word, the action of light airs on stay-sails may be justly regarded as frequently imparting an impulse which, but for the stay-sails, the ship would not have received; by means of them one light air may shoot the ship into another, which may advance her to a stronger and more extensive one, whereby she may progressively reach a regular breeze; and I do not hesitate to affirm, from my own actual observation, that properly organized stay-sails between the masts, besides tending to increase velocity in light weather, may essentially assist in shooting a ship, when she would otherwise have been motionless, and (regarded as the primary and inductive impulse) not improbably be the means of enabling a ship near the shore to keep off it, or (as may be desired) either to force or avoid an action."

Having shown the importance of properly shaped stay-sails, and the injury caused by the quadrilateral stay-sails now used, the gallant Captain proceeds to demonstrate the advantages of his trilateral patent ones.

"That the new sails are properly organ ized cannot be reasonably denied; as, 1 they are both proportioned and placed (ac cording to the exigencies of the case) so as to produce the greatest possible non-obstructing interception with the least possithe obstruction of wind. 2. Every part of them trims at that angle which is most conducive to the headway of the ship. 3. Whilst the wind remains light enough for auxiliary sails to be useful, these may be carried without deteriarating the action of the square sails."

"The trilateral stay-sails instead of having their tacks (like those of the old sails) all reaching forward to the foremost of the two masts between which they are set, shall have their tacks variously situated in that respect, extending from the mast further, or less far (or in some instances reaching close forward) as may, according to the actual dimensions of the masts and yards of the vessels for which they are designed, and their several distances asunder relatively, be found most conducive to the object of increasing the interception of wind passing between the square sails to the utmost extent, consistent with a due regard to their being so proportioned as to admit of their being easily managed in manœuvring, and to leave sufficient spaces between them and the square sails abaft them, to prevent the wind defluted by the former from materially affecting the latter."

The advantages to be derived from the adoption of the new sails are thus summed up:

"First, by abolishing the longitudinal triangle to relieve the ship incalculably from simply lateral pressure, tending only to endanger the masts, and increase the lee-way; and from a not less pernicious obstruction of wind from the square sails. 2. By the new method of setting and proportioning the stay-sails, to intercept a greater quantity of wind passing between the square sails, than is intercepted by the useful part of the old sail. 3. And to save a considerable quantity of canvas. 4. The new sails may be managed, taken down, and stowed more easily than the old ones."

In our notice of this Work our object has been to explain the nature of the subject, and to arrange the arguments in a manner which may render them intelligible to the general reader. Of the superiority or inferiority of the proposed improvement over the sails now in use, we will not presume to advance a positive opinion; first, because the arguments cannot be tried by scientific principles alone, so general and certain as to allow a moral conviction of their infallible truth; secondly, a capability of estimating them with any degree of correctness could have been acquired alone by such an intimate knowledge of the nautical details and professional technicalities (particularly of the action of the wind on sails) as a long life of seamanship and most attentive personal observation could alone bestow. Thirdly, because the mathematical calculations and scientific principles, however correct in themselves, must in their reduction to experimental practice, be liable to so many modifying circumstances and thwarting difficulties, as to render a prompt and infallible conclusion on the first or even fiftieth experiment a thing of incalculable improbability, if not of ultimate impossibility. The elementary nature of our publication, and the size of the extracts already made, prevent us from giving any of the mathematical calculations; to nine-tenths of our readers they would, perhaps, be uninteresting. They are, however, very correct. We shall feel happy if the notice of Captain Heathcote's invention, in our record of mechanical transactions shall help to extend the knowledge of it to quarters where abstract science or practical observation may be thus roused to throw their lights on any side of the question.

We almost forgot to mention that the Work is dedicated to his Majesty, and is lying "under consideration before the Lords of the Admiralty."

SINGULAR CUSTOMS.

At Dunmow, in Essex, forty miles from London, a curious custom was established by Fitzwalter, in the time of Henry III., who was crowned in 1216, and died in 1272, that whatever married man did not repent of his marriage, nor quarrel with his wife within a year and a day, should go to the Priory at Dunmow, and have a gammon or flitch of bacon. The canons formerly settled here, were obliged by their constitution to deliver the bacon to any person, from any part of England, who, kneeling on two sharp stones, would venture to repeat the following oath: much singing and many ceremonies were used to lengthen out the time of his painful situation.

'You shall swear the custom of our confession,
That you never made any nuptial transgression,
Since you were married to your wife,
By household brawls or contentious strife;
Or otherwise, in bed or at board,
Offended each other in deed or in word,
Or, since the parish clerk said amen,
Wished yourselves unmarried again;
Or in a twelvemonth and a day,
Repented not in thought any way,
But continued true and in desire
As when you joined hands in holy quire,
If to these conditions, without all fear,
Of your own accord you will freely swear,
A gammon of bacon you shall receive,
And bear it hence with love and good leave;
For this is our custom at *Dunmow* well known,
Tho, the sport be our's, the bacon's your own.

At the manor of Wichenor, in Staffordshire, there is a similar custom to that of

Dunmow observed, where corn as well as bacon were given to the happy pair.

In the manors of East and West Enbourn, in Berks, at Tor, in Devonshire, and other places in the west, there is a singular custom. On the death of a copyhold tenant, the widow is to have her free bench in all her copyhold lands; but if she be guilty of incontinence, she forfeits her widow's estate; yet after this, if she comes into the next court held for the manor, riding backwards on a black ram, and saying the following words, the steward is bound by the custom to admit her to her free bench again:

Here I am riding on a black ram,
Like a whore as I am,
And for my crincum crancum.
I've lost my bincum bancum;
And for my tail's game,
Am brought to this worldly shame:
Wherefore, good Mr. Steward, let me have
my lands again.

At Oakham, in Rutlandshire, here is a remarkable ancient custom kept up, viz. that every peer of the realm, the first time he comes through this town, shall give a horse shoe to nail on the castle-gate; and if he refuses, the bailiff of the manor has power to stop his coach and take the shoe from one of his horses. This is called the order of the Horse-shoe, and it is common for the donor to have a large one made with his name stamped on it, and often guilt. One over the Judge's seat in the assize hall, is of curious workmanship.

At Taunton, in Somersetshire, there is an extraordinary privilege, that every pot-walloper, that is, he who dresses his own victuals, is entitled to vote for Members of Parliament. Inmates and lodgers formerly, before an election, made fires in the streets, at which they dressed victuals publicly, lest their votes should be called in question.

A curious custom at the Isle of Cannay or Canna. This island lies nine miles N.W. of the Isle of Rum; it is about six miles long and one broad, containing 300 inhabitants; this is one of the four Hebrides, which form the parish of small isles.

There is in this island many horses, the chief use of which is to form an annual cavalcade at Michaelmas; every man in the island mounts his horse without a saddle, and takes up behind him some young woman or neighbour's wife, and rides backwards and forwards from the village to a certain cross. After the procession is over they alight at the public-house, where they are treated by the companions of the ride. When they return to their houses an entertainment is prepared, the chief part of which is an oat cake of a large size, called St. Michael's cake, formed like the quarter of a circle; it is daubed over with milk and eggs, and then placed before the fire to harden.

At Bissago, one of a cluster of islands, near the coast of Africa, at the death of their king, the best-beloved of his wives, and most useful of his slaves are killed and buried near the place where the king's corpse is interred, that they may go with him, to serve and divert him in the other world.

Buying Wives.—The Babylonians had a law, which was also followed by the Heneti, an Illyrian people, and by Herodotus thought to be one of their best, which ordained that when girls were of a marriageable age, they were to repair at a certain time to a place where the young men likewise assembled. They were then sold by the public crier, who first disposed of the most beautiful one. When he had sold her, he put up others to sale, according to their degrees of beauty. The rich Babylonians were emulous to carry off the finest women, who were sold to the highest bidders. But as the young men who were poor could not aspire to have a fine woman, they were content to take the ugliest, with the money which was given with them; for when the crier had sold the handsomest, he ordered the ugliest of all the women to be brought, and inquired if any person was willing to take her with a small sum of money? Thus she became the wife of him who was most easily satisfied; and thus the finest women were sold, and that from the money which they brought, small fortunes were given to the ugliest, and to those who had any bodily deformity. A father could not marry his daughter as he pleased, nor was he who bought her allowed to take her home, without giving security that he would marry her. But, after the sale, if the parties were not agreeable to each other, the law enjoined that the purchase money should be restored.

Another Way of Match-making.—Amongst the Cretans, the young men, when of mature age, were not permitted to marry as they thought fit themselves. They were not left to the impulse of passion, by which we are so frequently misled in that serious engagement. In forming the contract of wedlock, riches and pleasures were not their objects — those delusive phantoms, which often bring discord, indifference, and regret. In truth, a Cretan married not for himself, but for the State. The Magistrates had the right of choosing the strongest and best made of the young men, and of marrying them to women who resembled them in constitution and figure, that a well proportioned matrimonial union might produce a robust, tall, well-made prosperity, whose physical powers would do honour to the nation, defend it, terrify their enemies by their mere presence, and conquer and reduce them to subjection, by their strength and their valour.

Among the present public exhibitions at Paris, is that of a human fossil which was found near Moret, in the department of the Seine and Marne.

SINGULAR ADVENTURE WHICH BEFEL DR. CLARKE, IN PASSING ONE OF THE BATHS, AT ATHENS.

[*From the additional vol of Clarke's travels.*]

The following day was attended by a singular adventure. We had agreed to spend the greater part of the day with Lusieri, among the antiquities of the citadel; and for this purpose Mr. Cripps accompanied him to the Acropolis soon after breakfast. The author followed towards noon. About half-way up the steep which leads to Propylæ, he heard a noise of laughter and many clamorous voices, proceeding from a building situated in an area upon the left hand which had the appearance of being a public bath. As it is always customary for strangers to mingle with the Mahometans in such places without molestation, and as it had been the author's practice to bathe frequently for the preservation of his health, he advanced without further consideration towards the entrance, which he found to be covered with a carpet hanging before it. Not a human creature was to be seen without the bath whether Turk or Greek. This was rather remarkable; but it seemed to be explained in the numbers who were heard talking within. As the author drew nigh unto the door of the building, the voices were heard in a shriller tone than usual; but no suspicion entered into his mind as to the sort of bathers which he would find assembled, he put aside the carpet, and stepping beneath the main door of the bagnio, suddenly found himself in the midst of the principal women of Athens, many of whom were unveiled in every sense of the term, and all of them in utter amazement at the madness of the intrusion. The first impulse of astonishment entirely superseded all thought of the danger of his situation; he remained fixed and mute as a statue. A general shriek soon brought him to his recollection. Several black female slaves ran towards him, interposing before his face napkins, and driving him backwards towards the entrance. He endeavoured by signs and broken sentences, to convince them that he came there to bathe in the ordinary way; but this awkward attempt at an apology converted their fears into laughter, accompanied by sounds of Hist! Hist! and the most eager entreaties to him to abscond quickly, and without observation. As he drew back, he distinctly heard some one in Italian, that if he were seen he would be shot. By this time the negro women were all around him, covering his eyes with their hands and towels, and rather impeding his retreat, by pushing him blindfolded towards the door; whence he fled with all possible expedition. As the sight of women in Turkey is rare, and always obtained with difficulty, the reader may perhaps wish to know what sort of beings the author saw, during the short interval that his eyes were open within the bagnio; although he can only describe the scene from a confused recollection. Upon the left hand, as he entered, there was an elderly female, who appeared to be of considerable rank, from the number of slaves sumptuously clad and in waiting upon her. She was reclined, as is usual in all Turkish baths, upon a sort of divan, or raised floor, surrounding the circular hall of the bath, smoking and drinking coffee. A rich embroidered covering of green silk had been spread over her. Her slaves stood by her side upon the marble pavement of the bath. Many other women of different ages were seated, or standing, or lying, upon the same divan. Some appeared coming in high wooden clogs from the sudatories or interior chambers of the bath, towards the divan; their long hair hanging dishevelled and straight, almost to the ground; the temperature of those cells had flushed a warm glow seldom seen upon the pale and faded cheeks of the Grecian and Turkish women. Some of them were very handsome. Within the centre of the area, immediately beneath the dome, the black women and other attendants of the bath were busied bearing towels, and preparing pipes and coffee for the bathers; according to the custom observed when men frequent these places.

The cause of this mistake remains now to be explained. This bath was not peculiarly set apart for the use of females; it was frequented also by the male inhabitants; but at stated hours the women have the privilege of appropriating it to their use; and this happened to be their time of bathing; consequently the men were absent. Upon such occasions, the Greek and Turkish women bathe together; owing to this circumstance, the news of the adventure was very speedily circulated all over Athens. As he did not return until the evening, the family with whom he resided, hearing of the affair, began to be uneasy, lest it had been brought to a serious termination, well knowing that if any of the Arnauts, or of the Turkish guard belonging to the citadel, had seen a man coming from the bath while the women were there, they without hesitation or ceremony, would have put him instantly to death: and the only reason we could assign for its never having been afterwards noticed, was, that however generally it became the subject of conversation among the Turkish females of the city, their Mahometan masters were kept in ignorance of the transaction.

EXPERIMENT ILLUSTRATING THE SEPARATION OF BODIES BY WEIGHT.

Take a bottle with a long neck and fill part of it with water, take a glass and pour claret and water into it, reverse the bottle with the bottom upwards, stopping the mouth of it with your finger; then dip the mouth within the glass, and remove your finger, keep the bottle in that posture for a time, and the wine will separate from the water, ascend and settle in the top of the bottle, and the water will descend from the bottle and settle in the bottom of the glass, the passage will be apparent to the eye; for you shall see the wine as it were in a small vein rising through the water.

Let the upper glass be wine and the lower water, there follows no motion at all; this separation of the wine and water appears to be made by weight, the water being made pensile, and a considerable weight of it in the belly of the bottle, supported by a small pillar of the same liquid in the neck of the bottle, it is this circumstance which sets the motion at work: for wine and water in one glass with long standing will hardly separate.

MODE OF ATTRACTING WATER.

Hang a quantity of wool tied loosely together down into a deep well about five or six yards from the water, leave it in that position through the night, and its weight will be in the morning greater by one-fifth than when it was the evening before, the additional weight will have been caused by the accession of particles of water from the humid atmosphere.

ON THE POSSIBILITY OF DISCHARGING FIRE-ARMS WITHOUT PRODUCING A SOUND.

I conceive if it were possible to bring to pass, that there should be no air pent at the mouth of the piece, the bullet might fly with small or no noise: For first it is certain there is no noise in the percussion of the flame upon the bullet, next the bullet in piercing through the air, makes no noise, and then if there be no pent air to strike the open air, there will be no cause of noise; and yet the flying of the bullet will not be stayed, for the motion of it is in the parts of the bullet and not in the air. This may be tried by taking a small short barrel no longer than you mean to fill with powder, and laying the bullet in the mouth of it half out in the open air, no noise will follow the explosion.—Bacon.

BURNING GLASSES.

A conspiracy is said to have been laid in the reign of queen Mary, to kill that princess by means of a burning glass placed on the leads of a house which commanded a view of St. James' Park, where the queen was used to walk. The design is declared to have been discovered: there is no authentic account of the circumstance. It is to be doubted whether burning glasses had been brought to any such strength at that period of our history.

ON SOUND.

It is erroneously considered that the elision of the air is the cause of sound, and that the continuation of the elision is indispensable to the continuation of the sound, the falsehood of this proposition is proved by this, that the sound of a bell or string continues sometime after the string or bell has been struck, but ceases the moment their vibration is stopped by a touch of the finger; now if it was the elision of the air which caused the sound, the more touching of the string could not extinguish that motion of the air, it is plain then that the sound is produced by the result or springing back of the matter of the string or bill to its original place; that the continuation of the sound is caused by the continued vibration of the matter acting on the air, and that the stopping of that vibration causes the cessation of the sound. But there is a much stronger proof that air is not necessary to the existence of sound, for dip a pair of tongs into a vessel of water, and strike the ends of them against each other while immersed in the water, and you will hear the sound of the percussion clearly, yet there is no air at all present within the water, to produce the sound.

Or this; strike two hard bodies together in the midst of a flame, and the sound will differ little from that made by the same bodies in the air.

MAKING GOLD.

Bacon gives the following as a probable means of making gold on principles of natural philosophy.

Let there be a small furnace made, of a temperate heat; let the heat be such as may keep the metal moulten and no more; for the material, take silver, for that is the metal which symbolizeth most with gold; put in also, with the silver, a tenth part of quicksilver, and a twelfth part of nitre, by weight: both these to quicken and open the body of the metal; and so let the work be continued for the space of six months at least; there may be also some oiled substance put in to lay the parts more close and smooth, which is the main work. Note; to make gold of quicksilver because it is the heaviest, is not to be hoped; for quicksilver will not bear the manage of the fire: next to silver I think copper wire the best material." It is to be lamented, for the honor of philosophy, that the learned Bacon thought the acceptation of bribes for the corruption of his judicial integrity, a speedier way of making gold than the directions just quoted. What a remarkable proof he was of the nothingness of intellectual acquirements, unsupported by moral integrity; Pope justly described him—

"The wisest, brightest, meanest of mankind."

HOW TO PROCURE FRESH WATER.

Dig a pit upon the sea-shore somewhat above the high water mark, and sink it as deep as the low water mark, and as the tide cometh in, it will fill with water fresh and palatable. Cæsar knew this well when he was besieged in Alexandria; for in digging pits on the sea-shore, he frustrated the laborious works of the enemy, who had turned the sea water upon the wells of Alexandria. But Cæsar mistook the cause, for he thought that all sea sands had natural springs of fresh water; but it is plain that the water produced is sea water, because the pit fills according to the nature of the tide; and the sea water, passing or straining through the sands, leaves the saltness behind.

POLYGAMY.

(*From Sir J. Mackintosh's Account of the Population of Bombay.*)

One of the most curious results which these documents afford, is that relating to the proportions of the two sexes, and to the extent in which polygamy prevails in India. A philosopher, (Montesquieu) misled by travellers, too much disposed to make general inferences from a few peculiar cases, and pleassd to discover a seeming solution of the repugnant systems of domestic life adopted in Europe and in Asia, supposes the polygamy of eastern nations to be the natural consequence of the superabundance of woman produced in warm climates:—Mr. Bruce attempts to support this theory by a statement of a most extraordinary nature. According to him, in Mesopotamia, Armenia, and Syria, the proportion of births is two women (and a fraction) to one man; from Fatakia to Sidon it is two and three fourths to one man; from Suez to the Straits of Babelmandel the proportion is fully four to one man, which he believes holds as far as the Line, and 302 beyond it. But facts are directly opposed to this statement. By the report of Mr. Ravenshaw, contained in the very instructive travels of Dr. Francis Buchanan, we learn that in the southern part of the province of Canara, the whole number of the inhabitants was 896,672, of whom the males were 206,633, the females 190,039. The same excess of males above females is, he tells us, to be found in the Barra Mahl and other parts of the peninsula where accurate enumerations have been made. The return of deaths in the island of Bombay, for nearly eight years, establishes the same fact with respect to the whole population, and to each of the classes which compose it.

It is well known that the Mahometans are the only class of men in India who practice polygamy to any considerable extent. Out of 20,000 Mahometans in the island of Bombay, only about 100 have two wives, and only five have three; so inconsiderable is the immediate practical result of a system which, in its principles and indirect consequences, produces more evil than perhaps any other human institution, so insignificant is the number of those for whose imagined gratification so immense a body of reasonable beings are degraded and enslaved.

It is remarkable that the only apparent superiority of the number of females is in some of the returns of the Christian congregations, where polygamy is of course unknown. It is reasonable to refer this small exception to accidental causes, which inquiry will probably discover.

THE ENGLISH OAK.

The Oak, stiled the *Monarch of the Woods*. This tree grows in various parts of the world, but that produced in England is found the best calculated for ship-builing, which makes it so highly valuable. The oak gives name to a constellation in the heavens (*Robur Caroli*) the Royal Oak, named by Dr. Halley in 1676, in memory of the oak tree in which Charles II. saved himself from his pursuers, after the battle of Worcester; this famous oak grew near the borders of Shropshire, twenty-six miles from Worcester.

This valuable tree sometimes grows to a great size; one was felled at Wooten Park, Herts, which measured twenty-four feet round, and sold for 43*l*. One in Hainault Forest, near Barking, in Essex, known by the name of Fairlop, measures thirty-six feet in circumference. This enormous tree covered an area of 300 feet in circuit, under which an annual fair has been long held on the first Friday in July, called Fairlop Fair, and no booth is suffered to be erected beyond the extent of its boughs. A Society formed of distinguished characters of ladies and gentlemen of the county of Essex, under the name of the "Hainault Foresters," march in procession, at stated times, round this chief of the sylvan race, dressed in elegant uniforms, and attended by a band of music. In Dr. Hunter's Evelyn's Sylvia, there is a figure of a venerable oak at Cowthorp, in Yorkshire, of forty-eight feet in circumference, within three feet of the ground.

"Let India boast her plants, nor envy we
The weeping amber and the balmy tree,
While by our oaks the precious loads are borne
And realms commanded which these trees adorn."
POPE.

"The monarch oak, the patriarch of the trees,
Shoots rising up, and spreads by slow degrees;
Three centuries he grows, and three he stays
Supreme in state, and in three more decays."
DRYDEN:

"As o'er the aerial Alps, sublimely spread,
Some aged oak uprears his reverend head;
This way and that the furious tempests blow,
To lay the monarch of the mountains low

Th' imperial plant, tho' nodding at the
sound,
Though all his scattered honours strew the
ground;
Safe in his strength, and seated on the rock,
In naked majesty defies the shock;
High as the head shoots tow'ring to the
skies,
So deep the root in earth's foundation lies."

PITT.

The oak produces nut-galls, which contain a peculiar acid called the gallic acid, and tannin, or the astringent principle; they form a principal ingredient in ink, and are used as a dye-stuff. Galls are chiefly brought to us from Aleppo, hence called Aleppo galls; they are globular excrescences that grow on the hardest spices of oak, being the shells in which an insect breeds, and when grown to maturity gnaws its way through, which is the cause of the little holes in them.

THE LITERATURE AND SCIENCES OF THE SARACENS AND TURKS.

Whoever travels in Asia, especially if he be conversant with the literature of the countries through which he passes, must naturally remark the superiority of European talents. The observation, indeed, is at least as old as Alexander; and though we cannot agree with the sage preceptor of that ambitious prince, that "the Asiatics are born to be slaves," yet the Athenian poet seems perfectly in the right, when he represents Europe as a sovereign princess, and Asia as her handmaid: but if the mistress be transcendantly majestic, it cannot be denied that the attendant has many beauties and some advantages peculiar to herself. If reason be the grand prerogative of the people in the Western world, the Asiatics have soared to the loftiest heights in the sphere of imagination.* When we read the praises which Eastern scholars so warmly bestow upon the heroic verses of Ferdousi, the didactic strain of Sadi, and the lyre of Hafiz, who is there that does not lament his ignorance of the great originals, and think with regret, that most of the translations which we possess of Oriental poetry, have been performed by men of little genius or taste? Yet even through the dark medium of a wretched version, we can often discover an animation of description, a boldness of metaphor, and a strength of expression, which nothing but a mind prejudiced by one standard of excellence can fail to admire: and if the manuscripts which are within the reach of Oriental scholars were stripped of their thick coat of fable, and published with the usual advantages of illustrations and notes, a new and ample field would be opened for speculation: we should obtain a more extensive insight into the history of the human understanding; we should acquire a new fund of images and similitudes; and a variety of excellent compositions would be brought to light, which future scholars might explain, and future poets imitate.*

If the Asiatic nations of the present day appear to be overspread with the shade of ignorance, the times have been, when many parts of our boasted science were familiarly taught in Egypt and Hindustan. It is true, the results of the Calcutta Society have shewn many of the received opinions on the merit of Oriental literature to have been erroneous; yet it should be remembered, that the expectations of the world had been unlimited, and the history of the philosophy and religion of Asia is still incomplete. Some facts, however, appear to have been established. The systems of the philosophers of old were not originally formed in Greece. The six philosophical schools, whose principles are explained in the Dersana Sastra, comprise all the metaphysics of the old Academy, the Stoa, the Lyceum. Pythagoras and Plato penetrated into the mysteries of the priests of Egypt and the Magi of Persia.† The works of the Sage, which are said to contain a system of the universe, founded on the principle of attraction and the central position of the sun, are well

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* Jones's Dissertation on the Literature of Asia.

* Traite sur la Poesie Orientale. Jones's Works, vol. 5, p. 447, 4to. Thus, if the treatises on Algebra, which Mr. Colebrooke has lately translated from the Sanscrit into English, had been translated earlier, some addition would have been made to the means and resources of Algebra, for the general solution of problems which have been re-invented, or perfected, in the last two centuries in France and England. Prelim. Diss. p. 2, 4. It has been proved, that the Hindus had made a wonderful progress in some parts of Algebra; that in the indeterminate analysis, they were in possession of a degree of knowledge, which was in Europe first communicated to the world by Bachet and Fermat, in the seventeenth, and by Euler and La Grange, in the eighteenth century. Asiatic Res. vol. 12, p. 160.

† Cicero Tusc. Quest. 4. 19. 25. De Finibus, 5. 25. The Pythagorean, Manichean, and other famous systems of religion and philosophy, may clearly be deduced from the Hindus. See Mr. Halhed's translation of the Upaneeshad; or Commentaries upon, and Paraphrases of, the Vedas. Brit. Mus. Add. MSS. 5658; and also Bartholomeus, Mus. Borg. Velitris Codd. MSS. Romæ, 1790, p. 186, 197.

known by the learned Hindus.* The annals of Asiatic philosophy, and particularly in their connection with Grecian letters, are still incomplete; the claims, for instance, of the Hindus to the invention of what is called the syllogistic theory of Aristotle, are yet in question. The history of literature abounds with other rich and interesting subjects. The history of literature abounds with other rich and interesting subjects. The torch of science has been frequently kindled in Asia, and even the stern fanaticism of the Saracens yielded to the mild influence of letters.

Rude and unlettered people have generally been the founders of empires; and certainly the Arabians possessed in a high degree this claim to the inheritance of the world. Their history is divided into the two periods of ignorance and Islamism, and the division may include the literary, as well as the religious state of the country.† "The people of the book," was the honourable title of the Christians and Jews. The barbarous natives despised not the want of letters in the great Prophet of Mecca. Yet the spirit of Muhammed was liberal. In a noble admiration of science, he could exclaim, that "a mind without erudition was like a body without a soul," and that "glory consists not in wealth, but in knowledge." Absorbed, however, with the ideas of the conquest or conversion of the world, the early successors of the Prophet held in equal contempt the learning and the religion of their new subjects and tributaries.* When, however, the ages of violence and rapine were succeeded by those of security and peace, and Bagdad arose a fair and splendid city, the muses were courted from their ancient seats on the shores of Greece, to expiate the guilt of conquest and illustrate the reigns of the Abassides.—*Mills' History of Muhammedanism.*

(To be continued.)

* As we learn from Cicero, that the old sages of Europe had an idea of centripetal force, and a principle of universal gravitation (which they never indeed attempted to demonstrate), so I can venture to affirm, without meaning to pluck a leaf from the never-fading laurels of our immortal Newton, that the whole of his theology, and part of his philosophy, may be found in the Vedas, and even in the works of the Sufis. The most subtil spirit, which he suspected to pervade natural bodies, and lying concealed in them to cause attraction and repulsiou, the emission, reflection, and refraction of light, electricity, calefaction, sensation, and muscular motion, is described by the Hindus as a fifth element, endued with those very powers; and the Vedas abound with allusions to a force universally attractive, which they chiefly attribute to the sun. Jones on the Philosophy of the Asiatics. Asiatic Res. Vol. 4. p. 169.

† Pocock says, so great was the ignorance of the Arabians, that at the time of the promulgation of the Koran, there was not a person in the province of Yemen who could read or write. But I think that this remark is only correct so far as it relates to the Cufic characters of the Arabic language. This stile had been invented a short time before the birth of Muhammed, and the Koran was written in it. We can readily conceive, that the Cufic character was unintelligible to a people who had always been accustomed to the Hamjarik mode; the latter of which is also unintelligible in the present days to the Muhammedans themselves. Pocock, Specimen, p. 153. Niebuhr, p. 83, 84, note.

* The Saracens, as well as other good people, occasionally condemned books "au feu." Their most pious act in this line, was destroying a large library at Alexandria: it was done by order of the Caliph Omar, when Amrou conquered Egypt. The fact does not, as I once thought, rest on the sole authority of Abul-Pharajius; Macrisi, and also Abdollatif, the writer of a work expressly on Egyptian antiquities, mentioned the circumstance. I hesitated, with Langles, from crediting the story on the authority of Abul-Pharajius alone; but the authorities of Macrisi and Abdollatiff removed my scepticism. But when we talk of the destruction of the Alexandrian library, let us not be deceived by words. It must not be imagined, that the library of the Ptolemies was the one which the Saracens pillaged. That was destroyed in Cæsar's time; and the new collection which Cleopatra formed, was dissipated in the wars which the Christians made upon the Pagans, A. D. 300. The literary value of the library which the learned men of Alexandria subsequently formed, we know not. Abul-Pharajius says, the books were dispersed through the baths of Alexandria, and in half a year they were consumed. The number of books he neither says nor insinuates. To the disgrace of the Christian world the barbarous conduct of the Saracens remained unavenged for eight centuries. The great and good Ximenes thought, like his worthy countrymen the curate and barber in Don Quixote, that fire would purify the mind from all diseases, infidelity and madness not excepted; he therefore burnt and destroyed all the Muhammedan books he could collect, not even sparing their gold and silver ornaments, although the Saracens promised to convert them to other purposes. The Cardinal, however, knew very well that the word of an infidel was as little to be trusted as that of an heretic. Piety was his shining virtue, and knowing that the theology and philosophy of the Saracens were closely mixed, he would not save the former for the sake of the latter.

THE CHAMELEON.

"A Chameleon is a creature about the bignesse of an ordinary lizard: His head unproportionably bigge; his eyes greate: he moveth his head without the writhing of his necke, (which is inflexible), as a hogge doth. His backe crooked: his skinne spotted with little tumours, less eminent nearer the belly: his taile slender and long: On each foot he has five fingers—his tongue of a marvellous length in respect of his body, and hollow at the end; which he will launch out to prey upon flies. Of colour green and of a dusky yellow brighter and whiter towards the belly: yet spotted with blue white and red. If he be laid upon green the green predominateth—if upon yellow, the yellow—laid upon black, he looked all black. He feedeth not only upon aire (though that be his principal sustenance) for he sometimes taketh flies. Yet some have kept Chameleons a whole year together, and never could perceive that they fed upon any thing else but air."—Bacon.

So far his Lordship on this disputed point. But there is a notion which was generally entertained in the Sixteenth Century among Bacon's contemporaries, respecting another property of the Chameleon, and we think it worthy of record and remark. They supposed that if a Chameleon were burned on the top of a house or high building, it would occasion a violent tempest. This fancy would seem to have its origin in the notions of sympathy and magical influence which were so prevalent in that day; and the sages of the period alluded to, were doubtless of opinion that, inasmuch as the Chameleon was supposed to live upon air, the burning and decomposition of its body could not fail to produce serious effects upon that element. Yet while we smile at the dreams of those early philosophers, and hold their various conjectures sometimes but lightly; it must be acknowledged that they ascertained and established many old truths, added not a few fresh facts, and pointed out innumerable theories, many of which subsequent enquiry and experiment have tended to establish on the firmest foundations. Thus were they the (sometimes) ignorant prophets of future discoveries; and in their crude conceptions frequently exists the germ of important principles, which it remained for the scientific acuteness of our own day to ascertain and develope.

LORD BACON'S OBSERVATIONS ON THE PROPERTIES AND EFFECTS OF SNOW ON VEGETATION.

"Snows, lying long, cause a fruitful year; for first they keep in the strength of the earth; secondly they water the earth better than rain; for in snow, the earth doth (as it were) suck the water as out of the teat. Thirdly, the moisture of snow is the finest moisture; for it is the froth of the cloudy waters."

BEAR'S GREASE.

"You may turn all flesh into a fatty substance, if you take flesh and cut it into pieces, and put the pieces into a glass covered with parchment; and so let the glass stand six or seven hours in boiling water. It may be an experiment of profit for making of fat or grease for many uses. But then it must be of such flesh as is not edible, as horses, dogs bears, badgers, &c."

Mr. Atkinson should look to this: but we doubt not he and the other nurturers of bears have studied Verulam, and founded their doctrine of the *crini generativeness* of bears grease upon the principal "of sympathie" between the hairy coats of our friend the bears, and the bald heads of Sexaganarians. What saith his Lordship?

"Beasts are more hairy than men, and savage men more than civil." But now the converse of the proposition holds.

"It was observed in the great plague of the last year, that there were seen in divers ditches and low grounds about London, many toads that had tails two or three inches long at the least; whereas toads usually have no tails at all. Which argueth a great disposition to putrefaction in the soile and aire. It is reported, likewise, that roots, (such as carrots and parsnips), are more sweet and luscious in infectious years, than in other years.

"A man leapeth better with weights in his hand than without. The cause is, for that the weight (if it be proportionable) stregtheneth the sinews, by contracting them. For otherwise, where no contraction is needful, weight hindereth. As we see in horse races, men are curious to foresee that there be not the least weight upon the one horse more than upon the other. In leaping with weights, the arms are first cast backwards, and then forwards with so much the greater force; for the hands go backward before they take their race."

OBSERVATIONS UPON MORTIFICATION BY COLD.

"In the cold countries, when men's noses and ears are mortified, and as it were gangrened by cold; if they come to a fire, they rot off presently. The cause is, for that the few spirits that remain in those parts are suddenly drawn forth, and so putrefaction is made compleat. But snow put upon them helpeth; for that it preserveth those spirits that remain till they can revive: and beside snow, hath in it a secret warmth; as the monk proved out of the text—'Qui dat nivem sicut lanem, gelu sicut cineres spargit.' Whereby he did infer that snow did warm like wool, and first did fret like ashes. Warm water doth also good: because by little and little it openeth the pores without any sudden working upon the spirits. This experiment may be transferred unto the cure of gangrenes, either coming of themselves, or induced by too much applying of opiates! Wherein you must beware of dry heat, and resort to things that are refrigerent, with an inward warmth and virtue of cherishing.

CEMENTS.

There have been found under earth, certain cements that are very soft, and which when placed in the sun become as hard as marble. There are or were certain ordinary quarries in Somersetshire, in which the stone cut soft to any size, and when placed in the building proved firm and hard.

EXPERIMENT WITH SUGAR AND WINE.

Put sugar into wine, part above the wine, and part immersed in it, the part above the surface will soften and dissolve sooner than the part below; the cause is, that the wine enters the part within it, by simple infusion or spreading, but the part above the wine is forced by sucking also; for all spungy bodies expel the air and draw in liquor if it be contiguous; as may be also seen in spunges placed over a surface of water.

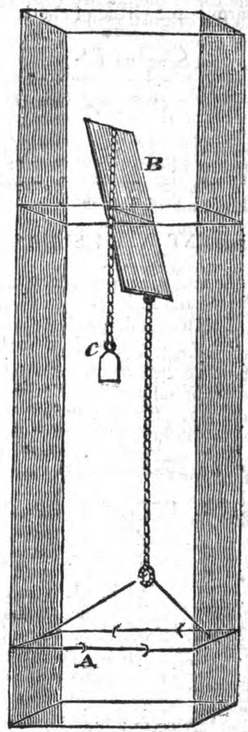
POWERFUL EFFECTS OF CHARCOAL.

The destructive nature of the vapour of charcoal in a close room is well known, many have perished by it. It is more dangerous, inasmuch as it produces no bad smell to notify its approach, but steals on by little and little, bringing on a gradual faintness without any manifest or perceptible suffocation. It is told of some Dutchmen who wintered in Nova Zembla, that in collecting materials for a fire, they gathered some charcoal, or, as the narrative, "Sea cole." At first they felt much refreshed by the heat; but after a little time a general silence grew upon them as they sat round the fire, which was succeeded by a general reluctance to converse any further; immediately after, one of them, the weakest, fell into a swoon, and a short time after another fainted; on this a suspicion arose as to the cause of the general torpid state of the company; one of them opened the door to admit air to the men who had swooned, this was no sooner done than the entire party recovered the freedom of respiration and former state of spirits. The torpid effect appears to have been produced by the inspissation or thickening of the air by the vapour of the charcoal, and the consequent inspissation of the breath and of the spirits. The son of a celebrated chemist on the continent, killed himself a few years ago by voluntarily locking himself up in a close room, lighting a fire of charcoal, and inhaling the vapour of it; he was so calm and philosophical in his act of self destruction, that he placed his watch, with paper, pen and ink, on the table, by which he sat and noted down in writing the progressive effects caused by the vapour on his system every advancing half minute. On bursting open the door, he was found dead on the chair, the written observations concluded by an illegible scrawl, which he was supposed to have written the moment before he became quite insensible, and to have been unable to write in an intelligible form, by the actual stupefaction of his faculties.

AN ACCOUNT OF THE REMARKABLE ACCUMULATION OF THE EXUVIÆ OF BEARS, IN A CAVE AT KULOCH, IN FRANCONIA.

The cave of Kuloch is more remarkable than all the rest, as being the only one, except that of Kuckdale, in which the animal remains have escaped disturbance by diluvial action; and the only one, also, in which I could find the black animalf earth, which many writers appear to have mistaken. The diluvial sediment, in which the bones are so universally found embedded, the only thing at all like it, which I could find in any of the other caverns, were fragments of highly decayed bone, which occurred in the loose part of the diluvial sediment in the caves of Scharzfeld and Gailinruth; but in the cave of Kuloch it is far otherwise—in this single cavern, (the size and proportions of which, are nearly equal to those of the interior of a large church) there are many hundreds of cart loads of black animal dust, entirely covering the floor to a depth, which must average at least six feet, and which if we multiply this depth by the length and breadth of the floor, will be found to exceed 5000 cubit feet. The whole of this mass has been again and again dug over in search of teeth and bones, which it still contains abundantly, though in broken fragments. The colour of them is a black, or rather dark umber throughout; many of them crumble under the finger into a soft dark powder, resembling mummy powder, and of the same nature as that of the dark earth in which they are embedded. Many hundred, I may say thousand, individuals must have contributed their remains to make up this surprising and appalling mass of the dust of death. It seems principally to be derived from comminuted and pulverized bone, for the fleshy parts of animal bodies produce by their decomposition, so small a quantity of permanent earthy residuum, that we must seek for the origin of this mass principally in decayed bones. The cave is so dry that the black earth lies in the state of black powder, and rises in dust under the feet: it also retains so large a proportion of its original matter, that it is occasionally used by the peasants as an enriching manure for the neighbouring meadows. The exterior of the cavern presents a lofty arch in a nearly perpendicular cliff, which forms the left bank of the gorge of the Esbach, opposite the castle of Ratensteen, the depth of the valley below it is thirty feet, whilst above it, the hill rises rapidly and sometimes precipitously to 150 or 200 feet; the breadth of the entrance of the arches is about 30 feet, its height 20 feet. As you advance inwards, the cave increases in breadth and height, and near its inner extremity branches off into two large and lofty chambers, both of which terminate in a close round end at the distance of about 100 feet from the entrance; it is intersected by no fissures, and has no lateral communications, connecting it with any other caverns, except one small hole close to its mouth, and which also opens to the valley. These circumstances are important, as they will assist to explain the peculiarly undisturbed state in which the exterior of this cavern has remained, amidst the diluvial changes which have affected so many others. The inclination of the floor for about 30 feet nearest the mouth, is very considerable; and but little earth is lodged on it; but further in, the exterior of the cavern is entirely covered with a mass of dark brown or blackish earth, through which are disseminated in great abundance, the bones and teeth of bears and other animals, and a few small fragments of lime-stone, which have probably fallen from the roof, but I could find no rolled pebbles. The upper portion of the earth seems to be mixed up with a quantity of calcareous loam, which before it had been disturbed by the digging, formed a bed of diluvial sediment over the animal remains: but as we sink deeper, the earth gets blacker and more free from loam, and seems wholly composed of decayed animal matter. There is no appearance of either stalactite or stalagmite matter; the absence of pebbles, and the enormous mass of animal dust, indicate a less powerful action of diluvial waters, within this cave than in any other, except that of Kirkdale; to these waters still we must refer the introduction of the brown loam, and the formation of the present mouth of the cavern; from its low position so near the bottom of the valley, this mouth must have been entirely covered under the solid rock, till all the materials that lay above it, had been swept away, and the valley cut down to nearly its present base. The throat of the cave by which we ascend from the mouth to the interior, is highly inclined upwards, so that neither would any of the pebbles that were drifting on with the waters, that excavated the valley, ascend this inclined plane to enter the cave; nor would the external currents, however rapidly rushing by the outside of the mouth, have power to agitate (except by slight eddies in the lower part of the throat) the still waters in the bottom of the cavern, and which being quiescent, would deposit a sediment from the mud, upon the undisturbed remains of whatever lay on the floor.

SAFETY CHIMNEY.



Letter A is a pitched rope continued all round the chimney, a part of which must be passed through the ring at the end of the chain attached to the plate B.; at the other end of the plate hangs a weight.

The advantages of this plan over those we submitted last week, are as follow:—The pitched rope, by being placed to touch each side of the chimney, is more likely to take fire than when it is fixed to only one spot. It will be observed, that being brought lower in the chimney, it is nearer the part where it is probable the fire would commence; besides, in case of the fire being higher in the chimney, the pitched rope, by being placed so low, might be cut.

The valve being inside the chimney, cannot be acted upon by the wind; and requiring only a pivot to support it, the required motion would take place with more certainty than in the other plans.

Its use requires better explanation. The fire communicating to the pitched rope A., the chain gets free; the plate B. is instantly brought by the weight C. to a horizontal position, and completely closes the opening of the chimney.

For the use of the pitched rope we are indebted to the original projector.

This is a subject on which we feel much interested, combining, as it does, the advantages of increasing our safety, and improving the morals of a useful and intrepid body of men.

The infamous system of perjury practised by firemen to obtain the reward, is too well known to require our saying more on the subject, than merely mentioning it; however, as many of our readers may not be fully aware of the extent to which it is carried we shall therefore state two facts, in which we were a party concerned, not as sufferers, but as witnesses; for were we the former, our statements might be supposed to arise from a vindictive feeling, to draw the attention of those whom we wish to interest, from the importance of the subject to our supposed wish for retaliation. But we intend to confine ourselves to the facts which we only witnessed, and, as we said before, not suffered from; we are sure our friends will feel satisfied that we attack the evil upon general grounds.

The first fact to which we wish to call the attention of our readers, is the following:— Being at the house of a friend, where a French cook was employed in preparing some of the mysteries of his art, (or as a young surgeon would say "giving the gastric juice a job,") when using more fat than the pan would hold, he threw a quantity of it into the fire, which immediately blazed out at the top of the chimney. The servant was sent for the sweep, and having told him for what purpose he was wanted, and the number of the house, he returned into his subterraneous abode, and from a recess, dark and deep, roused a dingy agent, who was, like many others we could mention, passing his moments in ease and comfort upon that which he had scraped together in the world; and having fixed his eyes intently upon the *chiaro oscuro* countenance of his master gave the following information, "the moment I am gone, run and tell the fireman;" this being ended he emerged from the darkness, and motioned his fair and trembling guide to lead the way; she elegantly nodded assent and obeyed him; he followed in all the rattling pomp of brush and scraper. Well, having arrived at the scene of action, and the fire being taken out of the grate, he ascended, but neither fire nor soot could be found, and had he found any it would have been to his own disgrace, for he had swept the chimney but three days before; by this time his friends the firemen had arrived with their engines; one of those worthies obtained admittance, and called to the sweep to send down the fire, but in vain, for the sweep could send nothing down but mortar. Notwithstanding this, the fellow had the hardened impudence to summon the parties to Bow-street, where he swore the chimney was on fire, and that he saw it; he having so sworn, the parties were ordered to pay the fine; it was to no purpose they urged that it was a gross falsehood, which they could prove, but unfortunately, the witness was gone to France; they were told that if they chose to incur the trouble and expense, they might gain redress by an indictment for perjury.

The second fact is curious enough, for it happened that two of these conscientious gentlemen swore against each other; but one of them happened to be able to bring forward a *respectable* witness, in consequence of which, his oath was taken in preference to that of the other.

We have submitted the original plans, together with what we conceive to be an improvement; and although they may not possess all the necessary requisites, we may be fortunate enough to lay the groundwork for improvement, and we hope, perfection, which we feel convinced would, in course of time, cause an alteration to be made in the Act of Parliament, which, by the present abuse is distorted into a shield for perjured robbery.

LONDON MECHANICS' INSTITUTE.

At the close of the Lecture on Wednesday evening, Doctor Birkbeck announced, that Mr. Black, having kindly consented to devote two evenings in each week, viz. Mondays and Thursdays, to the instruction of two classes of pupils in the French language, the committtee are anxious to divide the classes in such a manner as to be most suitable to the convenience of the pupils; it is therefore requested, that all those members who have given notice of their intention to avail themselves of Mr. Black's instructions, will take the earliest opportunity of calling at the Office of the Institution, in Southampton Buildings, to sign their names and addresses in a list, specifying whether it will be most agreeable to their respective avocations to attend the Monday, or the Thursday evening Class.

Mr. Partington not being able to complete his arrangements for commencing his course of Lectures on Optics, by Friday evening in the ensuing week, a Lecture will be delivered on that evening by Dr. Birkbeck, on Acoustics, or the Theory of Sound, and Mr. Partington will deliver the Lecture of his course on the following Friday, the 21st inst.

We are happy to hear, from Correspondents in Dublin and Norwich, that Mechanics' Institutions have been formed in those places, in which the journeyman mechanics themselves will form the greater portion of the Committee.

QUERIES.

Man in inquisitiveness should be strong,
From curiosity doth wisdom flow:
For 'tis a maxim I've adopted long,
The more a man inquires the more he'll know.
PETER PINDAR.

To the Editor of the Mechanics' Register.

MR. EDITOR.—I should feel obliged by the insertion of the following queries for explanation by some of your numerous readers.

Southville. S. HOLLANDS.

1. In what manner am I to obtain the contents of a bottle of wine, without drawing the cork, perforating it, or breaking the bottle?

2. What relation is that child to its father, who is not its own father's son?

3. If a lion can eat a sheep in five minutes, a wolf in eight, and a dog in ten,—how long will they be all together?

4. It being possible, by transposing the letters of the word "STARCH," to produce in the whole, 32 words,—they are required?

A gentleman has a square garden, planted with trees, the number of which are twenty-four, planted in twenty rows, and in every row three trees. In what form are they planted?

SIR,—Having been for some time much afflicted with worms, and being unable to pay for proper advice, I should be obliged, if any of your kind correspondents will inform me, through the medium of your Register, of any remedy for that disorder.

Yours, &c. W. H.

SIR,—As your Work appears to be a vehicle of information of every description, I beg leave to ask the following question, hoping to obtain an answer.

The best method of jugging a hare?

Yours, W. W.

SIR,—Having a wish to paint a small transparent blind for a window, merely for amusement, I should be glad to ascertain, through the medium of your valuable Register, the best means to prepare canvas or muslin for the purpose of transparent oil painting. By inserting this in your Register you will oblige your constant reader,

JEMIMA F.

SIR,—Being a subscriber to your Register, I wish to obtain all the useful information through it that is possible; I therefore wish an answer to the following: The best process of making a powder to clean plate, without the pernicious ingredient of quicksilver.

A DOMESTIC.

SIR,—I am a poor working man, with a wife and three children, and being troubled with an asthma, would be glad if some benevolent physician would favour me with a prescription, and attach his name to it that I may not be imposed on. Hoping that you will insert this, as a reply will benefit thousands, I remain your well-wisher,

A HARD WORKING MECHANIC.

ANSWERS TO QUERIES.

TO CLEAN BOOT TOPS.—The following genuine receipt may be fully relied on for actually producing this desirable effect, as well as for readily taking out grease, ink-spots, and the stains occasioned by the juice of fruit, red port wine, &c. from all leather or parchment. Mix in a phial one drachm oxymuriate of potash, with two ounces of distilled water, and when the salt is dissolved, add two ounces of muriatic acid. Then, shaking well together in another phial, three ounces of rectified spirit of wine, with half an ounce of essential oil of lemon; unite the contents of the two phials, and keep the liquid thus prepared closely corked for use. This chemical liquid should be applied, with a clean sponge, and dried in a gentle heat, the boot tops may be polished with a proper brush so as to appear like new leather.

VARNISH FOR PRINTS OR MAPS.—Take isinglass four ounces, separate it into small pieces, boil it in a quart of brandy or other strong spirit; when it becomes the consistence of strong glue, by being a little exposed to the air it will be ready for use. With this glue, while hot, wash over the print as quick as possible, and let it stand for a day or two to dry well; do this two or three times. when it should be varnished with the white varnish, made as follows. Should it at any time afterwards be soiled by flies, &c. it may be washed with a sponge and clear water.

The white varnish is usually made of gum sandarac and gum mastic, dissolved in spirits, and left two days to settle, then strained through a linen cloth, and after standing some time, the clear poured off and bottled for use.

TO STAIN GLASS OF VARIOUS COLOURS.—Procure a large piece of crown glass, and place the design (which should be previously drawn on paper) beneath the glass; then brush the upper side of the glass with gum water, and when dry, it will form a surface proper for receiving the colours, without danger of their spreading or running. The outlines of the design are then to be drawn with a fine hair pencil, in a black or blue colour, and when dry, the colours are to be laid on with larger brushes. After the colours are all laid on, they are to be again taken off those parts which are intended to be very finely done; this may be done with a goose-quill, cut like a pen, but without a sit. The glass must now be burned in order to fix the colours, or to stain the glass with the colours which have been laid upon it. This operation is best performed in an assayer's furnace, the fire of which must be allowed to die away gradually. as soon as the colours are found to be perfectly fixed, otherwise the glass would become too brittle. The following are the principal recipes for preparing the colours:

For a Red Colour.—Take one ounce of powdered red chalk, and mix it with two ounces of white hard enamel,* and a small proportion of the scales of copper, which fall off when much heated in a forge. This will make a very good red, but it should be tried whether it will stand the fire, and if not, add more of the copper scales.

For a Flesh Colour.—Take one ounce of red lead, and two ounces of red enamel,† pound them to a fine powder, and grind it with brandy upon a hard stone. This mixture, when slightly baked, will produce a fine flesh colour,

For a Black.—Take equal parts of iron scales, and of small beads or fragments of glass, pound them exceedingly fine, and grind them to a consistence to work with a pencil.

For a Brown Colour.—Take one ounce of white glass or enamel, and half an ounce of good manganese; grind them first very fine with vinegar, and afterwards with brandy.

For a Green Colour.—Take two ounces of brass burned to a calx, two ounces of red lead, and eight ounces of fine white sand, reduce them to a very fine powder, inclose the mixture in a well luted crucible, heated in an air furnace for one hour, with a strong fire. When this mixture is cold, pound and grind it in a brass mortar.

For a Yellow Colour.—Dissolve fine silver in nitric acid, and precipitate it by an alkali; mix the precipitate with three times the quantity of pipe clay well burned and pounded. Observe, as this colour will run into the others, it must be painted on the back of the glass.

For a Blue Colour.—Take mountain blue and beads of glass, of each equal portions, grind them whilst dry to an impalpable powder, and proceed as with those before mentioned. Observe, all the above colours must be mixed up for the pencil with gum water in sufficient quantity to make them work well.

To Marble Paper.—The following is a recent discovery, by very simple means, and may be used for marbling book edges or sheets of paper: Grind on a marble slab, Prussian blue with a little brown soap and water, to a fine pliable consistency, that it may be thrown on with a small brush. Also, grind king's yellow in the same manner, with white soap; when green is intended for the ground colour, grind it with brown soap, and have king's yellow with white soap. Lake may be used for a ground colour, and flake white ground with white soap. Any colour of a light substance may be used for marbling.

Method of Marbling.—Pour hard clear water into any vessel large enough for marbling; throw on large spots of Prussian blue till the surface of the water is nearly covered; then throw on king's yellow in small spots, which will immediately run into streaks or veins in all directions. Press the article to be marbled lightly on the surface of the colours, which will make a beautiful marble and burnish well. The ground colour or that which is thrown on first, must always be ground with *brown* soap, and that for the veins with white soap.

Sir,—The following is the analysis of the crude acetate of copper or verdegris:—

	French.	English
Acetic acid -	29 3	29 62
Peroxide of copper	43 5	44 25
Water - -	25 2	25 51
Impurity - -	2 0	0 62
	100 0	100 00

Vinegar from Wood.—M. Stolze, an apothecary at Halle, has discovered a method of purifying vinegar from wood, by treating it with sulphuric acid, manganese, and common salt, and afterwards distilling it over.

Smith's Scouring Drops.—Oil of Turpentine, scented with Essence of Lemon.

Furniture Varnish.—White wax, 8 ounces; Oil of Turpentine, one pint.

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* White Enamel.—Mix 100 parts of lead and 25 of pure tin. Put the crucible into a crucible and calcine it, and as the calcination is effected, take out the calcined parts, and continue the heat until the whole becomes pulverulent. After this submit the whole to a second calcination: 100 parts of this compound are to be mixed with an equal quantity of sand, and 30 parts of common salt, and the whole to be fused in the bottom of a furnace in which potter's ware is baked.

† Red Enamel.—Mix equal parts of sulphate of iron (copperas) and sulphate of alumina (alum), fuse them together in their water of crystallization, taking care that they are well mixed. Continue to heat them until they are completely dry, then increase the fire so as to bring the mixture to a red heat. This last operation must be performed in a reverberating furnace. Keep the mixture heated till every part of it has assumed a beautiful red colour, which may be known by taking out a little of it from time to time, and suffering it to cool in the air.

PICTURE VARNISH.—Mastich 12 ounces, Venice Turpentine, 2½ ounces; Gum Camphor, 30 grains; pounded glass, 4 ounces; Oil of Turpentine, 3 pints and a half: pour off the clear liquor:—for Oil Paintings.

Yours, &c.
HENRICUS GULIELMUS B.

SIR,—Perceiving in No. 9 of your excellent Register, that a Constant Reader wishes to be informed of the best means of curing chapped hands and lips, I send you the following, not only as a cure, but as a preventative. After washing your hands and face quite free from dirt, whilst wet take a piece of honey on the end of your finger about the size of a hazel nut, rub it well over your hands and face, and then with a clean cloth wipe yourself quite dry; this repeat as you think needful. Not the least inconvenience will be experienced from the honey, but the hardest and roughest skin will become supple and soft.

Yours, &c.
A MECHANIC.

SIR,—In answer to your Correspondent, J. Mawbery of York, I would recommend his mother to take the following medicines; and which I have no doubt will afford her relief.

Take of calomel, 6 grains.

(Compound) Extract of colocynth, five grains.

Make two pills to be taken at bed time.

And also take of infusion of senna half an ounce; purified Epsom salts, 2 drams; cinnamon water, 1 ounce.

Make a draught to be taken the following morning.

And also, in answer to your other Correspondent, I would advise a little spermaceti ointment to be applied to his chapped hands and lips night and morning, which will not fail to heal them.

I remain, Sir,
Your Obedient Servant,
H. W. DEWHURST, Surgeon, &c.
21, Francis-street, Tottenham Court Road.

SIR,—Having seen several queries in the 9th Number of your excellent Work, I beg you will insert the following answers to them from your constant reader and sincere well-wisher,

JUVENIS ADMIRATOR.

1. In answer to your Correspondent, C. S. the best thing to take off the varnish from paintings, is spirits of wine, which he is to rub on the painting with a piece of soft rag. The best way of cleaning them is to take a sponge and a little lukewarm water, and wash the picture, not all over at once, but beginning at one corner to wash a small part (about 4 inches square) at a time, and then dry it directly (if left wet too long, the water penetrates, and rots the canvas, and for this reason also, care should be taken not to wet your sponge too much); then go to another place, and proceed in the same manner till the whole is done.

2. I would inform W. M. that vegetables generate oxygen gas.

MR. EDITOR,—I have no wish, neither could I expect the pages of your interesting work to be devoted to any controversy, but as you have inserted in your last Number some observations from your correspondent J. E. T. in reply to G. B. C. on the subject of marbling book edges, I hope I may in my turn be permitted to exonerate myself in the eye of J. E T. for having (as so *flatly* stated by G. B. C.) misled him. I beg, therefore, to assure J. E. T. that I had no other motive in making the communication I did in No. 5 of the Register, than a desire to disseminate to others such information as I possessed myself: the directions forwarded by me were extracted from a little work in my possession, entitled "The whole Art of Bookbinding;" and from which I have for a similar purpose as that mentioned by J. E. T. gained much useful information, and practised the same with the fullest success.

Southville. S. HOLLANDS.

NOTICE TO CORRESPONDENTS.

Can Mr. Hollands favour us with another copy of his explanation of the Horizontorium? We have unfortunately mislaid it, or it should have appeared in this week's Number.

Juvenis Admirator's favours were duly received; want of room prevented their insertion.

We have received a variety of solutions to queries. One from T. D. R. and another from Mr. Taylor, shall, if possible, appear next week.

Various communications stand over.

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The London
MECHANICS' REGISTER

a short account of what you had do
of the advantages derived from you
And I pressed upon the consideration

PICTURE VARNISH.---Mastich 12 ounces, Venice Turpentine, $2\frac{1}{2}$ ounces; Gum Camphor 30 grains; pounded glass, 4 ounces;

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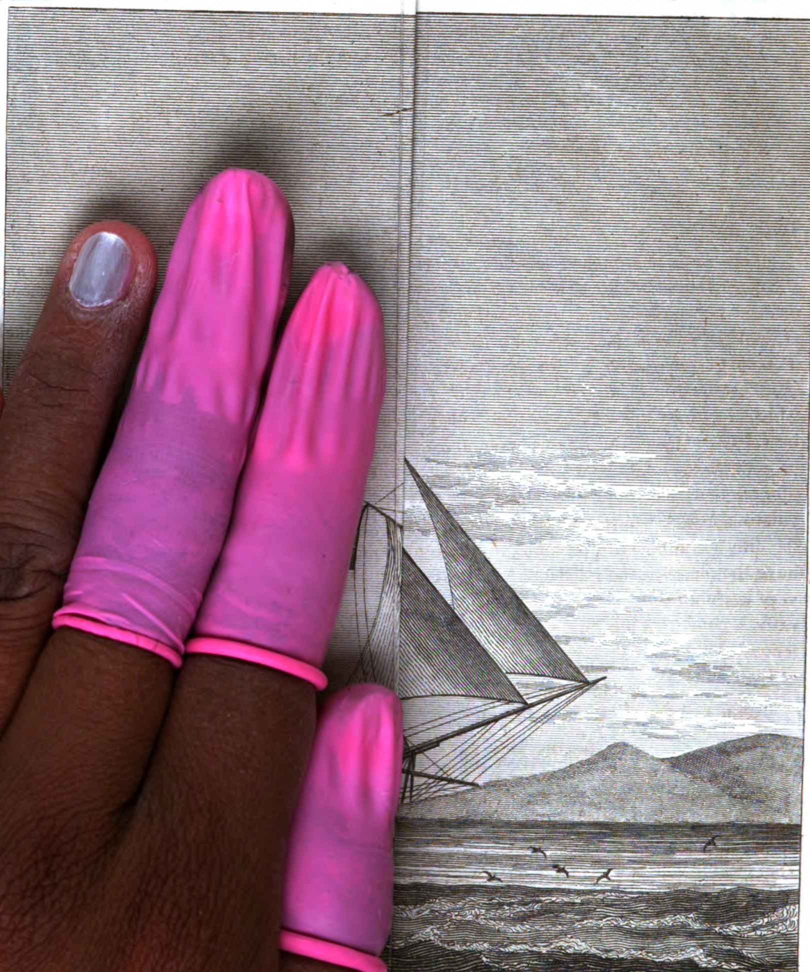


24, Fetter Lane, where ... requested to be addressed.

... Co., Paternoster Row; and may be had of all ...ers and Newsmen,

The London MECHANICS' REGISTER.

Man loves Knowledge, and the beams of Truth
More welcome touch his understanding's eye,
Than all the blandishments of sound his ear,
Than all of taste his tongue.—AKENSIDE.

No. 11.] SATURDAY, JANUARY 15, 1825. [Price 3*d*.

To the Editor of the Mechanics' Register.

50, Broad Street

SIR,—The following letter, which I lately received from my friend Mr. Bannatyne, one of the most enlightened and liberal-minded merchants in Glasgow, contains an interesting description of a small establishment, which ought to be universally known, and may, I am persuaded, with great advantage, be generally copied. If you can allot a portion of your well conducted and widely circulating Miscellany to this communication, its diffusion will be secured: and you will have the pleasure of giving publicity to the very laudable efforts of a little band of Operatives, combined to promote, in a most effectual manner, the intellectual improvement of each other.

I am, Sir,

Very faithfully your's,

GEORGE BIRKBECK.

Jan. 6, 1825.

Glasgow, Dec. 2, 1824.

My dear Sir,—It is long since I have had the pleasure of any direct communication with you, but I have from time to time heard of you from mutual friends, and latterly much and frequently through the newspapers, from your having been called upon to assist in establishing a system of instruction for mechanics and artizans in London, upon the plan of that which you originated here so many years ago.

I have long been anxious to see this excellent measure extended to all parts of the kingdom, and in the expectation of calling capitalists engaged in the cotton manufacture, to its benefits, I took the opportunity in an article which I drew up for the Supplement to the Encyclopedia Britannica on that manufacture, in the year 1817, to give a short account of what you had done, and of the advantages derived from your plan. And I pressed upon the consideration of the public the benefit that might be expected, if similar establishments were to be formed in all our manufacturing towns, and our artizans every where instructed in the science of their respective employments.

This desirable object appears now likely to be accomplished, and an extraordinary progress has been made towards it in the course of this last year.

My view in writing to you now, besides the pleasure of communicating again with an old friend, is to offer for your consideration a principle to be attended to in these establishments, which, from what I have had the opportunity of observing, appears to me to be essential to render them extensively and permanently useful.

The principle I allude to is, that of allowing the mechanics to conduct the establishment themselves, in place of the superiors managing it for them. In their own hands the object never loses its interest, and every thing that has taken place here tends to confirm this.

Some time after you left Glasgow, that desire for improvement with which you had inspired the operatives, began to abate, and the numbers attending the mechanics' class to decline. And this continued to be the state of things till the year 1808, when a library for the use of the persons attending the lectures was set on foot by Dr. Ure, and the management of it fortunately entrusted to a committee of their number, named annually by themselves. The feeling of importance attached to this charge, gave them a sense of self respect, and infused a new spirit into the whole body. It happened also to be the means of opening the way to other valuable results.

In consequence of some services rendered by Dr. Ure to the Gas Light Company here, when they were fitting up their works, and as an encouragement to the propagation of popular science, that Company agreed to light the mechanics' class-room, also their library, upon two evenings of the week when open for giving out books. The persons who came to change their books, were induced to remain in the library to converse upon what they had been reading, and a spirit of inquiry with a desire of distinguishing themselves in these evening communications, was gradually generated. This led in time to other consequences. The library committee, considering themselves as representing the whole body of mechanics, with whom they were brought so immediately into contact, began to assume importance, and even to claim a right to interfere with the trustees in some part of their management of this branch of the Institution. Some of their suggestions were acceded to; but they at last made demands which the Trustees did not feel themselves warranted to admit, and the effect was the secession of a great body of the Mechanics from the Lectures of the Andersonian Institution, and the formation of a new Mechanics' Institution supported, and managed by the parties themselves. This extended the spirit of improvement and desire of instruction beyond what could possibly have been anticipated. About a thousand students attended the Lectures given in the new Mechanics' Institution, last winter, while the numbers attending the Andersonian Lectures was scarcely diminished.

The facts of this detail, I think, afford satisfactory evidence of the necessity of keeping alive in the minds of the people, an interest in the measures intended for their improvement; and this, I am convinced, is in no way to be permanently accomplished but by leaving the establishments for this end, after they have been set agoiug, to the direction and support of their own members.

In further illustration of the principle I have been mentioning, I must beg to give you an account of what I am sure you will consider a very interesting little association, which you will perceive to have sprung from your measure of giving science to the working classes.

The Gas Light Chartered Company of this place, in which I hold a considerable interest, and of whose committee of direction I have for some years been a member, employ between sixty and seventy men constantly in the works. Twelve of these are mechanics, and the remainder furnace men and common labourers of every description; forming altogether a community not very promising, to be incited to measures for their intellectual improvement.

A little more than three years ago, our manager at the works, Mr. James Nelson, proposed to them to contribute each a small sum monthly, to be laid out in books, to form a library for their common use; and he informed them, that if they agreed to do this, the Company would give them a room to keep their books in, which they would heat and light for them in winter, and in which they might meet every evening after work-hours, to read and converse; instead of being tempted to go to the alehouse, as many of them had been in the practice of doing. That the Company would further give them a present of five guineas to set out with, and that the management of the funds, library, and every thing connected with the measure, should be intrusted to a committee of themselves, to be named and renewed by them at certain fixed periods.

With a good deal of persuasion he got twelve of them to agree to thr plan, and it was accordingly adopted. For the first two years, until it could be ascertained that they would take proper care of the books, it was agreed that they should not take them out of the reading-room, but meet there every evening to peruse them. After this period, however, they were allowed to take the books home; and last year they met only twice a week at the reading-room to change them, and to converse upon what they had been reading. The increase of the number of subscribers to the library was at first very slow, and at the end of the second year, the whole did not amount to thirty. But from conversing with one another twice a week at the library upon the acquisitions they had been making, a taste for science, and a desire for information, began to spread among them.

They had a little before this time, got an Atlas, which, they say, led them to think of purchasing a pair of globes. And one of themselves, Alexander Anderson, by trade a joiner, who had had the advantage of attending two courses of the Lectures in the Andersonian Institution, volunteered, about the beginning of last winter, to explain to them on the Monday evenings, the use of the globes. Finding himself succeed in this, he offered to give them on the Thursday evenings, some account of the principles, and of some of the processes in Chemistry and Mechanics, accompanied with a few experiments; and this he effected with a simplicity of illustration and usefulness of purpose that would have delighted you. He next, and while this was going on, undertook, along with another of the workmen, to attend in the reading-room during the other evenings of the week and teach such of the members as chose it, Arithmetic.

For the business of this season, the Library Society have made a new arrangement: for every thing is regulated by themselves.

The Members of the Committee have come under an agreement, to give in rotation a Lecture either on Chemistry or Mechanics every Thursday evening; taking Murray for their text book in the one, and Ferguson in the other; and they, a fortnight before, intimate to the person who is to do this, that he is to lecture from such a page to such a page of one of these authors. He has, in consequence, these 14 days to make himself acquainted with his subject, and he is authorised to claim during that period, the assistance of every Member of the Society in preparing the chemical experiments, or making the little models of machines required for illustrating his discourse.

It is a remarkable circumstance in this unique process of instruction, that there has been no backwardness found with any of the individuals, to undertake to lecture in his turn, nor the slightest diffidence exhibited in the execution. And this I can attribute only to its being set about without pretension or affectation of knowledge, and merely as a means of mutual instruction and improvement. And nothing, I conceive, could have been better devised for accomplishing this end. Indeed, I might with confidence say, that under this simple system of mutual instruction and improvement, which has grown out of the train of circumstances I have mentioned, these persons, many of whom when they joined the Society were in a state of complete ignorance, have acquired a clearer idea, and more perfect knowledge of the subjects which have been brought under their consideration, than would be found to have been attained by any similar number of students who had been attending the courses of lectures, given in the usual way by the most approved lecturers.

On the Monday evenings they have a volunteer lecture, from any Member of the Society who chooses to give notice of his intention, in either of these branches of science, or upon any other useful practical subject he may propose. And there is with the general body the same simple unpretending frankness and disposition to come forward in their turn that I have mentioned to exist among the Members of the Committee with regard to the lectures prescribed to them.

I think you will like my mentioning to you the subjects of their lectures this winter. They commenced the end of September, and were as follows:

First—On Solidity; Inactivity; Mobility; Divisibility.

Second—Attraction; Cohesion; Repulsion.

Third—Attraction of Gravitation.

Fourth,—Centre of Gravity, Expansion of Metals.

Fifth—Magnetism and Electricity.

Sixth—Central forces; All motion naturally takes a rectilineal line.

Seventh—Mechanical powers.

Eighth—The Lever; Wheel and Axle.

Ninth—The Pulley.

The volunteer lectures began the same week, and have been as follows:

First—Upon the Air Pump.

Second—Electricity.

Third—An Introduction to Chemistry, principally to shew chemical affinity.

Fourth—On the properties of the Atmosphere.

Fifth—On the Corn Mill.

Sixth—On Coal Mining.

Seventh—Practical Observations on the blasting of whin rocks.

Eighth—On boring, sinking, and mining; and the properties of Sir H. Davy's lamp.

N. B. The two lectures on mining were given by two labourers, who had worked in a coal-mine.

Ninth—On Optics.

Tenth—Practical Observations on the making of pottery ware.

The effect of all I have been relating to you, has been most beneficial to the general character and happiness of the individuals; and you will readily conceive what a valuable part of the community they are likely to become; and what the state of the whole of our manufacturing operatives would be, if similar measures were followed at every large work-shop. What might we not then be entitled to look for, in useful inventions and discoveries, from minds awakened and invigorated by the self-discipline which such a mode of instruction requires.

The Gas Light Company, seeing the beneficial consequences resulting from the instruction of their work-people, have fitted up for them this winter, a more commodious room to meet in, and for their lectures; with a small laboratory and workshop attached to it; where they can conduct their experiments, and prepare the models or machines to be used in the lectures. The men last year made for themselves, an air-pump, and an electrifying machine, and some of them are contantly engaged, during their spare hours, in the laboratory and workshop.

The whole workmen now, with the exception of about fifteen, have become members of the library, and these have been standing out, upon the plea that they cannot read. They are chiefly men from the remote parts of the Highlands, or from Ireland. But the others say to them, "join us, and we will teach you to read;" and I have no doubt of their soon persuading them to do so.

I send you a copy of their regulations drawn up by themselves, and of their catalogue of books, which amount now to above three hundred volumes; and the selection of which, so far as they have been concerned, you will allow to be creditable to them. One of the regulations I am sure you will be pleased with, that of every member being entitled to bring to the Lectures, his sons between the age of seven and twenty-one.

I happened to go into the Library one day, and found a parcel of books lying upon the table, which one of their Committee, who was in the room, told me they had just purchased, and called my attention to a great bargain they had got: Entick's History of the Seven Years War, in five volumes, handsomely bound, for eight shillings. I told him it appeared to me to be eight shillings misemployed. That they had already in Smollett the great part of what was necessary for them to know in that portion of history. He replied, that was true; but that they had a number of old soldiers among them, who were fond of reading of battles, and it was necessary to furnish food for them.

They admit no books on religion into the library; their body, they say, being made up of men of a variety of persuasions; Presbyterians, Seceders, Methodists, Church of England men, and Catholics; each of whom would be proposing to introduce books connected with their particular opinions, and give occasion to endless unprofitable disputes.

I think you will agree with me that there is much valuable instruction to be drawn from the history of this little Institution. And if this shall be your opinion, I would wish you to give publicity to this letter. For, an actual statement, of what this letter shews to have been so successfully and beneficially attained, and of the easy and simple means by which the object has been accomplished, circulated in the channels of a cheap periodical publication, is more likely than any thing I know of, to induce the Proprietors of large Works to offer to the people employed by them, similar facilities of improving themselves.

I am, with sincere regard,
My dear Sir,
Yours,
DUGALD BANNATYNE.

LONDON MECHANICS' INSTITUTE.

MR. COOPER'S LECTURE.

We regret that our reporter was prevented by an accident from reaching the lecture-room at the commencement of the lecture. When he entered, Mr. Cooper was explaining the nature and properties of carbonic acid gas. He stated that it was as ill-fitted to support animal life as combustion; the smallest animal plunged into carbonic acid gas, dies instantly: insects intended for preservation may be killed by it, with more ease to the operator, less pain to the animal, and with no injury to their colours. It may be useful to persons whose business consists in entering mines and wells, to know the following fact:—They should let a lighted candle descend before them; while the candle remains burning, they are safe, but if it should be extinguished without any apparent cause, then they should lose no time in retreating. This rule is founded on the well established principle, that the respiration of carbonic acid gas, will destroy life in confined spaces; it is well known that persons have been suffocated by the vapour of charcoal. Carbonic acid gas is produced in all cases where the combustion of charcoal takes place. Carbonic acid gas is heavier than atmospheric air; this is the reason why carbonic acid gas, or choke damp, is found in the bottom of wells, caves, and cellars; its specific gravity is greater than that of the atmosphere, by as much more. It does not support flame. These two last positions Mr. Cooper proved by experiment. Carbonic acid gas is absorbable by water: if both are contained in a glass, and the glass shaken, the water will be found to have absorbed the gas, and acquired a pleasant brisk taste. [This was shewn experimentally.] This compound was what is commonly known by the name of soda water; but in the commonly used preparations, there is no more soda than is sufficient to swear by.—(A laugh.) The water used in the last experiment, absorbed nearly an equal volume of gas, but in preparing soda water, by means of a condensing machine it is made to absorb six or seven times its own volume of gas. If a solution of lime be poured into it, the liquid will become opaque; but a small quantity of muriatic acid will make it transparent again, and the carbonic acid will escape. [This assertion was demonstrated.] There is one property more which, said the lecturer, I have to mention, namely, that of changing colours. By the agitation of water in a vessel with the gas, the acid will be absorbed; a piece of blue paper inserted will then become red; if it were exposed for some days to the air, or boiled, the carbonic acid would escape, and the blue colour return. [This he partly illustrated by experiment.] Whenever charcoal was burned, he stated, carbonic acid would be produced; even in the burning of a candle, where carbon and hydrogen were concerned. A proof of this was that if lime water (transparent) were put into a vessel, and the carbonic acid from the combustion of the candle conducted into the glass, the water would become turbid by the gas admitted from the combustion of the carbon, and a dew would be deposited on the sides of the vessel, in consequence of the combustion of hydrogen. In rooms close and full of lights, such as theatres, the air was said to be as liable to be contaminated with carbonic acid gas, as from a charcoal fire. Having mentioned the principal properties of carbonic acid gas, he would next show that it was a compound of carbon (or prepared charcoal) and oxygen. On the insertion of ignited charcoal into a vessel of oxygen gas, the combustion of the charcoal would go on quicker than in the atmospheric air. There was a period, he observed, when the combustion of the charcoal would cease; viz. when the oxygen was exhausted, and then the contents of the bottle would be changed into carbonic acid gas. Charcoal exists in a variety of forms, and in some degree in animal and vegetable substance. The most remarkable was the diamond. Carbon and diamond, the lecturer stated, were chemically the same; for carbonic acid was formed of charcoal and oxygen, and also made by diamond and oxygen. This he would prove, by burning with hydrogen, ignited by means of an electric spark some diamonds in a vessel full of oxygen gas. The consequence would be that the diamonds would disappear, and carbonic acid gas be produced. [This experiment failed in consequence of the removal of the diamonds from their proper position by the rush of the oxygen into the vessel.] Mr. Cooper promised a repetition of this experiment in the next lecture. Carbonic oxide gas, or gaseous oxide of carbon was produced by heating scales of iron and charcoal in a close retort; carbonic acid gas was produced in small quantity at the same time. This gas was produced also by carbonate of lime and filings of zinc. When inflamed it emitted a pale lambent light; it suffered combustion, and contained less oxygen than carbonic acid gas did. If gaseous oxide of carbon and oxygen were mixed in a proper vessel, and the electric spark passed through them, the result would be carbonic acid gas, and inflammation would take place at the moment of combustion. {This being tried experimentally, the inflammation was observed]. Lime water being poured in after, carbonic acid gas appeared to be the result of the combination of the two gases, carbonic oxide and oxygen. The lime made the liquid turbid. If oxygen gas were passed over ignited charcoal, the result would be carbonic acid gas. Mr. Cooper concluded his very interesting lecture by stating that his next (the last before he would lecture in the new Theatre) would be on the combinations of carbon with hydrogen.

At the close of the Lecture Dr. Birkbeck came forward, and expressed his regret that Mr. Partington could not commence his course on Optics sooner than Friday the 20th. The worthy President declared his own intention of giving a Lecture on Acoustics or the Theory of Sound. And he also stated Mr. Cooper's kind offer to examine, on a future evening, so many of the Members on the principles of chemistry, as may choose to prove their improvement in that science. The worthy President's announcements were received with hearty applause.

MR. BLACK'S LECTURE.

On Friday, January 7, Mr. Black gave his lecture explanatory of his system of teaching the French language.---The lecturer commenced by reading, as an account of the objects and effects of the Institution, the address pronounced by Dr. Birkbeck on laying the foundation of the new lecture-room. As that excellent composition has been given to our readers in a former number, we shall omit the insertion of it here. Mr. Black then proceeded to read an introductory address, containing some observations on the general state and probable progress of scientific information among the operative ranks of society, and dwelt at considerable length on the advantages resulting from the establishment of institutions for the diffusion of science amongst mechanics. This topic has been so forcibly and eloquently handled by many of the ablest practical and scientific men of the day, Dr. Birkbeck, Dr. Gilchrist, Mr. Brougham, Mr. Jeffery, and others, that a report of Mr. Black's observations would be unnecessary. We shall therefore proceed to the lecturer's observations on the proper subject of his lecture, language in general, and the French language in particular. He stated that he was able to simplify the elements of the language to such a degree, that he could communicate the knowledge of it in the course of a comparatively few easy lessons. By as much as the power of steam was superior to the forces of common labour, by so much was his system of teaching language superior to those generally used. The English language had been derived from the continental languages. The best way to acquire a knowledge of any, was to assist the study of that one by a contemporaneous study of another. Many of our inventions had been borrowed from the continental nations; commerce was a common source of intercourse between them and us. The French tongue was so commonly known in this country, that when quoted in print, it was not considered necessary to affix a translation of the quotation; there were many excellent works of science both speculative and practical printed originally in that language, but never translated into English; it was to be hoped that the time would come, when the cultivation of the French would become so general in the Mechanics' Institution, that the members may find it necessary to have those French works in their library, and be able to consult them in the original language in which they had been printed. The French was spoken in every city and great town on the continent, and a knowledge of it would enable a man to travel through all Europe. Why then was it not so generally spoken, or at least known in England? because the present methods of communicating it were extremely difficult to the learners. It would be his, Mr. Black's duty, to remove those difficulties, to simplify the rules, to make the study so easy as to be considered rather a relaxation than a toil of mind. His plan would be to translate extracts from celebrated French authors, He had published a work in two volumes on the principles of his plan, a specimen had been distributed among the members in a printed prospectus. His method of instruction was not calculated to torpify the faculties of perception, but to rouse, awaken, and exercise them. Here the lecturer gave a practical explanation of his system, by referring to a printed prospectus; he observed that the

English words being placed under their corresponding French words, those terms which were the same in both languages, rendered the *sub*-location of them in English unnecessary, the reader would understand when this identity occurred, by seeing a blank line under the French word. As instances of this identity, he pointed out the word *nature* in the second line of the prospectus, *empire* in the fourth, *science*, in the fifth, *guide* in the same line; and several other words through the page. He next observed that of those corresponding English and French terms which were similar in conformation, the identical parts were omitted in the underplaced English lines, this he illustrated by the word *condu*-it in the sixth line of the prospectus;

——- ct

de-couvr-e in the seventh, and charg-é in

dis —— ers ——— ed

the ninth. His next observation was, that the translation (of a French word,) once given, was not printed in any subsequent place. This he explained by referring to the word *royaume* in the sixth line where the English of it (kingdom) was subjoined, and to the same term in the seventh line where the translation is omitted, and its place supplied by a blank. Having given this illustration of his method of instructing by printed translation, Mr. Black called on one of the members, who might be ignorant of the French language, to translate the extract in the printed prospectus by the simple aid of the explanation first given. A member stood forward and translated the extract with considerable facility. The Lecturer proceeded. By this mode of translation, the mere listener would learn the language more easily and speedily than the book-student could by turning over the leaves of a dictionary. In his consideration of words, it was the Lecturer's intention to attend to the derivations, and the primary and secondary meaning; a circumstance rendered necessary by the many different, nay, opposite significations of one word. In Latin dictionaries this inconsistency was most frequent; but in the lately published French ones, the defect was partially avoided. Here he illustrated the difficulty resulting to a Frenchman from this diversity of the meanings of English words. The following is one of the possible instances of the perp'exity of a Frenchman in London, ignorant of the English language, and wishing to get some beer from the waiters in a tavern: he would have recourse for it to the sentence by which he would ask in his own language—*Garson donnez moi de la biere*—in trying to find English words for this by the assistance of a dictionary, he would find under *garson*, "a batchelor;" and under the word *biere*, "a coffin;" and meaning to order the waiter to bring him some beer, would address him with, "batchelor give me of the coffin:" the same mistakes may be made by an Englishman ignorant of French in Paris. Another point, to which Mr. Black would give his attention in the course of his tuition, would be the roots, affixes, prefixes, and euphonic interfixes. The English took a portion of their language from the Romans, the Saxons, and Norman French. In the medical and some other sciences, the technical terms were borrowed from the Greek language; the scientific terms are nearly the same in both English and French; as the English borrowed their military tactics from the French, so they borrowed their military terms. And of about 30,000 words in each language, so large a number as 15,000 were the same or similar, with very slight deviation. Here the Lecturer illustrated the prefixes, by referring to the third page of the prospectus, one prefix will explain the rest; the Latin preposition *de* (from) assists the learner in knowing the signification of the word, to which it is prefixed; as de-part, to part *from*; de-fame, to take fame *from* one—and so of the others. The knowledge of those prefixes was useful, indeed necessary, to understand the distinct meaning of the terms, and would tend to impress it more forcibly on the learner's mind. Here he referred to the French prefixes at the bottom of the third page of the prospectus. A-venir, to arrive at; con-venir, to come together, or agree; re-venir, to come again, or return, and so on. Mr. Black then alluded to Mr. Hamilton, who some time ago professed to teach the language in a few lessons. Mr. Hamilton's system was defective, inasmuch as it exercised the memory alone; but no method could be sure of success in this age, which should not employ every faculty of the mind, perception, association, judgment, and imagination. Mr. Black's method was pre-eminent in this; as every additional translated page would present the reader with a new combination of ideas. Here he explained the etymology of a few radical Greek words, by referring to the fourth page of the prospectus. Mr. Black stated, that it was this attention to the etymology of words, this decomposition of their component parts, which assisted himself in the acquisition of the French tongue. His next illustration was of the personal signs of French verbs, as printed in the middle of the fourth page of his prospectus; though his system differed from that of others, and his synoptical tables served extremely to facilitate the study of the language; yet, he would not arrogate to himself the exclusive honor, nor take from former grammarians the well-earned merits of their ingenuity and industry; had they not cleared the way, he could not have perfected his present system. The present was the age of inventions—he could only smooth the way for his pupils, if they were zealous, he should not be deficient in his assistance. Charles V. was used to say "when he acquired a new language, he found he had acquired an additional soul, he felt within himself a marked expansion of the powers of conception, comparison, and combination." And surely every one who has tasted the sweets of knowledge, must accord, that it gives to man a new species of intellectual existence, by enlightening his understanding, and rendering him more independent of the expensive and transitory pleasures, which can be neither beneficial to his health, nor can possibly afford those continuous and intellectual pleasures which a well cultivated mind ever presents to its possessor. Man without education resembles a barren waste, which presents but a disagreeable prospect to the eye, and a noxious odour to the senses, it remains for the goddess of science to shed the magic glow, the rich variety of colour, and the balmy perfume that attract and enchant all who approach her temple, it is only at her fount that man can imbibe the most delightful sensation that can swell the human breast —a conscious elevation in the scale of being.

At the close of the lecture Dr. Birkbeck gave the following notice :—

The Committee beg to remind the Members, that Mr. Black's original proposition for instructing them in the French language, was limited to a class of 50 pupils; but as the applicants very soon exceeded that number, Mr. Black kindly consented to extend his instructions to two classes instead of one; and an intimation was accordingly given to the members, that applications would still be received. Since that notice was given, however, so great an addition has been made to the number of applicants, that the Committee are apprehensive that it is, at present, greater than can be accommodated in the two classes to which Mr. Black's tuition must be limited in the first instance; and the Committee, therefore trust, that if they shonld find it necessary to omit a few of the Members who were latest in their application, those Members will not feel disappointed at a circumstance which is unavoidable; particularly, as the accomplishment of this wish, will be only deferred till further arrangements can be made for their accommodation. The Committee beg to add, that they hope to complete their preparations for the reception of Mr. Black's pupils, by Monday week; and they repeat their request, that the applicants will immediately call at the office, in Southampton Buildings, to enter their names and addresses, and to state whether they wish to attend with the Monday or the Thursday evening class.

LEEDS MECHANICS' INSTITUTE.

The first meeting of this Institution took place on Monday evening, in the hall of the Philosophical Society. The attendance was very numerous, and the lecture-room, which will contain from three to four hundred persons, was quite filled. By far the greater number of the auditors were workmen and small tradesmen, and several opulent and enlightened gentlemen sanctioned the meeting with their presence.

B. Gott, Esq. the President of the Institute, was absent from indisposition; and J. Marshall, Esq. one of the Vice-Presidents took the chair. The business was commenced at half-past seven, by reading a notice to the subscribers, intimating that a sub-committee would sit at the rooms of the Institute (No. 21, Park Row, 2 doors below New Bond-street) every evening, from Monday to Thursday in next week, from half-past seven to nine o'clock, to receive the names of such subscribers as wished to be instructed in Arithmetic, Mathematics, Mechanical Drawing, or the principles of Mechanics or of Chemistry, and to form them into classes. To avoid confusion, it was requested that they would adhere to the following arrangement as closely as possible :—Those, whose surname begins with any letter between A and D, to attend on Monday evening: those, whose surname begins with any letter between E and L, on Tuesday evening: those, whose surname begins with any letter between M and R, on Wednesday evening: and those whose surname begins with any letter from S to the end of the alphabet, on Thursday evening.

Mr. Marshall then gave a short introductory address, congratulating the society on the large numbers that attended its first meeting, and expressing a confident hope that they would conduct all their proceedings with propriety and good humour, and would succeed in the great object for which they were associated. The following address from the President was then read by the Secretary :—

"Gentlemen,—On the commencement of this establishment, for promoting the education of the working classes of our fellow-townsmen, it is proper I should address a few words to you, respecting the motives of bringing forward the measure, the ptan proposed for conducting it, and the results which may reasonably be expected from the persevering industry of the students. To enter more largely into the subject, would be only to repeat, what has been already most ably stated, and is accessible to you all, in the public journals.

"Among the various institutions of the present age, for improving the condition of society, that which will probably be productive of the most important consequences, is the general introduction of elementary schools, in which almost every person, under 20 years of age, has had an opportunity of learning to read and write.

"It is the design of the 'Leeds Mechanics' Institute,' to whose members I have now the honour of addressing myself, to provide the means of completing what has been so ably begun; and to present the students an opportunity of proceeding with their education, to qualify them for higher attainments, and particularly to direct their attention to subjects connected with their respective trades and occupations.

"For this purpose, a suitable building has been engaged, a considerable library is now preparing, consisting of books of science, which will receive constant future additions, together with philosophical apparatus; and school rooms are fitting up, where the students are to be taught the higher rules of arithmetic, and such branches of the mathematics, as are deemed most applicable to their circumstances and pursuits. It remains for future consrderation, whether rewards will be given to those who distinguish themselves.

"Gentlemen who conduct schools in the town, have for the present kindly offered their services as teachers, which have been accepted; it may hereafter be necessary to engage masters at the expense of the Society.

"A great proportion of the books will be allowed to circulate, in order to afford every student the opportunity of reading and studying the subjects, connected with his particular trade and pursuit, at his own home and at his leisure; that he may be enabled to proceed with his plans and experiments with greater certainty of success. Books, which their great size or value, render unfit for circulation, are to remain in the library, for reference at all convenient hours.

"The students will, during this season (besides the introductory lecture on chemistry, which Mr. West will favour us with this evening) have the advantage of lectures, on subjects connected with the mechanic arts; and for their accommodation, the Literary Society have granted the use of this room.

"The Committee purpose, next season, to engage one or more lecturers, on different branches of mechanical philosophy and chemistry; and, so soon as the funds permit, it is intended to erect a suitable building for the establishment, to consist of school rooms, a library, a model room, a lecture room, and a house for a resident teacher.

"The plan of instruction now submitted to you is fortunately no longer to be viewed as a questionable experiment; it has perfectly succeeded in Glasgow, Edinburgh, and London, and similar Institutions are now forming in many provincial towns. These cities possess men of learning in every department of the arts and sciences, who are willing to devote a portion of their time to the instruction of mankind—this is their great advantage. We possess flourishing manufactures, (among others, the staple one of the kingdom,) and reside in a neighbourhood, affording every advantage for cultivating the arts, abounding with waterfalls, coal, lime iron ore, stone, &c which resources we are just bringing into full activity. Availing ourselves of the example and encouraged by the success of others, what a field is opened for our exertion!—as promising and extended as perhaps the kingdom affords, and at a time when there is the greatest call for mechanical science and invention. On the right application of the advantages we possess our future prosperity will eventually depend.

"It is not however to be concealed from you, that this institution raised at first solely for your benefit and improvement, must ultimately rely entirely on your own spirit for support; if you neglect the opportunity afforded, it will soon cease to exist; if you cultivate it, the happiest and most splendid results may be expected. It now only remains for me, to express our united thanks to the editors of the public journals, for their valuable assistance and co-operation."

Mr. West then commenced his Lecture on the Utility of Chemistry, which was extremely well adapted to the purpose of showing the great importance and various practical applications of the science, and was delivered with a lively animation calculated to impress the minds of the auditory. The experiments were numerous and striking, the illustrations familiar, and the arguments to show the value of scientific knowledge very forcible. We never saw a more attentive audience, and they repeatedly manifested their satisfaction both in a visible and audible manner.

After the Lecture, Mr. Marshall again addressed a few observations to the meeting. He expressed his pleasure at witnessing the attention and interest, with which they had listened to the useful lecture that had been delivered; and stated that the Committee had received promises of two courses of lectures, on Mechanics and on Hydrostatics, from individuals in this town, which would be given during the present season. He said that, taking a general view of this Institute, it was a delightful feature of the times. Within the last twelve months, a degree of public spirit had been manifested in Leeds, which was not equalled, so far as he knew, in any other town in the kingdom. This was instanced in the great improvements making in our streets, in the new markets constructed, in the establishment of several new charitable institutions, in the projected new bridge and commercial rooms; all of which were undertaken, not from views of individual interest, but from a zeal to promote the public welfare. But none of these acts of public spirit promised such great and lasting utility as the establishment of the Mechanics' Institute, to which he looked for a great improvement in the character of our population, and in our manufactures. One of the principal causes of the public spirit that had been displayed, was unquestionably the flourishing state of our manufactures and trade. And to what was this prosperity to be ascribed? In a great degree, to our scientific skill, to our mechanical and chemical improvements and discoveries; and it must be maintained by the same means by which it had been raised. The Philosophical Society, in whose building they were now assembled, had also done much to create public spirit, and to produce a degree of liberality and harmony before unknown in the town. When they met there, they rubbed the rust from each other's minds, acquired a mutual esteem and good will, and communicated and received much useful knowledge. He expected that the Mechanics' Institute would produce the same beneficial effects, and diffuse the advantages of knowledge much more extensively. In that Society they were all equal; they had all the same rights; every member had a vote for the officers of the Institution, and they would elect only such persons as they thought best qualified to fill the situations; if they were dissatisfied with any officer, they would not re-elect him; in short, their constitution was entirely republican. The success of the Institute depended entirely upon the body of the members; with their zeal, it would rise or sink; and he had not the least doubt, that they would find its advantages to be so great, that their spirit and numbers would be increased, and the Institution would eminently flourish.

This address, like that of the President read at the opening, was received with the most cordial expressions of pleasure. The meeting separated at a quarter before ten o'clock.

ROYAL INSTITUTE OF FRANCE.

We have been favoured by a member of this Institute, with a verbatim copy of the eulogium pronounced in it upon the great astronomer, Sir William Herschel, by Baron Fourier. We think we shall render a service to the public, and to scientific men particularly, by giving an entire translation.

GENTLEMEN,

William Herschel, a member of this academy, was among the number of extraordinary men who, destined to know their country and the age in which they live, had in the outset to contend with those obstacles which an adverse fortune opposes to the first efforts of genius. He opened new paths to a sublime science; he saw stars, the existence of which was unknown, and removed all the limits which concealed the spectacle of the heavens. At length favoured by the patronage of a powerful monarch, he devoted his life to immortal labours, and during forty years the fame of his discoveries resounded throughout Europe.

At the age of nineteen, gifted with a lively imagination and an elevated mind, he was only a simple musician in one of the regiments of the Hanovarien guards. His father, a skilful music master, having to provide for the support of a numerous family, instructed five of his sons in his own profession. The second, William Herschel, in 1757, quitted his country and arrived in England, where science had promised him a better fate.

He resided for some years in the county of Durham, then at Halifax, and soon afterwards was appointed director of music to a chapel at Bath. He then enjoyed a considerable income, arising from his situation, and also from the public concerts and oratorios which he superintended.

His talents excited notice, his character was beloved, his morals were esteemed, and in a country where the fine arts are appreciated, if he had desired only wealth, all his wishes would have been satisfied. But a mental energy led him to higher destinies. It was for him to extend the boundaries of science.

The profound study of his art, conducted him by degrees to that of geometry, for there exist multiplied analogies between the laws of harmony and mathematics, as we have seen so fully proved by illustrious geometricians, from Pythagoras and Euclid to Descartes, Haygens and Euler.

Herschel being introduced by the study of geometry to the theory of astronomy, was seized with astonishment and admiration, and transported as it were into a new world. He desired to contemplate himself the celestial phenomena, whose laws human intelligence had discovered, and undertook to construct and improve telescopes for that purpose. He soon possessed instruments superior to all that an art so difficult and ingenious had yet produced, and his first astronomical observations in the year 1676, were followed by a memorable discovery, which excited public attention in the highest degree. I allude to the planet which has for so many years borne the name of Herschel.

The first observers of the heavens distinguished a small number of stars which continually changed their situation with respect to the fixed stars, and returned periodically to the same points of the sphere; from time immemorial the different durations of the revolutions of those planets have been known, it was the origin of the period of seven days, the universal monument of astronomy of ancient nations. Modern nations have made an admirable progress in the study of the heavens. Gallileo, Haygens, and Cassina, had first observed the secondary stars which these planets carried with them in their course, but until the end of the last century it was not known that there existed an immense planet beyond the orbit of Saturn. This discovery was the fruit of Herschel's labours. He pursued with constancy the enterprise which he had formed of examining successively the various regions of the heavens, and of noting all its remarkable phenomena. On the 13th of March, 1781, he observed at Bath, with one of his best telescopes, when looking at the constellation of the Gemini, a star whose light appeared very different from that of the neighbouring stars, and partook of the nature of Saturn's light, though more feeble. The perfection of his instrument enabled him to discover a disk distinctly marked.' Having continued his observations, he found that this star had changed its situation, and this observation having been transmitted abroad by him, was confirmed at Paris, Pisa, Berlin, and Stockholm.

(*To be continued.*)

POPULAR INSTRUCTION.

The various mechanical institutions, which within these few years have been established in the different great towns of this empire, have justly attracted the attention and merited the applause of every enlightened patriot. These institutions promise in a short time to better, materially, the condition, and to increase the power, of the labouring classes. Nor is their political vigilance likely to be lessened by augmenting their intellectual and moral strength, Their knowledge of their civil rights must keep pace with the general improvement of their minds; and as they rise in the scale of society, they must acquire that commanding influence, which their new relative position is calculated to confer. As the people become more intelligent, they are less liable to be misled—superstitious errors lose their hold—quackery is hooted out of existence—the power of demagogues is annihilated—mobs and tumults, occasioned by knavery working upon ignorance, are at an end; and as the great mass of society cannot be moved but when their rights and privileges are in real danger, their union and zeal on such occasions must render their strength irresistible. The Government of France does not entertain the same opinion on these subjects as we have above expressed, and therefore M. de Corbiere, the Minister of the Interior, has, in his wisdom, suppressed all the schools of mutual instruction, which had been established by benevolent societies or individuals. But there is one institution, similar in its object, though not in its origin or regulations, to our Mechanical Institutes, which has been allowed still to exist—namely, the public lectures at the *Conservatoire des Arts et Metiers.* In the amphitheatre or lecture-room of that establishment, a course of popular instruction is given in Political Economy, in Geometry, and Mechanical Philosophy applied to the arts, and in Chymistry applied to manufactures. It is enough in praise of the manner in which these courses of lectures are conducted, to state, that the first is given by M. Say, one of the first political economists of Europe; the second by M. C. Dupin, the author of the *Voyages en Grande Bretagne;* and the third by M. Clement, a well-known practical chemist. M. Dupin, whose publications we are always ready to welcome with pleasure, and whose activity of mind is such that he seldom allows the public long to forget him, has just published his introdnctory discourse to this year's prelections. Like all the other productions of the same author, this little work is distinguished by extent of information, elegance of diction, and liberality of views. M. Dupin is calculated to be a great benefactor to his countrymen, by introducing among them a knowledge of those mechanical arts in which we are their superiors—by explaining to them the causes of our superiority—by boldly informing them of the instances in which they must yield the palm to their neighbours—by converting their feelings of narrow jealousy into a sentiment of generous rivalship—in short, by liberalizing as well as instructing their minds, with regard to the scientific progress and mechanical improvements of other nations. M. Dupin reasons strongly in favour of instructing the industrious portion of society, and enforces his arguments by a reference to the state of knowledge among English and Scotch mechanics, and the advantages derived from it in the improvement of the arts. "I will tell those men," says he, "who see nothing but mere machines in the laborious classes, that I know a machine more powerful than that of Watt—more ingenious than that of Arkwright, and greatly more susceptible of improvement. The whole universe does not contain twenty thousand of Watt's machines, nor ten thousand of those of Arkwright; but the kind of machine to which I allude is multiplied on the face of the globe a thousand million of times. The steam-engines of the whole world do not represent a force greater than that of four hundred thousand horses; and I know one which represents the force of one hundred million of horses! What, then, is this machine? Must I mention it in adopting the degrading language of some persons?—It is man." We shall not enter further into this ingenious and liberal paper than by citing the following passage:

"In abusing England, we have sometimes heard it affirmed that she gained her victories by her treasures, which subsidized nations against us, rather than by the valour of her own defenders. But, in the first place, this is to avow that gold is even military force; and how did England acquire this gold? Did she draw it from her mines? No; she has no mines which produce gold. Did she extort it from conquered nations in her transmarine possessions? Never did India or

America, by their tributes or spoils, enrich the public treasury of Great Britain. What, then, in all times has been the source of her riches? The industry of her people, and the labour which is its element. We must admit that 14,000,000 of English and Scotch possess greater industry, and produce more commodities, than 30,000,000 or 40,000,000 of the nations of the continent. This is the reason why 14,000,000 of Scotch and English have been able to struggle with advantage during peace and war against more numerous adversaries. Far from us be those vain declamations of writers and orators, who sacrifice truth to popularity in our assemblies, our saloons, and our workshops —who tell us perpetually of our superiority, —who perpetually ring in our ears, that we are the first people on earth. Doubtless, we have every thing requisite to become so; but at the present moment, far from being in the first rank, I fear we are far, far distanced by England. England has arrived at a remarkable epoch, which prepares for her new destinies, and greater prosperity than she has ever before attained in peace or war."

We hear that M. Dupin has been made a Baron, and a Member of the Legion of Honour, by the new King. We hope that the liberality as well as the talent of his publication, had its due weight in procuring for their author these honorary distinctions.—*Times.*

DR. BIRKBECK.

This enlightened individual, who has the honour of having originated the first Mechanics' Institution in the kingdom, at Glasgow, and a similar Institution in London, is the youngest son of the late William Birkbeck, Esq. banker, of Settle, at which place he was born in the year 1776. He received his mathematical education under Mr. Dawson, of Sedbergh, who, though originally a shepherd, had raised himself by his genius and industry to eminence in the science of mathematics. When he determined to follow the profession of medicine, he came to Leeds, and was for some time with Mr., now Dr. Logan, and also attended the practice of the infirmary under that gentleman, Mr. Hey, and Dr. Hird. From Leeds he went to the University of Edinburgh, where he soon distinguished himself by his zeal in the pursuit of science, and became intimately acquainted with most of the eminent professors and students. He had scarcely quitted Edinburgh, when he was elected (in 1799) to the professorship of Natural Philosophy in Glasgow; and now he instituted, amidst the derision of many and the indifference of more, the first institution for instructing mechanics in the principles of science. He afterwards removed to London, for the purpose of pursuing the medical profession, which he did with eminent success, and became connected with some of the first medical institutions in the metropolis. He delivered several courses of lectures gratuitously at the London Institution, of which he was one of the projectors; and formed the plan of the London Mechanics' Institution. Of this society he was deservedly chosen President, and he continues to be its most valuable friend. It is delightful to contemplate the course of this enlightened man, whose spirit is characterized by the truest philosophy and philantrophy, and whose whole life is marked by his earnest and successful exertions to promote the interests of his fellow men, by disseminating light and knowledge through the world.—*Leeds Paper.*

PERPETUAL MOTION CLOCKS.

We never like to detract from the merit of a man who introduces to the public improvements on any subject of science or mechanism, but it becomes a duty to interfere when we see a plagiarism palmed upon the world as an original invention. For the last few years there has been exhibited in the window of a watch-maker near the Royal Exchange, a clock which is wound up and continued in motion upon the balance system, by balls running backwards and forwards, and truly we believe a patent has been taken out for this very new principle. What will our readers say when we inform them, that in a book upon mechanism, published at Rome in the year 1651, there is this invention, with a plate, describing as accurately as possible, the clock which an Englishman has introduced in the nineteenth century as original.

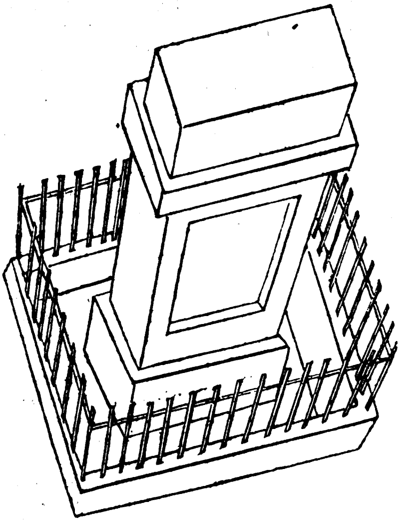
A ROYAL YACHT BY THE WIND, CARRYING THE PATENT STAYSAILS AND JIBS.

(See Plate.)

Head-sheets haul'd aft, and yards obliquely braced;
See the more towering jibs and staysails placed:
Along the stays they rapidly ascend,
On varied radii their feet distend;
And as their destined altitudes they reach,
Controlling tacks their due positions teach:
Checking, as hitherto, their upward flight,
Or aft-wise veering them to loftier height:
Insidious thus, the intervals they seize,
To intercept each softly vagrant breeze;
Whilst captive zephyrs all their powers unite,
To speed the vessel and regale the sight:
Come the rude squall, our gallant trim to try;
Snug in a trice, its malice we defy.

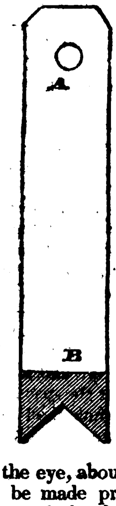
H. H.

THE HORIZONTORIUM.



DIRECTIONS FOR VIEWING THE HORIZONTORIUM.

As the effect of this optical illusion entirely depends on correctly placing the sight piece, a piece of card for that purpose must be cut out of the exact sixe and shape of the figure A. B.



An aperture for the eye, about the size of a small pea, must be made precisely at the spot shewn at A; and the shaded part at B must be folded back at a right angle, so as to form a kind of foot to stand upon.

The sight piece must then be placed perpendicularly, when by keeping the subject perfectly horizontal, and placing the eye close to the aperture A, there will be seen a perfect representation of a tombstone inclosed by pallisadoes.

ANTIQUITIES.

(FOR THE LONDON MECHANICS' REGISTER.)

Observations upon the Egyptian Mummy of the time of Adrian, which has been placed in the Royal Museum of Turin, and which was brought from Egypt by M. Drouetti.

This mummy is inclosed in a case of wood similar to that of *Petemenon*, which was brought from Thebes by M. Calliand. It has a Greek inscription near the head, the translation of which, is as follows:—"Tomb of Petemenophis son of Pabot; he was born in the 3d year of Hadrian the Lord, the 24th choiac; he died the year 7, the 4th of the epagamanan days. Thus he lived 4 years, 8 months and 10 days—Have good courage." The third year of Adrian commenced in Egypt on the 29th of August of 118 of the Christian Era; the 24th day of the Egyptian month choiac, of the same year, answers to our 20th of Dec, 118; and the 4th of the epagamanan days of the 7th year of the same reign, to the 27th of August, 123, which gives in the two calendars an equal number, if 1712 days making in the Egyptian mode 4 years, if 365 days 8 months, and 30 days, and 10 days over the year 1820, being bissextile; such, therefore, was the duration of the life of Fetemenophis. With respect to the final word ΕΥΨΥΧΕΙ—*Have good courage*, it was the usual funeral formality; the word ΘΑΨΕΙ, which is upon the Greek mummy in Berlin has a similar sense. The hieroglyphic inscription upon the mummy-case of Petemenophis, also describes the duration of his life. The first sign of the cross, in religious representations, denotes life; the second, which is a bent sceptre, signifies year, and according to the number of indentures in it, the number of years that the deceased lived on earth, the sceptre upon this case has 5 indentures, Petemenophis having died in his 5th year; on another part his age is marked distinctly by the following hieroglyphics:—the indentures 4, making 4 years, this twice repeated for the months, making 8 months, the solar disk followed by the perpendicular line with the figure 10, making 10 days; the figures are similar to those described in 1819, by M. Jourard.

STEAM GUNS.

We stated, in a former number, that the French had laid claim to the merit due to Mr. Perkins's invention for firing balls by steam; and explained at the time, the difference which really existed between his invention, and that which was submitted to the French Government. We now find, that the idle claim of priority which was set up, has been abandoned, and that the French have really turned their attention to putting into practice the plan submitted to them many years ago for discharging water by steam. An engine or gun, for this purpose, is now fitting up at the steam engine manufactory at Challot, near Paris; and will be ready for public exhibition very shortly. This engine is calculated to throw several tons of water in a minute, and is intended as a fixture on fortifications, to enable the besieged to overwhelm the besiegers within their lines. At present, we believe it is not the intention of the French government to apply it to any other purpose; although a report has been made upon it, in which it is stated, that it may be applied with effect to ships, so as to deluge an adversary during a broadside. Should a war break out, which heaven avert, there cannot be a doubt that these terrific engines will be adopted by the French government to a considerable extent; and we, therefore, put it to our ministers, whether they ought not instantly to order a report to be made on the subject, so that, in so calamitous an event, they might be able, without loss of time, to prepare for the worst—or in the words of American Jonathan, to give the French a dose of cayenne in return for common pepper. It is an extraordinary fact, that in the ports of Brest and Bordeaux, six steam vessels are building of an extraordinary size; the engines of which, are to be on a peculiar principle—what this principle is we are not told; but is it not highly probable, that the discharge of water from the sides of the vessel, is to form a leading feature in the construction. Now let us see what may result from all this:—the French, during a period of profound peace, build steam vessels, which the use in they way of commerce; these vessels, however, are so constructed, that in the event of a war, they have only to put in cannons and apply the principle of the engine in the way in which we have stated; and they produce enormous floating batteries which nothing can resist. We will imagine a fleet of steam boats sailing for the English coast, profiting by a calm, when the wooden walls of Old England cannot act, or proceeding with enormous speed boldly by our vessels, into which, they throw tons upon tons of water, deluging the decks, and preventing the men on board from working the guns; then attacking open and defenceless towns with shells or cannon, and turning back with impunity. Now there is nothing visionary in all this—it is perfectly practicable, and will be practised—*the French are preparing for it even now!* with honied words of peace in their mouths, they have war in their hearts, and are silently laying a train which may explode with an effect the more violent, as it was the less expected. Let it not be said again, has it as been long foolishly said, that the French will be years and years before they can attain sufficient mechanical power for all this; whereas, England, in a few weeks, could do all that is necessary. Is there not at this moment in Paris alone, a steam engine manufactory, with 250 men (all Frenchmen except two, the active partner and the foreman) in full activity? and has not this manufactory alone, in less than two years, turned out upwards of 400 steam engines? let us hear no more, therefore, of the inability of the French nation to put into execution their project of steam war vessels, but like a wise nation prepare for them at once, by devoting all our energies to a preparation which would avert war. If the French find us so preparing, they will be careful how they begin: but if we sleep at our post, we shall wake one day in alarm, and find that the frog-eaters are not so contemptible as we conceived them to be.

A Mechanic's institution has been formed at Alnwick, of which the Duke of Northumberland is patron, and Lord Grey president.

A society for the discussion of literary and scientific subjects has recently been established in the town of Nottingham. The Rev. R. W. Almond, M. A. is the president of this new institution, and a highly respectable committee have undertaken the management for the ensuing year.

A company has just been formed, whose object is to effect a communication between London and Great Yarmouth, by means of steam vessels, of from 250 to 300 tons burden.

The members of the Norfolk and Norwich Literary Institution are about to form a Museum of Natural History in Norwich.

It is proposed to form a rail road between Bath and Bristol, 30,000l. are already subscribed to carry it into execution.

To the Editor of the Mechanics' Register.

SIR.—Perhaps the following curious copy of an advertisement, which is extracted from an old paper, called the Public Ledger, of the year 1736, and which is in my possession, may prove interesting.

Yours', &c.
HENRICUS GULIELMUS B.

TO BE SEEN

Between the hours of ten and six, (price five shillings) in Leicester Fields Square, on the east side.

The new figure of ANATOMY, made and contrived by Mons. Chovet, Surgeon, which represents a woman chained down upon a table, supposed open'd alive, where the circulation of the blood is made visible thro' glass veins and arteries: the circulation is also seen from the mother to the child, and from the child to the mother; with the sistolick and diastolick motion of the heart, and the action of the lungs, all which particularf, with several other preparations, will be shewn and clearly explained in English and French.

NOTE. A gentlewoman properly qualified will attend on the ladies.

P. S. I think it a great pity that there is not such a model in these days of enlightened science, as I think it might be of advantage to medical students.

SIR,—You will perhaps give the following insertion in your esteemed publication.

If pork be fried, (in pieces) and when cold, packed in a jar, with melted hogs' fat poured on it, it will remain fresh and good for six months; fish fried, packed in jars with spices and vinegar, will keep for three or four months, This process is in use among the Asiatics.

FOR JOINING BROKEN PORCELAIN, &c.—The Malays dry the curd of coagulated milk; when required they scrape a portion, which they mix with lime and milk.

The Chinese method of joining porcelain is, by mixing the gluten of flour, (procured by carefully washing dough), with white of eggs; the composition is allowed to ferment before used, and the china remains at rest for a few days

To detect poisonous fungi among Mushrooms; boil them with an onion, having the outer skin stripped off which will be blue, or black if there be any poisonous ones with them, and white if not.

The cost of building Saint Paul's was 800,000*l.*; the Exchange 80,000*l.*; the Mansion-House 40,000*l.*; Monument 13,000*l.*

ARTIFICIAL MOULD FOR PLANTS.—Russian potash, one dram; water, four oz.; and one spoonful of oil: shake well.

In a work published in France, (Voyage a la Chine), we are told, that in Madagascar, the Indies, &c. &c. the inhabitants eat the leaves of garden nightshade, (Solanum nigrum) as a potherb, used as spinach; and the author asserts his baving partaken of it very often in France, and that the fruit (ripe) is the only poisonous portion of the plant, as the Tapioca before being washed is poisonous. G. G.

QUERIES.

Man in inquisitiveness should be strong,
From curiosity doth wisdom flow:
For 'tis a maxim I've adopted long,
The more a man *inquires* the more he'll *know*.
PETER PINDAR.

SIR,—Being a subscriber to your excellent Miscellany, I hope you will insert the following question: What is the best method of potting lampreys?

An answer from any of your intelligent correspondents will oblige

Yours, &c.
M. RUDGE.

SIR,—I wish to be informed, through the medium of your valuable Work, from which I have already gained much information, of the most proper way of making a cement for joining broken china and glass?

Your well-wisher,
W. W. T.

SIR,—I shall feel obliged to any of your intelligent correspondents if they will inform me, through your entertaining and instructive Miscellany, of the best method of bending glass.

Yours, &c.
Tonbridge Wells. E. J. S.

SIR,—I beg leave to submit the following questions for insertion in your useful Miscellany:

OPIFEX.

A reservoir for water has two cocks to supply it: by the first alone it may be filled in forty minutes, by the second in fifty minutes; and it hath a discharging cock, by which it may, when full, be emptied in twenty-five minutes. Now, supposing that these three cocks are all left open, and that the water comes in, in what time, supposing the influx and afflux of the water to be always alike, would the cistern be filled?

A person being asked the hour of the day, said, the time past noon is equal to four-fifths of the time till midnight. What was the time?

ANSWERS TO QUERIES.

Mr. Editor,—Ever anxious to promote a spirit of inquiry, particularly among that class to which your useful and entertaining publication is more specially addressed, and conceiving that if the queries inserted therein by many intelligent correspondents, remain unanswered, it would be the means of diminishing or damping their future communications, I have, as far as time and ability would permit, (following the example of many of your readers) endeavoured satisfactorily to answer their inquiries, and am gratified to see that you consider my communications worthy of a place in your Register.

I send you answers to two or three correspondents, in Nos. 9, and 10 of the Register; which, if you deem satisfactory, I have no doubt you will insert. Yours &c. W. P.

To W. G. C. (No. 9,) It would be a difficult task to say which is the *best* method of curing smoky chimneys, as what would effectually cure one, perhaps would not another, and I have little doubt but that every chimney-doctor would respectively insist that theirs was the best method. I have been for some years annoyed with the evil he seeks a remedy for, and have tried every plan that has been suggested, independant of having paid many pounds to persons who call themselves chimney-doctors, and who assure you that theirs is the only remedy, but every alteration has failed; till a few months since I was recommended by a friend to try the cottage stoves. I did so; and instead of having my rooms continually filled with smoke, I am now as free from it as if there were no fire place at all. There is always a cheerful fire, and but little fuel consumed. I presume many of your readers have seen them; but if W. G. C. would wish to see mine, if he or any other person will call upon me any evening, between half-past six and eight, I shall be glad to be the means of producing the same agreeable change in their rooms that there is in mine. My address is left with the publishers.

To Cure Chapped Hands and Lips.—A little bees wax, sallad oil, and a small quantity of mutton fat, cut from the kidney, to simmer at the fire till they are in a liquid state, stir it well, then pour it into pots.

In No. 10, to the first query of your admirable correspondent, S. Hollands,

Push the cork into the bottle.

No. 2, she is his daughter.

Mr. Editor,—In reply to several queries in the last and preceding Numbers of the Register, I beg the insertion of the following answers. S. Hollands.

Jugged Hare.—Let the hare hang a few days; and when skinned, do not wash it, but wipe it when necessary, with a clean cloth; cut it into pieces, season it high, and put it into a stone jar, jug, or pitcher, with half a pound of ham, or fine bacon, fat and lean together, six shallots, two onions, and a small portion of thyme, parsley, savory, marjoram, lemon-peel, mace, cloves, and nutmeg. Let the whole of the meat be stewed with these well mixed ingredients, pour over it half a pint of red wine, and squeeze in the juice of one Seville orange; stop the vessel close down with a bladder or leather, and brown paper, and carefully place it in a saucepan of boiling water, deep enough to dress the meat, not so high as for any of the water to boil into it. In this situation the jar or jug is to remain for three or four hours, the water being kept on the boil all the time, and more added as it boils away. Then taking out the hare, strain the liquor, skin off the fat, and thicken it up for sauce, with a little butter and flour. Serve it up as hot as possible, garnished with slices of lemon and currant jelly. The larger pieces of hare are sometimes larded with bacon.

Plate Powder.—In most of the articles sold as plate powder, there is an injurious mixture of quicksilver, which is said in some instances to so far penetrate and render silver brittle, that it will even break with a fall. Whiting, properly purified from sand, applied wet, and till dry, is one of the easiest, safest, and certainly the cheapest of all plate-powders. Jewellers, for small articles, seldom use any thing else. If, however, the plate be boiled a little in water, with an ounce of calcined hartshorn to about three pints of water, then drained over the vessel in which it was boiled, and afterwards dried by the fire, while some soft linen rags are boiled in the liquid till they have wholly imbibed it, these rags will not only when dry, assist to clean the plate, (which must afterwards be rubbed bright with leather) but also serve admirably for cleansing brass locks, finger-plates, &c.

Excellent Remedy for an Asthma.—Boil half an ounce of zeavary, two drachms and a half of flour of brimstone, one drachm and a half of gum ammoniac, and half a drachm of Saffron, in three pints of hydromel, or water sweetened at discretion with honey, till reduced to a quart. Drink an ounce of this three times a day; in the morning fasting, at five in the afternoon, and at going to rest.

Transparent Screens—Are prepared by brushing over a piece of fine muslin or lawn with white wax, dissolved in spirits of wine or turpentine.

To Clean Pictures.—Water is the first material, and of the most general use in cleaning pictures. This will remove many kinds of glutinous bodies and foulnesses; such as sugar, honey, glue, and many others: and it will also take off any varnish of gum Arabic, glair of eggs, or isinglass, and is therefore the greatest instrument in this work. It may be used without any caution with respect to the colours, as it will not in the least effect the oil which holds them together.

Olive oil, or butter, though not generally applied to this purpose, will remove many of those spots which resist even soap, as they will dissolve or corrode pitch, rosin, and similar bodies, they may be used very freely, having no bad effect on the painting. Pearl ashes, melted in water, make a proper dissolvant for most kinds of matters which foul paintings, but this must be used with great caution. Spirit of wine, as it will dissolve all the gums, and gum rosins, (except gum arabic) is very necessary for taking off picture varnishes composed of such substances; but it corrodes the oil of paintings, and softens them in such a manner, as to render all rubbing dangerous while they are under its influence. Oil of turpentine will likewise dissolve some of the gums used for varnish; but spirits of wine will generally answer the purpose much better. When paintings appear to have been varnished with those substances that will not dissolve in water, they are very easily and safely removed by the following method, viz.

Place your picture, or painting, in an horizontal position, and moisten, or rather flood the surface of it with stroug rectified spirits of wine; but all rubbing, beyond what is absolutely necessary, must be avoided. Keep the painting moist, by adding fresh spirit if requisite, for some minutes, then flood the surface copiously with cold water, with which the spirit, and such part of the varnish as it has dissolved, may be washed off; but in this state of it, all friction must be avoided. When the painting is dry, the operation may be repeated, until the whole of the varnish is removed.

To Prepare the Pearl and Wood-ash Ley used in Cleaning Pictures.—Let an ounce be dissolved in a pint of water, to be stirred frequently, for half a day, and then decanted from the settlings. This is used warm, with a sponge, and with the same caution as just described; when thick spots are not easily removed, a strong soap lather may be of use, not suffering it to touch any other part of the picture but the spot it is to be engaged with.

Sir.—Your correspondent Domestic will find this a very good plate powder.

Take powder of tin or potee powder; powder of burnt hartshorn, of each eight ounces; whiting or prepared chalk, one pound; mix them well together in a mortar.

I am, Sir, yours', &c.

Jan. 8, 1825. Henricus Gulielmus B.

Powder to destroy Mice.—Take of black hellebore root, and the seeds of stavesacre, of each one ounce in powder; oatmeal one pound; oil of carraways thirty drops; mix.

Hair Oils.

Huile Antique a la rose.
tuberose.
Fleur d'Orange.
au Jasmin.

Oil of ben nuts or olives, scented with the essences of the different flowers.

Sir.—In answer to your correspondent S. Hollands's fourth question, the following are the words: at, as, ah, act, acts, arc, arcs, arch, art, arts, chart, charts, cat, cats, car, cars, cart, carts, chat, chats, hat, hats, hast, hart, harts, rat, rats, star, scar, sat, tar, tars.

Yours, &c. I. J. M.

NOTICE TO CORRESPONDENTS

We perused Medicus's letter with much pleasure, and agree with him in thinking that much useful and important information may be elicited by his queries. We shall be happy to receive his first series as soon as may suit his convenience. Though our publication will admit every miscellaneous communication tending to enlighten the intellect, we must remind him that our main object is to make it a vehicle of mechanical knowledge, and request on this ground that some of his queries may occasionally bear on points illustrative of mechanical principles in general. His papers on meteorology will also be particularly welcome. We regret that want of room prevents us from inserting his letter. We anticipate much interesting correspondence as the result of his promised queries, and shall be at all times willing to lend our attention and aid to the sound practical views of such valuable correspondents as Medicus.

Fidex, Justus, A. R., M., T. R., and P. E. are under consideration.

Want of room prevents us from noticing a variety of communications. We shall endeavour to make room for them in a subsequent number.

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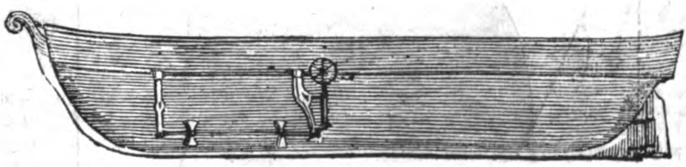
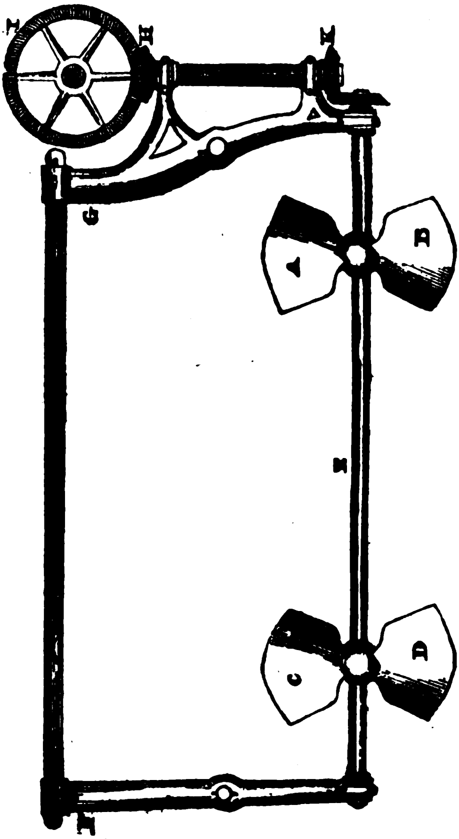
The London MECHANICS' REGISTER.

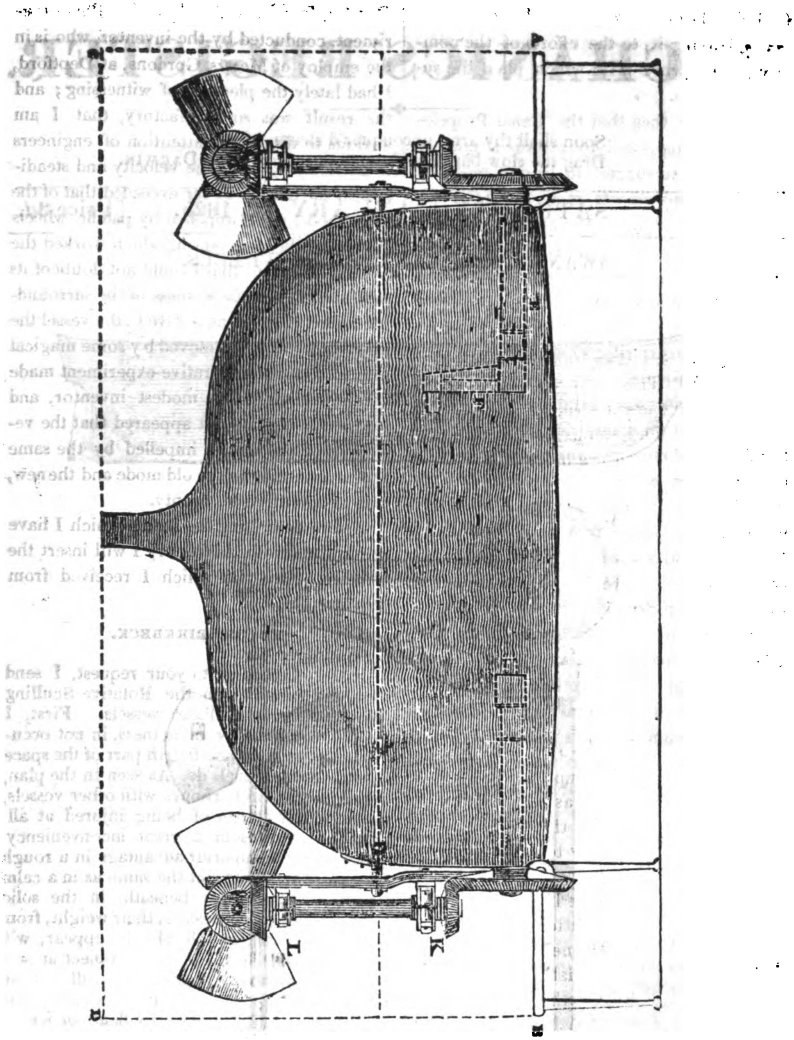
Soon shall thy arm, unconquer'd steam, afar,
Drag the slow barge, and move the rapid car.—DARWIN.

N°. 12.] SATURDAY, JANUARY 22, 1825. [Price 3d.

SWAN'S ROTATIVE SCULLING WHEELS.







To the Editor of the Mechanics' Register.

50, Broad Street.

SIR,—Amidst the eagerness with which the public are rushing forward to form plans for establishing communications by means of rail roads, the old conveyance by canals is almost forgotten; and indeed, from the prospect of gain and celerity displayed by the projectors of these roads, it may be expected that the aid of water will soon be discarded. The proprietors of some canals, although much disposed to be supine, have I believe begun to take the alarm; and probably all will become alive to their danger, when bills are presented to the House of Commons for forming rail-roads; acting as is too often the case, for the defence of their own property, by opposing the plans of the incipient speculators. Judging from the liberal spirit lately displayed by Parliament, I am inclined to suspect that they will not allow private interest to arrest the march of improvement, but that they will permit rail-roads to be attempted in all directions, even if obviously in the way of older establishments, leaving it to the efforts of the competitors, to prove with which plan the superiority rests.

Presuming then that the Canal Proprietors will be compelled to sustain a competition, I wish to suggest to them a mode by which their movements, more fit for the torpor of past ages than the enterprize of the present period, may be accelerated: and as they do possess some advantages over their opponents, the suggestion which I am about to make, may if properly applied, preserve for them a superiority, which otherwise they could not maintain.

It is not necessary here to remark, that the use of steam constitutes the distinguishing feature of modern improvements. This power has in some degree superseded the use of wind in navigation, and of wind and water as the prime movers of machinery. It is now nearly ready to supersede the use of horses upon our roads; at least hydrogen one of the constituents of steam is about to do so; and if it be not also found in place of horses as the impeller of barges upon our canals, inland navigation must soon be discarded. To drag several barges in succession by a steam boat, is a plan which I have no doubt has occurred to many when thinking upon this subject; but the inconvenience of the paddle wheels generally used, and especially the injury done by them and the agitated water to the banks, which are necessarily very near to the barge, have appeared insuperable difficulties. In general steam navigation I have always considered the paddle wheel the most imperfect and objectionable part of the arrangement: the manner in which it strikes the water is attended with loss of power; it is dangerous if approached by small boats on account of the swell which it occasions; and in a stormy sea or river, it appears to be ill adapted to continuing the motion or resisting the waves which dash against the vessel. Thus impressed with the necessity of improving the method of propelling vessels by steam, I was much gratified by receiving an invitation to be present at the exhibition of a new and improved mode, by way of experiment, on a sheet of water in the grounds of Charles Gordon, Esq. of Dulwich Hill. This experiment, conducted by the inventor, who is in the employ of Messrs. Gordons, at Deptford, I had lately the pleasure of witnessing; and the result was so satisfactory, that I am anxious to direct the attention of engineers in particular to it. The velocity and steadiness of the motion so far exceeded that of the same model, when impelled by paddle wheels moved by the same spring which worked the new contrivance that I could not doubt of its superiority; and the stillness of the surrounding water, was such as to give to the vessel the appearance of being moved by some magical power. In a comparative experiment made by the ingenious and modest inventor, and frequently repeated, it appeared that the velocities of the model, impelled by the same spring according to the old mode and the new, was as seventeen to twenty.

Before describing the sketch which I have transmitted with this letter, I will insert the account of his plan which I received from the inventor.

TO DR. BIRKBECK.

Honoured Sir,

According to your request, I send you my remarks on the Rotative Sculling Wheels, for propelling vessels. First, I would notice their compactness, in not occupying more than one fourth part of the space the common wheels do. As seen in the plan, they may lay in harbour, with other vessels, without any danger of being injured at all, which is at present a great inconveniency. Secondly, the superior advantage in a rough sea, in which they act the same as in a calm pool, being entirely beneath, in the solid dense water; and besides, their weight, from their situation, as will plainly appear, will be as ballast in the hold, an object at sea, worthy of consideration. Thirdly, from their situation beneath the surface, they are not liable to be impeded by floats of ice, or by storms; therefore I think they might be suitable to packets for dispatch, and might be used all the winter. Fourthly, they make no swell or commotion, either disagreeable, or dangerous, in the water, as the common wheels do when lighting in a fermentation of air and water; but go as smoothly as a vessel under sail—their action being in the solid water as a lever upon a rock for a fulcrum.

I shall decline saying any more at present upon the principle, and leave it, Sir, to your very superior judgment to comment upon. The apparatus has been shewn several times to some gentlemen of the first respectability and genius, both mechanical and nautical, and has constantly met with the highest approbation. I remain, &c.

JOHN SWAN.

35, Deptford-Green, Sept. 28, 1824.

On the axis E, Fig. 1, supported by the frame work, F, G, are placed the vanes, A, B, and C, D, having a sur ace equal to that part of the floats of the paddle wheels which are immersed whilst acting: these are so situated with respect to each other, that whilst working they act as a screw within the water, and thus draw the vessel forward The angle which these planes make with their axis is about thirty degrees. At H is seen the end of the crank, on which the wheel I is fixed to convey the motion of the engine through the train K,H,I. This machinery however, is merely a suggestion; and probably a better and more simple mode, might be devised for producing the requisite motion. The convenient manner in which this plan adapts itself to the vessel is observable in the end view, Fig. 2. where it may be seen to lie entirely beneath that part of the deck which extends from A, to B. The dotted lines represent the axes within the vessel, on which the wheels I, I, Fig. 1, belonging to each side are fixed; and F, in the same figure shews the crank on one side. G and H represent strong bolts by which the whole apparatus is attached to the vessel, affording a very ready method of disengaging them, whenever circumstances may require such separation.

If by this description of what seems to be an excellent contrivance, I should be so fortunate as to obtain for the inventor the notice of any competent practical man, so that it might be applied in actual steam navigation, or if it tend when introduced to relieve the Canal Proprietors from the difficulty into which they are likely to fall, it would be found to justify the favourable opinion of it now entertained by Your's truly,

Jan. 18, 1825. GEORGE BIRKBECK.

LONDON MECHANICS' INSTITUTE.

MR. COOPER'S LECTURE ON CHEMISTRY.

Mr. COOPER commenced his thirteenth lecture on Wednesday evening in last week, by a reference to the subject of his previous discourse, in which he had occupied the attention of his hearers with the two combinations of *carbon* and *oxygen*, called *carbonic acid* and *carbonic oxide*, and had shewn that one of these compounds, contained a much greater proportion of carbon than the other, but as he had not explained their exact chemical constitution, he would now exhibit a diagram for that purpose, by which it would be seen that their specific gravities were as follows, viz.

	grains.
100 Cubic Inches of carbon vapour weigh - - -	12,708
100 ditto oxygen ditto	33,888
100 ditto carbonic acid ditto	46,596
200 Cubic Inches of carbon vapour weigh - - -	25.416
100 ditto oxygen ditto	33,888
	2)59,304
100 ditto carbonic oxide ditto	29,652

The diagram also shewed, that the two equal volumes of carbon and oxygen, which formed *carbonic acid* were condensed into one by their combination, and its weight was therefore found, by adding together the weights of its constituents; but as *carbonic oxide* consisted of two volumes of the vapour of carbon and one of oxygen, and the three volumes were condensed into one and a half, it was necessary to divide the weight of the constituent quantities by 2, to ascertain the true weight of the compound.

These were the only compounds of carbon and oxygen, but carbon was capable of forming two other combinations with the supporters of combustion, to which he should briefly advert. One of these was a *chloride of carbon*, recently discovered by M. Fraridày, and the other a compound of *iodine and carbon*, which the lecturer had himself discovered during the process of preparing iodine, but not yet in sufficient quantities to demonstrate its exact proportions; these compounds were not of material importance, except as forming links in the chain of the combinations of carbon, with the supporters of combustion.

The combinations of *carbon* with *hydrogen* were next to be considered, and were of extreme importance. The first of these, viz. *carburretted hydrogen gas*, was a gaseous substance, commonly found at the bottom of stagnant pools, from whence it may be collected in large quantities by stirring the sediment, but it was always contaminated with *azotic gas* and *carbonic acid*, the latter of which may be easily disengaged by means of an alkali, though it was difficult to clear it of azote. Many substances, when exposed to the action of fire, give out carburetted hydrogen, but one of its most abundant sources is *coal*. Coal gas is procured by heating the coals in iron vessels, when the carbon is deposited in the form of coke, and the great bulk of the gas is found to be the *heavy hydro-carburet*, or carburetted hydrogen, mixed occasionally with *olefiant gas*, or the *heavy hydro carburet* and also with carbonic oxide, carbonic acid, and sulphuretted hydrogen. The purity of coal-gas, depends on the proper management of the gas works, as some of the contaminating substances may be easily got rid of; he should, however, have occasion to speak more particularly of coal-gas, at a future period.

He should first direct the attention of his hearers to the heavy hydro-carburet, or olefiant gas. If one part of alcohol, or spirits of wine, was put into a retort with three parts of strong sulphuric acid, it would be perceived that the first action of the acid on the spirit blackened it; but if heated to a temperature sufficient to boil the sulphuric acid, the blackness was greatly increased, and a considerable deposition of carbon took place, the carbon sometimes becoming almost solid from the quantity deposited from the alcohol, and the gaseous matter is given off in considerable abundance. Mr. Cooper performed this experiment, and while the process was going on, proceeded with his remarks on the light hydro-carburet.

As coal gas differed but little from carburetted hydrogen, he should use it for the illustration of the subject, and it would be seen that it would burn, and that during its combustion the same effect would be produced as by other substances containing the same elements. It would be recollected that in his last lecture he had shewn that water and carbonic acid were produced by burning a common tallow candle, and it would be evident that the constitution of this gas was the same as that of tallow, by the occurrence of the same results from its combustion. Mr. Cooper then directed the flame of the gas to the orifice of a long glass tube, bent in the form of a syphon, to the opposite extremity of which a phial of lime water was attached, which soon indicated the presence of carbonic acid by assuming a turbid appearance, while the deposition of moisture in the tube proved the formation of water by the union of hydrogen with the oxygen of the air which rushed through the tube. It had been seen that the light hydro-carburet was inflammable, but it should be observed, that it requires very considerable dilution, or the addition of a large quantity of oxygen, before it arrives at the explosive point. It had been thought by some that six volumes of atmospheric air, and one of carburetted hydrogen, formed the most powerfully explosive mixture, while others considered the proportion of 8 to one to possess the greatest explosive force, which was his own opinion: it might be diluted with 12 times its volume of atmospheric air, and would still remain slightly explosive, but whatever was the extreme point, it was certainly explosive with greater or less violence, when mixed with the air in any proportion between six and twelve times its volume.

Every one had heard of the dreadful explosions of this gas in mines, when its effects had been so fatally calamitous. To prevent the occurrence of such accidents, the safety-lamp of Sir Humphry Davy had been contrived, the operation of which it was unnecessary for him to state, except by observing that the cooling influence of the wire gauze which surrounded it, prevented flame from passing through meshes of a certain diameter. In order to exemplify the protection afforded by the safety-lamp, Mr. Cooper placed on the lecture table a large lantern contrived for the purpose, and putting a Davy lamp on the inside, he closed the lantern, and introduced into it a sufficient quantity of carburetted hydrogen to render the mixture explosive. The lamp became extinguished, but the platinum wire connected with it being red-hot, immediately re-lighted the lamp on its being removed from the mixed gases in which it had been standing; and that this mixture was really explosive, Mr. Cooper proved by throwing a lighted paper into it, when it instantly exploded with sufficient force to shew the destructive effect that must ensue from the sudden explosion of vast quantities of this gas, when accumulated in mines. &c.

The experiment commenced in the former part of the Lecture for the production of the *heavy hydro-carburet*, or olefiant gas, being now completed, the Lecturer exhibited the retort, which was perfectly black from the deposition of carbon, and proceeded to explain the action of *chlorine* on the gas evolved by the operation, and its utility in determining the constituents which enter into the composition of coal-gas. The illuminating power of gas depends upon the presence of the heavy hydro-carburet, which possesses a more intense power of illumination than any other gas, which Mr. Cooper exemplified by igniting the olefiant gas just produced, when it burnt with a dense white flame of extreme brilliancy, giving off a portion of carbon at its apex. A measure of this gas was then mixed with an equal quantity of chlorine, and it was seen that the result of their union was a peculiar fluid of an oleaginous nature, which repelled water, and was the cause of its being distinguished by the name of olefiant gas. A diagram was here exhibited for the purpose of shewing the weights of the two combinations of carbon and hydrogen, which appeared as follows, viz.

			grains.
200	Cubic Inches of	Hydrogen weigh	4,236
100	ditto	Carbon vapour	12,708
100	ditto	Carburetted Hydrogen	16,944
200	Cubit Inches of	Hydrogen weigh	4.236
200	ditto	Carbon vapour	25,416
100	ditto	Olefiant gas	29,652

In the former case, two volumes of hydrogen and one of the vapour of carbon are condensed into one volume to form the *light* *hydro-carburet;* and in the latter, two volumes each of hydrogen and carbon vapour unite to produce the *heavy hydro-carburet*, or olefiant gas, and the four volumes are condensed into one by their union.

Mr. Cooper then observed that with the present lecture, he should terminate the first division of his course, as he had now illustrated the whole of the simple combustible bodies except *boron*, or the basis of boracic acid, and had pointed out their various combinations, with the supporters of combustion. He felt much gratification at the attention with which his audience had uniformly listened to his remarks, and should be happy to renew his lectures when their new theatre in Southampton Buildings was completed. In the interim, he would willingly attend here on one or more evenings, for the purpose of examining the members on the subjects which he had endeavoured to elucidate. His examination would not be a rigid one, as he did not expect them to be at present deeply grounded in chemical science; but he wished to ascertain their acquaintance with those leading features of his lectures, which might be useful to them at a future period, whether they studied the science of chemistry as an amusement, or applied it to practical purpose.

This intimation was received with great applause by the members, and the acclamations with which Mr. Cooper was greeted on his retiring from the Lecture table, sufficiently evinced their obligations for his kindness, and their respect for the abilities displayed by him as a public Lecturer.

DR. BIRKBECK'S LECTURE ON ACOUSTICS, OR THE THEORY OF SOUND.

On Friday evening the learned President, Dr. Birkbeck, delivered a Lecture illustrative of the theory of Sound, or the Science of Acoustics. He introduced the subject by observing, that for the discovery of those mysterious links which connect the universe of matter with the universe of mind, the philosophers of all ages had instituted the most profound and persevering investigations; which, though in a great degree unavailing, had not been entirely without instructive results: for though the change which in that mysterious organ the brain immediately precedes perception, had never been detected, yet several of the intermediate links in that subtle chain of events had been discovered, and the organs of sense themselves, through whose agency the qualities of external bodies commence their influence upon sentient beings, were now well understood. Respecting the remaining portions of this great transaction, incessantly carried on between man and the external world, notwithstanding the observations of Descartes on the seat of the soul, or the more recent remarks of Gall, Spurzheim, and other phrenologists, on the numerous seats of its affections and powers, our only hope for the removal of the veil which conceals this intellectual wonder, was the hope of another and more intellectual existence, when that which now is dark within us shall be illumined.

An essential difference must have been observed in the exercise of the various senses with which man is endowed. The organ of *touch*, the simplest of the number, requires the immediate contact of the body, whose figure is communicated to the mind. The next in simplicity, the organ of *taste*, requires approximation with a degree of solubility. The organ of *smell* is brought into exercise by the approach of particles detached from the odorous body, and diffused through the air. The organ of *sight* requires the impulse of luminous matter projected or reflected from the body to be perceived, and lastly, the organ of *hearing* requires the application of undulating matter, the undulations of which are either directly impressed, or conveyed through an elastic medium, adjacent both to the vibrating body, and the organ to be affected by it. The lecturer here introduced an appropriate quotation from Professor Dugald Stewart's Philosophical Essays, on the exclusive restriction of the term "Beauty" to the objects of the two latter senses, *sight* and *hearing*, which he attributes to the intimate association between the eye and the ear, as the great inlets of acquired knowledge, and the only media of communication between different minds. The pleasures which we derive from the material world by means of these organs, are superior to all others in variety and duration, and being the most nearly allied to the enjoyments of the intellect, fall exclusively under the cognizance of *intellectual taste*.

Dr. Birkbeck then alluded to the opinion promulgated by Epicurus and other ancient philosophers, that there exists a peculiar *sonorous fluid*, or matter of sound, distinct from the air, and that sound issues from the body which produces it, as smell is emitted from a flower, filling the air with subtle exhalations calculated to affect the sense of hearing. An unsuccessful attempt to revive this doctrine had been recently made by Lamarck, in the 69th volume of the Journal de Physique; but without dwelling upon this hypothesis, he would proceed at once to an analysis of the phenomena comprehended under the term ACOUSTICS, by a discussion of the following questions, viz.

First, What are the conditions requisite to constitute a *sonorous body*?

Second, What is the *medium* by which sound is usually conveyed? and

Third, What is the constitution and operation of that *organ* on which the communicated impressions are made?

It is universally admitted that those substances which are best fitted for vibration, or are most *elastic*, are always the most *sonorous*: hence the harder metals and animal membranes, which will bear considerable tension, are usually chosen for the production of sound: a bell or wire of tin or lead, which possess but little ductility or elasticity, yield only a dull heavy sound when struck, while copper, brass, or steel, which are capable of extensive vibration, are therefore well adapted to that purpose. It is obvious that if the production of sound depended upon the motion of the *whole mass*, as all matter is equally mobile, no reason for preference could be assigned; but as sound results from the agitation of the particles *individually*, it is only elastic substances that can be employed with effect. When a bell, for instance, has been struck, it instantly assumes an elliptical figure, though circular before, and a tremulous motion occurring among all its particles, the point which is struck, together with the portions carried along with it, return to their first position with a degree of velocity, which carries them beyond that position, to which they again return and again advance, and with each successive change of figure the sound is renewed, though with strength regularly decreasing from that which was first awakened.

This subject, the lecturer very clearly illustrated by a diagram, exhibiting the section of a bell, and the ellipses formed in opposite directions during its successive vibrations; and observed, that the sound of a bell was, in fact, compounded of a variety of sounds, as every section produced a different sound; and it had been stated by persons accustomed to a nice discrimination of tone, that besides the primary sound of St. Paul's bell, its octave, twelfth, and seventeenth could be distinctly heard. Another part of the diagram exhibited the form assumed by a single elastic cord, fixed at both ends and stretched, and it was seen that when the cord was struck, its form became curvilinear, and it described the arc of a circle on each side the original line, till its vibrations ceased, and it resumed its first position. These vibrations, like the oscillations of a pendulum, were performed in equal times, and De la Hire had remarked, that besides the vibration of the whole string, a vibration of its parts occurred which caused it to assume a vermicular form, the undulations of which were fewer as the string employed was thicker. It was necessary, in order to produce vibration, that the body struck should be free in all its parts, for if a complete sphere of brass was struck, it would return no sound, though each of its hemispheres would vibrate separately. This the lecturer exemplied by striking two small hemispheres of brass, which returned a shrill and musical sound, but when the sphere was completed by exhausting them of air, and uniting them firmly by the pressure of the atmosphere, only a dull sound was produced, because the sphere possessed no power to undergo a change of figure, and consequently there was no vibration.

Since we hear sound, under circumstances where no connection can be supposed to exist between the vibrating body and the organ of hearing, except by means of the atmosphere, it follows that atmospherical air is a *medium* through which vibrations may be transmitted, or is a *vehicle of sound*; and the motion acquired by the air in communicating these vibrations, is not simultaneous, but it is transmitted from particle to particle, without any observable exertion upon the most minute substances which may intervene. The difference between these two motions may be illustrated by comparing the motion of an entire stream of water, with that of the circular undulations produced on its surface by any agitation near it. The impetuous torrent, and the placid stream, occasion sound solely by their impulse against opposing substances, as the howlings of the tempest, or the warblings of the gentle breeze, are caused by the rude or soft impulse of agitated masses of air, against bodies disposed to vibrate: but the water and air under these circumstances, are not the vehicles of a sound in consequence of their sensible motion, for sound travels with much greater velocity than either the wind or the stream. Many resemblances might be pointed out between the undulations on the surface of a pool of water, and the presumed motion of the particles of air during the transmission of sound: they differ, however, in the material circumstance, that the former consists in alternate elevations and depressions of the part in motion, and the latter in alternate condensations and rarefactions; a disagreement obviously arising from the peculiar qualities of the two fluids.

Dr. Birkbeck then performed one or two experiments, to elucidate the dependence of sound upon the presence of air, &c. A small bell was placed under a receiver, and, upon being put in motion, it was heard in every part of the lecture-room; but when the air was exhausted from the receiver, though the bell was still rapidly moving, it was entirely voiceless to all audible perception. It was in allusion to this experiment, that Dr. Darwin introduced the beautiful line

"And silence dwells with vacancy within."

A contrary effect was produced in another experiment, which evinced the increased power of sound in condensed air, and this effect corroborated the observations of persons who had descended in the diving bell to a depth at which the pressure of the atmosphere was doubled, and had found that the sound of their own voices was painful to them, while others, who had ascended to great altitudes in the air, had observed, that from the greater tenuity of the atmosphere, their voices were scarcely audible. Other sub stances, as well as air, were capable of conveying sound, as the scratch of a pin might be distinctly heard at the opposite extremity of a piece of timber, though the sound might not be perceptible to an ear placed immediately above the pin; and the blow of a hammer at the top of a brick wall, would be doubled to a person at the bottom, from the sound being conveyed through the air and the brick-work, with different degrees of velocity.

After some other remarks, explanatory of the nature of sonorous bodies, and the manner in which their vibrations are transmitted, the lecturer gave a minute and clear description of the internal construction of the ear, with the assistance of diagrams, which exhibited, on a large scale, all the intricate and complicated organization of this curious part of the human system, and it was impossible to contemplate, without feelings of admiration, the extraordinary structure of this organ, and the manner in which its numerous parts are adapted to the purposes designed by the Creator.

[Dr. Birkbeck here referred to the POPULAR ENCYCLOPEDIA, in which he stated they would find the subject of Acoustics treated of with considerable ability; which read inc onnection with part of a very excellent article on Anatomy, with the 7th plate, contained in the same work, would enable his hearers clearly to understand the subject.]

The lecturer then observed, that there were two subjects connected with Acoustics, to which it was necessary that he should briefly advert, viz. the reflection of sound producing an *echo,* and its graduated variations of intensity producing *music*. The reflection of sound resembles that of light, and hence echo had been called "*imago vocis,*" and was a favourite object with the poets, who had described her as a nymph dwelling in caverns, grottoes, vallies, &c. One of the most beautiful of these personifications occurs in the *Pleasures of Imagination*, where Euphrosyne thus addresses her votaries—

Lo! I am here to answer to your vows,
And be the meeting fortunate! I come
With joyful tidings; *we shall part no more.*
Hark! how the gentle echo, from her cell
Talks through the cliffs, and murmuring
o'er the stream,
Repeats the accents—"*we shall part no more!*"

Dr. Birkbeck then explained the general principles upon which the production of echo depends, and the various distances at which the reflecting surfaces must be situated to return one or more syllables distinctly. He adduced several instances of remarkable echoes in various parts of the world, particularly one in Woodstock Park which returns 17 syllables by day and 20 by night, and another near Milan which repeats the sound of a Pistol 56 times, and he illustrated the subject by applying its principles to the reflection of sound in elliptical music rooms, the whispering gallery at St. Paul's Cathedral, the speaking trumpet, the hearing trumpet, &c.

Upon the subject of music, the Lecturer remarked that it consisted of a succession of varied tones, arranged and adjusted at intervals best adapted to the powers of the human voice, according to a scale long and universally established. A diagram was then exhibited, shewing the succession of the notes in music, and the various accords and discords resulting from their combinations, and after some interesting remarks on the vibrations of stringed instruments and those of metal wires fixed at one end only, Dr. Birkbeck caused considerable amusement among his auditors, by producing an instrument called a *pinnetto,* consisting entirely of pins of different lengths, upon which he distinctly played with a pin, the tune which is set to one of Moore's songs "Believe me if all those endearing young charms," &c.

The worthy Doctor added some appropriate observations on the cause of those emotions which music is felt and acknowledged to awaken. This he observed, was a subject which would lead to a discussion too extensive for the present occasion, and he should therefore content himself with the assertion, that the beauty of sounds arises from the qualities of which they are expressive, and not from any *original fitness* in them to produce the emotions. This opinion he confirmed by quotations from Mr. Alison and Dr. Beattie, attributing the pleasure communicated by the sound of the curfew, the hunter's horn, the sheepfold bell and the shepherd's flute, rather to the associations formed in the mind, than to the sounds themselves, and he concluded his Lecture amidst the plaudits of his numerous hearers.

PRINCELY DONATION OF ONE THOUSAND POUNDS!!!

We are happy to communicate to the Public an instance of princely munificence on behalf of this valuable Institution, to the merits of which we have had frequent occasion to advert, with the most sincere wishes for its prosperity and a conviction of the benefits which it must ultimately confer upon the community. At the close of an admirable Lecture on the theory of the Winds delivered on Wednesday evening by Dr. Birkbeck, (a full account of which we shall give in our next) the worthy president announced to the Members that a correspondence had recently taken place between Sir FRANCIS BURDETT and Francis Place Esq. of Charing-Cross respecting the nature and objects of the Institution, and the heavy expenses which must be incurred in carrying them into complete effect, particularly for the erection of the New Theatre or Lecture Room in Southampton

Buildings, and the President therefore requested the attention of the Members to the following letter from Sir FRANCIS BURDETT:

"Dear Sir—On my return home from a hunting excursion, I found your last, giving me all the information respecting the Mechanics' Institution necessary, and all the advice in your power; for both, my thanks. As, however, it amounts to little, I must take my own way.

"The Institution, I consider as holding out the prospect of the greatest benefit to the people—the working people—of any that has been hit upon up to this time. I have it, therefore, much at heart—PUT ME DOWN FOR A THOUSAND POUNDS!!!

"In haste, yours, very sincerely,

"F. BURDETT."

"Mr. Place, Charing-Cross, London.

It is impossible to convey an adequate idea of the electric effect produced on the crowded assembly by the communication of this letter. The lecture room rung with enthusiastic acclamation for a considerable time, and the Members appeared to vie with each other in the expression of their gratitude for the splendid donation presented by the philanthropic Baronet. We trust that this liberal example will be imitated by other individuals not more distinguished by their rank and fortune, than by their zeal for the diffusion of scientific knowledge, and that by their assistance the Institution will be at once enabled to bring into operation those beneficial objects which must otherwise require the lapse of a considerable period for their accomplishment

STEAM ENGINES IN RUSSIA.

It is not generally known that the Emperor of Russia has ordered from Paris two Steam Engines of eighty horse power, which are to be employed in the powder manufactories at Moscow. The Emperor is said also to have it in contemplation to explore the lately discovered mines in the interior of his kingdom, by means of this stupendous production of human science. In the course of another year, it is more than probable that a Steam Engine Manufactory of considerable extent, will be established in St. Petersburg, as an enterprising Englishman named Munro has lately had several conferences with the Russian Ministry on the subject. The advantages of such an establishment to the Russian Empire would be very great, and there cannot be a doubt of the facilities which would attend it. The quality of the iron would be of course superior to that which is manufactured in Paris with coals, which are abundantly impregnated with sulphur, and which, therefore, tends to make the iron soft, whereas the iron which would be used in St. Petersburg would be drawn from Sweden, where the fire which is used in its production is from wood, and by no means calculated to injure its quality

STEAM BOATS.

It is a remarkable fact, that throughout Europe more than nine-tenths of the Steam Boats now in use are the property of Englishmen, and that wherever other projectors appeared, they have almost invariably been compelled to call in the aid of English capital. It will be scarcely credited that all the improvements effected in the countries with which we have relations by the enterprising spirit of English capitalists, have been looked upon as innovations of a dangerous nature by persons in authority, who have been reluctantly compelled to yield to the public feeling, and consent to their introduction, not, however, until they had secured very handsome douceurs for their permission. The Steam Boat at Venice, and that at Naples are, we believe, entirely of English property, and it is an English Company which has proposed to establish others upon the Lakes of Switzerland. It is but justice, however, to the Swiss to observe, that they have come forward with much spirit to co-operate in the undertaking, and have offered to advance a considerable sum of money towards its completion at 3½ per cent.

THE LITERATURE AND SCIENCES OF THE SARACENS AND TURKS.

(Continued from No. X.)

Almansor, the second prince of the dynasty of the Abassides, enriched his mind by the study of jurisprudence and astronomy. Harun-el-Raschid was equally curious, but in both Caliphs this desire of knowledge was aided by adventitious causes. In the simple mode of life of the Arabs, a healthful frame of body was preserved. and their knowledge of medicine was limited to their occasions. But in the luxurious courts of Damascus and Bagdad new vices engendered new diseases. The Caliphs resorted to the Christian professors of the healing art, and the ignorant Arabians beheld with astonishment the cure of apoplexy by bleeding. The disciples of Esculapius have in all ages been distinguished for general learning. Established in reputation at Bagdat, they enforced by precept and example the studies of literature and philosophy. The Muhammedans, now inflamed by the love of letters, as much as their ancestors had been by the desire of military renown, lamented the insufficiency of their own treasures of knowledge. But the funds of the Greeks were inexhaustible. In the reigns of Almansor, of Raschid, and of Almamon the second Caliph in succession to Raschid, and seventh of the Abassides, the Christians resident at Bagdat and at Cairo transfused the philosophy and science of Athens into the copious language of Arabia. Yet, in the true spirit of barbarism, many of the Greek originals were destroyed, immediately after the translations had been made. But this instance of illiberality must not be extended to general character. Almamon was a liberal and enlightened prince. "He was not ignorant," says one of our guides in the history of literature, "that those persons are the elect of God, his best and most useful servants, whose lives are devoted to the improvement of their rational faculties. The mean ambition of the Chinese or the Turks may glory in the industry of their hands, or the indulgence of their brutal appetites. Yet these dexterous artists must view with hopeless emulation, the hexagons and pyramids of the cells of a beehive: these fortudinous heroes are awed by the superior fierceness of lions and tigers; and their pleasures of sense are less exquisite than those of the most sordid quadruped. The teachers of wisdom are the true luminaries and legislators of a world, which, without their aid, would again sink into ignorance and barbarism." Appointed by his father to the dignity of Governor of Korassan, Almamon collected from every quarter the expert in art and the learned in science. But his nomination of Messua, a Christian physician of Damascus, to the high office of the President of the college, shocked the orthodoxy of his father Raschid. Almamon remonstrated in a noble strain. "I chose," said he, "this learned man, not to be my guide in religious affairs, but to be my teacher of science; and it is well known, that the wisest men are to be found among the Jews and Christians."

To the Editor of the Mechanics' Register.

Rotherhithe, January 20.

SIR,—I beg leave to suggest the propriety of establishing Branch Mechanics' Institutions in the distant parts of the metropolis; in this neighbourhood, for instance, we have a number of shipwrights, caulkers, carpenters, &c. who be disposed to avail themselves of the benefits of such an institution, if it could be obtained nearer home. But after a days' labour, few men feel disposed to walk seven or eight miles to attend a philosophical lecture. I am, Sir, yours &c.

J. D.

In answer to J. D.'s inquiries as to the terms of the Mechanics' Institution, and the form of admission, we beg to state that the terms are one pound per annum, or five shillings quarterly; and that the form of admission is very simple, being merely an introduction by two members.—ED.

SIR,—The period having expired for sending the answers to my queries, inserted in No. 7, of your Register, I have proceeded to decide on those forwarded to you, and have awarded Bird's Astronomical Lectures, to Mr. John H. Marshall, for the best arithmetical answer to the first query, who will please to send to the publishers for the same.

No answers of any other kind having been received, and wishing that the prizes should not be returned, but be obtained by some one; I beg to say, that the four other prizes will be given to *any person* (thereby removing the restriction, of their being members of the London Mechanics' Institution,) who shall forward to the Editor of this Register, on or before the 15th February next, the best answers required at page 107, of No. 7, of the Register. F.R.E.

SIR,—In fulfilling my intentions, of sending weekly, a history of some drug or plant, used in the Materia Medica, I therefore begin with the first class, viz. Evacuants, and the first of them is Ipecacuanha.

Ipecacuanha, the common or officinal name, Callicocca Ipecacuanha, the Linnean name, Class Pentandria, order Monogynia, natural order Aggregatæ—the Root, comes from South America. There are two varieties of this root; first, the Peruvian, and the second, the Brazilian; the former is thought to be a different species. The Ipecacuanha of the shops, is usually in small wrinkled pieces, externally grey, internally white, has a faint and bitter smell, slightly acid taste. It contains, both a resinous and gummy matter, or at least a matter soluble in alkohol, and another soluble in water; it is supposed that the emetic power, and indeed, its principal virtues reside in the former; Dr. Irving affirms, they depend on the latter. Its active matter is completely extracted by proof spirit, vinegar, or wine. The dose of Ipecacuam, as an emetic, is 15 grains, though 20 or 30 grains of the powder may be taken with safety. Of the Ipecacuanha wine about an ounce; when it is combined with opium, it as act a sudorific.

It has two preparations, ordered in the last edition of the London Pharmacopæia of the Royal College of Physicians, in 1824, viz. the Powder of Ipecacuanha with opium, or the Dovers Powder, and the Ipecacuanha wine.

HENRICUS GULIELMUS B.

SIR,—If you think proper to devote a portion of the London Mechanic's Register to Chemistry, I will weekly send you the analysis of different substances, &c. which may not prove unacceptable to your scientific readers. I shall give the analysis of some animal substance, and also that of some vegetable.

Analysis of Urine.

1. Water; 2. Urea; 3. Phosphoric Acid; 4. Phosphate of Lime; 5. Phospate of Magnesia; 6. Phosphate of Soda; 7. Phosphate of Ammonia; 8. Lithic Acid; 9. Rosacic; 10. Benzoic; 11. Carboric; 12. Muriates of Soda; 13. Muriates of Ammonia; 14. Gelatin; 15. Albumen; 16. Resin; 17. Sulphur; or, according to Berzebius—Urine is composed of Water 933; Urea 30,10; Sulphate of Potash 3,71; Sulphate of Soda 3,16; Phosphate of Soda 2,94; Muriate of Soda 4,45, Phosphate of Ammonia 1,85; Muriate of Ammonia.

Free acetic acid, with lactate of ammonia, animal matter soluble in alcohol, urea adhering to the preceeding altogether 17,14; earthy phosphates with a trace of fluate of lime 1.0; uric acid 1; Mucus of the bladder 0.32; Silica 0.03 in 1000.0.

The phosphate of ammonia and soda, obtained from urine, by removing by alkohol, the urea from its crystallized salts, was called fusible salt of urine, or microsmic salt; and was much employed in experiments with the blow pipe

Yours, &c. Henricus Gulielmus B.

THE NEW COMPANIES.

It is a remarkable fact, that more than seventy-five millions of capital have been embarked, or are to be embarked in the various schemes which have been brought before the public during the last three years. That many of these schemes are worse than absurd may be truly said, but the great principle is highly honourable to the British character. Of the mining speculations in South America we have already expressed an opinion, and we have also said something on the subject of Rail Roads, but of the importance of the latter we have been fully convinced by arguments which are at once favourable to commerce and humanity. It cannot, we think, be denied, that in proportion as the means of communication of a commercial country become more certain and rapid, so must its wealth increase; but few persons appear to have taken into consideration the enormous amount of capital which will be employed in labour if these Rail Road schemes are carried into execution. From a calculation now before us, we find, that if they should be all in activity in the month of August next, more than 50,000 labourers will be at work upon the roads, besides the workmen employed in the iron foundries. This alone is an important argument in their favour. Here is no capital carried out of the country, but an honest and patriotic employment of it upon our own soil and for our own benefit.

PATENTS.

A Correspondent begs us to say something against the enormous charge made by the government for Patents, and which he says deters many an industrious but poor man from giving his inventions to the public—We quite agree with our correspondent in thinking that the system is bad, and we are the more led to this conclusion from a comparison with that adapted in other Countries. In France an ordinary patent is obtained for 500 francs, (20*l*) and the rights of the Patentee are protected even more efficaciously than in this country.

EULOGIUM UPON HERSCHEL IN THE NATIONAL INSTITUTE OF FRANCE.

(Continued from No. XI.)

This star was generally considered as an extraordinary comet not nebulous. Philosophers occupied themselves in discovering the parabolical elements of its course. The President Cochard de Claron, of the academy of sciences at Paris, and Lexel, astronomer of St. Petersburgh, who was in London, were the first who ascertained the dimensions of its orbit. Soon after, it was no longer doubted that it was a new planet, and all ulterior observations served to confirm it. The perfection of modern theories here became strikingly manifest, for now the movement of this star was determined before it had performed a tenth part of its course, this movement was not known with less precision than that of the other planets seen so many centuries ago. Its distance from the sun is double that of Saturn, that is to say, more than 660 millions of leagues, its volume more than seventy times that of our earth; it can be seen by the naked eye in clear weather. It performs its revolution in about eighty-four years, and the temperature of this star situated at the extremities of the known planetary system, is forty degrees below freezing point. To give some idea of its distance from the earth, we have to observe, that its light, although it travels at the rate of 70,000 leagues in a second, would be two hours and a half coming to our globe.

Herschel, and before him Dominique, Cassini, and Galileo, gave the names of the princes who patronized their labours to the planets they discovered; several other astronomers have professed to give the names of those who first discovered them, but neither remembrance nor justice has dictated the names of the planets recently discovered. It is from ancient fables, confused ideas of which only remain, that the names of the planets have been taken. The new planet received from Herschel the name of the Geordium Sidus, from astronomers that of Herschel; some have called it Cybele, Neptune, and Uranus, the latter has prevailed.

When the movement of this planet has been calculated, the points that it has occupied in the heavens, during the preceding century can be marked, and it will be found upon consulting the observations of Flamstead, Mayer, and Lemoniez, that they marked stars in the same points which are to be seen but now and then, is little doubt, but that it was the planet they had seen, but had not distinguished from the fixed stars.

It was supposed by Kepler, Lambert, and Rant, that there was an eighth planet between Jupiter and Mars, the comparison which they made of the distance of each planet from Mercury which is nearest the Sun, suggested a similar remark. The discovery of Uranus determined the astronomers to attempt new discoveries. It happened, that in the enormous space between Mars and Jupiter, and at a distance differing very little from the one already calculated, four little stars were discovered, which appeared to be as many parts separated from one planetary body, which could only be seen by the help of telescopes. These observations were made towards the commencement of the present century, for which we are indebted to Piazzi, Ocbers, and Harding.

The astronomical labours of the music master of the Chapel at Bath, have interested the English, and indeed, all Europe; the various singular circumstances of his life, and above all the noble use he made of his leisure hours, of which George the 3d. being informed, who loved the sciences as the greatest ornaments of the state, and as a pure source of national glory, invited Herschel to fix his residence at Datchett, and afterwards at Plough, on account of its being at a short distance from Windsor Castle.

The retreat at Slough, became one of the remarkable places to which the enlightened part of the world resorted; it was visited by all illustrious travellers. Herschel and his family inhabited it, and terminated his long and memorable career. The king interested himself in all his researches; and frequently added to the estimate of expenditure, rather than that he should be limited, either in the proportion or the dimension of his instruments.

History should preserve for ever the memorable answer made by George the 3rd. to a celebrated foreigner who was thanking him for the large sums which he had bestowed upon astronomical labours. "I defray the expenses of the war" said the King "because they are necessary; as to those of science it is agreeable to me to defray them their object draws no tears and is honourable to humanity."

Herschel had invited over from Germany one of his brothers, a man deeply versed in the theory and practice of mechanism. who recorded all his labours took the management of his workmen and brought to perfection all the inventions of his brother. Their Sister Caroline soon became conversant with astronomy and mathematics. A friendship without limit, the desire to contribute to the fame of her brother and probably the peculiar disposition of mind with which this extraordinary family was gifted, procured for her studies an unexpected success. She revised and published the observations of Herschel, and to her we are indebted for the discovery of several Comets. She partook of all the labours of her brother, and it may justly be said that never before had astronomer a more faithful attentive and diligent cooperator.

(To be concluded in our next.)

NEW ALARUM

Among the recent inventions of our clever neighbours the French is an alarum, which is perfectly unconnected with a watch but which answers all the purpose of an alarum watch and is ten times louder.—In this invention the watch is set upon the frame of the alarum and is connected with the index of the latter by means of a key which is fixed upon the handles of the watch, and which turns round and discharges the alarum at the hour marked by the person who sets it. The great merit of this invention is its simplicity, and its cheapness.—The price in Paris is only 30 francs and it is really an elegant little article.

THE JEWELLERY TRADE.

We are informed that one of the first measures of the ensuing Session of Parliament will be, the regulation of a standard for all articles manufactured from gold. Such a measure as this has long been wanted, to protect the public from the unfair dealer, and also the reputation of the honest jeweller from the suspicion which attaches to the trade but too generally. It is indeed, almost incredible, that whilst the Legislature should have fixed the standard of plate, and of certain articles, such as watch cases, &c. it should have left no other barrier to imposition in the more numerous and expensive articles of jewellery, than the conscience of the manufacturer. At present, no man who purchases a gold seal or a chain, or any small article of jewellery, has the slightest satisfaction on the score of its intrinsic value; whereas, in other countries, the smallest article is stamped by a Government Officer. In France, for instance, when a person purchases a new article of jewellery, he can throw his old gold into the scale of the jeweller, and insist upon his weighing it against Napoleons, the sterling coin of the country, and allowing its full value. When the purchase of a gold chain is made in Paris, its weight is charged first, and the fashion afterwards, so that its intrinsic value may be fairly ascertained. So just a mode of protecting the public cannot be too warmly praised, or the example too speedily be followed.

THOUGHTS ON FREEMASONRY.

Masonry is the most perfect and sublime institution ever formed, for promoting the happiness of individuals, or for increasing the general good of the community. Its fundamental principles are those grand bulwarks of society, universal benevolence, and brotherly love. It holds out in its precepts those captivating pictures of virtue, which stimulate the brotherhood to deeds of greatness; and offers to its professors dignity and respect. It expands the ideas, enlarges the benevolent feelings of the heart, and renders man the friend of his species. It teaches us those great and awful truths, on which futurity is founded, and points to those happy means, by which we may obtain the reward of virtue. It also instructs us in the duty we owe to our neighbour, and teaches us not to injure him, in any of his connections, and in all our dealings with him to act with justice and impartiality. It discourages defamation; it binds us, not to circulate any whisper of infamy, improve any hint of suspicion, or publish any failure of conduct. It orders us to be faithful to our trusts, not to deceive him who relieth upon us; to be above the means of dissimulation; to let the words of our mouths express the thoughts of our hearts; and whatsoever we promise, religiously to perform.

When the rude blast of war assails an happy country with its ravages, and embattled legions of kindred men are opposed in direful conflict; when all around perish by the victor's sword, and humanity stands appalled at the sight, the mason's extended arms preserve him from destruction. He meets with friendship and protection from his enemy, and instead of receiving the fatal weapon in his bosom, his heart is gladdened by hearing the endearing appellation of brother. When the corsairs of Algiers, with unprincipled fury attack the defenceless vessels of unoffending nations, and load the unhappy crews with the bond of servitude, to drag a miserable existence under the lash of tyranny; the mason's well-known sign preserves him from chains, and the kindly offices of a brother are extended to him.

Such being the advantages of Masonry, it ceases to be a matter of surprise that in every country the art has been professed, and encouraged by the most enlightened and virtuous of their inhabitants. The rulers of mighty empires, and the chieftains of great nations, have oftentimes joined this fraternal society, and immortalized their names by practising the virtuous principles of the order.

The manner in which the mysteries of the craft are revealed to masons, none but masons can ever know. The ceremonies used on those occasions, are calculated to impress upon the mind of the candidate, religious awe, and a high veneration for the cause of virtue. Notwithstanding the depravity of mankind, and the many vicious characters who have unfortunately been received into this society, yet the mysteries of the order have never been disclosed to the world.

The origin of masonry may be dated from the creation of the world. The symmetry and harmony displayed by the Divine Architect, in the formation of the planetary system, gave rise to many of the mysteries.

" *Let there be light*, proclaimed *th' Almighty Lord*,
Astonish'd Chaos heard the potent word:
Through all his realms the kindling ether runs,
And the mass starts into a million suns;
Earths, round each sun, with quick explosions, burst,
And second planets issue from the first:
Bend, as they journey with projectile force
In bright ellipsis, their reluctant course,
Orbs wheel in orbs, round centres centres roll,
And form, *self-balanc'd*, one revolving whole;
Onward they move amid their bright abode,
Space without bounds, *the bosom of their God*."

In the earliest age of man, when the human mind was untainted by the vices and prejudices of later times, unshackled by the terrors and anathemas of contending sectaries, and the machinations of bigotted priests, the God of Nature received homage of the world, and the worship of his admirable name constituted the principal employment of him to whom the mysteries of nature were first revealed.

(*To be resumed.*)

QUERIES.

Man in inquisitiveness should be strong,
From curiosity doth wisdom flow:
For 'tis a maxim I've adopted long,
The more a man *inquires* the more he'll *know*.
Peter Pindar

To the Editor of the Mechanics' Register.

Sir,—I shall feel obliged to any of your ingenious readers, if they can supply me, through the means of your Register, with the best way of making the matches for phosphorus boxes.

A Constant Reader, H. W.

Sir,---I am a female, and a constant reader of your valuable little work, and as I have not yet troubled you with a query, I hope the following will not be deemed intrusive:

I wish to know the best method of curing all sorts of swine-flesh, without the process of smoking, and yet must have the flavor of smoked swine-meat. I am not aware of any method of doing this, but as I and mine con

sume a large quantity of this description of provision, the insertion of this will oblige one of your earliest subscribers and admirers,
H.
Hackney.

SIR,—I would be glad to be informed by any of your correspondents, how glass may be stained, without burning, of different colours?

I should also be glad to learn, from some of your nautical correspondents, upon what principle Stay-sails act upon a vessel running before the wind. I know they assist in propelling the vessel, but I want to know their action, and why they are termed stay-sails.

Yours, &c.
HENRICUS GULIELMUS B.

SIR,—You would oblige me by inserting the following query in your inestimable work.

Yours, &c.
JUVENIS ADMIRATOR.

Having dug a square pit, six feet every way, how many solid feet of earth were taken out of it?

SIR,—I shall feel obliged to any of your intelligent correspondents, to inform me, through the medium of your interesting miscellany, a cure for a burn or scald, without leaving the scar or mark which the effects of fire usually leave on the skin.

Yours, &c.
D. ANDERSON.

SIR,—I will feel obliged to any of your numerous correspondents by their informing me what is the reason a poker, when made red hot, does not immediately lose its luminous appearance when plunged in water in which your hands have been previously washed with soap, as it does immediately in common water.

Yours, &c.
TYRO.

P. S. It continued at a red heat under the water exactly one minute and 25 seconds.

SIR.—As I have derived great benefit from your Register of useful knowledge, I am desirous of deriving more; and therefore make the following enquiry if you or any of your numerous correspondents could tell me how to extract spots of dirt, stains, and scorches, from marble.

Your sincere admirer,
ISAAC B.

SIR.—I should be glad to know the best mode of making lead and iron trees.

Yours, &c. I. J. M.

SIR.—Having lately began housekeeping, I wish to be informed through your work, of the best method of making the following wines, viz.: raisin, ginger, and orange.

SIR.—Perceiving in the Register many good and useful receipts, I wish to be informed of the best method of making red and blue inks for letter-press printing. By inserting this in your valuable work, you will oblige your constant reader,

Plymouth. A PRINTER.

SIR.—Being in the habit of wearing black silk neckerchiefs, and having them repeatedly spoiled through washing, I should wish to know the best method of so doing, that they may retain their colour.—W. W.

SIR.—Being greatly troubled with corns and bunnions, I wish to ascertain through your useful work, the best means of destroying the same.—J. T.

SIR.—Having gained much information from the solution of queries in your valuable work, I wish to be informed of the following.—The best method of potting beef, and also veal.

Chelsea A HOUSEKEEPER.

SIR,—I wish to be informed through your interesting publication, the best method of making aromatic vinegar.—J. J. A.

SIR,—Being in the habit of shaving myself, and having a very strong beard, I should wish to learn through the medium of the Register, the best method of recruiting a razor strop, with that preparation that will keep a fine smooth edge on the razor.

JOHN NORRIS.

SIR,—Having met with at places where I have dined, a family soy, generally useful for made dishes, hashes, and also for fish sauces, I wish to ascertain through your useful work, the best method of making the same.

A HOUSEWIFE.

A Constant Reader wishes to be informed of the best means of pickling cabbage, so as to retain its colour and crispness.

ANSWERS TO QUERIES.

SIR,—I shall be obliged by your inserting the following answers in your entertaining work, which I hope will be found correct.

To S. Holland's 3d query in page 158—2 min. 20 sec.

To Opifex's 1st query in page 174.—3 hours, 45 min.

To Opifex's 2d query in page 174.—20 min. past five.

Yours, &c P.B.E.

CHINESE METHOD OF MENDING CHINA.—Boil a piece of white flint glass in river water, for five or six minutes; beat it to a fine powder, and grind it well with the white of an egg, and it joins the china without rivetting, so that no art can break it again in the same place. Observe, the composition must be ground extremely fine on a painter's slab.

A VERY STRONG CEMENT FOR BROKEN CHINA.—Take equal parts of isinglass, mastic and turpentine, beat them together in a stone mortar, till they are well united and then join the pieces well together. If the composition is not of a proper consistency, add more turpentine.

CEMENT FOR MENDING CHINA, GLASS, &c.—Take a piece of Cheshire or Gloucester cheese, boil it in three or four different waters, till it forms a soft elastic mass, freed from the whey, and the extraneous ingredients. After having expressed all the water from this mass, and while yet warm, it must be gradually rubbed upon a piece of marble, such as is used by colourmen, and as much unslacked or quick lime, in powder, must be added, as will be absorbed by the cheese without making it too hard. This compound forms the strongest possible cement; if allowed to dry slowly, it is able to withstand fire as well as water.

GERMAN CEMENT FOR MENDING GLASS AND CHINA.—Reduce separately to the finest powder, equal quantity of unslacked lime and flint glass, and as much lithage as both of them together, the proportions to be adjusted by measure, when reduced to powder. Mix them well together and work them up into a thin paste with old drying oil. This cement or paste which is very durable, will even acquire a greater degree of hardness when immersed in water.

S. HOLLANDS.

SIR,—Inclosed I send a solution to the 1st query of F.R.E. the insertion of which in an early number, will oblige,

Yours, &c. John H. Marshall.

THE area common to each figure we will suppose to be 50.

1. To find the radius of a circle, whose area is given.

Rule. Divide the area by, 7,854, and half the square root of the quotient will be the radius required.

Thus $\frac{\sqrt{50 \div ,7854} = 7,9788}{2} \times = \frac{3,9894}{2} \times$ the radius required.

2. To find the radius of a circle the area of whose semi-circle is given.

Rule. Multiply the area of the semi-circle by 2, for the area of the circle, then proceed as in No. 1.

Thus $50 \times 2 = 100.\ \frac{\sqrt{100 \div ,7854}}{2} = 5,64$ the radius required.

3. To find the radius of a circle, the area of whose quadrant is given.

Rule. Multiply the area of the quadrant by 4, for the area of the circle, and then proceed as in No. 1.

Thus $50 + 4 = 200.\ \frac{\sqrt{200 \div ,7854}}{2} = 7,9788 \times$ the radius required

4. To find the side of an equilateral triangle of a given area.

Rule. Divide the area by, 433013, and the square root of the quotient will be the side as required.

Thus $\sqrt{50 \div ,433013} = 10,7337$ the side required.

5. To find the sides of a right angled triangle of a given area.

Rule. First find the radius of a circle, whose area is the same as the triangle, and then the circumference by multiplying twice the radius, by 3,1416; then as the perpendicular of a triangle multiplied by half its base is equal to its area, and the radius of a circle multiplied by half its circumference, is also equal to its area; consequently the triangle will be formed by making the perpendicular equal to the radius, and the base equal to the circumference, or vice versa, and the hypotenuse is formed by extracting the square root of the sum of the squares of the legs.

Thus by No. 1. 3,9894 is the radius of a circle, whose areas is 50, therefore, $3,9894 \times 2 \times 3,1416 = 25,066$, the circumference; then 3.9894 is one leg and 25,066, the other; and $\sqrt{3,9894^2 + 25,066^2} = 25,3814$ the hypotenuse.

N.B. Either leg may be taken as the perpendicular, the other will be the base.

6. To find the sides of an isosceles triangle of a given area.

Rule. Find the legs of the right angled triangle, as in the last case, then find the hypotenuse of a right angled triangle, whose base shall be equal to the base of the former, but the perpendicular only half that of the former, this will be one of the equal sides of an Isosceles triangle, whose base is equal to the perpendicular of the former right angled triangle.

Thus $3,9894 \div 2 = 1,9947$ the perpendicular of the new triangle;

Then $\sqrt{1,9947^2 + 25,066^2} = 25,1452$ hypotenuse of the new triangle;

Therefore 25,1452, is one of the equal sides, and 3,9894, the base.

7. To find the sides of a Scalene triangle of a given area.

Rule. Find the legs of the right angled triangle as in No. 5, then divide the base into two unequal parts, and find the hypotenuse to the triangles formed by the perpendicular, and each division of the base, the two hypotenuse as to two sides, together with the whole base, as the third will form a Scalene triangle of the given ar-

Take 25,066 one of the legs of the triangle, by No. 5, as the base, and the other 3,9894, will be the perpendicular, then
$25{,}066 \div 4 = 6{,}2665$, one part and
$25{,}066 - 6{,}2665 = 18{,}7995$, the other part.

Therefore $\sqrt{6{,}2665^2 + 3{,}9894^2} = 7{,}4286$, the hypotenuse of one triangle, and
$\sqrt{18{,}7995^2 + 3{,}9894^2} = 19{,}2181$, the hypotenuse of the other.

Consequently, 7,4286 . 19,2181 & 25,066 are the sides required.

8. To find the side of a square of a given area.

Rule. Extract the square root of the area, and it will give the side.

Thus $\sqrt{50} = 7{,}071$, the side required.

9. To find the sides of a parallelogram of given area.

Rule. Find the legs of a right angled triangle, of the same area, by No. 5, then the half of one leg, will be one side, and the remaining leg the other; or, divide the area by any number except its square root, the division and qnotient will be the sides.

Thus by No. 5, 25,066 is one leg and 3,9894, the other, then $25{,}066 \div 2 = 12{,}533$, one side, and 3,9894, the other.

Or, $50 \div 5 = 10$, one side, and 5, the other.

10. To find the sides of a Rhombus of a given area.

Rule. Take any distance less than the square root of the area, for the height of the Rhombus, then divide the area by the height, and the quotient will be the side required. Suppose 5 to be the altitude, then $50 \div 5 = 10$ the other side required.

11. To find the sides of a Rhomboid of a given area.

Rule. Take any distance for the altitude greater than the square root of the area, then divide the area by the altitude, the quotient will be one side, the other is arbitrary.

Thus $50 \div 10$ the altitude 5=THE ONE SIDE.

12. To find the sides of a four sided hapezium of a given area.

Rule. First find the side of a square or parallelogram equal to half the area given, then find the hypotenuse of a eight angled trangle, also equal to ½ the area, and whose base is equal to one of the sides of the square or rectangle, and add the perpendicular to the other, then the hypotenuse, the base, the perpendicular, the side, and the side will form the sides of the trapezium required.

Thus $\sqrt{25} = 5$ the side of a square of ha the area.

Then $(25 \div 5) \times 2 = 10$ the perpendicular.

Consequently, $\sqrt{10^2 \times 5^2} = 11.18$. the hypotenuese

And 10 the perpendicular + 5 the side= 15

Therefore, 11,18. 5. 15. and five are the four sides required.

13. To find the side of a regular polygon of a given area.

Rule. Divide the area by the number standing opposite to the name of the polygon in the following table, and the square root of the quotient will be the side required.

TABLE.

Pentagon - -	1,720,477
Hexagon - -	2,598,076
Heptagon - -	3,633,912
Octagon - -	4,828,427
Nonagon - -	6,181,824
Decagon - -	7,694.209
Undecagon - -	9,365,641
Duodecagon - -	11,196,152

Thus $\sqrt{50 \div 1{,}720477} = 5{,}29$ the side of the Pentagon.

Thus $\sqrt{50 \div 2{,}598076} = 4{,}386$ the side of the Hexagon.

Thus $\sqrt{50 \div 3{,}633912} = 3{,}709$ the side of the Heptagon.

Thus $\sqrt{50{,}4{,}828427} = 3{,}218$ the side of the Octagon.

Thus $\sqrt{50 \div 6{,}181824} = 2{,}844$ the side of the Nonagon

Thus $\sqrt{50 \div 7{,}694209} = 2{,}549$ the side of the Decagon.

Thus $\sqrt{50 \div 2{,}365641} = 2{,}31$ the side of tho Undecagou.

Thus $\sqrt{50 \div 11{,}196152} = 2{,}113$ the side of the Duodecagon.

NOTICE TO CORRESPONDENTS

AN OBSERVER's hint shall be attended to. We feel obliged to him for his communication.

We have received communications from J. Rainsford, E. Bacon, F. L. B., J. R. R., Henricus, L. S., E. P., and others, which we regret we could not find room for.

A. R. K.'s request cannot be complied with. If he will procure us the plans, they shall be inserted or returned in a day or two.

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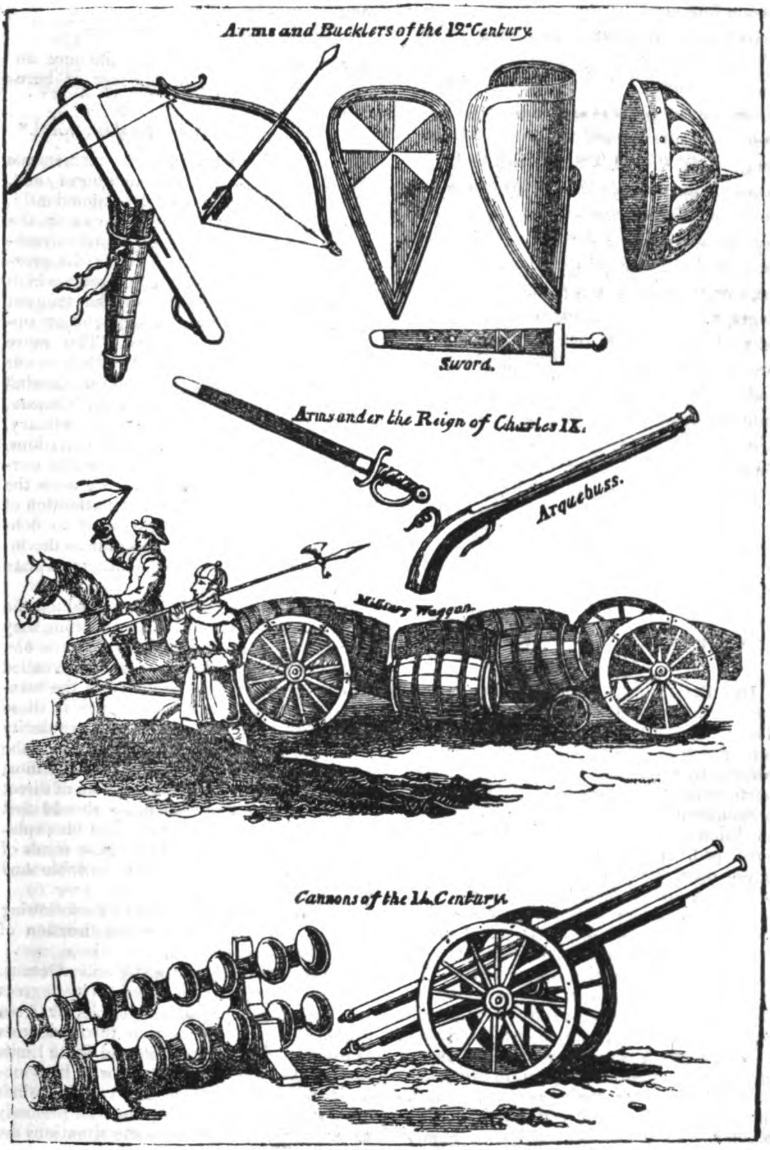
The London
MECHANICS' REGISTER.

No. 13.] SATURDAY, JANUARY 29, 1825. [Price 3*d*.

ANCIENT ARMS.



ANCIENT ARMS.

We have been favoured by a friend in Paris with some drawings, representing the arms in use in France during the 12th and 14th centuries. Contrasting the cannon then in use with Perkins's Steam Gun, the ideas which it will create, will be very curious. By a book in King's Library at Paris, it appears that the cannons in use during the 14th century *did wonderful execution!* being discharged not less than 25 times in an hour! If some of the gunners of that day could rise from their graves, and find themselves suddenly in Mr. Perkins's Steam Engine Manufactory, witnessing the discharge of balls from his Steam Gun, at the rate of 3 to 400 in a minute, we imagine they would be a little astonished. The engraving in the preceding page represents the cannon used during sieges, and which were composed of several bars of iron united; and a field piece with two barrels of an enormous length. We understand that the cannon used at the famous battle of Cressy, and which were the first ever brought into a field, were precisely similar to that exhibited in the engraving. The Military Waggon is equally curious.

LONDON MECHANICS' INSTITUTION.

DR. BIRKBECK'S LECTURE ON THE THEORY OF THE WINDS.

Dr. Birkbeck, on Wednesday the 19th instant, illustrated the intricate subject of the Theory of the Winds by an admirable lecture, which he introduced by remarking that *caloric*, by which the forms of the various portions of this globe are regulated, exerts a preponderating influence in determining the condition of the aeriform fluid by which it is enveloped. By the unequal action of this power upon the different parts of the atmosphere, the diversified appearances of the lower heavens are produced, not less than those movements of the aerial mass, which, according to their extent and intensity, administer largely to the accommodation or the destruction of man. To describe and explain the changes which thus occur in this region of the atmosphere, is the province of meteorology; a science which has deeply engaged the attention of man, in every state of society, from the roving savage to the refined votary of wealth and pleasure. The moment we cross our thresholds, we commit ourselves to the influence of the weather: an influence which we are essentially interested in comprehending, if we are placed at its mercy, in the degree represented by Shakespear, when, in speaking of human life, he says—

> "A breath thou art,
> Subject to all the skyey influences
> Which do this habitation wherein thou keepest,
> Hourly infect."

or, if we are justly described by the same unrivalled poet, as being, either now or hereafter, destined incessantly,

> "To be blown about this pendant world."

Directly or indirectly, all these momentous changes are ascribable to the matter of *heat*, which distributed more or less abundantly, more or less equally, through the earth, the sea, or the air, produces the soft and refreshing dew, or the rain which swells the overwhelming torrent; the gentle breeze which sooths us by its murmurs, or the tempest which overthrows every obstacle that opposes its desolating progress. The more regular and ordinary varieties which occur in the distribution of *caloric*, constitute what is generally expressed by the word *climate*, the less obvious and more extraordinary, though perhaps not less regular variations, occasion the numerous atmospherical currents which are called *winds*. To these the Lecturer should now direct the attention of his hearers, while he endeavoured to delineate their phenomena, and as far as the intricacy of the subject would admit, to explain them.

According to the periods during which the winds continue to blow in one direction, they are called *perennial*, *periodical*, or *variable*. To the two first kinds belong what are called the *trade*, or *tropical winds*, and the *monsoons*, while the last comprehends those which blow without any apparent regularity from every point of the compass. Since the *trade winds* seem to arise from the most general causes, and to be susceptible of direct and satisfactory elucidation, he should first describe and consider them; but his explanations would be found to apply to winds of every description, the most variable and local alone excepted.

Dr. Birkbeck then submitted the following observations on the extent and direction of the trade winds, viz.

1. Over the Atlantic and Pacific Oceans, the general trade winds extend thirty degrees on each side the equatorial circle, or from thirty degrees of northern to thirty degrees of southern latitude, and beyond these limits the variable winds begin to blow. The boundaries between the trade and variable winds are not, however, always preserved precisely as above stated, as in some situations the

trade winds, from local circumstances, do not extend beyond the 28th degree from the equator, while in others they reach as far as the 32nd degree of latitude.

2. While the sun continues immediately above the equator, the trade-winds tend from the East towards the North, and still proceeding northwards, on their arrival at the above limits, become nearly north-east. In like manner, in navigating from the equator towards the South Pole, the direction of these aerial currents, is found continually to approach nearer to the South-east.

3. When the sun has reached the most northern extremity of his annual course along the Ecliptic, the general trade-winds blowing towards the equator from the opposite hemisphere, are observed to become more directly South; and similar deflections occur when the circumstances are reversed by the sun attaining to his greatest southerly declination.

4. The place where the trade-wind is due east, is not situated, as might be expected, upon the equator, but from three to five degrees on its northern side.

Lastly, although the winds in the northern temperate zone are justly characterised by their variableness, yet they are found, by numerous observations, to incline particularly towards the west and south-west, and towards the east and north-east.

To elucidate the preceding remarks more fully, a diagram was exhibited, which shewed the relative situations of the various oceans and continents upon the surface of the earth, on Mercator's projection; and upon this map the regions to which the trade-winds extend on each side the equatorial circle were distinguished by a dark shade, to indicate to the audience those portions of the atmosphere between and near the tropics, to which their operation is limited. Dr. Birkbeck then retraced upon the map, and also on the terrestrial globe, the parts referred to in his observations, particularly the Atlantic and Pacific Oceans, presenting a widely extended expanse of waters, under which circumstances, upon the principles which he should subsequently explain, the trade winds could alone occur It must be remarked that these winds blow from east to west, or in a direction contrary to the diurnal motion of the earth upon its axis, and the mass of air moves at the rate of eight or ten miles an hour, or rather, as he should endeavour to show, the air remains at rest and only appears in motion in consequence of the earth's revolution in the opposite direction.

The lecturer then alluded to the *monsoons*, or those periodical winds, which, in the Indian Ocean, blow from nearly opposite points of the compass at different parts of the year. One of these monsoons, during the six months from May to October, blows from the south-east, and for the rest of the year from the north-west. In a different part of the same ocean, another monsoon blows from the north-east point from October to April, and from the south-west and west-south-west during the remaining months. After minutely pointing out the situation and direction of these monsoons, with the various degrees of latitude to which they respectively extend, by tracing their courses on the map and the globe, Dr. Birkbeck proceeded to explain the atmospherical occurrences by which the tropical winds are produced.

To account for the production of these winds, many fanciful and absurd theories had been offered, some of which the lecturer particularized, but the first solution of these phenomena, resting upon solid physical grounds, was given by Dr. Halley. The principle employed by him is the rarefaction or expansion of the air by caloric. "Since the earth," says he "in revolving from west to east, exposes the whole zone to the influence of the direct rays of the sun, the sea, and land, and of consequence the air incumbent upon them, will there receive the greatest degree of heat. The maximum, or greatest degree of heat in those regions which are most heated will always *follow* the sun, because no part at once acquires its utmost heat, and must therefore move in a direction contrary to that of the earth's surface; and the rarefaction thereby produced, disturbing the parts of the atmosphere within the tropics in succession, a current of air must constantly *follow* the extreme of heat to restore the equilibrium."

Dr. Birkbeck here exhibited some experiments, for the purpose of establishing the principle involved by Dr. Halley's theory, viz. the expansion of the air by heat. A long glass tube nearly filled with a coloured liquid, and furnished with a bulb at the top, containing a portion of atmospheric air, was placed on the lecture table, and it was seen that the mere application of the hand to the bulb communicated sufficient heat to expand the air, and depress the fluid in the tube, and when a greater degree of heat was applied, the air became so much rarefied, that it occupied nearly the whole of the tube. The ascent of the smoke in a chimney is owing to the rarefaction of the air by heat, in consequence of which a continued current of cold air enters at the bottom, to supply the place of that which ascends as it becomes rarefied. The revolution of the smoke-jack, as it is erroneously called, is not occasioned by the smoke, but by the current of heated air striking upon its inclined planes. This the lecturer further illustrated by a simple apparatus, consisting of a spindle, round which a paper spiral was made to revolve, solely by the ascent of the air which was heated by placing a spirit lamp below the spiral. The ascent of heated air was also proved by applying a taper to the top and bottom of the door of a room, when the opposite directions assumed by the flame would shew that the current of warm air flowing out at the top, was replaced by a stream of cold or dense air enteriug at the bottom. In the same manner, the rarefaction of the atmosphere in the equatorial regions by the heat of the sun, causes it to ascend, and currents of cold air are continually rushing in to supply its place. A beautiful experiment was then performed to exemplify the tendency of a light fluid to ascend in a denser medium, by sinkiug a phial, containing a red liquid, in a deep vessel of water, the cork being then withdrawn, the coloured fluid immediately ascended in spherical globules, and rested on the surface of the water, without mixing with it, the phial being quickly emptied of the fluid, and its place supplied by the water which flowed through an aperture at the bottom. This experiment would illustrate the manner in which the smoke is carried up our chimneys, by a current of rarefied air, while the colder stream presses forward to occupy its situation.

The rarefaction of the atmosphere between the tropics, was not, however, as Dr. Halley had imagined, of itself sufficient to elucidate the phenomena of the trade-winds; it was therefore necessary to consider the operation of this cause, in connection with the effect produced by the revolution of the earth on its own axis. The surface of the earth moves with the greatest velocity at the equator, and this velocity decreases as we ascend to higher latitudes. A table of the houly rotatory velocity of the earth's surface, for every tenth degree of latitude from the equator to the poles, had been constructed by Mr. Dalton, and was now exhibited, from which it appeared that its motion at the equator is at the rate of 1000 miles per hour, and its gradual diminution in velocity in different latitudes is as follows, viz.

Degrees.	Miles.	Difference.
0	1000	
10	984,8	15,2
20	939,7	45,1
30	866	73,7
40	766	100
50	642,8	123,2
60	500	142,8
70	342	158
80	173,6	168,4
90	——	173,6

The general principle deducible from the different degrees of velocity above stated is, that as the masses of cold or dense air, which rush from the temperate latitudes towards the equator, move with *less rapidity* than the rarefied air at the equator itself, the aerial mass between the tropics becomes *retarded* in its progress, and therefore revolves with *less velocity* than the subjacent parts of the earth's surface. If, for instance, a mass of air, moving at the rate of 500 miles an hour rushes towards part of the earth, which travels with a velocity of 1000, it will advance with a diminished velocity, and as the earth at the equator will revolve with greater rapidity than the incumbent atmosphere, a constant current of air will appear to flow in a direction contrary to that of the earth's motion on its axis. Dr. Birkbeck then exhibited two diagrams, by means of which he clearly illustrated the combined operation of *rarefaction* and *rotation*, as the two principal causes of the trade-winds in the equatorial regions, and proved that the direction in which these currents regularly blow, was such as must necessarily result from the influence of these two influences.

It would be easy to apply these principles to an explanation of the periodical winds, or *monsoons*, if the time would admit of it, but he should only observe that the proximity of the continents which are situated on the borders of the Indian ocean is the principal cause of the difference which exists between the *monsoons* and the trade winds; for as the earth imbibes the heat of the sun in greater quantities than the water, the air which is over its surface becomes more rarefied, and, upon the principles already explained, the cooler mass upon the surface of the ocean rushes towards the continental regions at certain periods of the year, and occasions the occurrence of periodical winds. The land and sea-breezes, and the day and night currents of air which are experienced in some places, may be satisfactorily accounted for by rarefaction alone, without reference to the principle of rotation.

The *variable* winds are the only class which remains to be noticed, and notwithstand ng their apparently uncertain and capricious character, it is far from improbable that equal constancy ought to be ascribed to them as to the former, and that future researches will prove that they belong to the most unchangeable phenomena. Blowing, as they do, from every point of the compass in these regions, there exist, it is probable, but two original winds, a north-wind and a south-wind. Aerial masses, by whatever cause or causes put in motion, are thus understood to be proceeding in the first instance, from the pole to the equator, or from the equator to the pole, and the impelling force has by some been conceived to exist principally in the arctic and antarctic regions. The Lecturer here introduced a beautiful quotation from Dr. Darwin, describing, in highly poetical language, an imaginary monster existing in the dreary polar regions, and producing the changes of the wind from north to south, by alternately drinking and disgorging immense masses of the atmosphere.

Dr. Birkbeck here introduced some experiments with the air-pump, to show the force with which air rushes into a partial vacuum, and to illustrate the production of winds by the tendency which a dense mass of air possesses to flow towards those portions of the atmosphere which are more rare. Thus when a double quantity of air was condensed into a strong glass vessel, upon removing the pressure which confined it, the air rushed forth with considerable violence, and a strong current of wind was produced. Upon the same principle, the barometer sinks before an approaching storm, because less atmospherical weight presses upon the mercury, and this effect is sometimes perceived some days before the storm occurs, but if the barometer rises during a storm, its duration will be short, as the elevation of the mercury in the tube shews that the air is recovering its equilibrium.

After a variety of other interesting remarks, illustrative of the numerous deflections and velocities of the aerial currents, denominated variable winds, the learned lecturer observed, that difficult as it might appear to reconcile all the variable and capricious phenomena of the atmosphere, with the hopes and expectations he had ventured to express, there could not exist a doubt, that from a system so impressively stamped with design and intelligence, fortuitous occurrences must be universally excluded. He who at the Creation proclaimed, "This be thy just circumference, O world!" who declared to the impetuous ocean, "Thus far shalt thou go, and no farther, and here shall thy proud waves be stayed;" and who, by his mandate, "has stopped his thunder in mid-heaven," has not allowed, we may be persuaded, the subordinate phenomena to proceed without equal control. Every breeze which murmurs through the air, must have received its commission, in accordance with unchangeable laws, and when we have extended our inquiries into second causes to the utmost limits to which science can aspire, we must terminate our researches by reverently admitting the existence of a presiding Intelligence, a Great First Cause, even like

"— the poor Indian, whose untutored mind,
"Sees God in clouds, and hears him in the
WIND!"

MR. PARTINGTON'S FIRST LECTURE ON OPTICS.

NATURE OF LIGHT—REFLECTION—REFRACTION.

Among the various sciences comprehended under the general head of natural and experimental philosophy, according to the arrangement of Professor Vince of Cambridge, the only branch upon which the Members of this Institution had not yet heard Lectures was Optics; and the circle will now be completed, through the kindness of MR. PARTINGTON, of the London Institution, who commenced a course of Lectures on this interesting subject on Friday evening the 21st inst. We were sorry to observe, that this gentleman laboured under considerable indisposition, and sincerely hope that his anxiety to prevent disappointment on the part of the Members, will not be attended with any injurious effects. He observed, that in introducing his subject, he should not trespass upon the time of his hearers by any extraneous remarks, but proceed at once to the more immediate purpose of this Lecture, in which he should examine the nature of *light*, and the effects of *reflecting* and *refracting* bodies.

Light, according to the hypothesis of Sir Isaac Newton, is *material*, and consists of an infinite number of rays projected in right lines from any luminous or radiating body, and of inconceivable minuteness. That these molecules, or particles of light, supposing them to be material, must be infinitely more minute than the smallest grain of sand, is evident from their striking upon the eye without hurting the sight, though they travel with such amazing velocity that they describe the immense distance between the sun and the earth in a few minutes, and their minuteness may also be inferred from their passing through metals, or rather through extremely small apertures in them, as a thin lamina of gold is found to transmit rays of a green colour. Prior to the promulgation of Newton's system of the *materiality* of light, it had been maintained by Descartes that light is not projected from the luminous bodies themselves, but arises from the vibration of the particles of an invisible fluid, put in motion by external agency, in a manner analogous to the production of sound by the vibrations of the air, and that these radiations resemble the undulations produced on the surface of water when a pebble is thrown into it. There were, however, many objections to this theory, among which it might be observed, that light is always found to proceed in right lines, for though we may bend its rays, or turn them from their course by reflection, we cannot see through a bent tube. Mr. Partington illustrated this remark by an apparatus on the lecture table, which showed that though the rays of light ascended through a tube, and passed through another horizontally, they would not descend through a third which was attached to the lateral branch.

It is necessary to explain, in the first instance, what is meant by a *luminous body*, as it does not follow that all bodies which shine are luminous. The sun is the fountain of light and heat, but the moon also shines, yet it is not a luminous body, as it shines only by a borrowed light, or by *reflection* The polished surfaces of mirrors appear to send out rays of light, but those rays are previously received from some other body and indeed, all bodies, not of themselves luminous, shine only by reflected light. Instances however occur, in which bodies are found to retain the power of radiating light, when the source from which it is derived is removed; the phosphoric light emitted by the glow-worm, is an example of this property, and phosphorus itself shines for a considerable time after it is removed from the light, and retains its radiating power till its chemical nature becomes changed by exposure to the atmosphere.

The Lecturer then made some interesting observations on the influence of light on the vegetable creation. Some plants are found to follow the light of the sun, and it is evident that the colour of vegetables depends, in a great measure, upon the presence of light, for plants which are removed from its operation are white and free from colour; thus the lower part of a head of celery is colourless, while its upper foliage assumes a green tint, and the external leaves of a lettuce are green, while its interior, which is not exposed to the rays of the sun, is destitute of colour. The animal world also presents many obvious instances of the effect of light in the production of colour, as the upper parts of fishes are coloured, while their lower surfaces are white; and in the tropical climates, where light is poured in the greatest profusion, the insects and birds are observed to display the richest and most variegated colours; but even in those climates, the beautiful plumage of the feathered race obeys the general law, and is nearly white on the lower parts of their bodies.

Mr. Partington then proceeded to illustrate the nature of light, which had been considered by the early philosophers as a simple body, but was now ascertained to be a compound, for if a white ray of light is made to pass through a prism, it is found to be divided into seven different colours, possessing different degrees of refrangibility. These seven colours may be reduced to three primitive ones, from which the others are derivable, for according to the arrangement of the prismatic colours, the blue and yellow rays are intercepted by the green, and the union of the two former colours produces the latter. In the same manner, the yellow and red unite to form the orange, or intermediate ray. Dr. Wollaston, by looking through a long narrow line of light had been enabled to reduce the seven rays into four. Having thus explained the *analysis* of light by means of the prism, the lecturer observed, that its composition might be *synthetically* demonstrated by placing a second prism in the coloured rays, by which means they would be re-composed, and reduced to their original whiteness. A similar effect was produced by an instrument now exhibited, consisting of a circular plane, divided into three equal sectors, painted respectively green, red, and yellow, which was made to revolve rapidly, when all distinction of colour was absorbed, and the circle, during its revolution, appeared nearly white.

In the analysis of light thus effected by means of the prism, one of its constituent elements is the *violet ray*, and it is a remarkable circumstance that a steel needle, if passed gradually through this particular ray, acquires magnetic properties. The attention of the public was first attracted to this circumstance by Dr. Morichini, and it had since been confirmed by the experiments of Sir Humphry Davy, whose veracity could not be doubted. This singular effect received a further confirmation from Colonel Gibbs, who observed, when in North America, that iron ore, possessing no magnetic properties when first dug from the earth, became magnetized by exposure to the light of the sun for two or three days, and acquired North and South polarity.

From a reference to the principles thus briefly examined, the nature of coloured bodies may be readily comprehended; for as the colour of a body is known only by the rays which it reflects to the optic nerve, and as different bodies reflect different portions of the rays into which light is divisible, it will be evident that a red surface reflects only the *red rays*, absorbing all the others, and the same observation is applicable to all the other colours. A white body reflects all the rays of light, while they are nearly all absorbed by a black one. Mr. Partington then shewed by experiment that three fluids of different colours, viz. blue, yellow, and red, each of which was transparent when viewed separately, appeared perfectly opaque when placed together, as the rays of light from the lamp would not pass through the combined colours.

The Lecturer now directed the attention of his audience to the laws which govern the *reflection* of light from polished surfaces. If a ray of light falls perpendicularly upon a flat plate of glass, it is reflected precisely in the same direction, and the incident and reflected rays coincide with each other; but if the incident ray, or that which proceeds from the luminous body, strikes the surface at any angle from the perpendicular, it is reflected at exactly the same angle beyond it; thus if a person stands directly before a mirror, he sees his own image reflected, but if two persons stand at an equal distance on each side the glass, each of them will see the figure of the other reflected, and not his own. Upon this principle it was easy to conceive why an image appears inverted in a concave mirror, for supposing its surface to consist of an infinite series of planes, it is evident that the reflected rays must be thrown back in opposite directions, and that the image must appear inverted, except within the focal point. Mr. R. Bradley was the first to point out the application of plane mirrors to the construction of the Kaleidoscope, which has since been much improved by Dr. Brewster, who employed plates of polished metal instead of glass, by which means the reflection is rendered more perfect, because looking-glass produces a double reflection, one proceeding from the surface and the other from the quicksilver, and thus occasions an indistinctness in the image which is obviated by the substitution of metal plates.

Previous to entering upon the subject of the *refraction* of light, Mr. Partington particularly explained the difference between *reflection* and *refraction*. The former meant the return of an image to the eye from a polished surface, and the latter, the bending of the rays proceeding from a luminous body, on passing through a *medium*. A ray of light passing from the air into water, is refracted, or bent from its first direction, in consequence of the greater density of the medium through which it passes. The Lecturer exemplified this principle by pouring water into a vessel, across the bottom of which a black line was traced, and the refraction of the rays of light was evinced by the apparent elevation of the line as the water was introduced into the vessel. As many of the members present could not exactly see the effect of this experiment, they might easily convince themselves of the fact by placing a piece of money at the bottom of a basin, and receding from it till the coin was concealed from their sight, and they would find that if water was poured into the basin, the refraction of the rays of light would make the piece of money visible. The refractive power of water is of considerable importance to bathers, as it has the effect of materially diminishing its real depth to the eye. The effect of the atmosphere itself, as a refracting medium, is of great importance in astronomical observations, for the rays of light, in passing through the air, assume a curvilinear direction, as the density of the atmosphere continually varies in their passage to the surface of the earth, and in consequence of this refraction of the rays of light, the Sun appears to rise before it really ascends above the horizon. Mr. Partington here illustrated the effect of atmospherical refraction by a reference to Mr. Christie's Tellurion, an apparatus ingeniously contrived for the purpose of elucidating the motion of the earth round the sun, and the variations of the seasons, as well as the different lengths of the days and nights, in consequence of the obliquity of its axis to the plane of its orbit.

At this period of the lecture, Mr. Partington introduced the phantasmagoria lantern, for a further illustration of some of his preceding remarks, and also to shew the manner in which light is refracted during its passage through lenses of different forms. The lights in the lecture room being lowered, the various images were very distinctly thrown upon a screen, and the first represented the division of a ray of light into seven different colours on passing through a prism; the various degrees of refrangibility in the rays were very clearly marked, the most refrangible being the most turned upwards, and the lecturer observed, that there was a difference of temperature in each of the rays, the red ray possessing the most heat. The second image or spectrum illustrated the refraction of a ray of light during its passage through glass. The third spectrum exhibited the direction of the rays of light on passing through two double convex lenses, placed at such a distance that the focal point was exactly equidistant from their surfaces, and it was seen that the rays which converged on entering the first lens, diverged from the focus towards the second, and then proceeded in lines parallel to their first direction. The fourth spectrum shewed the refraction of the rays through a single lens, plane on one side, and convex on the other, in which case, the focus was situated at the circumference of the circle of which its convex surface formed an arc, instead of being placed at its semi-diameter, as in the preceding instance.

Mr. Partington then alluded to his previous observations on the different degrees of refrangibility of the rays into which light is divided by the prism, and stated that the defect which this property would otherwise occasion in optical machines, was obviated by using lenses of different refracting powers. He might here observe, that the essential oils possessed a greater power of refraction than water, and that this power was greatest in the most inflammable. It was from observing the great refractive power of the diamond, that Sir Isaac Newton supposed it to be a combustible body, long before the progress of chemical science had established the fact. The lecturer then described the manner in which a lens might be formed by introducing oil of turpentine between two concave glasses, and after briefly stating the forms of the various lenses, viz. the plano-convex, plano-concave, double convex, and meniscus, or crescent-formed lens, he concluded by observing, that in his next lecture, he should request the attention of his hearers to the most wonderful of all natural lenses, the human eye.

ADDITIONAL DONATIONS TO THE INSTITUTION.

We feel great pleasure in stating that the splendid example recently given by Sir Francis Burdett, in his munificent donation of one Thousand Pounds to promote the important purposes of the London Mechanics' Institution, has already been followed with a degree of liberality which reflects the highest credit on the Donor and affords a cheering prospect of the future progress of the Society.

The following subscriptions have been received during the present week, and were announced to the members at the Lecture Room on Wednesday evening last, viz.

JOHN CAM HOBHOUSE, ESQ. M. P. second Subscription - - -	100*l.*
JEREMY BENTHAM, ESQ. second subscription - - -	100*l.*
REVEREND GEORGE ATWICK, Bennet Street, St. James's -	50*l*
DR. GILCHRIST, Vice President -	10*l.*
HENRY BICKERSTETH, ESQ. second subscription - -	10*l.*
G. P. GREENOUGH, ESQ. - - -	10*l.*

IMPORTANT INVENTION,

A person of the name of Roberts, who is at present in Bolton, has constructed an apparatus, which will prove useful and valuable, in the highest degree. Its object is the safety of life and property, in cases of fire, or where any suffocating or noxious vapour exists. It consists of a hood and mouth piece, so contrived, as to render the wearer enabled to breathe, with perfect ease and safety, in the midst o the densest smoke. In case of dwelling houses, warehouses, factories, ships at sea, &c. being on fire, its advantages are incalculable. Roberts exhibited the efficacy of the above extraordinary discovery at the mines of the Earl of Balcarras, a few weeks since, to the complete satisfaction of those who witnessed it. On Wednesday week, at the recommendation of several personsi n Bolton and the neighbourhood, of the highest respectability, he invited some of the principal tradesmen and inhabitants o f the town, to meet him at Messrs. Crook and Dean's Foundry, Little Bolton; where he demonstrated the infallibility of his apparatus, to the utter astonishment of a very respectable party of gentlemen. In the course of the trial, he went into a stove room, in which sulphur, hay, &c. were burning at the same time. He was shut in for the space of twenty minutes; and came out at the expiration of that time, perfectly sound and uninjured. Had any one without the apparatus remained in the room longer than a minute, it would have been attended with certain death. The invention will be submitted to the Society for the encouragement of Arts and Sciences. He has been advised by some to apply for a patent; but like all who are possessed of true genius, he is modest and unobtrusive; and consequently abhors quackery, or even the appearance of it. He prefers allowing the public the full benefit of his exertions, and trusting to their benevolence, as the reward of his labours. We understand that some gentlemen are endeavouring to raise a subscription for him

To the Editor of the Mechanics' Register

SIR.—Your Correspondent J.L.B. has not I think been sufficiently explicit in his answer to G.L's query, p. 127, No. 8.—He says, "that the water poured into the vessel, being colder than the atmosphere in which it is, condenses the *atmosphere* into *steam*."—It appears by this, that atmospheric air is convertable into steam—that is, vapour of water—by a reduction of temperature!—Again, it is to be inferred from this statement that the moisture deposited on the exterior of the vessel is not water itself, but steam, that is vapour of water! Now Sir, as this mode of explanation is very likely to mislead, I would with deference to J.L.B. beg to submit the following.

It is an established law of nature, that cold contracts and heat expands all substances to which they are applied, and as the atmosphere always holds more or less water in suspension in the state of invisible vapour, the water in the vessel being in this case colder than the air immediately surrounding it, contracts or condenses the vapour it contains into its original liquid form of water, upon the outside of the vessel. Had the atmosphere on the contrary been the colder substance of the two, the reverse of what J. L.B. asserts in the latter part of his explanation, would result, the vapour which is continually rising from all water exposed to the air would when it rose from the vessel into the colder air, have been partially condensed and rendered visible by the reduction of temperature thus effected. The water in this case would appear to be warm, which indeed, it is, comparatively. This effect may be seen, when water is taken from a spring or pump in a cold frosty day.

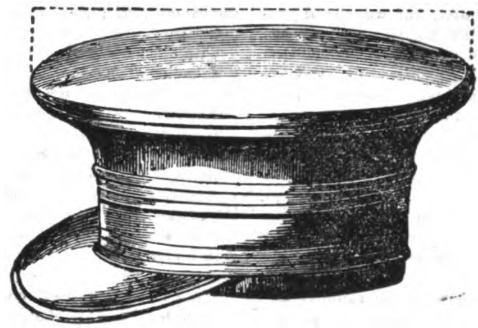
With respect to G.L's query as to the rationale of the effect produced by rain, in increasing the flames when falling upon a house on fire, if this be the fact, I can only account for it in the following way. The rain being insufficient to extinguish a large body of flame, only serves to purify the air, by absorbing the Carbonic Acid Gas which is formed by the combustion of the wood, and which being heavier than atmospheric air and incapable of supporting combustion, would otherwise remain in combination with the atmospheric air in the Building.

Your's respectfully,
W. K. M
Member of the L. M I.

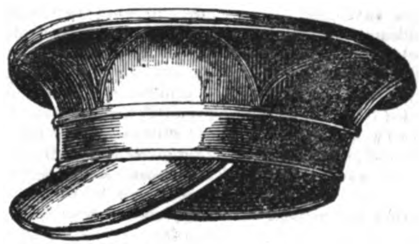
SIR,—As some of your naval readers out of London might wish to see the cap now established, I beg to send a drawing of it for insertion in your useful Register. The band is gold.

Yours, &c.
W. P G

FLAG OFFICERS, &c. 11 Inches.



PHYSICIAN, SECRETARY, &c



SIR,—I should feel obliged by your inserting the following answer in your Register.

For procuring an iron tree the following process is used.

Dissolve iron filings in aqua fortis moderately concentrated, till the acid is saturated, then add to it gradually a solution of fixed alkali (commonly called oil of tartar, per deliquum) a strong effervescence will ensue, and the iron, instead of falling to the bottom of the vessel, will afterwards rise so as to cover the sides, forming a multitude of ramifications heaped one upon the other, which [illegible] sometimes pass over the edge of the vessel, and extend themselves on the outside with all the appearance of a plant.

FOR A LEAD TREE.—To a piece of zinc fasten a wire, crooked in the form of the worm of a still, let the other end of the wire be thrust through a cork. You then pour spring water into a phial, or decanter, to which you add a small quantity of sugar of lead; thrust the zinc into the bottle, and with the cork at the end of the wire, fasten it up; in a few days the tree will begin to grow and produce a most beautiful effect.

In answer to Juvenis Admirator, 216 solid feet.

THOUGHTS ON FREEMASONRY.

(*Continued from p.* 189.)

After the deluge, the worship of the Most High was obscured by clouds of Imagery, and defiled by Idolatry. Mankind were conscious of some great and incomprehensible cause of the uniformity, and wonderful progression of the works of nature; and bewildered in conjecture, they represented the great unknown cause by such objects, as appeared to produce the most powerful effects on the face of the world, from whence the Sun and Moon became the symbols of the Deity. As the manners of the people became more depraved, their knowledge of truth was lost in their apostacy, and their ignorance and superstition increased with their debasement; they at length forgot the emblematical allusion, and adored the Symbols instead of the divinity.

It is much to be feared, the same charge may be made against the masons of the present day; and that many are satisfied with the outward trappings of the Order, and neglect to study those grand principles, of which the decorations are but emblematical significations. The splendid parade on a masonic festival, the gorgeous apparel to attract attention and make the vulgar stare, are it is to be feared, objects of more real concern to many, than the exercise of those acts of benevolence which are so strongly inculcated by the Order,

In many of the ancient nations of the East, their religious rights were enveloped by the priests in allegories, emblems, hieroglyphics, and mystic devices, which none could understand but their own order. From these ancient examples, the mysteries of the craft have been wisely concealed from the vulgar; and under cover of various well adapted symbols, is conveyed to the enlightened mason an uniform and well connected system of morality

We are of opinion, that the ancient society of free and accepted masons was never a body of architects; that is, they were not originally embodied for the purposes of building; but were associated for moral and religious purposes. It must be evident to every mason, particularly to those brethren who have received the sublime degrees, that the situation of the lodge and its several parts, are copied after the Tabernacle and Temple; and represent the universe as the temple in which the Deity is every where present. The manner of teaching the principles of this mystic profession, is derived from the Druids, who worshipped one Supreme God, immense and infinite; the maxims of morality from Pythagoras; who taught the duties we owe to God as our creator, and to man as our fellow-creature; many of the emblems are originally from Egypt; the science of Abrax, the characters of those emanations of the Deity, which have been adopted, are from Basilides

The word mason is derived from the Greek and literally means a member of religious sect, or one who is perfectly devoted to the service of the Deity. The reason of the term free, being prefixed, is probably derived from the crusades, in which every man engaged in the expedition, must have been born free, and under no vassalage or subjection.

The term accepted, is derived from the indulgencies granted by the Pope, to all those who would confess their sins, and join in the enterprize for the recovery of the Holy Land. It is well known that immense numbers of freemasons were engaged in the holy wars, and that their gallant and enterprizing conduct, gained them the esteem of the leaders of the army, who solicited initiations into the mysteries of their order. This subject is well understood by those brethren who have received the 20th degree.

That freemasons were considered as a set of architects most probably took its rise from the following circumstance:—when Moses ordained the erection of the sanctuary, and afterwards when Solomon was about to build a temple at Jerusalem, for the worship of the only true and living God, they chose from among the people those whose wisdom and zeal for the true faith, attached them to the worship of the Most High, and committed to them the erection of those works of piety. It was on those great occasions that our predecessors appeared to the world as architects.

To cultivate peace and good-will towards men, to improve the general condition of mankind, and to worship the only true and living God in fervency and truth, are among the indispensable obligations of freemasons. A firm belief and acknowledgment of the supreme Being, the Grand Architect and ruler of nature, forms the first essential of a mason, who ought cheerfully to submit to his divine commands, and to rely on his Almighty protection, whose wisdom cannot mistake his happiness; whose goodness cannot contradict it.

As humanity ever springs from true religion, every religious sect which acknowledged the Supreme Being, is equally respected by the order. Religious disputes are banished from the society of masons as tending to sap the foundation of friendship, and to undermine the basis of the best institutions. The great book of nature is revealed to our eyes, and the univeral religion of her God is what is professed by freemasons.

(*To be continued.*)

THE COMPENDIUM STOVE.

(FROM THE PHILADELPHIA GAZETTE.)

Burning of Water!—Our town (or at least a par of it) has been kept in a state of excitement for three days and a half by a discovery which has been made of a mode of using water for fuel! The proprietors of coal mines and woodlands are all in alarm—

(by Monday we may expect that panic will spread among the wood sawyers and coal heavers)—the question whether it will be advisable to let the Liberties have the Schuylkill water, now we have this new use for it, already begins to be discussed—and fears have been expressed lest our Professor of Pyrotechny should carry his art so far as to set fire to the Delaware! As he has, however, given his word and honour that before he attempts any thing of this kind he will give suitable notice, so that the ships may be removed, no apprehensions on this score need for the present at least be entertained. In the existing state of public feeling, those, perhaps, are most rational who talk of petitioning Councils to assess an additional tax on such as burn the Schuylkill water as well as drink it.

Seriously and soberly—Mr. Augustus Day, who resides at No. 124, North Third-street, has invented a stove, by which it has been calculated a room may be kept warm for a whole day, and no more than four cents worth of Lehigh Coal be consumed in that period. It is of small size, and in shape an inverted cone, with several longitudinal openings near the apex. On a grate within rests a small quantity of coal. A pan of water placed beneath the openings insure a constant supply of vapour. In passing through the ignited coal, the aqueous vapour is decomposed, and we have that powerful heat which is produced by the combustion of oxygen and hydrogen. The cover of the stove is attached to a moveable section of pipe, which is raised and lowered by a fixture similar in principle to that of a suspended lamp, and by this contrivance the fire is regulated. So powerful is the heat that a small quantity of water thrown into the stove is immediately decomposed, and the combustion of its component parts follows of course. Of this we have ourselves been witness.

The principle of the invention has long been applied in the mechanic arts, especially by the blacksmith, who, as is well known, when he wishes to increase the heat of his fire, throws on it a small quantity of water. Of late years chemists have in their compound blow-pipes made sundry new and very valuable applications of this principle; but the honour of applying it to Domestic Economy, belongs to Mr. Day alone. His stove has not yet been used extensively enough to enable us to speak positively of the estimation in which it ought to be held by thrifty housekeepers; but what reason is there that a principle which has long been successfully applied in the mechanic arts, and to push the discoveries of science, should not be extended to the common purposes of life?

The saving of fuel will be immense, if the calculations which have been made be correct; but this is not the only advantage which the new stove promises. The aqueous vapour which is diffused through the room, keeps the air in that state which is most agreeable to the feelings and most conducive to health.

On account of the small space it occupies, Mr. Day calls his invention "The Compendium Stove." That in Mr. Potter's Bookstore in Chesnut-street is not larger than a tea-urn, and has cost, including the fixtures, thirteen dollars and fifty cents. The price of a stove without fixtures, but with eight feet of pipe, including the regulator, is eight dollars. Ornamental stoves, which Mr. Day proposes to make for parlours, will of course sell higher.

Experience is the true test of inventions. After the Compendium Stove shall have been brought more extensively into use, its practicability can be determined. At present it is legitimate object of curiosity, and as such deserves the attention of men of science and of the public in general.

The view of the invention given above is the one most favourable. Like every other question this has two sides, and the side which remains to be examined leaves some room for hope to the proprietors of coal mines and wood lands, and also to the wood-sawyers and coal-heavers. This, however, we shall not give at present, but merely remark, that there will still be enough Schuylkill Water to supply the Liberties, and that no apprehensions need be entertained of the river being set on fire.

BOMB CANNON.

We have more than once alluded to the preparations making by France, to improve her present means of warfare, and we may take to ourselves the credit of having cautioned the British Government against a supineness which might be attended with serious injury to the state. The construction of a Steam Gun in Paris, and of Steam Boats at Brest and Bourdeaux, to which the new principle is to be applied are subjects that deserves the serious attention of his Majesty's Ministers particularly, when they reflect, that the French are at this moment in possession of some of our best Mechanics, by whom all the inventions of which Frenchmen are so fertile, are likely to be brought to perfection. We now find by the French papers, that Charles the 10th has offered a premium of 5,000 francs to the person who shall discover the best means of resisting musket balls, and we extract the following from a respectable morning paper.

"Mr. Paixham (a Frenchman) has invented a mortar which throws bombs horizontally, exactly in the same manner that cannon discharge balls. This bomb cannon, executed under the orders of the Marquis de Clermont Tonnerre, was lately proved at Brest. It answered every expectation, and carried as far as the largest ship guns. The bomb went true to the direction, and the effect produced was so powerful, that considerable changes are immediately to be made in the naval *materiel*. In consequence of this new invention, large ships will no longer have the advantage of crushing smaller vessels without running any risk. A well directed discharge o' one of these bombs may blow up or sink the largest ship."

It is surprising that in a period of profound peace, Sovereigns, instead of offering premiums for those improvements in science which are honorable to humanity, should evince so much anxiety to promote mutual destruction.

RUSSIAN ROADS AND GAS LIGHTS.

The two officers of Engineers who arrived some time since in this country from the Imperial Government for the purpose of examining the improvements made in the roads, and also those in the various dock yards, bridges, &c., are we believe still in England. Mr. M'Adam's principle has been some time adopted in the neighbourhood of St. Petersburgh, and soldiers are continually employed in breaking stones, and laying them at suitable distances in small beds on the road side, for the convenient purpose of repair. The only difference discoverable in the Russian mode of road making, is that they generally neglect making a small elevation in the centre of the road, for the fall of the water and of keeping open the ditches for the reception of the same, and of constantly scraping the roads so much observed throughout this kingdom.

His Imperial Majesty has granted an exclusive privilege to the house of Messrs. Wm. Griffith & Co. in the City of London. in conjunction with a Mr. Matthew Clarke, Inspector of the Imperial Foundry, and who holds the rank of Colonel, to make oil gas erections throughout the Russian empire and dominions, for the space of 10 years. The principle of lighting by gas, has made some progress in the splendid City of St. Petersburgh.

LOCOMOTIVE STEAM ENGINES.

We have seen it stated in several of the Papers that the use of Locomotive Engines upon Rail Roads was never likely to become general, as all the experiments whi h had been made with them, had been attended with failure. We suspect that these statements had their origin in a quarter whence they might naturally be expected, for it is not probable that so positive a falsehood would be the result of mere error. That Locomotive Engines are not capable of performing all that has been promised in some of the Prospectuses for new Rail Roads, we are very ready to admit, nor would we indeed wish to be whirled along at the rate of twenty miles an hour; but that they are an important improvement in science. and in the application of human means to the great purposes of commerce, cannot, we think, be denied by any, except those whose interest is directly opposed to the adoption of them.

The following account of an experiment made with a Locomotive Engine on the 17th inst. at Killingworth Colliery, near Newcastle-upon-Tyne, will be found interesting In this account we have, indeed, no statement to astonish, but much to gratify the man of science, who is aware how much may be done in the way of improvement upon a novel invention. Yet if we look at the great weight drawn by this engine, and at the very small expense attending it, we shall have good reason to contend, that with less burthen, and more fuel, a great part of what has been promised by the Projectors of Locomotive Carriages for the conveyance of passengers, will be realised. We repeat that we do not wish to travel at the rate of twenty miles an hour; but if we can go at the rate of ten without the danger of having our necks broken—or the insolence of coachmen, or the annoyance of dust and mud, and. what is more than all, the distress to that noblest of the brute creation, the horse, we shall bless the labours of Steam Carriage Projectors.

"A grand experiment as to the power of Locomotive Engines, was performed at the desire and in the presence of more than twelve gentlemen from the Committees of the intended Manchester and Liverpool, and Birmingham and Liverpool Rail-Road Companies at Killingworth Colliery on the 17th inst. and the result was as follows:

'The engine, being one of eight-horse power, and weighing with the tender (containing water and coals) five tons and ten hundred weight, was placed on a portion of Rail-road, the inclination of which in one mile and a quarter was stated by the proprietor, Mr. Wood, to be one inch in a chain, or one part in 792; twelve waggons were placed on the Rail-road, each containing two tons and between thirteen and fourteen hundred weight of coals, making a total useful weight of thirty-two tons and eight hundred weight. The twelve waggons were drawn one mile and a quarter each way, making two miles and a half in the whole, in forty minutes, or at the rate of 3¾ miles per hour; consuming four pecks and a half of coals. Eight waggons were then drawn the same distance in thirty-six minutes, consuming four pecks of coals; and six waggons were drawn over the same ground in thirty-two minutes, consuming five pecks of coals."

We had sent the above to our printer, before we learned that the very paragraph which we have quoted as illustrative of the importance of Locomotive Engines, had been inserted in the newspapers by the Canal interest, and regularly paid for to the Proprietors, with the view to oppose the Rail Road

Bills in the House of Commons. It is remarkable that what these gentlemen consider as conclusive against Rail Road projects, appeared to us to be rather favourable; and we cannot refrain from doing them the justice to say, that they have inserted the facts without any unfair comment. We have since ascertained from one of the leading men interested in the opposition to Rail Roads, that if the weight to be drawn be reduced, the Engines will travel at the rate of 12 miles an hour, and that the only obstacle to be apprehended, would be the carriages falling off the Railway, a danger which we conceive can exist only in the imagination of the Canal Interest. Thus the practicability of Steam Carriages for the conveyance of passengers is fully established, and we have as little doubt that the conveyance of goods at the rate of seven or eight miles an hour, will soon be as easily accomplished.

LONDON AND EDINBURGH VACUUM TUNNEL COMPANY, CAPITAL 20,0000 STERLING.

At a time when so many Joint Stock Companies have started, some of them of a very doubtful tendency, the proprietors of THE LONDON AND EDINBURGH VACUUM TUNNEL COMPANY have come to the resolution of laying their Prospectus before the public with considerable reluctance; but having carefully matured their plans, and being conscious of the public importance of the measure, and of the ultimate advantages which must accrue to those who engage in it, they have determined publicly to announce them, and are confident that a discerning body of capitalists will at once perceive the difference between their scheme, which rests on the solid basis of mathematical calculations, and the many Utopian projects which have of late made their appearance, and which it requires no great degree of sagacity to foresee must ultimately end in the disappointment and ruin of thousands of those who have so foolishly embarked in them.

Without further preface, the projectors of the present scheme proceed to detail their plans. The London and Edinburgh Vacuum Tunnel Company is proposed to be established, with a capital of Twenty Millions Sterling, divided into 200,000 shares, of L.100 each, for the purpose of forming a Tunnel or Tube of metal between Edinburgh and London, to convey Goods and Passengers between these cities and the other towns through which it passes.

The interior dimensions of the Tunnel—which is to be of a rectangular form—are to be 4 feet high by 12½ feet broad, divided into two equal spaces, of 6 feet by 4; the one to carry goods from London to Edinburgh, the other to carry them from Edinburgh to London.

It is a well known fact, that steam, in consequence of its extreme lightness, when allowed to enter any vessel, completely displaces the atmospheric air, and that when the apertures by which it enters and the air escapes are effectually shut, and the vessel is allowed to cool, a vacuum sufficient for every mechanical purpose is formed.

The vacuum in the Tunnel, then, is proposed to be produced in this manner, by means of steam, which will be conveyed from boilers erected in its vicinity, at the end of every second mile.

The impelling power is to be the pressure of the atmosphere, which, on a vacuum of the dimensions proposed, is so astonishing as almost to exceed belief, even when demonstrated with mathematical precision.

The goods are intended to be conveyed by waggons, which, when loaded, will be placed in the tunnel, and connected together. A very strong air-tight sliding door, running on several small cylindrical rollers, to lessen the friction, will then be placed in the end of the tunnel, and, on a signal being made that every thing is ready, the engineers who have the charge of the boilers are to allow the steam to enter the tunnel, that by displacing the atmospheric air a vacuum may be formed. When the first two miles of the tunnel are filled with steam a signal will be made to cut off the communication between it and the boilers, and to shut the apertures by which the air escaped.

At each of the boiler stations there is to be placed a galvanic battery, and the whole are to be connected by means of metallic rods, so that the signals may be repeated instantaneously by the engineers, and conveyed between London and Edinburgh with nearly the rapidity of lightning.

After the steam has been condensed, and the vacuum formed, which it is supposed will be effected in less than an hour, the pressure of the atmosphere will be allowed to force in the sliding door, and consequently to drive forward the waggons.

The question now naturally occurs, with what force will the pressure of the atmosphere impel the waggons?

Without entering minutely into the principles on which the following calculations are made (for which the bounds of a prospectus are too circumscribed), suffice it to say, that they are to be found in most of the works which treat of rail roads, and that as they have recently been elegantly and accurately explained in a series of articles which appeared in an Edinburgh journal, which can easily be obtained, it has been thought sufficient merely to mention what the fundamental principles are from which all the conclusions have been deduced. These principles are, 1st, That the atmosphere presses on any body with a force of 14lbs. on every square inch of surface. 2nd, That a force of 158lbs. will move a body weighing

100lbs. on a common rail road, at the rate of twenty miles an hour, and that, if no resistance was made by the atmosphere, the velocity would increase in the ratio of the squares of the times; that is, if the body was to move over one foot in the first second; it would move over three feet in the second; over five feet in the third; seven feet in the fourth, and nine feet in the fifth, and so on *ad infinitum*

As the door of each of the tunnels will be 6 feet by 4, and the pressure of the atmosphere on each square inch is 14lbs., the gross amount of force employed in pressing it forward will be equal to 48,384 lbs.: but as the friction of an air-tight door of the dimensions proposed will be very great, suppose that one-half of the force, employed in pressing it forward, will be lost in overcoming this friction, the real force employed, in moving the waggons, will be 24,192 lbs. Now, if 158lbs. will move 100 lbs., on a common rail-road, at the rate of 20 miles an hour, notwithstanding the resistance made by the atmosphere, 24,192 lbs. will move 2,296 tons with the same velocity, under the same circumstances; but, as the waggons in the vacuum will not have to encounter the resistance of the atmosphere, they will move with an accelerating velocity, increasing in the ratios of the squares of the lines. Suppose, for example, that the waggons in the tunnel, with their loads, weighed 2,296 tons, they would start with a velocity of 20 miles an hour, or 28 feet and a fractional part, which has been disregarded, per second.

In the first second, therefore, they would move over a space of 28 feet; in the next, over a space of 84 feet: in the 3d, over 140 feet; and the velocity would for ever continue to increase in the same proportion.

In the first 30 seconds they would move over a space of 25,200 feet; and in the next 30 seconds they would move over 75,600 feet, or nearly 15 miles. In the second minute they would move over 58½ miles; in the third minute, over 95 miles and 1520 feet; in the fourth minute, over 136 miles and 576 feet; and in the fifth minute, they would move over 171 miles and 3936 feet, making altogether, in the first five minutes, 480 miles 4448 feet.

If each of the waggons weighed a ton, and carried a load of a ton and a half, 1143 waggons could be moved at the same instant, with this velocity; and if each of them measured 4 feet 8 inches long, which is nearly the length of the common rail-road coal waggons, they would cover a space of 1 mile and 43 feet in length.

By means of this invention, then, it has been shown that 1143 coal waggons weighing half a ton, and carrying a load of a ton and half each, making in all 2,296 tons, and covering a space of more than a mile in length, *might* (if the wheels would not melt in consequence of the rapidity of their motion) be conveyed between Edinburgh and London *in less than five minutes*, and at considerably less than half the expense charged by the Canal Companies, for carrying goods between Edinburgh and Glasgow.

As the power of the vacuum is so great, it will be more than sufficient to carry the vehicles over the highest acclivities that occur on the road to London, so that it will never be necessary to raise the tunnel above, or to make it descend below the surface of the country through which it passes.

This circumstance will greatly lessen the expense of its construction, and, at the same time, will allow the top of it to be made into an excellent rail-road for the conveyance of passengers.

The carriages for the conveyance of passengers are proposed to be drawn by means of a powerful magnetic body placed in one of the carriages within the tunnel, which will act on another body of the same kind placed in the carriage without; so that when the carriage within the tunnel moves, the one without will follow. If this contrivance should not answer the expectations of the projectors, it is proposed to employ Brown's Vacuum Engines to drag the coaches at the rate of 30 miles an hour.

After the London waggons have reached their destination, a vacuum will be formed in the same manner as before, and goods will be forwarded to all the principal towns through which the tunnel passes. All the waggons will be dispatched at the same time, leaving the one that has to go farthest placed first, and the one that has to go the shortest distance last. By a contrivance in the interior of the tunnel, which resembles the lock of a canal, all the waggons will be stopped at the first stage, and the last one taken out by means of a folding door at the side; and, as soon as the air which enters while it is open is expelled, the rest will proceed on their journey, and the same operation will take place at every succeeding stage.

The water which is formed in the interior of the tunnel by the condensation of the steam will prevent the wheels of the waggons and the cylindrical rollers on which the door moves, from becoming red hot.

A patent has already been obtained for the invention, which the patentees have agreed to sell to the London and Edinburgh Vacuum Tunnel Company, for the sum of twenty thousand pounds.

The advantages to be derived by subscribing to the scheme, must be so obvious, as to require no farther notice. The carrying trade between London and Leith alone, (not to mention the sums that will be obtained for allowing other Companies to form vacuum tunnels) would be an immense source of wealth to any Company; and the whole of this there is an absolute certainty of monopolising, as the London and Edinburgh Vacuum Tunnel Company will be able to carry goods for less than a tenth part of the sum which any of the Shipping Companies can afford to carry for. This must at once be evident from the circumstance, that a greater quantity of goods could be sent to London, through the vacuum tunnel, in one day, than all the shipping of Leith, of every class, could carry in a month, while the only expense incurred by the Vacuum Tunnel Company would be the price of about 200 tons of coals, and the wages of about 240 men; the whole amount of which would be 150*l.*, which is less than the proceeds of the freight of a single smack with a good cargo.

To prevent disappointment, an early application for shares is requested, as a considerable proportion of them have been subscribed for.

Written applications alone will be attended to, which must be *post paid*, and addressed to Williamson and Ziegler, W. S. Interim Secretaries, who will be happy to give any farther information that may be required.

The foregoing *Jeu d'Esprit* appeared in a recent number of the *Edinburgh Star*, and being well calculated to throw ridicule upon some of the preposterous plans now before the public for the investment of money, we insert it in the Register.

QUERIES.

Man in inquisitiveness should be strong,
From curiosity doth wisdom flow:
For 'tis a maxim I've adopted long,
The more a man *inquires* the more he'll *know*.
PETER PINDAR

To the Editor of the Mechanics' Register.

MR. EDITOR,—I beg to send you the following queries, the insertion of which will oblige

Yours, &c.
S. HOLLANDS.

1. A lady sent her servant to buy twenty birds for twenty pence; he bought pigeons at fourpence each, larks at a halfpenny each, and sparrows at a farthing each.—How many of each sort did he buy?

2. Suppose there was a bird upon a peach in a garden, and you wanted that peach, how would you get it, without disturbing the bird?

3. Supposing a person to be perfect in the formation of his hands, which is his longest finger?

4. When may a man be said to be over head and ears in debt?

5. What letter in the alphabet is that (and the only one) which requires the lips to be kept close to pronounce?

A Constant Reader wishes to be informed of the best method of making a durable ink for marking linen?

A Housekeeper would be glad to learn, through your useful Work, an easy and expeditious method of cleaning and polishing steel fenders and fire-irons?

SIR,—Your insertion of the following queries will greatly oblige your constant reader,

T. WILSON.

Limehouse.

1. Of what class of minerals are chalk, diamond, gold, coals, and salt?

2. Which is the heaviest, and which the lightest of metals, and how many pounds of the lightest will make ten pounds of the heaviest?

3. What weight of height of quicksilver, is equal to 33 feet of water?

4. How often must Snowden be placed on Snowden to make a Mont Blanc or a Chimboraco?

5. How many trades are requisite to build and furnish a house, and what are they?

6. How do wind instruments, as the windpipe of men and animals, and tubed instruments, produce their effect?

SIR,—I wish to learn, through your interesting Register, the best method of taking grease out of clothes, &c.

Your Register's well-wisher, W. T.

ANSWERS TO QUERIES.

MR. EDITOR.—I beg to send you the following replies to the queries in yonr last number. S. HOLLAND.

TO CLEAN MARBLE CHIMNEY PIECES, &c.—Mix finely pulverised pumice stone, with verjuice, somewhat more than sufficient to cover it, and after it has stood an hour or two dip a sponge in the composition and rub it well over the marble or alabaster which requires cleaning, wash it off with warm water and dry it with clean linen or cotton cloths.

TO PICKLE RED CABBAGE.—After cutting the cabbage in the usual manner put it in a baking dish, and sprinkle a good handful of salt over it, let it stand for 24 hours, and draw the salt and water well from it, the cabbage must then be put into a stone jar, adding a sufficient quantity of the very best vinegar *cold*, with ginger and allspice. The ginger and allspice being first boiled in about a quarter of a pint of the vinegar, all of which is to be put into the jar; this will be found not only very crisp, but of a very beautiful colour, and ready for use in a fortnight or three weeks.

FINE POTTED BEEF.—Take four pounds of tender lean beef, and one pound of fine streaky bacon, two ounces of lump sugar, and half an ounce of saltpetre. Let them lay 24 hours in a pan, seasoned with a little finely beaten mace, white pepper and common salt; then cut the meat in small pieces, put it in an earthen pot with six ounces of butter, and place it over a moderate fire for three hours, stirring it so as to prevent its burning. It must now be taken out, and should there be any outward hardness, cut it off, and beat the remainder in a marble mortar; adding a little mace, pepper, or salt, according to palate, with six ounces of clarified butter gradually mixed in. The whole being pounded exceedingly fine, must be put into pots, pressed closely down, covered over with clarified butter, and kept in a dry situation. Veal may be managed in the same manner. The convenience of having such articles as potted beef, and other ready dressed keeping provisions always in the house, is much greater than might be imagined, particularly to those who are frequently obliged to return home, fatigued at uncertain hours.

Ginger Wine.—The following valuable receipt is but little known, but will be found to be the best method of making this very cheap, pleasant and salutary wine.—To every gallon of water, put 2lbs. of lump sugar, and one ounce and a half of grossly pounded ginger tied in a coarse linen bag. Boil these together half an hour, or as long as any scum arises, which must be carefully skimmed off. Put this liquor when sufficiently boiled, into a tub, and on its becoming the warmth of new milk, add the juice and rinds of two lemons, and half a Seville orange for each gallon. If ten gallons be made, put in two table spoons ul of yeast on a bit of toasted bread. Should the wine be made in cold weather, it must be kept in a warm place, the better to promote fermentation, which sometimes does not take place for a day or two. If it ferments freely, tun it up the third day, ginger and rinds together, in a cask just calculated to hold it, keeping out a small portion for the purpose of filling up the cask while it continues to work, which must by no means be filled up with any part of what flows over. When it has ceased fermenting rack it off into another cask, adding to every fonr gallons, a quart of the best brandy, with half an ounce of isinglass previously disolved in some of the wine. In one month's time it will be fit to drink, or bottle; and few familiesi t will be presumed, who once make it and experience it's good effects, will ever after chuse to be without a cordial wine at once so cheap and comfortable.

Superlative Orange Wine.—To ten gallons of water, put 28lbs of loaf sugar, and the whites of six eggs, boil them together for three quarters of an hour, keeping the liquor well scummed all the time, and pour it hot into a tub or large pan, over the peels of 50 Seville oranges. When it is nearly cold take three spoonfuls of yeast spread over a piece of toasted bread, and put into the liquor to make it ferment. After it has stood two or three days pour it from the peels into a cask with a gallon of orange juice; which takes about one hundred and twenty Seville oranges; let it remain in the cask until done hissing, when the fermentation will have ceased, endeavour to proportion the size of the cask to the quantity, as it must be kept filled so as to work out at the bung hole. When the fermentation is over, draw off as much of the wine as will admit one quart of brandy for every five gallons of wine. It will be fit to bottle off or drink from the cask in four or five months. This wine if carefully made, according to these plain directions, will be found exquisitely delicious, and if kept 4 or 5 years, would be found to surpass most of the best foreign wines as they are usually sold in England.

Sir,—In answer to your correspondent, E. J. S. No. 11. I submit the following as the best method of bending glass.

To have a cove of cast iron the figure of what you wish the glass to be, placed in an oven, with the glass laid upon it, when it comes to a sufficient temperature of heat the glass will bend flat to the iron.

Your's &c. D. A.

NOTICE TO CORRESPONDENTS.

Several communications have been received, and are under consideration.

Erratum.—In part of last week's impression, the following error inadvertently occurred, which our readers are requested to correct, viz. page 180, col. 2, line 7 from the bottom, for "*heavy*" read "*light*" hydro-carburet.

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The London

MECHANICS' REGISTER.

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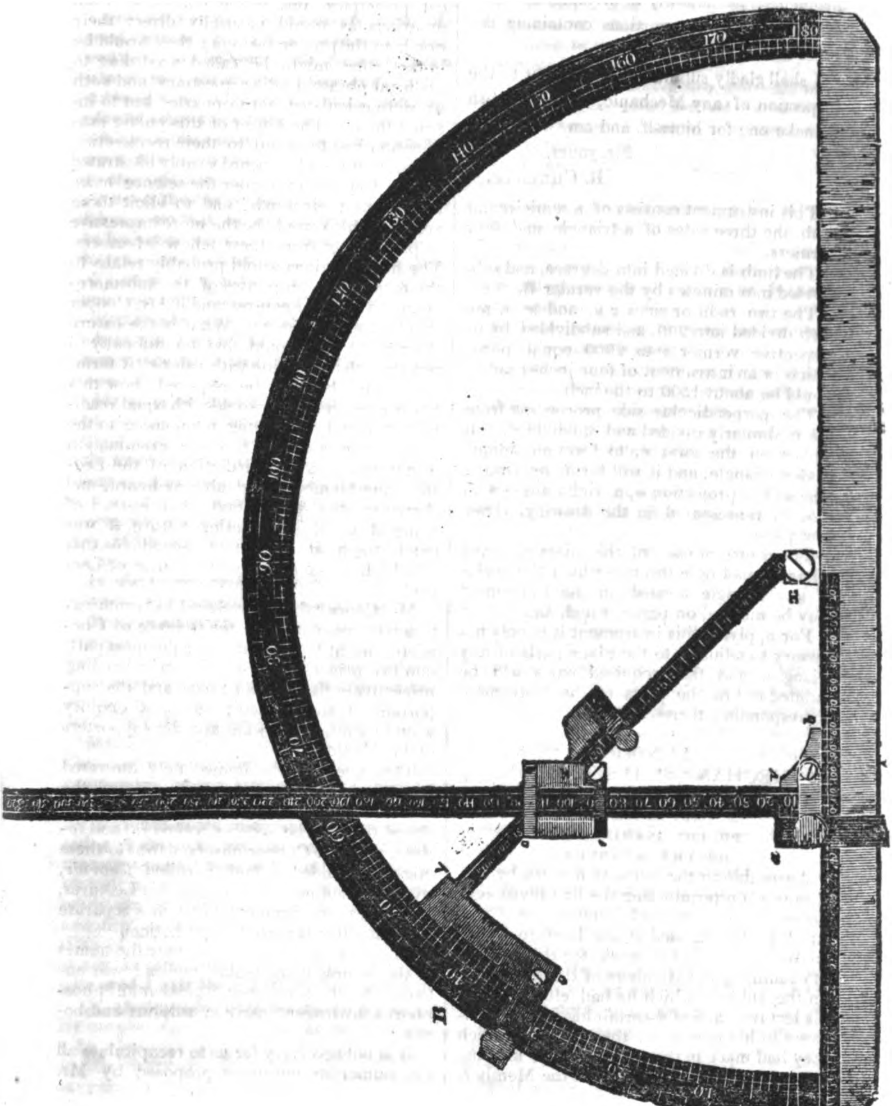
MR. CHRISTIE'S PROTRACTOR.



To the Editor of the Mechanics' Register.

46, Southampton Buildings.

SIR,—The accompanying diagram and description of an instrument for solving and protracting trigonometrical problems, may be interesting to some of your readers. I had the instrument constructed some years ago, and have frequently found it useful in solving Mechanical, as well as Mathematical problems; particularly in dividing circles of different radii into portions containing degrees and minutes.

I shall gladly submit the instrument to the inspection of any Mechanic, who may wish to make one for himself, and am

Sir, yours,

R. CHRISTIE.

This instrument consists of a semicircular limb, the three sides of a triangle, and four verniers.

The limb is divided into degrees, and subdivided into minutes by the vernier B.

The two radii or sides *x y*, and *x b*, are each divided into 200, and subdivided by its respective vernier into 2000 equal parts, which in an instrument of four inches radius would be about 1500 to the inch.

The perpendicular side proceeding from *a b* is similarly divided and subdivided. It moves on the joint *v*, to form an oblique angled triangle, and it will form, by resting against the projection *a*, a right angle with *x b*, as represented in the drawing. [See first page.]

The centre of each of the joints *x*, *v*, and *z* has a small hole through which the angles of any triangle formed on the instrument may be marked on paper, wood, &c.

For applying this instrument it is only necessary to adjust it to the given parts of any triangle, and the required parts will be pointed out on the parts of the instrument corresponding thereto.

LONDON MECHANICS' INSTITUTION

MR. COOPER'S PUBLIC EXAMINATION OF THE MEMBERS.

Agreeable to the intimation given by Mr. COOPER, on terminating the first division of his extensive course of Lectures on CHEMISTRY, he attended at the Lecture Room on Wednesday in last week, for the purpose of examining the Members of the Institution on the subjects which he had elucidated in his lectures, and of ascertaining, by their answers to his questions, the progress which they had made in the science. The meeting was numerously attended, and the Members appeared to feel a deep interest in the proceedings of the evening.

Previous to the commencement of the examination, DR. BIRKBECK, at the request of Mr. Cooper, addressed the audience with a few appropriate remarks on the purpose for which they were assembled, with a view of dissipating any apprehension which they might feel of replying to the questions that would be proposed to them. The examination would not be conducted with severity, nor would it relate to difficult or hypothetical principles, but would consist of such questions as would naturally direct their minds to the proper answers; they would be in fact, what might be called, according to the legal phrase, leading questions, and such as were calculated not to puzzle, but to instruct them. The object of this public examination was to recall to their recollection the subjects they had heard so ably illustrated by Mr. Cooper, to render the science more familiar to their minds, and to elicit those answers which would be the more impressive as proceeding from their fellow Members. The first questions would probably relate to the nature and properties of the substances alluded to in the Lectures, and if Mr. Cooper should ask, for instance, What is the nature of oxygen? they would find no difficulty in replying, that in union with caloric, it forms a gas; and should it be required, how this gas is procured, they would with equal readiness answer, by exposing manganese to the operation of heat. Thus the examination would only be a recapitulation of the Lectures the Members had already heard, and therefore they would find, that instead of being at all of an alarming nature, it was one of the most interesting appendages that could follow the delivery of a course of Lectures.

Mr. Cooper then introduced his examination by observing that the science of Chemistry might be separated, for the most part, into two principal divisions, comprehending respectively the combustibles and the supporters of combustion; his first enquiry would therefore be, what are the supporters of combustion?

This question was immediately answered by a youth about twelve years of age, the son of a Member named SWEET, who declared them to be *oxygen*, *chlorine* and *iodine*, and Mr. Cooper observed that to these might be added a fourth, called *fluorine*, which he had not dwelt upon in his Lectures, as it had never been exhibited in a separate state, and it was merely hypothetical.

The next question, viz. what are the names of the simple combustible bodies? was answered by the same young gentleman, phosphorus, hydrogen, carbon, sulphur and boron.

It is not necessary for us to recapitulate all the numerous questions proposed by Mr.

Cooper during this interesting examination, as the answers would be only a repetition of the principles embodied in our details of his Lectures; we shall therefore select a few of the most important questions on the various subjects to which they applied, and add the answers given by a considerable number of Members during the evening, as specimens of their acquaintance with the science, and as the most decisive and satisfactory proofs of the attention they had paid to the able instructions of the worthy Lecturer.

Mr. Cooper's questions respecting the different modes of procuring *oxygen* having been correctly answered, he required, what were its most important and leading characters?—It is a supporter of combustion, and it forms acids and oxides.

What is the effect produced by acids on vegetable colours, particularly blues?—They are changed to red.

What is the compound formed by the union of hydrogen with oxygen?—Water.

In what proportions do they unite to form water?—Two of hydrogen to one of oxygen.

That is their relative proportion by *volume*, said Mr. Cooper, but what by weight?—Eight of oxygen, to one of hydrogen.

What is the relative specific gravity of oxygen compared with hydrogen?—Sixteen to one.

Mr. Cooper further illustrated the formation of water and the specific gravities of its constituents, by a reference to the diagram exhibited during his Lectures, in order to impress the subject still more strongly on the minds of his auditors, and he then asked whether carbon combined with oxygen?—Yes, and it forms carbonic acid and carbonic oxide.

In what proportions do carbon and oxygen combine to produce these substances?

This question was answered incorrectly by one member, but the error was instantly corrected by another, who replied that *carbonic acid* consisted of equal volumes of carbon and oxygen, and *carbonic oxide* of two volumes of carbon to one of oxygen.

Mr. Cooper here took occasion to remark that one of the advantages resulting from an examination of this kind was, that knowledge was elicited by the members themselves correcting each other when any mistake occurred, and any erroneous impression their memories might have received was thus removed in a manner which they could not easily forget. He then exhibited a diagram as a further elucidation of the two combinations of carbon with oxygen, and proceeded to ask, in what manner *hydrogen gas* was procured?—By the decomposition of water.

By what means is water decomposed?—By employing a metal or an acid.

In what manner does the metal act in producing decomposition?—By absorbing the oxygen.

Mr. Cooper corrected this answer by observing, that it should have been, by *combining* with the oxygen, instead of *absorbing* it.

Supposing that an acid is not employed to decompose water, in what manner is the effect produced?—By passing steam through a hot iron tube.

How is the next of the supporters of combustion, viz. *chlorine* produced?—By distilling muriatic acid with the oxide of manganese, by which means the hydrogen of the muriatic acid unites with the oxygen of the manganese to form water, while the chlorine is liberated.

This is one method of procuring chlorine, but it is not generally adopted by manufacturers, on account of its great expense; what is the more economical method?—By distilling common salt with sulphuric acid and manganese.

Would you employ any water in the process?—Yes.

In what proportions do chlorine and hydrogen unite, and what is the compound?—In equal proportions, and they produce muriatic acid.

Do you mean equal volumes or equal weights?—Equal volumes.

And what is the agent employed to produce their union?—The electric spark.

What else?—The sun's rays.

Is there any compound of chlorine and oxygen?—Yes, chloric acid.

Any other?

No reply was given to this question, and Mr. Cooper adduced this circumstance as a proof of the attention the members had paid to his instructions. It was true that there were four compounds of chlorine and oxygen, but *chloric acid* was the only one he had particularised in his lectures.

How is iodine procured?

Mr. Cooper answered this question by stating that it was obtained by the distillation of soap-makers' lees, and also from the ashes of the various *fuci*, or sea-weeds. To procure iodine during his lectures he had put a portion of soap-lees into a porcelain basin, and he now asked, what he had added to it?—Sulphuric acid.

For what purpose?—To unite with the alkali.

How was the process continued?—By adding manganese and distilling the mixture.

And by what test was it known that iodine was produced?—By the appearance of a purple vapour.

What are the compounds called which are produced by the union of chlorine with the metallic bodies?—Chlorides.

What is the name of the compounds of oxygen with other substances?—Oxides and acids.

Mention the substances which combine

with oxygen to produce acids?—Sulphur, carbon, fluorine, and phosphorus.

What is the effect of water when admitted to the *chlorides?*—Double decomposition takes place.

What are the compounds formed by adding water to the chloride of copper?—Oxide of copper and muriatic acid.

What are the general characters of *sulphur?*—It is inflammable, burns with a blue flame, is brittle, a bad conductor of heat, and a non-conductor of electricity.

How is sulphur separated from the substances in which it is found?—By subliming the sulphur.

Mr. Cooper repeated the explanation given in his lectures of the difference between sublimation and distillation, the product being *solid* in the former case, and *fluid* in the latter, and after several questions relative to the formation of sulphuric acid, and sulphurous acid gas, he inquired why he had employed quicksilver in the preparation of sulphurous acid?—Because it is rapidly absorbed by water.

What are the properties of a solution of sulphurous acid gas in water?—It *reddens* blue colours, said a member. it *whitens* them, said Master Sweet.

Mr. Cooper smiled and observed, that they were both right, for it first reddened and then whitened them.

To what purposes is it applied in the arts?—To the bleaching of wool and straw bonnets.

After some questions on the subject of the application of the *chlorine,* as well as sulphurous acid gas to the purpose of bleaching, Mr. Cooper asked in what manner sulphuric acid was produced by the combustion of sulphur?

In reply to this question, both the old and new processes of preparing sulphuric acid, particularised in Mr. Cooper's lectures, were minutely described by different members, and with perfect correctness, except that in detailing the improved method, the member who gave the answer mentioned *nitric acid,* instead of the *nitrous acid gas,* which is employed in the process; a mistake which Mr. Cooper observed, was very excusable, as he had not yet explained the difference between nitric acid, and nitrous acid gas.

The examination was terminated by a few questions on the subject of *sulphuretted hydrogen,* which were very satisfactorily answered, when Mr. Cooper observed, that as the usual time was expired, he should for the present take his leave, but should be happy to avail himself of the first vacant evening to continue his examination, as he had many other questions to propose connected with the subjects to which he had adverted in his lectures. He felt highly gratified by the correct manner in which the members had replied to his inquiries during the evening, and had no doubt that by a reference to such notes as they might have taken, or to those chemical treatises to which they had access, they would be fully prepared, on an early evening, for another examination on those parts of the subject upon which he had not yet questioned them.

We cannot conclude the account of the proceedings of the evening, without observing, that the result of the examination far exceeded the anticipations in which we had ventured to indulge, and was such as to reflect the greatest credit on the members, from the general conviction it must have produced, that they had not only listened with attention, but had distinctly comprehended the instructions communicated to them. Scarcely any of the numerous questions proposed by Mr. Cooper, were unanswered by his auditors, and the answers which, in a few instances, were given incorrectly by some of the members, were immediately rectified by others. To Mr. Cooper we are also happy to express our acknowledgments for the praiseworthy motives which suggested the examination, as well as for the kind and conciliatory manner in which it was conducted. It was truly observed by Dr. Birkbeck, in his excellent address on laying the first stone of the new lecture room, that for the deficiency of scientific information among mechanics, we ought "to blame the culture, not the soil;" and the intelligence evinced by the members upon this occasion, affords the best comment on the learned President's remark, as it not only proves the fertility of the soil, but the excellent cultivation it has received by the establishment of the London Mechanics' Institution.

Before the meeting separated, Dr. Birkbeck announced that on the following Wednesday, Dr. Matthew Allen would commence a course of three lectures on a new method of investigating the powers of the Human understanding, and he also read the following notice, viz.

"The Members are desired to take notice, that the annual election of a President, four Vice-Presidents, and a Treasurer, and also the half yearly election of fifteen new Committee-men, in lieu of the fifteen going out by rotation, will take place on Tuesday the 1st day of March next, at six o'clock in the evening, agreeable to the rules

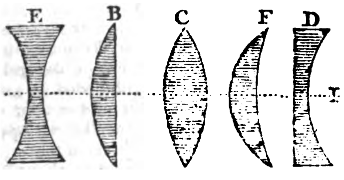
The Members are therefore requested to transmit to the Committee of Managers the names, profession and residences of any qualified Members whom they may wish to put in nomination for any of the above offices, specifying whether they are of the working classes or not."

Dr. Birkbeck concluded by reading the handsome list of additional donations announced in our last number, which communication was received with reiterated bursts of applause, and the Members departed with the double satisfaction resulting from the acquisition of knowledge and the exhilarating prospect of its still further diffusion.

MR. PARTINGTON'S SECOND LECTURE ON OPTICS.

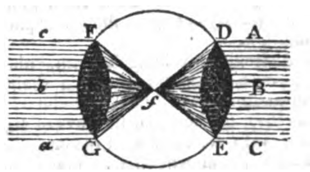
REFLECTION AND REFRACTION—THE RAINBOW—THE HUMAN EYE.

MR. PARTINGTON commenced his second Lecture on Friday, the 28th ultimo, by observing, that before he proceeded to the more immediate subject of his present discourse, viz. the refractive properties of the natural lens, or human eye, he would re-examine the laws which govern the *refraction* of the rays of light on passing through a body of water, or any other refracting medium. His reason for recalling their attention to the laws of refraction was, that he was now provided with a series of diagrams on a larger scale, by means of which he trusted that he should be enabled to render the subject more intelligible to his auditory. The diagrams alluded to by Mr. Partington, and now exhibited to the members, were admirably executed, and extremely well adapted to the elucidation of the subjects adverted to in his lecture. To these diagrams the lecturer referred, while he recapitulated his former observations on the refraction of light when it passes from the atmosphere into the denser medium of water, in which case it is bent from its first direction, affording an additional demonstration of the great principle of gravitation which pervades all nature. The various degrees in which the rays of light are refracted, or bent from their original course, according to the angle at which they strike the surface of the refracting medium, and the density of the medium itself, were distinctly and ably pointed out by a reference to the illustrative diagrams; and in order to render the subject of refraction more familiar to our readers, we have procured engravings of the diagrams representing the forms of the various lenses through which the rays of light are refracted, and the foci to which they converge on passing through the double-convex and plano-convex lenses.

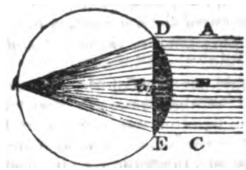


In the above diagram, E represents the double-concave lens, B the plano-convex, C the double-convex, F the meniscus, or crescent-formed lens, D the plano-concave, and the dotted line I, the direction of the central ray.

The following figure illustrates the refraction of the rays of light on passing through a double-convex lens, and their divergence from the focus when two are employed.



The parallel rays A B C (excepting the central ray B *b*) are refracted by the double-convex lens D E, and converge to the focal point *f*, the distance of which from the surface of the lens is exactly the radius, or semi-diameter of the circle of which it is a portion. From the focus the rays diverge towards the second lens F G where they are again refracted, and on passing through it, resume their parallel direction, as represented at *c b a*



In this diagram it is seen that when the rays of light A B C pass through the plano-convex lens D E, the distance of the focal point from the surface of the lens is the diameter of the sphere, instead of the radius, as in the preceding instance.

Mr. Partington further elucidated the laws of *reflection* by a diagram, shewing that if a ray of light falls on the surface of a polished mirror at any angle from the perpendicular, it is reflected at the same angle beyond it, the angle of *reflection* being always equal to the angle of *incidence*. If a ball is thrown against the wainscoat in a straight direction, it returns towards the hand by the same line; but if it is thrown slanting, or at any angle from the straight line, it flies off at exactly the same angle on the opposite side: in this case the ball on approaching the wainscoat represents the *incident*, or falling ray, and on quitting it the *reflected* ray.

The decomposition of white light is also effected by a nearly similar process, for as the rays of light differ in their degrees of refrangibility, it is evident that the most refrangible will separate themselves from those which are less so, and the spectrum may by this means be represented on a screen by means of a prism, as in the preceding lecture, and according to the arrangement on the diagram now exhibited, in which the *violet*, or most refrangible ray appears at the top, and is followed in succession by the *indigo*, *blue*, *green*, *yellow*, *orange*, and lastly, the *red* ray, which possesses the least refrangibility and consequently occupies the lower part of the diagram.

A circular revolving diagram, painted with the seven prismatic colours in their proper proportions, was then introduced by the Lecturer to shew that the rays of light thus analysed were capable of recomposition into their original whiteness. The circle being whirled round with great rapidity, the blended colours appeared perfectly white, and Mr. Partington observed that the same effect might be easily produced by any of his hearers with a card tee-totum, coloured in a similar manner, but the effect would be increased by painting the center of the circle black.

In the *rainbow* we find the prismatic colours exhibited in the greatest perfection. It is, indeed, a *natural* prism, and separates the component particles of light with the same accuracy and precision. The rainbow was one of those phenomena which astonished and perplexed the ancients; and after many absurd conjectures, their greatest philosophers, Pliny and Plutarch, relinquished the enquiry as one which was above the reach of human investigation. In the year 1611, Antonio de Dominis made a considerable advance, however, towards the true theory of this singular phenomenon, by suspending a glass globe in the sun's light, when he found that while he stood with his back to the sun, the colours of the rainbow appeared to his eye in succession as the globe was moved higher or lower. He was however unable to account for the production of all the different colours, as the experiments with the prism had not yet been made, and it was reserved for Newton to perfect the discovery.

Mr. Partington then exhibited a diagram for the purpose of illustrating the production of the prismatic colours by the refraction and reflection of the rays of light on passing through the falling drops of rain. In addition to the primary rainbow, a second and fainter bow was frequently observed, and the diagram therefore consisted of two large spherules, each of which represented a single drop of rain, and the Lecturer observed that upon the principles of refraction which he had previously explained, a ray of light would not pass through the spherule in a straight direction, but would become refracted by the greater density of the water, and upon again entering the rarer medium of the atmosphere, the drop of rain, acting like a prism, would separate the ray into the seven prismatic colours. The angles formed by the refraction and reflection of the ray during its passage through the spherule were distinctly seen on the diagram, and upon similar principles the appearance of the second bow was accounted for, and the faintness of its colours, as well as their inverted order, was shewn to be owing to the difference of the angles and the greater absorption of light. In the primary bow, the rays of light formed two refractions and one reflection, and in the second, three refractions and two reflections. As one drop of rain passes, others occupy its situation in constant succession, and the spectrum continues as long as the sun's rays fall upon the shower in the same direction. Lunar rainbows are sometimes observed, but from the faintness of the light, the colours are seldom distinguishable. Artificial rainbows may be formed by ejecting water from the mouth, or discharging it from a syringe, and a beautiful prismatic bow is occasionally depicted in the dew on the grass.

The nature of *Inflection* was first discovered by Grimaldi, who made many curious experiments on it, but the following experiment of Sir Isaac Newton will be better adapted than Grimaldi's, to explain the nature of this property of light. At the distance of two or three feet from the window of a darkened room, in which there was a hole three-fourths of an inch broad, to admit the light, he placed a black sheet of pasteboard, having in the middle a hole about a quarter of an inch square, and behind the hole the blade of a sharp knife to intercept a small part of the light which would otherwise have passed through the hole. The planes of the pasteboard and blade were parallel to each other, and when the pasteboard was removed to such a distance from the window, that all the light coming into the room must pass through it, he received what came through the hole on a piece of paper two or three feet beyond the knife, and perceived two streams of faint light shooting out both ways from the beam of light into the shadow. As the brightness of the direct rays obscured the fainter light, by making a hole in his paper he let them pass through, and had thus an opportunity of attending closely to the two streams, which were nearly equal in length, breadth and quantity of light. That part which was nearest to the sun's direct light, was pretty strong for the space of about a quarter of an inch, decreasing gradually till it became imperceptible, and at the edge of the knife it subtended an angle of about twelve, or at most of fourteen degrees. Another knife was then placed opposite to the former, and he observed that when the distance of their edges was about the 400th part of an inch, the stream divided in the middle, and left a shadow between the two parts, which was so dark, that all the light passing between the knives seemed to be bent aside to one knife or the other; as the knives were brought nearer to each other, this shadow grew broader, till upon the contact of the knives the whole light disappeared. He observed also, fringes of different coloured light; three being made on one side by the edge of one knife and a similar number by the edge of the other. Grimaldi, Dr Hook, and all the philosophers who made experiments on *inflection* before the time of Newton, ascribed the broad shadows, and even the fringes which he mentions, to the ordinary refraction of the air; but the investigation upon which he entered to discover their cause, afforded him satisfactory evidence to conclude that bodies have the power of acting upon light at a distance.

After some further remarks on the subject of inflection, which Mr. Partington observed, was altogether different either from refraction or reflection, he proceeded to give a minute description of the mechanism of the *human eye*, particularising the various parts of which it is composed, and pointing out their relative situations on the diagram, which exhibited them on a large scale. The greater portion of the external coat of the eye is called the *scelerotica*, which is strong and inelastic, and the muscles which move the eye are attached to it: what is called the *white* of the eye is a part of this coat. The front part of the outer coat, which bulges out a little from the eye-ball, is the *cornea*, which is circular, and exceedingly transparent. The next coat to the scelerotica, is called the *choroides*, which serves as a lining to it, and is of a dark colour in the human eye, but white in cats and owls, and green in most animals that live on grass and vegetables. Its texture is soft and pulpy, and too weak to be susceptible of muscular motion, except at its extremities towards the front of the eye. Like the scelerotica, it is distinguished into two parts; the fore part being called the *iris*, while the hinder part retains the name of the choroides. The iris commences immediately under the commencement of the cornea, where it attaches itself more strongly to the scelerotica by a cellular substance, forming a kind of white, narrow, circular rim, called the *ciliary circle*. The iris is that remarkable circle which gives to the eye its character as to colour; it is composed of two sets of muscular fibres, the one tending, like radii, towards the center of the circle and the other forming a number of concentric circles round the same center. The central part of the iris is *perforated*, and the aperture, which is called the *pupil*, is always round, but varies in its diameter by the action of the two sets of muscular fibres composing the iris. When a very luminous object is viewed, the *circular* fibres contract, the *radial* are relaxed, and thus the size of the pupil is diminished; on the contrary, when the objects are dark and obscure, the *radial* fibres of the iris contract, the *circular* are relaxed, and the pupil is enlarged, so that it admits a greater quantity of light. By candle light the contraction and dilation of the pupil may be very distinctly observed, with the assistance of a looking glass. If, with our eyes directed to the mirror, we bring the candle close to the face, we shall find the pupil become very small; if the candle be removed and completely shaded for about a minute, and then brought to its former place, it will be found that the pupil has greatly dilated, and that it again contracts as the light draws nearer. The whole of the choroide membrane is opaque, by which means no light can enter the eye but what passes through the pupil.

The third and last coat of the eye is called the *retina*. This is a fine and delicate membrane, being an expansion of the *optic nerve*, which proceeds from the brain. It is spread like a net of exquisite delicacy, all over the concave surface of the choroides, and terminates at the ciliary ligament. The *retina* receives the images of external objects, which are depicted upon it by the rays of light that enter at the pupil. The different coats of the eye envelope it in a manner resembling the concentric coats of an onion, and the impressions made on the retina are conveyed to the brain, or to the sensorium, wherever it may be situated, by means of the *optic nerve*, which passes through a small hole in the bony cavity containing the eye, and is not exactly in the center, but a little on one side, inclining towards the nose.

The three transparent substances, inclosed by the coats of the eye, are called the *aqueous*, *crystalline* and *vitreous humours*. The first of these, or aqueous humour resembles water, whence its name. It gives a protuberant figure to the cornea, filling the two cavities between the cornea and the ciliary ligament, which cavities communicate by the pupil. The *refractive* power of the aqueous humour is like that of water. The second, or crystalline humour, is more transparent than the purest crystal, and its form is that of a *double convex lens*, but more convex on its interior than its exterior surface. Resembling a lens in its form, it also resembles one in its use, as it *converges* the rays which pass through it from every visible object to its focus on the *retina*. At the back of the crystalline, lies the third, or vitreous humour, which is nearly of the consistence of melted glass, and fills up the interior cavity of the eye from the crystalline lens to the retina.

Mr. Partington, in the course of his comprehensive description of the wonderful structure of the eye, elucidated his remarks by dissecting several bullock's eyes, and pointing out the various coats and humours to which he had alluded. One of the diagrams was a beautiful representation of the construction and operation of the *camera obscura*, the effect of which is doubtless familiar to our readers, and the lecturer observed, that the eye itself might be compared to a camera-obscura in miniature, as the images of external objects are depicted on the retina, in a manner exactly analogous, and the rays of light passing through the aqueous and vitreous humours, the retina receives the images in an *inverted* form, as would be found on dissecting the eye of a sheep or an ox, and holding it up to the candle, the flame of which would appear inverted. The fact that images are inverted on the retina had been denied, upon the principle that if such was the case, every object would appear inverted to the eye: but there can be no apparent inversion without a standard of *comparison*, and as all objects are presented to our view in the same invariable relation to each other, the impression made upon the mind is that of their true position.

That the impression of light upon the retina, is to a certain extent permanent, is evident, when a burning brand is whirled rapidly round, as the effect produced is the appearance of a complete circle of fire, though we are sensible that the flame can only occupy one part of space at a time. The same effect results from the employment of a small fire-wheel, which exhibits a number of concentric circles of variegated fire. One of these wheels was then let off to the great amusement of the audience, and the gratification of those who were partial to the smell of gunpowder.

Mr. Partington then alluded to that defect in the eye-sight, which is occasioned by the crystalline lens becoming, through age, too flat to shew the images distinctly. In this case, the rays of light are refracted to an imaginary focus behind the retina, and a plane or double convex glass is used, which by converging the rays, brings the focal point to the exact extremity of the ball of the eye. If, on the contrary, the indistinctness arises from an over-rotundity of the crystalline lens, a double concave glass must be used to produce a divergence of the rays, in order to make the focus coincide with the retina. The lecturer illustrated his remarks by a diagram which clearly shewed the manner in which defective vision is remedied by using lenses of different forms, according to the circumstances of the case.

Another diagram exhibited the divergence of the pencils of rays issuing from every point of the object viewed, and crossing each other in every possible direction. If it were asked, how it was possible for all those innumerable rays to pass each other without an interruption of their progress, he would answer, that the fact might be experimentally demonstrated; for if a small hole was made in a card, and five or six candles were placed before it, it would be found that the images of all the flames would be distinctly delineated beyond the card, though in this case the rays must cross each other in every direction on their passage through the orifice, and the experiment was an additional proof of the inconceivable minuteness and velocity of the particles of light.*

The lecturer now called the attention of his hearers to those photometrical instruments which were used for the purpose of showing the quantity of light radiating from any luminous body. This might be ascertained by merely placing an opaque rod perpendicularly upon a table, and observing the intensity of the shadows cast by two lights placed at some distance before it. If two candles, emitting an equal quantity of light, were employed at the same distance, the shadows would appear alike; but if an argand lamp was substituted for one of the candles, there would be a material difference between them; and by moving the stronger light to such a distance from the rod that the shadows assumed the same intensity, the quantity of light emitted from the two bodies would be in exact proportion to their respective distances from the rod.

Mr. Partington then produced Mr. Leslie's photometer, which was a very delicate instrument, employed for a similar purpose, and in some degree resembling a differential thermometer. In this instrument, a coloured fluid rises in a slender tube, in proportion to the quantity of light thrown upon it, and its intensity is ascertained by a graduated scale attached to the tube. The lecturer exemplified its effect by suddenly igniting a blue, or Bengal light, the extreme intensity of which elevated the fluid about eight degrees, and he concluded his interesting and instructive lecture by stating, that when he next addressed his auditory, he should call their attention to a new and ingenious mode of constructing lenses, which he conceived would particularly interest them, as it was the invention of an uneducated mechanic.

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* To the remarks of Mr. Partington on this subject, we may add the suggestion of Mr. Canton, who observes that the difficulty will vanish, if a very small portion of time be allowed between the emission of every particle of light and the next that follows in the same direction. Suppose for instance, that one lucid point of the sun's surface emits 150 particles in a second, which are more than sufficient to give continual light to the eye without the least appearance of intermission; yet still the particles of which it consists will, on account of their great velocity, be more than 1000 miles behind each other and thereby leave room enough for others to pass in all directions.

MR. BROUGHAM'S PAMPHLET.

A highly interesting pamphlet has just been published by Mr. Brougham, entitled "Practical Observations upon the Education of the People, addressed to the Working Classes and their Employers." In this work of 32 pages modestly brought forth, and as modestly dedicated to the President of the London Mechanics Institution,* we find more real patriotism, more real information, and more real inducement to a numerous and important class of society to adopt a system of universal benefit, than we had ever before seen in the most elaborate and studied production. The Pamphlet is sold for the benefit of the Mechanics' Institution, and we doubt not that it will add a considerable sum to the funds of that excellent establishment; but we would have the merit of Mr. Brougham's gift measured not by the number of pounds shillings and pence which it may produce, but by its effects upon the morals of the industrious classes, the amelioration of which is one grand object of the Mechanics Institution. A fortnight ago we had to announce a princely gift of 1000*l* towards this Institution by Sir Francis Burdett, with delight we now add the gift of Mr. Brougham. We would not make a distinction between them; they both proceed from the same pure motives, they are both alike calculated to rouse public interest in favour of a system which requires only to be known to be appreciated, and they both tend to inflame the zeal of its already steady adherents. If the lives of Sir Francis Burdett and Mr. Brougham had been only remarkable for these acts, their memory would go down to a grateful posterity. They have however added one great work to a long course of usefulness, and the effects of this work upon society will be felt when they shall be slumbering with their ancestors.

Mr. Brougham commences by observing upon the pleasure and improvement to be derived from reading, and proceeds as follows:

"Their (the working classes) difficulties may all be classed under one or other of two heads—want of money, and want of time. To the first belongs the difficulty of obtaining those books and instructors which persons in easier circumstances can command; and to the second it is owing that the same books and instructors are not adapted to them which suffice to teach persons who have leisure to go through the whole course of any given branch of science. In some lines of employment, there is a peculiar difficulty in finding time for acquiring knowledge; as in those which require severe labour, or, though less severe, yet in the open air; for here the tendency to sleep immediately after it ceases, and the greater portion of sleep required, oppose very serious obstacles to instruction: on the other hand those occupations are less unfavourable to reflection, and have a considerable tendency to enlarge the mind.

The first method, then, which suggests itself for promoting knowledge among the poor, is the encouragement of cheap publications; and in no country is this more wanted than in Great Britain, where, with all our expertness in manufactures, we have never succeeded in printing books at so little as double the price required by our neighbours on the continent. A gown, which any where else would cost half a guinea, may be made in this country for half a crown; but a volume, fully as well or better printed, and on paper

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* We give this dedication entire. Its simplicity alone renders such an attention an act of mere justice.

"TO

GEORGE BIRKBECK, M.D. F.R.S.

President of the London Mechanics Institution.

As I have chiefly in deference to your opinion, sanctioned by that of our fellow-labourers in the North, undertaken to make the following pages public at the present moment, I beg leave to inscribe them with your name.

You are aware that they contain a portion of a larger discourse, which more pressing but less agreeable pursuits have long prevented me from finishing, upon the important subject of Popular Education, in its three branches, Infant Schools, Elementary Schools (for reading and writing), and Adult Schools. It is only with the second of these branches that the Legislature can safely interfere. Any meddling on the part of Government with the first would be inexpedient; with the last, perilous to civil and religious liberty. In conformity with this opinion I have brought the question of Elementary Education repeatedly before Parliament, where the lukewarmness of many, and the honest and by me ever-to-be respected scruples of some, have hitherto much obstructed my design; the other two branches belong to the country at large. Having, in concert with those friends who hold the same doctrines, endeavoured to establish Infant Schools, it seems to follow from the same view of the subject, that I should lend any little help in my power towards fixing public attention upon the Education of Adults; by discussing the best means of aiding the people in using the knowledge gained at schools, for their moral and intellectual improvement.

A considerable portion of the Observations was inserted in the Edinburgh Review, together with a good deal of other matter, and with one or two statements in which I do not altogether concur."

which, if not as fine, is quite fine enough, and far more agreeable to the eyes, than could be bought in London for half a guinea, costs only six francs, or less than five shillings, at Paris. The high price of labour in a trade where so little can be done, or at least has been done by machinery, is one of the causes of this difference. But the direct tax upon paper is another; and the determination to print upon paper of a certain price is a third; and the aversion to crowd the page is a fourth. Now all of these, except the first, may be got over. The duty on paper is threepence a pound, which must increase the price of an octavo volume eightpence or ninepence; and this upon paper of every kind, and printing of every kind; so that if by whatever means the price of a book were reduced to the lowest, say to three or four shillings, about a fourth or a fifth must be added for the tax; and this book brought as low as possible to accommodate the poor man, with the coarsest paper and most ordinary type, must pay exactly as much to government as the finest hot-pressed work of the same size. This tax ought, therefore, by all means, to be given up; but though, from its being the same upon all paper used in printing, no part of it can be saved by using coarse paper, much of it may be saved by crowding the letter press, and having a very narrow margin. This experiment has been ried of late in London upon a considerable scale; but it may easily be carried a great deal farther. Thus, Hume's History * has been begun; and one volume, containing about two and a half of the former editions, has been published. It is sold for six shillings and sixpence; but it contains a great number of cuts neatly executed; the paper is much better than is necessary; and the printing is perfectly well done. Were the cuts omitted, and the most ordinary paper and type used, the price might be reduced to 4s. or 4s. 6d.; and a book might thus be sold for 12s. or 14s., which now costs perhaps above two pounds. A repeal of the tax upon paper, which is truly a tax upon knowledge, and falls the heaviest upon those who most want instruction, would farther reduce the price to nine or ten shillings."

There is so much justice in these observations, that we shall interrupt the course of our quotations only to express a belief that they will command the attention of Government. We no longer live, thank God, under a Government which steadfastly sets itself against every suggestion for improvemen which comes from the Opposition, and we may fairly expect that no part of what Mr. Brougham recommends here and in other parts of his pamphlet, will fail to excite a lively interest in his Majesty's Ministers. For a long time many men in power were opposed to the education of the working classes, and to every thing which could tend to their mental improvement, upon the mistaken ground that to enlighten men generally was to render them dangerous to society. The folly of such a doctrine has been proved, and the excellence of the contrary position satisfactorily demonstrated. Let us hope, therefore, that no more silly and pernicious objections of this kind will be raised to prevent the diffusion of knowledge, and the extension of the benefits of science to every branch of the community.

The benefit of publishing in numbers is forcibly insisted upon by Mr. Brougham, who mentions several cheap works as having contributed to produce an important change in the habits of the people. Among them are the Mirror, Dolby's Histories,* and the MECHANICS' REGISTER. Speaking of the latter, he says, "A Mechanics' Register has lately been begun, and with immediate success. It is a weekly paper, for the same price (three pence,) and although, being principally intended for the use of the workmen, it bestows peculiar attention on whatever concerns that order, yet the occurrences which it communicates and the discussions which it contains are also those most interesting to Philosophers themselves."

We feel very grateful to Mr. Brougham for the way in which he is pleased to speak of our work, and we can assure him that he has not been misinformed as to its success. In the history of cheap scientific publications there is no example of a more steady and progressive increase than that of the Register. Already have we been compelled to reprint several of the numbers and to stereo type others. We mention this not as a boast, but as a proof of the feeling that exists to promote all works which tend to the great object which Mr. Brougham so ably advocates.

Mr. Brougham then proceeds to recommend the general institution of *Book Clubs* or *Reading Societies*. The arguments which he uses are forcible and conclusive:

"Three halfpence a week laid by in a whole family, will enable it to purchase in a year one of the cheap volumes of which I have spoken above, and a penny a week would be sufficient, were the publications made as cheap as possible. Now, let only a

* It is to be regretted that any edition of this popular work should ever be published without notes, to warn the reader of the author's partiality when moved by the interest of civil and ecclesiastical controversy, and his careless and fanciful narrative when occupied with other events.

* There is another very useful work publishing in numbers upon the same plan, "Rollin's Ancient History."

few neighbours join, say ten or twelve, and lend each other the books bought; and it is evident, that for a price so small as to be within the reach of the poorest labourer, all may have full as many books in the course of the year as it is possible for them to read, even supposing that the books bought by every one are not such as all the others desire to have.* The publication of books in Numbers greatly helps this plan; for it enables those who choose to begin it at any time without waiting until they have laid by enough to purchase a volume in each family."

We regret that our limits will not allow us to give the whole of the observations made by Mr. Brougham on this subject. For them we must refer our readers to the pamphlet. In speaking of Lectures in Mechanics' Institutions, Mr. Brougham appears to be fully sensible of their importance. We have seen their effect, and are convinced, from experience, of the truth of his observations. His arguments against their being gratuitous, are, we think, unanswerable:

"The yearly cost of a lecture in the larger cities, where enlightened and public-spirited men may be found willing to give instruction for nothing, is indeed considerably less than in smaller places, where a compensation must be made for the lecturer's time and work. But it seems advisable, that, even where gratuitous assistance could be obtained, something like an adequate remuneration should be afforded, both to preserve the principle of independence among the working classes, and to secure the more accurate and regular discharge of the duty. We shall therefore suppose, that the lectures, as well as the current expenses of the room, and where there are experiments, of the apparatus, are to be paid for; and still it appears by no means an undertaking beyond the reach of those classes. The most expensive courses of teaching will be those requiring apparatus; but those are likewise the most directly profitable to the scholars. Contributions may be reckoned upon to begin the plan, including the original purchase of apparatus; and then we may estimate the yearly cost, which alone will fall upon the members of the Association. The hire of a room may be reckoned at 30*l.*; the salary of a lecturer, 40*l.*; wear and tear of apparatus, 20*l.*; assistant and servant, 10*l.*; clerk or collector, 10*l.*; fire and lamps, 5*l.*; printing and advertising, 15*l.*; making in all 130*l.*

"But if two, or three courses are delivered in the same room, the expenses of each will be reduced in proportion. Suppose three; the room may probably be had for 50*l.*, the printing for 20*l.*, and the servants for 30*l.*; so that the expense of each course will be reduced to about 100*l.* Each course may occupy six months of weekly lectures; consequently, if only a hundred artisans are to be found who can spare a shilling a week, one lecture may be carried on for 130*l.*; and if 120 artisans can be found to spare a shilling a week, three courses may be carried on during the year, and each person attend the whole. This calculation, however, supposes a very inconsiderable town. If the families engaged in trade and handicrafts have, one with another, a single person contributing, the number of 100 answers to a population of only 770, supposing the proportion of persons engaged in trade and handicrafts to be the same as in the West Riding of Yorkshire; and 710 taking the proportion of Lancashire. If, indeed, we take the proportions in the manufacturing towns, it will answer in some cases to a population of 5,500. and in others of little more than 500. But even taking the proportion from towns in the least manufacturing counties, as Huntingdonshire, the population required to furnish 100 will not exceed 900—which supposes a town of about 200 houses. One of three times the size is but an inconsiderable place; and yet in such a place, upon a very moderate computation, 200 persons might easily be found to spare sixpence a week all the year round; which would be amply sufficient for two lectures. In the larger towns, where 500 or 600 persons might associate, five shillings a quarter would be sufficient to carry on three or four lectures, and leave between 150*l.* and 200*l.* a year for the purchase of books.

"In estimating the expenses I have supposed a room to be hired and the rent to be moderate. To make a beginning, the parties must make a shift with any public room or other place that may be vacant; the great point is to begin: the numbers are certain to increase, and the income with the numbers, as the plan becomes known and its manifold attractions operate upon the people. For the same reason I reckon a small sum for apparatus. Great progress may be made in teaching with very cheap and simple experiments. Indeed some of the most important, if not the most showy, are the least costly and complicated. By far the grandest discoveries in natural science were made with hardly any apparatus. A pan of water and two thermo-

* It is found that the average number of volumes read by the members of a Mechanics Institution, in a great town, is between ten and eleven a year; by the members of a book society, in the villages of an agricultural district, between five and six. Now the cheap books contain between two and three times the matter in the ordinary publications; therefore, it is evident, that such an association as that proposed, would have three times as much reading as is wanted in towns, and five or six times as much as in the country.

rameters were the machinery that in the skilful hands of Black detected latent heat; a crown's worth of glass, threepenny-worth of salt, a little chalk, and a pair of scales, enabled the same great philosopher to found the system of modern chemistry, by tracing the existence and combinations of fixed air; with little more machinery the genius of Scheele* created the materials of which the fabric was built, and anticipated some of the discoveries that have illustrated a later age; a prism, a lens, and a sheet of pasteboard enabled Newton to unfold the composition of light, and the origin of colours. Franklin† ascertained the nature of lightning with a kite, a wire, a bit of riband, and a key:—to say nothing of the great chemist of our own day, of whose most useful, perhaps most philosophical discovery, the principle might have been traced with the help of a common wire fireguard. Even the elements of mechanics may be explained with apparatus almost as cheap and simple.—To take one instance: the fundamental property of the lever (and I may say of the whole science) may be demonstrated by a foot rule, a knife and a few leaden balls of equal size. The other mechanical powers (which are indeed for the most part resolvable into the lever) may be explained with almost equal ease; and after all, it is those principles that practical men most require to have unfolded, and their application to mechanism illustrated, by figures and instruments. Machinery, even in its complicated form, is more easily understood by them, because they are in practice familiar with its operations and terms, and will follow the description of an engine and its working without a model, or at most with a drawing, far more readily than the learners of natural science in other conditions of life. The simplification of apparatus for teaching physical science is an important object, and one to which learned men may most usefully direct their attention. There cannot be a doubt, that a compendious set of machines may be constructed to illustrate at a very cheap price a whole course of lectures. Certain parts may be prepared capable of being formed into various combinations, so as to present different engines; and where separate models are necessary, their construction may be greatly simplified by omitting parts which are not essential to explain the principle, and show the manner of working. The price, too, will be greatly reduced when a larger number being required of each, they may be prepared by wholesale. A friend of mine is at present occupied in devising the best means of simplifying apparatus for lectures upon the mechanical powers; and cheap chemical laboratories may then receive his consideration. It is likewise in contemplation at a great manufacturing establishment, where every part of the machinery is made upon the spot, to prepare a number of sets of cheap apparatus for teaching, so that any Mechanics Institution may on very moderate terms be furnished at least with what is necessary for carrying on a course of dynamics. The drawings may be multiplied by the polygraphic methods generally in use."

* A working chemist.

† A working printer.

We regret that our limits will not allow us to give any more extracts from this valuable Pamphlet. We will, however, resume the subject in an early number.

THE NEW BUBBLES.

We learn with infinite regret that the mania for speculating in the shares of the new South American Companies, has reached many of the industrious classes, and that the savings which with great labour and perseverance they have been enabled to make, instead of being invested in solid securities which would be available to themselves in an hour of need, or to their progeny, are embarked in those bubbles which ere long will cease to have existence. This spirit of gambling, for under the pretence of seeking a higher interest for capital than the fair modes of investment offer it is nothing but gambling of the grossest and silliest description, is censurable in all classes, but how much more so in those whose habits and inclinations ought to lead them to seek competency by the slow but certain paths of prudence. The mere circumstance of all these bubbles having appeared at the same time and under the influence of nearly the same parties ought we think alone to create suspicion, for we can hardly allow that up to the present period man has been so silly as to leave such mines of wealth as these American Schemes are said to be unexplored. All that has been recorded of the follies of our ancestors on the Mississippi and other schemes of that day, falls short of what we now witness, and we fear the time is not far distant when the dupes of these schemes will be suffering deeply for their credulity. If we had time to examine the origin of all the South American Bubbles we doubt not we should prove them to be such to the satisfaction of the public, and what we chiefly desire, to the removal of all inclination from the industrious classes for dabbling in them. For the present let one well authenticated exposure which has come before us serve to raise suspicion at least against the whole as it will be found that they all spring from the same source, the avarice of a few persons of influence in the city, who seek to make fortunes out of the credulity of the honest and industrious tradesman and artisan.

About eight months ago a South American mine proprietor who had quitted one of the states of that part of the world arrived in Paris, having been driven from home on account of his political opinions. When in the French Capital he opened a negociation with an English Stock Broker named D——i for the sale of his mines, demanding we believe upwards of 100,000*l.* purchase money, of which 20,000*l.* was to be paid down; the Englishman caught at the proposal and was about to sign the contract, when his friends interposed and advised him to ascertain the solidity of the ground upon which he was standing. He took advice, and the result was that he would be mad to complete the negociation it being discovered first, that the South American mine owner was a man of such loose character that no contract would bind him.

Secondly—That by his political conduct he had exposed his property to the probable clause of confiscation by the existing Government.

Thirdly—That the expense of working the mines would for at least ten years entirely preclude all chance of profit.

The failure of this man's schemes was however destined to be only of temporary duration. What in 1824, foolish as we were, was difficult of execution because there remained a slight portion of common sense in the British Public, which would have prevented the success of a contract made under such circumstances, is in 1825 quite easy of execution; and this very scheme, destitute as it is of every thing which could recommend t to a man of the slighest reflection, is now in the market at a fluctuating premium of 15 to 20 per cent.

We sincerely trust that this fact, of the authenticity of which we do not entertain the slightest doubt, will open the eyes of a misled public to the danger of the speculations for which they have such a mania. If the savings of the industrious artisan must be invested in the Shares of Public Companies let him turn to those which without offering any extravagant prospects of success, are founded in reason and public utility. Such are the Milk and Water Companies and a few others which we could enumerate. Much loss there never can be from such investment, and there will probably be a return of from 5 to 10 per cent. to the share holders for the employment of his Capital, whilst at the same time he will have the gratifying reflection of having contributed to promote the comfort and health of his fellow citizens.

RAIL-WAYS, AND DUTIES ON FOREIGN METALS.

It has been objected by some who have ventured to oppose the introduction of railways, that these undertakings are promoted, and their advantages interestedly over-rated, by the iron-masters with a view to their private advantage. The price of iron, which was in Wales some months past, seven pounds per ton, has been rapidly advanced to 12*l.*, confessedly in anticipation, for the most part, of the demand certain to follow the introduction of the proposed new means of conveyance.

A useful public measure is not, however to be rejected either because partial interests may suffer, or because other partial interests may be extravagantly and temporarily benefited. It would be disguising the truth, however, to deny that the persons interested in the iron trade will, by the establishment of rail-ways, reap a great harvest, or to conceal that they will use every expedient to make this as abundant as possible. The public will consequently, be made to pay very dearly for this most necessary of metals, which enters into such a multitude o implements and machinery in husbandry manufactures, and commerce. It is indeed allowed in the iron trade, that the admission by Parliament of the establishment of rail-ways will be the signal for a further advance. and the price of bar iron, which is in Wales 12*l.* and in London 13*l.* 10s. per ton, will probably be raised to 20*l.* per ton. The price is usually established on such occasions by the union of a few great iron-masters; some five or six of whom possess the principal portion of the trade, and a rise is at their option.

But there is a remedy to this inconvenience attendant on the great public measure of the formation of rail-ways, which has not been adverted to, and which is in accordance with the general policy of the Government—that is, the admission of foreign iron, either free of duty, or at a slight duty, in lieu of the present prohibitory one. Swedish and Russian iron pay 6*l.* 10s. per ton. Both these kinds are in quality superior to the English, and are worth, in bond, 15*l.* to 18*l.* per ton; and therefore, duty paid, 21*l.* 10s. to 24*l.* 10s. If duty free, the public might reap the benefit of the use of this better kind at 15*l.* to 18*l.* 4s.

Other metals are subject to prohibitory duties which call for revisal. English blocktin has risen to 105s. per cwt., while East India and Peruvian can be had in bond from 80s. to 90s. The duty is 190s. 3d. per cwt.! British copper is 107*l.* per ton; Russian and and Chilian can be had in bond for 80*l.* to 85*l.*, but the duty is 60*l.* per ton; spelter or zinc has been brought of late years largely from Germany, in 1823 about 5,000 tons, in 1824 about 10,000 tons, and is exported chiefly to India, where it has supplanted the China Tutenague in a multiplicity of useful purposes of ship building, &c. The price of Silesian spelter in bond is 23*l.* per ton, but the duty is 28*l.* 10s. making the price for consumption 51*l.* 10s. per ton which is altogether an exclusion.

This is the seasonable moment for the

Chancellor of the Exchequer to lower the duties on all foreign metals, (if not in some instances wholly remove them,) which would render an addition to the revenue from a source perfectly new, and would be of general service to the agricultural and manufacturing industry of the country. If the exclusion of foreign grain be impolitic, the same must hold as regards foreign minerals. If an unrestricted intercourse with the world be our true interest, it must in a paramount sense be the case in respect to the rude materials and primary ingredients of capital. If the industry and wealth and comfort of the country consist in the variety as well as the magnitude of its productions, we debar ourselves these advantages by banishing from our use the metallic bounties of nature. The British metals fear not foreign competition—iron, copper, lead, tin, meet all over the world the like produce of other quarters, and with advantage. They are the inherent riches of the country, and will exist when the manufactures of cotton and silk, of a more forced and exotic kind, may have reverted nearer the sources of those products. Our metallic staples need no props and defences.

ARTIFICIAL STONE.

Mr. Joseph Aspden, of Leeds, has taken out a patent for a new mode of producing an Artificial Stone or Cement for the covering of Buildings. He calls it Portland Cement, from its resemblance to Portland stone: its compotent parts are as follow:—A given quantity of lime-stone, of the kind usually employed for mending roads, is to be pulverized by beating or grinding, or it may be taken from the road in a pulverized state, or in the state of puddle: this, when dried, is to be calcined in a furnace in the usual way. A similar quantity of argillaceous earth or clay is then to be mixed in water with the calcined lime-stone, and the whole perfectly incorporated by manual labour or by machinery, into a plastic state. This mixture is then to be placed in shallow vessels for the purpose of evaporation, and then to be submitted to the action of the air, the sun, or the heat of fire, or steam conducted by pipes or flues under the pans of evaporating vessels. This composition, when in a dry state, is to be broken into lumps of suitable sizes, and is then to be calcined again in a furnace similar to a lime-kiln, till the carbonic acid has been entirely expelled. The mixture so prepared is then to be pulverized by grinding or beating, and when reduced to a fine powder, is in a fit state for use, and with the addition of so much water as will be sufficient to bring it into the consistency of mortar, will, when applied to its purpose, make a compact and durable artificial stone, equal to the Portland stone itself.

BROWN'S GAS VACUUM ENGINE.

We have great pleasure in copying from the *Times* newspaper of Tuesday last, the following account of Mr. Brown's engine.

"Among the various mechanical inventions which talent and science have bequeathed to the arts since the construction of the steam-engine, Mr. Brown's gas vacuum engine holds the first rank for ingenuity of contrivance and extent of application. We mention this machine in conjunction with the steam-engine, not only on account of the kindred ability which it displays, but the similarity of purposes which it may serve, and the probability that, in certain circumstances, it must supply the place, or supersede the use of its celebrated predecessor. It would be impossible, without the use of plates, or the introduction of details of which our space will not admit, to give the general reader an idea of this ingenious machine; we shall therefore content ourselves with a mere outline of some of its properties.

"Chemistry, in ascertaining, long ago, the fact that when a combustible substance is burnt in atmospheric air, the oxygen of the air is consumed, and a consequent diminution of volume takes place, gave Mr. Brown one of the principles on which his engine is constructed. Two gases, oxygen and hydrogen, burnt together in certain proportions, form water, and consequently, if the combination were effected in close vessels by an electric spark, would leave nearly a vacuum. But the oxygen of the common air composes only one-fifth of its volume, and consequently, though entirely consumed by entering into union with hydrogen, would only give us a diminution of volume to a fifth. The hydrogen contained in coal or oil gas not being pure, and containing carbon, would not, though burnt, create such a vacuum as hydrogen. This applies, however, only to the result of combustion in close vessels: the effect is very different when open vessels are employed. In the latter case, the heat arising from the combustion expels the incombustible part of the common air along with the products of the action; so that if the vessel be shut at the instant of inflammation, a near approach to a perfect vacuum is made. The effect of a little burning paper in emptying of air the glasses used in cupping, is a familiar example of the fact, and a test of the extent to which its force may be carried without any care in the experiment. Mr. Brown's machine consists of a contrivance by which, in consequence partly of this combination of the inflammable matter with oxygen, and partly of the expulsion of the air by heat, the cylinders employed are emptied of their contents, and an approximation to a vacuum is produced, the valve through which the gasses escape preventing the admission of air. If the power be thus acquired, it may of course, like that of steam be applied to endless mechanical purposes. Mr. Brown's engine has been seen and examined by many scientific characters, and by them its efficacy, as well as ingenuity, has been generally acknowledged. The great question lies in its comparative merits in relation to the steam-engine. On this subject it may be stated, without entering into particulars, that the pneumatic engine being light and portable, is therefore well adapted to propel carriages on roads and rail-ways; that the expense of working it is in most situations moderate; that it is entirely free from danger, as it is impossible that the cylinders can burst, though they might collapse; and that the original cost of the machine, as well as the expenses of wear and tear, are small compared with those of the steam-engine. As applied to drain mines in the neighbourhood of coals, its advantages over other modes of operation cannot be disputed. Though we have seen this ingenious machine in action, we would not venture to pronounce so decisively on its merits, unless we had authority superior to that of our own opinion for stating, that "it is new in its application, safe and effective in its operation, and less expensive, both in its construction and mode of working, than any other artificial power with which we are acquainted."

Mr. Brown has executed an order for a small half-horse power for the King; and His Majesty could not, certainly, possess or exhibit a more beautiful philosophical toy.

NEW MECHANICAL POWER.

Several months ago the newspapers contained a statement that a vessel was building at Cadiz, which by the application of a new principle of mechanism, would when completed proceed as rapidly through the water as one navigated by steam. Great *secrecy* has been observed respecting this invention, little more having transpired than that the wheels or paddles are set in motion by powerful air pumps, the action of which is continued by the action of the paddles. We now find that a Company is forming in France for the establishment of vessels upon this or a similar principle on the Canals and Rivers of that Country. The mode in which the machinery is first set into action is said to be by a powerful wheel almost without friction, which although capable of producing an action equal to a 40 Horse Power, is continued in action by one person.

EULOGIUM UPON HERSCHEL PRONOUNCED IN THE ROYAL INSTITUTE OF FRANCE.

(*Continued from No. XII.*)

In this retreat, ornamented by the fine arts, and still more by peace and domestic virtue, Herschel, free from all cares but those of his favourite study, and surrounded by a beloved wife and family, devoted to science, gave himself up to the inspirations of his genius and to his unconquerable desire of studying nature, and interrogating the heavens. To borrow the expression of a contemporary, the village in which Herschel lived, was the spot from which the whole civilized world learned all that was to be known of the wonders of the Almighty.

The history of optical inventions and of their progress is too well known to require notice here. The telescopes of Herschel were of the kind called Newtonian. He did not cease to study their properties and to extend their use. He succeeded in suppressing the use of the plain mirror, which produces a second reflection, and this judicious change which had been long before proposed by Lemaire, but the execution of which was extremely difficult, doubled the optical effect of the instrument. Herschel ascertained that by exercising the eye by degrees we may succeed in rendering it more sensible to the impression of a feeble light, and from this discovery he was able to increase the images of objects far beyond the limits which had restrained other astronomers. He remarked two different properties which had never before been noticed, that which consists in augmenting the apparent dimensions of a heavenly body, and that of penetrating into the profundity of space to discover those objects which would have been actually imperceptible. Numerous examples convinced him of the truth and utility of this distinction. At length he undertook to carry to the utmost extent the application of optics to the purposes of astronomy, and constructed a telescope of extraordinary dimensions: the largest indeed which had ever been seen.

To form an idea of this instrument we must picture to ourselves a tube of iron 40 feet long, with 4 feet and a quarter diameter, suspended under inclined masts, and put into motion in every possible way by proper machinery. The entire system moves round a vertical axis and describes a circumference of 40 feet diameter, a highly polished metallic mirror weighing about 2000 pounds is placed on this tube, and when the instrument is turned towards the sky, this mirror reflects the shining image of the stars. The observer is moved at the same time as the tube in all directions, for he is placed in a seat attached to the upper extremity: the objects which he observes are behind him, and he looks upon their reflected image.

Herschel discovered with this telescope two new satellites of Saturn, which are both nearer the planet than those discovered by Huygens and Cassini. Never before had the study of the heavens been made with so extraordinary an instrument, and it may fairly be said that the greatest phenomena assumed a new aspect, the nebulæ, that is to say those little luminous and irregular clouds which are seen among the fixed stars in various regions of the Heavens, were found to consist of a multitude of innumerable Suns: others which had been almost imperceptible assumed a distinct form. At the entrance of the star Sirius in the field of the telescope, the eye becomes sensibly affected, and to such a degree that immediately afterwards the largest stars are invisible. The effect upon the eye is so great that it is necessary to allow 20 minutes to elapse for it to recover before we attempt to regard other heavenly bodies.

Down to the time of Herschel no astronomer had obtained so complete a knowledge of the heavens; for instance, they ceased to observe the ring of Saturn, when its plane was inclined towards the earth, but the feeble light which its thickness reflected was sufficient for Herschel, so that to him the phase of the ring never disappeared.

One observation entirely new and important, was that of the remarkable points upon the surface of the ring of Saturn. Herschel concluded from them, that this satellite, which is of so singular a form, turns upon itself round an axis, perpendicular to its plane; and he measured the duration of the movement of rotation, which is about ten hours and a half; a short time previous, a great geometrician in France was occupied on the same subject, and resolved it by mathematical analysis, the most powerful and universal mode in practice. M. de la Place demonstrated that the rotation of Saturn's ring, is a necessary consequence of the general principle of gravity. From his analysis, he had deduced the same duration of ten hours and a half, as that which Herschel obtained by direct observation; the history of science offers nothing more worthy the attention of philosophy, than this admirable concurrence of theory, with the perfection of practice.

The observations of Herschel are too numerous and varied, for us to give a regular expose of them. The greater number have been so fully confirmed, that they now form the basis of many of our own conclusions. The instruments, however, which Herschel used, powerful and astonishing as they are, were subject from their very bulk, to many disadvantages which prevent their applicability for the general purposes of astronomical observations; they are rather to be considered as instruments of discovery, than of measure and precision Under the former view, they offer all that is most perfect in the invention of man.

(*To be continued.*)

CAMBERWELL, PECKHAM, AND KENNINGTON LITERARY INSTITUTION.

On Tuesday evening the Camberwell, Peckham, and Kennington Literary Institution was opened, and an excellent lecture delivered by the Rev. I. Pebbs, M.A. at the temporary Reading Room, at Mr. Dawson's Academy, Mansion House, High Street, Camberwell. We regret that we have not room to insert a report of this highly-interesting lecture, but will, if possible, insert it in our next number.

RAIL ROADS.

It has been calculated that the saving which would be effected throughout Great Britain by the general adoption of Iron Rail Roads, and Locomotive Engines, would amount in twelve years, to more than 70 Millions sterling. If this calculation be correct, and we have no reason to doubt its accurracy, it offers a strong argument for the interference of the Legislature in favour of the new principle. By laying a tax upon Rail Roads, which they would be well able to pay, ministers might materially add to the sinking fund for the redemption of the National Debt, or remit a portion of the taxes which press immediately upon the industrious classes.

NOTICE TO CORRESPONDENTS.

We have now before us a pile of correspondence, much of it very valuable, and which it was fully our intention to notice in the present number. The great length and importance of some of the articles which now appear and which we could not postpone, will we sincerely trust be accepted as an apology for not attending to the favours of our correspondents.

Mr. Holland's request will be attended to with great pleasure.

A Letter for G. Morley is left with the Publishers.

C. Puttock has been received.

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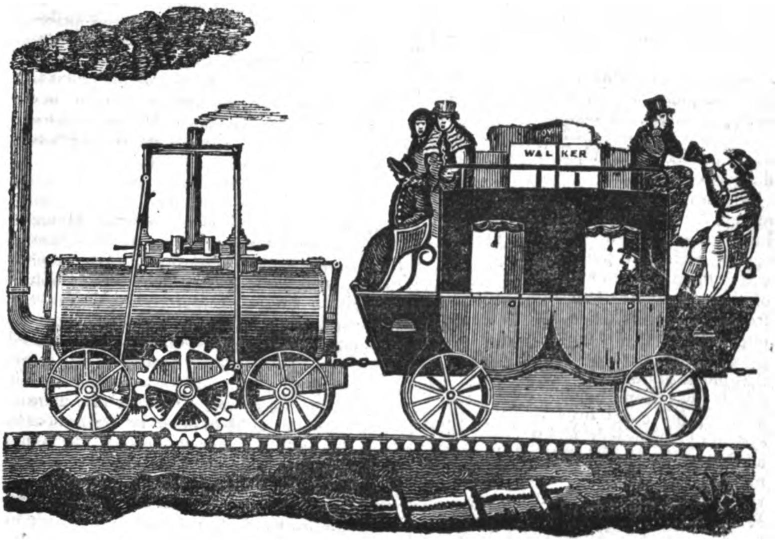
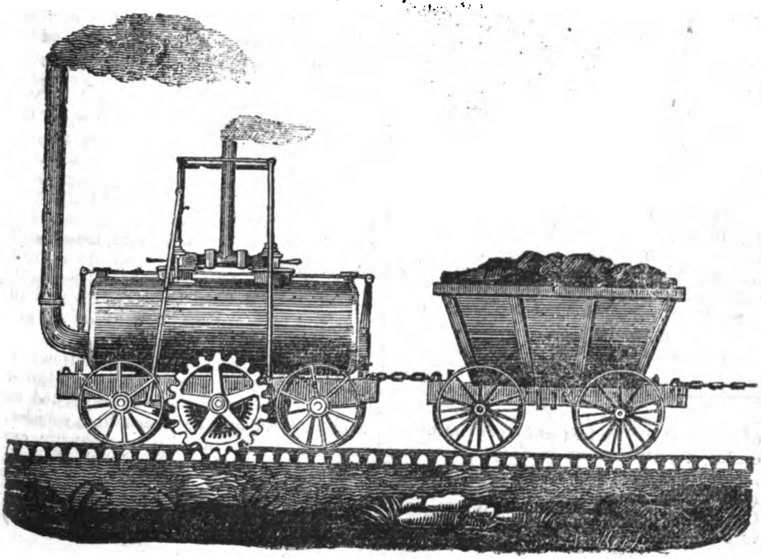
The London
MECHANICS' REGISTER.

No. 15.] SATURDAY, FEBRUARY 12, 1825. Price 3*d*.

LOCOMOTIVE ENGINES UPON THE COG-WHEEL PRINCIPLE.





RAIL ROADS AND LOCOMOTIVE ENGINES.

Every body has heard of Rail Roads and Locomotive Engines, but there are few who have had such a description of the latter as will enable them to judge of their value. We give an Engraving in our present Number of an engine in full operation upon a Rail Road dragging several carriages. The limits of our paper do not permit us to give the entire number which one of these Engines is capable of drawing, but we understand that ten coaches or galleries connected by chains, and carrying each from eight to twelve persons with luggage can be drawn at the rate of ten or twelve miles an hour over an iron Rail Road, without the slightest danger of accident.

The Rail Road question is one which will agitate the Parliament and the country. It involves many private interests, an enormous capital, and much public consideration. We will not add to what we have said in favour of the principle. Our observations arose from our conviction of the importance of improvement in the mode of conveyance of persons and merchandise, because we feel that much of our greatness as a commercial country has been produced by the improvement of the canal over the common road system of conveyance, and we imagined from all that we had heard and seen, that just so much as canals are better than common roads for the conveyance of goods, Rail Roads are superior to canals, with this additional advantage, that in the one case only goods can be conveyed, owing to the tediousness of the journey, in the other passengers might proceed with equal or greater speed, and much greater convenience. We are aware that many objections, some of them important, may be advanced against the general construction of Rail Roads, and the use of Locomotive Engines, but what public improvement was ever introduced to which in the first instance objections were not offered. The greatest objection in our opinion is, we think, the injury which the new principle may inflict upon the proprietors of canals in districts where it is proposed to lay down Rail Roads, but some plan may surely be devised to compensate these persons for the loss which they might sustain. Nothing could be more reasonable, and the projectors of the Rail Roads, after the statements which they have made in their prospectusses of the enormous profits to be derived from them, and the greater part of which would probably be realised, cannot object to such a compensation. Upon the broad principle of public utility we frequently consent to sacrifice private interests. This principle, however, ought not to apply in the present instance, because when the Proprietors of Canals obtained the sanction of the Legislature to their construction, they never could have contemplated the possibility of infringement, and therefore embarked their capital with an assurance of permanent security, which, or a compensation in lieu of it, they have now a right to demand. We doubt not that the Legislature will act wisely and justly on the discussion of this important question, neither turning to the right nor to the left, but acting for the interest of the public, the credit of the country and the fair encouragement of science. The enormous price of iron, and the still more enormous price to which it would rise if all or even half the projected Rail Roads should be laid down, have been brought forward repeatedly as objections to the plan. We might as well say that only one portion should eat bread, because increased consumption would increase the price of flour. In the one case we should answer. Whilst there remain many thousand acres of land uncultivated, and our ports are open to receive foreign corn, the price of flour can be regulated by a fair standard. In the other we say, Whilst the bowels of the earth remain unexplored to the extent of many hundred miles, in quarters where iron stone may be presumed to exist in abundance, and our ports are open to the introduction of foreign iron, there can be no danger of such an increase of price as ought to deter us from a public improvement, under the dread which our alarmists would instil into us.

The Engravings which we have given in our present Number, are taken from some which we find in a valuable little work by Mr. Gray, entitled "Observations on a General Rail Way," published nearly two years ago, but the circulation of which has been rather more limited than its merits would have led us to expect. From this work we shall borrow largely, because we consider that in doing so we are only doing justice to the wishes of Mr. Gray, and at the same time rendering a service to the public. Mr. Gray, after some general remarks upon his proposed system, says, "Why may not the same facility and dispatch be given on land, as we now find in practice by Steam Boats from Dover to the Continent, and from other ports of the United Kingdom? By means of Rail Ways and Steam Engines, the same, if not superior advantage may be enjoyed throughout England, Ireland, and Scotland, as a general and uniform conveyance to all commercial towns and places of any importance.

"In order to establish a general iron railway, it will be necessary to lay down two or three rail-ways for the ascending, and an equal number for the descending vehicles, the waggons laden with merchandize can never be expected to proceed with the same velocity as coaches, but they should all be built on exactly the same plan as to width, which would prove extremely economical by affording the same accommodation to all; for carriages going with a greater speed, may, on coming up to any other, pass off into the next track and fall again into the first track, by which method, any carriage of superior speed may continue its course without any obstruction.

"The sums quoted, as the expense of rail-ways, vary too much to be depended upon; but by following the middle course, we may, perhaps, be nearer the mark. I shall, therefore, take the sum of one thousand pounds per mile, for the single rail-way; the present plan, as above mentioned, requiring six rail-ways, will consequently cost six thousand pounds per mile."

Before we proceed with our quotations from Mr. Gray's pamphlet, it will be necessary to premise that his project is for a general Rail Way, which he estimates at two thousand miles. We have no means of ascertaining correctly the number of miles over which it is proposed to lay iron rail-ways by the different Companies which have been formed, nor of the expense of their construction. The latter is stated variously from four to ten thousand pounds per mile according to the nature of the country through which it is to run. Mr. Gray's calculation is therefore probably pretty near the mark.

We shall proceed with our quotations, adhering to his principle of a General Rail Way of 2000 miles only for the purpose of showing the total expense, according to his own calculation, and also the general advantages and disadvantages of the system.

"If (says Mr. Gray) we take the draught of the plan, for Great Britain, as given in this pamphlet, for our guide, and allow for a few branch rail-ways, which may still be added thereto, the number of miles will be about two thousand, which, at the rate already stated, will amount to twelve millions sterling; supposing that double, or even treble, this sum be demanded, it would be found, that the present revenue drawn from the public roads, the great expense of their repairs, and the enormous sums of money expended in the purchase and keep of horses, will sufficiently demonstrate the abundance of wealth this new scheme would yield to its subscribers.

"I feel assured, that the total expense of the purchase of horses might be completely saved, and that the annual expense of their keep alone would more than provide for the steam-engines necessary for this new projection, as well as defray the whole annual expense of repairs on a general iron railway; it should also be remarked, that as the journeys would be performed nearly in one half the time, the proprietors of steam-coaches and waggons would considerably augment their receipts for conveyance of goods and persons, and at the same time diminish the charge to the individual.

"The conveyance by waggons, coaches, and post-chaises, must ever prove expensive as at present, even in the most favourable times, arising from the great prices paid by the proprietors for horses, the precarious existence of these animals employed in coaches and post-chaises, and the intolerable expense of their food. These several points, duly weighed and impartially considered, will be found the real cause of those heavy charges made on the public, and convince every reflective mind of the impossibility of any reduction. The very great cruelty inflicted on coach and post-chaise horses has long called forth the commiseration of the humane: and in a country where every nerve has been exerted to abolish the slave trade, it is hoped, that the same national feeling may be excited in behalf of these poor dumb animals; the plan here proposed will not only diminish these acts of cruelty, but also present a more expeditious and considerably cheaper conveyance, even where horses shall be made use of; the strength required would be comparatively trifling to the present system, as the coaches running on the rail-way might convey three times the weight of luggage, and passengers in like proportion, with half the horse power."

"One great advantage," says Mr. Gray, "which would arise from the use of locomotive engines, would be the very great quantity of land used solely for the keep of horses, which might then be cultivated for the growth of corn and vegetables: if the land now required to raise food for these animals could be converted to the use of man, the number of human beings which might be supplied, by this alteration in our national economy, with the means of existence, would be very considerable indeed."

The succeeding observation we consider important. To us it seems that there can be no danger from the use of the Steam Engine upon iron Rail Ways, and that there must be much pleasure and convenience.

"Mechanic power, when once put to the test, by comparison on land and water, will, no doubt, prove more favourable by the former, in proportion as that element is more stable, and not under the influence of wind, tides, or currents; besides, the preference given, by the generality of mankind, to land carriage, the misfortunes which might happen to steam-vessels cannot affect the steam-coaches or waggons, as the steam-engine on land is a separate vehicle, and only connected with the coach or waggon by a bar or chain."

"A general iron rail-way," says Mr. Gray,*

* No scheme for a general rail-way is be-

"would prove one of the most important branches of political economy, by introducing a system of conveyance every way superior to our present establishments, and at the same time presenting a fair opportunity to ministers of improving the finances of the country. Many millions of capital now annually required and expended in horses and their provender to keep up our present internal intercourse, might, besides augmenting the revenue of the country, be diverted into other channels of profitable employment, and various improvements in every county. One half the time and expence might be saved to the public, in forwarding and receiving the outward and homeward bound mails to and from Falmouth, and other ports whence the packets sail. The most effective communication might be established between all outports throughout the United Kingdom and the Admiralty, which would not only prove highly beneficial to our commercial interest, but in time of war considerably accelerate operations against any enemies that might present themselves on our coasts.

In time of war or civil commotion, troops might be dispatched from one end of the island to the other in one quarter of the time now required. Provisions and equipments might be forwarded to outports with the greatest speed and facility on fitting out an expedition.

The great mortality amongst horses employed in coaches and post-chaises, is so very general, as to admit of no dispute: and it is equally evident to every individual, that the public must bear this expence, as no proprietors of stage-coaches or post-chaises could bear such an immense and continual loss, were they not secured by fares and rates of carriage in proportion to the risk: taking the number of horses now employed in coaches and post-chaises *only*, to be 100,000, and each horse to average in value 20*l*. the net amount is two million sterling; this sum (agreeable to the statements made by several of the first coach proprietors) is completely sunk within the short space of six years—every six years! and the very same amount, two millions, is annually expended in the keep of these animals, reckoning the same average sum of 20*l*. a head.* No immediate reference has hitherto been made to horses employed in stage-waggons; there can be no doubt that the number is considerable, and that the expence of first purchase, together with the daily expence of food, will bear a relative proportion to those employed in coaches: for the present, this short remark will be sufficient to convey the idea, that the sum already given, as a calculation of the aggregate number of horses employed in England, is far under the mark."

We regret that our limits will not allow us to follow Mr. Gray through all the arguments which he advances; the table with which we must conclude our quotations from his work, is however, so curious that we give it entire.

"An abstract statement of the comparative difference between horse and mechanic-power.

The real number of waggon, coach, and post-chaise horses employed on our main turnpike roads, will, perhaps, be found to exceed 500,000: taking, however, this number for a calculation, and computing the value of each horse at 20*l*.—the keep at 20*l*. each, per annum; in the course of twelve years, allowing for the renewal of stock every four years, and the interest of capital, the consequent expence in this limited space of time is - - -		173,500,000*l*
The expence of 10,000 steam-engines, 300*l*. each in value, which would, on a rail-way, be more than equivalent to the horse power, above stated, amounts to .	3,000,000	
Interest of this capital for 12 years. -	1,800,000	
The fuel necessary to feed the steam-engines taken at 14*s*. per day for each engine, in 12 years amounts to -	30,660,000	35,460,000
		138,040,000*l*.

fore the public, but if all the rail road projects already brought forward, and those which are to be brought forward in the event of the bills now before the House, passing into iaw, be put together, we shall find Mr. Gray's idea of general rail way completely realized.—Editor.

* A stock of one hundred thousand horses renewed every four years, the keep and interest of capital included, amounts, in twelve ears, to the prodigious sum of thirty-four millions seven hundred thousand pounds.

The following extract from a very useful philosophical work will be read with interest, as it contains most valuable practical information on the subject which we endeavour to illustrate.

"The origin of railroads may be traced back to the year 1680. About that period coal came to be substituted for wood as fuel in London, and other places; the consequence was, that at the mines the greatest inconvenience accrued in conveying the coal from them to the ships, as well as immense expense in horses and machinery for the purpose; to remove which, waggon roads were made, consisting of wooden rails or ledges, which the waggons were formed to move upon, and from out of which improvement it was found that a single horse could easily draw a waggon on these rails, which previously required three or more horses to be employed to effect by the common roads; and it was also drawn more quickly, arising from laying down the frames upon an easy descent, which was always done.

"In 1738, this improvement was farther improved, by substituting cast iron rails instead of the old wooden ones; but owing to the old fashion waggons continuing to be employed, which were of too much weight for the cast-iron, they did not completely succeed in the first attempt. However, about the year 1768, a simple contrivance was attempted, which was to make a number of smaller waggons and link them together; and by thus diffusing the weight of one large waggon into many, the principal cause of the failure in the first instance was removed, because the weight was more divided upon the iron. In 1797, these roads having stricken the minds of intelligent men as of great importance, numerous essays appeared, setting forth their utility, and as many plans for rendering them of permanent construction. Hence, cast-iron railroads became a second desideratum to canals; excepting only that the invention is due to Englishmen.

"After this time the cast-iron railways began to be constructed as branches to canals, and in some places as roads of traffic from one place to another, established upon permanent principles, so as to produce a permanent revenue to the undertakers. In surveying a line to set out a railway upon, it will be necessary, as a preliminary step, to ascertain, as accurately as the nature of the thing admits, the quantity of lading expected to traverse each way upon its line; because in forming the slope or descent, this will be the data on which to ground a medium for effecting the required purpose most easily.

"If it should turn out that as much lading is expected one way as the other, with a preponderance at periods only, the railing must in such a case be set out in levels, or in lines nearly level, and the ascents and descents made by planes inclined accordingly. Previously to beginning any part of the work, that is of laying the sleepers, &c. for the iron-rails, a rough sketch or section of all the different routes intended to be passed by the railway should be made, from which, and a view of the ground, the engineer will be enabled to determine the place, and also the extent of the inclined planes which will be required in passing the steeper parts, or the rising ground to which these planes are to be employed; it will always be desirable to get them as short as the site of the place will admit.

"When sudden valleys present themselves approaching to higher ground, it will be necessary so to conduct the line as to cut into the hill at each side, and the cutting from the latter will be useful in raising the road-way of the former. On approaching rivers or brooks, which it is determined to pass, it will be necessary to keep up the rail road to a higher level by embankments, and on passing the water to raise a platform on purpose for it, composed of piers of masonry or columns of iron, with a covering of iron also to receive the rails; or a bridge altogether similar to an aqueduct bridge will answer the purpose. Rail ways may be divided into single and double: by the former are understood, when a single road only is formed; by the latter, when two or more are made for the ready passage of waggons up and down the road. Single roads are generally made, including horse and attendant paths, four yards wide; and double ones vary from six to eight yards wide, exclusive of all the common appendages of such roads of drains, fences, &c. &c.

"Every tram or rail-road must be provided with passing places; a passing place consists in forming large plates of cast-iron, in such a manner as to admit of common rails being joined to them, and which will allow the waggons traversing the road to pass off into another or adjoining track. The cast-iron plates at the passing places should be somewhat stronger than the common rails, as at the passing places there is the greatest wear and tear upon the whole line. The iron moveable tongues should be of wrought iron, and made about two feet six inches, or three feet long, standing up upon the plate equal in projection to the highest part of the rim of the common rails. It should be on a good strong axis or pin, that it may be strong and yet allow of being easily turned round, which it will require to be every time the waggons are passing by the different tracks up and down the rail-way. In passing deep descents, pieces of cast or wrought iron must be provided, called sledges or slippers; these are provided to be placed under the wheels of the waggons to prevent their too rapid descent, and are similar in principle to the same kind of instrument made use of, and appended to our road waggons, for putting under the wheels on their going down a hill. When the whole iron rail-way is fixed, and levelled to the satisfaction of the engineer, it will be necessary to begin to prepare the horse and attendant paths; the foundation of the former should be, if possible, composed of good lime-stone, broken into small fragments, and strewed to the consistence of at least from 10 inches to 14 inches in thickness, rather convex towards the centre of the path; upon this, large screenings of gravel should be laid: the attendant path should be firm and regular, with a gravelly surface. The horse-tracks and rails ought to be always kept clear and free from soil, which is constantly collecting on rail roads of great traffic; and they ought also to be properly drained and kept dry at all seasons of the year; as on this, in a great measure, will depend their substantiality, and of course their utility.

"With respect to the waggons employed on iron rail-roads, those in most general use are so constructed, that their weight, including their lading, does not exceed three tons and a quarter.

"This is found, by experience, to be the most eligible size; as the rail roads retain their shape without much dilapidation, by the use of waggons equal to such weight. The wheels of the waggons are made of cast-iron, two feet five inches high, having twelve spokes, which increase in width as they approach the hub, or centre of the wheel. The hub is eight inches long, and receives an axle of wrought-iron, the rims of the wheels are two inches broad. The axles of the wheels are fixed at two feet seven inches distance from each other; the bodies of these waggons are seven feet nine inches long, four feet five inches wide, and two feet four inches deep; and this sized waggon is calculated to contain the quantity of coal or other matter, equivalent, with the waggon added to it, to make a weight altogether amounting to three tons and a quarter, as before stated, as the most eligible weight to move upon a cast-iron rail-road.

"In the Philosophical Magazine, July 1811, are the following remarks concerning waggons, and also rail roads, from which some idea may be formed of the utility of such roads. 'The waggons on our cast-iron rail-roads, have not received the improvements of which they are capable; but with their present disadvantages, the following facts will evince the great saving of animal force to which rail ways have given rise; first, with a declivity of one and a quarter inch per yard, one horse takes downwards three waggons, each containing two tons; second, in another place with a rise of 1 6-10th of an inch per yard, one horse takes two tons upwards. Third, with eight feet rise in 66 yards, which is nearly one-fourth of an inch per yard, one horse takes two tons upwards. Fourth, on the Penrhyn rail way, (same slope as above) two horses draw downwards four waggons containing one ton of slate each. Fifth, with a slope of 55 feet per mile, one horse takes from 12 to 15 tons downwards, and four tons upwards, and all the empty waggons. Sixth, at Ayr, one horse draws on a level five waggons, each containing one ton of coal. Seventh, on the Surrey rail way, one horse, on a declivity of one inch in 10 feet, is said to draw 30 quarters of wheat. From these cases, and the known laws of mechanics, we may perhaps safely infer, that where the apparatus is tolerably good, and well constructed, and the slope 10 feet per mile, two horses may draw five tons upwards, and seven tons downwards.

"'In cases in which inclined places are to be had recourse to, to carry the rail road over high ground, (and as there are several now passing such ridges,) the mode pursued in raising the waggons may not be unacceptable. The common plan is by a perpetual chain suspended at each end: it is so contrived, that the waggons disengage themselves the moment they arrive at the upper or lower extremity of the inclined plane. In some cases, the laden waggons descending serve as a power to bring up the empty ones; but where there is an ascending as well as a descending traffic on the rail way, steam-engines, water-wheels, or other machinery, to answer the same purpose, are used. At Chapel le Frith there is an inclined plane of 550 yards. On the proposed rail from Glasgow to Berwick several inclined planes will be required, the summit of that rail way being 753 feet above the level end of Berwick quay. As to the expense of rail ways, they are inconsiderable in comparison of canals.

"'According to Mr. Fulton, the cost of a single rail road, with sufficient crossing places for a descending trade, was estimated at 1,600*l.* per mile. In Dr. Anderson's Recreations, 1,000*l.* is mentioned as the estimate for a double one. However, Mr. Fulton's is most likely to be the nearest to accuracy, as his calculations were made from observation, and embraced the whole minutiæ of such a work.

"'The principal rail ways in England and Wales are, the Cardiff and Merthyn, 26¾ miles long, and running near the Glamorganshire canal; the Caermarthen; the Sexhowry, 28 miles, in the counties of Monmouth and Brecknock; the Surrey, 26 miles; the Swansea, 7½ miles; one between Gloucester and Cheltenham; besides several in the north of England.'"

LONDON MECHANICS' INSTITUTION.

DR. ALLEN'S FIRST LECTURE, ON THE NEW METHOD OF INVESTIGATING THE POWERS OF THE HUMAN UNDERSTANDING.

On Wednesday, the 2nd instant, Dr. M. Allen commenced a course of three lectures on the above subject, which he introduced, by observing, that before he ventured to examine whether the new mode of ascertaining the nature and extent of the powers of the human mind, possessed any advantages to recommend it to the attention of his audience, he begged to premise that he had long since examined, thought, and lectured on the subject, and that, whether his own powers enabled him to perceive and think correctly or not, he might state, as some recommendation to their attention and the exercise of their patience and forbearance, that he had been actuated solely by a sincere and ardent love of truth. This he was the more anxious to impress upon them, as it formed the ground upon which he felt himself justified in appearing before an audience, on whom all the well-wishers for mankind are now looking for brighter and happier times to come, an anticipation which he was convinced they would not disappoint.

The great importance of the subject it is unnecessary to prove, for what can be more important than the consideration of man; of man, as the being, who is alone endowed with the high gifts of intellectual greatness? who, when the rest of creation was finished, was formed and appointed, like the key-stone of a noble arch, to his all-important place in the order of nature, and endowed with dominion over the rest of animated creation. And what gives to man this pre-eminence? What renders the rest of animated nature subservient to him? It is not activity nor physical strength, nor the superiority of his senses, for in all these, many animals excel him. It is mind—it is that which dwells (— uncovering a human skull which was placed upon the table, and exhibiting it to the audience—) in "This dome of thought, this palace of the soul."

Even the Heathens, who worshipped the Sun, did not give that glorious luminary more than a second rank among the works of creation; reserving the first for that stupendous production of divine power, the mind of man.

There is something of grandeur and sublimity in the consideration, that Aristotle, that prince of philosophers, studied physics for the express purpose of obtaining a knowledge of that agent or power of nature, which unseen (except in its effects) produces all the forms and movements of material substances; and hence he has given to this department of his works the name of *metaphysica*, (from *meta*, beyond, and *physicon*, matter,) or that which is beyond, or can only be got at through the medium of matter. Indeed, so striking is the dignity of this subject, that our highest admiration of any works of art, of speaking or writing, is expressed by saying, that "soul is there," &c. and we can say nothing more forcibly illustrative of the excellence of man, than is contained in the well-known line,

"Mind is the standard of the man."

Such then being the importance of the subject, the lecturer hoped he should not be accused of being blinded by zeal, or misled by ignorance, when he stated, that if we did not hail, at least, we ought to examine, a system which professes to have discovered a principle by which the mysteries of the mind, that grand, but hitherto sealed book, are thrown open before us, and which furnishes a key to its sublime and glorious contents. In the present lecture, he should confine himself to some general remarks on metaphysical authors, and writers on physiognomy: in the next, he should examine those general arguments, which may be fairly deduced from the writings of zoologists and physiologists, as well as from his own observations, that the size and shape of the head, have some correspondence with the talents and disposition: and in his third lecture, he should point out the importance of the principles deducible from these facts, in all the most important sciences.

The studies of Aristotle were directed by one principle, which was, to obtain some knowledge of that unseen cause or agent, or power pervading nature, which is called attraction, for which purpose he studied the effects or manifestations of its energies, throughout nature. Modern philosophers profess having a similar object in view, and in the department of chemical science, their practice agrees with their profession, as they seek, through the medium of experiments on matter, to obtain a knowledge of the laws of attraction; but this mode of investigation, originated in the infatuated zeal of the alchemists, and to them therefore the credit is due, of thus interrogating nature, and making her, in the language of Lord Bacon "confess her secrets"; for long after the practice of the workshop and the laboratory was the rage throughout the civilised world, it was despised, as much as phrenology, by men jealous of a philosophical reputation, and only became fashionable among them, after the famed discoveries of Galileo, and the subsequent influence of Lord Bacon's mighty genius in this country. Matters are now however changed, and experimental philosophy is universally resorted to; but it has been said that "we cannot apply the experimental mode of investigation to matters of mental enquiry, as we can to the objects of chemical research; that the mind cannot be subjected to the action of acids and alkalies, or decomposed in a crucible." To this it may be replied, that we may know as much of the qualities and functions of mind through the medium of matter, as we can of those of attraction, and it may therefore be asserted, that, whatever the mind is, it is only through the medium of matter that we can obtain any knowledge concerning it: this may be proved by the order and unity which exists throughout nature, for nature is one undivided whole, and if we would unveil her mysteries, we must keep this principle constantly in view, as all-important in our investigations. The world is the great crucible of the moral and intellectual philosopher: but writers on the mind, have for the most part, spoken disre spectfully of matter, and it is therefore my object to remove the repugnance which modern metaphysicians have to our new mode of investigating the nature of the human mind, and through the medium of material forms, to introduce my hearers to a better acquaintance with that which is beyond matter, "the divine intelligence of mind."

If these philosophers had obtained clear views of the nature of the human mind, we should have been furnished with general principles which would safely guide us in all our investigations and more immediately in those which have the happiness of man for their object; but so little has this been the case, that the very word metaphysics had lost its original meaning and become, with the vulgar, a term equivalent to "bewildered fancies," and even metaphysicians themselves talk of their transcendental philosophy. History furnishes abundant proofs that opinions the most foolish and wicked were once most cordially received, while the wisest and most important truths were "despised and rejected." It cannot, however, be expected that men should at once change their habits of thought at our bidding, yet it ought not to be forgotten that it is our duty to exercise a spirit of candour, temperance, and impartial investigation in all matters offered to our consideration. And with respect to our present subject, we should banish from our minds that spirit which judges before it has heard and understood, and by the exercise of candour and liberality, we should satisfy ourselves whether the claims of this new doctrine are well or ill founded.

It is evident, that in order to ascertain accurately the nature of the human mind, we must not only study *ourselves*, under every possible variety of feelings, of sentiments, and of passions, which changing incidents, circumstances, times and age produce, but also the overt acts, or the expressions of the sentiments, feelings and passions of men as they appear in various nations and individuals, and under every possible degree and kind of difference in talent and cultivation. It may then be asked, why we should not, at any rate try the further help of the system of Gall and Spurzheim, and see whether it may not enable us to ascertain the nature and extent of the powers of man under all these different circumstances? In the works of those who have written on the mind, we shall find little or nothing to guide us in forming an estimate of our own powers, or of the nature of mind in general. Of separate faculties, or organs, we meet with no information, though they describe to us, as such, the qualities of mind in general, such as sensation, perception, conception, instinct, memory, &c., and also divide the mind into affections and passions—emotions and desires—pleasures and pains—which, in our new view of the matter, are common rather to the agent which operates through them, than to the instrument itself. We must ascertain how all these separate and combined modes of action are affected by the temperament of the system in a state of health or disease, and how these modes of action of the mind themselves operate on the system; for I contend that the exercise of each organ produces its specific influence on the animal economy.

Dr. Allen then alluded to Hartley's work on man, which he considered replete with good sense, and was of opinion that, were he now alive, he must almost necessarily adopt phrenology, as proving the mechanism of his system of the association of ideas. Similar remarks might be applied to the elaborate and splendid works of Dugald Stewart, and others; and he could not omit the opportunity of eulogizing Locke, to whom the greatest portion of credit is due, because he was the first to warn us how habits are formed—prejudices engendered—judgment influenced, and will determined, and he was also the noble and sublime pioneer of liberal principles and universal toleration. Yet the lecturer imagined that the abuses which had arisen out of the writings of Locke, were to be traced to this excellent principle which directed his intellectual labours; for in his anxiety to remove the seeds of superstition from the minds of men, he seems to have thought that those who made every thing *innate*, and to depend on sensation and reflection, had proved too much, and thus he was led into the opposite extreme, or at least, his disciples have been so; for Locke, in denying *innate ideas* and principles, never meant to deny that man was created with *native powers* which rendered him capable of forming principles and ideas. Aristotle has beautifully described the evolution of mind by the various circumstances in which we are placed, and hence his clear distinction between innate capabilities, and faculties brought forth; thus justly combining that which the partial views of modern metaphysians have apparently made to oppose each other. Addison has borrowed from this combination, in comparing the uncultivated mind to a rude block of marble, and the cultivated to the same marble when fashioned into the fine piece of sculpture, but Aristotle's illustration is much more complete, in making the effect more or less perfect, in proportion to the exertion of that energy or power, which acts on the various degrees and kinds of capabilities in the substances or things on which it operates, just as various pebbles are rendered smooth by their attraction in the running stream; so the mind, by education, and collision with the world, exhibits different degrees of polish and improvement.

Dr. Allen then proceeded to observe, that the ideas of sensation and reflection can only be rendered rational, by being explained in agreement with the phrenological theory of the functions of the perceptive and reflective powers or organs, and after a variety of remarks on the writings of Locke, and the contrariety of the opinions entertained by different metaphysical authors, he observed that if ever a peace should be accomplished between these conflicting principles, it must be by a powerful and comprehensive representation of the whole system of the human mind, agreeing with religion; a system which will shew, that to every part ought to be appropriated its due and relative share of activity, so that neither science nor religion shall be unhinged by enthusiasm, nor generous feelings frozen by the power of misplaced calculation. Whatever approximation may have been hitherto made towards the truth, it is evident to me said the lecturer that metaphysicians have not yet embodied the whole truth they have not obtained correct and complete views of the nature of man, nor any certain method to guide them in forming an estimate of the nature and extent of the powers of the human mind; now as the system of Doctors Gall and Spurzheim professes to have done all this, it seems to be the business of the true philosopher to brave all that prejudice can oppose and to examine the validity of their claims. But before doing this, it is proper that some notice should be taken of the physiognomical system of Lavater.

This system the lecturer proceeded to examine at considerable length, particularising in the first instance a number of observations and proverbs in common use in all languages expressive of our faith in physiognomy. We say, the countenance is prepossessing or forbidding—what a mean, or what a noble look! or, as Lord Chesterfield would say, that the countenance with some, was a passport to secure their introduction every where. Many other phrases are used to denote intellectual expression in the face, such as sensible, penetrating, thoughtful; and many others which intimate the general result of the experience of the world, and that consequently something of truth on this subject is founded in Nature. However vague and indeterminate these expressions are, the attempt to explain them gave rise to the grand, but imperfect work of Lavater, the greatest among philosophers, the most pure among moralists, and the most amiable among men.

Our limits will not allow us to follow the lecturer through the whole of his remarks on Lavater's system; but we may state that he gave a very beautiful and striking description of the wonderful expressiveness of the human face divine, in which the emotions of the soul, where dissimulation has no place, are infallibly depicted, and if not definable, are universally felt.

The countenance absorbed in the contemplation of any changing scene undergoes corresponding changes of expression. Medical men know that certain appearances in the countenance indicate the nature of the disease with greater certainty than the patient's own description; the emotions of the mind are most strikingly impressed upon the countenance in our dreams, and are most beautifully so in children. In fact, in all languages, the very word countenance expresses the mental and physical state of man. "I will praise God," says the Psalmist, "who is the health of my countenance and my God."

But still if we consider that the muscles of the countenance are all voluntary, and of course can assume an artificial and fictitious cast, it becomes extremely difficult to determine when expression is natural and when it is affected. From this, and many other circumstances, connected with the hypocrisy of those we look upon, the variable state of our own minds, and the fleeting and transitory nature of the corresponding expression, it is evident that we cannot wholly trust to physiognomy, as an infallible guide. There is one part, however, which we must exempt from this charge of fallacy, and which, though little noticed by Lavater, is included in the investigation of this subject, and will enable us to ascertain the difference which nature has made between one man and another, and not that which art and habit has assumed, as we have stated can be done by the muscles of the face. From this part we will now withdraw the veil;—it is THE HEAD, especially the forehead.

Dr. Allen again impressively referred to the human skull, and observed that to prove how largely the head enters into physiognomical expression, it was only necessary to place on the same face different heads, which would be found to produce a totally different impression; and in the same way, a very different impression is made upon us by the same person with his head covered or uncovered. The lecturer exemplified these remarks by exhibiting several portraits, to the faces of which he attached various heads in succession, and concluded by observing, that having thus, by an easy and natural transition, arrived at the desired haven, he should defer entering it till his next lecture, when he would endeavour to lay the foundation of the Phrenological Building which he was attempting to raise among his audience.

MR. PARTINGTON'S THIRD LECTURE ON OPTICS. FRIDAY, 4TH FEB.

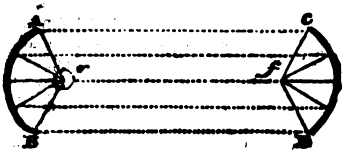
ANALOGY BETWEEN MUSIC AND LIGHT—BURNING MIRRORS—CAMERA OBSCURA—MICROSCOPE—MAGIC LANTERN.

MR. PARTINGTON commenced his third lecture, by alluding to his former observations on the decomposition of white light by means of the prism, and stated, that from the circumstance of its component parts being seven in number, several ingenious persons had been induced to notice an extraordinary analogy between the prismatic colours and the seven primary notes in music. This analogy had been applied to the musical glasses, by a mechanic named Tate, who had stained the glasses with the seven colours into which the rays of white light are separated by the prism, by which means, a person unacquainted with the musical notes, might acquire a knowledge of the prismatic cords in half an hour. The instrument now before the audience was constructed upon this principle, and was intended to be employed by the worthy President in his recent lecture on Acoustics; but as want of time prevented him from exemplifying its effect upon that occasion, Mr. Partington observed, that though he was no musician himself, he would attempt a tune, for the purpose of pointing out the analogy subsisting between music and light. The lecturer then played the national air of "God save the King," in a very masterly manner, with an accompaniment, which harmonized delightfully with the tune, producing those exquisite tones which fall upon the ear with indescribable sweetness, and are unequalled by any other instrument. The audience listened with breathless attention to the mellow chords which enriched their favourite melody, and as the last cadence died away, an involuntary burst of applause testified their obligation to the lecturer for the treat which he had afforded them. Mr. Partington then observed, that in his accompaniment, the octave was produced by touching two *yellow* glasses, the fifth by the *yellow* and *violet*, and the third by the *yellow* and *red*, the various intervals on the musical scale being found to correspond exactly with the relative situations of the seven colours on the prismatic spectrum.

When the rays of light pass through a semi-transparent medium, they become broken and refracted in every possible direction, and this property produces a mellowness and uniformity in the diffusion of light which, in many cases, may be very advantageously employed. The lecturer exemplified this remark, by exhibiting a series of large cards, upon which the various constellations were delineated, and the situations of the different stars were distinguished by perforations in the cards. If one of these constellations was held between the eye and the flame of a candle or lamp, as the rays of light diverge in straight lines, the flame would be seen through the perforations near the center of the card, while the rest would be scarcely distinguishable; but if the luminous body was surrounded by a semi-transparent medium, such as ground glass, the multiplied refractions of the rays would diffuse the light equally, and all the stars in the constellation would appear equally luminous. If the card was held between the light and the wall, the image of the constellation would be thrown upon it, and the size and relative distances of the stars would increase as the card approached the light, but would diminish in an equal ratio as it was held nearer to the wall. The members might easily produce a map of the heavenly bodies by perforating cards in this manner, and they would be found extremely useful as a medium of astronomical instruction.

Mr. Partington then proceeded to illustrate the concentration of light and heat by means of burning lenses and mirrors, and observed that to produce the intended effect, a *burning lens* must be *convex*, and a *burning mirror* must be *concave*, because both produce their effect by concentrating into a very small compass the rays of light and heat incident upon a large surface. If we take a lens only two inches in diameter, a large portion of the rays passing through it from a luminous body are conveyed to the focal point, and their density being proportionably increased, an inflammable body will be ignited at the focus, and by employing lenses of greater diameter, bodies may be burnt at a considerable distance. We had, indeed, been told that a fleet of ships had been set on fire by means of a glass of this description. This subject was further illustrated by a diagram somewhat similar to the second and third figures introduced in our report of Mr. Partington's previous lecture, which will sufficiently elucidate the manner in which heat, as well as light, is concentrated at the focus of a convex lens.

That the same effect might be produced by means of a concave surface would be evident from an experiment with the apparatus on the lecture table, which consisted of two concave mirrors, about a foot in diameter, placed exactly opposite to each other at the distance of several feet. In the focus of the first mirror, a red hot ball was placed, from which the rays of heat diverged to the surface of the mirror, and, upon the principles which he had before explained, were reflected in parallel lines to the opposite mirror, the surface of which again reflected the rays and converged them to its own focus, at which point an inflammable substance was placed. The lecturer's observations were strikingly exemplified by the result of this experiment, for the heated ball had been placed in the focus of the first mirror but a few seconds before the phosphorus at the focus of the second became ignited and burst into a flame. The following figure will convey a general idea of the apparatus employed upon this occasion, and the manner in which the heat is radiated from the red hot ball to the inflammable body.



The rays of heat diverging from the red hot ball *r*, are reflected by the concave mirror A B in the parallel lines A C, B D, &c. to the opposite mirror C D, by which they are converged to its focus *f*, at which point the inflammable substance is placed, and Mr. Partington observed, that in performing the experiment he had placed the phosphorus in the focus of a third reflector of small dimensions, by means of which its immediate ignition took place. If he placed his hand at any intermediate part between the hot ball and the phosphorus, only a small increase of temperature was perceptible, which proved that the greatest heat was concentered at the focus of the second mirror, and the same effect would be shewn if a thermometer was employed instead of the inflammable body, though it would not be so apparent to the audience. The lecturer then placed a thermometer, inclosed in a glass globe, at the distance of about two feet from the ball, when it rose two degrees, but when placed at the focus of the second mirror, it was instantly elevated eight degrees, and would have risen much higher if sufficient time had been allowed for the communication of heat to the air contained in the globe.

A similar effect is produced, if the rays of the sun are concentrated by means of a concave mirror, and it had already been observed that the convergence of the rays on passing through a convex lens produced an intense heat at the focal point. If a piece of charcoal is put into a glass vessel of water, and placed in the focus of a burning lens, the water in front of the charcoal will become heated; but if the charcoal is withdrawn, the rays will pass through the water without producing any material increase in its temperature, as the presence of the charcoal is necessary to absorb the heat and communicate it to the water.

One of the most remarkable burning lenses that has ever been constructed, was made by Mr. Parker, of Fleet street, at an expense of upwards of 700*l*. His lens was of flint glass, three feet in diameter, and when fixed in its frame exposed a surface of two feet eight inches and a half in diameter to the rays of the sun. Its weight was 212 pounds, its focal length six feet eight inches, and the diameter of the focus one inch, which was reduced to a smaller diameter by means of a second lens. It was undertaken with a view of fusing and vitrifying such substances as resisted the fires of ordinary furnaces, and more especially of applying heat *in vacuo*, and under other circumstances in which it could not be applied by any other means. The heat produced by this extraordinary lens was so intense that pieces of metal were melted in a few moments, and every substance exposed to its influence became vitrified, or changed into glass. Its effects were, in fact, similar to those which had since been produced by voltaic electricity, and were of so much importance to chemists.

The next subject to which he should direct the attention of his auditory was the principle upon which the *camera-obscura* is constructed. If a hole be made in a window shutter, or the side of a darkened room, the inverted images of all external objects from which rays of light can enter at the hole, will appear upon the opposite wall of the room. This is the camera-obscura in its most imperfect state, for as only a small portion of light can pass through the aperture, the images are necessarily indistinct; but if a convex glass be applied to the hole, a large quantity of rays are converged to their proper foci, and a picture is produced, incomparably superior to the most perfect effort of the painter's skill. The lecturer then referred to an excellent diagram, which represented the manner in which the rays of light proceeding from a large tree passed each other at the point occupied by the convex lens, and depicted the image of the object on the screen in an inverted position. He also produced a portable camera obscura, and explained the principle upon which the rays of light passing through the convex lens are received upon the surface of a diagonal mirror, which reflects them upwards, and exhibits the picture on a piece of ground glass fixed in the top of the camera obscura. If the screen upon which the external objects are received is flat, a partial distortion of the images occurs, which is obviated by employing a concave surface and proportioning the concavity to the focus of the lens, by which means a perfect delineation of the surrounding scenery is produced.

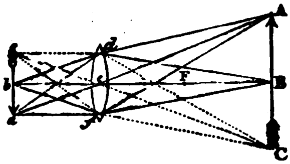
Mr. Partington then entered upon an examination of the construction of the *microscope*, which, in common language, is said to magnify the objects seen through it; this, however, is only true with regard to their apparent magnitude, which is measured by the angle under which those objects are seen by the eye. Hence, an object at the distance of half a mile, will appear twice as large as it would at the distance of a mile, because the angle which it would make on the eye, would be twice as large in the one case as in the other. Upon the same principle, if, at the distance of six or seven inches, we can but just discern an object, and then by interposing a lens, we can view that object at a nearer distance, it will appear as much larger through the lens than it did to the naked eye, as its distance from the lens is less than its distance was from the eye. That this is not because the object is magnified by the lens, is evident from the circumstance, that the same thing will happen, if, instead of a lens, a piece of dark-coloured paper, perforated with a small pin-hole, be interposed between the object and the eye. If the eye be brought within an inch or two of a book, it will be impossible to distinguish the letters, but if they are examined at the same distance through a hole in the dark coloured paper, they will not only be visible, but apparently very much magnified, which would not be the case if the print was examined through the same hole, at the distance of six or seven inches.

The object of the microscope then is to increase the angle under which minute objects are thrown upon the retina of the eye, and this angle is increased in proportion to the convexity of the lens through which they are viewed. A small hollow globe filled with water will magnify an object three or four times, but to produce lenses of very high magnifying powers, a method had been adopted by Mr. Lewenhoeck, which he would now describe. Mr. Partington then took a piece of common window glass, which he heated till it became sufficiently softened to enable him to draw it into an extremely fine filament or thread. By melting the extremity of this thread in the flame of a spirit lamp, the glass was formed into small spherules, and the microscopic apparatus would be completed by fixing them between two thin plates of sheet lead, perforated with small holes, adapted to the size of the glass spherules. Microscopes of this kind will increase the apparent magnitude of objects to many thousand times their original bulk, but it is difficult to make the globules perfectly spherical, and hardly half a dozen perfect microscopes will be found among twenty or thirty spherules.

The solar microscope consists of a plane mirror, placed in an oblique direction to receive the rays of the sun, which are reflected through a large double convex lens, at the focus of which a second lens is placed, and the image of any transparent object situated a little behind the focus of the first lens is thrown upon a screen at some distance beyond the second, where it is seen magnified to a very great extent. The great increase in the apparent diameter of objects produced by the solar microscope might be shewn by the lucernal apparatus on the lecture table, in which the flame of the lamp was necessarily substituted for the rays of the sun. The lecture room was then darkened, and some miniature figures of flowers being passed through the lucernal, their images appeared upon the screen very greatly magnified, in consequence of the increase of the angle formed by the divergent rays on passing through the lens.

In calculating the size of the minute objects seen through a microscope, it is necessary to employ an instrument called a micrometer, which measures extremely small distances by means of threads or filaments crossing each other at right angles, and which are adjusted by screws. The threads of the spider's web have been used for this purpose, but as they appeared much too coarse when magnified, Dr. Wollaston endeavoured to remedy this inconvenience by substituting platina wire, drawn as fine as possible. Finding that this wire was still much too large for micrometers, it struck him that it might be drawn much finer by inclosing the platina in a cylinder of silver, and drawing them both together to the same degree of tenuity. Having done this, he cut the wire into pieces, about 7 or 8 inches in length, and bending them into the form of a loop, immersed them in nitric acid, which dissolved the exterior coating of silver, and left the platina wire so extremely fine that it did not exceed the 4000th part of an inch in diameter. By adapting this wire to his micrometers he was enabled to measure the smallest objects with tolerable accuracy.

A diagram was then exhibited to shew the construction of the magic lantern, which consists of a kind of box, furnished with a lamp, the rays from which pass through a large plano-convex lens, placed in a tube fixed in the front, and illuminate the objects painted on the glass slides, which are introduced behind the lens in an inverted position, and the images being reflected through a double convex lens, are thrown upon a screen in their natural position and greatly magnified. If the lantern is near the screen, the size of the images is not much increased, but their magnitude extends in proportion to the distance of the screen. Mr. Partington observed, that the effect of the lamp was rendered much more powerful by the addition of a concave reflector, and as he should be furnished with such a lantern when he next addressed his hearers, he should again advert to the subject. We may however remark, that the following figure will illustrate the manner in which the image of any object is magnified as well as inverted, when depicted upon the screen by means of a double convex lens.



The pencils of rays proceeding from the small object *c b a*, after passing through the lens *d e f*, proceed to the screen placed beyond the focal point F, and exhibit the image magnified as at A B C, and in a position contrary to that of the object it represents.

Mr. Partington concluded his highly interesting lecture, by observing that in the present improved state of mankind, it was not necessary that a new discovery in science, or an excellent invention in art, should be carefully concealed lest it should expose its possessor to the suspicion of supernatural agency, or to the persecution of such as believe that the fruits of knowledge and evil must still of necessity flourish together. The scroll of history is, however, dark with the records of such events, but happily for my auditors, happily for Britain, and I may add, even for the whole world, these thick and palpable clouds of error are rapidly disappearing. The astronomer may now turn his unprohibited optic glass to the ethereal expanse above, and if Providence vouchsafe him the discovery of an unknown star, he no longer conceals his knowledge with trembling, but its publication becomes a matter of interest to half the globe. Nay, it does more for him, for he derives from it both honor and encouragement, and no future Milton can write of him in another nation so affecting a passage as that immortal poet did, when speaking of the greatest optician of his day, perhaps the greatest that ever lived; "There it was," says he, with a simplicity and pathos peculiar to himself, "There it was, that I found and visited the famous Galileo, the inventor of the telescope, grown old, a prisoner to the inquisition for thinking in science otherwise than the Franciscan and Dominican licensers thought right."

At the close of both the preceding lectures, Dr. Birkbeck repeated the notice previously given to the members, to send in their nominations of Officers for the ensuing Election in March next; and he also strongly recommended to the attention of the members the admirable pamphlet of Mr. Brougham, from which we have made several extracts. The worthy President apologised for the inadvertent omission of Mr. Tatum's excellent course of lectures on electricity in Mr. Brougham's statement of the different courses delivered to the Members of the Institution, which would be supplied in the next edition; and he observed, that having himself been mistaken when he mentioned on Wednesday that the price of the pamphlet was three-pence, he would now rectify the error by stating that it was sixpence, as Mr. Brougham found it impossible to include all the information he wished to communicate, within the limits he at first intended. This trifling difference, he was however convinced, would not be considered of importance by the Members, particularly as the whole profits of the pamphlet would be devoted to the Institution.

Dr. Birkbeck also gave notice, that in addition to the two classes of pupils now receiving instruction in the French language from Mr. Black, a third class would shortly be formed, which would be under the superintendence of Mr. Reynolds, a Member of the Committee, who was perfectly competent to communicate instruction upon Mr. Black's system, and had kindly offered his services for that purpose. As, however, the number of applications already received was more than sufficient to complete a third, and even a fourth class, the more recent applicants must not feel disappointed if the accomplishment of their wishes was deferred till further arrangements could be made for their accommodation.

APPOINTMENT OF A SECRETARY TO THE INSTITUTION.

The Committee of Managers have been engaged for some time past in the important task of selecting a competent and efficient person to fill the office of Secretary to the Institution, and after a careful and patient investigation of the claims of nearly eighty candidates, the final ballot took place on Monday evening last, when the majority of votes fell upon Mr. Robert Christie, of No. 46, Southampton Buildings, who was accordingly declared duly elected to the situation. This gentleman was one of the original members of the Institution, and an active member of the committee appointed to prepare the rules and orders, and to act as a provisional committee, till the first election took place in December, 1823. Mr. Christie's experience as a mechanic and an able mathematician, has been proved by his invention of the Tellurion, the Protractor (an engraving of which we gave in our last number), and other mathematical instruments; and we sincerely hope that his general qualifications, as Secretary to this excellent Institution, will justify the confidence reposed in him by the committee, and afford satisfaction to the members at large.

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PUBLIC LECTURE.

On Tuesday week, the above Institution may be stated to have commenced its existence by a Public Lecture. The premises (temporary), are those in the occupation of Mr. Dawson, the respectable proprietor of the Mansion House Academy, High-street, Camberwell.

At a few minutes before seven o'clock, the doors being opened, the room filled almost immediately. It was highly gratifying to witness so many ladies in attendance on such an occasion. Precisely at seven o'clock a number of the gentlemen, promoters of the Institution, entered the room, accompanied by the Rev. J. Peers, M. A., and took their station on the platform :—

The Rev. Gentleman commenced a very excellent lecture on the advantages of Literary Institutions by a reference to the early ages, when mankind had not the advantage of communicating their thoughts in the manner and by those means which the improvement in the use of letters and printing enables us to employ at the present day, but were compelled to make use of symbols or hieroglyphics, as was the custom among the Egyptians. That mankind had from the earliest period made use of some symbol was evident, by the circumstance, that upon the discovery of America, the same method was observable among the Mexicans. The Chinese possess a language of this kind, which is very imperfect from the number of characters used, being in the whole 80,000, and that man is considered a very wise one who knows 20,000 of them; whereas we have but twenty-six signs, the letters of the alphabet, from which all our words are formed. In all other sciences we can trace the origin, but of the science of the written language we have no means of arriving at its origin; by some it is supposed that God made the communication to Moses, and that the tables delivered to Moses by God, was the first specimen, and by Moses transmitted to the world.

The use of hieroglyphics or symbols gave rise to painting, as men were accustomed to convey the name of any substance by a sign, so they began to describe places and substances by representing them in sculpture and pictures; the shepherds who kept watch with their flocks during the night, and in those parts of the globe where the sky is always clear, had an opportunity of observing the motion of the heavenly bodies from time to time, this led to astronomical observations; the practice of measuring the land by the Egyptians, after the overflowing of the Nile gave rise to the right line figures, thi. introduced mensuration : the Rev. Gentleman went back to the earliest periods, to shew the advantages which all countries had felt, where knowledge and the arts were cultivated, during which he remarked, that the first literary female was a Greek, who used regularly to hold her coteries of the then learned, at her house at Athens, where the first public library was established; that literature flourished here till the Greek republic fell before the Macedonians; at that conquest the spirit of literature was destroyed, and with that, fell the spirit of liberty (much applause). Here the Rev. Gent. went at great length into the Roman history, to shew the important characters produced in that republic, during the time that literature was encouraged, and the great change in the Roman character produced by a change of public taste; that, when the Goths appeared before the walls of Rome, it was decided to send all the useless mouths out of the city; when all the men of learning were dismissed, and about 3,000 actors, and the same number of dancing girls, kept within the city. The loss of taste for literature, produced that ferocious character among the Romans, which continued during the time the people were under military service, when all prisoners taken in battle were considered and treated as slaves—with greater severity than the slaves are treated in our West India possessions, their heads being shaved, and wearing iron collars, with the owner's name engraved thereon; that the military character or notion of appeal to arms, produced the ordeal or appeal to God—then came the trial by combat. In the year 775, one took place at Paris, a bishop and an abbot having disputed respecting some right to abbey lands, they each choose a champion, who was to stand with the right arm extended before the high altar, and he who could keep his arm thus, the greatest length of time, decided the case. Even cases that should have been submitted to the decision of a judge, were decided by knights or champions, who fought it out; even so late as 1571, in Elizabeth's reign, preparations were made for trial by combat in Westminster Hall, but that princess (who governed with so much wisdom) set it aside.

To shew the means which were employed to instruct the people in Scripture History, in the early ages, the lecturer related many anecdotes of the sacred subjects introduced on the stage in the fourteenth century. A piece of this kind was performed at Vienna, it was a law-suit between "The Devil and the Saviour of Mankind," the Virgin Mary was the judge, this was objected to by the Devil, as that the Virgin being the mother of God, such a counsellor would give an improper preference, but these matters being argued on both sides, the Devil was of course beat, and thus ended the piece to the satisfaction of the auditors. Another exhibition of this kind took place at Barcelona, called "The Birth of Christ," in which messengers arrived to say, the Son of God was born, then all the tailors were summoned to prepare his garments, a naked child was then introduced on the stage, when the question was asked, 'if the infant had brought any soap with him to wash away the sins of the people?' and other equal absurdities; but these things were performed during the time that despotism had closed the mental faculties · the Rev

Gent then proceeded to contrast the progress of literature at different periods: that in the year 1340 (Edward sixth), there were 3,000 students at Oxford, and 2,000 at the different Inns of Court; that when Europe was sunk in ignorance, literature flourished at Constantinople; he then dwelt on the importance of a book, before the art of printing, when large sums or value in plate was left as a security for the loan of a single book; that it was customary to present a book to a monastery, for the good of the soul of the donor; so little was the spirit for reading, that in the reign of Henry 8, when the first edition of the Bible was printed—600 copies, it took three years to dispose of them. That as literature increased in this country, so did our commerce increase, for the desire to read produced a demand for printed books; this in its turn produced a demand for paper, and all the various articles connected with the manufacture, that printing and paper-making require. The worthy lecturer alluded to the very great desire among young persons to read the newspapers, this gave rise to an equal desire for a knowledge of geography, politics, and history, which they had not previously felt. The first newspaper ever published, was at Venice, and appeared half-yearly, 1536; thirty volumes of this paper are preserved at Florence. During the time of the intended Spanish Armada for the invasion of this country, Lord Burleigh published a newspaper, which was called the English Mercury, but it only extended to 50 numbers; the first in Germany, 1612; the first in Paris, 1630; in 1709, during the reign of Queen Anne, the first daily paper was published; the success of this produced periodicals; the first of these was the Gentleman's Magazine, then followed the Reviews and Literary Journals; to such an extent is it now carried, that literature is actually an article of commerce. A few years back most of our books and all our best prints were imported; when the exertions of one man produced a total change, by an attempt to encourage native talent; the late worthy Alderman Boydell succeeded in this to such an extent, that our exports of these articles are now 60,000*l.* a proof of what can be done by exertion, when the cause is good. Instil into a man a taste for literature and you will render him a valuable member of society; the human mind is active and must and will be engaged.

The Rev. Gent. expressed much pleasure to see so many females attending a meeting of this kind, and very ingeniously combatted the notion that women had nothing to do with learning, and mentioned many learned females, who had adorned the pages of literature: after which, the Rev. Gent. stated the object of the Surrey Literary Institution, and spoke at considerable length on the importance of such Institutions.

Mr. Green, the Honorary Secretary came forward and announced that the reading-room was to be considered as opened, from this evening.

Samuel Favell, Esq. the Treasurer, proposed thanks to the Rev. J. Peers, for his important services this evening (carried with applause).

The Rev. Gentleman replied in a short speech replete with good sense, and evincing the fullest conception of the importance of the business on which he was engaged. He was then, at the suggestion of S. Favell, Esq. elected an Honorary Member of the Institution. The meeting then adjourned, at half-past nine o'clock.

We were favoured with a view of the apartments, at the Mansion-house, that are appropriated for the library and reading-room, they are spacious and commodious, but we think they will shortly be too small for the purpose; the house was built by Sir Christopher Wren, and he occasionally resided in it during the building of St. Paul's Cathedral.

To the Editor of the Mechanics' Register.

NEW MECHANICAL POWER.

Sir,—I invented about two years ago a mode of propelling vessels by means of a pump, but was unable to obtain a patent, in consequence of its enormous expense. The pump far surpasses steam engines for propelling vessels, as it requires no fuel, which is of so great importance in long voyages. It is likewise so simple in its construction that its discovery would not excite astonishment, except that it was not discovered centuries before.

I would here ask, Sir, whether England does not stand in her own light by preventing the humble class of society from obtaining patents for their inventions; has she not lost many important discoveries that would be of great utility? For instance, the present. I do not mean that the lower class of society should obtain their patents without paying for them, but that they should have two years at least before the payment is demanded, which would do away with the present grievance.

Yours, &c.

33, John-street, Blackfriars. David Thomas.

To the Editor of the Mechanics' Register.

Sir,—It is not generally understood that there is a difference between a tram and a rail road, and as I wish to set your scientific readers thinking on the subject, they may as well know that a tram road is the sort commonly in use, which may be seen in Surrey, and is employed generally at large excava tions: it consists of plates of cast iron, about three feet long, from three to five inches broad, and from half an inch to an inch thick, with a flaunche turn-up or crest on the inside from two and a half to four inches high.

The rail, or edge railway, consists of bars or plates of iron, which may be formed in the best way to sustain the weight and suit the wheels which are to pass over them. When complete, they are of directly contrary shapes, the former making a grove or indentation, the latter a ridge or elevation.

Now, whether the vehicles be set in motion by men, horses, steam, or gas, the question will apply in what form of the iron plate, unrestricted to either of the before-mentioned, will the wheels meet with least resistance from friction? And what shaped wheels, unrestricted to any yet used, will occasion least friction?

We find that a horse can draw 50 tons on the water without difficulty. Why is it that he can draw only nine tons on a railway? and what is the remedy? I say *only* 9 tons, although he can draw but one on a common road, for surely there ought not to be so great a difference against the instance where there is less surface and less weight.

Let me ask, also, what forms of railway and wheel would best allow the same vehicle to go as well on a common road as on the railway?

As it is probable some of your scientific readers will give the public, through your Register, the fruits of their contemplations, before the expense of casting the plates has taken place. I expect some answers which will better elucidate the subject than my questions; at all events, you will be thanked if any good results by this medium, either to the public, or more unobserved, to individuals. Yours, &c. PICK AXE.

To the Editor of the Mechanics Register.

SIR,—The reading of a patent being granted for an invention to enable a person to enter buildings on fire, has brought to my recollection, a circumstance which occurred about five years ago. A fire was discovered in a large wine cellar, in St. James's-street, and from the contamination of the air, no one, without suffocation, could enter; one man was with great difficulty restored, and at last the cellar was obliged to be closed for some days, to extinguish it, and it being a brick vault, no danger arose in doing so, but had it been any other building, the time lost would have been fatal to it, perhaps the neighbourhood. It afterwards occurred to me, that it might have been entered by the following plan, which I intended to have made public, but was prevented by illness, and it had passed my recollection till I read of this patent

Let a fire-engine be placed as near to the entrance as possible, after passiug a little water through the hose to close its pores, unscrew the branch, and tie a cord round the end of the hose, by this cord suspend it below the chin of the man, let the engine be worked and by the assistanee of others to ease the hose as he enters, he would be able to carry the branch of another engine, and so put out the fire, or at any rate ascertain its situation, for the engine, acting as an air pump, would supply him with air. Of course the suction pipe must be taken off, or kept out of water.

Yours, &c. S. E. A.

NOTICE TO CORRESPONDENTS.

We have been favoured by Mr. PLACE with a long but very interesting article, which we will take an early opportunity of noticing.

H. W. D.'s drawing, and a letter on the subject of propelling vessels by paddle wheels instead of oars, have been received, and shall be attended to. We quite agree with him in his observations, and beg to inform him that there is in Paris a boat with wheels of this description, which is worked by two men. This boat carries to St. Cloud, a few miles from Paris sixty or seventy persons without fatigue to the men who work at the wheels.

The great length of our article on Rail Roads compels us to defer the remainder of Mr. Brougham's Pamphlet and many valuable communications.

We have received Mr. WEBB's drawings and communication. They shall be attended to as early as possible.

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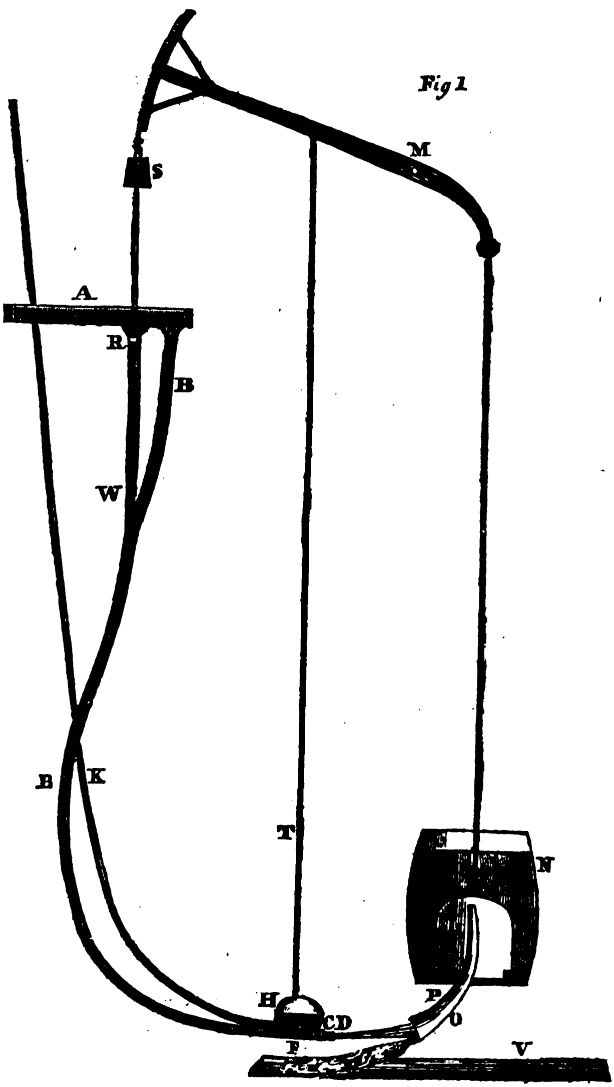
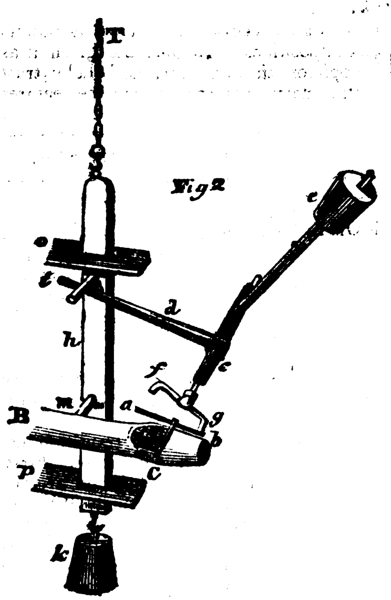
WEBB'S SELF-ASSISTING MOMENTUM ENGINE.





WEBB'S SELF-ASSISTING MOMENTUM ENGINE.

We have been favoured by Mr. Webb with a Description of a New Engine for impelling Machinery by Human Weight and Labour, which appears to us to possess considerable merit, but as we have had no opportunity of ascertaining its practical utility, we refer our mechanical readers to Mr. Webb's description and our Engravings.

Fig. 1.

A is an aqueduct communicating with the upper level of a water-fall: B B is a pipe supplied by the aqueduct. C is a valve which shuts from the lower extremity of the pipe B at D, (where the water is discharged) when the valve C is quickly shut the water in the pipe presses in a radiating direction, and with increased force nearest the valve. Some of the water is forced through the valve F into the vessel H (communicating with the pipe B) the dense air in the vessel H forces the water up the pipe K to some assigned situation.

So far this Engine is similar to the Momentum Engines which have been invented several years.

It is well known by those acquainted with hydraulics, that jets and fountains carry a current of air on their surfaces; the quantity is in proportion to the speed or force of the water. My improvement consists in collecting or causing the air (carried by the water) to accumulate and assist the water to press with greater force.

L is a cylindrical vessel, open at the bottom with an hemispherical top, suspended by a wire, or chain, from the lever beam M; N is an immoveable barrel nearly filled with water for the reception of the vessel L; O is a conical bent tube (to face the vessel D) which goes through the bottom of the barrel into the vessel L; P is a valve in the tube O, shutting to the vessel L, R is a forcing pump, the barrel of it is open to the pipe B, and aqueduct; S is a counter-weight (to vessel L) fixed to the top of the pump rod, and suspended by a chain from the arched head of the beam above it; T is a chain, or wire, and weight for opening and shutting the valve C, which is shown in a larger scale in the annexed figure. [See first page.]

When the valve C is opened, the water jets from D, carrying air with it, the air ascends the tube O into the vessel L, the water is repelled, and falls into the lower level of the water-fall at V, the vessel L becomes more buoyant and ascends, the counter-weight S and piston descends, the water in the aqueduct following and assisting, the valve W is shut by the increased pressure, when the top of the vessel L, has ascended to the top of the barrel, the weight at the bottom of the chain T shuts the valve C, and the air is discharged from the vessel L (through the tube O), the vessel L nearly fills with water and descends, the chain T opens the valve C, and the vessel L ascends as before stated.

The vessel L is made heavier at the bottom with lead to steady it. The valve P is shut while the barrel is filled, previous to the engine's commencing work.

When the engine begins working, the valve P is only partially closed. An adjusting arm or regulator is attached to the spindle of the valve, and the speed of the engine is regulated by it, to discharge the air from the vessel L quicker or slower. When the valve C is opened, water and air is forced up the tube O, but as the air accumulates it repels the water: when the vessel L ascends, the overplus flows over the barrel.

When the vessel L begins to ascend, the air in it expands and increases its buoyancy; the increased quantity of air added by the jet accelerating (in consequence of the greater pressure of the pump), increases the vessel L's ascent. The pump and counter-weight being attached to the larger arm of the beam, acquires a greater impelling impulse, and when checked, by instantaneously shutting the valve C, it causes the water to press as if by a column of a much greater height.

Momentum engines are limited to power; but in this invention the power can be increased (where water can be obtained in sufficient quantity), by enlarging the vessel L, &c.

Fig. 2, *a* and *b* are levers attached to the extremity of the spindle, or axis of the valve C; *c* is an axle, *d* a lever, *e* a tumbling weight, *f g* shanks, *h* is a wooden slide connected with the chain T, *k* is a weight hanging from the slide, *o p* guides for slides.

The valve C is represented open in the engraving.

When the vessel L, Fig. 1, ascends, the slide *h* descends with the weight *k*: the pin *l* depresses the lever *d* till the tumbling weight *e* passes the centre of gravity, when it falls, and the shank *f* strikes the lever *a*, and shuts the valve C. When the vessel L, Fig. 1, descends, the slide *h* is raised by the chain T attached to the beam M Fig. 1,; the pin *m* raises the lever *d*, till the tumbling weight falls; the shank *g* strikes the lever *b*, and opens the valve C.

A groove is made in the pipe B for the valve C, and a small weight hangs on the lever *b*, to prevent the valve shutting while the lever *d* is depressed.

I have a contrivance on this principle, for charging the water press by manual labour, and much quicker than the present method, without giving shocks to the operator; but it is unavoidably complex, therefore on that account I think it would be objectionable.

To prevent confusion, the frame work that supports the apparatus is left out.

Yours, respectfully,
White Cottage, J. WEBB, Engraver,
(back of the Sportsman,)
City-road.

LONDON MECHANICS' INSTITUTION.

DR. ALLEN'S SECOND LECTURE ON THE NEW METHOD OF INVESTIGATING THE POWERS OF THE HUMAN MIND.

WEDNESDAY, 9TH FEB.

DR. ALLEN's previous discourse having prepared our minds for the illustration of his important subject, by a reference to the form of the human head, we were not surprised, on entering the Lecture Room this evening, to find the front of the Lecture table occupied by a considerable number of plaster casts, exhibiting all the varieties of conformation observable in the different nations of the earth, from the head of the rude and uncultivated savage to that of the enlightened and scientific European.

The Doctor introduced his subject by observing, that in his first lecture he had endeavoured to show that the systems of metaphysicians were incomplete and unsatisfactory, and that they did not enable us to explain the nature of the human mind, or to obtain an accurate estimate of its powers and dispositions. He had also given it as his opinion, that we could not wholly trust to the indications afforded by the features and expression of the countenance alone, and that the head had a much larger share in giving us the estimate of character which we deduce from physiognomical impression, than had hitherto been generally assigned to it. The feelings of the painter, the poet and the sculptor of all ages may perhaps be excepted from this general opinion, for it is a remarkable fact, that the Grecian remains of sculpture strikingly accord with the views of phrenologists. They have given to gods, goddesses, heroes, legislators, &c. very different heads to those of gladiators, &c. and this, if not an argument, is something like presumptive evidence in favour of the phrenological system.

We have thus by a natural transition, arrived at the object of our inquiries. First, Whether the functions of the mind are discharged by the *brain*, and secondly, Whether the brain consists of *one or more organs*; and, if it consist of a number, can their nature and the respective places which they occupy, be ascertained by a comparative examination of the cerebral organization of men and animals? That is, whether the different propensities, sentiments, instincts, understanding, and habits, which distinguish different classes of animals from each other, and men from animals, as well as particular individuals singled out from each of these classes, are marked out by a corresponding peculiarity in the organization of their brain; indicating, not only that every manifestation of these faculties depends, like seeing and hearing, on *separate* and *distinct portions* of the brain, and that these parts are the seats of *different functions*, but also that their relative size may be recognised in the *external* corresponding configuration of the head, and that the talents and disposition exist in proportion to this relative size.

With respect to the first question, Whether the functions of the mind are discharged by the brain, the position appeared so obvious to the lecturer, that he could hardly persuade himself of the necessity of proving it, especially as all the most celebrated physiologists had espoused that opinion. A modern eloquent zoological writer says, "Bear in mind that every organ has its living phenomena and its use, and that the chief ultimate object of anatomy is to learn the function; on the other hand, that every action of a living being must have its organic apparatus. There is no digestion without an alimentary cavity,—no biliary secretion without some kind of liver,—*no thought without a brain*." And he adds, "the vast superiority of man over all other animals in the faculties of the mind, which may be truly considered as a generic distinction of the human subject, led physiologists at an early period to seek for some corresponding difference between men and animals; and the result of this examination and comparison was universally deemed so satisfactory, that without prosecuting the subject further, a general proposition was laid down, that man has the largest brain in proportion to his body."

In fact, the daily experience, consciousness, conversation and deportment of every individual in the world, pronounce it as the universal opinion of mankind, that the head is the seat of feeling, of thought, and of volition. What! while every thing has its use in nature, and all forms, however minute, have some relative influence on every thing around them, does this, the most noble part of the human frame, and the most beautiful and sublime work of creation, serve no purpose higher than that of a physical nature?

Dr. Allen here directed the attention of his hearers to a human skull on the lecture table, and emphatically exclaimed,

"Observe this skull, from out the scattered heaps;
Is this a temple where a God may dwell?—
Look on its broken arch, its ruined wall,
Its chambers desolate, its portals foul;
Yet this was once Ambition's airy hall,
The dome of thought, the palace of the soul!"

Where is the hand that shall grasp that which resides beneath the skull of man? Who shall approach the surface of that now tranquil, now tempestuous abyss?—We shudder at contemplating the powers contained in so small a circumference, by which a world may be destroyed, or a world may be enlightened.

Of all the parts of the human frame, the *brain* is the most curious in its matter and the most mysterious in its structure: there is nothing in the whole range of material substances like it, nor has nature more carefully and more strongly protected any other part. The mysterious chamber which contains it is encircled with an arch of ivory, upon which regal pride places her costly ornaments, and nature has taught us, in all cases of threatened danger, there instinctively and instantaneously to direct our hands for its protection. And it is right that it should be so, for it is against the head that the midnight murderer directs his aim, knowing that if he fails to destroy life, he may soonest there suspend or derange opposition; for who has to learn that volition has no power, if partial or general concussion, pressure, fracture or injury, is suddenly sustained by the brain? But it is not so with any other part, for every other part of the system may be bruised and almost destroyed, without immediately and directly disturbing the integrity of the mental functions.

Not only does every thing depend on the brain, but the more or less perfect discharge of its functions depends on its particular state at the time. Life and health, feebleness and disease, sleeping and waking, appear also to have a close connection, between the relative pressure of the atmosphere, and the resisting energy of the nervous fluid generated within and by the *cerebral mass;* and the integrity of all the functions of our organization necessary to existence, ceases or becomes deranged, in proportion as this relative pressure exceeds or falls below the standard at which the balance of power is maintained. Hence apoplexies and palsies arise both from plethora and collapse of the brain, and hence men of intemperate and bad habits never possess that even flow of the animal spirits, which depends on the equability of this reciprocal pressure.

The lecturer, after some further observations, stated, that he considered it unnecessary to add any more arguments to prove that the functions of the mind are connected with the brain, and he should therefore proceed to the examination of the second question, viz. "If the functions of mind are discharged by the brain, does the brain consist of *one or more organs?*"

To this question he would answer, that the character of variety is stamped upon all the works of nature. She has made it a fundamental law, that no two of her productions shall be exactly alike, and this law is invariably observed through the whole creation. Each tree, each flower, each leaf exemplifies it; every animal has its individual character; each human being has something distinguishing in form, proportions, countenance, gesture and voice—in feelings, in thought and in temper—in mental as well as corporeal physiognomy. This variety is the source of every thing beautiful and interesting in the external world, the foundation of the whole fabric of the universe. If then it is admitted that this variety does exist in nature;—that different propensities, feelings, sentiments, instincts, understanding and habits, distinguish different animals from each other and men from animals, and particular individuals among different classes under each of these heads, are these differences attended with a corresponding variety in the organization, and consequently of the *external configuration* of the head? If so, the inference is just, that *character* is the direct result of this difference of organization; for it is a law throughout nature, that there exists no peculiarity of form or substance, without its being attended with a corresponding peculiarity in the phenomena and effects produced by the properties of the universal agent of nature which acts on them. Dr. Allen here combated the idea that the application of this principle to the *mind*, had a tendency to prove its *mate-*

riality, and proceeded to state, that he could assert, without fear of contradiction, that it was impossible for the differences of organization to which he had alluded to exist, without their phenomena and effects, or the manifestation of these *cerebral functions* being equally various. If then it can be proved that these differences of organization *do exist*, variety in the character of all men and animals so differing, must inevitably follow as a consequence, whether we are able to perceive or are willing to admit it or not.

The lecturer here repeated the general proposition laid down by physiologists, "that man has not merely the largest brain in proportion to his size, but that the place which the superadded portion occupies is different, and its fibrous texture more delicate." An eloquent modern zoologist, after reviewing the comparative differences in the size of the organs of sense in men and animals, observes, "that in proportion as any animal possesses a larger share of the *cerebral* and more noble part; that is, in proportion as the organ of reflection exceeds that of the external senses, may we expect to find the powers of the mind more diversified and more developed. In this point of view, man is decidedly pre-eminent; although in his senses and common animal properties he holds only a middle rank, here he surpasses all other animals, and is the first of living beings." The same writer adds, "that the most striking character of the human brain is the prodigious developement of the *cerebral hemispheres*, to which no animal, whatever ratio its whole encephalon may bear to its body, affords any parallel. It is also the most perfect in the number and developement of its parts; none being found in animals that man has not, while several of those found in man are either reduced in size, or deficient in various animals. Hence it has been said that by taking away, diminishing or exchanging proportions, you might form from the human brain that of any animal; while, on the contrary, there is not one from which you could construct the brain of man."

Dr. Allen then adverted to the corresponding contrast between the character of man and that of animals, which was rendered equally obvious by comparing the operations of animals, who always construct and perform their work in the same manner, and never improve, with the results of human industry and invention, which had transformed marshes and forests, the abode of wild beasts, into fruitful vales or cities full of beauty and intelligence. The lecturer proceeded to observe, that if *cerebral organization* accounted for the pre-eminence of man over animals, it equally explained the superiority of the European variety over the rest of the world.

To illustrate this remark, he directed the particular attention of his audience to the casts on the lecture table, which exhibited the formation of the heads of the Hindoo, the Caribbean, the Malay, the American Indian, the Ethiopian, &c. the various characteristics of which the lecturer regretted that the time would not allow him to particularise; but it must be obvious that a material difference existed between all these varieties, and still more so, that the whole of them displayed a striking contrast to the European heads with which they were placed in juxtaposition. Among the latter we noticed the heads of Napoleon, Bacon, Franklin, Gall, Spurzheim, &c. and also the head of an idiot, which was exhibited with that of Dr. Franklin, to shew that the difference between the exterior conformation of the two heads was as striking as the disparity between their mental powers.

In conformity with the views he had already explained respecting the mental part of our being, the lecturer referred all the varieties of moral feeling, and of capacity for knowledge and reflection, to those diversities of *cerebral organization* which are indicated by, and correspond with, the differences in the shape of the skull. If the nobler attributes of man reside in the cerebral hemispheres, we shall find, in the comparison of the dark and white races, a sufficient explanation of the superiority constantly evinced by the latter, and of the inferior, subordinate lot of the former.

Dr. Allen then stated the opinion of Blumenbach, that from the finely formed skull of the European race, as from a primitive configuration, all the other forms descend by an easy and simple gradation, on the one hand to the Mongolian, and on the other to the Ethiopian variety. The inferior races he divides into four varieties, which with the European make five. "The *European* variety," says he, "have the most expanded forehead, the upper and anterior regions particularly developed. The second, the *Mongolian*, have a head of a square form, with a small and low forehead. The third, or *Ethiopian* variety, the forehead low, narrow, and slanting. The fourth, or the *American* variety, the forehead low, and the fifth, or *Malay*, the head rather narrow.' The lecturer mentioned these particulars, to show that the head is stated by Blumenbach, not merely as extremely various in its shape and size, but that it has a general correspondence with the character. Many other names might be added, such as Haller, Camper, Cuvier, Hunter, Abernethy, &c. &c. but he trusted that he had adduced sufficient authority to show the existence of striking differences in the organization of the brain, and if so, the position was established, that according to an universal law of nature, such differences could not exist without corresponding differences in the character.

It remains for us now to discover what are the forms in the size and shape of the head, which are uniformly attended with corresponding manifestations, and the places which they occupy. It is an admitted fact in natural history, that the number of faculties increases from the lowest animal up to the highest gifted man, in proportion to the multiplication of the *cerebral parts*; to convince ourselves of the truth of this, it is only necessary to glance at Lavater's or Camper's imperfect scale from the frog to the Apollo Belvidere. (This scale the lecturer exhibited to the audience, and pointed out the progressive change in the inclination of the facial line, from a nearly horizontal to a perpendicular direction.) Dr. Allen then described the various parts of the head in which different portions of the brain preponderate in different animals, according to their contrary habits and propensities, and proceeded to contrast them with the nobler conformation of the brain of man, which he separated into three principal divisions, viz. the *intellectual*, the *sentimental*, and the *animal*. Animals have not the first of these divisions, or the intellectual portion, which in man occupies the front, or most prominent part of the head, while the animal portion is placed at the back of the head, and the intermediate space is assigned to the sentimental division.

The lecturer adduced a variety of arguments to prove the complete coincidence existing between the relative fulness of the different *cerebral parts*, and the various peculiarities of mental physiognomy among men; as well as to refute the opinion entertained by some persons, that the phrenological system inculcated principles contrary to the truths of Christianity; and he concluded by deferring till his next lecture the general practical inferences furnished by his arguments, when he should endeavour to show in what manner the powers of man ought to be exercised, so as to elevate him in the scale of moral and intellectual beings, by the proper discharge of those duties, in performing which every one should contribute his portion in the grand economy of the universe.

At the close of the lecture, Mr. M'William, who presided during the evening, gave notice that the establishment of the mathematical school, for the instruction of the members in algebra, geometry, and trigonometry, was under the consideration of the committee, who therefore wished those members who were desirous of enrolling themselves as pupils, to transmit their applications to the office of the institution. It was, however, necessary to state, that no pupil would be admitted into the mathematical class, except he was previously acquainted with the vulgar and decimal arithmetic.

MR. PARTINGTON'S FOURTH LECTURE ON OPTICS. FRIDAY, 11TH FEB.

POLARIZATION OF LIGHT—MOTHER OF PEARL—TELESCOPES—MANUFACTURE OF LENSES—CONCLUSION.

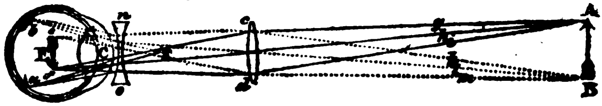
Having, in his preceding lecture, pointed out an extraordinary analogy subsisting between light and sound, Mr. PARTINGTON commenced the present, by directing the attention of his audience to another analogy, not less remarkable, which was denominated the *polarization of light*. If we take a straight metallic rod of a reasonable length, it will be found capable of communicating sound from one extremity to the other, by the vibration of its parts; but if the same rod be bent at right angles, it can no longer transmit sound to the auditory nerve. If a magnetic needle is placed on the surface of water, its polarity causes it constantly to assume one invariable position; and in a similar manner, if a ray of light falls on the surface of a polished mirror, at one particular angle, it becomes polarised; and upon striking the surface of a second mirror placed at right angles with the first, the light is completely lost. The angle of incidence at which this polarization occurs, is 56 degrees, but it was observed by Dr. Brewster, that if the surface of the glass was slightly moistened, the angle of polarization was 53. This may be considered as a new fact in the science of optics, for though the polarization of light was noticed by Sir Isaac Newton, it was not generally known till it was demonstrated by the experiments of Dr. Brewster.

Another singular fact connected with the properties of light, is its decomposition by the surface of *mother of pearl*, which appears to divide the rays into the various prismatic colours. Sir Isaac Newton supposed this effect to be attributable to a succession of extremely thin laminæ, each of which reflected its own particular portion of the incident ray. Dr. Brewster has, however, shewn that this is not the case, and that it is not the internal parts of this substance, but the surface only, that produces the effect. If a plate of mother-of-pearl, such as the lecturer now held in his hand, is examined with a powerful microscope, its surface is found to be completely *striated*, or divided into parallel lines, and Dr. Brewster having pointed out this circumstance to Mr. Barton, of the Mint, this gentleman conceived it possible to communicate the same property to metallic plates. The experiment was attended with complete success, and Mr. Partington exhibited to his hearers a number of gold and steel buttons, which reflected the prismatic colours with all the exquisite delicacy and variety observable in mother-of-pearl. To produce this effect, the surfaces were first highly polished, and then divided by a ruling machine, furnished with a micrometer scale, into parallel lines, at the distance of only the 2,000th part of an inch from each other. Mr. Barton found that the light became decomposed when 500 lines were ruled to an inch, but by increasing the number to 1,000 or 2,000, the effect was much more perfect. The surface of a steel knife, if exposed to the heat of a spirit lamp, or a hot iron, assumes a variety of tints, which arise from the combination of portions of the steel with the oxygen of the atmosphere, and a process of a similar nature doubtless occasions the decomposition of light by the surface of mother-of-pearl. The colours which appear on the steel blade may be removed by spirits of salt, but they cannot be restored without repolishing the surface of the knife.

Mr. Partington proceeded to examine the construction of the telescope, previous to which he considered it advisable to introduce a few remarks on the nature of the lens itself. In order to become familiar with the laws of refraction and the properties of lenses, the student should make experiments in a darkened room, with lenses of different foci, diameters, and colours, admitting the sun's rays through an aperture in the shutter. It would be proper also to have lenses ground to the figure of a *meniscus*, or watch-glass, in order to include different fluids between them, and thus exemplify the refractive powers of fluid lenses. The *axis* of a lens is a line supposed to be drawn through the center of its spherical surface, and when one side of the lens is plane, the axis of course falls perpendicularly upon that side. If the axis is correctly continued, it will pass exactly through the center of that circle, of which the surface of the lens is an arc.*

The telescope was invented about the end of the sixteenth century, and the discovery is commonly supposed to have been casual. The account which is generally received is, that Zacharius Jansen, a spectacle-maker of Magdeburgh, trying the effect of a convex and concave glass united, found that when placed at a certain distance from each other, they had the property of making distant objects appear nearer to the eye, but the reason of this effect was not discovered till the time of Kepler. The microscope was also an invention of the Jansens, and as it is rather a simpler instrument than the telescope, it may be very properly introduced to illustrate the nature of these kinds of glasses. The lecturer had previously observed that the nearer any body is to the eye, the larger is the angle under which it will be seen, and in order to render this increase of the angle more familiar to his audience, he exhibited a simple apparatus, consisting of two pieces of wood, crossing each other, and turning upon a pivot; and upon introducing a circular piece of wood between the extremities of the apparatus, the opposite angle diverged and became larger, in proportion as the circular body approached the central point.

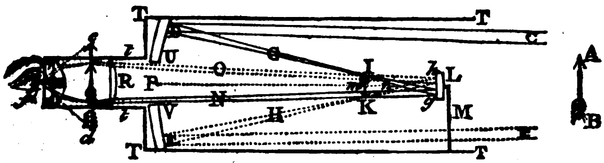
The length of the common *refracting telescope* must be increased in no less a proportion than the square of the increase of its magnifying power: so that in order to magnify twice as much as before, with the same light and distinctness, the telescope must be lengthened four times, and to magnify three times as much, nine times. On this account, when great powers are desired, an unwieldy length is unavoidable. To explain the construction of the *refracting* telescope, the lecturer referred to a diagram, of which, as well as of the reflecting telescope, we have procured engravings, for the purpose of communicating to our numerous readers a more perfect idea of their operation, than could be conveyed by description alone.



* This remark will be illustrated by a reference to the figures at page 213, in which the central ray B *b*, represents the axis of the lens.

The preceding figure exhibits the relative situations of the two lenses inclosed in the tube of the *refracting* telescope; the double concave lens *n o*, which is nearest to the eye, representing the eye-glass, and the double convex lens *c d*, situated nearest to the object A B, representing the object-glass. The pencils of rays flowing from the extremities of the object A and B, diverge in the lines *g h i*, &c. till they reach the convex lens *c d*, by which they are refracted towards the points *e* and *f*, where they would form the image of the object, as at E, diminished and indistinct; but, owing to the interposition of the double concave lens *n o*, the rays are again diverged, previous to their passing through the chrystalline lens C, so as to bring them to a focus exactly on the retina of the eye, upon which the image is enlarged and distinctly depicted as at *b a*.

The effect of the *reflecting telescope*, the invention of Sir Isaac Newton, which acts principally by means of *concave mirrors*, will be clearly comprehended by the following figure:—



In this diagram T T T T represents the large tube, and *t t* the small tube of the telescope, at one end of which is D F, a concave mirror, with a hole in the middle at P, the principal focus of which is at I K; opposite to the hole at P is a small mirror L, concave towards the great one; it is fixed on a strong wire M, and may be made to move backwards and forwards by means of an adjusting screw. A B is a remote object, from which the rays flow to the great mirror D F. The direction of these rays may be traced in the figure as they proceed from C and E to the surface of the great mirror, by which they are reflected in the lines D G I, F H K to the focus of the mirror, where they would form the inverted image I *m* K, if there was any thing to receive it; but as their course is not interrupted, they proceed to the second mirror L, by which they are again reflected at *h g*, and describing the lines *h* O U, *g* N V, they arrive at the plano-convex lens R, which causes them to converge, so as to form the image near the eye in the small tube of the telescope. It now only remains to magnify the image, which is effected by means of the plano-convex eye-glass S, through which the eye, situated at *f*, sees the image under the enlarged angle *c f d*, and its size appears magnified as at *c d* *.

The description of the solar microscope in our account of Mr. Partington's previous lecture (page 236) will be further illustrated by the annexed diagram, in which the rays of the sun B B, falling upon the inclined mirror C C, are reflected in the direction

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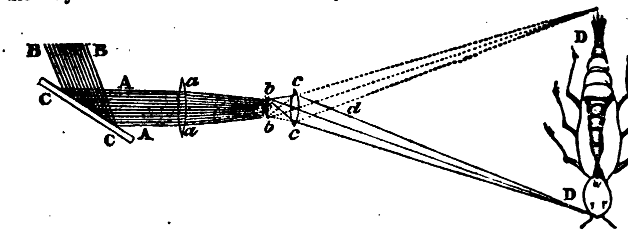
* When we view the great power of telescopes, as they are now constructed, it is scarcely possible to predict any certain bounds to their power; and Dr. Chalmers has very properly asked, in his admirable Discourses on Astronomy:—" Who shall assign a limit to the discoveries of future ages? Who can prescribe to Science her boundaries, or restrain the active and insatiable curiosity of man within the circle of his present acquirements? We may guess with plausibility what we cannot anticipate with confidence. The day may yet be coming when our instruments of observation shall be inconceivably more powerful. They may ascertain still more decisive points of resemblance. They may resolve the same question by the evidence of sense, which is now so abundantly convincing by the evidence of analogy. They may lay open to us the unquestionable vestiges of art, and industry, and intelligence. We may see summer throwing its green mantle over those mighty tracts, and we may see them left naked and colourless after the flush of vegetation has disappeared. In the progress of years, or of centuries, we may trace the hand of cultivation spreading a new aspect over some portion of a planetary surface. Perhaps some large city, the metropolis of a mighty empire, may expand into a visible spot by the powers of some future telescope. Perhaps the glass of some observer, in a distant age, may enable him to construct the map of another world, and to lay down the surface of it in all its minute and topical varieties. But there is no end of conjecture, and to the men of other times we leave the full assurance of what we can assert with the highest probability, that yon planetary orbs are so many worlds, that they teem with life, and that the mighty Being who presides in high authority over this scene of grandeur and astonishment has there planted the worshippers of his glory."

A A to the large convex lens *a a*. Near the focus of this lens is placed the insect, or other transparent object *b b*, through which the rays reach the second lens *c c*, and crossing each other as at *d*, represent the image of the object on the screen placed to receive it, in an inverted position, and magnified as at D D.



As the value of optical instruments depends entirely upon the quality of the glass employed in their construction, it may be necessary to give some account of the manner of making the frangible substance called glass, previous to its being ground into the form of lenses. Mr. Partington then gave a brief description of the manufacture of glass from silica, the oxide of lead and the pearl-ash of commerce, and after stating that the most perfect lenses are formed out of large bl ocks of glass, cut into plates, and then ground to the required form, he proceeded to read from a pamphlet kindly furnished by Lieut. Stratford, a member of the Institution, an interesting memoir of M. Guinand, the uneducated mechanic to whom he had alluded in his second lecture, and who, by his own talents and perseverance, had acquired the highest celebrity as a manufacturer of lenses of great magnitude, entirely free from those defects which it had previously been found impossible to obviate.

This memoir, written a short time previous to the decease of M. Guinand, which took place about two years ago, stated that nearly 70 years had elapsed, since that interesting man, who, when the memoir was written, was on the verge of four-score, and resided in a remote village of Neufchatel in Switzerland, was employed in assisting his father as a joiner, and in his advanced age, his manner of reading and writing shewed that he had scarcely obtained even the first rudiments of education. At this period he became acquainted with a buckle-maker, from whom he learnt the art of casting and working various metals, which enabled him, about the age of twenty, after once witnessing the process, to attempt the construction of a watch-case; having succeeded, he adopted the occupation of a watch-case-maker, which was then very lucrative. At the house of M. Droz, for whom he had made clock-cases, he first saw a very fine English reflecting telescope, an instrument at that time very rare in Switzerland, and this circumstance turned the mind of M. Guinand, then in his twenty-second or twenty-third year, towards that subject to which he afterwards more particularly devoted himself

At the age of forty and upwards, he relinquished the trade of watch-case maker, and purchased a piece of ground in a retired place, where he constructed, with his own hands, a furnace capable of melting at one time two hundred weight of glass, for the purpose of prosecuting, on a more extended scale, his experiments on the construction of lenses. Here, by determined perseverance in the midst of many discouraging circumstances, he succeeded in forming lenses of an extraordinary size, possessing a perfect refracting power, without occasioning any decomposition of the rays of light. One of the most valuable of these glasses is now in the possession of the Astronomical Society of London.

From this interesting piece of biography, Mr. Partington impressed upon the minds of his hearers the great moral lesson, that the possession of high birth and fortune, or even the ordinary advantages of education, are not essential to the developement of real talent, and that if we pursue the chequered scene exhibited in the life of M. Guinand, it will afford an additional illustration of the well known aphorism, that "any thing is possible to the willing mind;" the lecturer did not mean to assert that every object could be accomplished by one individual, but that a degree of eminence in any one walk of life might certainly be attained by steadily pursuing that object.

Mr. Partington then begged to introduce to the notice of his hearers, a living illustration of the preceding remarks, in the person of a working mechanic named Francis, who was in attendance this evening, and had been requested to explain to the members the nature of his improvements in the construction of spectacle-glasses.

Mr. Francis, whose appearance was that of a plain and unassuming workman, accordingly addressed the assembly, and in very clear and intelligible language, though evidently unpolished by the refinements of education, proceeded at some length to detail a variety of experiments which he had made for the purpose of improving the form of spectacle-glasses, and adapting them to the mechanical structure of the human eye.

His efforts appeared to have been in a great measure directed to a consideration of the exact proportion which should subsist between the *concavity* of the interior, and the *convexity* of the exterior surfaces of his lenses, so as to convey the maximum of light to the eye, and to avoid the appearance of the prismatic colours on the edges of the objects of vision. He then particularised the various attempts he had made to construct an *artificial eye*, and exhibited to the audience the result of his experiments, consisting of a number of glasses of different degrees of convexity, which he had combined in such a manner as to produce a perfect resemblance of the human eye, in its external appearance, its lateral, vertical and rotary motions, and its various refractions of the rays of light. We had an opportunity of minutely inspecting this ingenious piece of mechanism, which was not only adapted to shew the complicated structure of the eye in its perfect state, but as the retina was moveable, it also illustrated the nature of defective vision, and the form of the different lenses required to correct the deficiencies arising from long or short sightedness or cataract.

Mr. Francis having concluded his remarks, which were received with great applause by the members, Mr. Partington resumed his lecture, and after paying a just tribute of praise to the ingenuity and perseverance of the mechanic who had just addressed them, and who afforded a practical exposition of the lecturer's previous observations, he repeated his explanation of the construction of the magic lantern, and being now in possession of an apparatus furnished with a reflector, he shewed its effect by throwing upon the screen a variety of images, some of them of a grotesque and humourous description, which appeared to much greater advantage in consequence of the increased quantity of light communicated by the concave reflector.

Mr. Partington then observed, that in concluding the brief course of lectures which he had delivered to the members of this institution, he could not omit the opportunity of returning his sincere thanks for the liberal and respectful attention he had received. It might be proper to state, that he had invariably employed language as free from the ordinary technicalities of science as the subject would admit of, and had rather attempted to make his lectures conversational than didactic, by this means identifying his audience with himself. With respect to the experimental part of his course, he had spared no pains in the collection of such apparatus and illustrative diagrams as appeared best calculated to simplify those branches of science to which he had alluded. He should, however, be wanting in justice to the worthy President of the Institution, as well as to the Committee of Management, if he omitted to thank them for their active co-operation and assistance. Mr. Bluett, his ingenious assistant, also merited his warmest commendations, and he would only add, that if there was one individual present, in whose mind he had implanted such a knowledge of scientific truths as would tend to explain the more visible operations of nature, it would furnish the most delightful reward that his labours could possibly receive.

With these few remarks he should now retire, trusting, that amongst the members of the institution, science and literature would continue to flourish, and that the walls of their embryo theatre would often inclose as eager aspirants after knowledge as the intelligent auditory to whom he now respectfully bade FAREWELL!

Mr. Partington then withdrew from the lecture table amid the warmest acclamations of the members, whose reiterated plaudits evinced their deep sense of the condescending and conciliatory manners of the enlightened lecturer, and their obligations for the ability and perspicuity with which he had illustrated his highly interesting subject.

At the conclusion of the lecture, Dr. Birkbeck informed the members that Mr. Francis, whose intelligent observations had been so cordially received, was a working shoemaker, who had employed his leisure hours in the pursuit of optical enquiries; with what success they were enabled to judge, and they would doubtless consider this example of the effects of perseverance and ingenuity, as an admirable illustration of the appropriate remarks of the worthy lecturer.

Dr. Birkbeck then gave notice, that on Friday the 18th instant, Mr. George Ogg would commence a course of three lectures on Geology, or the History and Theory of the Formation of the Earth, and that on the following Wednesday, Mr. Cooper would resume his examination of the members on the science of chemistry.

LIST OF MEMBERS

Nominated as Candidates for the undermentioned Offices, previous to the election on Tuesday the 1st day of March, 1825.—The ballot will commence at six o'clock in the evening, and close at half past nine precisely.

FOR PRESIDENT.

GEORGE BIRKBECK, M.D., 50, Broad-street.

FOR VICE-PRESIDENTS.

GILCHRIST, JOHN BORTHWICK, LL.D. 11, Clarges-street

MARTINEAU, JOHN, Esq. Engineer, City-road.

MILLINGTON, J. Professor of Mechanics in the Royal Institution, Bloomsbury-square.

M'WILLIAM, ROBERT, Esq. Furnival's inn.

FOR TREASURER.

John Key, Esq. Alderman and Sheriff, Abchurch-lane.

FOR COMMITTEE.

Candidates of the working class, from whom not less than ten are to be chosen.

Adams, Nathaniel, upholsterer, 5, Goodge-street, Tottenham Court-road; Aumonier, Henry, working jeweller, 7, North-street, Pentonville; Collar, Charles, cabinet-maker, 20, Lower Brook-street, Grosvenor-square; Deville, Elijah, brass-founder, 6, Mercer-street, Long Acre; Dixon, James, tin plate worker, 34, Wych-street, Strand; Duthie, Thomas, bookbinder, 2, Bartlett's-place, Bartlett's-buildings; Edwards, Thos. painter, Harp-alley, Shoe-lane; Fowler, Richard, ironmonger, 19, Gray's Inn-lane; Hall, William, printer, 34, New Union-street, Little Moorfields, Hogan, James, colour-maker, 2, Blewitt's-buildings, Fetter-lane; Holdup, John, silver spoon finisher, 2, Kirby-street, Hatton-garden; Hetherington, Henry, printer, 13, Kingsgate-street, Holborn; Jackson, M. David, weaver, 38, Carnaby-market; Jones, William, plumber, &c. Tysoe-street, Clerkenwell; Mills, George, stove-maker, 15, High-street, Marylebone; Mote, Henry, teinter, 8, Lower Mall, Hammersmith; Parry, Charles, silk hat maker, 281, Bermondsey-street; Pavyer, Benjamin, type-founder, 31, Featherstone-street, and Eden-place, Hoxton; Stacy, George, working jeweller, 2, Charlotte-street, Sadler's Wells; St. Leger, Barry, bookbinder, 18, Gray's Inn-lane; Styles, William, Mathematical instrument maker, 1, Sharp's-alley, Cow-cross; Thurnell, George, jeweller, Margaret-street, Spa-fields; Turner, Joseph, working cutler, Castle-street, Turnmill-street; Waterman, William, carpenter, 3, Winsley-street, Oxford-street.

Candidates not of the Working Class, from whom not more than five are to be chosen.

Dempsey, John, tailor and draper, 10, Bouverie Street, Fleet Street; Fayerman, Edmund R. clerk, Upper Street, Islington; Lane, Charles, 54, Leonard Street; Marshall, John H. veneer cutter, Honduras Mills, Old Street; Nash, Eliezer, jeweller, 2, Red Lion Street, Clerkenwell; Smythe, Thomas, machinist, 309, Oxford Street; Thomas, Joseph, accountant, 19, Exeter Street, Strand; Tijou, William, carver and gilder, 17, Greek Street, Soho; Wheeler, William O. clerk, 16, Mabledon Place, Burton Crescent.

*** As no person is entitled to ballot except he has been a member Six Months, the votes of those members who have joined the society during the present quarter, must necessarily be rejected, if tendered.

The members are requested carefully to efface the names of those they do not vote for, leaving only the names of those they wish to return.

JAMES FREDERICK BLAKE,
Hon. Secretary.
29, Southampton Buildings, Holborn,
Feb. 14th, 1825.

We feel pleasure in stating that a very intelligent Member of the Society has printed, in an elegant manner, a correct copy of the Inscription on the First Stone of the New Lecture Room of the London Mechanics' Institution, to which is subjoined the eloquent and impressive Address delivered by Dr. Birkbeck, after the Stone was laid. It is introduced by an appropriate dedication to the Members of the Institution, and is printed in a convenient form, for the purpose of enabling them, at a trifling expense, to become possessed of a memorial of the interesting ceremony by which the First Anniversary of the establishment of the Institution was distinguished. Copies may be had of Messrs. Cowie and Strange, at the Mechanics' Register Office, 24, Fetter-lane.

MECHANICS' INSTITUTION.

We mentioned last week that we had been favoured by Mr. Place, of Charing-cross; with the address of a mechanic, which we were unable, from want of space, to notice. This address, which is signed by T. Blake, and which is in the form of a letter to the *Norwich Mercury*, is now before us; and we fully agree with Mr. Place that it would do honour to the best cultivated understanding. Much of this letter, however, relates to local circumstances, which cannot be of interest to the general reader, and we shall, therefore, give only such extracts as appear to us to bear upon the great principle which we have advocated—the establishment of mechanics' institutions. Speaking of these, and of the present principles of domestic economy, as they relate to the industrious classes, Mr. Blake says:—

"It ought to be shewn that these institutions, now spreading so rapidly over the face of Great Britain, are instituted solely for the benefit of the working classes, to advance the happiness of this part of the population of the country alone their purpose. The happiness of a people does not merely depend upon a stocking being made by machine rather than by hand—it does not merely depend upon the application of steam to a rail-way or spinning jenny—it does not merely depend upon the solution of a problem in mathematics, or upon the successful event of some chemical analysis; though these are agents, yet I contend they are very inferior agents to that intent, and are not the objects to be dwelt upon and considered as of primary importance in the discussion of the usefulness of a mechanics' institution. But the working classes are well aware to what they owe the welfare or the contrary of their condition—that it is governed by *the proportion borne by wages to the price of food and other necessaries of life*, requires but little ingenuity to determine at first sight, though it is somewhat more difficult to decide upon what regulates these latter. I do not now intend to plunge into the midst of such questions, a consideration of which may be reserved for another opportunity, but I may be allowed to state here the effects of these institutions, on what so mainly and nearly affects us. When the severest labour meets with but a slight return, as has been the case in this country of late years, every nerve is strained and every resource is called into action to increase its reward, and in vain. Bound down by ignorance and prejudice, the labourer is prevented employing his exertions in the most profitable manner and on the most productive objects; deprived of education, and consequently of all new ideas, he plods on in the old beaten track, unconscious of any other, and drags on a miserable existence, to be only relieved by the constant attendant on forced and unremitting labour—a premature death. Early marriages, another evil of the want of instruction, with their consequences, numerous and unhealthy children, weakening the body, as well as the spirit of their country, and the poverty-stricken labourer hourly sinks deeper into the most grovelling vices. That these are some of the consequences of ignorance and want of education has been lamentably demonstrated in the latter years of the history of the English labourer. To rouse him from this state, to the miseries of which long habit has made him callous, is the greatest aim of the philanthropical politician, and to this in a great measure have given way the useless animosities and absurd rivalries of the high and low factions. Lancastrian schools formed the first step, and by preparing that portion of the people who had the good fortune to have been brought up in them, for the introduction of the means of a more extensive distribution of knowledge, of a more useful kind, by the establishment of institutions of the nature of the one upon which the committee is now employed, have laid the sure and certain foundations for the future happiness, independence, and power, of the British mechanic.

The strong prepossession formerly entertained by every class against the aid of machinery, as being prejudicial to the interests of the labourer, has in some measure subsided; this may be ascribed to two reasons;—the first, the general increase of information on every subject, and particularly in that branch of knowledge called political economy; to the study of which the talents of the most able men have of late years been directed, as a science promising more to promote the advancement of the human race than any hitherto discovered. The true principles of the creation, circulation, and consumption of wealth, are no longer unknown, and from them it has manifestly appeared, amongst other equally important truths, that the harm to arise from machinery to the poorer classes of the community is merely imaginary. The second is experience, which has shown that an increase in the demand of labour has constantly and invariably followed the application of machinery to any new purpose, being a corroborative proof what, to all reasonable men was sufficiently proved before, the truth of the conclusion arrived at by the political economists. Even amongst the thinking part of our own class this prejudice has nearly disappeared—but amongst those unaccustomed to use their senses it exists with all its old and inveterate obstinacy. If any thing would do good, it would be a total eradication of it."

Speaking of the low rate of subscriptions to the Mechanics' Institution at Norwich which had been mentioned as an advantage, as no one would have to depend upon the benevolence of the rich for the share he may hold in the institution, Mr. Blake says:—

"It is not for that portion of the community which having to submit to the most intense labour from twelve to fifteen hours every day, to furnish themselves and their families with the mere necessaries of life, to look upon these things with such indifference, but it becomes them as a duty to inquire into their nature, for the purpose of relieving their own hard and melancholy situation. The word charity did delude us for a long time, but year after year passed, and instead of bringing relief to us, it only produced fresh establishments by the benevolent, without the slightest decrease of the evil it intended to remedy; for as these charitable institutions have multiplied, the more have we had to exert ourselves, the greater has been our share of labour, and a general decline in the rate of wages, except in some of the favoured districts of the country, has been the consequence and result—not of charities I admit, but of their total inefficacy as a means to produce that happiness which an accurate observation of the facts influencing the political state of society, and sound reasoning, have at length showed depends upon *circumstances only to be controuled or obviated by our own exertions*."

THOUGHTS ON FREEMASONRY.

(*Concluded from p. 202.*)

"*Religion's all!* descending from the skies
To wretched man, the goddess in her left
Holds out *this* world, and in her right, the *next*

Religion! the sole voucher, *man is man;*
Supporter, sole, of man above himself;
Ev'n in the night of frailty, change and death.
She gives a soul, a soul that acts a *God.*
Religion! Providence! an after state!
Here is firm footing; *here* is solid rock;
This can support us, all is sea besides:
Sinks under us; bestorm, and then devours."

The duty we owe to our country, is another important obligation on a mason. To pay due obedience to the laws, and to respect the government of the country in which we live, is a debt of gratitude we owe, for the protection of our lives, our liberty, and our property.

The faithful discharge of the duties which we owe to each other, and to the great family of mankind in general, will enhance the brethren in the eyes of the world; and support the reputation and utility of the craft, against the cavillings of ignorant or malicious men. It is not sufficient that we know these obligations, but it is our indispensable duty, both as gentlemen and masons to practice them.

The behaviour of a mason is of considerable importance, both in private societies and in his intercourse with mankind in general; not merely as affects his own character, but as it often brings on the Order unfavourable reflections. From these considerations we hope the brethren will indulge us with a few minutes attention, while we point out to them, those feelings which sink them in the estimation of the world, and render them less acceptable to the society of their friends.

The first thing necessary in all societies, is to render ourselves agreeable to those with whom we associate. As urbanity of manners is indicative of a polished mind, so is a rough, harsh demeanour, the natural attendant on ignorance and brutality. The greatest mark of incivility, is to pay no attention to what is agreeable or unpleasant to the feelings of those whom we converse with. To give unbounded sway to our own humours, without reflecting how much it may interfere with the ease and social rights of others, is a breach of good breeding, of which none would be guilty, but those who place no value on their own character, or on that of the company they are in.

Treat no person with contempt; it is repugnant to good manners, and militates against the principles of the institution; pity the weakness of human nature, and cover the failings of a brother with the mantle of fraternal love. Turn no one into ridicule, though under the specious pretext of innocent amusement, and decorated with the flashes of a mistaken wit. The subject of your raillery will feel the keen wound, you will embitter those hours with pain, which he had dedicated to festive gaiety, and social recreation; and you will make an enemy where you before had a friend. Although the rest of the company may smile at your efforts to please them, yet it will not be made the smile of satisfaction; they will feel an irksome restraint in your presence, lest they should inadvertently give you some trifling cause to turn them into ridicule, in the next company you go into. In this manner you will lose your friends, your acquaintances will shun you, and you feel yourself alone in the midst of society. To conceal from the world the failings of our friend is charitable; to speak of his virtues noble; but to flatter him to his face, revile him behind his back, and point him out as an object of ridicule, befits only the character of an assassin.

The sweetest consolation and pleasure we receive from society, is the enjoyment of friendship, it smooths the rugged paths of life, and dissipates corroding care from our brow. When our bodies are wrestling with pain, and our minds tortured with anguish, friendship, sacred friendship, pours into the wounds the sweet balm of sympathy, alleviates pain, and makes sorrow smile. Friendship extends through every branch of the great family of mankind; its influence is as unbounded as the horizon; it unites men of different religions and countries, and of opposite political sentiments, in the firm bond of fraternal affection. The wandering Arab, the civilized Chinese, and the native American, the rigid observers of the Mosaic law, the followers of Mahomet, and the professors of Christianity, are all cemented by the mystic union. How valuable is an institution, founded on sentiments like these— "How infinitely pleasing must it be to him, who is seated on a throne of everlasting mercy! to that God who is no respecter of persons."—We cannot conclude this subject at a better moment, than by introducing the following remarkable circumstance, which at once shews the advantages arising from this truly excellent institution.—During the late dreadful tempest, a Swedish vessel the "Carl Joahn," Capt. Peter Walrouth, master, a Swede, was driven on shore on the coast of Hampshire, and totally wrecked. The captain and crew were with very considerable difficulty saved; but immediately on their setting foot on shore, a gentleman who was a freemason, by a peculiar sign, recognized in the captain a brother mason; the latter immediately flew to the gentleman, as to an old and confidential friend, and firmly grasped his hand, to the no small surprize of all the crew, and other persons assembled. It appeared a very great consolation to the captain, who in broken English expressed his thankfulness to the allwise Disposer of events, that in a foreign land, and amidst the horrors of shipwreck, he had met with a friend and a brother, in whom he could implicitly confide. It is needless to add, that the captain and his crew, during their stay, experienced every hospitality and comfort; and since Capt.

Walrouth's arrival in Sweden, he has written to express his gratitude for the humanity and friendship shewn him.

To the Editor of the Mechanics Register.

50, Broad Street, Feb. 15th, 1825,

SIR—The following query, has, by mistake, been addressed to me as Editor of the MECHANICS' REGISTER. If you think with me, that it is worth submitting to the ingenuity of your readers, you will give it a place in your very useful publication.

I am, truly yours,

GEORGE BIRKBECK.

MR. EDITOR—I am desirous of cutting a circular mahogany table of four feet in diameter, so as to form two ovals; but how is this to be done without wasting any portion? and that my family may gladden the old dinner table as heretofore. I shall be grateful for the information, and am

Respectfully, Sir,

Your very humble Servant,

J. A. B.

To the Editor of the Mechanics' Register.

SIR—One of your correspondents wishes to know the manner of making percussion caps. The caps are formed of very thin plates of copper, cut into the form of a cross, and these caps are driven through a hole by a punch, when they are formed. The detonating mixture is formed of the chlorate of potash and sulphur, with a small quantity of charcoal; these ingredients being thoroughly mixed in a mortar with a little water, the composition is spread upon a thin plate, and cut by means of a punch into small circular disks. These disks being properly dried, are fixed by means of a little gum water to the bottom of the copper caps, and their surface afterwards polished by means of a wooden peg, to which rapid motion is communicated by a lathe.

Another of your correspondents, J. J. A., desires to be informed of the best method of making aromatic vinegar,—let him put into a retort half a pound of the acetate of potash; having evaporated it to dryness, pour on it four ounces of sulphuric acid, immediately connect the neck of the retort to a receiver, and apply a gentle heat—he may scent it with camphor, oil of cloves, lavender, and of rosemary.

TYRO.

We shall be happy to receive the communications promised by Tyro.—ED.

STEAM ENGINES.

Since the restrictions upon the exportation of machinery has been taken off, many manufacturers in France have availed themselves of the opportunity of erecting steam engines upon their premises, The number of English and French steam engines now in operation in France, would appear incredible to persons who remember what it was only a few years ago.—At Lyons, and in the neighbourhood, there are at this moment upwards of 100.—At Rouen. and other manufacturing towns, they are in the same proportion.

THE AMERICAN STOVE.

Having heard a great deal about an American stove, which was exhibiting at Mr. Cobbett's, in Fleet-street, we dropt in the other day, and were very politely allowed to inspect it. The peculiarity of this stove consists in its being much lower than any other, and having the aperture for the escape of the smoke so small, that all the heat must be felt in the room, whereas with most of our stoves half the fire goes up the chimney. We were also assured by Mr. Cobbett, jun. that with such stoves there is no danger of the smoke coming into the room, whatever may be the construction of the chimney. This alone is a great point, and the saving of fuel must necessarily be considerable, but we were astonished to hear that the expence of an ordinary stove is 3*l.* 10s. We can inform Mr. Cobbett that stoves of this construction have been in use in Paris for the last two years, where they cost only 30 to 40 francs (25s. to 34s.); they answer very well as far as the economy of fuel is concerned, but not so as to smoking, for Mr. Cobbett ought to know that smoking chimnies, like scolding wives, are frequently incurable.

A very important discovery for the French Nation has lately been made near Paris in a vein of excellent coal, with a large quantity of iron stone in its immediate vicinity.—An English Company has offered to take the ground on lease, and to establish a foundry upon a large scale, on condition of being incorporated for a certain number of years by the French Chamber, but hitherto the ministers have refused their sanction.

The mechanics and labourers in France and other parts of the Continent make a soup from white French beans, which they boil with sorrel, adding an egg and a little flour when it is nearly ready. This soup is really excellent, and with the beans forms most nutritious food, the latter being served up with a little butter and salt and pepper. M. Chauvelin, the celebrated French chemist, has ascertained that the nutritive property of this grain exceeds that of most animal food in the proportion of five to four.

MR. BROUGHAM'S PAMPHLET.

We were compelled last week to postpone giving further extracts from this useful and excellent work, and our limits even now are we desire. The few extracts however, which it is in our power to make, will, we trust, be such, that we cannot do all the justice to it that found adapted to the taste of our readers. We begin with Mr. Brougham's observations on the system of instruction by lectures established in Mechanics' Institutions. He says:

"Its commencement was the work of Dr. Birkbeck, to whom the people of this island owe a debt of gratitude, the extent of which it would not be easy, perhaps in the present age not possible, to describe; for as, in most cases, the effective demand precedes the supply, it would have been more in the ordinary course of things, that a teacher should spring up at the call of the mechanics' for instruction: but long before any symptoms appeared of such an appetite on their part, and with the avowed purpose of implanting the desire in them, or at least of unfolding and directing it, by presenting the means of gratification, that most learned and excellent person formed the design, as enlightened as it was benevolent, of admitting the working classes of his fellow-countrymen to the knowledge of sciences, till then almost deemed the exclusive property of the higher ranks in society, and only acquired accidentally and irregularly in a few rare instances of extraordinary natural talents, by any of the working classes. Dr. B, before he settled in London, where he has since reached the highest station in the medical profession, resided for some time in Glasgow as Professor in the Anderson College; and about the year 1800, he announced a course of lectures on Natural Philosophy, and its application to the Arts, for the instruction of mechanics. But a few at the first availed themselves of this advantage; by degrees, however, the extraordinary perspicuity of the teacher's method, the judicious selection of his experiments, and the natural attractions of the subject, to men whose lives were spent in directing or witnessing operations, of which the principles were now first unfolded to them, proved successful in diffusing a general taste for the study; and when he left Glasgow two or three years afterwards, about 700 eagerly and constantly attended the class.

"For some time after Dr. Birkbeck's departure, the lectures of his able and worthy successor Dr. Ure were well frequented; and when the number of the students began to decline, probably from the circumstance of their having no direct share in the management of the institution, the Professor happily thought of adding to it a library for the use of the mechanics, and entrusting the direction of it entirely to a committee chosen by themselves. This gave new life to the enterprise, and the Gas Light Company having in return for some services rendered them by the Professor, agreed to light the book-room two evenings in the week, a custom arose among the men who came to change their books, of remaining to converse upon the subjects of their reading, and an extraordinary impulse was thus given to their spirit of inquiry. The Library Committee, too, being chosen by the whole body, became in some sort its representative, and claimed to interfere in the management of the institution. It soon happened that some of their suggestions were not attended to; and a difference, at first to be regretted, led to consequences highly beneficial; for a great number seceded from the lectures and formed an institution entirely under the management of the mechanics themselves. It has been successful beyond all expectation; a thousand working men attended it last winter, while the numbers of the parent establishment were scarcely diminished. Out of these public associations has arisen one upon a more confined but more useful plan, applicable to every large manufactory. The Gas Light Company's men, between 60 and 70 in number, have formed themselves, on the suggestion of Mr. Nelson the foreman, into a club for mutual instruction; laying by a small sum monthly, they have collected about 300 volumes, and the company giving them a library room, which they light and heat, the men meet every evening, to converse upon literary and scientific subjects, and once a week to lecture; any one who chooses, giving a fortnight's notice that he will treat on some subject which he has been studying. The books are of all kinds, with the exception of theology, which from the various sects the men belong to is of necessity excluded.*

"It is somewhat singular, that although there are many towns in Scotland, and some within a short distance of Glasgow, where hundreds of artisans are collected, yet twenty years elapsed before the example was followed, and men profited by an experiment, which, for so long a period, was constantly before their eyes, and attended with such remarkable success. It was not till the year 1821 that Edinburgh adopted the plan with some variations, a part of which appear to be improvements."

The origin of the London Mechanics' Institution is thus stated:

"The complete success of Dr. Birkbeck's plan both at Glasgow originally, and after-

* Mr. Brougham, in a note, says:—"I owe this interesting information to an admirable letter of Mr. D. Bannatyne to Dr. Birkbeck, in the Mechanics' Register. Mr. B. as early as 1817 strongly recommended to the country the extension of Dr. B's plan, in a valuable paper which he contributed to Mr. M. Napier's Encyclopædia."

which in a place abounding far less with artisans, very naturally suggested the idea of giving its principles a more general diffusion by the only means which seem in this country calculated for universally recommending any scheme—its adoption in London.

"A meeting was held in November; the Mechanics Institution was formed; a subscription opened; and a set of regulations adopted. Of these by far the most important and one which in common, I believe, with all my colleagues, I consider to be altogether essential, provides that the committee of management shall be chosen by the whole students, and consist of at least two-thirds working men. The plan was so speedily carried into execution, that in January Dr. Birkbeck, our president, most appropriately opened the Institution with an introductory address to many hundred workmen, crowding from great distances in the worst season and after the toils of the day were over, to slake that thirst of knowledge which forms the most glorious characteristic of the age; nor was the voluntary offer of a course of lectures upon Mechanics less appropriate on the part of Professor Millington, who with an honest pride declared to his audience, that he had originally belonged to the same class with themselves. In the course of the year, lectures were delivered by Mr. Phillips on Chemistry, Mr. Dotchin on Geometry, Dr. Birkbeck on Hydrostatics, Mr. Cooper on the application of Chemistry to the Arts, Mr. Newton on Astronomy, Mr. Tatum on Electricity, and Mr. Black on the French language, to great and increasing numbers of workmen. About a thousand now belong to the Institution, and pay 20*s.* a year. Temporary accommodation has hitherto been provided at the chapel in Monkwell-street, formerly Dr. Lindsey's; and if upon such a subject we might make any account of omens, surely a scheme for the improvement of mankind could not be commenced under happier auspices than in the place which so virtuous and enlightened a friend of his country had once filled with the spirit of genuine philanthropy and universal toleration. But extensive premises have been procured in Southampton Buildings, for the permanent seat of the Institution; and the foundation has been laid there of a spacious lecture-room, and other suitable apartments for the library and apparatus. The sum required for these buildings exceeds three thousand pounds; and it has been generously advanced by Dr. Birkbeck. Others have made presents of money, books, and apparatus; and I should mention with greater admiration the gift of a thousand pounds from Sir Francis Burdett, but that those who know him and who mark his conduct, have so long since become accustomed to such acts of wise and splendid benevolence, that they cease to make us wonder. Let me further express my conviction, founded upon information, that the mechanics of this great city are resolved, as they are well able, to perpetuate and extend the system; nor have I a doubt that they will, even if unassisted, erect other Institutions in those parts of the town which are too remote to benefit by the parent establishment."

Lieutenant George Lindesay, of the Royal Navy, has lately invented a machine, which he terms a marine circuitor, by which means he can place our largest ships of war in any position immediately, when ships are dismasted in action, or attacked by gun-boats during a calm.

NOTICE TO CORRESPONDENTS.

F. C.'s answers to queries have been received, for which we are very thankful; but the great mass of important matter prevents our inserting any of them this week.

The article on the South Sea Company, by J. L. B. is very useful, and shall appear next week.

E. X., on the Tea Plant, has been received, and shall be attended to.

The observations on Mr. Brougham's Pamphlet, by a Member of the Mechanics' Institution, are not exactly in the spirit we could wish, but we doubt not the rectitude of the writer's motives, and would willingly insert his article if we did not feel that it might lead to a discussion very inconsistent with the plan of the Register.

We feel very much obliged to Mr. Spreckley for his suggestions.

Errata.—In the report of Dr. Allen's lecture, in part of our last week's impression, at page 232, second column, line 30, for "*rumour*" read "*remove,*" and line 59, for "*attraction*" read "*attrition.*"

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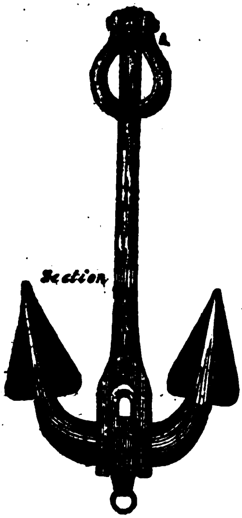
HAWKINS'S PATENT ANCHOR.



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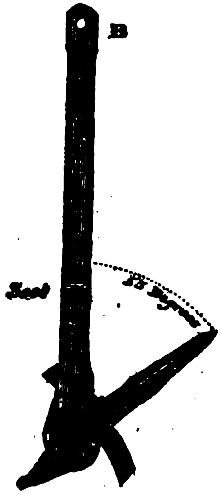

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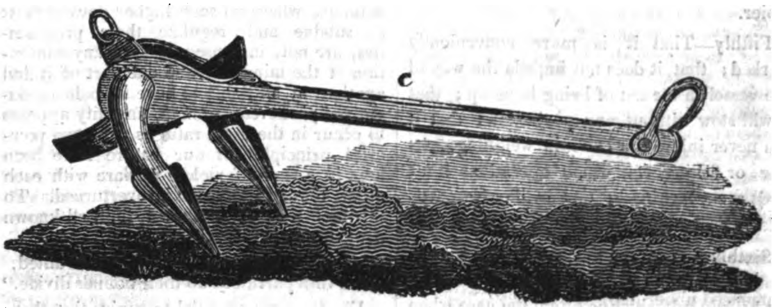

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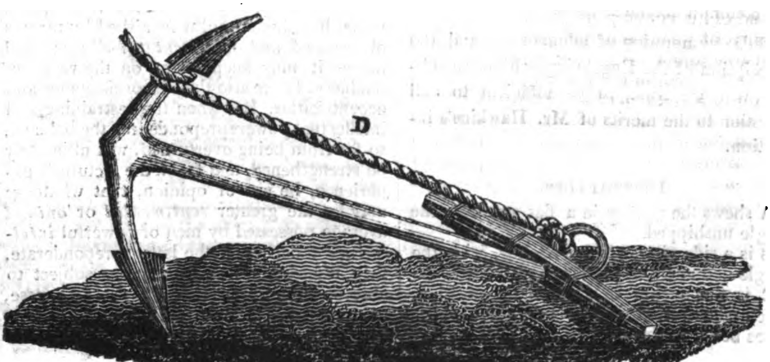


D

HAWKINS'S PATENT ANCHOR.

The Patent Anchor by Mr. Hawkins, of which we have this week given an Engraving, appears to us to possess considerable merit, principally as it does away with that awkward appendage of the common anchor, the stock; the only use of which is to throw the flukes vertically, so that one may enter the ground and hold the ship, and as it tends to prevent the cable getting foul of the anchor. Mr. Hawkins, however, divides the enumeration of the advantages of his anchor, under six distinct heads, as follows:

Firstly—That biting (which it does, immediately, in whatever position it falls) by both flukes at the same time, it therefore holds nearly equal to two anchors; and, consequently, may be made of less weight than an ordinary one, and a greater effect obtained.

Secondly—That it will not foul, nor cut, chafe or injure the cable.

Thirdly—That it does not require a stock.

Fourthly—That it breaks ground much easier.

Fifthly—That it is more conveniently worked; that it does not impede the way of the vessel in the act of being hove up; that it will stow without any projection; that it can never injure the bows in weighing, catting, or fishing, (for which operations it affords great facilities); and is likewise particularly well adapted for kedging. And

Sixthly—That in the event of a ship grounding upon her anchor, her bottom cannot be injured, which is often the case when the common anchor is used.

This enumeration of advantages, and the description of the Engraving, which we subjoin, will, we trust, prove sufficient to call attention to the merits of Mr. Hawkins's invention.

DESCRIPTION.

A shews the anchor in a flat position, the toggle unshipped.

B is a side view of the anchor, with the toggle and angle of the arms.

C is the anchor in its holding position, which shews that it can never foul, bot flukes being in the ground.

D is the common anchor in its holding position, shewing that it is always liable to foul.

LONDON MECHANICS' INSTITUTION.

DR. ALLEN'S THIRD LECTURE ON THE NEW METHOD OF INVESTIGATING THE POWERS OF THE HUMAN UNDERSTANDING.

WEDNESDAY, FEB 16.

Dr. Allen introduced the subject of his present discourse by referring to the conclusion of his previous lecture, in which he had deferred till this evening, the general application of the principles he had endeavoured to elucidate. He was apprehensive, from his limited time, that he must do this very partially and imperfectly; but as he had slightly adverted to some arguments, deducible from the superadded portion of the brain in men, to prove that the brain consists of a *plurality of organs*, he thought it necessary to submit some further considerations on this head, at well as on the subject of *insanity*.

Another powerful argument in favour of the great superiority of man over animals, and for proving that the superadded portion of brain is connected with his responsible agency, may be drawn from the fact, that animals, where no such higher powers exist to subdue and regulate their propensities, are not, in consequence of any contention of the mind between one part of it and another, at all liable to have its balance destroyed; whereas in man, insanity appears to occur in the exact ratio as these two powerful principles of our nature have been kept in a state of violent warfare with each other, till at last reason is overturned. To this fact may be attributed the well-known couplet of the poet;

"Great wits to madness nearly are allied,
And thin partitions do their bounds divide."

For it seems essential to genius that there should not only be powerful *intellectual* parts, but the stimulus furnished by masses of *animal* and *sentimental* feelings; and hence it may keep them on the verge of madness; hence also their inconsistencies and eccentricities. But when the restraining and intellectual powers preponderate, the balance, so far from being overturned, will ultimately be strengthened, and from the lecturer's experience, he was of opinion, that whatever may be the greater *sentimental* or *animal* average possessed by men of powerful *intellectual* faculties, if the latter preponderate, they are rather less than more subject to absolute derangement than others. Of course, to every general rule there are exceptions; but these very exceptions will be found to occur chiefly in those whose heads present great inequalities in the two hemispheres, or some very striking and unequal preponderating size of some one organ, or class of organs, or their hereditary constitution. To prove that it is rather those whose sentimental and animal feelings preponderate, that fall victims to insanity during seasons of great religious, political, or commercial excitement, when insanity proportionably coexists, we have only to read Pinel, who speaks of having "no where met with more exalted patriots, more impassioned lovers, or fonder husbands than in Lunatic Asylums." This remark applies to the insane of that eventful period in modern history, the French Revolution. Insanity is always characteristic, and to shew that wherever the feelings exceed the intellectual department, and exciting causes are sufficiently powerful and constantly applied, there is the greatest danger of insanity, we may mention that it happens most frequently at that age (between 30 and 40) when the feelings retain their susceptibility, and habits are formed. It is at this period that exciting causes more frequently overturn the balance of the mental economy, especially in the unmarried, for it must be remarked, in confirmation of the preceding reasoning, that the single are more subject than the married to insanity; indeed, the happily married are almost wholly exempt from the incurable kinds of insanity.

It may be asked, why are females, with that preponderance of sentimental and instinctive feelings which is essential to their character, not more subject to insanity than men? Because they are not exposed to the same exciting causes, and are more regular in their habits; besides, there is scarcely ever that inequality of the two sides of the head so common among males; and again, they have, or ought to have, man to lean upon.

These facts, and many more of a similar description, are only explicable on the principles of the *plurality of organs*, and while they explain the influence of circumstances, they prove also the original differences in the mental constitution of man. Hence we perceive that there have been certain eventful periods, when very different exciting causes have been applied, and we find the results as opposite as the causes by which they have been produced, and the minds on which they have operated. For insanity, at such periods, is marked out by the peculiar character of the times, and of those who are its victims; so true is this, that the Quarterly Review, speaking of the French Revolution, says, "Bloodshed always produces bloodshed. There is a state of morbid excitement, during which the contagion of murder spreads with as much rapidity and certainty as the plague, and the individuals composing a nation, may be exalted into a paroxysm of moral phrenzy, possessing as little control over their actions as the raving maniac." We might quote language equally strong from our best historians, applied to seasons of religious zeal, and to periods of commercial speculation; but in these cases the feelings called into action are of a different complexion.

To sum up the whole upon this subject, it may be observed, that not only the growth and decay of the brain, and its increased and diminished manifestations are in perfect accordance, but also particular parts are more developed at one age than another —more in some parts in females than males; and in others, more in males than females—more in some families than others—also in nations—all agreeing with the changes of disposition, and the differences of character. So also in mental diseases it is always characteristic; it is different at different ages—widely different in the two sexes—in different families and nations; that of the French and English, for instance, differ widely from each other, and both bear the stamp of the national character still about them. Hereditary insanity of families, is melancholy or flighty, animal, sentimental or intellectual, just in proportion as the organs (or habits if you prefer the word, for this system does not determine how much is cause, and how much is effect,) of the exhilirating or depressing passions, or the animal, sentimental or intellectual parts naturally, or from habit, preponderate. And what is most striking in some cases of absolute derangement, so decided that the patient can scarcely connect two sentences together, some single faculty is preserved almost in a state of perfection. The lecturer had known instances, in which the patient, though utterly incapable of connected conversation, could yet perfectly remember the words of some favourite song. Again, it often happens that the patient's reasoning and consciousness intimate the approach of a paroxysm; he feels some direful propensity struggling for absolute dominion, and he requests that the strait waistcoat may be put on him. From these and other circumstances, it is impossible to resist the inference, that different parts of the brain serve different purposes, and may be either generally or specifically diseased.

Dr. Allen proceeded to remark, that he could not now advert to similar arguments deducible from the same mode of explaining the phenomena of dreams—the fact that different poisons affect different parts of the cerebrum and cerebellum—that inflammation and diseases of different parts are attended by very different mental indications —nor to the more striking fact, that apoplexies of the cerebrum and cerebellum are so easily distinguished from each other. It was, indeed, impossible in three lectures to do the subject justice, or to state all the grounds of his conviction that there was much truth in this system. He had, for many years, pursued his examinations to a great extent, and under circumstances as little liable to entangle his judgment as could be conceived possible. Without any previous theory to support, without any fixed belief on the subject, or any wish to believe in one way rather than another, unless the truth was there, he had continued his enquiries among strangers, and among all descriptions and degrees of character in the world, in large manufactories, in hospitals, in schools, and in lunatic asylums; in the latter instances as professed trials of the system, and for the last five years he had indirectly pursued the subject, in connection with the constant and anxious study of, and sympathy for, between one and two hundred "minds diseased." He could not now dwell upon these circumstances, nor upon the fact that the manners and gestures, like the expression of the features, correspond with the seat and degree of activity of the organs most prevailingly exercised, as pride draws the head back, and cunning on one side. If the time would have permitted him to go through the demonstrations of his subject, he was of opinion that he should have succeeded in convincing some of his audience, that these views tend to give us clear and definite conceptions of the various passions and faculties of the human mind.

In his first lecture he had stated, that metaphysicians seemed to have inaccurate conceptions of the mental functions, and had treated as abstract faculties those functions which, perhaps, ought to be considered as properties or qualities common to them all. For instance, they have said that animals are guided by *instinct*, but that man is regulated by his *understanding*. Now *instinct* is a general expression, applicable to all; there are instincts common to certain classes, and there are instincts special. In the same way, sensation, perception, &c. are words which ought to be applied in a more definite and specific manner, and the word *understanding* should be used less vaguely, as it differs in different persons and animals, not only in degree but in kind. This should teach us the important duty of mental forbearance—we cannot all think alike; but we may all feel kindly one towards another.

It is necessary therefore to use the words sensation, perception, instinct, understanding, memory, recollection, imagination and judgment, in a more special and determinate sense. These observations are intended to shew that the mind may be divided exactly in the same manner as we divide other subjects of natural knowledge. In man, there are three orders of faculties, which are necessary to constitute the true philosophical mind. The first of these in the order of nature, comprehends the senses. The next, the faculty of observation, is that which, according to the extent and perfection of its parts, gives us the capability, with the help of its sub-instruments, the senses, of becoming acquainted, in a more or less perfect manner, with facts, objects, and events. By these, which may be called perceptive organs, the facts, &c. become treasured up as internal objects of memory. The third order of faculties has a higher part to perform; it works with these materials—it compares these facts, objects, and events, and asks why they occur in a certain connection, and invariably attended by certain phenomena and effects. Over these operations, there appears to preside a still higher power,—that which enables the "mind's eye," as it were, to take a grand and comprehensive view of these facts, objects and events—of these comparisons on them, and of these relations between cause and effect,—that power which is, in fact, the grand internal camera obscura of the mind.

Besides these powers, which are proper to man, he possesses others which are common to animals, but which, in consequence of the superaddition of these higher faculties, are, or ought to be, ennobled and dignified in man. For instance, let the animal instinct of increasing the species, be in man changed into moral love;—let that of attachment to their young be exalted into the virtues of well-regulated maternal and paternal care and instruction of children;—let the attachment to each other, which we observe in animals, constitute in us the endearing and invaluable blessings of friendship,—let the animal susceptibility of flattery, become in man a moral and intellectual ambition to promote his own, and the improvement and happiness of the common brotherhood of mankind. In short, let all the various instincts of animals be regulated and extended in their usefulness or sphere of enjoyment, by those nobler powers proper to man. Thus we see how uniform, how sublime, is every part of nature; the parts differ from each other, not in the absence of all points of resemblance, but in the alteration in the arrangement of these points; in the addition of some, and in the abstraction of others.

From this view of the superiority of the faculties of man over those of animals, Dr. Allen enforced the general principle, that man must be accountable or responsible for the proper or improper gratification of animal propensities, exactly in proportion to the predominance of these higher faculties over the animal. Even among animals themselves, there are few who cannot be taught to restrain their instincts and propensities in obedience to the will of their masters, and we may hope that the period will soon arrive, when neither wolf nor tiger in human form, will be untaught to submit to the will of Heaven.

It now remains to shew how the modes of action of these faculties or organs, their quantity in power, intensity, or activity, and the particular direction which their single or combined actions take, produce all the effects and phenomena of mind,—all the features that have marked out the character of the world. Every faculty may exist in a greater or less degree of *activity*; want of activity we express by heaviness, indifference, laziness, negligence, apathy;—the complete want of activity, imbecility, and when destroyed by disease, fatuity. The different degrees of activity are, inclination, desire, longing, want, ardour, passion; and when unrestrained or diseased, it becomes irresistibility or madness. Hence while impatience is the bane, eagerness is the characteristic of genius. Another thing to be attended to is, that all these faculties or organs may be agreeably or disagreeably affected, and there are also different degrees of agreeable or disagreeable affections, as pleasure, joy, extacy;—pain, grief, misery. The exciting causes will also differ with each individual, as the natural organization, disposition and cultivation vary. Hence affections and passions, pleasures and pains, are modes and degrees of activity in one or more of the faculties and propensities. For instance, the propensity to fight or retaliate, will produce *anger*;—to fight and destroy, *fury* and *rage*; but when combined with cautiousness and self love, and other moral and intellectual faculties, there will arise the mixed feelings of anxiety, sorrow, anguish, fear, terror, melancholy, pride, contempt, disdain, aversion. In fact, in proportion as these lower feelings are allowed to war with the higher, there is no peace,—all is internal conflict and ruin; whereas when all is well regulated, when each has its relative and appropriate share of exercise, all these powers constitute the perfection of character and the happiness of this life.

In the activity of the different faculties, they differ in power and intensity; a smaller surface possessing more activity, a larger, more power. But the degree of credit or usefulness in this world depends infinitely more on well directed and temperate activity, than on the difference of original capabilities; for however great the powers, without excitement, without exercise, they remain latent, and this makes the grand difference. We know not the powers we possess till we try them; but, continued Dr. Allen, you have tried them; your virtues and the circumstances in which you have been placed have made you think and feel, and have called forth your powers; so that, but for the want of school and college, you would be prepared to run the career of science much better than those sons of ease imagine, whom you have rather over than under estimated. "Surely," I may exclaim with the poet,

"Surely there is some heavenly power,
That rightly suffers wrong;
Gives vice to bloom *its little hour*,
But virtue *late and long*."

The lecturer proceeded to observe, that it had been his intention to apply the general principles deducible from his train of argument to the treatment of the insane; to the treatment of criminals and their proper punishment; and to the system of education. He had also intended to shew, or endeavour to shew, wherein they are contary to nature, and that every thing that is so, is dangerous and ultimately subversive of itself. Time, however, would only allow him to conclude with a few words on ourselves.

How are the duties of man performed? Why are some things commanded and others forbidden? How are we to attain perfection of character, or rather, in what does perfection of character consist? It consists in having the feelings, thoughts and actions all duly exercised, no one usurping the time and place of another, for when any of these monopolise too much to themselves, they lead to errors and derangements in the character and in society. All our organs should have their relative and appropriate portion of exercise; those of the soul as well as those of the body. Exercise improves the former as it does the latter; nay, it does more, for we cannot duly exercise the faculties of the soul without becoming wiser and better; for when any of the animal propensities are exercised at the expense of reason, the servants rule instead of the master, and one rebellious subject may produce many. We should therefore watch the first emotions of passion, the first risings of evil propensities, and either destroy, or properly direct and apply them. If we cannot gratify these feelings, according to the dictates of reason, we should subdue their force, and keep the *brute* in subjection to the *man*; for the greatest superiority we can attain in this world, is dominion over *ourselves*. The sum of duty in man is to exercise his feelings to the utmost in a social and relative capacity, and at the same time to exercise his talents; for we are not only to feel, but to think aright,—not only to feel and to think, but to apply all these to practice. This is to love the Author of our being "with all our heart, with all our mind, and with all our strength;" this is to present our bodies, souls and spirits, a living sacrifice, which to the Author of all, and for our own advantage, is indeed a reasonable service. O that this were the case in every family, and in every government, for governments are but families on a larger scale, and that the whole world would consider themselves but as one family! Then might we hope to see man ruled by the faculties which link him to heaven, and not by those he has in common with animals: then, and not till then, shall benevolence rule the earth, justice lift aloft her scale,

"Peace o'er the world her olive wand extend,
And white robed innocence from heaven descend!"

The worthy Doctor concluded his impressive and excellent lecture nearly in the following words:—Before parting with you, allow me to say, that I find it impossible to convey to you any conception of the gratification your intelligent attention has given me; still less in having been allowed a share in trying to excite you to mental cultivation; to excite every one of you to dig in his own mine, which I assure you is the best, the richest, and the most productive mine in the world, and from the profits of which no one can exclude you. God grant that you may reap a full measure of these profits.—FAREWELL!

DR. BIRKBECK, at the conclusion of the preceding lecture, after announcing that Mr. Cooper's second public examination of the members would take place on the following Wednesday, stated, that as the whole circle of the sciences included under the head of Natural and Experimental Philosophy had now been gone through, lectures would be delivered on Miscellaneous Subjects, till the completion of the New Theatre should enable the committee to recommence the series on a more extended scale.

MR. OGG'S FIRST LECTURE ON GEOLOGY.

PRIMITIVE MOUNTAINS—GRANITE—GNEISS—PORPHYRY—SERPENTINE—TRANSITION MOUNTAINS—CLAY—SLATE—LIME-STONE.

FRIDAY, 18TH FEBRUARY.

Agreeable to the notice previously given to the Members, Mr. OGG, this evening, delivered the first of a series of three Lectures on the subject of GEOLOGY, or the history and theory of the formation of the Earth. The lecture table was covered with a variety of beautiful mineral specimens, and a considerable number of illustrative diagrams occupied a conspicuous situation in front of the audience.

Mr. Ogg commenced by observing, that if the choice of his subject had been left to his own discretion, he should have selected one which was more susceptible of illustration by experiment, as he was well aware that the experimental elucidation of scientific subjects made the deepest impression, and was most agreeable to the taste of a public audience. As, however, the lecturers who had previously addressed them, had availed themselves of the opportunity of making the first choice, it only remained for those who followed to illustrate such branches of science as had not yet been explained to his hearers. Upon this occasion, he could not avoid adverting to the advantages resulting from the establishment of such valuable institutions as the present, the members of which were enabled to examine the various subjects presented to their consideration in every point of view, and to see demonstration piled on demonstration, till error was crushed beneath the ponderous heap.

The subject to which he should this evening direct the attention of the members was highly interesting, though not adapted for the introduction of many experiments. In his third lecture, he should probably have occasion to introduce a few, and in treating a subject which was of a very extensive nature, he should select those parts which could be most usefully and agreeably illustrated.

GEOLOGY comprehends objects of a two-fold nature. The attention of philosophers was devoted to this subject at a very early period, and some persons, in their anxiety to discover the way in which the crust of the earth assumed its present appearance, and the manner in which the world was created, had imagined it possible for the finite faculties of man to trace the footsteps of the Almighty; while others, considering this knowledge not so easily attainable, were satisfied with accumulating facts, in the hope that a favorable combination of such facts, might throw a brilliant light upon a subject at present involved in impenetrable obscurity. From these researches, results the division of Geology into two parts, viz. the *speculative* and the *practical*. The Lecturer considered it unnecessary to occupy the time by dwelling upon the speculative part of the subject, or particularising the various theories connected with the formation of the Earth, and he should therefore proceed to observe, that the attention of the practical geologist was principally directed to an examination of the structure of the exterior part, or the crust of the earth. The greatest depth from its surface to which the industry of man has penetrated, does not much exceed 3000 feet, and if we compare this with the whole diameter of the earth, which is nearly 8,000 miles, we shall be enabled to judge, whether we are likely to acquire a correct knowledge of any part except the crust.

To obtain this information, the geologist avails himself of every opportunity of minutely examining the structure of that portion of the earth which falls within the sphere of his observation. He ascends the summits of lofty mountains, through intricate and almost inaccessible paths, he surveys terrific precipices, traces the beds of rivers, and descends into the gloomy recesses of the deepest mines. By such means many important discoveries have been made, and we cannot better illustrate the subject, than by describing the grand divisions among rocks, which, instead of presenting the appearance of irregularity or confusion, are found to be arranged in a definite and regular order. Mountains are divided by geologists into different classes, the first of which comprehends those which are theoretically supposed to have been the first formed, and are therefore called *primitive* mountains. In the mountainous districts in which these primitive rocks prevail, immense masses of solid stone rise from below, and are surrounded by successive portions of other kinds of stone, which, to compare great things with small, envelope them, as the coats of an onion surround the central part. The lecturer illustrated this remark by referring to a diagram exhibiting a section of a mountain in the Hartz district, the centre of which consisted of an immense block of granite, rising from the earth in a pyramidal form, surrounded by layers of stone increasing in thickness as they approached the base, and distinguished in the diagram by different colours. From this example, Mr. Ogg pointed out the regularity of arrangement observable in the formation of mountains, and impressed upon the minds of his hearers the important fact, that wherever these rocks are formed, the different parts of which they are composed, always occupy the same relative situation with respect to each other. The principal characteristics which distinguish the primitive mountains are their highly crystalline texture, their being intermixed with a number of shining particles, forming part of their substance without any visible cement, and their containing no remains of organised bodies, either animal or vegetable.

Having thus described the general structure of the primitive mountains, the lecturer proceeded to particularise the various substances included in this class, the principal of which is *granite*. This kind of stone is extremely hard, but is not of a uniform texture, as it is composed of *quartz, felspar*, and *mica*. It would occupy too much time to state minutely the exact proportions in which these three substances unite to form granite, and it may therefore be sufficient to mention the principal ingredients without an accurate analysis. The hardest of these component parts is *quartz*, which consists principally of *silex*, appears in a variety of different forms, and in its purest state becomes *rock-crystal*. It crystalizes in six sided prisms, sometimes of considerable length, though in some specimens, only the terminations of these crystals are seen. It is sufficiently hard to scratch glass, is not acted upon by any acid, except the *fluoric* acid, and is not fusible by the common blow-pipe. It is the basis of glass; the most useful material in the formation of roads; and is one of the most abundant substances in nature.

Felspar is not so hard as quartz, as it may be scratched by the latter substance, and is fusible by the blow-pipe. It usually appears of a crystalline texture, is sometimes very compact, and when broken, is slightly translucent at the edges.

Mica, the third component of granite, is a substance well known, and is used for the purpose of inclosing microscopic objects. In Russia, when split into thin laminæ, it is employed as a substitute for glass, and is quarried in Siberia in large quantities.

These are the principal ingredients which enter into the composition of granite, of which substance the highest mountain peaks are formed, though from their present appearance, it is supposed that they were much higher at a former period, and that the ruins of their summits have been spread over the adjacent parts. The scenery produced by Alpine granite, as displayed in the diagram now exhibited by the lecturer, is of a very peculiar kind. Huge mountains rise up in a multitude of sharp-pointed peaks, though occasionally deviating from the pointed form, and assuming the appearance of immense blocks. This scenery, though sublime, is unproductive for two reasons; the first of which is, that granite is not usually visible except above the regions where vegetation flourishes; and secondly, because it has no tendency to produce that fine powder which is essential to the formation of a fertile soil. Even the vallies in the neighbourhood of granite rocks exhibit but a slight production of verdure.

So infinite is the variety in the texture and colour of granite, that there are not two mountain masses exactly similar to each other, and there are also many hard stones which do not contain all the constituent parts of granite. Mr. Ogg illustrated this remark by exhibiting several specimens from Cornwall, Scotland, &c. and after explaining their peculiar characteristics, he expressed his regret that public edifices should be constructed of Portland stone, which, from its softness, discovers marks of decay, even during the life-time of the architect; whereas if built with such hard stone as he had described, and which abounds in various parts of the island, such structures would remain to future ages, as monuments of the taste and talents of their founders.

Many other kinds of granite might be particularised, but he would only introduce one more variety to the notice of the audience. This was easily decomposed, and from its containing a great quantity of white felspar, was too soft for the purposes of building, but was applicable to other purposes in the arts. From this substance the fine white clay is formed which is used in the potteries in Staffordshire; and the lecturer stated that it had been applied to another purpose, which would excite the astonishment of his hearers, for when ground to an impalpable powder, it had actually been used to adulterate flour. The discovery of this nefarious practice shewed what men are capable of doing for the sake of profit. Its prevalence at one period excited considerable alarm, which was increased by the opinion entertained by the public, that the presence of clay in their bread might be detected by plunging a hot knife into it, which would appear white on being withdrawn. Now it so happens, that a hot knife plunged into the finest wheaten bread will assume a white appearance, and the consequence was, that as all tried the experiment, all found their knives whitened, and all took it for granted that they were poisoned.

The next of the primitive rocks is *gneiss*, or slatey granite, which resembles granite from its being composed of the same ingredients, but arranged in layers instead of little lumps. Mica usually predominates in this variety, which is frequently found stratified. The diagram now exhibited was copied from a treatise by Dr. Mac Culloch, on the geology of the Western Isles, and shewed the curved appearance assumed by gneiss rocks. Another variety, which usually reposes upon gneiss, is *mica slate*, of a shining silvery appearance, in which mica is also very predominant.

Porphyry, which is included in the class of primitive rocks, is extremely hard, and being susceptible of an exquisite polish, is used for making vases and other vessels. Many fine specimens are met with in our Island, but they are seldom applied to any purpose, as porphyry must be foreign to be esteemed. The highest mountain in the kingdom, Ben Nevis, is chiefly composed of porphyry, and being separated into abrupt precipices, exhibits scenery of a very beautiful description.

Serpentine is also classed with the primitive rocks, and this stone is used in London under the name of *Mona-marble*. It is capable of a fine polish, and displays shades of red and green, and a variety of other colours. Specimens of serpentine, both polished and unpolished were exhibited to the audience, and the lecturer observed that its smoothness to the touch, and its lustre in an unpolished state, were derived from an admixture of magnesia. The curved appearance of serpentine rocks was illustrated by a view near the Lizard Point. *Steatite*, or *soap-stone*, is chiefly found in veins passing through serpentine; it appears and feels like soap, contains magnesia, and being very soft, may be turned in a lathe, and is useful to potters.

Mr. Ogg then proceeded to describe the characteristics of another class of rocks, called the *transition* series. The first variety of the transition class was well known to all his audience, and was called *clayey slate*. Those substances to which he had hitherto alluded were of a hard nature, and were not acted upon by acids, but this was so soft that it might be scratched by the nail. It is usually of a blue or grey colour, sometimes inclining to a red or yellowish hue. *Roofing slate* is one of its varieties, with which every individual is acquainted. Rocks of this kind are more abundant than any other, except granite. One side of a mine is sometimes formed of granite, and the other of clayey slate; sometimes mica is interposed between these two substances, and they are sometimes divided by primitive marble. The scenery which accompanies clayey slate rock presents a peculiar appearance, though it does not rise to the altitude of the primitive rocks. The lecturer directed the attention of his hearers to a view near Dalgelly, in Wales, as a specimen of the scenery accompanying this rock, and stated that it had a tendency to split into cubical fragments, and before their angles were worn away, other layers split off in succession. The delightful scenery of clayey slate rock, displays a rich luxuriance of verdure, for, being very soft, its decomposition produces a fine soil, which supplies nourishment to immense trees, where scarcely a crevice is to be seen. The vallies in its vicinity, like the valley of Llangelly, in Wales, are usually distinguished by great fertility.

The lecturer here drew an animated comparison between the scenery of the primitive mountains, and that which was the subject of his present remarks. The former was characterised by a sublimity, to which it was impossible for description to do justice;—if his audience could accompany him in imagination to the western isles of Scotland, to the banks of the Rhone, to the vale of Chamouny, or to the majestic Mont Blanc, clothed with eternal snows, and girded with eternal frost, they would be enabled to form some idea of the awful magnificence by which the primitive rocks are distinguished. The scenery of clayey slate rock combines beauty with sublimity, and its luxuriant fertility displays a delightful contrast with the steril grandeur of the primitive mountains.

The next variety requiring particular notice, is the species of *lime-stone* found above clayey slate, which differs from the limestone found lower down, in its possessing a less degree of crystallization, and from the rocks above by its containing few organic remains. The celebrated Breakwater at Plymouth, to form which mountains have been removed and cast into the sea, is composed of this variety, which is usually called *mountain lime-stone*. Specimens of limestone scenery in Derbyshire and on the banks of the Wye were exhibited by the lecturer, and the views were extremely picturesque, every fissure in the rocks being filled with verdure.

After briefly alluding to some other varieties, one of which was distinguished by the extraordinary name of *Grauwacke*, Mr. Ogg described the principal characteristics of lime-stone and the many useful purposes to which it is applicable. When broken into fragments and thrown into a kiln, where it is disposed in layers and burnt, it loses almost half its weight by parting with its carbonic acid, and becomes *lime*. When water is thrown upon lime, it assumes a solid form and is chemically combined with the lime, while its heat passes off during the process.

The Lecturer then introduced a beautiful description of the gradual formation of pillars in lime-stone caverns, where their growth may be distinctly observed. As the water, impregnated with lime-stone, filters through the roof, it evaporates and leaves the stony matter behind; successive drops of water deposit successive films of stone round the central nucleus, and the mass continually increasing, projects from the upper part of the cavern; while a portion of the water dropping on the ground forms the base of the pillar, which, by a similar process, becomes enlarged in size, and approaches the pendent portion, till the masses unite and the pillar is completed. Those masses which hang from the roof are called *stalactites*, and those formed on the floor *stalagmites*. Other pillars are produced in a similar manner, and projections are also formed by the splashing of the water against the sides of the cavern, till it becomes completely filled up. Mr. Ogg exhibited as a specimen part of a stalactite cut in two, to shew its internal structure, which appeared to display an infinite number of concentric circles surrounding the original nucleus or center.

The great utility of *plaster of Paris*, which is a *sulphate of lime*, was then pointed out by the Lecturer, who described the process of baking it, for the purpose of driving away its water of crystallization, and stated that its property of again combining intimately with water, rendered it extremely serviceable in the arts, from its applicability to the purposes of taking perfect casts. One of the most important purposes to which plaster of Paris is applied, is the modern process of *stereotype printing*. This process Mr. Ogg minutely described, and it may be briefly stated as follows: the types, which ought to be in good condition, are set up, and carefully corrected in the usual manner, after which the plaster of Paris mixed to a proper consistency, is poured upon them, and becoming hard in a short time, a perfect mould of the whole page is produced. The mould is then baked in an oven, and afterwards put into a proper iron vessel, where the melted metal, consisting of one part of antimony, to from four to six parts of lead, is poured upon the mould, and a perfect metallic fac-simile of the page is thus formed. It is a most valuable property of plaster of Paris, that, notwithstanding its brittleness, it will bear without breaking, the intense heat of the melted metal, which insinuates itself into spaces finer than a hair. By means of stereotype plates, booksellers are enabled to avoid the risk of keeping a large impression of any valuable work, or the expence of setting the types again, as they can at any future time print exactly the number they wish, with a certainty of correctness in the impressions, of which these plates are capable of printing an immense number.

Mr. Ogg concluded his excellent lecture by a few appropriate observations on the enlargement of the sphere of our enjoyments, by the acquisition of knowledge derived from the contemplation of the works of nature. A Northern poet, whose works shew that he "looked through nature up to nature's God," had enthusiastically exclaimed—

"O Nature! how supreme in every charm,
Whose votaries feast on raptures ever new;
O for the voice and fire of cherubim,
To sing thy glories with devotion due!"

We cannot but draw a melancholy contrast between such enlightened minds, and the contracted views of those who possess no taste for the acquisition of scientific information. Such persons as these, in the vanity of ignorance, would attribute insanity to the botanist who traversed dangerous paths to cull the vegetable productions of the earth, or the geologist and mineralogist who loaded his pockets with stones; and they would look with contempt on the great Sir Isaac Newton blowing soap-bubbles, or Franklin flying a paper kite.

At the close of the lecture, Dr. Birkbeck officially announced to the members the appointment of Mr. Robert Christie as secretary to the institution, who would enter upon the duties of his office on the first Monday after the ensuing Quarterly General Meeting, till which period their able Honorary Secretary, Mr. Blake, with the kind assistance of Mr. Place, would continue to perform the arduous duties of the situation.

Dr. Birkbeck also informed the meeting, that Balloting Lists of the Candidates nominated for the approaching election, were now ready for delivery to the members, agreeable to the rules; and he particularly requested that they would apply for them as soon as possible, in order that they might have an opportunity of exercising a deliberate judgment on the merits of the respective candidates, previous to the period when they attended for the purpose of balloting. It was also the anxious wish of the present committee, that the members should avail themselves as extensively as possible of this important right, and that every member who was intitled to vote should give his suffrage upon that occasion.

BROWN'S PNEUMATIC ENGINE.

(*From the Scotsman.*)

A very ingenious paper on this engine appeared lately in a cotemporary paper (the *Caledonian Mercury*) and on Wednesday night Dr. Fyffe made some interesting remarks on the same subject, at the close of his lecture in the School of Arts. Before proceeding farther, we may remark, that Mr. Brown's engine has made us acquainted with a fact, which we believe was scarcely known before—the extraordinary rarefaction produced by the sudden combustion of a quantity of gas in a mass of common air. It is upon this, and not upon the condensation of a part of the gaseous fluids, that the power of Mr. Brown's engine chiefly depends; and till the engine itself was exhibited, it was not, we believe, suspected that the momentary effect of the heat evolved in dilating the aereal mass, was one third part of what it is actually found to be.

It has been stated in the *Mercury*, that, by mixing 1 part of coal gas with 7 of common air, a vacuum equal nearly to 5 parts was produced, the residuary air occupying three parts of the glass vessel, and this proportion of 1 part of gas to 7 of common air was found to be most advantageous. When oil gas, however, was employed, 1 part of the gas added to 20 of common air was found the most advantageous, and the vacuum formed amounted to 10 parts. In the first set of experiments, therefore, 1 foot of coal gas afforded 10.

Dr. Fyffe conducted his experiments pretty nearly in the same way, but arrived at results considerably different. He stated, that after many trials he found that the greatest effect was produced when 1 part of coal gas was mixed with 30 of common air, and that he had sometimes obtained a vacuum equal to 24 parts, though on account of the nicety of the operations it was often much less. He repeated the experiment with 1-30th of gas several times in presence of the class, and the vacuum obtained varied from 15 up to 21 parts—the whole contents of the glass being 30. The Doctor considers the vacuum as produced almost entirely by the sudden dilatation of the air; and he has no doubt that with apparatus properly contrived, a vacuum equal to 24 or 25 parts, that is to 4-5ths, or 5-6ths of the contents of the cylinder, might be constantly obtained. He added, that he has since learned that 1-30th of gas is the quantity actually used by the patentees in London, and that the vacuum produced is nearly what he stated.

The price of coal gas in Edinburgh is 12s. per 1000 cubic feet in shops. But this price covers the great expense of pipes, the loss from breakage, and the profits of the manufacturer. Dr. Fyffe stated that the prime cost of the gas was 4s. 11d. per 1000 cubic feet, but that gas sufficiently good for working an engine, extracted from a cheaper coal, and purified by a less expensive process, might be furnished at 2s. 9d. or, taking a round sum, at 3s. Now, assuming that 24 feet of steam per minute afforded a power equal to that of one horse, one foot of gas, yielding 24 of vacuum, should produce the same effect. Hence a pneumatic engine of one horse power should consume 60 cubic feet per hour, or, in round numbers, 1500 cubic feet per day, the cost of which, at the price mentioned, would be 4s. 6d. It follows, that this expense, though moderate, would be considerably greater than the expense of steam But still, if by the additional cost we should get rid of the vast and cumbrous machinery of the steam engine, there are cases where it would be highly advantageous.

Assuming, as previously stated that 60 cubic feet per hour are equal to a horse power, it follows that 1000 cubic feet would supply a four horse power engine for four hours. Now, since 30 atmospheres of gas can be compressed into the bulk of one, it follows that a cubical copper vessel, scarcely exceeding one yard each way, would hold the quantity of gas required to work the engine for four hours. The engine itself is said to weigh only one-fifth part of the steam engine. One of four horse power might consequently weigh something less than a ton, while the locomotive steam engine of the same power weighs four tons. Were engines of this description, therefore, adapted to locomotive machines, a four hours, or even a six hours supply of gas could be stowed into the machine, and all the bulky apparatus for manufacturing the gas, with the fuel, and part of the attendance, could be dispensed with. The extra price of the gas compared with steam, (and compressed gas would cost more than gas of ordinary densities) sinks into nothing in a case of this kind, where every ton of stowage gained may be worth 10s. or 20s. per day. If the machine fulfils the promise of its inventor, its value for purposes of this kind will, beyond a doubt, be very great.

The following paragraph is from the *Glasgow Chronicle*:—" From the principles laid down by the writer in the *Mercury*, that a foot of gas will form five feet of vacuum, and that 1000 cubic feet will cost 12s. he shows that the expense of one of Mr. Brown's engines, besides tear and wear, " will amount to 1*l*. 1s. 9d. a day, for each horse power, or 430*l*. a year for gas alone;"—and he adds, that a steam engine, however, will not cost above 30*l*. a-year for each horse power, including all expenses." Now, as Dr. Fyfe has proved that each foot of gas will produce a vacuum of 25 feet, and that 1000 cubic feet may be obtained for 3s. it follows that the expence of such an engine will only be 1-20th part of this sum, or 21*l*. 1s. for each horse power

Fig. 1.

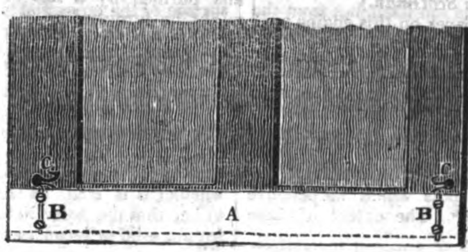
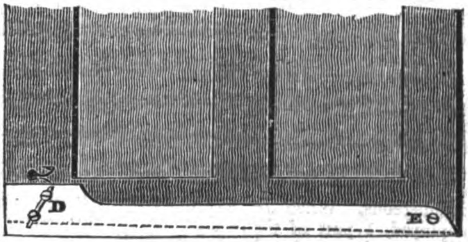


Fig. 2.



To the Editor of the Mechanics' Register.

MR. EDITOR,—Should you think the above simple contrivance for excluding the admission of air under parlour, and other doors, worth being generally known, you will be pleased to give it a place in your valuable Register.

Southville. S. HOLLANDS.

Fig. 1 represents the method of excluding the current of air, under a door whose bottom is perfectly *level*, as represented by the dotted line. A is a flat piece of brass, iron, deal, mahogany, or any other material suitable for the purpose, which should be rounded on the bottom edge, to allow of its passing easily over the surface of the floor or carpet, having two grooves or apertures B B, cut at the ends, and fastened on by screws, but not so tight as to prevent its rising and falling. C C are two small springs such as are generally used in the interior of door locks, and placed just above each end, in order to insure the slide returning to its place when the door is shut.

Fig. 2 represents the method of exclusion from under a door whose bottom is *not level*, as also pointed out by the dotted line, the only material difference in the formation of this slide is, that the groove D must be a little curved, and none at the end E, which is to be merely screwed on; one spring only will be required to this slide.

If made of deal, or any common material they may be covered with green baize or leather.

EULOGIUM UPON HERSCHEL, PRONOUNCED IN THE ROYAL INSTITUTE OF FRANCE.*

(*Concluded from p. 224.*)

The experiments of Herschel relative to the nature of the rays of the sun, induced

* In giving the first part of this Eulogium we made a few short observations on its importance, as proceeding from a foreigner. We trust that our readers have perceived already that our observations were not misplaced. It is delightful to turn from the prejudices and follies which keep mankind asunder in the bulk to those ties by which men of science of every nation are bound together. We see here a Frenchman in a French Institution, paying a tribute of respect to the memory of a great man, who was patronized by a sovereign with whom France was in hot contention. We hear him speak, too, of that sovereign in terms which could scarcely have been expected from a foreigner. Surely if the importance of science could need any such weak advocacy as that which we could offer, we should be justified in supporting it upon the ground of humanity. Is it not a reproach to warriors and

him to conclude that they do not proceed from the body of the sun itself, but from the brilliant and phosphoric clouds which exist in the atmosphere of this body. According to this doctrine, this immense ocean of light is subject to violent agitation, and through the chasms occasionally caused by this agitation, we perceive either the solid mass, which is not luminous, or its volcanic cavities—and thus do we account for the dark and varying spots which we perceive upon the sun's disk.* The extent of these spots is frequently greater than the entire surface of the terrestrial globe, and they disappear when calm is restored in the solar atmosphere. These spots, when first discovered by Galileo, enabled him to determine the motion of the sun on its own axis, and to fix its duration at 25 degrees and a half.—The improvement in optics, which has taken place within the last few years, has come very opportunely to enable us to discover whether it is true, as Herschel imagined it to be, that the solar light does not proceed from a solid or incandescent liquid mass.—When such a body, raised to a very high temperature, becomes luminous, the rays which emanate from it, do not proceed from its superficial extremity, but are emitted like those of heat, from an infinity of little material points placed under the surface to a certain depth, and which though very minute are absolutely in existence. Now such of these rays as traverse obliquely the envelope of the heated body acquire and preserve an especial property which experiment may render sensibly evident; they are polarized. But if the same mass, instead of being rendered luminous by its own temperature, is simply covered by an extended flame, which is the source of its light, the rays have not this property.

The light which proceeds from the sun has been submitted to the test of experiment.

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statesmen to exist in enmity when they see men of science of all countries united in the bond of peace, and can the former advance any arguments in favour of their unnatural conduct towards each other, which the latter could not with equal force bring forward, if they did not prefer the truths of science to the arguments of sophistry? Certainly not. Let us then hope that as science becomes more general, mankind will become more remarkable for wisdom and humanity.—Ed.

* This doctrine of Herschel is certainly much more reasonable and more consonant with general astronomical demonstration than the idea that the sun itself is a body of fire—a position at variance with all that man has hitherto discovered in nature. Speaking merely as a philosopher, no man would advance such a position, and although it must not be denied that there are certain phenomena for which the experience and reason of man are unable to account, yet it is a fact which cannot be too forcibly impressed upon the mind, that much of the philosophy of nature, which was a mystery to our forefathers, is perfectly intelligible to us as part of the great principle of nature which it is permitted us to investigate. Unless it can be shewn from scriptural testimony or reasonable deduction that the sun is a body of solid fire, we must contend for the contrary, because the position is as we have before stated, at variance with our own observations, and with the harmonious principle which we distinguish throughout nature. It has been forcibly observed by an Italian philosopher, that the arguments against the doctrine of the ancients, that the body of the sun is fire are twofold—first, we discover around that luminary itself indications of the direct contrary; and secondly, as there is no such thing in the known world as fire existing in an elementary state, it is only reasonable to attribute the heat of the sun to some natural chemical causes, which distance hides from our investigation. There is something novel in the assertion that fire is not an element, but we think it is one which will bear discussion. The four elements of nature are said to be air, earth, fire, and water. Now of three of these elements, as they are called, we have sensible demonstration: we tread upon the earth, without being able to account for the mode of its formation; we respire the air from the moment of our birth, and although we understand its component parts, we must allow that it is an element, because we find it eternal. So is it with water: the seas ebb and flow under fixed laws, and only in convulsions of the earth, (exceptions which do not affect a general principle) do we find them vary in their courses. But how is it with *fire?* Where do we find it in an elementary state? Is it eternal? No! Is it inexhaustible? No! In spontaneous eruptions we trace it to its chemical cause, and when the materials for its combustion are exhausted, we see it expire. Is not this the doctrine of volcanoes? Fire is produced by friction; it is produced by chemical combination; it is produced in various ways by the ingenuity of man, the elements for its production being supplied by nature. But do we find it existing in a pure and perpetual state? Certainly not. Here then is an argument permitted to the reason of man, which he will do well to investigate. It is a position which can do no harm, for it does not place the self-pride of man in contention with the wisdom of the Creator, but merely exercises those faculties which God gave to us for our good government and comfort.—Editor.

M. Arago has clearly ascertained that the rays of the sun, when they are even obliquely transmitted, are not polarized.

Herschel, when studying the nature of the sun, employed glasses of different colours for the purpose of weakening the effect of its light upon his vision. He had thus frequent opportunities of ascertaining to what extent the interposition of these glasses modified the heat or light of this great body. It was not in his nature to be satisfied with superficial observation, and he undertook a series of experiments, in the course of which new and important facts confirmed the theory which he had established. It had been long imagined that the rays, which are separated by the prism, and which form the solar spectrum, did not possess to the same extent the power of heating terrestrial bodies. This opinion was also verified by experiments in France and Italy. If we trace the origin of the discussions on this important subject, we must go back to the writings of a celebrated woman named Emily du Chatelet. Long before she had translated and commented upon the writings of Newton, she had forwarded to the Academy of Sciences in Paris, a work upon the theory of fire, and had also assisted Euler in his experiments on the same subject. In the work of Madame du Chatelet, which was printed in 1738 by order of the Academy, the illustrious author proposed a series of experiments to prove whether primitive rays of different colours had different degrees of heat;—to show, for instance, whether the red ray did not give more heat than the violet, a conclusion to which she had come from her theory. The subsequent experiments of Landriani, Rochon, and particularly Herschel, gave not only a complete solution of this question, but led to new and important results. He measured with accuracy the thermometrical effects of seven rays unequally refrangible, and ascertained that the red ray alone contained more heat than all the rest together. The impression upon the thermometer diminished rapidly, from the red rays at one extremity, to the violet rays which were placed at the other. In repeating his experiment he endeavoured to discover the precise limit at which all sensible impression of heat ceases, and also the point at which it is strongest. He succeeded by a result which was altogether unexpected; he saw that the thermometrical effect existed beyond the red rays in the obscure space bordering the spectrum; and it was even in this more enlightened part, and upon the prolongation of the axis, that he found the point at which the communicated heat is the greatest. Although the result of this experiment must depend on the mode in which it is conducted, he was quite convinced that this mixture of rays which are conveyed to us from the same body, and which the prism reports unequally, and divides into differently coloured elements, contain also an invisible heat, of which we can measure the action.—Herschel then proposed to himself to discover which are the rays that possess the greatest power of light. By a peculiar train of experiments, he ascertained that this property belongs to yellow rays, and that it decreases rapidly from these brilliant rays to the extremity of the spectrum.

These singular discoveries excited much interest in all the academies of Europe.—Many contended that they were not founded in truth, and Herschel was exposed to contradictions which were unworthy of scientific men, who pretended to liberality. This great philosopher, however satisfied with the accuracy of his experiments, preserved a dignified silence, and at length they were repeated with success in England, France, and Germany, under the inspection of first rate philosophers. In discovering the difference between the rays of the sun, as to the invisible heat which they communicate, another remarkable property was also ascertained. The intensity of the chemical action of the different rays was observed, and it was found that this action exists like that of heat in an unenlightened space, but at the opposite extremity of the spectrum and beyond the violet rays. We shall confine ourselves to this single experiment, which does not properly belong to our subject, but we will add, that no philosopher of the present day entertains a doubt of the existence of invisible rays of heat mingled with the light of the sun.* This was the great principle of the discovery announced by Herschel. It seemed as if it was his destiny to discover and bring to the test of experiment subjects, the knowledge of which had escaped other men during a series of ages.

[We did not imagine when we sat down to the translation of the Eulogium upon Herschel, that it would have occupied so large a space of the Register, but when the importance of perpetuating the merits of so great a man are considered, we trust that in fulfilling our pledge of giving the Eulogium entire, we are but meeting the wishes of our readers. The discoveries alluded to in this paper, are known almost to all, but the mode in which they are spoken of may probably awaken attention to them, and so far prove useful to the purposes of science. Many of our readers are in a class of society where

* A M. Vieusseux, of Toulouse, has invented a mode of determining the power of light and heat transmitted in the rays of the sun, which is said to be more perfect than any thing of the sort hitherto in use. We have been promised a detailed description of this apparatus, and if we should find it equal to what has been said of it, we will present it to our readers.—Editor.

few apparent opportunities present themselves of bringing to perfection scientific ideas, which require encouragement and pecuniary assistance for maturity: but we would have no man despair of encouragement in a country which is so eminently distinguished by its patronage of true merit. Herschel once moved in a very insignificant capacity, but Herschel lived to be a great man, and his eulogium has been pronounced in the first scientific Academy in Europe. So will it be with every man who stedfastly and earnestly pursues the path of science, and by his own good conduct entitles himself to approbation.]—Ed.

THE SOUTH SEA COMPANY.

We have been favoured by a Correspondent with the following:—

"The establishment of this company as a corporate body, having the privilege of carrying on an exclusive trade with all places, from the river Orinoco to the South Cape, and with the whole of the Western Coast of the Northern and Southern Continents of America, was granted in consideration of the company so appointed, making purchase of all the unprovided debts of government from the individuals possessing the claims.

"The amount subscribed for this purpose, was 9,177,968*l*. for which the company were allowed an interest at the rate of six per cent. from the produce of certain duties that were levied for that purpose.

"It may be readily supposed, that as the greater part of the assigned territories were those from which British subjects had long been carefully excluded, no great results were rationally to be expected from their trade; yet as the East India Company, with, at one period, very little better prospects, had obtained great wealth from their traffic with the Eastern World, it was hoped that similar success would ultimately attend the South Sea Company, and that the wealth of Peru would be laid at their disposal.

"The charter of this company was obtained in 1706, and the benefit of a contract made with Spain, was transferred to them at the peace of 1713.

"This permission or engagement, which was called the Assiento Contract, conferred upon the company the right of furnishing the Spanish mines and plantations with slaves, and of sending one large ship annually to the Spanish West Indies, with a particular assortment of European goods, principally consisting of our woollen manufactures.

"In 1715, by an application of the interest and sums received for management, the company's capital was increased to 10,000,000*l*. and in 1720, proposals were made by government to the South Sea Company to purchase of the public creditors the amounts of their debts, and of all annuities except those granted for lives, for which the company were to be allowed certain nominal capitals, or stock, bearing interest with their preceding stock, at the rate of five per cent.

"No other particular advantages were to be received by the company, as at their first establishment, but on the contrary, they offered to give the sum of five millions of money, for permission to make these purchases; yet a general opinion at that time was entertained, that the government would form an exchange of places with Spain, and giving the company a footing in South America, enable them to realize all their splendid ideas.

"The contention to subscribe, or purchase the company's stock, to which these rumors gave rise, advanced it in value above 1000 per cent.! to the immense advantage of those by whom they were propagated; all this took place in *less than the course of a year*, when at length the delusion was exposed, and very great distress was experienced by those who had invested their money in making the purchases.

"Between the 8th of December, when the discovery took place, and the 29th of the same month, the stock fell nearly 850 per per cent; a violent outcry against those who had enriched themselves by these artifices, was raised in the nation, and upon parliament interfering, above a million and a half of money was repaid to the proprietors, from the produce of the delinquents' estates.

"The arrangement made with the company for taking charge of all the public debts, was, however, generally carried into effect; and as the few that remained were afterwards discharged by the Sinking Fund, all the other public annuities date their origin subsequent to that period. The oldest belong to the three per cent. stock of 1726; for the nominal Exchequer Life Annuities of King William and Queen Mary, have in all probability long since terminated, though no official information has been received of the fact.

* * * * *

"In 1815, the privileges of an exclusive trade being surrendered by the company, a duty of two per cent was laid upon all goods except the produce of the Fisheries, that may be imported from any places within the limits of their charter, with a duty of 1s. 6d. per ton on all ships loading to those places, and the amount is to be invested either in the purchase of three per cent. consols, or reduced until they amount together to 613,466*l*. stock, being one-half per cent. on their trading capital, and this sum is then to be transferred, as a compensation, to the company. In the intermediate time, deficiencies in this profit of one-half per cent. are to be supplied by government.

J. L. B

FAMILIAR LESSONS ON MINERALOGY.

At a period so distinguished as the present for the intellectual zeal of our countrymen, it is not surprizing that Mineralogy should have attained its due elevation in the rank of physical sciences; our universities awakened to the importance of cultivating this branch of knowledge, have diffused through their various channels no small degree of information on this interesting topic; and Mineralogy, as it is universally useful, will soon be almost universally understood. The possessor of landed estates, and the man of science, the manufacturer and the artisan, may all render Mineralogy subservient to their respective interests; and the object of these familiar lessons is to unlock, as it were, a casket of useful knowledge, and to present to the learner a compendious view of the beauty and value of its contents. It being desirable that an acquaintance with our mineral resources may be cultivated rather as a recreation than a study; that the produce of our mines may be regarded as an object of interest, and that the traveller may be able to recognise the substances that compose the ground on which he treads, all obscure terms and technical phraseology have been carefully avoided.

To explain what is meant by Fossils or Minerals, and how to distinguish one substance from another, is the subject of the following lessons:—

Minerals are produced in the earth, and commonly situated in what are called veins, which, when worked, are called mines, whether at the greatest depths we have penetrated, or in the alluvial soil on the surface. Be it a diamond, a coal, or any metallic substance, it is a mineral. The Gems are usually called stones; and crystallizations, fossils; yet all are ranked under the term minerals. A distinct piece is commonly called a specimen; and a number of various substances, a collection.

It is true, that this science is not marked by those distinguishing laws, that are the leading features of the sister sciences, yet a general knowledge may be attained with little difficulty, although the way to set about it may appear clouded and rather obscure; when however this mist is once cleared, a brilliant display of useful knowledge is opened to our senses, and by advancing step by step the summit will be gained.

To suppose any one who is unacquainted with Minerals can discriminate them would be as unreasonable, as to expect, that an unlettered man could discriminate classical authors without seeing the title page of their works.

Without further preface, we will therefore endeavour to point out the most easy method by which a learner, who possesses a few Minerals, may have the means of proving to himself what they are.

Suppose a person to be in possession of a piece of lead ore, a piece of calcareous spar, or limestone, and a few pebbles that have been found on the sea shore; these are selected as being the most common of all substances, and which may be said to be generally met with, and further, we will for example suppose him to ask the following questions:—

QUESTION.—How can I satisfy myself that this is lead ore? and this calcareous spar? or that limestone?*

To the first question we reply, break a small portion off from the lead ore, and observe the fragments and their brilliancy (remarks on these will be noted hereafter) place a bit not larger than a peppercorn on a piece of charcoal, then with the blow pipe blow through the flame of a candle, directing the jet of flame from it, upon the lead ore; it will almost instantly discharge sulphurous vapours, and in half a minute melt into lead; if the experiment is attended with this result, it furnishes a decided answer. The ores of this metal are both various and numerous; the most common is blue lead ore, which occurs in great quantity, and from it the lead in commerce is produced, others are of various colours, as pearl and silk white, green, brown, yellow, and red; it also occurs earthly, &c.

QUESTION.—How can I determine this to be calcareous spar, or that limestone?

Detach a small bit with a hammer, and observe its fragments; try to scratch it with the point of a knife, and notice the effect; then place a small particle under the flame of the blow pipe, and it will in a minute burn to lime, which may be known by its losing its transparency (if calcareous spar) by its styptic taste, or by throwing it into a glass of water, when it will fall to powder with a hissing noise; or place a few fragments in a watch glass, and let fall a drop of acid into it, which will produce a violent effervescence. Calcareous spar is always soft to the knife and yields a white powder when scratched. Limestone is harder than spar, it is in great abundance, forms mountains, and when fine enough to receive a polish, is called marble, which never can be mistaken for spar. These easy experiments performed in a few minutes so satisfactorily, cannot fail to lead the learner forward; they are every thing to the

* The learner should provide himself with a little instrument called a blow pipe, a magnet, a few small bottles for acids and tests, and a small steel mortar; with the assistance of these, much may be done by himself, but in the first instance, one lesson from a practitioner will be worth a volume of letter-press.

beginner, and may be considered as the first and second letters of the alphabet.

(To be resumed.)

To the Editor of the Mechanics' Register.

Sir,—I experienced, in common with many hundreds of my fellow members, the greatest satisfaction in listening to the able lectures of Mr. Partington on the interesting science of Optics, so fully reported in your instructive miscellany; and though I am aware that it was impossible for the lecturer to explain every minute circumstance connected with the subject, in the course of four lectures, there is one point upon which I should be happy to receive some information, and to which he did not advert, viz.

As all external objects are painted upon the retina of each of the eyes, why do we not see them double?

Should this question be seen by Mr. Partington, I shall feel greatly obliged to him for an answer, through the medium of the Mechanics' Register, and I have no doubt that his illustration of the subject will be very acceptable to your numerous readers.

Fredericus.

PATENTS FOR INVENTIONS EXPIRING NEXT WEEK.

We had determined, as a part of our plan, to publish an abstract of the titles of all the patents granted for new inventions at the time of their becoming public property, by the expiration of the term of fourteen years from their respective dates; but we have not, until this week, had an opportunity of carrying this part of our plan into effect, because no patent has before expired, since the commencement of our publication.

Joseph Hume, for a Sweeping Machine or Brush. Expire Feb. 28, 1825.

Robert Salmon, for Instruments for the Relief of Hernia, which instruments he calls "Salmon's New Royal Patent Artificial Abdomens." Expire March 4th.

Wm. Southwell, for Improvements on the Piano Forte. Expire March 4th.

Edw. Savage, for a Machine for Washing and Bleaching of Linen and other Articles, and for Cooking by means of Steam, with a Roaster or Oven, and Warm Closets attached, all heated by the same fire. Expire March 4th.

John Trotter, for Improvements on Musical Instruments. Expire March 4th.

Sarah Guppy, for a mode of erecting and constructing Bridges and Rail-roads without Arches or Sterlings, whereby the danger of being washed away by floods is avoided. Expire March 4th.

William Turner, for a Pike or Halbert, with Couteaux. Expire March 4th.

NOTICE TO CORRESPONDENTS.

Our numerous subscribers are respectfully informed, that in order to furnish them with a full and accurate report of the ballot for the election of officers of the London Mechanics' Institution on Tuesday next, and the proceedings of the Quarterly General Meeting on the following evening, with the report of the Board of Managers; and also to insert the communications of several correspondents, hitherto delayed for want of room, we shall publish a double number next week, the price of which will be sixpence.

The Editor of the Mechanics' Register presents his compliments to A. B., and begs to assure him that there is no other objection to the insertion of his remarks on Mr. Brougham's pamphlet than a desire to prevent a discussion to which the limits of the Register would prove very unequal. If articles of mere discussion from correspondents were admitted, there is no saying to what length they would go, and the Editor would have to choose between offending many persons, or giving up the pages of the Register entirely to correspondents. He begs to thank A. B. for his politeness, and to return the manuscript.

Answers to the second query at p. 107, have been received from the following persons: J. H. B.—C. Puttock—G. Morley—J. Taylor—and A Cheesemonger; but as they are all incorrect, or insufficient, the writers will please to send to the publishers of the Register for them, and return correct answers, together with their former ones, before the 10th March. They will find various observations for their guidance with their letters.

We feel much obliged to Mr. Edward Yenneson for the drawing with which he has favoured us, but beg to inform him that the explanation which accompanied it is not sufficiently explicit. Perhaps he will have the goodness to go more into detail.

R. S. has been received, but we cannot insert it, on account of the personality of some of the expressions.

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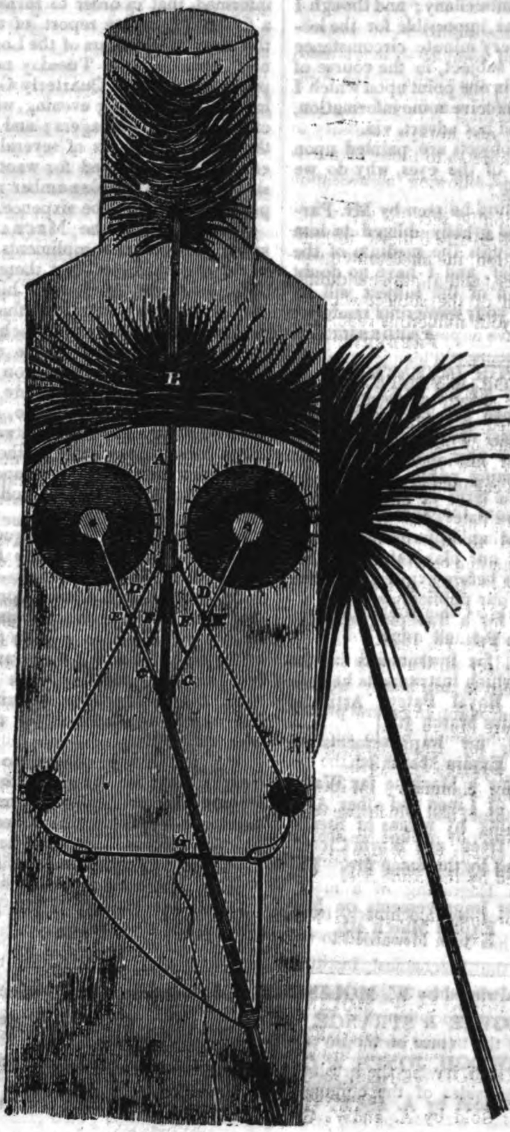
The London
MECHANICS' REGISTER.

No. 18.] SATURDAY, MARCH 5, 1825. [Price 3d.

IMPROVED METHOD OF SWEEPING CHIMNIES.



CLIMBING BOYS.

There is no class of the community so truly deserving of our commiseration as these poor little creatures, who are sent round by their unfeeling masters to sweep the chimnies of the metropolis. Let us imagine a human being, one of those whom God made in his own image, and to do him honor—possessed of the feelings of our nature—of all its susceptibilities—of its sense of kindness and of comfort—young, innocent, and friendless—the victim of the cupidity of traffickers in human blood—deprived of the portion of rest always necessary to mortals, but still more so to those of a tender frame and age—following an avocation abroad, attended with dirt, inconvenience, and danger—faring at home upon the coarsest food, and that, too, in inadequate quantity—surrounded with filth, and without a bed to rest his weary limbs upon; and in this picture we have a poor little sweep of the British metropolis. This picture is but an outline—a skilful hand would bring out its points, and shew the poor little fellow wringing his hands, and turning up his eyes to Heaven, whilst his inhuman persecutor stands beside him calculating the gains which he is to receive from the child's labour, and the mode of reducing his fare, which, however scanty, the master considers too abundant and expensive. It is a terrible thing that such a picture as this should be exhibited in the proudest and most enlightened city of the world, and that with all our boasted perfection in machinery we have hitherto put no invention in general practice, the object of which would be to supersede the use of these climbing boys for the purpose of sweeping chimnies. With such impressions as these, and which we doubt not are common to our readers, we shall not be required to apologise for presenting the public with an Engraving of a mode of sweeping chimnies by machinery, from a Drawing which has been forwarded to us by a Member of the Mechanics' Institution. We trust that a reference to the Engraving, and the following description will be sufficient to explain the nature of the invention.

A is a rod or staff, having the brush B extending to all the sides of the chimney, to the lower part are hinged two rods C C, having a wheel at the end studded with points; to prevent the friction from a tube that slides on the rod A are two other rods, D D, jointed to the rods C C at E E, the machine is kept extended to the corners of the chimney by the springs F F (or the sliding tube may be of sufficient weight to effect it), which are fixed to the rod A. Should the machine receive any check, it may be relieved by pulling the line G. The action of this machine, and those now in use, will be obvious, on reference to the Engraving.

NEW METHOD OF TRACKING VESSELS.

The success which has attended the efforts of the rail road projectors, in completing the companies necessary for carrying their projects into execution, has put all the canal proprietors upon the alert, and is likely to produce, as in almost all other cases of competition, considerable benefit to the public. Amongst those whom the rail road people have roused to exertion, is a Mr. Grahame, who seems to have the Canal interest much at heart; he has published some observations upon an improvement on water conveyance, which, if put into practice, would, he thinks, render rail roads perfectly unnecessary; and if Mr. Grahame has made his calculations correctly, we will honestly say, that he has made out a strong case, and that the formation of rail roads in districts where there are canals, would in all probability be an act of great folly on the part of the shareholders without proving of the slightest utility to the public. We have our doubts however, of the correctness of Mr. Grahame's calculations.

Mr. Grahame proposes to fix a steam engine in a boat, which would tow others, and which for that purpose should be fitted up with two rope wheels, drums, or cylinders, on which the engine might act alternately. To enable the engine to act, there should be erected or built on the bank of the canal or river, strong pillars with iron work and hooks, at each place where a stationary engine would, according to Mr. Thomson's plan, be necessary. From one to another of these pillars, two lines of rope or fine strong chain, would require to be stretched. Each rope would terminate on a pillar, and have at each end the necessary hooks for attaching it to these pillars, or to the cylinder or drum erected in the locomotive engine boat. The number of pillars on a canal need only be limited by the length of rope which the engine could with ease coil on the cylinder or drum.

In order to render his proposal more intelligible, Mr. Grahame says, "he shall suppose a canal fitted up in the manner proposed, with four strong pillars erected at the points A, B, C, and D. To each of these pillars are attached two ropes by hooks. The first set of ropes stretches from the point A to the point B, the second from the point B to the point C, and so on. The locomotive engine boat being about to start from the point A, one of the ropes is detached from the pillar A, and attached to one of the rope wheels, drums, or cylinders erected in the engine boat. The steam engine, being put in motion, causes the cylinder to revolve and coil up the rope, and in this way drags itself with the attached boats or rafts to the point B. At this point the first cylinder or drum is thrown out of gearing, and the power of the steam engine is brought to operate on the second cylinder or drum, to which is attached one of the ropes extending from the point B to the point C. In this way the locomotive engine boat again drags itself forward from the point B, to the point C. The first cylinder being in the mean time thrown out of gearing, the rope which had previously been coiled up on it being still attached to the pillar B, is as the locomotive engine boat advances to the point C, uncoiled from the first drum or cylinder, and then stretches from the point B, to the point C, to which it is attached, and thus replaces the rope which has been taken up on the other or second drum; this operation of uncoiling may be aided, if necessary, by the steam engine. In this way the locomotive engine boat, with its attached boats, moves on to the end of the canal at the point D. By the return of this or any other locomotive engine boat from the one end of the canal at the point D to the other at the point A, the ropes are replaced in their original position. Where turns or bends occur in the canal, the rope is kept in its place in the line of the canal by means of posts, in the way done on rail-roads, where fixed engines are employed."

Mr. Grahame then goes on to remark, that the present system of towing boats or vessels by steam with paddles, is very wasteful, and calculates that two boats upon his principle, or the locomotive steam engines of 10 horse power each, would drag in a year 270,000 tons, 10 miles, besides returning with the empty boats, at the expence of 1232*l*., or 1-10th of a penny a mile, which is considerably less than the charge for conveyance on rail roads. Mr. Grahame particularly recommends his plan upon rivers against the current, and there we doubt not it would be found most advantageous. We will now dismiss the subject by observing, that there is nothing new in the recommendation, for it is in daily practice on the Rhone near Lyons, and on a smaller scale in many parts of the Continent.

SCULPTURE AND ARCHITECTURE.

THE origin of Sculpture is of course very ancient, and its use among the Gauls, with whom it flourished, was, with the exception of the Roman states, more general than in any other country. The Celts or Gauls, before they had the least idea of the arts, erected in honor of their Gods, *Peu von* and *Dolmen*, which were rude pillars of stones piled upon each other in the form of an obelisk. The Dolmens have generally been considered as graves or altars upon which the Druids performed their sacrifices; one of these remarkable edifices still exists in Brittanny, and is much resorted to by the curious. The Romans having made themselves masters of Gaul, introduced there all the arts for which they had become famous, and was much astonished at the aptitude which they found among the vanquished, for all of them, but particularly sculpture, for which from the first, they appeared to have a predilection. In a short time, the Gauls became more expert in the art than their masters, and specimens of their taste were exhibited, which would not probably have disgraced the present period. When the French however, invaded Gaul, the arts fell back into the state of obscurity and barbarism from which they had emerged, and the specimens of sculpture, of the first year of the Monarchy, present only rough and incorrect forms, with an ill formed drapery. The great blow to the progress of sculpture, appears to have been in an edict issued by Charlemagne, in which he ordered its discontinuance; the Gauls had exercised all art and invention, in constructing their altars and the images which they worshipped, and being unable to gratify their mistaken ideas of religious duty, in the way consonant to their own feelings, they turned with disgust from an art, which upon such an occasion, they were not permitted to exercise; the subsequent intestine wars, and the continued ravages which were made by the Normans upon the French territory, entirely overthrew all that existed to denote the improvement which had taken place in society; and the art of sculpture, the existence of which seems incompatible with a slavish or unenlightened people, fell into disuse, and under the second race of the French kings never recovered. In this deplorable state it remained, until after the Crusades. The So vereigns and their retainers, who had performed valorous deeds, were desirous of perpetuating them, and therefore freely rewarded all who were able to comply with their wishes, but this improvement was of short duration.—Sculpture degenerated by degrees during the 14th century, until its existence was scarcely known, but under the reign of Francis the Ist., it threw off all the fetters which ignorance or tyranny had imposed upon it, and burst forth with a splendour which was the more dazzling, as it was utterly unexpected. At this period, the taste for sculpture became so marked, that there were not less than twenty who enjoyed a first rate reputation, and who succeeded by the exercise of their art, in realizing splendid fortunes. The first sculptors of real eminence, were Paul Ponce and John Gongon. Up to the reign of Francis I., the state of agriculture was as deplorable as that of sculpture; no buildings on earth could be worse designed or executed than the French; the houses were built like dove cots, and the chateaux of private gentlemen, exactly like fortresses. The architecture in use, until this period, was only a remnant of the architecture of the Romans of the lower empire; the forms of which had not been at all changed in passing to an uncivilized people. Under the reign of Charlemagne, the Lombardian architecture was introduced into France. This style was at once noble and imposing, and commanded respect and attention down to the 11th century, but the subsequent ravages of the Normans removed all traces of civilization, and of course sculpture fell into discredit.—At the time of the Crusades, the Arabian or Saracen architecture, which is very improperly called the Gothic, was introduced into France, and into many other parts of Europe—this style of architecture was employed for a long period, as the appearance of many of our churches will testify, and it was only in the 15th century, under the reign of Louis the XIIth, that the Arabian architecture was abandoned; after this, architecture was truly Asiatic, we had a style half Lombardian, and half Arabic; this however did not last long in France, where it was introduced, or in England, where many persons of wealth had introduced it. Under the reign of Francis I. of France, the Frenchmen seemed to soar, and the writings and buildings of the celebrated Palladio became generally admired. The monuments in France, the architecture of which was half Greek and Roman, were chiefly erected by Palladio; after this sculptor appeared several who were really eminent, viz. Lescot de Lorme, Perault Mansard and Blondel. These great artists purified the prevailing taste, brought back art to its true principles, and raised, and gave to it a dignity and an elevation which has never been surpassed.

LABOURERS' WAGES.

We have received several communications from correspondents in the country, on the subject of the low rate of wages now paid to agricultural labourers, as compared with the prices which they are compelled to pay for all the necessaries of life. One gentleman in Dorsetshire informs us, that the wages in that part of the country do not, on the average, exceed 6s. or 7s. per week, whilst bread is selling at 9d. the loaf, and potatoes at 6s. per sack. At the same time observing, that every article of clothing has risen in price, and that the few luxuries of life which a labourer is ever to command, such as tea and sugar, are rising in price so rapidly, that the use of them will soon be prohibited. This is indeed a distressing situation for the labourer, and one which calls loudly for a remedy on every possible ground, whether as it tends to the debasement of our fellow-creatures, in a country where industry and sobriety, in every class of life, ought to procure comfort and an independence from shame, pauperism, and inducement to crime; or as it promotes physical disease, against which we are bound to use every possible precaution, either as it regards ourselves or the community. Can it excite astonishment, that want and disease are become so prevalent among the lower orders of our population, when we consider the scanty proportion and the bad quality of the food which they are able to obtain? The wealth and fame of England are derived from the industrious classes, and yet how frequently do we see them suffering under privation and disease, whilst those for whom they labour enjoy abundance. We have seen the artisan and the mechanic so suffer, though, thank God! they are now (with few exceptions) in a state of prosperity; we have now to witness the misery of those who till the earth, and prepare for us those benefits without which the mechanic, the merchant, and the gentleman would have no existence. In other times the cause of this distress was national; we deplored, but could not apply an immediate remedy. It is more, we think, the result of a vicious system, which may be remedied, and with this impression we gladly quote the following pertinent and appropriate observations from the *Sherborne Mercury*, sincerely trusting that they will attract the attention which they deserve, and produce the effect for which they were intended.

" Much has been said respecting the poor laws, and the increase of the rates, and many have been the expedients proposed for alleviating this burthen imposed on the land; but, in our opinion, no considerable decrease can be expected in this branch of parochial expenditure, unless a change takes place in the mode of employing and paying the labourer. The truth is, those large sums which we see every year noticed as collected for the relief of the poor, are, in fact, for the relief of the farmer, who gives such low wages as to oblige his workpeople to apply for parochial aid; and thus he slips the burthen from his own shoulders, on which it ought to rest, on those of the land-owner, who is obliged to lower his rents in consequence, as it is said, of the pressure of the poor's rate upon his tenants; and so, in effect, *he* pays for the labour done on his estate, whilst another reaps the advantage.

" But that we may not trespass too much

on the patience of our readers, we shall sum up what we would recommend in a very few words:—Let the agriculturist pay his labourer a fair remunerating price for his labour, equivalent to the price of wheat, and let that be the standard of wages: if wheat be 8s. 6d. per bushel, let the labourer have that sum per week, and so in proportion to the value of corn, and then he will be enabled to procure a maintenance without the galling necessity of receiving parochial relief. Let this experiment be tried, and in a very short period it will be found that the poor's rate will amount to a mere trifle—the condition of the labourer will be ameliorated—his spirit, now sunk under the load of his necessities, will be revived—and he that soweth and he that reapeth will rejoice, together with him who gathereth the increase into his barn."

IMPORTANT INVENTION.

We have before had occasion to speak in the Register, of a very ingenious invention, by a person named Roberts, of Bolton, in Leicestershire, by means of which he is able to enter any building on fire, through a volume of suffocating smoke. The description of this invention, which was supplied to us at the time by the local prints, was, however, by no means sufficiently explicit to do justice to the inventor. We have pleasure, therefore, in copying the following from the *Manchester Guardian*, of Saturday last.

"On Wednesday last Roberts repeated his experiments in presence of a very considerable number of gentlemen, with the same complete success as on the former occasion; and, what fully proved that there was no trick or imposture in the plan, a number of persons besides the inventor, (we should think near a dozen) at different times entered the stove (which was filled the densest smoke that can be conceived,) and remained shut up in it for periods quite sufficient to prove that the apparatus completely answered the purpose for which it was intended. One of the great advantages of the invention is its extreme simplicity. The apparatus consists of a leathern head-piece, which completely covers the head and face of the wearer, and buckles tight round his neck, having a piece of glass before the eyes; and opposite to the mouth is inserted one end of a leathern tube, the other end of which hangs nearly to the ground, and is attached to a tin funnel. The mode in which it operates is this: The fresh air which finds its way into a room on fire, (being cooler and consequently heavier, than the smoky atmosphere of the room) lies near the floor, and is inhaled by the wearer of the apparatus through the tube; but he would also occasionlly inhale considerable quantities of smoke, were it not for a contrivance, in which the principal merit of the invention consists. The tin funnel which we have already mentioned, is filled with moistened sponge, and the air cannot find its way into the tube, except by passing through the pores of that sponge, by which means the gaseous and other matters which float about in the air, and form smoke, are condensed by the water, and the air passes almost entirely pure, to the mouth of the wearer of the apparatus. Of course it is necessary that the head-piece should fit so closely round the neck as entirely to exclude air in that quarter: but in this respect some of them were rather deficient, and the wearers were a little incommoded by the smoke which found its way under the leather; but that is not the slightest drawback on the merits of the invention. Yesterday, we understand, the inventor tried his experiments afresh, in the presence of the directors of the Manchester Assurance Company, and of Mr. Dalton, Dr. Henry, and other scientific gentlemen, who attended at the request of the directors, with the view of scrutinising the merits of the invention. All the parties were highly gratified with the result of the experiment; and a meeting of the directors will be held on Monday, to consider the propriety of granting a sum of money to Roberts, for the invention and publication of his apparatus. We trust that their example will be followed by all the fire offices in the kingdom; and that the poor inventor will be amply and liberally rewarded for his useful discovery."

ADVENTURES OF A POUND OF COTTON

The following history of a pound weight of manufactured cotton, will shew the importance of the trade to the country in a very conspicuous manner. The wool came from the East Indies to London; from London it went to Lancashire, where it was manufactured into yarn; from Manchester it was sent to Paisley, where it was woven; it was next sent to Ayrshire, where it was tamboured, afterwards it was conveyed to Dumbarton, when it was hand-sewed, and again returned to Paisley, when it was sent to a distant part of the county of Renfrew, to be bleached, and was returned to Paisley, whence it was sent to Glasgow and was finished. It is difficult to ascertain precisely the time taken to bring this article to market; but may be pretty near the truth to reckon it three years, from the time it was packed in India, until in cloth it arrived at the merchant's warehouse in London, whither it must have been conveyed at least 10,000 miles by sea, and 920 by land, and contributed to reward no less than 150 people, whose services were necessary to the carriage and manufacture of this small quantity of cotton, and by which the value has been advanced two thousand per cent

THE MOCKING BIRD.

The plumage of the American Mocking Bird, though none of the homeliest, has nothing gaudy or brilliant in it, and had he nothing else to recommend him would scarce entitle him to notice; but his figure is well-proportioned and even handsome. The ease, elegance, and rapidity of his movements, the animation of his eye, and the intelligence he displays, in listening and laying up lessons from almost every species of the feathered creation within his hearing, are really surprising, and mark the peculiarity of his genius. To these qualities we may add that of a voice, full, strong, and musical, and capable of almost every modulation, from the clear mellow tones of the Wood Thrush, to the savage scream of the Bald Eagle. In the measure and accents he faithfully follows the originals; in force and sweetness of expression he greatly improves upon them. In his native groves, mounted on a bush or half-grown tree, in the dawn of every morning, while the woods are already vocal with a multitude of warblers, his admirable song rises pre-eminent over every other competitor. The ear can listen to *his* music alone, to which that of the others seem a mere accompaniment; neither is this strain altogether imitative. His own *native* notes, which are easily distinguished by such as are well acquainted with those of the various song birds, are bold and full, and varied seemingly beyond all limits. They consist of short expressions of two, three, or at the most five or six syllables, generally interspersed with imitations, and all of them uttered with emphasis and rapidity, and continued with undiminished ardour for half an hour at a time. His expanded wings and tail glistening with white, and the buoyant gaiety of his action arresting the eye as his song most irresistibly does the ear, he sweeps round with enthusiastic extacy, he mounts and descends as his song swells or dies away. Whilst thus exerting himself, a by-stander destitute of sight, would suppose the whole feathered tribe had assembled together on a trial of skill, each striving to produce his utmost effect, so perfect are his imitations. He many times deceives the sportsman, and sends him in search of birds that are perhaps not within miles of him, but whose notes he exactly imitates, even birds themselves are frequently imposed on by this admirable mimic, and are decoyed by the fancied calls of their mate or dive with precipitation into the depths of thickets at the scream of what they suppose to be the sparrow hawk. The mocking bird loses little of the power and energy of his song by confinement. In his domesticated state, when he commences his career of song, it is impossible to stand by uninterested, he whistles for the dog, Cæsar starts up, wags his tail and runs to meet his master. He squeaks out like a hurt chicken, and the hen hurries about with hanging wings and bristled feathers clucking to protect her injured brood. The barking of a dog, the mewing of the cat, the creaking of a passing wheelbarrow, follow with great truth and rapidity. He repeats the tune taught him by his master, though of considerable length, fully and faithfully. He runs over the quiverings of the Canary, and the clear whistlings of the Virginia nightingale, or red bird, with such superior execution and effect, that the mortified songsters feel their own inferiority, and become altogether silent, while he seems to triumph in their defeat, by redoubling his exertions. This excessive fondness for variety, however in the opinion of some injures his song. His elevated imitations of the brown thrush, are frequently interrupted by the crowing of cocks; and the warblings of the blue bird, which he exquisitely manages, are mingled with the screaming of swallows, or cackling of hens; amidst the simple melody of the robin, we are suddenly surprised with the shrill reiterations of the whip-poor-will, while the notes of the killdeer, blue jay, martin, and twenty others, succeed with such imposing reality, that we look round for the originals, and discover with astonishment, that the sole performer in this singular concert is the admirable bird now before us. During this exhibition of his powers, he spreads his wings, expands his tail, and throws himself around the cage in all the extacy of enthusiasm, seeming not only to sing but to dance, keeping time to the measure of his music. Both in his native and domesticated state during the *solemn stillness of night*, as soon as the *moon rises in silent majesty*, he begins his *delightful solo*, and serenades us *the live long night*, with a full display of his vocal powers, making the whole neighbourhood ring with his imitative medley.

MECHANICS' INSTITUTIONS.

The Institution at Norwich, continues to increase in numbers, as also that at Ipswich The contributions have been extensive and liberal, at Dublin the Mechanics have found great benefit from the Institution, and in Cork the intention of forming a similar establishment was no sooner announced than more than one hundred mechanics enrolled themselves, and were soon followed by others. Mechanics' Institutions are now forming in many parts of Ireland, where they cannot fail to produce beneficial effects; indeed, we doubt not that they will tend to inculcate a love for the moral and social qualities, and an ardent attachment for the constitution.

At the last meeting of the Mechanics Institution at Newcastle, which was very numerously attended, a valuable paper on Historical Architecture, by Mr. Dobson, was read by one of the Secretaries, which excited great approbation. The thanks of the meeting were voted to Mr. D., and a hope expressed that he would make it the first of a series of papers on similar subjects. Mr. Dobson also presented the Society with all the parts hitherto published of "Examples of Ornamental Sculpture in Architecture, drawn from the Originals of Bronze, Marble, and Terra Cotta, in Greece, Asia Minor, and Italy, in the years 1818, 1819, 1820, and part of 1818, 1819, 1820, and part of 1821, by Lewis Vulliamy, Architect, engraved by Henry Moses," promising to furnish the remainder as they issue from the press. Three persons were elected members of the society, and 29 individuals were proposed as candidates for admission on the next monthly meeting. A Drawing Class has been established, which is conducted voluntarily by members of the Institution. A Class has also been established for studying the use of the Globes. These Classes, it is hoped, will tend greatly to the advancement of knowledge in their respective branches, as the students are applying themselves with the most pleasing alacrity.

A private meeting of mechanics took place a few days ago at Hull, to take into consideration the practicability of establishing an Institution for that place, when it was unanimously resolved to attempt the accomplishment of so desirable an object, and a provisional committee was chosen to proceed forthwith.

On Thursday se'nnight, Mr. Lockwood delivered at the Leeds Mechanics' Institute the concluding lecture of his course on the Steam Engine. His apparatus was excellent and in good order; and his locomotive engine, which travelled on a toothed railway, round one of the lamps, was highly imposing. The Hall was filled to overflowing.

The *Manchester Guardian* says, "The Mechanics' Library was opened to the subscribers to the Institute on Monday last; and a large number of persons have already come forward, since that time, and paid subscriptions to entitle them to take out books for perusal. The library, at present, consists of about six hundred volumes.

The *Leeds Mercury* corrects a typographical error in Mr. Brougham's Pamphlet, when speaking of Messrs. Gott and Marshall, the chief promoters of the Leeds Mechanics Institution. In the Pamphlet the name of *Scott* was printed. The *Mercury* also states, that since Mr. Brougham's Observations were written, the number of members has increased from 282 to 460.

It affords us much satisfaction to state, that communications have recently been received by the Committee of the London Mechanics' Institution, from Portsmouth, from Ross in Herefordshire, and from Bristol, announcing the intended formation of Mechanics' Institutions in those places; and we are also enabled to lay before our readers the following extract from the *Cork Commercial Courier* of the 24th ult. which, we have no doubt, will be perused with considerable pleasure.

"We have great pleasure in perceiving that the interest excited by the intended formation of a Cork Mechanics' Institute continues still unabated, as fully appears from the list of Donations which have been received.

"We observe that the Committee appointed from the Public Meeting to prepare a series of Rules for the Institute, are most indefatigable; they have held several meetings, and are considerably advanced in their labours, though the variety of topics which these regulations must necessarily embrace, and the perspicuity with which they are endeavouring to render them so that they may be perfectly comprehended by all the members, have taken more time than at first was anticipated, and obliged them to postpone the General Meeting to the 8th of March, when it is intended to submit these rules for approval, and which we trust will not be less gratifying or numerous than the preceding one.

"A Deputation consisting of Messrs. W. Crawford, jun. J. Murphy, J. Lane, T. Deane, and W. Hall, have during the past week waited on several gentlemen, whose other avocations prevented from making full enquiry into the nature of, and essential advantages likely to result to the city at large from the proposed Institute, we have been given to understand, that their urbanity in explaining its objects, and strength of reasoning in pointing out its beneficial tendency, have been met by those to whom they addressed themselves with a cheerful acquiescence and liberal co-operation.

"The citizens of Cork, not merely of the present generation, but of those yet unborn, will owe a debt of gratitude to the exertions of those Gentlemen, and we would humbly suggest to those of opulence and station in the community, whose names we have not yet had the pleasure of seeing among the contributors, but who, we have no doubt, have every intention of becoming so, as well as the respectable tradesmen, who should feel deeply interested in this measure, to lighten the work of those gentlemen, by entering their names in either of the books at the Club-Houses, the Commercial Buildings, the Chamber of Commerce, and the Mayoralty.

"We have the gratification to add, that his Grace the Duke of Devonshire, on seeing a report of the measures already adopted, without waiting for any application, has expressed his intention of subscribing to the Funds, and that it is probable his Grace will consent to become the Patron of the Institute."

RAILWAYS.

Having devoted a considerable portion of the REGISTER to this subject, a circumstance which proves that we, at least, consider it important, we owe some apology to our subscribers for having omitted to notice some very interesting experiments recently performed by a Mr. Roberts, of Manchester. We have now before us the *Manchester Guardian*, containing a very full account of his proceeding, which we shall probably give next week, with an illustrative engraving; at present, however, we must confine ourselves to a brief statement. The chief object of Mr. Roberts appears to have been to devise means for measuring accurately the friction of a carriage moving over a railway, but it occurred to him, that the difficulty would be obviated, if the railway were made to move under the carriage. When this idea once presented itself, it was easy to reduce it to practice. Mr. Roberts procured a cast iron drum or flat hoop, six inches broad, and three feet in diameter, which was made to revolve vertically (like a grindstone) by a pulley and strap. This served the purpose of a railroad. A small waggon with four cast iron wheels was placed exactly on the top of this drum, and attached on one side to an upright post, forming part of the wooden frame which supports the drum. It was attached to this post by one of Marriott's patent weighing machines, for the purpose of measuring the friction. To insure greater accuracy, a tempering screw was employed by which the centre of the waggon could be kept at all times exactly over the axis of the drum; in order that no part of the weight of the waggon might be blended with the pressure produced by the friction. As a farther precaution, a wooden board was so placed on one side of the waggon as to prevent the disturbing action of any current of air generated by the motion of the drum. Now, if the drum is made to revolve with any velocity, say four miles an hour, and the waggon is held in its place, it is perfectly obvious that the wheels will turn on the surface of the drum, precisely in the same manner as if the waggon had moved along a flat railroad; and the friction will be the same excepting a minute addition occasioned by the curvature of the drum, but which will not affect the *relative* friction at different velocities. This will be accurately exhibited by the index of the weighing machine, against which the waggon pulls with a force equal to the friction. The experiment has this grand advantage over those made on level roads, that the resistance of the air is entirely got rid of.—The apparatus being adjusted, and the waggon loaded with 50 pounds (including its own weight), the periphery of the drum was made to revolve "at different velocities, varying from 2 *to* 24 *miles an hour*:" but "in every case *the friction as indicated by the weighing machine, was precisely the same*." And that there was nothing in the construction of the apparatus to produce a fallacious result was evident from this, that though no increase of speed affected the index of the weighing machine in any degree, it immediately shewed an increase of friction, when an addition was made to the *weight*. The experiments we consider as of very great importance to every railway company in the kingdom. They fully confirm the doctrines laid down, paradoxical as they seemed to many, and justify our most sanguine anticipations of the advantages to be derived from railway communications. To use the words of the able journal which contains the report of Mr. Roberts's experiments, there is no doubt that "goods may be conveyed from Manchester to Liverpool with very nearly the same expenditure of steam, whether they are carried two miles, or four miles, or 20 miles an hour."

FAMILIAR LESSONS ON MINERALOGY.

(*Resumed from page* 271.)

The exterior form of fragments, fracture, nice discrimination, tact, &c. belonging to minerals, cannot be known as it were by magic, or attained all at once, but afford but little information to the beginner; and indeed for him, what are considered the best books may be deemed the worst, as they often disgust by their prolixity, and by their continued use of hard phrases and technical terms almost impossible for him to understand. Such works, though highly useful to the connoisseur and the experimental mineralogist, are quite unfit for the generality of those who are unacquainted with minerals.

Let it be supposed the learner has received some shining yellow pyrites*, which, being very heavy, he believes to be gold, or to contain gold.

Question.—How am I to proceed to know what it is?

In answer to this question, let the learner attempt to cut the mass with the point of a knife; if it is gold it will be soft, and may be cut like lead; or if he strike it gently with the small end of a hammer it will be indented, gold being malleable; if he melt a small particle with the blow-pipe, its colour will remain the same; but if it be brittle and hard to the knife and hammer, it is a proof that it is not gold; or if he place a

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* How many, having met with this common substance, both abroad and at home, have treasured it with the greatest secrecy, believing they had discovered a gold mine, &c.

few fragments upon a hot fire-shovel, or under the flame of the blow-pipe, and the sulphur burn away, leaving the scoria that is attracted by the magnet, this proves it to be a combination of sulphur and iron, which is answering this important question with great facility: or if he put a few of the particles into a watch-glass, and drop a little acid upon it, and hold it over the flame of a candle or lamp until it boils, if it is gold no alteration will take place; but if not, an effervescence and change of colour will be the result, which shows that the substance is acted upon by acid; the contents may be thrown into a glass of water, into which if he let fall a few drops of prussiate of potass, the liquid will become a beautiful blue. The iron of the pyrites being dissolved by the acid, and held in solution in the water, is as it were regenerated, and precipitated in the form of Prussian blue, after which the water becomes again clear. This elegant and easy proof cannot fail to give pleasure to the learner, and shows that the steps to the attainment of some knowledge of minerals is by no means difficult, and will not fail to prepare and encourage his mind for other experiments.

Gold is generally obtained from the alluvial soil, in small particles called grains, or gold dust, seldom so large as a pin.

The gold mines of Brazil and Africa are on the surface; the simple act of washing peculiar places separates the gold from the gravel, and by this means great quantities are found. In Brazil alone, about twenty tons weight are annually procured, which forms a large share of the circulating medium of Europe. The mining district is called Minas Gerais; the reader will learn with surprise, that it does not contain one subterraneous excavation. What is there termed a mine, is a peculiar place or superficies of greater or less extent, where the surface is raked from, or dug to the solid rock, which consists of rounded pebbles, earthy matter, sometimes precious stones, besides gold and diamonds, of which it is the great receptacle.

In Africa gold dust is an article of commerce, and considerable quantities are exposed for sale. It is often adulterated with those varieties, which are the nearest to it in colour, and not unfrequently with brass filings, which the merchants appear not to know how to detect, and from the want of this sort of knowledge many have suffered great loss; some of the better informed negroes make a trade of "trying gold," and are called "Tryers." Merchants and captains pay them particular attention and respect, when they are employed on this business, as from their slight knowledge they save their employers from imposition; on these days the poor negro is admitted to the captain's table.

Gold, if impure, may be detected by nitrous acid, as before described.

Platina is found also in grains in the same way as gold; it is of a white colour, more like silver, hence called platina, being the diminutive of plata, meaning silver in the Spanish language.

Pyrites often contains a large portion of arsenic, and is then called arsenical pyrites. Its colour is pale yellow, almost white, and may be known by its white fumes and peculiar smell of garlic when under the flame.

Rounded stones from the gravel pit, or gathered from the sea-coast, may, with a little attention, be generally known and determined.

How many pick up pebbles of crystal, believing them to be diamonds, and so little are diamonds known, that it is difficult to convince them they are not so, even after they have been cut and polished.

As it is well known that diamonds cut glass, many imagine that a crystal or a pebble, gathered from these sources, and hard enough to *scratch* glass, must be a diamond, or *something approaching to it*. This is not to be wondered at, when it is considered how few have seen rough diamonds, or have ever reflected that there is a wide difference between *scratching* glass and *cutting* it.

(*To be resumed.*)

BRITISH LACE TRADE.

There is nothing more cheering to contemplate than the various improvements and discoveries which are daily taking place throughout the British empire, and as constantly adding to its unexampled commercial prosperity, and extending its gigantic resources. Among the many novelties of the day, a most important one, as regards the British lace trade, is, at this moment exciting a strong sensation in the minds of all who are interested in this branch of manufacture, and bids fair to give a great additional impulse to the consumption of the beautiful article which forms its object. For this discovery the public is indebted to the genius of Sir Robert Peel. A small lace manufactory has recently been established, at Tamworth, by the Messrs. Willcox, and was, a short time since, honoured by a visit of inspection from the worthy bart. His powerful and sagacious mind instantly suggested the idea of printing on the lace, and the experiment instituted under the direction of that excellent practical chemist, Mr. Alsop, of the Bonehill works, has answered the most sanguine expectations. Some exquisitely beautiful specimens of lace dresses, printed in fast colours, were, last week, exhibited in Nottingham, from the house of Edmund Peel and Co., and excited great interest and admiration. The necessary steps have already, it is said, been taken to secure, by patent, to the company, the exclusive advantages of this novel and elegant invention. Differing, as we do, from Sir Robert Peel, on many points of political conduct and opinion, yet cannot we suffer to pass, unimproved, the present opportunity of offering our feeble eulogy to the character of that extraordinary man, who, after having, by a life of successful enterprise and exertion, raised to a proud elevation the fortunes of his family, and incalculably extended the commerce and resources of his country, deems it no degradation to descend from the splendid retirement of his later age, and suggest to others, less gifted and less experienced than himself, improvements, which, while productive of great national benefit, may contribute to atchieve for his own reputation, honours more bright and permanent than wealth can purchase, or all the vaunted pride of ancestry confer.—*Lichfield Mercury*.

THE CONSERVATORY OF ARTS.

The public and gratuitous lectures of this admirable and useful establishment have been resumed this year, under the happiest auspices of increased success. M. Dupin has been appointed Professor of Mechanics applied to the arts; M. Clement Desormes, of Chemistry and Physics applied to the Arts; and M. Say, of Industrial Economy, or of the principles of Political Economy applied to the useful Arts. Two ameliorations have taken place in these courses of lectures, very favourable to the national prosperity. The lectures are delivered at half-past eight o'clock in the evening, when the classes of artizans and working mechanics have completed the labours of the day, and consequently are at leisure to attend to the acquirement of knowledge without injury to their interests, and the Professors distribute a lecture in advance, a bulletin of the matters to be treated in the next. M. Dupin, following the example of English Professors who prepare before the commencement a brief analysis of the subjects to be treated in each lecture, is writing a treatise of practical geometry and mechanics, adapted to the comprehension of artizans. This instruction is not, however, offered altogether gratuitously to those who wish to avail themselves of it, two sous being required for each bulletin. This very small contribution is sufficient to obtain a moral result of great importance; they put more value on a paper which is thus acquired, preserve it with greater care, and are more anxious to impress its contents on their understanding.—*Rev. Enc.*

PORTABLE FIRE ENGINES.

So numerous are the fires in this vast city, so extensive the calamities of life and property, which result from them; so inefficient all the precautions which have been taken, and the remedies which have been applied, that the subject is become one of deep and painful interest to the man of science, of philosophy and of humanity. It is always, therefore, with delight that we turn to any thing calculated to rouse the community to some exertion for the suppression of an evil so frequent in occurrence, and so destructive in its consequences. The following observations and statements, from that able paper, "*The Scotsman*," have been read by us with much interest, particularly as they remind us of the vast superiority of the French police, and in the dexterity and promptitude of its body of *Sappeurs Pompiers*, over the confused assistance given at fires in England by a mixed crowd, amongst whom we too frequently find wretches who avail themselves of such opportunities to plunder the unfortunate. The *Scotsman* has not said, what in justice to the French government we will say, that there is rarely an instance of a robbery in Paris at fires even in the most confined quarters, and that such are the precautions taken by the police that every man who is near is compelled to assist in the efforts to extinguish a fire, under fixed and invariable rules, which prevent confusion, and consequently much additional calamity. A peer, a prince, nay, the sovereign himself, were he passing at the time, would be compelled to lend his assistance, and to form one of the chain which is established for the supply of water from hand to hand (there being no water laid on in the streets as in London), and for the protection of property.

The *Scotsman* says, "We have had an opportunity of taking a hasty glance at some documents which the committee of General Commissioners of Police have obtained through the Chevalier Masclet, Consul for France. They relate to the Parisian system of extinguishing fires; and as far as we can judge, nothing can be better arranged, or more completely adapted to the end in view. We think our readers will join with us in opinion when we mention, that although the number of fires in Paris be extremely large, (being 788 in the year 1823, and averaging 540 in the 19 previous years) yet such is the dexterity of the corps of Sappeurs Pompiers, that the whole annual amount of loss by fire is estimated at one part in 23,000, so that the number of houses in Paris being about 26,000, there is less than one house annually destroyed out of 788 which take fire. We were present also at the trial of a portable fire engine, made here under the direction of one of our fellow-citizens. We were much gratified in observing its simplicity and its great power, and not a little struck in perceiving its close conformity in all essential points with the engines described in the French documents; while we know that it had been *completed and tried* before the person who gave the drawings had had an opportunity of knowing any thing whatever of the French form of construction.

IMPROVEMENT IN THE CONSTRUCTION OF ORGANS.

Hitherto, every note in the organ has demanded a separate pipe; and some pipes are as long as thirty-two feet, with bulk in proportion. Thus every additional bass octave or stop, desirable for increase of dignity or grandeur of effect, has involved great space in the sound-board, and much expense. Reflecting upon this restraint to all the variety of harmonious expression which one pair of hands might otherwise produce, Mr. E. Hodges, an organist of Bristol, (an equally restless inquirer in mechanics as in sweet sounds,) conceived that, like the flute, one tube, of whatever large capacity, might possibly be the vehicle of at least five, six, or seven additional notes or tones; and having made the experiment on a small scale, he communicated the result to an ingenious organ-builder, Mr. Smith, whose first public application of the principle was made by the addition of two notes to one of the largest pipes in the organ of St. Mary Redcliffe, Bristol. The whole of that already stupendous monument is now about to receive the benefit of Mr. Hodge's discovery; and Mr. Smith's operative brethren throughout the musical world will doubtless freely share in the gains; for these gentlemen have severally declared themselves indisposed to procure the privilege of a Royal patent.

To the Editor of the Mechanics' Register.

SIR,—I send you the enclosed brief account of the Tea Plant, which if you think worthy of a place in your very useful work, is at your service; but I wish you distinctly to understand, that I do not claim it as original, but merely as a compilation from various works, and chiefly from a small book which I have in my possession, the author of which I do not know.

I remain, Sir, your obedient Servant,
E. X.

A BRIEF ACCOUNT OF THE TEA PLANT.

Tea is the leaf of a shrub which grows in several provinces of China, Siam, and Japan. It is planted in rows, and pruned to prevent luxuriancy. "Vast tracts of hilly land (says Sir G. Staunton) are planted with it, particularly in the province of Tochen. Its perpendicular growth is impeded for the convenience of collecting its leaves, which is done first in the spring, and twice afterwards in the course of the summer. Its long and tender branches spring up almost from the root, without any intervening naked trunk. It is bushy like a rose-tree, and the expanded petals of the flower bear some resemblance to that of the rose."

"The tea shrub must have reached three years growth before the leaves are fit to be plucked, which it then bears in plenty, and very good ones. In seven years it rises to a man's height; but as it grows but slowly, and bears but few leaves, it is cut down quite to the stem, the leaves it bore having been previously gathered. The next year many young twigs and branches grow out of the remaining stem, which bear leaves in such abundance, as to amply compensate for the loss of the former shrub. Some defer cutting them down till they are ten years old.

"It is generally believed that there is but one species; the difference depending on the nature of the soil, culture, age, and manner of drying; for it has ever been observed, that a green tea tree planted in a black tea country, will produce black, and on the contrary; and that on examining several hundred flowers, brought from the black and green tea countries, their botanical characters have always appeared uniform.

"No particular gardens or grounds were formerly allotted for this plant; it was cultivated round the borders of the fields, without any regard to the soil; but it has since become so important a branch of Chinese commerce, that they have formed regular plantations of it in various parts of their extensive empire. The soil selected is generally of a strong quality, which requires little or no preparation.

"When the tea plant has reached the growth of three years, the leaves are collected very carefully one by one, lest they should be torn. The first gathering (which is called Ficki Tajua, or powdered tea, because the Japanese grind it to powder, and dip it in hot water) begins in the middle of the first moon, immediately before the vernal equinox. These leaves are not fully opened, being only two or three days old; they are called the flower of the tea, and fetch the best price.

"The second gathering called Tootsja, or Chinese tea, because it is infused and drank in the Chinese manner, begins about a month after the first; it is often sold for the first, especially by those who carefully pick it up, and separate the smallest and tenderest leaves. The third and last gathering, called Bau Tsjaa, is in June, the leaves are sorted into three different classes, according to their quality. It is said that the greatest quantity imported into Europe, is of the third or grossest sort, and of this the natives in general drink.

"The first process is that of making holes in the ground at short distances from each other, in a straight line, this is done by labourers with an implement for the purpose, having a long handle and sharp pointed head. After the ground is prepared, another class of labourers are employed in sowing the seed. This is done by putting a few of the seeds, varying in number from six to twelve, into each of the holes, which are generally four or five inches deep in the ground, they are then watered and vegetate with little further care.

"The tea leaves when gathered are prepared in Tsusi, as they are termed, that is, public drying houses or laboratories, built for the purpose, and where every person may bring leaves to be dried. There are, in these public laboratories, 1st, Several ovens, sometimes as many as twenty, each of which is three feet high, with a wide, flat, square or round iron pan at the top; the side, over the mouth of the oven, is bent upwards, for the person who attends the dying, who stands on the opposite side secure from the fire, and turns the leaves.—2nd, One or more low but very long tables, covered with fine reed mats, on which the leaves are to be rolled.—3rd, A number of workmen, some of whom are employed in attending the dying of the leaves by the oven, and others sifting cross-legged by the tables, to roll the leaves as they come hot from the pan. Sir G. Staunton in his description, says,—"young women are employed in rolling the leaves."—The leaves must be dried when fresh, and they are generally brought to the laboratory the same day they are gathered. The process of drying is thus performed:—Some pounds of the leaves are put into the iron pan, which, by the fire underneath, has already been heated to a degree, that the leaves when they are put in may crackle at the edges of the pan. The fire in the oven must also be so regulated, that the man attending the drying pan may be able to stir up the leaves with his hands, which he continues to do till they become so hot, that he cannot handle them any longer; the instant they become so, he takes them out of the pan with a shovel, broad at the mouth like a fan, and pours them upon the mat in order that they may be rolled.

"It may be here necessary to refute a very common prejudice already noticed, viz. that the leaves of tea are dried on copper plates, and consequently must be in some degree poisonous, for chemistry has now ascertained, beyond the possibility of a doubt, that no materials but iron and earthenware are used for the drying of tea; and that were it tinctured with the slightest particle of copper, it would easily be detected by the chemical experiments that have been made on it.

"The method of preparing the leaves of tea is nearly the same, both by the Japanese and Chinese, the only difference appearing to be, that the latter expose the leaves to the steam of boiling water, or put them in soft water for half a minute, a process not observed by the Japanese. Each person takes before him a quantity of the leaves, and whilst they are hot, immediately commences rolling them with the palms of his hands, until they are cold, by which means they are equally curled. They then undergo a second drying very slowly and deliberately, for fear of breaking the curls. After this they are again delivered to the rollers, and if the leaves are not fully dry, the process of drying and rolling is repeated a third time. Great care is taken in the second and third drying, that the heat of the fire be lessened in proportion as the leaves have lost their juices and humidity, or they would be burnt or turned black.

"For the more valuable teas, the process of drying and rolling is repeated four or five, or even seven times, thus drying the leaves more gradually, by which means they preserve that lively and agreeable green color which distinguishes the best teas. The pans are always washed clean with hot water between each drying, because a sharp juice sticks to the edge and bottom of the pan, which is apt to discolor the leaves. The leaves are next spread on the floor, or on tables covered with mats, and are sorted into classes, by which the grosser leaves, and such as are not well curled or too much burnt, are separated from the rest. The dust and smaller leaves are also separated by means of sieves. It may be necessary to observe, that the above description more particularly refers to green teas, not so much care being taken in curling and preserving the color of black teas. The leaves of Ficki tea are dried to a much higher degree, as it is always used in powder, and some of these leaves, which are very young and tender, are put into hot water, and then laid on thick paper, and so dried without being curled at all. When the tea has been dried, it is packed in earthen vessels or baskets; and after it has been kept some months in these, it is taken out and again dried over a very gentle fire, to deprive it of all its humidity. It is preserved from the air in earthen or porcelain vessels, until it is packed into boxes lined with lead, covered with a species of fine tissue paper, in which manner it is exported. The Chinese preserve the finest sorts of teas in coned vessels made of tutenague, tin, or lead, covered with neat matting of bamboo, until intended for exportation.

"The Chinese infuse their tea in boiling water as we do, and it is said, that when they have drawn off the proper quantity, they prepare the leaves with sugar, oil, and vinegar for an evening sallad! The Japanese reduce their tea to a fine powder, which they dilute with warm water, until it has acquired the consistence of their soup, this makes the tea of a more rough, earthy, and disagreeable taste. Their manner of serving it it is curious, they place before the company the tea equipage, and a box in which a quantity of finely powdered tea is contained; the cups are then filled with warm water, and taking as much powder as will lay on the point of a knife, they throw it into such of the cups, and stir it till the liquor begins to foam; it is then presented to the company, who sip it while it is warm; this custom also prevails in some parts of China. Tea does not appear to have been introduced into Europe until the year 1606, when the Dutch imported a quantity, for which they exchanged dried sage with the Chinese, who were very fond of it, and called it the wonderful European herb, attributing to it numerous virtues; the rate of barter was four pounds of tea for one pound of sage. (Guthrie in his Grammar of Geography, asserts that the Portuguese were the first who introduced it into Europe.) For such as they could not get in exchange, they purchased at 8d. or 10d. per pound, and on bringing it home, they readily sold it in Paris for 30 livres, and some as high as 100 livres per pound. It was introduced in this country before the restoration, as mention is made of it in the first act of Parliament that settled the excise on the King for life in 1660. Catherine of Lisbon, wife of Charles the 2nd, rendered the use of it common at his court.

EFFECTS OF THE SOUTH SEA BUBBLE.

Gay, in that disastrous year, had a present of some South Sea Stock from young Craggs, and once supposed himself to be master of 20,000*l.* His friends advised him to sell his share; but he dreamed of dignity and splendour, and could not bear to obstruct his own fortune. He was then importuned to sell as much as would purchase him a hundred a-year for life, "which," says Fenton, "will make you sure of a clean shirt and a shoulder of mutton every day." This counsel was rejected, The profit and principal were lost, and Gay sunk under the calamity so low that his life became in danger. Samuel Chandler, the learned nonconformist divine, lost his whole fortune in the South Sea bubble, so that he was under the necessity of opening a bookseller's shop in the Poultry, which he kept two or three years, whilst he continued to discharge his duty as a minister.

GEOLOGICAL CURIOSITY.

The Clarksburg Intelligencer states that on the premises of David Hall, about five miles and a half from Booth's Ferry, North America, a company have been engaged for some time in boring for salt water. They commenced in the bed of Elk Creek, upon a solid rock; at the distance of about twenty-four feet, they struck a large vein of beautiful water, exceedingly cold, and a little brackish to the taste, which discharges itself at the top of a gun inserted into the rock, and about eighteen inches high. At the distance of about 118 feet, they passed through a rich vein, or bed of copper, about four feet in thickness; and at the depth of about 180 feet, they opened a strong vein of wind, which instantly found vent at the top of the well in a tremendous roaring and spouting of water, throwing up perpendicular columns of that element, to the distance of thirty feet! Although the diameter of the well is not more than two inches and a quarter, it is supposed there are not less than 160 gallons of water discharged in one minute of time. For some distance round this perpendicular shoot of water, plays an imperceptible gas or vapour, so very inflammable, as instantly to take fire whenever that element comes in contact with it. The verge of the circumference of this gas is not perceptible; therefore, those who are unacquainted with its ignitible qualities, in the act of putting fire to this curious lamp of nature, have found themselves enveloped in flames, and pretty well singed before they had any idea of being within reach of its touch. It has been tried in vain to extinguish the flames with water. The only effectual method is to smother it with a large cloth, which can only be applied when the spouting and flame have somewhat abated. The intervals between the times of spouting are uncertain; it has been known to spout two or three times in a week, and may be seen to spout at any time, by putting down the poles after the well has been eight or ten days unoccupied.

FRENCH ROYAL ACADEMY OF SCIENCES.

At a late sitting of the Royal Academy of Sciences at the Institute on Monday, 17th ult. Count Chaptal was President, and Baron Cuvier Secretary. Nothing of any interest took place at this meeting, the business being principally confined to the election of new members for the present year. Some new works were laid upon the table; among the rest the 7th number of a Voyage round the World, by Captain Freycinet; the 45th and 46th numbers of the Natural History of the Mammiferes, by M. Geoffroy Saint-Hilaire; and the last number of Physiological Observations, by M. Laplace. A letter was read by the President from the Society of Geography, presenting to the Academy the 1st volume of their Collection of Travels and Memoirs, and requesting the patronage and encouragement of the Academy to their new Society Several Memoirs were read.

The Section of Surgery of the Royal Academy of Medicine of Paris, which now fills the place of the Academy of Surgery, held its annual public sitting on Thursday the 20th. Baron Portal, perpetual Honorary

President of the Academy, presided, and attracted a very numerous auditory. M. Richerand, Secretary of the Section, pronounced an able discourse on the progress made by Surgery within the last thirty years, and several papers were read: among the rest a very interesting Memoir, by Professor Roux, on the Suture of the *Velum Palatinum*, a most ingenious operation, invented a few years ago by that skilful surgeon, and which he has already put in practice twelve times. The object of this operation is to restore the free use of speech to those who are deprived of it by the division of the *velum palatinum*, a vice in conformation of the inside of the mouth, which is almost as common as the *labia leporina*, or hard-lip. This invention is one of the most important and useful that has been made in surgery within a considerable time; and the reading of the Memoir excited the general applause of the meeting.

To the Editor of the Mechanics' Register.

SIR,—A correspondent in your useful Register has requested to be informed how to make and use varnish. For oil painting the mastic varnish is the only proper varnish, as it may at any future time be got off from the picture, by a rag moistened with spirits of turpentine. This varnish to be laid on with a hog's hair brush. For prints, drawings, maps, plans, &c. the best white spirit varnish should be used, and laid on at about half a yard from the fire, and with a flat camel's hair brush. The prints, &c. should first have two or three coats of isinglass or leather size, to prevent the varnish from sinking in. For furniture, painted woods, &c. different kinds of varnishes are used. As to the making of varnish, it is often attended with uncertainty and risk in the hands of the regular manufacturer, and I advise the inexperienced not to attempt it; but if they will, most particularly to avoid placing any mixture over the fire containing spirits of turpentine, or spirits of wine—many dreadful accidents having happened therefrom: and unless the quantity required be very considerable, it can never answer the purpose of any one to make varnish.

ORLANDO CREASE

West Smithfield, London.

To the Editor of the Mechanics' Register.

In Bonnycastle's Arithmetical Recreations is the following query, (I think the 25th.) In what manner is eight gallons of a fluid to be divided into two equal parts by measure, by two other measures, whose capacity is three and five gallons each. Yours, BLUETT.

SIR,—Having culled much useful and philosophic information from your well arranged Register, in its miscellania of query and answer, and seeing that you have not discarded those points which can at all tend to the comfort and enjoyment of man—physical as well as mental, I am induced to hope the insertion of the following, earnestly entreating an answer of some scientific reader.

What will efface from the skin the blue tattooing which the arms and body of seamen generally display, (and of which they boast and consider as both honour and ornament), and which is thus effected. The figure is first sketched in pencil, then deeply punctured with needles, and made permanent by the rubbing in of Indian ink. The person praying the information, has some exposed figures on the back of his hands, to obliterate which, he has suffered both cutting and cauterizing, but with little effect, as the part may not thus be acted upon with safety. Yours, &c. G. M. C.

SIR,—You will oblige me by inserting the following query in your interesting miscellany. W. G. C.

In what manner are crystalized alum baskets made, and the ingredients made use of in colouring them blue, purple, &c.

SIR,—I should be glad to know if any of your correspondents could inform me, through the medium of your Register, of the principal uses to which the common glass blow-pipe may be applied.

Yours, &c. P. B. F.

SIR,—I wish to learn through the medium of your valuable miscellany, the best method of painting on glass, and in answer to your correspondent T. Wilson in No. 18, I beg leave to submit the following remarks.

'Such different views have been taken of the mechanism of the human voice, that it is by no means easy to reconcile them. Galen the Greek physician compared it to a flute, supposing it to be of the nature of a wind instrument. Ferrein and others on the contrary, have compared it to a violin. Kratzenstein thought it was like a drum with its head divided, and perhaps we shall come nearer the truth by combining those opinions and comparing it with Blumenbach, to an Eolian harp—a stringed instrument played upon by the wind. Our comparison will be still nearer the truth, if with M. Majendie, we refer to those instruments whose sound is produced by a reed, such as the hautboy, the pipe, and the clarinet. There is this remarkable difference, however, that the various tones of the voice are produced, not by stopping holes at different distances, as in those reed instruments, but in varying the width of the windpipe, at its orifice, or outgoing, where the organ of voice is situated.

The orifice of the windpipe, or organ of the voice, is only about a tenth of an inch at its greatest stretch, viz. when uttering a bass note, and it is capable, in most voices, of about sixty variations in width. These must, consequently, be all confined within this small opening of the tenth of an inch. Dodart therefore may justly say, that the variation of the fiftieth part of a silk worm's thread, or of the three hundredth part of a hair in the diameter of the orifice will occasion a perceptible difference of tone. The motions of the organ in speaking or singing may be easily felt externally, by placing the finger on the fore part of the throat. In this way it is discovered that the organ is drawn farther up, and more forward in producing a shrill tone, and to assist the muscles the head is inclined more backwards than in producing a grave tone. The lowering or raising of the organ is thus ascertained by the finger to be an inch for every octave. The edge of the orifice is composed then of such materials as vibrate like the reed of a hautboy, when the air is thrown forcibly up from the lungs. This apparatus is inclosed in a little box made of gristle, and having moveable sides. This box is called Adam's apple, and is very small in females, and those who have a weak voice. As it is lowered or raised the sides of it are drawn farther asunder, or brought closer together, and consequently the 'reeds,' as we may call them, are either stretched or relaxed as the tone may require. In singing or speaking at a high pitch of voice the orifice is therefore much narrowed; and as this obstructs the air from passing out of the lungs, it affords an explanation of the great heat in that case produced, according to the theory that animal heat proceeds from breathing.

J. H. B.

To the Editor of the Mechanics' Register.

Mr. Editor,—For the information of several of your Correspondents in the previous numbers of the "Register," I beg to transmit the following answers to their queries.

S. Hollands.

Permanent ink for marking linen.—Mix together in a phial 100 grains of lunar caustic, two drachms of gum arabic, one scruple of sap green, and one ounce of rain water.—The cloth to be marked must first be wetted with the following liquid, and suffered to get quite dry before writing on it. One ounce of sal soda, dissolved in two ounces of rain water, when the articles are marked they should be exposed to the sun, which will turn the writing quite black.

Red marking ink.—Vermillion half an ounce, sal of steel one drachm, finely levigated with linseed oil to a proper consistency.

Method of cleaning and polishing steel.—After well oiling the rusty parts of the steel, let it remain two or three days in that state; then wipe it dry with clean rags and polish with emery or pumice stone, on hard wood. Frequently however, a little unslacked lime finely powdered will be sufficient, after the oil is cleared off. Where a very high degree of polish is requisite, it will be most effectually obtained by using a paste composed of finely levigated blood stone and spirits of wine. Bright bars are however, admirably cleaned in a few minutes, by using a small portion of corn emery, and afterwards finishing with flour of emery or rotten stone; all of which may be obtained at any ironmonger's or oil shop. This last very simple method will render any other superfluous.

To remove spots of grease, pitch, or oil from woollen cloth.—In a pint of spring water dissolve an ounce of pure pearl ash, adding to the solution a lemon cut in small slices. This being properly mixed and kept in a warm state for two days, the whole must be strained and kept in a bottle for use. A little of this liquid being poured on the stained part, is said instantaneously to remove all spots of grease, pitch or oil, and the moment they disappear, the cloth is to be washed in clear water.

Preparation of printer's ink.—Put a quantity of nut or linseed oil into an iron pot, so as to half fill it; make it boil for some time then set it on fire, and when it has burned for half an hour, put out the flame, and let it boil gently till it acquires a proper consistency. It is then to be removed from the fire, and when cold, ground with lamp black in the proportion of two ounces and a half, to sixteen ounces of oil. Vermillion or Prussian blue, is used for inks of those colours.

To prepare a Metallic Tree, which may be removed from the vessel in which it is formed.—Mix together about equal parts of saturated solution of silver and mercury in nitric acid, diluted with a little distilled water; in this mixture suspend five or six drachms of pure mercury contained in a piece of fine linen rag doubled. The metallic solution will soon penetrate to the mercury inclosed in the cloth, and clusters of beautiful needle shaped crystals will begin to form round it, and adhere to the nucleus of mercury; when the arbonization ceases to increase, the bag loaded with beautiful crystals may be taken out of the vessel where it was formed, by means of the thread by which it is suspended and hung under a glass jar, where it may be preserved as long as may be thought proper.

Cure for Corns.—Bathe the feet in warm water, in which bran or oatmeal has been previously boiled; cut the corn as close as possible, apply an ivy leaf after being steeped 24 hours in strong vinegar, which remove every morning, and apply a fresh leaf, prepared as before, for eight or nine days, and the corn will be eradicated

Burns and Scalds.—A medical writer in one of the Bath Journals, in speaking of the best remedies for burns and scalds, which are to be procured instantly in most houses, states that oil of turpentine is an excellent application; but this is not always at hand Next to this in effect, are the strongest spirits that can be procured, as æther, spirits of wine, brandy, &c. or in the absence of these, vinegar has been found to answer the purpose.* These should be applied by means of folded linen cloths to every kind of burn and to scalds, before the skin begins to rise.

PAINTING.

The influence of the pencil is sometimes truly wonderful;—it is said that Alexander the Great trembled and grew pale on seeing a picture of Palamedes betrayed to death by his friends, as it brought to his mind an acute recollection of his treatment of Aristonicus. Portia could bear with unshaken constancy her final separation from Brutus; but when she saw some hours afterwards a picture of the parting of Hector and Andromache, she burst into tears. Such are often the effects of this noble art.

There is or lately was living at Tunbridge Wells, a Lieutenant of the Navy, named Relf, who although he has lost one arm and two fingers of the remaining hand, has made every article of furniture in his own house. The chests of drawers, tables, and other articles, are equal in workmanship to nine-tenths of those which are sold in the first-rate shops.

A Patent has been granted to M. Thin, an architect, at Viewforth, for a new invented kitchen roasting smoke jack. The properties of this machine, are that it is made at a much less expence than the common smoke jack, or even the common winding up jack; that it is put into any common sized square vent, without enlarging the vent; that it is more powerful than the common smoke jack; and that having little machinery, and that of the simplest kind, it requires little cleaning, and a wine glass full of oil will serve it a year. This little machine, so very plain and simple, promises to be of general use.

* Vinegar is now generally used in preference to any thing else, as it prevents any inflammation taking place, and in some degree heals the wound

A New Club is being formed in London, for the association of individuals known for their scientific or literary attainments—men of eminence in any class of the fine arts, and others who are distinguished as liberal patrons of science, literature, or art. It is to be called the Athenæum, and is said to have originated with Sir Humphrey Davy. Amongst its members are the Duke of Sussex and Prince Leopold, Dukes of Bedford, Northumberland, &c.

Deputations from London, Manchester, Liverpool, Leeds and Birmingham, have lately been in the neighbourhood of Newcastle, examining several of the colliery railways, and trying experiments on the locomotive engines. They have been highly gratified with the ingenuity their construction displays.

The Manchester Institution for the Promotion of Literature, Science, and the Arts, is rising rapidly into importance. The alliance between commerce and the liberal and ornamental arts, is not only very natural, but extremely beneficial. There is no branch of the former which may not feel the good effects of such a system; and we are happy to state, that the manufacturing interests of Manchester, with a munificence worthy of their wealth, have already contributed above thirty-four thousand pounds to this noble undertaking. We hope the patrons of the fine arts, throughout the kingdom, will not be slow in giving their countenance to so excellent a design.

A gentleman of Rye has, it is said, by some ingenious chemical process, produced an essence of malt and hops, which gives beer of any strength, and of genuine flavour, by the addition of water only; and it is further said, that he intends shortly to offer his essence to the public, under the sanction of letters patent.

CHAIN BRIDGE.

A Chain Bridge, the first of its kind in Russia, is about to be constructed over the canal at Moska. It will be executed after the design of Colonel Dufour at Geneva, who has sent to St. Petersburg a correct model of one which he erected in his own country last year.

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No. 19.] SATURDAY, MARCH 5, 1825. [Price 3d.

BRIDGE OF HIDE ROPES.

BRIDGE OF HIDE ROPES.

IN the preceding page of the Register, there will be found a faithful representation of a Bridge of Hide Ropes over the River La Plata, in South America. This mode of conveyance is very curious, and to Europeans somewhat alarming. It will readily be conceived, however, that the danger is less real than imaginary, as will appear from the following account by Mollien, a French gentleman, who has recently published his travels in Columbia:—

"Leaving the banks of the Paï, I proceeded along the Rio de la Plata, which falls into it, and before two o'clock in the afternoon, arrived in sight of the town of that name. We could not immediately enter it, on account of the bridge of communication not being sufficiently commodious for the number of persons going to and from La Plata. On each side of the river, leather bands are made fast to stakes, driven into the ground, and upon this tarabita (for thus they call this singular sort of a bridge) is placed a piece of wood, furnished with leather straps, by which the traveller is fastened, and according to whichever side he wishes to go, he is drawn across. The passage, at first, seems rather alarming; and one cannot, without shuddering, find one's self suspended over an abyss by a few hide ropes, which are very liable to be injured by the rain, and consequently, to break. Accidents, however, seldom happen. Animals are made to wim across."

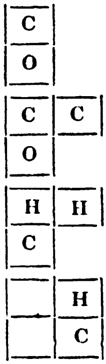
LONDON MECHANICS' INSTITUTION.

MR. COOPER'S SECOND PUBLIC EXAMINATION OF THE MEMBERS ON THE SCIENCE OF CHEMISTRY.

WEDNESDAY, FEB. 23.

The result of Mr. Cooper's previous examination, of which we gave an account in our 14th number, (page 210) was of so gratifying a nature, that the announcement of its renewal was hailed with general acclamations; and the numerous attendance of the members this evening, afforded sufficient evidence of their anxiety to promote the diffusion of scientific instruction, by a mutual inter-communication of the knowledge they had acquired, during the able lectures with which they had been favoured by Mr Cooper.

On the former evening Mr. Cooper had intimated, that he should probably have occasion to repeat some of the questions he proposed during his first examination, for the purpose of preserving the connection of his subjects, and impressing them more firmly on the memory of his audience. His first question this evening was, therefore, How many compounds are there of carbon and oxygen? There are two—carbonic oxide and carbonic acid. What are their respective constituents by volume? One volume of carbon and one of oxygen form carbonic acid; and two of carbon to one of oxygen form carbonic oxide. What is the number of compounds of carbon with hydrogen? Two—carburetted hydrogen, or the light hydro-carburet; and the heavy hydro carburet, or olefiant gas. Tell me their constituents by volume. One of the compounds alluded to was incorrectly described by the first member who replied to the question; but it was gratifying to observe upon this, as upon the former evening, that the error was corrected by another member. The result of the two answers was, that carburetted hydrogen consists of two volumes of hydrogen to one of carbon, and olefiant gas of equal volumes of the two substances.



Mr. Cooper then drew the various diagrams represented in the margin, for the purpose of impressing more forcibly upon the minds of the members the relative proportions, by volume, in which the preceding gaseous bodies combine, and having inquired the names of the various compounds resulting from their union, was correctly answered carbonic acid, carbonic oxide, carburettedhydrogen, and olefiant gas.

Mr. Cooper's next question was, How much oxygen is necessary to saturate carburetted hydrogen, or the light hydro-carburet?

Some hesitation being occasioned by this inquiry, Mr. Cooper directed his hearers to an answer, by dividing the question into two parts, and first asking, How much oxygen is required to saturate one volume of simple hydrogen? The answer was, Half a volume.

And how much for the two volumes represented in the diagram?—One volume of oxygen, and the extra volume of carbon will also require one volume of oxygen.

Mr. Cooper then observed that it was evident from the two answers, that carburetted hydrogen required two volumes of oxygen to burn, or completely saturate it. A similar inquiry was made respecting the heavy hydro-carburet, and the answer having been correctly given, viz., That three volumes of oxygen were necessary to saturate the mixture represented in the margin, Mr. Cooper added that this system of diagrams was calculated to supersede the necessity of numerous experiments.

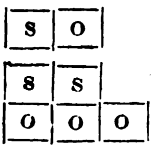
After repeating the remarks made in the course of his lectures on the degree of condensation which occurs in these two compounds of carbon and hydrogen, the three volumes composing the light hydro-carburet being condensed into two by their union with oxygen, and the four volumes constituting the heavy hydro-carburet, into one volume. What are the substances which combine to form the coal-gas which is used for the purposes of illumination?—Light hydro-carburet, heavy hydro-carburet, sulphuretted hydrogen, carbonic acid, and carbonic oxide. By what process would you separate the impurities, sulphuretted hydrogen and carbonic acid?—The sulphuretted hydrogen by simple washing with water, and the carbonic acid by washing with lime-water.

Both these substances may be taken away by lime-water; but suppose these two constituents of coal gas are thrown out, and there only remain the heavy and light hydro-carburets and carbonic oxide, how would you go to work to separate them?—By the addition of chlorine.

And how does the chlorine act?—It combines the whole of the heavy hydro-carburet. Under what circumstances?—Exposing it to to the solar light. Will it not act in the dark?—Yes, but only on the light hydro-carburet; it therefore requires to be excluded from the light to separate the olefiant gas. You have stated that you would use chlorine to separate these substances; suppose you were operating upon 100 cubical inches of coal gas, how would you determine the relative proportions of its constituents, by means of chlorine?—By operating in the dark, the chlorine has no action on the heavy hydro-carburet, while the light hydro-carburet is removed. In what proportions do chlorine and the heavy hydro-carburet combine? In equal volumes. Supposing then that a certain degree of condensation occurs during the process: for instance, suppose that to 100 cubical inches of coal-gas, you add 30 of chlorine, and that an absorption equal to 60 inches takes place, how much olefiant gas does the mixture contain? As this question was not immediately solved, Mr. Cooper was about to *chalk it up,* in order to illustrate it by a diagram, when one of the members answered, 30 cubic inches. Mr. C. said the answer was quite correct, and observed that though the question appeared at the first glance rather complicated, a little consideration would shew that it was like the old question, if a herring and a half cost three half-pence, how many can you buy for eleven pence? In fact, with proper attention, the members would find that there was no more mystery in chemistry than in handling a hand-saw. Having got rid of 30 cubic inches of olefiant gas by the action of chlorine, how would you separate the light hydro-carburet from the remaining 70 inches?—By exposure to the sun's rays. And what is the resulting volume?—Carbonic oxide. Suppose you wish to be certain that it is really carbonic oxide, what would you do next, to prove that no inflammable gas was left? One of the members replied, that he would try whether it would burn; which Mr. Cooper said was a very good way; and another member answered, that he would add another volume of oxygen. Exactly so, said Mr. Cooper, and what is the compound then formed? Carbonic acid. And how would you know that it was carbonic acid? By adding lime water.

After some other questions relating to the compounds of carbon and hydrogen, Mr. Cooper observed, that in detonating them with oxygen, it was always necessary to use more oxygen than was sufficient to combine with them, in order to prevent the deposition of a quantity of charcoal unburnt; for if there was not enough to saturate the whole at once, by means of the electric spark, &c. a deposition of part of the carbon would take place, in consequence of the hydrogen possessing a mnch greater affinity for oxygen than for carbon, and the experiment might lead to erroneous results.

How many combinations of sulphur and oxygen are there? Two—sulphurous acid and sulphuric acid. What are their proportions by volume? Sulphurous acid, one volume of each; and sulphuric acid, two volumes of oxygen to one of sulphur.



Mr. Cooper corrected the latter part of this answer by stating, that sulphuric acid consists of three volumes of oxygen to two of sulphur. or one and a half of oxygen to one of sulphur; and drew the annexed diagrams to exhibit the relative proportions of the two compounds more distinctly.

What are the constituents of sulphuretted hydrogen by volume?

This question being answered incorrectly, Mr. Cooper stated, that sulphuretted hydrogen was composed of equal volumes of sulphur and hydrogen, and that sulphur, like carbon, did not change its volume by combination, excepting in the instance of olefiant gas. He, also, very kindly added, that he did not expect the members to recollect all the various proportions with perfect accuracy; he could not always remember them himself; and these examinations were intended to refresh their memories, and to correct any mistaken impression which they might have received.

How much oxygen is required to burn sulphuretted hydrogen? One volume and a half. Exactly so; and what are the resulting compounds? Sulphurous acid and water. How would you ascertain whether sulphurous acid is produced? By means of blue litmus paper. And what is the effect produced upon it? It reddens it. What then? It whitens it. Suppose you have a mixture of sulphurous acid and carbonic acid, how would you separate them?

Mr. Cooper answered this question by stating, that the whole must be thus exposed to the action of water. The gases being confined by quicksilver, a small portion of water is first let up; this rapidly absorbs the whole of the sulphurous acid; then a larger quantity of water being introduced, both the gases will be absorbed in the same manner. To prove the analysis, the water being afterwards boiled, the carbonic acid is given out, while the sulphurous acid remains in solution. Mr. Cooper drew a diagram for the further illustration of this process, which is applicable to a variety of other analytic purposes. How many compounds are there of phosphorus and oxygen? Two—phosphorous acid and phosphoric acid. What is the nature of these acids? Phosphorous acid is fluid, and phosphoric acid solid. Is there any compound of phosphorus and hydrogen? Yes—phosphuretted hydrogen.

P	H

Mr. Cooper observed that this compound consists of equal volumes of its constituents, as represented in the diagram, which are condensed into one by their union. He then enquired, What are the properties of this gas? It takes fire immediately on coming in contact with the atmosphere. How much oxygen is required to consume it? One volume and a half. Is there any other compound of phosphorus and hydrogen? Yes, sub-phosphuretted hydrogen. This compound was stated by Mr. Cooper to contain less phosphorus or more hydrogen than phosphuretted-hydrogen. The two compounds bear the same relation to each other as the light and heavy hydro-carburets. He added that there is only one detonating compound of sulphur and hydrogen, but there are two of carbon and hydrogen, and two of phosphorus and hydrogen.

H	P	H

The constituents by volume of sub-phosphuretted hydrogen being two of hydrogen to one of phosphorus, as shewn in the diagram, how much oxygen is required to burn it? Two volumes.

Mr. Cooper here closed his interesting and instructive examination, and observed that he thought he had carried it as far as he need go at present. He expressed the satisfaction he felt at finding the members so well acquainted with the subjects which he had illustrated in his lectures, and stated that he should certainly take the earliest opportunity that business would allow, to meet them in the new lecture room they were now building, till which period he bade them Farewell.

The worthy lecturer was greeted with the warmest acclamations, on withdrawing from the lecture table, and the members appeared deeply sensible of their obligations to Mr. Cooper for the able instructions afforded during his lectures, and the forcible manner in which they had been impressed upon their minds by his subsequent examinations. We need only add, that these examinations have afforded another striking proof, if any were necessary, of the native talent existing among the mechanics; and we cannot but look forward with delightful anticipations to the period, when the further cultivation of these hitherto-dormant powers, by means of Mechanics' Institutions, shall lead to a complete revolution in the sentiments and habits of the classes for whose instruction they are intended, and produce those beneficial effects, of which it is impossible to calculate the extent and importance.

MR. OGG'S SECOND LECTURE ON GEOLOGY.

FRIDAY, FEB. 25.

STRATIFICATION—MR. SMITH'S GEOLOGICAL MAP—COAL MINES—RED SAND STONE—ROCK-SALT—ORGANIC REMAINS—CHALK.

Mr. Ogg commenced the present lecture by a brief recapitulation of the principles illustrated in his previous discourse; particularly the important divisions denominated the *primitive* and *transition* series of rocks. As this general division had been considered very defective, a more perfect arrangement had been adopted in the valuable work on the geology of England and Wales, by Mr. Phillips and Dr. Conybeare, who divided the rocks into the five following classes; viz., *inferior*, *sub-medial*, *medial*, *super-medial*, and *superior*; in which classes rocks of every different description are included. The *inferior*, or lowest division in the series, are of a highly chrystalline texture, and contain no organic remains: immediately above these chrystalline primitives are the *sub-medial* rocks: next above these appear the *medial*, or middle series, including all those rocks which assume the coal formation: proceeding upwards, the next in order are the *super-medial*, and above these the *superior*, or highest series of rocks.

Before proceeding to the principal subjects of the present discourse, the lecturer observed that it might be necessary to make a few remarks on the nature of *stratification*, which had not been sufficiently explained. He had requested the attention of his hearers to a diagram, representing a section of a mountain in the Hartz district, for the purpose of shewing that the chrystalline and transition rocks repose, or lie closely upon one another, and also to point out the order in which they are invariably arranged; but he had not particularized the arrangement of the strata in flat countries. It is believed that the *natural* position of rocks of every description is *flat* or horizontal, as it is only in mountainous districts that they are found to rise upwards. When rocks rise from a horizontal direction at any given angle, this angle is called the *dip*. When rocks of different classes repose upon each other in joints, they are said to be *stratified*; and when inclined to the horizon, the angle which they assume is called the *dip*, or inclination of the strata.

The reason why it is supposed that the primitive rocks were first formed, and that the transition series is derived from them, is, that the former contain few organic remains. Mountain lime stone was formerly classed with the transition rocks, but is now separated from that class, as its characteristics and situation are ascertained to be of a different kind. We may here remark, that in alluding to the formation of the Breakwater at Plymouth, in our last number, we should have stated it to be composed of *transition* lime stone, instead of mountain lime stone.

The first of the medial series of rocks to which he should request the attention of the audience, was the *old red sand stone*, which is found in very large quantities, the stratum extending over a base of several counties, and affording many elevated mountain masses. This stratum assumes different appearances in different places, but is usually like the specimen now exhibited by the lecturer. It is not ascertained to be enriched with metallic treasures, or to be mixed with organic remains, but it forms the base of the important series called *coal*. It is not of a fertile nature itself, but when united with argillaceous substances, it produces a soil of considerable fertility.

Mr. Ogg now referred to a large diagram, representing a geological section of our island from London to Snowdon, and also to a geological map, as delineated in a very able manner by Mr. William Smith. Upon this subject he thought it necessary to say a few words, as his audience might think there was nothing extraordinary in the appearance of the map now exhibited, and that it resembled a geographical map in its construction. This, however, was not the case, for a geographical map was confined to the surface of the earth, whereas the map now presented to their notice represented not only the surface, but the various substances beneath it. The great difficulty of producing such a map might be imagined, and yet this arduous task had been accomplished by the labours of one individual. The lecturer scarcely knew how to speak of this extraordinary effort in terms of adequate praise, or where another instance of persevering industry could be found to equal the admirable geological map of Mr Smith. Whatever improvements might have been subsequently introduced by others, the chief merit was unquestionably due to that gentleman, who had devoted twenty years of his life to the construction of this map, and had visited every part of the kingdom many times over, for the purpose of tracing all the various kinds of stone which compose the crust of the earth, throughout the whole extent of the island.

Previous to his description of this map. Mr. Ogg referred to a general map of England and Wales, and observed, that the western parts of the kingdom are occupied by the mountainous districts, in which the primitive rocks are situated, while the opposite, or eastern districts exhibit strata of a soft, smooth, and rounded appearance, composed of depositions of a subsequent formation. The lecturer then pointed out, in Mr. Smith's geological section, the gradual increase in the heights of the mountains in in this country, from the gentle elevation of Shooters' Hill, (if it might be called high land,) to the loftiest summits in Wales; and he also particularized the various kinds of rocks prevailing in the different districts exhibited in the map, particularly the *clay-slate* rocks, (not *clayey*-slate, as stated in our last,) the *old red sand stone*, and those important divisions called the *coal measures*. It is remarkable that the latter track is only met with in a certain geological position; and though coal has been sought for in other parts, the search had been fruitless, and is likely to continue so. Many gentlemen have expended large sums in digging for coals in districts where they would not have looked for them, if they had known any thing of the geological situation in which they can alone be found.

Mr. Ogg here exhibited a section of a coal mine, in which the veins of coal laid in a semi-circular form, as if reposing in a basin of lime stone; the various strata of coal are always found interposed between rocks of different kinds, such as lime stone, mill-stone grit, shale, iron-stone, &c. To give some idea of the numerous strata which it is necessary to pass through in working a coal mine, the lecturer read, from the geological work to which he had previously alluded, a description of a mine in the south of Staffordshire; containing a minute account of the strata of slate-clay, lime stone, gravel, sand stone, bituminous shale, &c. &c., which were found between the veins of coal. Some of the latter did not exceed one or two feet in thickness, while the substances by which they were divided, measured many yards. The miner sometimes finds 32 different strata of coal, but many of these are not worth working, the low and high mains being generally the best. The principal main in Staffordshire is called, from its thickness, the ten yards main. A familiar idea of the general formation of coal mines may be conveyed by supposing a number of basins, decreasing in size, placed within each other, and the interior of each strewed with small coal. The whole series will then represent a coal mine; the substance of the basins being substituted for the stony matter found between the veins of coal, which are represented by the thin strata of small coal.

Coal mines in all countries are very nearly alike; the same kinds of stony matter are found in separate beds, and the same impressions of numerous vegetables, many of which are not known upon the surface of the earth at the present time. Coals are of several different kinds, some of them being very difficult of ignition, but giving out an intense heat when ignited. These are called stone coal, and are chiefly composed of carbon, but do not contain bitumen, of which hydrogen is a constituent. Others, from their more bituminous nature, emit smoke and flame in great abundance.

After particularizing some other varieties of this useful substance, Mr. Ogg proceeded to state, that coal was believed to be of vegetable origin. It was not his intention to enter into the controversy, but briefly to allude to some of the facts upon which this opinion is founded. Impressions of plants and the remains of vegetables are found among coal in great abundance. Wood has also been found in many different states, from perfect wood to a substance nearly resembling coal. Peat-mosses are formed by the gradual decay and subsidence of vegetables, and the deeper we penetrate into them, the greater is the resemblance they bear to coal. Water is believed to possess the power of communicating bituminous properties to substances; but as something still appeared to be wanting, Dr. Mac Culloch, by melting *jet* under pressure, succeeded in converting it into perfect coal. Some geologists are of opinion that the agency of fire must have been exerted in the formation of coal; they admit that water may occasion vegetable substances to approach nearly to the nature of coal, but conceive that there must be fire to render it perfect. Others believe that the effect may be produced by means of water alone.

Coal-mines not only supply us with the *ore of iron* in considerable quantities, but they also furnish the most useful substance for reducing that ore to metal. The ore is sometimes found to contain 30 per cent. of iron, and being thrown into furnaces with limestone, which facilitates the reduction of the ore to iron, the iron-masters of this country are enabled to supply immense quantities of that valuable metal.

Another circumstance connected with coal mines must be alluded to, which the audience are, no doubt, perfectly aware of, viz., the great danger to which the miners have been exposed, from the dreadful explosions of carburetted hydrogen which have so frequently occurred in these mines. His hearers would sympathize with the unfortunate coal miners, who had toiled in these dreary regions, exposed to the danger of losing their lives, and compelled to labour almost in the dark, to avoid the recurrence of these fatal accidents; for such is the nature of the gas by which they are occasioned, that when mixed with atmospheric air, in a certain proportion, it becomes explosive, and upon coming in contact with flame, it expands with a force which drives every thing before it, and a sudden vacuum being thus produced, the violence with which the air rushes in to supply its place, completes the destruction commenced by the explosion. The proprietors of the mines did not sit down and calmly witness this alarming evil; they spared no expense in endeavouring to discover a remedy for it; but all their contrivances were ineffectual. They prohibited the use of candles in the mines, and the miners worked by the dismal glimmer emitted from the steel-mill, an instrument which only afforded the feeble light proceeding from the successive sparks struck out by the collision of flint and steel. He might be suspected of exaggeration if he stated the number of lives which were annually sacrificed by these explosions; but he spoke within compass when he estimated them at several hundreds. And was no remedy to be found for this dreadful evil? Where, indeed, could such a remedy be successfully looked for, except by having recourse to science?—and there it was found.

Mr. Ogg then paid an animated tribute of respect to the scientific attainments of Sir Humphry Davy, and described the origin of his great discovery of the *safety lamp*, and the principles upon which it is constructed. It is unnecessary to repeat this description here, as the same subject has been frequently dwelt upon by former lecturers. We need only observe, that Mr. Ogg exhibited the lamp, and clearly exemplified the protection it affords, by holding a piece of wire gauze over the flame of a spirit lamp, when it was distinctly seen that the cooling power of the gauze prevented the flame from passing through it. It was truly strange that so important an invention should meet with opposition; yet it had been violently opposed, though the strongest argument brought against it was, that the materials of which it was composed would wear out. The audience would be able to judge of the validity of such an argument as this, and he should only add, that though explosions had occurred since the introduction of the safety lamp, they had been occasioned solely by carelessness; and as an instance of this, he might mention that some of the miners had actually made use of *candles* and safety lamps at the same time.

Proceeding with his illustrations of the geological map, the lecturer stated, that next to the coal measures there occurred an extensive track of *red sand stone* or *marl*, which is sometimes soft, and sometimes much harder. It is, in some places, so red, that the sheep which feed upon the pastures where it abounds become reddened. It contains no organic remains; and it may be here remarked, that the depositions in which these remains occur are *alternate*. Substances of a valuable nature are, however, found in it, such as sulphate of lime, or gypsum, which when crystallized, is called selenite.

The lecturer then made some remarks on the valuable stratum called *rock salt*, which forms so important an article of traffic, and from which the duty has been recently taken off. The removal of this duty, amounting to no less than £30. upon a quantity of rock salt not exceeding 12s. in value, would doubtless occasion a great increase in this branch of commerce. Mr. Ogg also gave an interesting description of the appearance of salt mines, into some of which he had descended, and the roofs of which appear as though a variety of lines and figures had been traced upon them by the hand of art.

We regret that the great length of the lecture, and the limits to which we are restricted, oblige us to mention, in a cursory manner, Mr. Ogg's able illustrations of the nature of organic remains, several very curious specimens of which were exhibited, and handed round for the inspection of the audience. In the lower strata are found zoophytes, shell-fish, and other animals of the most imperfect kind, and proceeding upwards, the remains of the more perfect land animals are found in the highest strata, many of which animals are of great magnitude, and belonging to species entirely extinct at the present time.

The next series of importance is the oolitic series, consisting chiefly of calcareous *sandstones* and *free-stones*, containing an infinite number of little globules, like the roe of a fish, from which resemblance they have been called roe-stones. These particles do not always assume a globular appearance. Portland-stone and Bath-stone belong to this series, and pea stone is a variety in which the globules are very large.

After particularizing several other varieties, Mr. Ogg proceeded to the important stratum called *chalk*, and besides pointing out on the geological map the districts in which it is situated, exhibited a beautiful view of Dover Castle, as a specimen of chalk scenery. There are two varieties of chalk, the upper stratum of which is white, and the lower grey. In this stratum are found organic remains, such as sharks' teeth, and shells in a high state of preservation; but the most remarkable circumstance connected with it is, the occurrence of layers of flint, the situation of which has never been satisfactorily accounted for. Some persons had supposed that the flint, at a former period, had filtered through the chalk; but had this been the case, it would have formed beds, and not layers. Above the chalk are found extensive depositions of sand and clay, containing the organic remains of very large animals, such as the elephant, the rhinoceros, the hippopotamus, &c. We cannot dig through the clay in the vicinity of London, without finding these remains in considerable quantities.

Mr. Ogg then exhibited several very curious specimens of vegetable and other organic remains, and observed that much entertainment as well as instruction might be derived from the collection of stones, and the examination of their internal structure. He was in the habit of examining stones wherever he went, and often found amusing and curious specimens. If he could induce his hearers to become collectors, by promising them amusement in so doing, he should be glad. The gravel stones of some districts, when broken, contain very amusing configurations. Between Shooters' Hill and Blackheath he had picked up several stones which he prized very much, from their containing distinct representations of different figures. One of these, which the lecturer shewed to his hearers, presented a perfect delineation of a horse's head, with a bridle upon it.

Mr. Ogg concluded his admirable lecture by some appropriate observations on the facilities of obtaining knowledge afforded by this institution, and the advantages which the members would derive by mutually advising and assisting each other. Pope had remarked, that

"A little learning is a dangerous thing,
"Drink deep, or taste not the Pierian spring."

In this observation he could not, however, allude to the little learning which makes us a little more wise, but to that which has a tendency to puff us up with vanity. He would recommend to his hearers not to be satisfied with shallow draughts of this spring, but to drink as deeply as possible, from which they would undoubtedly derive much more advantage than from deep drinking of any other kind.

At the conclusion of the lecture, after repeating several notices already inserted, Dr. Birkbeck mentioned, that he had received an intelligent letter, containing an enquiry, which, from not knowing the name of the writer, he was obliged to adopt this mode of answering. The letter which he read is as follows:—

SIR—Happening a short time since to visit our national Museum, my attention was attracted by a bust of Egyptian granite, in which a mason was endeavouring to make a hole for the insertion of a cramp of iron; in this, however, his attempts were rendered almost abortive, as the hardness of the stone turned the edge of his tools. On a nearer inspection, I discovered a circular hole drilled in it, the surface of which retained an excellent polish. As I am not so far wedded to antiquity as to suppose the Egyptian workmen were more conversant with their business than those of the present day, an idea struck me that this granite must have been originally of a very soft nature; the excellent lecture of Friday last tended to confirm this opinion rather than otherwise, especially as regards the "*transition rocks*," which, if I understood the lecturer correctly, were formed during the transition of the earth from its chaotic to its habitable state. (I do not mean that granite is of this class, but merely refer to it as affording the first instance of that process of petrifaction which has since been continually operating upon the productions of nature.) I wish to know whether the idea I have formed is at all confirmed by the observation of geologists. In my enquiries I have been told by some persons that the granite was originally a composition formed by the Egyptians themselves, but this opinion appears to be refuted by the circumstance of the granite caverns at Elephantine.

This communication might perhaps have been addressed with more propriety to the lecturer himself, but as I am ignorant of his name, and my avocations do not allow of my making a visit to Southampton Buildings, I am under the necessity of troubling you with it:—in this, however, I have some excuse from your kind offer, on Friday, of elucidation upon subjects not correctly understood.

The enquiry I have made may be premature, but as the primitive rocks have already been examined and commented upon by the lecturer, (in which class the Egyptian granite may be introduced,) I trust you will ascribe it to the true motive, viz., "a thirst for knowledge." I remain, sir,

Yours, very respectfully,
A YOUNG MEMBER OF THE INSTITUTION.

To Dr. Birkbeck.

You perceive, said the President, that what your intelligent and interesting lecturer has just said of organic remains, "we cannot handle them without speculating about them," is likewise applicable to the remains of antiquity. I am not, however, inclined to adopt the opinion of the writer, respecting the original softness of the Egyptian granite; for, believing with geologists in general, that this primitive rock is a crystallized mass, it must at once have acquired its present degree of hardness, and not have existed like the transitive rocks, which are partly mechanical deposits and partly crystallizations, in a state of comparative softness. It is probable that the bust in question is that species of granite found in Upper Egypt, near the Cataracts of the Nile, at Syena, and thence called Sienite—a species containing much quartz and mica, but little hornblende, and no felspar, and therefore very hard. If the workman at the British Museum had been as patient as the labourer under the Egyptian task-maker, he would have found a tool, no harder than that which he used, equal to the task; for, said Dr. Birkbeck, I cannot prevail upon myself to believe, that our workmen or their tools are inferior to those of Egypt: and I am persuaded, that if it were desirable to imitate their pyramids, those wonderful monuments of the industry and folly of past ages, British perseverance, British power, and British mechanical ingenuity, would be found abundantly competent to the mighty undertaking.

BALLOT,

FOR THE ELECTION OF A PRESIDENT, FOUR VICE-PRESIDENTS, A TREASURER, AND FIFTEEN COMMITTEE-MEN.

TUESDAY, MARCH 1, 1825.

The ballot for the election of the above officers of the LONDON MECHANICS' INSTITUTION took place this evening, agreeable to the rules, at the Lecture Room in Monkwell Street, between the hours of six and half-past nine; upon which occasion, the chair was taken by Mr. M'WILLIAM, one of the Vice-Presidents. The following members were appointed as Scrutineers, viz.,

Mr. John Gloyn, 10, New Wharf, Whitefriars, clerk;
Mr. John Cave, 9, Bartholomew Square, Old Street, chairmaker, &c.; and
Mr D. Taylor, jun., 14, Clifford Street, Bond Street, shoemaker.

The proceedings of the evening were conducted with the greatest regularity, and in strict conformity with the articles; the name of every member being marked off in the books of the Society, upon his proceeding to give his vote; and we are happy to mention, as a circumstance highly creditable to the members, that not a single vote was tendered, during the ballot, by any individual who had not been a member six months. It rained hard from the commencement of the ballot to its termination; and the unfavourable state of the weather, no doubt, had the effect of preventing the attendance of a great number of the members; besides which, many of them, from a mistaken opinion that they could vote by proxy, transmitted their tickets and balloting lists, which were necessarily rejected. After the Scrutineers had carefully examined and cast up the numbers, the state of the ballot was announced to the members by Mr. Blake, when the Chairman declared the following gentlemen duly elected, viz.:

FOR PRESIDENT.

George Birkbeck, M.D.	104

FOR VICE-PRESIDENTS.

Professor Millington -	104
Dr. Gilchrist - -	103
John Martineau, Esq. -	102
Robt. M'William, Esq.	97

FOR TREASURER.

John Key, Esq., Ald. and Sheriff	104

FOR COMMITTEE.

Candidates of the Working Class.

Elijah Deville - -	71
George Stacy - -	65
William Styles - -	65
William Jones - -	60
Henry Hetherington -	48
William Waterman -	39
Barry St. Leger - -	38
Henry Aumonier -	37
Thomas Duthie - -	37
Richard Fowler - -	37

Candidates not of the Working Class.

Thomas Smythe -	78
William Tijou - -	51
Edmund R. Fayerman -	48
Joseph Thomas - -	47
John H. Marshall -	41

QUARTERLY GENERAL MEETING OF THE MEMBERS OF THE LONDON MECHANICS' INSTITUTION.

The Fifth Quarterly General Meeting took place on Wednesday last, at 8 o'clock in the evening, and was very numerously attended.

Dr. BIRKBECK in the Chair.

The worthy President, who was accompanied by Dr. Gilchrist, Mr. M'William, and George Grote, jun. Esq., one of the Auditors, opened the business of the evening, by briefly stating the purposes for which the Members were assembled, pursuant to the Rules; and requesting their attention to the minutes of the last Quarterly and Special Meetings, which would be now read, by the Honorary Secretary, Mr. Blake.

The minutes of the Quarterly General Meeting, on Wednesday, the 1st. of Dec. 1824, and of the Special Meeting, held on Friday, the 17th. of the same month, were then read, and confirmed unanimously.

Mr. Blake then read the following comprehensive and satisfactory Report of the Committee of Managers, which was heard with profound attention, interrupted only by the spontaneous expressions of applause, which occasionally burst from the Members.

FIFTH QUARTERLY REPORT OF THE COMMITTEE OF MANAGERS OF THE LONDON MECHANICS' INSTITUTION.

So numerous are the subjects for congratulation which present themselves to your Committee, on laying before their constituents the Fifth Quarterly Report of their proceedings, and of the advances made by the Institution towards the accomplishment of its important objects, that they feel some difficulty in deciding to which they ought first to direct your attention. The highly flattering state of its financial affairs—the great increase in the number of members—the foundation and progress of the new Lecture Room—the munificent liberality of those enlightened patrons of science, who have stepped forward to facilitate the progress of the Institution—the developement of native talent among the members themselves, evinced by the recent public examinations—and the powerful influence of the example of the mechanics of London, in accelerating the formation of similar institutions in other parts of the kingdom—all these gratifying circumstances have followed each other in rapid succession during the last three months; and while they have more than realized the most sanguine anticipations in which your Committee had ventured to indulge, have afforded an unquestionable demonstration, that the London Mechanics' Institution is founded upon an immoveable and imperishable basis.

To begin with the events which distinguished the First Anniversary of the Institution, and which, as they occurred at the immediate commencement of the last quarter, cannot be passed over in silence, though their publicity has already made them generally known to the members, your Committee beg to state, that on Thursday, the 2nd of December last, the first stone of the New Lecture Room, in Southampton Buildings, was laid by your worthy President, Dr. Birkbeck, in the presence of the various officers of the Institution, and a considerable number of the members. After the ceremony, which was concluded by an admirable and appropriate address from the President, the members celebrated the Anniversary by a dinner at the Crown and Anchor Tavern; upon which occasion, they were honoured by the attendance of a number of distinguished individuals; and your

Committee entertain no doubt, that the manner in which the important proceedings of the First Anniversary were communicated to the public at large, contributed in a great measure to the increasing prosperity which has since accompanied the progress of the Institution.

Having thus adverted to the foundation of the New Lecture Room, your Committee have next to announce to the members, that during the past quarter, every exertion has been made by the Board of Works, to whose superintendence the erection of the building is confided, to complete it as rapidly as the season of the year would allow, consistently with the security and durability of the structure. The exterior walls have reached their elevation, and considerable progress has been made in the construction of the roof. The interior of the building will proceed with the least possible delay; and though your Committee are unwilling to incur the risk of disappointing the expectations of the members, by fixing too early a date as the probable period of its completion, they can with confidence assure them, that their next Quarterly General Meeting will be held within the walls of the New Theatre.

Your Committee have also to state, that agreeable to the notice given in their last quarterly report, the Elementary School of Arithmetic was opened on the evening of the first anniversary, and has since been regularly continued on Tuesday, Thursday, and Saturday evenings in each week, with the exception of an interval of a few days at Christmas. The attendance of the members in the Arithmetical School has been numerous and regular, and the mode of instruction adopted by Mr. Collins has afforded general satisfaction. Your Committee beg to add, that they have nearly completed their arrangements for commencing the Mathematical School, for the instruction of the members in algebra, geometry, and trigonometry, which will be opened in a few weeks, and will be followed by the School of Perspective and Architecture as soon as circumstances will permit.

As an important branch of that portion of the society's utility which is derived from the establishment of Schools, your Committee cannot omit this opportunity of directing your attention, with feelings of peculiar satisfaction, to the very handsome and liberal offer of Mr. Black, to communicate to the members a knowledge of the French Language, upon a system admirably adapted to facilitate the attainment of this valuable object. The numerous applications received from members, anxious to avail themselves of the advantage thus offered to their acceptance, has sufficiently evinced their sense of its importance, particularly as the means of enabling them to read a number of valuable French works on Mechanics, Chemistry, Architecture, & other scientific subjects, and your Committee are happy to have been already enabled to introduce 180 of the members to a participation in this department of instruction, by the formation of three classes, each consisting of 60 pupils. To Mr. Black, for his admirable introductory Lecture on the French Language, and the zeal and perseverance with which he has superintended the two first classes of pupils, your Committee beg to express their warmest acknowledgments; and they also feel great pleasure in returning their sincere thanks to Mr. Reynolds, one of the members of your Committee, for his kindness in voluntarily undertaking the instruction of the third class, upon the very superior system of Mr. Black.

Your Committee are deeply sensible of their obligations to the various Lecturers, whose zeal for the prosperity of the institution has induced them to devote their talents to the scientific instruction of the members, during the last quarter. To Mr. Tatum, for his very valuable course of Lectures on electricity, magnetism, and electro-magnetism,—to Mr. Cooper, for the first division of his extensive and scientific course of Lectures on chemistry, and most particularly for his public examinations of the members, which elicited so gratifying a display of talent on their part, and so forcibly exemplified the incalculable advantages resulting from the establishment of the Institution;—to your excellent president, Dr. Birkbeck, for his admirable Lecture on Acoustics, and his lucid explanation of the abstruse phenomena of the winds;—to Mr. Partington, for his able illustrations of the interesting science of Optics;—and to Dr. Allen, for his impressive Lectures on the new method of investigating the powers of the human mind; —your Committee are happy to express, upon this public occasion, their warmest and most unqualified feelings of gratitude.

Your Committee have now to lay before the members the following statement of the receipts and disbursements of the last quarter, during the whole of which period the financial affairs of the society have been under the direction of your honorary secretary, Mr. Blake, with the assistance of the Sub-Committee of accounts, whose joint endeavours to establish a regular and systematic method of keeping the books, they trust will meet with the approbation of the members.

From the financial statement here alluded to, which was of the most satisfactory and gratifying description, it appeared that the receipts of the quarter amounted to the large sum of £682. 0s. 6d.; of which amount £343. 10s. 0d. consisted of the annual and quarterly subscriptions of the members of the society; £297. 15s. 0d. had been received for donations: and the remainder from other sources. The balance in the hands of the bankers, after the payment of the disbursements, which were minutely particularized, was £607. 16s. 8d.

After the preceding exposition of the pecuniary state of the society's affairs, in which they trust the members will discover ample cause for congratulation, your Committee, with sentiments of indelible gratitude to the enlightened and liberal DONORS, who have so largely contributed to the diffusion of scientific information among the members of this institution, present the following list of donations, which have been received and paid to the bankers, as above stated, during the last quarter, viz.

	£.	s.	d.
John Cam Hobhouse, Esq., M. P.	100	0	0
Rev. George Atwick	50	0	0
John Taylor, Esq.	21	0	0
The Right Hon. Earl Spencer	20	0	0
Sir Benjamin Hobhouse, Bart.	10	0	0
Dr. Gilchrist, V. P.	10	0	0
Wm. Tooke, Esq., Hon. Solicitor	10	10	0
Francis Garratt, Esq.	10	10	0
Henry Bickersteth, Esq.	10	0	0
Edward Smith Bigg, Esq.	10	10	0
Edward Wakefield, Esq.	10	0	0
G. P. Greenough, Esq.	10	0	0
A. Robinson, Esq.	5	5	0
Thomas T. Clarke, Esq., 1st annual donation	5	0	0
Lieut. Col. Torrens	5	0	0
Mr. Henry Peto	5	0	0
Mr. James Fairlie	5	0	0
Total	£.297	15	0

To the foregoing handsome list of donations already received, are to be added the following, which, from the pressure of parliamentary and other business, are at present forthcoming, but will doubtless be very shortly added to the balance in the hands of the bankers; viz., Jeremy Bentham, Esq.,£100; JohnGeorgeLambton,Esq.,M.P., £50.; Mr. Alderman Wood, M. P., £10; and lastly, the splendid and munificent donation of £1000. from Sir Francis Burdett. Of the latter gift, your Committee feel it impossible to speak in terms sufficiently expressive of their admiration and gratitude. To appreciate it according to its merits, it is necessary to look, not only at the large amount of the donation, but at the effect already produced by so noble an example, and at the further beneficial consequences expected to result from its powerful influence. Your Committee cannot but be sensible that the extraordinary liberality of the Honorable Baronet, and the subsequent pecuniary aid of so many other patrons of the institution, have anticipated by several years the unassisted exertions of the members, and proportionably advanced the accomplishment of all the important objects of the society. Your Committee would here gladly pay a just tribute of grateful admiration to Mr. Place, sen., of Charing Cross, through whose persevering energy the donation of Sir Francis Burdett, and the greater part of the others have been obtained, but they resign to the members the task of estimating the extent of those sentiments of gratitude which language is too feeble to express.

Your Committee have now to offer their public acknowledgments to H. Brougham, Esq., M. P., for the eloquent and powerful manner in which he has advocated the establishment of Mechanics' Institutions, in his excellent pamphlet on the Education of the People, and for the striking proof he has afforded of the deep interest he feels in the prosperity of this institution, by disinterestedly devoting to its funds the whole of the profits arising from this able effort of his talents.

Your Committee are also called upon to record their grateful thanks to the various donors who have so liberally contributed to the enlargement of the library of the institution, by the following numerous list of valuable books, presented during the last quarter.

DONATIONS OF BOOKS,

RECEIVED DURING THE QUARTER.

	Vols.
Treatise on Stay Sails, by Captain Sir Henry Heatheote, R. N. — Presented by the Author.	1
Lewis's History of Short Hand — Presented by Mr. Moore.	1
London Mechanics' Register, 1st Part (and continued) — Presented by the Publishers.	
The Works of Francis Bacon, Lord Verulam — Presented by Mr. John Hill.	12
Guthrie's Geographical Grammar — Presented by Mr. Morland.	1
The Works of Lucian, from the Greek, by Thomas Franklin, D. D. 2, Panorganon, or a Universal Instrument for performing Geometrical and Astronomical Conclusions, by Wm. Leybourn, 1672, 1 — Presented by Mr. Whitaker.	3
Whitty's Treatise of the Sphere 1, Huygen's Conjectures concerning the Planetary Worlds 1, Adams on Vision 1, Phillip's Method of Teaching Ancient and Modern Languages 1 — Presented by Mr. Tovey.	4
Asiatic Annual Register — Presented by Mr. Edward Howell.	3

	Vols.
Blair's Lectures on Rhetoric and Belles Lettres 1, Memoirs of Ancient Chivalry 1	2
Presented by Mr. J. Osborne Barratt.	
Ferguson's Art of Drawing in Perspective	1
Presented by Mr. Richard Bright.	
Hume and Smollett's History of England	3
Presented by Mr. Alex. Crawford.	
The Artificial Clock Maker	1
And a Specimen of Petrified Oak.	
Presented by Mr. John Reynolds.	
Popular Encyclopedia, Parts 4, 5, and 6, 2 copies, 6 parts.	
Presented by the Editors.	
Mechanics' Oracle, 6 numbers.	
Presented by the Editor.	
Switzer's Universal System of Water and Water Works	1
Presented by Mr. Wm. Jones.	
Enfield's Institutes of Natural Philosophy 1, Hodgson's Doctrine of Fluxions 1, a Parallel Ruler, Adams's Graphical Essays 2, Wilkinson's Elements of Galvanism 2, Marratt's Mechanics 1 -	7
Presented by Mr. Bevan, of Leighton Buzzard.	
Recueil De Divers Memoires 2, Principes D'Hydraulique et De Pyrodynamique 1	3
Presented by Sir John Byerley.	
The Death of Abel	1
Presented by Mr. Alfred Simms.	
Sir Richard Phillips on the Proximate Causes of the Material Phenomena of the Universe 1, Adams on the Globes 1, A Guide to Peake's Hole 1, Tales and Fables from La Fontaine and La Motte 1, Thompson's Seasons 1, Homer's Odyssey 2, Franklin's Observations and Experiments on Electricity 1, Annals of Philosophy, 3 numbers	8
Presented by Master Geo. Sweet.	
Emerson's Algebra 1, ditto Mechanics 1, ditto Astronomy 1, ditto Geography, Navigation, and Dialling 1, ditto Optics, Perspective, &c. 1, ditto Chronology, Combinations, Mensuration, &c. 1, Fenwick's Essays on Practical Mechanics 1	7
Presented by Dr. Olinthus Gregory.	
Instructions from the Bengal Government to the President at Lucknow 1, Marquis of Hastings's Summary of the Operations in India with their Results 1	2
Presented by Mr. Richard Porter.	
Laing's Plans of the Custom House 1, Outlines of Phrenology 1, a Tygercat's Skull from the Island of Ceylon, a Phrenological Bust	2
Presented by Mr. Peter Thompson.	
Chesterfield's Advice to his Son 1, Mrs. Murray's History of France 1, Volney's Ruins 1, Robinson Crusoe 2, The Book, or Delicate Investigation 1, Lucius Junius Brutus, a tragedy, 1, A New Way to Pay Old Debts, a play, 1, Rushton's Poems 1, The Princess of Babylon, a romance, 1, The Spirit of the Magazines, 6 numbers, The London Magazine, 4 numbers	10
Presented by Mr. S. Donne.	
Parkes's Rudiments of Chemistry 1, The History of Aberdeen 2 . . .	3
Presented by Mr. George Waller.	
Sentimental Fables in French and English 1, Reports on Artizans and Machinery 1	2
Presented by Mr. Le Gros.	
The Death of Abel 1, Bonnycastle's Introductions to Algebra 1, Curran's Speeches 1, Volney's Ruins 1 . .	4
Presented by Mr. J. J. Cope.	
A Lecture on Human Happiness, 3 copies.	
Presented by Mr. John Gray.	
Bigland's Letters on History	1
Presented by Mr. John Ball.	
Wakefield's Description of Ireland . .	2
Presented by the Author.	
Paley's Evidences of Christianity . . .	2
Donor unknown.	
Blair's Sermons 5, Johnson's Lives of the Poets 3, Transactions of the Royal Society of Edinburgh 4, Falconer's Marine Dictionary 1, Sale's Translation of the Koran 2, Maclean on Quarantine Laws 1, Greece in 1823 and 1824, by Leicester Stanhope 1, Bower's History of Edinburgh 2, History of the Westminster Election 1, Asiatic Journal for 1824 2, Oriental Herald 3, Observations on Objects interesting to the Highlands of Scotland 1, Parliamentary Reform on Constitutional Principles, by Dr. Gilchrist 1, The Oriental Green Bag, by ditto, 1, T. Southwood Smith's Appeal in behalf of Unitarian Christians 1, Polyglossal Diorama 1, Letter to the Court of Directors, The Independent, 2 numbers, Edinburgh Christian Instructor, 1 number, The Edinburgh Quarterly Review, 5 numbers, The Scottish Review, 3 numbers . . .	30
Presented by Dr. Gilchrist.	
Wraxall's History of France	2
Presented by Mr. R. H. Wood.	
Boyle's Philosophical Tracts	1
Presented by Mr. Gloyn.	
Martin's General Magazine	4
Presented by Mr. Henry Wilson.	
Vols.	124
7 Parts, 33 Numbers.	

From the same causes which prevented your Committee from stating in their last report the exact number of members then belonging to the society, they are still unable to ascertain the number with perfect precision. It affords them, however, the greatest satisfaction to be enabled to state, that a very considerable increase has taken place during the last quarter, and also to approximate very nearly to correctness, by announcing that in the course of that period 934 members have paid their subscriptions; and allowing, upon the most moderate calculation, that there are 150 annual and half-yearly members, whose subscriptions did not become due within the quarter which has just terminated, the actual number of members at the present time must be nearly, if not quite, 1100.

Your Committee having informed the members in their last quarterly report, that their late secretary, Mr. Flather, had been compelled to absent himself from his situation, in consequence of private embarrassments, have now to announce that the circumstances were such as to preclude the possibility of his resuming the office of secretary. As the Sub-Committee of Accounts were at that period actively engaged in the investigation of the financial affairs of the society, with a view of establishing a correct and systematic method of keeping the accounts, they were desirous that the vacant situation should not be filled up, till they were fully prepared for the adoption of their arrangements by the gentleman who might be appointed to the important office of secretary to the institution. Your Committee therefore accepted the offer of your honorary secretary, Mr. Blake, to continue the performance of the duties attached to the situation, with the able and valuable assistance of Mr. Place, till the close of the quarterly accounts of the society, and their subsequent examination by the auditors. Your Committee, in the mean time, devoted their anxious attention to the appointment of a competent individual to the vacant situation, and after a patient and laborious investigation of the respective claims of nearly eighty candidates, their election fell upon Mr. Robert Christie, of Southampton Buildings, who, in pursuance of previous arrangements, will enter upon the duties of his office, on Monday evening next. The strict integrity of this gentleman, and his qualifications as an able mathematician and mechanic, are so well known to the members, that it is unnecessary to expatiate upon them; and your Committee entertain a confident expectation that their choice will meet with the general approbation of the members, and that the conduct and abilities of their newly appointed secretary will amply merit the confidence reposed in him. Your Committee need only add, that Mr. Christie has given the security required by the rules, for the due performance of his duties; and that a Sub-Committee of Accounts has been constituted a permanent appendage to the general Committee, for the purpose of superintending and carrying into effect the system of book-keeping now established.

Your Committee beg to state that the inconvenience necessarily occasioned by the distance between the premises in Southampton Buildings and the temporary Lecture Room in Monkwell Street, together with the continual removal of portions of the apparatus for the purpose of illustrating the various courses of Lectures delivered to the members, have hitherto rendered it impossible for the Sub-Committee of Apparatus to complete their arrangements for submitting the museum to the general inspection of the members. As these impediments still continue, your Committee are apprehensive that this desirable object must remain unaccomplished, till the completion of the new Lecture Room shall enable them to pursue the whole of their operations upon the premises of the institution in Southampton Buildings.

Your Committee, in conclusion, are happy to repeat their most cordial congratulations to their numerous constituents, on the highly prosperous state of the society's affairs, and the rapid advances towards maturity which the institution has made during the last quarter. They beg to express the great pleasure they derive from witnessing the undisturbed unanimity which prevails among the members, and which forms the grand basis of the permanent prosperity of the institution; and while your Committee have the satisfaction to reflect that their past exertions have been rewarded by your approbation, they beg to assure you that their whole energies shall be devoted to an undeviating perseverance in those efforts, which, they venture to hope, have hitherto secured them a place in your esteem and confidence.

After the reading of the above report, which was received with much cheering, the worthy president, Dr. Birkbeck, rose and stated that George Grote, jun., Esq., one of the auditors, who had honored them with his attendance this evening, would communicate to the meeting the result of his examination of the accounts of the Institution. Mr. Grote then read the auditors' report of the receipts and disbursements of the last half-year, and after congratulating the meeting upon the prosperous state of the finances of the Institution, he expressed a hope that the tide of success would continue, and that the next report would be

The report of the committee was then put to the show of hands in the usual form, upon the motion of Mr. Stacy, and unanimously received.

The report of the scrutineers at the election of the preceding evening, was next read, when Mr. Waterman, one of the members who had been chosen to act as a Committee-man, declined accepting the office, as it would be impossible for him to attend to the duties, and he had not been previously consulted as to whether he would like to accept it.

Mr. Frend, after a few preliminary observations on the necessity of completing the number of the Committee, moved, that the next member in rotation on the balloting list should be put in nomination, in lieu of the gentleman who had declined to take office. This motion being seconded, Mr. Blake, the Honorary Secretary, stated that the three next members in rotation had balloted exactly the same number. *(Loud laughter.)* Dr. Birkbeck then put the motion to the vote that lots be prepared by the scrutineers, one of which should be drawn out by the president, and that the member whose name should be drawn, should supply the vacancy. This motion gave rise to some discussion, but was ultimately agreed to. A lot was accordingly drawn from the three members next in rotation, and was found to contain the name of Mr. John Holdup, whose name was substituted for that of Mr. Waterman.

The meeting then proceeded to take into consideration the notices of motions for additional Rules and Orders, which had been transmitted to the Committee, agreeable to the Rules; the first of which was proposed by Mr. Mote, as follows, viz.:—

"That one free admission to either of the lectures of the Institution be given by the Secretary to each of the members recommending a person to become a member, on the admission of the person recommended."

Upon this resolution being put, several members successively stated their opinions as to its merits, and in the end it was unanimously agreed to.

The second Resolution entitled every member, whether annual or quarterly, to receive, on paying his subscription, one free admission for each quarter paid in advance. This Resolution was also carried after some discussion.

Mr. Mote then proposed his third Resolution, which in substance empowered the Committee to fill up any occasional vacancy in their number in consequence of death, resignation, or any other cause, by appointing the next member in rotation, on the last ballotting list. He considered this motion to be of a very important nature, and that its necessity was enforced by the instance which had occurred to-night. It might, however, happen, that a member who had previously given his consent to be nominated, might be unable afterwards to fulfil the duties of a Committee-man, from removing into the country, or from other causes, and much inconvenience would be sustained by the remainder of the Committee, unless they were enabled to fill up the vacancy.

Mr. Frend seconded the motion, which he considered a very proper one, as it conferred no additional power upon the Committee, and merely instructed them, in case of a vacancy, to supply it with the name of a member previously nominated by the general body.

Mr. M'William was of opinion that vacancies in the Committee ought to be filled up, but he was doubtful whether the method proposed was the best that might be adopted. Individuals who were perfectly eligible and meritorious at the time they were proposed, might not be so after the lapse of a few months; and it was also possible that a member might resign from improper motives. It was not his intention to move any amendment, and he merely threw out these hints for the consideration of the meeting.

Dr. Gilchrist rose principally with a view of asserting his right, though one of the Committee, to give his sentiments on any subject whatever, as a member of the society. He never resigned, when acting as chairman in the committee, his rights as a private individual. He considered the mode proposed so complete in itself that it could not be altered for the better, and if a member's character should change in 2 or 3 fleeting months, from sinister motives, or to get a dirty job, he trusted that there would be virtue enough left among the remainder of the Committee to disappoint him.

A Member stated his determination to oppose the resolution, and begged every one to do so too: *(laughter)* as the gentlemen seem pleased, perhaps they would be of his opinion. The Committee, by this resolution, would be called upon to fill up vacancies with the names of individuals who had been previously rejected by the members. If the number of committee-men was not large enough, make it 40 instead of 30, rather than hold out what he considered to be a premium for resigning.

Mr. Gloyn stated, that he hoped no member would ever resign from petty motives. He did not look upon the number of votes as a criterion of the comparative merits of the candidates, and, for himself, should be contented with the lowest on the list. The resolution was then put and carried with only three dissentients.

Mr. Jones then rose to move, "That any person presenting to the Institution ten guineas or upwards in one payment, or delivering a gratuitous course of lectures shall be admitted an honorary member for life." He felt a diffidence almost amounting to reluctance, in addressing the meeting upon this occasion; but he thought that both from motives of gratitude, and for the interest and prosperity of the Institution, the motion ought to be agreed to. It would be illiberal to close the doors against those noble individuals, who had done honour to their station by assisting the Institution; and with respect to lecturers, he thought their merits should not be measured by pounds, shillings, and pence; but he would ask, whether, if the lectures the members had heard were to be paid for, they could offer for any of the courses so small a sum as ten guineas. Mr. Jones then combated some objections which might possibly be made, and concluded by moving his resolution.

Mr. Frend enquired, whether one, two, or three lectures constituted a course? and observed, that if a course of lectures was commenced, which was not approved of by the members, they might, according to the terms of the resolution, be placed in the awkward predicament of being obliged to admit as an Honorary Member a gentleman whose lectures were not acceptable.

Dr. Gilchrist stated, that a course of lectures implied a complete illustration of some art or science; and if the members disliked the lectures of any gentleman, a gentle hint would be sufficient to cause their discontinuation; and as the course would not be completed, the claim to be admitted an Honorary Member would not be established.

Mr. Stacy agreed with the principle of the resolution, but suggested the propriety of referring the mode of carrying it into effect to the consideration of the Committee, to report at the next general meeting the most eligible means of obviating any inconveniences that might be apprehended from its adoption.

Mr. Adams objected to the admission of Honorary Members altogether, as being opposed to the principles recommended by Mr. Brougham, and subversive of the preponderance that the Mechanics ought to possess, in conducting the affairs of the Institution.

Mr. Blake conceived, that the last speaker had entirely misunderstood the purport of the resolution, which placed Honorary Members on a footing, totally different from that of other Members of the Institution, and neither gave them any vote or influence in the management of its affairs, nor conferred eligibility for office.

After some further discussion, the resolution was carried in a modified shape, by omitting "the sum of Ten Guineas," and substituting the words, "a sum to be hereafter specified."

Mr. Jones then proposed his second Resolution, "That females shall be admitted members of the Institution on the usual terms, but to be honorary members only."

This proposition was received with some disapprobation, and an amendment was moved, that it be laid upon the table for future consideration.

Mr. Jones expected that his resolution would have met with a different reception, and was surprised at the opposition made to it. He could discover no reason why this Institution, which ought to set an example of candour and liberality to others, should be the only one in London which excludes females from its lectures. Why should not females be enabled to cultivate their powers, and by acquiring solid and useful learning, become better qualified to perform the delightful task of communicating to their children the first rudiments of education?

Mr. Whitaker admired the argument urged by the mover, that we receive our first tuition from females, and stated that if women were admitted generally to places of public instruction, much good might result from it, for we should then have a greater number of better women, and consequently a greater number of better men.

Dr. Gilchrist coincided in opinion with the supporters of the motion, but said that a proposition might be reasonable, but not seasonable. The time would probably arrive when the motion would be more successful than it was likely to be upon the present occasion.

Mr. M'William observed, that no reason had been given why the resolution was improper, and he believed it was because no reason could be given. Still he thought the proposition was rather premature, and suggested the propriety of postponing it for three months, when the members would be better prepared for the discussion.

Mr. Jones ultimately withdrew the resolution.

The preceding resolutions having been thus disposed of, Mr. Gloyn proposed that the thanks of the meeting should be given to Mr. Blake, the honorary secretary, and to Mr. Place, the assistant honorary secretary, for their indefatigable exertions, during the last three months.

This resolution was warmly seconded by Dr. Gilchrist, and carried unanimously.

Mr. Blake begged to offer his most sincere acknowledgments for the very flattering manner in which the meeting had expressed their approbation of his conduct. If his exertions during the last three months, under the circumstances in which the institution had been placed, had been in any degree conducive to its welfare, he was amply rewarded for them, and should be happy, at any future period, whether on or off the committee, to contribute as far as his humble abilities would enable him, to the prosperity of this valuable institution.

Mr. PLACE also expressed his gratitude to the members for the honor conferred upon him, as well as for the polite attention he had uniformly experienced during the receipt of their subscriptions. The higher orders had assumed a monopoly of good manners, but he thought they might receive a salutary and useful lesson from the members of the London Mechanics' Institution.

The thanks of the meeting having been voted to the Committee-men retiring from office, Mr. FREND, as one of the retiring Committee, rose to express his gratitude, and begged to be indulged with a few observations upon this particular occasion. He had attended their first meeting at the Crown and Anchor Tavern, and had there expressed his sentiments on the advantages to be expected from the union of science and art, which was likely to result from the establishment of such an Institution as the present. He quitted town immediately afterwards, and on his return, he found that they had elected him a member of their Committee. For this honour, he returned them—not common thanks, but the heartfelt expression of gratitude. He congratulated the members on the great progress the Institution had made in so short a time; a progress which had far exceeded his most sanguine anticipations, and he trusted that a long period would not elapse before the grand moral and intellectual machine which they had constructed would be in full operation. With respect to the nature of the proceedings of the committee, he was happy to see that there existed but one spirit between them and the body at large, which he attributed to that excellent regulation by which half of the committee went out by rotation periodically; for by this means there was a constant circulation going on between the committee and their constituents, and their interests became completely identified. He should always reflect with pleasure on having been a member of a committee, whose proceedings were uniformly conducted with such order, regularity, and devotedness to the great interests of the body which they represented.

The thanks of the meeting were afterwards successfully voted to the Building Committee, for their exertions in erecting the New Lecture Room; to Mr. Tatum, Mr. Cooper, Mr. Parkington, and Dr. Allen, for their excellent cources of Lectures; to Mr. Black, for his Lecture on the French Language, and his valuable instructions to the members; to Mr. Reynolds, for teaching the Third Class of pupils, in the French School; to Mr. Place, sen., for his indefatigable exertions, on behalf of the Institution; to the Vice Presidents—to the Auditors—and finally, to the President, Dr. Birkbeck, for his admirable Lectures on Acoustics, and the Phenomena of the Winds, and for his able and impartial conduct in the Chair this evening.

Dr. BIRKBECK observed, that as he had to return thanks to the members for several favors, he regretted that the evening was too far advanced to allow him to intrude upon their indulgence, by expressing his gratitude as he wished. In a few words, then, he thanked them for having again placed him in the situation of their President; for their promptitude and assiduity in forwarding the views with which the Institution was formed; for a display of talents which had hitherto been denied, or admitted to exist but scantily in their minds; and lastly, for the intellectual glory which countless multitudes were preparing to shed around the human character. Of the stability of the institution he had no fears: it was founded on a basis which nothing could shake; it was supported by the good and the wise; and those who once doubted, had ceased to feel any apprehensions of an interruption to its prosperity.

The worthy President's observations were received with the strongest marks of attachment and esteem, and the meeting adjourned at eleven o'clock.

PATENTS EXPIRING NEXT WEEK.

John Plasket and Samuel Brown, for a method of making casks and other vessels by machinery. Expires March 6th.

Thos. Wm. Stergeon, for improved castors. Expires March 6th.

Abraham Willis, for a method of producing steel toys of different descriptions, such as barbers' curling-irons, sugar-nippers, snuffers, and other articles. Expires Mar. 6.

Richard Jackson, for a method of making the shanks of anchors, and other large bodies of wrought iron, by using one solid cove of iron for the centre, with bars of feather-edged iron around. Expires March 6th.

John Collinge, for an improvement on axletrees. Expires March 9th.

James Smelhurst, for improvements on lamps. Expires March 11th.

James Mallory, for a method of making certain machines for cutting and shearing the fur from all peltries, and for shearing cloth. Expires March 12th.

Errata.—Page 264, col. 2, line 17, for *Dalgelly*, read *Dolgelly*; and line 28, for *Llangelly*, read *Llangollen*.

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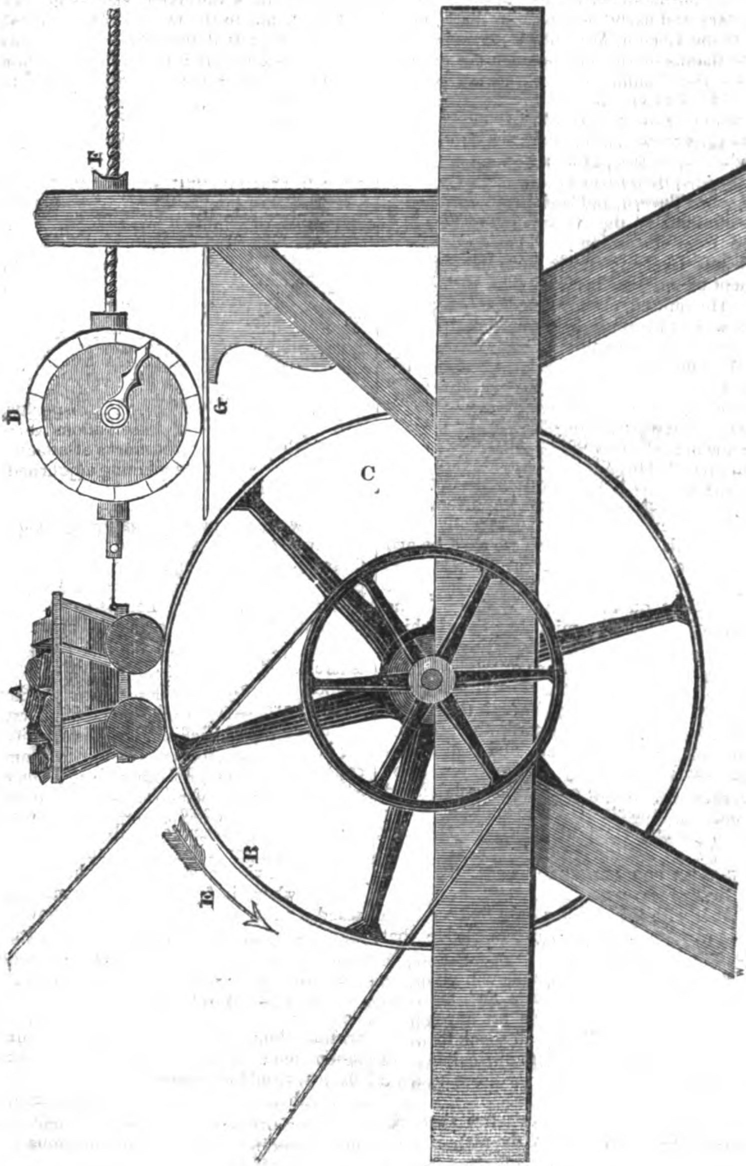
The London MECHANICS' REGISTER.

No. 20.] SATURDAY, MARCH 12, 1825. [Price 3d.

MR. ROBERTS'S EXPERIMENTS ON FRICTION—RAIL-ROADS.



EXPERIMENTS ON FRICTION—RAIL ROADS.

In the last number of the REGISTER, we alluded briefly to some experiments on rail-roads by a Mr. Roberts, of Manchester. The intense interest excited by this subject—the vast amount of capital about to be absorbed by the different rail-road projects—and the efforts used by the different promoters or opponents to secure or prevent the passing of the Bills—all serve as our excuse for our again returning to the subject. The following article, from the *Manchester Guardian*, will, we trust, be read with interest:—

"The object of the papers on rail-roads, which appeared in the *Scotsman*, was, in a great measure, to shew the practicability of transporting commodities upon rail-roads, at a very considerable speed; and (with some fallacies, which we shall endeavour to point out) they contain a great deal of valuable information, on the relative merits of highways, canals, and rail-roads. The principal point, however, and the one to which we shall confine our observations, is an enunciation of the laws which regulate the friction of rolling and sliding bodies, as deduced from the experiments of Vince and Coulomb. With a view to the illustration of this part of the subject, some very important and conclusive experiments have recently been made in this town, to which we shall by and by have occasion to refer at some length; but before doing so, we must make a few observations on the rule laid down in the *Scotsman*, and the misconceptions which appear to have prevailed respecting it, both in that journal and in other quarters.

"After comparing the resistance experienced by a boat moving through the water, with the friction which retards the progress of a waggon on a rail-road, and stating that they are governed by different laws, the *Scotsman* notices the conclusions established by the experiments of Vince and Coulomb; the most important of which is, that *the friction of rolling and sliding bodies is* THE SAME FOR ALL VELOCITIES. The writer then observes:—

'It is with this last law only that we have to do at present; and it is remarkable that the extraordinary results to which it leads, have been, so far as we know, entirely overlooked by writers on roads and railways. These results, indeed, have an appearance so paradoxical, that they will shock the faith of practical men, though the principle from which they flow is admitted without question by all scientific mechanicians.

'First—It flows from this law that (abstracting the resistance of the air), if a car were set in motion on a level railway, with a constant force greater in any degree than is required to overcome its friction, the car would proceed with a motion continually accelerated, like a falling body acted upon by the force of gravitation; and however small the original velocity might be, it would in time increase beyond any assignable limit. It is only the resistance of the air (increasing as the square of the velocity) that prevents this indefinite acceleration, and ultimately renders the motion uniform.

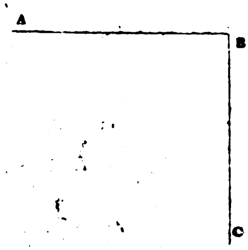
'Secondly—Setting aside again, the resistance of the air (the effects of which we shall estimate by and by), the very same amount of constant force which impels a car on a railway at two miles an hour, would impel it at ten or twenty miles an hour, if an extra force were employed at first to overcome the *inertia* of the car, and generate the required velocity. Startling as this proposition may appear, it is an indisputable and necessary consequence of the laws of friction.

'Now, it would be at all times easy (as we shall afterwards show) to convert this accelerated motion into a uniform motion of any determinate velocity; and from the nature of the resistance, a high velocity would cost almost as little, and be as easily obtained as a low one. For all velocities, therefore, above four or five miles an hour, railways will afford facilities for communication prodigiously superior to canals or arms of the sea.'

"Now we are perfectly satisfied, both by the experiments of Vince and Coulomb, and those more recent and more conclusive experiments, to which we have already alluded, that the rule laid down here is correct; but the writer ought to have guarded against the misconception to which his last paragraph is liable. When he says that a high velocity would cost almost as little as a low one, he should have said that it would cost as little per mile,—or as little over any given space: for it cannot be his meaning, that a carriage can be kept moving for an hour, or for any given time, at a high velocity, with as little expenditure of power, as at a low velocity. Yet this he has been generally understood to mean, and a great deal has been written and said with a view of proving that he was mistaken; when, in fact he was only misunderstood. In a subsequent article, however, the writer appears to have, in some degree fallen into the error into which he has led other persons. He says:—

'Every body knows that the rate of stage coach travelling in this country has increased within the last twenty-five years, from six or seven miles an hour to eight or nine, and this, too, before roads were M'Adamized, and with much less injury to the horses than was anticipated. Supposing that a coach-horse could run fourteen miles unloaded, with the same muscular exertion which car-rises forward the stage coach at eight or nine miles, then professor Leslie's formula becomes 3-4ths $(14-v)^2$. Each horse would, of course, draw with a force of 48lbs. at six miles, and of 27lbs. at eight miles an hour. But if the friction increased in the ratio of the velocity, the load upon each horse would increase from 48lbs. to 60lbs., when the speed increased from six to eight miles an hour: and as the horse exerting the same strength, would only pull with a force of 27lbs., he would thus have more than double work to do—which is plainly impossible. But admit that the friction is equal in equal times; then, since the time is diminished 1-4th, by increasing the speed from six to eight miles an hour, the horses have actually 1-4th less to do; the load upon each is reduced from 48lbs. to 36, and the horse would have to increase its exertion only 1-3rd—that is, from 27lbs. to 36. The facts, we believe, will be found strictly consistent with this hypothesis, and decidedly at variance with the other. However strange it may sound, then, to common observers, it is practically true, that a smaller absolute amount of force will drag a coach over the same space in three hours than in four, and in one hour than in two.'

"This paragraph seems to us to contain a very obvious fallacy. If the speed be increased from six miles an hour to eight, the horses have by no means 1-4th less work to do, supposing the friction a constant quantity, and the traction consequently the same. It is true that they exert this power for a shorter time, but it is over the same distance. Supposing the power of traction necessary to overcome the friction is 100lbs., then that power must be extended over every yard of the distance, whether the carriage moves at six or at eight miles an hour; and it is by the distance, not the time, that the power must be measured. That this must be the case, will be obvious if the experiment be put in another shape. Suppose a perfectly horizontal railway, a mile long, with a perpendicular descent of a mile at one end of it, as represented on the following diagram.



"Suppose a waggon placed on this railway at A, attached to a rope passing over a pulley at B, and loaded at that point with a weight exactly sufficient to overcome the friction, then, if the resistance of the air is nothing and the rope be without weight, it follows, from the rule laid down, that if the waggon is set in motion at any given speed, it will continue to move at that rate until it reaches the point B and the weight falls to C. But whether the waggon passes over the railway in an hour or in three minutes, it is obvious that the same weight will descend through the same space, and that consequently, the same amount of power will be expended. It is, perhaps, necessary to observe here, that if the weight is only just sufficient to overcome the friction, there will (as is proved by the experiments of Mr. Vince) be no acceleration of motion on the principle of falling bodies.

"However, though a carriage cannot as we think we have shewn, be moved ten miles in one hour, with a smaller expenditure of power than in two, it is very interesting to know that it can be moved with the same expenditure, (excepting always the additional resistance of the air.) In many cases dispatch is of so much consequence, that the elucidation and application of this rule will probably lead to very important results. Many persons, however, are very sceptical on this subject, and contend that the experiments of Vince and Coulomb do not authorise any such conclusions as have been drawn from them. It has been asked, if the same constant force will move a carriage as well at a high as at a low velocity,—why we do not see something like this in practice? —why a carriage moved by a steam-engine, instead of acquiring, as it proceeds, a high degree of velocity, moves on at one uniform rate after it has overcome the *vis inertiæ* at the commencement of its journey? We think the reason is very obvious. A locomotive steam-engine does not exert the same constant force on the peripheries of the wheels of the carriage, when it moves at different velocities. For instance, suppose the piston of an engine to move 220 feet in a minute, and to impel the peripheries of the travelling wheels at a velocity of two miles, and with a force just sufficient to overcome the friction,—how can the speed be augmented without increasing the power of the engine? If the diameter of the wheels be increased, with the view of increasing the speed, the force with which they are impelled will be diminished in the same proportion; and the engine will stop, unless the pressure is increased. To increase that, of course, will be to augment the power. As it is obvious, therefore, that a steam-engine cannot exert the same force at different velocities, some other means must be devised for putting to the test of experiment the rule laid down in the *Scotsman*.

"We now come to the most important and interesting part of this article. As none of the experiments of Vince or Coulomb (so far as we have seen or heard them detailed) were made with bodies resembling rail-way waggons, either in form, or in the nature of their motion, the correctness of the conclusions deduced from them, with respect to such carriages, was doubted by many persons of considerable scientific attainments. It became desirable, therefore, that other experiments should be tried, with carriages, upon rail-ways, which, of course, would be much more satisfactory. This, however, it did not, at first sight, appear very easy to accomplish in a satisfactory manner: but Mr. Roberts, of this town, recently devised a mode of determining the point, which appears to us wholly unobjectionable, and which exhibits, in a high degree, the simplicity and facility of execution, by which that gentleman's inventions are so eminently distinguished. It was very difficult to devise means for measuring accurately the friction of a carriage moving over a railway; but it occurred to Mr. Roberts, that the difficulty would be obviated if the railway were made to move under the carriage. When this idea once presented itself, it was easy to reduce it to practice. Mr. Roberts therefore constructed an apparatus, of which the engraving will give a pretty correct notion.

A is a small waggon with four cast-iron wheels, placed on the periphery of a cast-iron drum B, three feet in diameter, and six inches broad, (which acts as the rail-road.) This drum is fastened on the same shaft with the pulley C, which is driven at different speeds by a strap from another pulley. The waggon is attached by a wire to one of Marriott's patent weighing machines D, for the purpose of measuring the friction, and the board G, prevents the current of air, occasioned by the motion of the drum, from acting upon the carriage. Now if the drum be driven with any given velocity, say four miles an hour, in the direction indicated by the mark E, and the waggon held in its place by the wire which attaches it to the index, it is perfectly obvious that the wheels will revolve on the drum in precisely the same manner as if the waggon moved forward on a horizontal road; and the friction will also be the same, except, perhaps, a small addition occasioned by the curvature of the drum, but which will not affect the *relative* frictions of different speeds. As the waggon is stationary, the resistance of the air will be entirely got rid of; and the index of the weighing machine will indicate the precise amount of traction necessary to overcome the friction. Of course, in making the experiment it will be necessary to keep the centre of the waggon *exactly over the axis of the drum;* for if it were permitted to go beyond the centre, a part of the weight would be added to the friction: if, on the contrary, it was brought nearer the index, a part of the weight would act against the friction, and diminish the apparent quantity. The tempering screw F, is therefore added to keep the waggon in its proper situation, in whatever way the spring of the weighing machine may be acted upon by the friction.

This simple apparatus having been constructed, a number of experiments were made, chiefly with a view to determine whether the friction was the same at different velocities. The waggon was loaded with 50 pounds, (including its own weight) and the drum was driven at different velocities, varying from two to twenty-four miles an hour on the periphery: but in every case the friction, as indicated by the weighing machine was precisely the same. No increase of speed affected the index at all, bnt on increasing the weight, it immediately shewed a corresponding increase of friction.

We consider these experiments as perfectly conclusive of the fact,—that the friction on a rail-way is the same for all velocities; and that a carriage may be propelled twenty miles in one hour, with the same amount of force which would be necessary to drive it twenty miles in ten hours, provided the resistance of the atmosphere was out of the question: and, if the carriage was properly constructed, that would not amount to much. In other words, goods may be conveyed from Manchester to Liverpool, on a rail-road, with very nearly the same expenditure of steam, whether they are carried two miles, or four miles, or twenty miles an hour. A steam engine, which will propel 20 tons at four miles an hour, will with the same expence of coals, propel 10 tons at eight miles an hour; so that, with the smaller load, it might make a journey to Liverpool and back, in the same time which would be occupied in going thither with the larger load. Or, to put the matter in another shape; suppose a four-horse engine will convey 40 tons to Liverpool in eight hours,—an eight horse engine will convey the same weight thither in four hours. There will be the same expenditure of steam in both cases, but, in the latter, a saving of half the time; a saving, which, we need not add, will frequently be of immense importance.

Mr. Roberts also tried some experiments to determine the rate of friction, and the relative frictions of different weights; but as these experiments will probably be repeated with greater care and accuracy, we shall at present abstain from further notice of them."

FAMILIAR LESSONS ON MINERALOGY.

(*Resumed from page* 281.)

The diamond cuts* it so, that it breaks in

* Some have said the diamond poison

the line frequently under the very act; other substances merely scratch it. Pebbles, compared with diamonds, are at least one-third less in weight. Diamonds in their rough state, are generally very small, and have almost always a sort of shining metallic hue, and a crystalline form, exhibiting planes and angles different from those of any stone. The beginner, without confining himself to these marks of discrimination, may procure a fine file, and rub the substance with a little pressure; if it be a pebble the file will with difficulty leave an impression; or he may try it on a piece of lead charged with emery, or upon a lapidary's wheel, any one of which will wear down the pebble, but will not produce the smallest effect upon a diamond.

When cut and polished, the rays of light will pass through the pebble, whereas in the diamond, the rays are by its great powers of refraction reflected (as it were) to the surface, which gives it this highly marked difference in society, viz.

Diamonds are best seen and known by the *beholder*, who may at any distance distinguish the reflected ray of light, but other stones are best seen by the wearer, or those who are nearest to them.

After due attention to these remarks, a crystal cannot possibly be mistaken for a diamond.

Pebbles,* rounded substances from these sources, are commonly hard and siliceous, as crystal, usually called quartz, chalcedony, agates, and jaspers; their varieties are numerous. They all give fire when struck with steel, do not yield to the knife, but are slightly affected by the file, and when broken have generally a shining and uneven fracture; the fragments are splintery and sharp edged.

The crystal may be known by its transparent appearance, although the exterior may be dull. Quartz is a variety of crystal, but differs from it in colour, being less transparent, often opaque, and of various hues of brown and yellow, sometimes milk blue; its fracture is shining, and fragments splintery as crystal.

Agates, are commonly very rough on the exterior; of brown and blueish colours, and rounded; when broken, they exhibit lines generally curvilinear and angular of different shades of colour and texture; sometimes they are composed of quartz, and not unfrequently are hollow and crystallized; the Scotch pebble belongs to this class. Agates may be said to form innumerable varieties, and rank amongst the most beautiful class of polished stones.

The *chalcedony* generally has rather a peculiar appearance, agreeable to the eye from the pleasing softness of the colour which is commonly pale blue. It is of fine texture and semi-transparent, with lines of opaque white. It sometimes forms agate, is often stratified or zoned, and is of great beauty; other varieties are stalactitic, and frequently marked by low half globular projections (mammillated). It is of various colours, the latter variety is frequently brown and yellowish, not unlike that of horn. *Cornelians* belong to this class, also *Oriental agates, Mocha stone, sardonyx*, &c. The learner will not fail to remember the leading features which form the characters of this beautiful series, after seeing and examining some of its varieties.

Jaspers do not fall short of the preceding families, either in extent or variety; they may be known by their colour, which is commonly brown, yellow, or red, of various shades, and sometimes green, often striped, veined, arborescent, moss like, or as if blotched. The Egyptian variety, or brown jasper, is most peculiarly marked, frequently presenting figures, profiles (lusus naturæ) even likenesses, and most curious and whimsical appearances, some of which have been sold at great prices.

Jaspers generally occur larger than the preceding varieties, with their exterior rounded, and generally of the colours beforementioned; they are held in great estimation by those who form collections of polished specimens, and many ladies and gentlemen have a small apparatus for cutting and polishing these productions, which may be brought upon a parlour table without any inconvenience, and afford a most agreeable evening's employment and amusement; all these varieties are hard enough to receive a good polish; but often jaspers are softer than either agates or quartz. These substances (more particularly quartz), are usually met with on the sea coast, or in gravel, including *flint*, which is so common and well known as not to need any description. *Flint* often forms a large portion in the alluvial soil, particularly in the vicinity of chalk.

Rounded pieces of *granite, green stone*, and *porphyry*, occur less frequently in this situation, though they are not uncommon, therefore it may not be improper to notice them in this place.

Granite is composed of three distinct substances, viz. mica, quartz, and felspar, which the learner will easily distinguish.

Green stone is composed of hornblende and felspar; it is often very hard, and of a dull green colour.

Porphyry is a substance that equals jasper in hardness, and is generally of a brown or red-brown colour, speckled with whitish spots. These spots are very seldom round, almost always angular.

(*To be resumed.*)

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glass, for it often separates the instant it has performed its office; perhaps from the action of the air.

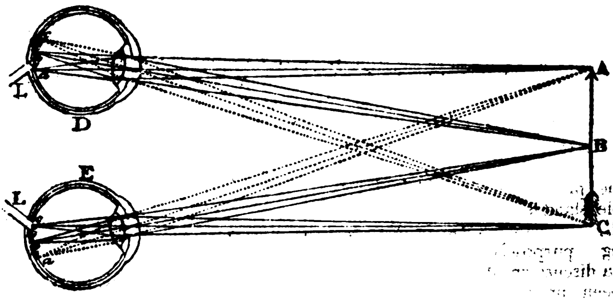
* From the sea-coast, gravel, &c.

To the Editor of the Mechanics' Register.

SIR—Although a reader of your valuable work, I regret to say that the query proposed by your correspondent FREDERICUS, escaped my recollection till the present moment; and as the subject of vision, with reference to the operation of both eyes, was not distinctly alluded to in my lectures at the London Mechanics' Institution, it may be advisable to call the attention of your correspondent, and the members of the Institution, to the following brief illustration, furnished by the "self-educated philosopher" Ferguson:

"In the following diagram is exhibited the manner of seeing the same object, A B C, by both the eyes, D and E, at once.

"When any part of the image, *c b a*, falls upon the optic nerve L, the corresponding part of the object becomes invisible. On which account nature has wisely placed the optic nerve of each eye, not in the middle of the bottom of the eye, but towards the side next the nose; so that whatever part of the image falls upon the optic nerve of one eye, may not fall upon the optic nerve of the other. Thus the point *a* of the image *c b a* falls upon the optic nerve of the eye D, but not of the eye E; and the point *c* falls upon the optic nerve of the eye E, but not of the eye D; and therefore to both eyes taken together, the whole object, A B C, is visible*."



From the above diagram it will be seen that vision is perfect with both eyes; but that the sensation being simultaneous, and exactly similar on the retina of each eye, a single impression only is conveyed to the brain. Whether, however, single vision is merely an effect of the association of two distinct sensations; or whether, from the junction of the corresponding fibres belonging to each eye, before they reach the brain, a single sensation is produced, is a question which a better acquaintance with the structure of the brain than we at present possess can alone answer.

I am, &c. yours faithfully,

C. F. PARTINGTON.

London Institution, March 8.

LONDON MECHANICS' INSTITUTION.

MR. OGG'S THIRD LECTURE ON GEOLOGY. FRIDAY, MARCH 4.

BASALT——FINGAL'S CAVE——GREENSTONE—SIENITE—GEOLOGICAL THEORIES OF HUTTON AND WERNER—BOILING SPRINGS—EARTHQUAKES—VOLCANOES—CONCLUSION.

MR. OGG observed on commencing his third lecture that he had purposely omitted to mention a very interesting class of rocks, in his previous illustrations of the science of geology, in order that he might this evening direct the particular attention of his audience to an examination of their nature. The class to which he alluded was denominated *trap*, or *basalt*, and its proper place, according to geological arrangement, was in the *medial* series, or the same series in which coal is found. The large specimen now exhibited, and which belongs to the Institution, will show the dark colour of this kind of stone, though not the exact form it assumes, nor the peculiar properties which appertain to it. This remarkable substance, which bears a strong resemblance to rocks of volcanic origin, though some persons consider it as an aqueous deposition, is found in vast columnar masses, apparently broken and scattered about; the columns being sometimes perpendicular, sometimes horizontal, and occasionally assuming a curvilinear appearance. One of the most extraordinary basaltic caverns in existence is *Fingal's Cave*, in the island of Staffa, one of the Hebrides, or Western Isles of Scotland. Dr.

* Ferguson's Lectures, edited by C. F. Partington, page 241.

Johnson has observed that the works of nature throw the works of art into the shade, and that regularity is alone wanting to complete the superiority of the former; but in this magnificent natural cavern, there is no want of regularity, and it is impossible for the power of the pencil to communicate an adequate idea of the grandeur and sublimity of the scene. The lecturer here pointed out two large views, representing this astonishing cavern in perspective, as it appears to the spectator on approaching it from the sea in different directions. The depth of the cavern from the entrance to the extremity is 371 feet, its height at the mouth 117 feet, decreasing to 70 feet in the interior parts. The waves of the sea reach to the remotest recesses of the cavern, every part of which is distinctly visible, owing to the great altitude of the entrance. It is entirely formed of basaltic pillars of many different sizes, and a variety of figures of four, five, and six sides, but so closely connected together that it is difficult to introduce the blade of a knife between them. The pillars are also *jointed* at irregular distances; not by means of flat surfaces, as they are *articulated*, and the parts rest upon each other in a manner similar to the principle of a ball and socket. The whole island is supported upon pillars of this kind.

Having purposely reserved till this lecture a discussion of the theories which have been promulgated by geologists, he would now observe, that some persons contend that all depositions are occasioned by the agency of water alone, and that basalt owes its origin to this source, having been originally deposited in a state of mud. Mr. Ogg here referred to the celebrated Giant's Causeway in Ireland, as well as to other places, where immense basaltic pillars are found, measuring 150 feet in height by five in diameter, and proceeded to state, that those who adopted the opinion to which he had alluded, endeavoured to account for the appearance assumed by basalt, by supposing that during the process of drying it became separated into columnar masses. It is well known that mud or starch in drying separates into something like columns, but there are always spaces between them, which is not the case with basaltic columns. Others are of opinion, from the many points of resemblance between *basalt* and the different varieties of *lava*, that it must be of volcanic origin. A remarkable circumstance in confirmation of this theory, is the existence of an extended line of basaltic rocks from the Canary and Madeira isles to Ireland, the Hebrides and Iceland, which has active volcanoes at each extremity. The igneous origin of basalt, has also been proved by the experiments of Mr. Watt, who melted it in large quantities, and found that in a state of fusion it formed a vitreous body, like volcanic glass, and that when cooled gradually it assumed the appearance of the same kind of stone which is often formed by lava. Mr. Watt, after melting seven hundred weight of basalt, suffered it to cool very slowly by withdrawing the fire from his furnace, and carefully noticed the different appearances of the mass at different stages of the process of cooling. It formed globules, which became larger, and pressing upon each other, assumed a prismatic form; and when sufficiently compressed, the parts became articulated into each other, something like a ball and socket. Can it then be doubted that basaltic rocks are of volcanic origin, and owe their existence to the agency of fire?

Before quitting this subject, it is necessary to advert to another circumstance connected with coal mines; in which walls of basaltic stone are frequently found, passing through all the various strata, and shifting them out of their places with evident marks of great violence. These are called *faults* by the miners, but are serviceable in keeping the mines dry; and as a further proof of the agency of fire in their formation, it may be stated that the coal which is found in contact with this kind of stone, is actually *charred*. The lecturer here exhibited a specimen of this basaltic stone, which is tough and difficult to break, is fusible by the blowpipe, and is usually of a dark iron grey or black colour.

After briefly describing the constituents of *green-stone* and *sienite*, which are closely allied to basalt, Mr. Ogg requested the attention of his hearers to a concise exposition of the different theories which have been promulgated with respect to the formation of the earth; and while he disavowed any intention of speaking disrespectfully of the able writers by whom they had been advocated, he claimed the privilege of judging for himself, and of forming his own opinion of the principles upon which those theories were supported.

The two theories to which he should first allude were those of Dr. Hutton and Professor Werner. The former eloquent writer considers that all substances are in a constant state of decay, but subject to renewal or reproduction. The mountains are worn down by frost, by the action of the winds, by moisture, and a variety of other causes; and their ruins are carried by rivers into the sea, where their finer particles accumulate in the form of layers, and thus become the origin of new rocks, to be elevated at a future period by the agency of fire. He also conceives that the valleys are scooped out by the action of these torrents. The lecturer admired the boldness of this theory, but was of opinion that the agency of the rivers was rather calculated to fill up, than to excavate valleys.

Professor Werner imagined, that all the rocks which compose the crust of the earth, were originally either dissolved or suspended in water. It is perhaps, almost superfluous to state the difference between *solution* and *suspension*, but it may be illustrated by mixing sugar, and afterwards dust or saud, with water. In the former case, the sugar will be *dissolved* by the water, but in the latter, the sand will be merely *suspended*, without undergoing solution. Professor Werner's theory, therefore, requires us to believe that in the chaotic state of the earth, all the rocks were held in solution or suspension by water, and that the various strata were formed by their crystallization or subsidence.

The lecturer could not, however, imagine that this effect could be produced, except by the immediate exertion of the miraculous power of the Creator. Professor Werner supposes, that those particles which were chemically dissolved, formed the first or primitive stratum, and that the others were successively produced above them, by the particles mechanically suspended in the water. If it was asked, in what manner the rocks assumed an inclined appearance, the Wernerians replied, that the nucleus of the earth upon which the strata were deposited, caused them to assume that form. There were, however, so many difficulties attached to this theory, that the lecturer could not persuade himself of its correctness; and he might here observe. that though it was very advantageous for philosophers to pursue their theories with zeal, and to accumulate facts in confirmation of their opinions, it often happened, that from being too much attached to some favorite theory, they overlooked the facts by which it was contradicted, or only viewed them through a distorted medium.

Dr. Hutton admits, that the rocks were chiefly deposited from a state of suspension in water, and imagines, that they were all originally flat; but that the lower strata were melted, and the others forced upwards by the agency of fire. Werner says, that if the primitive strata had been fused, they would not have been crystallized; but though substances lose their crystalline texture when melted under ordinary circumstances, it is known that when melted under pressure they crystallize in cooling. Of the elevating power of fire, there exist many striking proofs. The formation of a hill one thousand feet above the level of the sea, in the course of a single night, near the Bay of Naples,—the phenomena of Volcanoes,—the dykes or faults in coal-minea, previously alluded to; all afford such evident demonstrations of the agency of fire, that this fact may be considered as one of the clearest parts of geological science. It it not in the power of the finite faculties of man, to unveil all the mysteries of nature; but he cannot be blamed for endeavouring to discover them; and as his researches have thrown considerable light on the formation of some of the rocks, a perseverance in his exertions may perhaps elucidate the subject still further.

Mr. Ogg then pointed out several diagrams, which exhibited the extraordinary manner in which the different rocks are, in some instances, found to deviate from the regular order of stratification, and which are favourable to the igneous theory of Dr. Hutton, while they are irreconcilable with that of Professor Werner. In one of these diagrams, a mass of granite appeared shooting into the stratum above it, in a manner exactly resembling the trunks and branches of trees. In another diagram, portions of granite were seen entirely surrounded by slate; and in a third, the slate was pervaded by detached portions of porphyry and granite, divided in a strangely irregular manner. Other examples might be adduced, indicative of the action of fire, and confirmatory of Dr. Hutton's theory; but the lecturer wished it to be understood that he did not adopt any particular theory as his own opinion, but endeavoured to select what was most rational from the whole of them.

By another theory, which has been supported by many philosophers, particularly by Mr. Granville Penn, in his Estimate of the Mineral and Mosaical Geologies, all the various appearances found in the earth, and among rocks and organic remains, are accounted for by supposing the earth to have been subjected to the operation of two vast revolutions. The advocates for this opinion disagree with Hutton and Werner, as to the agency of chemical causes; and think, with Newton, that the earth was at first formed complete by the hands of the Creator, admitting that some of the changes it has undergone have proceeded from causes acting upon it since its original formation. The first of these great convulsions occurred when the waters that covered the earth were called into the cavities which were to be their bed, in consequence of the breaking down of a part of the solid crust of the earth. By the rushing of the immense torrents of water, as they retired from spaces previously covered, fragments of various strata were mingled and deposited at the bottom of the ocean. In the course of 1656 years that these deep places were occupied by the sea, there was ample time for the deposition of immense quantities of organic remains, chiefly marine; and it is well known that vast rocks are now formed by the amazingly extended operations of minute animals, of which *coral* may be adduced as an example. The rivers must also have assisted in conveying these remains to the bed of the ocean. With respect to the second great convulsion, let it be remembered that when the Almighty threatened to destroy mankind, he threatened to destroy the earth also And was this dreadful climax completed? In one sense the earth was utterly destroyed, for the whole of its inhabited part sunk in the abyss of waters, while the parts which had before formed the bed of the ocean, were elevated to become the abode of future inhabitants. Here then, according to this theory, is a clear explanation of the present appearance of the earth, the surface of which is covered, and even saturated with the remains of animals, which appear as though they had lived and died in the situations where they are found; situations, in some instances 10,000 feet, and in Asia even 15,000 or 16,000 feet above the level of the sea.

There are few persons who have studied geology, who do not admit the universal action of the Deluge. Many rocks, which are now divided by vallyes, correspond so exactly in the number and dip of their strata, that no observer can doubt that they were once united, and that their separation was occasioned by the retiring waters of the Deluge. If we suppose our island covered with water, which begins to rush from the highest parts with a force which nothing can resist, the effect of the torrent must be to tear away the strata which interrupt its progress, and to produce appearances similar to those which have been described. Professor Buckland has, indeed, brought forward still stronger proofs of the effects of the Deluge, by tracing the course of water-worn fragments of rocks from the north-west side of the island, to the midland counties, and from thence to the opposite coast; and demonstrating that their present appearance could only have been produced by the rushing of torrents of water.

Mr. Ogg then requested his audience to notice a diagram, representing a section of a very remarkable cavern, discovered at Kirkdale, and containing a large quantity of antediluvian remains. The floor of this cavern, which was found in a limestone quarry, was covered with a stalagmitical crust, below which was a thick deposition of mud, completely filled with bones. Many of these bones were those of animals not belonging to this climate, such as the elephant, the rhinoceros, and above all, the hyena, the bones of which were very numerous. The cavern also contained a quantity of the minute bones of the water-rat; and it might be observed that the cavern was situated by the side of a valley, which in all probability was once a lake, as its form and appearance shewed, even now, that by closing the avenues, it might be converted into a lake again. Mr. Ogg then gave an interesting and amusing account of the remarks of Mr. Granville Penn, and other geologists, on the discovery of this cavern, and their endeavours to reconcile the extraordinary mixture of the remains of the different animals, with their respective theories.

Without dwelling further upon this subject, he would now proceed to give a brief account, as far as the present state of human knowledge would allow, of some of those phenomena of nature which are closely connected with geology and geological theories, and would endeavour to illustrate his remarks by a few experiments.

The first of these phenomena was the existence of *boiling springs*, which are connected with the heat known to prevail in the interior of the earth; and some idea might be formed of the manner in which water is made to spout to a considerable height, from an experiment which the lecturer now exhibited. Some water having been boiled, the pressure of the steam on its surface forced the water through a small tube, closely fitted into the neck of a glass vessel, and a jet of hot water rose to the height of six or seven feet in a very beautiful manner; affording considerable amusement to the audience, several of whom were feelingly convinced of the success of the experiment, by a gentle sprinkling from the tepid shower-bath.

Boiling springs are not, however, so intimately connected with geology as the awful activity of *earthquakes* and *volcanoes*, to which he ought, perhaps, to have confined his attention. These terrific phenomena are so closely allied, that it is impossible to separate them from each other. It has been supposed by some, that they may be attributed to the agency of electricity; but, without positively deciding this question, the lecturer seemed of opinion that this cause was not sufficient to account for those tremendous earthquakes which had not only shaken one continent, but had passed the immense Atlantic Ocean, and had convulsed the earth from Lisbon to Lake Ontario. Where, indeed, can an adequate cause be found for such extensive and terrific effects, but in the active combinations of matter, some of which instantly produce flame, heat, and detonation?

Mr. Ogg here introduced several interesting chemical experiments to illustrate the active powers of matter; the combinations of which produce such changes, that it is difficult to calculate their effect. Two cold fluids, viz. *water* and *sulphuric acid*, were mixed together, and a degree of heat was instantly generated, which was sufficient to boil a third fluid, contained in a test-tube introduced into the mixture. This effect is caused by the escape of the *latent heat* given out during the condensation which occurs when the two fluids are combined. There are various artificial compounds, which only require the motion of their particles to produce flame and explosion; and similar compounds might exist in the earth in large quantities. Some *sulphur* and *chlorate of potash* were then pounded in a mortar, and the friction of their parts produced a series of smart explosions, accompanied with brilliant sparks. In another experiment, a portion of *chlorate of potash* was pulverized, and intimately mixed with rather more than its own bulk of *lump sugar*. A drop or two of *sulphuric acid* was then added to the mixture, which instantly burst into a volume of vivid blue flame, extending to the height of a foot above the mortar.

In the next experiment, the lecturer exhibited the extraordinary properties of *potassium*, the base of *potash*. A small portion of this substance was thrown upon the surface of a blue infusion, contained in a glass, when it became ignited as soon as it came in contact with the water, in consequence of its powerful affinity for the *oxygen* of that fluid, with which it enters into combination, and is converted into *potash*. By the great degree of condensation, which accompanies the union of potassium with oxygen, its latent heat escapes in sufficient quantities to ignite the hydrogen of the water. Mr. Ogg contrived to make this a double experiment by using a coloured fluid, as the conversion of the potassium into potash was demonstrated by the alkali changing the blue colour to green.

This substance cannot possibly exist in a pure state at or near the surface of the earth; for upon coming in contact with either air or water, it combines with oxygen, and assumes the form of potash. Most metals are found both in a state of purity, and in a state of combination with other substances. Potassium, and other metals possessed of similar properties, have only been found in a state of combination for the reasons stated, but judging from analogy, it is probable they may exist in the earth in a pure state, and in large quantities; and this supposition furnishes an adequate cause for earthquakes and volcanoes. If flame and explosion are produced by the minute portion of potassium used in the experiment, what must be the effect of water upon large quantities of this substance? The vapour and flame resulting from the combination must escape, and their operation must first shake, and then rend the surface of the earth. The phenomena actually attending these convulsions of nature are exactly such as might be expected to arise from such causes, and to their powerful agency we cannot but ascribe the awful effects of earthquakes and volcanoes.

After some observations on the evident connection subsisting between earthquakes and volcanoes, and the general nature of volcanic countries, Mr. Ogg observed, that though it might be difficult to point out the utility of these awful phenomena, there was no doubt that, like every other operation of nature, they were productive of beneficial effects to the creation, and he should be sorry if the short course of lectures he had delivered did not impress this truth upon the minds of his hearers. That every arrangement connected with the formation of the earth is intended for the benefit of mankind, may be inferred from the irregularity of its surface, for if it was perfectly flat, the minerals which are so essential to civilized man, and the rocks which fertilize the soil, would be buried at inaccessible depths. The lecturer also described the important effects occasioned by the existence of mountains, which attract the vapours floating through the atmosphere to their surfaces, where the cold condenses them into drops, which filter through the body of the mountains, and become rivers. The rivers arrive at the ocean, whence they are again taken up by the heat of the sun in the form of vapour, and again conveyed to the mountains, and thus a continual circulation is going on, through their beneficial agency.

Mr. Ogg concluded his able course of lectures by thanking the members for the close and polite attention they had paid to his remarks, and stating that, at a future period, he should be happy to meet them again, and to illustrate any subject connected with Natural Philosophy. The worthy lecturer then withdrew from the table, amidst the grateful plaudits of his numerous hearers.

At the close of the lecture, Dr. Birkbeck informed the members that as the arrangements for future lectures were not quite completed, it was unavoidably necessary to omit the following Wednesday. On the succeeding Friday they would be resumed, though he could not exactly specify the subject which would be illustrated on that evening. Several subjects were in agitation, among which were Mnemonics, or the Art of Improving the Memory; Botany, or the Philosophy of Vegetation, upon which subject a course of lectures would be delivered by Mr. Wheeler; and Electro-Magnetism, which the President himself intended to illustrate, for the purpose of introducing to the members a self-taught artist, originally a wheelwright, of the name of Marsh, who had invented a part, and constructed the whole of the apparatus which would be exhibited upon that occasion.

Dr. Birkbeck has been elected President of that highly respectable Association, the Medical and Chirurgical Society of London; the Members of which have thus afforded an additional proof of the estimation in which the talents and urbanity of the learned Doctor are deservedly held by the scientific world.

SPITALFIELD'S MECHANICS' INSTITUTION.

We feel peculiar gratification in announcing to our readers the intended formation of a MECHANICS' INSTITUTION in the populous district of Spitalfields. Several enlightened individuals, taking into consideration the distance of this part of the town from the central Institution in Southampton Buildings, and also the dense population by which it is inhabited, comprehending at least 20,000 workmen, conceived the idea of communicating scientific instruction to them, by the establishment of one of those admirable institutions, which seem destined to effect a complete revolution in the sentiments and habits of the operative mechanics of this country.

With a view of ascertaining the probability of success in this laudable undertaking, diligent enquiries have been made among the masters and journeymen in the silk trade, and the result of these inquiries was so satisfactory, that the gentlemen who had so kindly interested themselves in the business, felt no hesitation in determining to attempt the accomplishment of their design. As a preliminary step, it was, however, considered advisable that a few Lectures should be delivered to the Mechanics of Spitalfields, previous to the final arrangements for establishing the Institution, in order that they might be better acquainted with the principles upon which it was to be conducted, and the advantages to be derived from its establishment.

For this purpose a request was made to Mr. PARTINGTON, of the London Institution, (for whose valuable communication, inserted in the present Number, we are much indebted to him) that he would have the kindness to deliver the introductory lectures, with which request he immediately complied; and the enlightened and philanthropic President of the London Mechanics' Institution, Dr. BIRKBECK, having also consented, at the solicitation of the promoters of the plan, to elucidate its nature and objects by an opening Address, it was finally determined that the preliminary Address of the worthy Doctor, and Mr. Partington's first Lecture, should be delivered on Thursday evening last, at Gibraltar Chapel, in Church-street, Spitalfields.

Of the interesting proceedings of this meeting we hope to give an account in our next Number; but the late period of the week at which it occurred, and the necessity we are under, in consequence of our extensive and increasing circulation, of putting our sheets to press immediately, prevent us from saying more than that the meeting was very numerously attended, and that the excellent address of Dr Birkbeck was followed by a clear and comprehensive illustration of the science of mechanics by Mr. Partington, both of which were heard with profound attention, and received with unanimous feelings of approbation.

We beg to add our sincere tribute of praise to the gentlemen who have so indefatigably exerted themselves to promote the establishment of the SPITALFIELD'S MECHANICS' INSTITUTION; and to express our hopes that this promising branch may flourish in unison with the parent tree, and that both may dispense to countless thousands the invaluable fruits of science.

CORK MECHANICS' INSTITUTE.

One of the most flourishing institutes, considering the short time that it has been formed, has been that of Cork; and we are truly happy to observe, that it is becoming daily more popular. On the 26th ult. a special meeting of the committee of the Cork Institute, was held for the purpose of receiving a communication of great importance. After some preliminary business, the mayor, who was in the chair, rose and said, that the period had arrived for making known to the meeting that he had the honour of a letter from his Grace the Duke of Devonshire, (*cheers*)—which would be read by the secretary, and which would best evince the feelings entertained by his Grace, for the welfare and happiness of the mechanics of this great commercial city, (*cheers*). It was pleasing to be enabled to state, that the intention of soliciting his Grace's patronage did not originate in his communication—on the contrary the letter only reached him (the mayor) on Sunday last, and he understood that the proceedings of the committee to invite the Duke to become the patron were adopted some days previously. With this explanation, which he considered due to this exalted Nobleman, he would request the secretary to read, and who accordingly read the following important communication :—

"London, Feb. 18, 1825.

"The Duke of Devonshire presents his compliments to the mayor of Cork; he has seen in the *Southern Reporter* an account of the proceedings relating to the establishment of a Mechanics' Institute, and believing from a knowledge of the great benefits derived from similar societies elsewhere, that it is likely to be highly advantageous to the class of persons for whom it is intended, he feels desirous (should it not be contrary to the rules of the society) to offer a donation. He will therefore be much obliged to Mr. Wrixon to inform him whether he can with propriety do so.

John N. Wrixon, Esq. &c. &c."

After the reading of this letter, several gentlemen addressed the meeting on subjects of local interest, and Mr. Deane, the treasurer, rose to detail the progress of the Funds of the institution, which was found to be very flattering.—Thanks to his Grace the Duke of Devonshire for his gracious communication were then voted. As the remaining part of the proceedings possessed only local interest, we omit them.

MR. SPRING RICE AND MECHANICS' INSTITUTIONS.

We have great delight in laying before our readers the following letter from Mr. Spring Rice. We shall not insult the good sense of the public by adding any thing to the observations of this enlightened and excellent Member of Parliament:—

TO THE MANUFACTURERS AND MECHANICS OF LIMERICK.

House of Commons, Feb. 18, 1825.

"MY EXCELLENT FRIENDS—I venture to address you on a subject in which I conceive your best interests to be concerned—and I trust you will receive with indulgent kindness suggestions which have no other object in view than your interest and welfare. Laws which have passed in the late sessions of parliament have freed the trade and manufactures of Ireland from many restrictions, imposed in the days of ignorance and prejudice—and our national industry may now exert itself and may extend, unfettered, in every direction. It is admitted on all hands, that no people on the face of the earth are more desirous of obtaining employment than the natives of our common country. It is admitted that their ingenuity and abilities are of the first order.—It therefore only remains, that these powers should be directed to proper objects for the improvement of their own condition, and for the purpose of raising them from that state of poverty in which, from a combination of causes, they have unhappily been placed. Look at your fellow-countrymen here—their bodily strength, and the natural powers of their minds, are not in any respect superior to yours. Yet whilst you are poor, they are rich—whilst you are suffering, they are happy. They possess wealth and independence, of which you recollect, they made a noble use, when they poured out their relief in the season of our distress, in a stream so abundant as even to exceed the calamity it was intended to relieve. But why should we not endeavour to follow their example, and profit by their experience? What are the causes which prevent our people from pursuing the same glorious course? You well know how deeply I feel in the political causes which have retarded our advancement in wealth and industry.—You will not, therefore, suspect me of undervaluing them when I state, that although much must, ought, and I trust, will be done for us by the legislature, there is also a great deal which depends upon ourselves—that, at least, which we can reach, we should try to attain. To your industry, and to your abilities must, therefore be added skill and knowledge.—That skill which is founded on experience, and that knowledge which constitutes power. For the purpose of acquiring and extending both, institutions have been formed for the purpose of teaching the various improvements which science and learning have made applicable to arts and manufactures. These institutions have been formed throughout Great Britain—and, in Ireland, I rejoice to find that they have already been introduced. I entreat that you, my excellent friends, may not delay in gaining for yourself similar advantages. Do not think that the recommendation is unimportant. Suppose that our carpenters were without the knowledge of the saw, the plane, and the augur, how invaluable would be the benefit conferred by him who would teach the use of these ordinary instruments. Would not the first introducer of the plough, the inventor of a wheel, or of a pulley, confer everlasting obligations upon a community where such matters were unknown? Such benefits may still be conferred upon us by those who can teach us how to make our own powers more available in the production of the comforts and necessaries of life—of all that can improve our own condition directly, as well as of that which we can exchange with others for money. In our own city you have seen an example, in the works at the marble quarries, what skill and knowledge can effect—you have seen stone raised, which you would formerly have considered to have been beyond all human power—you have seen one horse draw upon the rail-road a heavier weight than in the common system twenty could have moved, you see in the Scotch carts the load of three common carts safely and expeditiously carried. All this can be done in other matters as well as in these; and information on all these points is what we must seek to acquire.

"Let me, therefore, entreat you, as your sincere friend to lose no time in forming a Mechanics' Institution at Limerick. The extension of these establishments is greatly owing to the exertions of one of the ablest friends to Ireland and to the empire, Mr. Brougham. Read his letter on the subject, and profit by his advice. Humbly, but zealously, I tender you my own personal aid; and if we can, together succeed in giving new means of profitable employment and independent support to our fellow citizens, not even the final issue of that glorious contest in which we together struggled and succeeded, will be to me so gratifying as becoming your fellow-labourer in this new effort.

"Further—I can with truth inform you, that English capital will not be wanting to stimulate and assist your efforts, if peace and tranquillity, so fortunately restored, be effectually maintained. In that tranquillity no persons are more deeply interested than yourselves; and, I am confident that your course will continue to be, as it has been in all respects, that of good subjects and good Irishmen.

"I write in the midst of my public business, and may, therefore, have explained myself imperfectly—but you will excuse the manner in which I write, when you consider the motives which have induced me to address you.

"Believe me, with the truest good wishes and regards, your obliged friend and servant,

T. SPRING RICE.

PURE SOFT SPRING WATER.

To the Editor of the Mechanics' Register.

SIR,—I cannot refrain from congratulating you and the public upon the probability of some real convenience and benefit accruing by the establishment of one among the many New Companies. We are to have Rail Roads all over the kingdom, New Insurance Companies on peculiar plans, Washing Companies, a Filtered Water Company, A PURE SOFT SPRING WATER COMPANY, and many others.

There is something so refreshing in the very sound of pure water, and so melancholy in the truth that it is not to be found in London, that the hope of seeing the metropolis supplied with such a desideratum, has roused me from an existing apathy towards new projects, meant only, as I have generally considered, to benefit the projectors, and led me to enquire what this pure water means. In pursuance of such determination, I have learned that the proposed supply is to be raised from below that amazingly thick and impervious mass, called by geologists London clay. By the agency of powerful engines, the water will be conducted into reservoirs, formed at peculiar stations, whence the supply will be derived in the usual way in proportion to consumption.

By a perusal of the best geological writings, and the conversation of some of our most experienced enquirers and scientific men, it appears to me not at all a matter of wonder that the town should at the present era be furnished with pure wholesome water, but that it should have been content to remain so long without it. As one thing generally leads to another, so have I from the probability of supply, reached an acquaintance with the quality. And I do from my heart congratulate the public, that by the united efforts of persons forming a Company, there exist great hopes of their being supplied with a pure, wholesome, soft, spring water, brilliant in appearance, and exquisitely adapted to every domestic use.

The circumstance of water being raised from so great a depth leads one to suppose it simply to be common hard spring water, such as is furnished by street pumps, &c. and the principal reason I have for troubling you, Sir, with this is, to set aside such an erroneous opinion, in order that the public may be better acquainted, and prize accordingly their prospective luxury. Be assured, Sir, its exquisite softness is one of its best qualities. I examined a well sunk through the clay at Notting Hill, and I can only refer you, Sir, or any of your readers, to it, as a specimen of the substitute likely, I hope, to be adopted for river water, the best of which cannot fail of being impregnated with the foulest matters and substances. I understand the laundresses who have discovered the admirable softness of this water, send many miles for it. A few of the public brewers, who are famed for the best beer, also obtain their supply from a similar source. I will not, Sir, occupy your time or columns by enumerating the various wells about town, which to satisfy myself I visited, but merely state, that the supply from all of them appeared inexhaustible, and the quality of water the same.

It would be invidious to say any thing to deteriorate the services of other Water Companies, but really I do think if this new Water Company succeeds, of which there can be no doubt, the Proprietors will do more real service to this great metropolis, than has been produced by any improvement of late years. There still is one addition to the anticipated benefit, which is, if I am informed aright, a reduction in the rate charges.

This statement may perhaps afford the public some gratification, and if, Sir, you think so, probably I shall see it in your excellent publication, of which I am a constant trader.

A LAND-SURVEYOR.

MINING SPECULATIONS.

We have received several letters from the Mining Districts, from persons who have had offers made to them to proceed to South America, in which they express a hope that we will give them our opinion as to whether they may safely venture out, either as it respects the climate—their own prospects—or the probable duration of the companies under which they are offered employment. We shall answer these questions as briefly as possible.—In the first place the climate of South America is so very unequal, that it would be impossible to say how far it would suit an European, unless we knew the precise spot at which he intended to reside. In Colombia for instance, the climate at Carthagena is so bad from the heat of the sun and the exhalations from the marshes, that an European may well expect to squeak fo his temerity in visiting it; whilst at Bogota, the capital, a distance of only a few days, an Englishman would hardly know that he was not in the vicinity of Richmond, on one of the finest days of the spring or autumn. We believe, that generally the mines are in the mountainous parts of South America, where the air is pure and wholesome; but that in Mexico, the space to be traversed before some of them can be reached, is through a climate in which the greatest prudence is necessary to avoid disease and death. This is not the case in some other parts of South America. Of the prospects of the miner, he must be the best judge from the agreement which he makes before he quits his native land. We believe that he has nothing to fear from the natives, and as he is well paid, perhaps he cannot do better than by making the voyage, particularly if he has no family ties to render such a step one of imprudence.

The duration of the Mining Companies must depend upon the success attending their efforts.—That some of them will meet with success, appears quite probable; from all that we read and hear; and there is no fear that the abundance of the precious metals which they will obtain, will so deteriorate the price of them, that they must eventually fail from the very extent of success. Let it be recollected, that if gold and silver become more abundant, so they will be more generally used, and that for at least a century to come, and indeed for ever, until more precious metals can be obtained. Millions of persons will be found to purchase them for the construction of articles of art or luxury, and thus the more gold and silver the miners find, the richer their employers and consequently themselves will become. We have thus endeavoured to answer the questions which have been put to us briefly and honestly. We now subjoin an interesting article, which bears immediately on the subject, and which was forwarded to this country a long time ago by an intelligent Englishman resident at Buenos Ayres:—

"The mines of Chili are the richest in the world; the knowledge of which the Indians have kept entirely to themselves. Besides, it is by their laws, instant death to any one who should discover to a Spaniard, the approaches to any of the gold mines. They have therefore remained unworked ever since the Chilians obtained the victory over Valdivia, but they will be opened to reward their liberators; and the natural produce of Chili is so abundant, that provisions of every kind can be supplied with profusion.

"The riches of Chili are of two sorts:—First, those which nature has bestowed upon it, without the help of human industry; and secondly, those which have been produced by the inhabitants. To the first belong its mines of gold, silver, copper, tin, quicksilver, and lead. Of the copper of Chili, are made all the great guns for Peru, and the neighbouring kingdoms; in the garrisons of which, and in particular on the coast, are great quantities always in store. All the bells of the churches, and family utensils, are of this metal; so that since the working of these mines, no copper has come from Spain, they being so rich in vein; there is more than enough to supply all the kingdoms of the Indians. There is little lead worked, and quicksilver less, because the mines are but lately discovered; for as they were going to work them, the obstacle to the working of those of Guancabilica, in Peru, was removed, which put a stop to the working of those in Chili. Those of silver likewise lie unwrought, because the golden ones are worked with much less charge; therefore all who are concerned in the mines turn their industry to them. They are so many and so rich, that from the confines of Peru to the straights of Magellan, there is no part of the country in which they have not been discovered by those gentlemen, whom his Majesty was pleased to send out to examine the mountains; and it is generally received, that in all the Indies, no gold is so pure and fine as that of Valdivia, in Chili, except the famous mine of Carabya.

"The gold mines are far more easy to work than the silver, as the silver is first dug out of the hard rock, which is very difficult, as is also the grinding the ore in the mills to powder: then a great expense attends the quicksilver, which must be used in the progress to make it unite; besides the long operation requisite to refine it, all which require a great deal of cost and trouble.* Thus the advantage of getting gold is evident, as not attended with such variety of labour; for in most cases there is no other trouble than to carry the earth in which it is found, to the water-mill, constructed on purpose, where a stream is turned on and carries off the earth, whilst the gold, being heavier, sinks to the bottom; this simple process is followed only for the gold found in a loose state, incorporated with the earth. Sometimes a vein of pure gold is found in mass, but this does not always answer the owner's expectations, unles in following the vein through the rocks, they chance to meet a soft part, where the gold vein has power to expand; this they call Boldu, and, whenever met with sufficiently repays the labour and pains they have been at to obtain it. There is now less gold found than formerly, by reason of the continued wars the Spaniards have so long had with the nations of the Auracanos, but still some is found, particularly in Jaquimbo. During the winter, when

* Much of these difficulties are removed by the English mode of smelting.

the rains fall heavily, great masses of rock are washed away, and an easy passage is opened to the veins of gold: there is likewise some obtained in the territory of the Conception, but this is found by the Indian women in ponds, or small pieces of water, at the foot of a mountain, which is seldom deeper than two or three feet; these ponds the women go into without any thing on their feet, and they keep puddling with their toes till they feel the grains of gold, which theyt ake up perfectly free from sand or dirt of any kind: and when they have found enough to supply their immediate wants, they seek no farther, but retire perfectly satisfied, being not at all a covetous people like the Spaniards, who never think they can get enough. I brought with me to Italy one of these grains of gold, found in this way, of a pretty good size, which I sent to Seville to be assayed; and without putting it in the fire, or any other proof, it was found to be 23 carats of very pure gold."

To the Editor of the Mechanics' Register.

Yarmouth, March 6, 1825.

SIR—In answer to your correspondent, (A Housekeeper, No. 12,) I send the following receipt for raisin wine:—

Take forty pounds of Malaga raisins in March, cut them slightly, and throw the stalks into two gallons of water; then taking this water in part, put the raisins into a cask with six gallons more water and a pint of the best brandy, stir it up with a stick once a day for a week, then close it well up, let it stand half a year, and bottle it off.

You would oblige me by inserting the following queries:—To make pasteboard for hats or boxes.—A receipt for flavouring the best French brandy.—The best method of refining sugar, and making capillaire in small quantities.—To harden cast steel for dressing millstone, without brittling.

I am, Sir, your very obedient servant,

W. C.

To the Editor of the Mechanics' Register.

SIR—The following, I believe, you will find a correct answer to the query (inserted in No. 18) of your correspondent Bluett.

I remain, Sir, your humble servant,

JUVENIS ADMIRATOR.

First measure from the vessel containing the eight gallons three gallons into the five, then again from the eight fill the three, fill up the five from the three, which takes two gallons and leaves one in the three; then empty the five into the eight, there is then seven gallons in the eight and one in the three, which you empty into the five (then empty). Measure then three gallons into the five, containing the one gallon, which makes four gallons; and having thus taken three from the seven gallons in the eight, there remains four gallons in the eight: the liquor is thus divided into two equal quantities, four gallons in the five, and the same in the eight.

[We have also received solutions of the above from G. Allsop and H. S.]

To the Editor of the Mechanic' Register.

SIR,—Perceiving in your last number that one of your correspondents wishes to be informed how to make "Chrystalized Alum Baskets," will you oblige me, by inserting in your greatly esteemed publication, the following receipt, which I met with in a very clever little book not long ago, and I hope it will enable W. G. C. to construct these elegant "philosophical toys" hereafter without any material difficulty.

"Form a small basket, about the size of the hand, of iron wire, or split willow, then take some cotton, such as ladies use for running into flounces; untwist it and wind it round every limb of the basket.

Boil a pound of alum in a quart of water, or in the same proportion; let it boil well, stirring it all the time; when com pletely dissolved, pour it into a deep pan or other convenient vessel, and by a thread suspend the basket into it to a good depth, so as that no part shall touch the vessel; let it remain perfectly at rest for twenty-four hours, and when you take it out, the alum will be found very prettily crystallized all over the basket, making a very neat chimney ornament to hold flowers, &c. The alum may be coloured pink, purple, or yellow, by boiling Brazil, logwood, or French berries with it.

If, instead of the basket, you suspend in the solution of alum, cinders, or small pieces of stone, they will be covered with crystals, and assume a very pretty appearance, making a good imitation of mineralogical spars.

Yours, H. S.

RAISING PINE APPLES BY STEAM.

If the information which we have received be correct, we shall soon have pine apples as plentiful as oranges; and this rich fruit, the taste of which is unknown to more than nineteen-twentieths of the British people, will form the *bonne bouche* of the good folks in the pits and galleries of our theatres, and be hawked about the streets "three for a shilling." The cultivation of pine apples in this climate has hitherto, we believe, been a matter of some difficulty and uncertainty; and we have been assured, that notwithstanding the high price at which they are sold, they scarcely remunerate the grower for his trouble. It is probable, however, that in this article, as in many others, the price is artificially kept up, and the production purposely limited, to prevent its becoming less an article of luxury, and therefore less valuable to those who consider scarcity and high price as the only criterions of excellence. Were pine apples cultivated generally upon even the present system, we might, perhaps, obtain for four shillings that for which we now pay fifteen; but the result would be very unsatisfactory to the cultivator, for the price would still be too high for general consumption, and too low to maintain the reputation of the fruit, as one with which no Alderman or Bishop could dispense, if he pretended to good taste, or the means of treating his friends properly. It is with pine apples as with Champaigne wine, they are both excellent things in their way; but if we reduce their price to just such a scale that they may be obtained by the middling classes, we take away their value in the estimation of the rich, and without so reducing them, they will not be generally used, nor remunerate the producers by the increased amount of consumption. Whether Champaigne wine will ever become the beverage of those who now content themselves with "heavy wet" and "blue ruin," is a great question; but they have at least the prospect of getting pine apples cheap, and of drinking pine apple brandy. A manufacturer in the country, who has a steam engine on his premises, and a considerable portion of superfluous steam, has conceived the idea of growing pine apples by means of this superfluity. The steam is introduced under the roots of the plant, and the warmth and moisture together operate so powerfully upon it, that it soon arrives at maturity; whilst the body of the plant, being freely exposed during the day to the open air, acquires a firmness and healthiness which contributes powerfully towards the fine flavour of the fruit, and renders it very superior to that which is produced in close hot-houses. We have not yet had any means of judging how far the economy of this principle is carried, but we can at least assure our readers, that it is no longer theoretical. We have seen and tasted pine apples so produced, and certainly no flavour could be more delicious. In a few days we may probably be enabled to give a more minute account of this new mode of cultivation, and the exact expenditure which attends it.

PATENTS EXPIRING NEXT WEEK.

Thomas Jones, for a machine for Cutting Corks and Bungs. Expires March 14th.

Thomas Willis Cooper, for certain Apparatus to be fixed on the Naves of Wheels, and Beds of Axletrees of Carriages, so as to prevent accidents from the axletrees breaking; or if either of the axletrees should happen to break, the carriage dropping only about a quarter of an inch, the same carriage will proceed on its journey, without danger of any accident happening from the same; or if by any means the linch pins get out, or cap screws get off, the wheels will keep in their former situation. Expires March 14th.

Robert Davis, for a Composition for certain Improvements in the Manufacturing of all kinds of Umbrella and Parasol Furniture. Expires March 14th.

George Ferguson, for a Camp with its Appendages. Expires March 14th.

NOTICE TO CORRESPONDENTS.

We are very much obliged to Amor Modestiæ for the interest which he takes in the success of the REGISTER, and the proof which he has given of it in his letter. We assure him most positively, that he only does justice to the conductors of this Work in supposing that the circumstance in question arose unintentionally.

We have received Mr. JENNESON's letter, and attach all the credit to his plan which it deserves. It seems however to require personal explanation. Perhaps he will favor the Editor by calling upon the Publishers.

The suggestion of J. G. is very good, but we much fear that it will not be in our power to devote sufficient space in the REGISTER for the publication of "the whole of the Lectures delivered in the London Mechanics' Institution, before the date of the first reported lecture in the Register." We quite agree with him these lectures were well reported in the *Morning Advertiser*, they could not have been better reported, and certainly if we could find room, we should be happy to reprint them.

We cheerfully bear testimony to the merits of a very pretty little book called "the Economy of Social Life," which has been sent to us with a motto from the pen of Mr. Brougham. Perhaps we may find some room next week for an extract.

W. B., A. S., M. N., L. L. Opifex, Jane Smart, a Printer, &c. has been received, and will meet with early attention.

A letter will be immediately sent to H.W.D. for whose polite attention we are very thankful.

H. S. is requested to favour us with his contributions as early in the week as possible.

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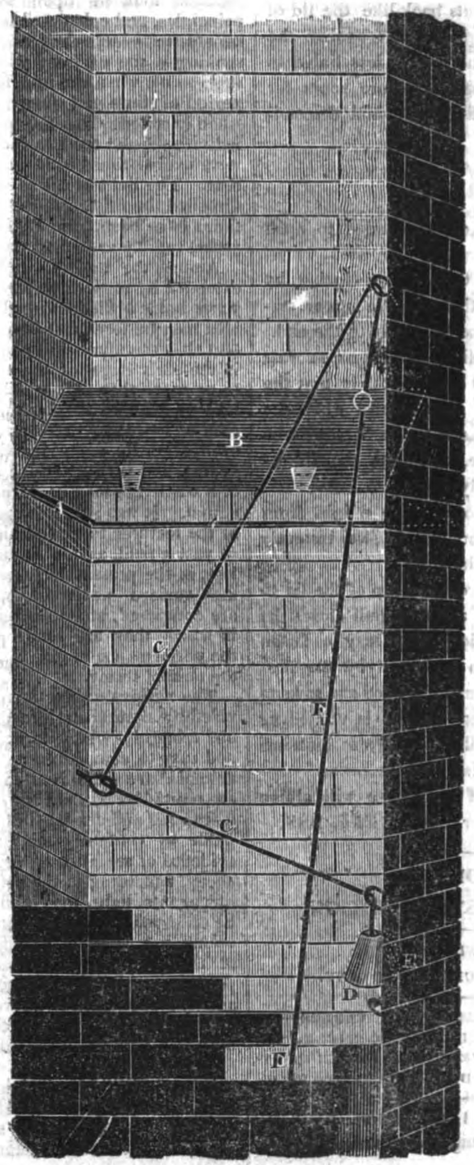
The London
MECHANICS' REGISTER.

No. 21.] SATURDAY, MARCH 19, 1825. [Price 3d.

NEW SAFETY CHIMNEY.



SAFETY CHIMNEY.

To the Editor of the Mechanics' Register.

Tunbridge Wells.

SIR,—The above design is presented to your notice as being superior to one inserted in a former Number of the Register, as instead of the valve turning on a pivot in the centre, this simply puts back like the lid of a box, and lays completely flat against the chimney, and thus the soot is less liable to attach itself, allowing also more room for the poor sweep in ascending and descending.

Description of the Engraving.

A an iron frame.

B a lid, or cover, on two hinges to open and shut.

C a rope to keep the lid from closing, by means of passing it through the upper staple, and attaching the weight D to the end.

It would be as well to pass the rope across the chimney, and to pitch or tar it, that the desired effect may be obtained when the chimney is on fire, as it would of course be soon burnt asunder, and thus the lid or cover would instantly fall.

E a small chain to save the weight from falling into the room, and is also instantly found in repairing the rope.

F a small chain from the top of the lid to the room, which by a single pull closes the lid, and to keep it down it is easy to fasten the end of the chain to a nail by the fire-place, which may answer a good end to keep close in summer when no fire is wanted, as the wet and soot will be in great measure prevented from falling into the room.

Your insertion of the above will oblige your constant reader, EFF. ESS.

LONDON MECHANICS' INSTITUTION.

MR. WHEELER'S FIRST LECTURE ON BOTANY.

CHARACTERISTICS OF VEGETABLES—THEIR CONSTRUCTION—CUTICLE, OR EPIDERMIS—CELLULAR INTEGUMENT—BARK—WOOD—MEDULLA, OR PITH.

FRIDAY, 11TH MARCH.

Before commencing his examination of the immediate subject of the present course of Lectures, Mr. WHEELER made some appropriate remarks on the happy period in which we live, and the increasing facilities which are now afforded for the diffusion of knowledge. He was gratified to observe the progress of this noble establishment, and thought that every Briton must congratulate himself and his country on the existence of an Institution founded upon such enlightened principles, and calculated to afford so much benefit to every class of society. How striking is the contrast which history presents to us, when the imagination recals the period of time, not many centuries back, when knowledge was the privilege of a few individuals, and the great mass of mankind were overwhelmed with ignorance and darkness. The light of science has now happily dispelled the mist, and the studies of early times have been, comparatively within a few years, rapidly extending their bounds.

Among the studies which have been thus extended by modern researches, that of BOTANY holds a distinguished place, and some idea may be formed of its progress, from the fact that the number of plants particularised in the early stages of the science amounted to no more than 600, which number, by the labours of successive botanists, has been increased to 40,000. This pursuit has afforded occupation to many individuals of exalted genius, and is so extensive that the industry of a whole life may be devoted to its investigation. It was not, however, the intention of the lecturer to extend his observations to so vast a field, as his more immediate object, in the present lectures, was to describe the various parts of which vegetables are composed, and to consider the manner in which they are rendered subservient to the performance of offices similar to those of the animal frame.

The various productions of nature are divided by naturalists into animal, vegetable, and mineral; which terms are appropriate, and easy to comprehend. Vegetables, like animals, are organized in their structure; are nourished by food and air, and are subject to life and death; but they are not capable of voluntary motion, and exhibit no evidence of sensation. Vegetables thrive or decay, according to the action of the various agents, light, food, and air, which may be observed when plants are placed in situations not suitable to the due operation of these agents. The sensitive plant appears to be acted upon like a living being, and the spontaneous movements of plants are observable, as well as the vital principle by which they are actuated.

The opening of flowers depends upon the action of this vital principle, as the *nymphea alba*, or common *water-lilly* regularly expands every morning as soon as the sun rises; and in other instances the opening of flowers is observed to vary according to circumstances; thus the *anagallis arvensis*, or *pimpernel*, a beautiful plant common in corn-fields, expands its blossoms if the day is bright; but in dull, rainy weather, when the sun is obscured, its blossoms close. These examples are evident proofs of the existence of vitality in vegetables, and the manner in which the effect is produced will be explained in a future lecture. The operation of this vital principle is still more evident, from the circulation which is constantly going on in animals and vegetables, from the human frame down to the lowest plant or fungus. Fluids, as fine as those which are found in the eye, pervade the minute tubes of plants, but no sooner does death happen, than the property of holding these fluids ceases, and they are exhaled. This is found to be the case with animals; for as the gall-bladder which contains the bile during life, loses its power when death occurs, and the bilious secretion transudes; so in plants, the membranes which retain the fluids while they are living, lose their power of retention when life ceases, and the fluids transude through the pores of the tubes themselves.

Some philosophers consider *loco-motion* as the principal characteristic which distinguishes animals from vegetables; but they have not sufficiently noticed the extraordinary properties of *zoophytes*, which are as firmly fixed to the rocks on which they grow at the bottom of the sea, as any vegetables are to the earth. These productions of nature were first distinguished from plants by Mr. Ellis, and modern science has clearly proved them to be animals. Loco-motive power, of which these are destitute, cannot therefore be considered as the distinguishing characteristic of animals. Others are of opinion that animals are distinguished from vegetables, by the former receiving their nourishment *internally*, and the latter *externally;* but the correctness of this distinction is invalidated by facts connected with the natural history of *polypi*, and the lower orders of animals, such as *worms*. Where, then, are we to look for the proper distinction between plants and animals? M. Mirbel observes, that vegetables derive their nourishment from substances *which have not been organized*, and that animals live upon substances possessing either *animal or vegetable organization*. But without entering into these refined speculations, the existence of *ammonia*, during the destructive distillation of animal matter, which is not evolved under similar circumstances by vegetables, may be stated to furnish the most decisive distinction. The simple experiment of burning will therefore be sufficient, as no plant evolves ammonia in large quantities by the destructive application of heat.

After these preliminary observations, Mr. Wheeler proceeded to divide the subject of BOTANY into three parts, comprehending 1st. The physiology of plants, or their organization and production. 2. Their systematic arrangement; and 3. Their economical and medical uses. The two first of these divisions are of great importance, and an intimate knowledge of them is necessary to a proper understanding of the third.

In studying the functions of vegetables, it is necessary to consider them, not merely as composed of a collection of tubes or vessels, but as endowed with life, and capable of forming peculiar secretions. As animals secrete fat, milk, &c. from the bodies by which they are nourished, so vegetables secrete gum, sugar, &c. from the juices of the earth, or even from air and water. From their tubular or vascular construction, Grew, Malpighi, and others had assimilated the circulation of the sap in plants, and the manner in which they derive nourishment from the air, to respiration and other functions performed by animals: but we are indebted to Mirbel for the anatomy of plants, and a knowledge of the construction of the tubes and cells, of which they are composed.

Before proceeding to a physiological consideration of the nature of plants, it will be necessary to present a general view of their structure. The exterior covering of every plant is called the *cuticle*, or *epidermis*, which bears a strong resemblance to the cuticle of animals. In animals it varies from the hard skin of the hand or foot to the fine coating of the eye, and also envelopes the rhinoceros or tortoise; while in vegetables its variety is exhibited from the surface of the most delicate flower, to the strong coating of the palm. By macerating any part of a plant in water, the cuticle may be separated, and there are many beautiful specimens of this kind in the museum left by the immortal John Hunter to the College of Surgeons. Life appears to be wanting in the cuticle, which is porous, and its pores are found by the microscope to be differently constructed in different plants. The leaves of *aloes*, and other succulent plants which grow in hot sandy countries may be exposed to the heat of the sun for several weeks without becoming perfectly dry; the cuticle being so constructed that it absorbs moisture rapidly, but parts with it slowly. The cuticle is pervious to the air, and is a powerful guard against external injury, forming, as in animals, an essential barrier between life and destruction. In old trees, it is cracked in all directions, or wholly lost, and as before observed, does not appear to be endued with life.

Under the cuticle is found the *cellular integument*, which the lecturer exhibited to the audience by removing the cuticle from a branch of alder, in which this substance appears of a green colour, and is in general the seat of colour in plants. In this particular it is analogous to the *rete mucosum*, or net-work beneath the cuticle of animals, which in the negro is black; but here the analogy ceases, as the two substances do not possess similar properties in other respects.

Beneath the cellular integument we find the *bark*, which is frequently not distinguishable from the wood. In old trees, the bark consists of layers, corresponding in number with the years during which the tree has been growing; but it is only in the inner layer, or *liber*, that the functions of the bark are carried on, the rest being lifeless, like the cuticle. In the carrot, the whole of the red external part may be considered as the bark, and it is the internal layers of plants that contain the real principle of those secretions which constitute the resin of fir or willow, and the astringent vegetable matter which is used in the process of tanning. If part of the bark is removed, the remainder possesses the property of extending to close the wound, and the process is facilitated by excluding air and moisture. In France, many hollow trees, by careful management, have been filled up with new wood; and in this country, some old pear trees have been restored, by the process of Mr. Forsyth, to such a degree of health and vigour as to cover the walls of Kensington Gardens with plentiful branches of fruit.

On removing the bark we come to the *wood*, which, when cut transversely, is found to consist of a number of concentric circles, which are particularly distinct in fir and some other trees; but it frequently happens that the common center of these layers is not the center of the block itself. Wood owes its strength and tenacity to its longitudinal fibres, some of which convey the sap, some contain air, and others the secretions of the plant itself. Most writers are of opinion, that the age of a tree may be known by counting the number of layers it contains.

Philosophers differ in opinion as to the origin of wood. Grew and Malpighi conceive that it proceeds from the bark, and this opinion is confirmed by Duhamel, who placed a piece of tinfoil under the bark of a tree, and after some years found layers of new wood on the outside of the tinfoil. Duhamel also engrafted the peach-tree on the plum-tree, and always found that the layers of new wood were connected with the bark, and not with the old wood. From these and other experiments of a still more decisive nature, it is therefore placed beyond a doubt that the *liber* produces the new wood.

The center or heart of a vegetable body contains the *medulla*, or *pith*, which is commonly of a pale yellow, and when the tree is old, becomes dry. It is of a highly cellular texture, and may be almost compressed into nothing. The hollow stems of thistles and hemlock are lined with pith o an exquisitely delicate appearance. Different opinions have been entertained of the uses of pith, to which some have attributed very important functions; but the most probable opinion seems to be, that the pith of plants is analogous to the nervous system of animals. There is no absurdity in believing that the pith contributes to the life and nourishment of plants, though not in a greater degree than the nerves perform similar offices in animals. Mr. Knight had endeavoured to trace a connection between the pith and the leaves of vegetables, and his opinion was confirmed by his experiments on bulbous-rooted grasses. When the common cats'-tail grass was grown in pastures uniformly moist, its roots were fibrous, but in an arid or dry soil it acquired a bulbous root. It seems the province of nature to guard plants against a too sudden deprivation of moisture by means of the pith; but leaving its origin and uses in doubt, Mr. Wheeler concluded by observing, that in his next lecture he should illustrate the construction of the vascular organs and cells of plants, and the manner in which the sap is conveyed into the leaves and branches.

Dr. BIRKBECK then announced that on the following Wednesday a lecture on Mnemonics, or the method of Improving the Memory, illustrative particularly of Mr. Smith's system, would be delivered by Mr. REYNOLDS, one of the members of the committee.

The President also read a well written letter from Mr. Kelly, a member of the Institution, suggesting that those Members who were receiving instruction in the French language, would derive considerable advantage from attending the French Protestant Church in Threadneedle-street, where they would have opportunities of hearing that language spoken in its greatest purity, by the Rev. Mr. Scholl and the Rev. Mr. Boisseau, the alternate morning and evening preachers. To the place of Divine Worship pointed out by Mr. Kelly, were added, at the suggestion of one of the Committee, the Chapelle Helvetique, in Moor-street, Soho, and the French Protestant Chapel in Milk-alley, Soho,

Dr. BIRKBECK, after reading the letter above alluded to, stated that he had received a communication from one of the mechanics belonging to the Institution, which amongst some valuable hints, not necessary then to notice, contained the following paragraph:

"In the last number of the LONDON MECHANICS' REGISTER there is a question, why the objects of sight are not seen doubly, as the image is formed on the retina of each eye. I do not know the structure of the optical nerves, but probably they meet in one point before the sense of sight is conveyed to the mind. Perhaps you will be so good as to settle this on Friday evening."

Now this difficulty, indeed, said Dr. Birkbeck, I cannot *settle;* but I will mention what has been proposed for its elucidation, and leave you to draw your own conclusions. This celebrated question, why we see objects single with two eyes, on which so much has been said and written, was answered by Galen, Alhazen, Dr. Briggs, Sir Isaac Newton and others, by stating that the two impressions are united before they are communicated to the mind: and this in fact, is the solution offered by the writer of the letter, from which I have just quoted. In favour of this idea it may be mentioned, that the optic nerves, by means of which visible impressions are conveyed to the mind, do approach each other and even come in contact, if they do not actually coalesce or intermingle, in their course from the brain to the eye. They are bent towards each other, and where they approximate most closely, seem as if soldered together by a considerable quantity of nervous matter. Here therefore the impressions may be supposed to be blended; and from hence proceed as one to the *thalami nervorum opticorum,* where they originate or terminate. But to invalidate this explanation it is sufficient to notice, that by pressure on the eye, by a blow on the head, by the influence of inebriating liquors, by certain narcotic poisons, and by some diseases, double vision is produced, whilst no change in the nervous union can be demonstrated; and that, even after squinting has occurred with double vision, by degrees, the squint remaining, single vision is restored. A second opinion which has gained considerable reputation was suggested by Aguilonius, and adopted by Dr. Porterfield, Dr. Smith, and Dr. Reid: they maintain that an object is seen single by both eyes, because it is seen by each of them in the same external place; and this sameness of place is determined as to the organ, by what they term corresponding points of the retina. To this opinion, which has been very ingeniously defended, particularly by the celebrated Dr. Reid with certain modifications, many objections may be urged, and especially those which arise from the adaptation of the eye to permanent changes in the direction of the optic axis. Of the more recent opinions of Dr. Wells and Dr. Wollaston, I cannot now undertake to give you a sketch, as they would require more illustration than is consistent with our time at present. I will merely state, without advancing any of his ingenious reasons, that Dr. Wells endeavours to prove, that the single appearance of an object, occurs because its two similar appearances, in regard to size, shape, and colour, are seen by both eyes in one and the same direction, or in two directions, which coincide with each other through the whole of their extent. The more I have examined this opinion, the more I have been convinced of its soundness; and its further development I believe, will show how nearly it approaches to the truth. In conclusion it may be worth remarking, that a corresponding phenomenon, single hearing with two ears, does not at all admit of the doctrine of coalescing nerves or corresponding points; for the seventh pair or auditory nerves, on quitting the brain, proceed in a direction nearly opposite to each other, and correspondence as to the place of impressions, is quite out of the question. Why under such circumstances, as to a double impression, we become conscious of the existence of one sonorous body, must be considered a matter of curious and interesting research: and it is somewhat remarkable, that whilst the optical difficulty has received so much attention from ingenious inquirers in various ages, no one should yet have seriously engaged in the examination of this question; why do we ever hear singly with two ears?

SPITALFIELDS MECHANICS' INSTITUTION.

Having given, in our last number, a brief sketch of the circumstances which gave rise to the numerous meeting at Gibraltar Chapel, on Thursday the 10th instant, we proceed with great pleasure to fulfil our intention of presenting to the public a detailed account of the important proceedings of the evening; and we have the additional satisfaction of being enabled to add a correct report of Mr. PARTINGTON's second lecture, delivered on Tuesday evening last.

The chapel, which will contain about 800 persons, and the use of which had been kindly granted by the Rev. Mr. BROWN, was crowded to excess at an early hour, and the entrance of Dr. BIRKBECK, accompanied by the gentlemen who have so indefatigably exerted themselves on this occasion, was greeted with loud applause. As soon as silence was obtained, the learned Doctor commenced his introductory address as follows:

So exhilerating is the appearance now before me, that I cannot proceed to consider the important business which has caused us to assemble here this evening, without offering my thanks to your friends, the promoters of your intellectual improvement, for permitting me to partake with them in this interesting service. The occasion of this high gratification can only be adequately understood by one, who like myself, had witnessed the effect of the voice of science when first directed towards the operatives of a large and manufacturing city; at which time not a tithe of the individuals here assembled, seemed willing to listen to its truths. I did not however, apprehend that we should now experience equal indifference, for the inhabitants of this district have long been noticed for the prevalence of a certain spirit of enquiry; and I did not believe that amidst the great movements which are taking place in the civilized world, you could remain spectators insensible to the means, which are rapidly advancing the moral and intellectual amelioration of mankind.

From the period at which fortunately for this country, the French refugees the objects of a dreadful persecution, the ancestors of many whom I have the pleasure of addressing, settled in this district, the cultivation of Natural History, especially of Botany and Entomology, has I am informed conti nued with little interruption by their descendants; and the curious in the latter branch frequently apply to the Spitalfields' weaver for rare specimens of British insects, which they cannot elsewhere procure. From your looms, it is well known, proceeded a man who has greatly contributed to extend the boundaries of science, by the improvement of optical instruments; for the celebrated Dollond was a Spitalfields' weaver: and even whilst pursuing his original employment, he had the honour of making a discovery which had eluded the observation of Sir Isaac Newton. In consequence of domestic difficulties, the celebrated Simpson, one of the greatest mathematicians of his age, left Lincolnshire to follow his business as a weaver in Spitalfields; and here, before he quitted the loom, not only did he teach the Mathematics and publish several valuable elementary works, but even some tracts, disclosing and extending some of the most sublime truths promulgated by Newton. I may also add for the scientific credit of this district, that it has contained for more than a century, a Mathematical Society, the only one in the kingdom, which has generally flourished, and which has by its annual courses of experimental lectures, conveyed to the surrounding inhabitants a great deal of useful information.

In the silk manufactory, which in consequence of the circumstance before alluded to, has taken deep root in this district, and afforded the means of subsistence to a large population, you employ I may observe, one of the two machines, the plough and the loom, to which the wants of man first gave birth: machines, essential to the production of simple food and simple covering, "the fabled inventors of which, were deified by the erring gratitude of their rude contemporaries;" but in your hands I have reason to believe the loom as to improvement, has remained nearly stationary for the last hundred years, whilst machinery has been acquiring greater perfection around you: and in some departments of human industry, even the loom either as to its construction or the mode by which it has been impelled, has been materially improved. I allude of course to the introduction of the fly-shuttle and the power loom; neither of which, however, may be at all adapted to your particular fabrics. Now you can scarcely doubt, that something must soon be accomplished by you in this respect, as in another year you will have to compete with the silk manufactory of France, under several disadvantages. Many facilities, I have no doubt, will yet be given you; one indeed within a few days has occurred: the admission of raw silk into the kingdom, without being subjected to the delay and the loss from quarantine, or the heavy charges attendant upon the ordinary circuitous route through France. By the power of steam the raw material will now be rapidly and economically transplanted from Italy through the Mediterranean to your shores. With fair opportunities aided by British capital, British industry, and British ingenuity, I am firmly persuaded that you will soon successfully contend with your rivals, and that, ere long, even in their own markets. To this extent indeed, has this country already succeeded in one manufacture of comparatively recent introduction, our cotton goods having gained complete admission into the East Indies, which for nearly three thousand years supplied the countries situated to the west, and received in return for them the treasures of Europe. Now mark the effect produced by the superiority of our machinery. We bring the raw material from India, we transport it four thousand leagues across the ocean, we convert it into articles of clothing, we return it four thousand leagues, and then in their own markets we undersell the natives, with all their advantages of growing, manufacturing, and vending on the same spot; and likewise of the low price of labour. At the same time employment is obtained for one million of labourers; for to that number, according to the report of M. Dupin, one of the most intelligent writers on the subject of machinery, do the individuals amount, who, directly or indirectly, are concerned in the cotton manufactory of England.

As it is possible that there may be amongst you, some who entertain fears respecting the object of your employers in promoting this measure, or the effects of machinery, I think it proper now briefly to advert to such topic. Whilst your employers have no objection to your possessing knowledge, you need never fear their intentions: if the highest intellectual authority have justly pronounced that "knowledge is power," in offering knowledge they offer power to you, certainly not for the purpose of making encroachments, but to place you upon a more equal footing. Thus creating a reciprocity of interest between masters and workmen, to the manifest increase of your comfort and happiness; and surely if they are not afraid of imparting to you power, no jealousy can exist on your part to prevent you availing yourselves of their offer. With respect to the effect of machinery, it is almost an insult to the understanding of the age, to attempt its vindication. It has been conjectured that machinery would supersede, as it is termed, manual labour; and under this impression, erring multitudes have occasionally proceeded to destroy it. This prejudice, for such it unquestionably was, is now fast receding before the light of science. One particular instance will serve for its demolition. In the Netherlands, some time since, a considerable manufactory of stockings by knitting was carried on; during the continuance of this slow process, the knitters, although devoting their whole time to labour, were generally unable to supply themselves with stockings. The introduction of a machine to produce the article more rapidly, which at first was looked upon as an instrument of destruction, soon not only improved their food, their houses, and their coats, but supplied them with stockings into the bargain. Thus machinery continued to supply them with all which they before enjoyed, and likewise with much which they had not before possessed. Again, where machinery has been introduced into the manufactories of this country, the condition of the workmen has uniformly appeared to be improved. In the cotton manufacture we have not the same proofs, because it was introduced by machinery itself; but it has strikingly exhibited one effect of machinery, the creation of employment. Within about fifty years, the period which has elapsed since Arkwright, himself a humble mechanic, invented the cotton machinery, it has extended with such rapidity, as to furnish employment for about a million human beings. This advance has been in various ways assisted by the introduction of steam as a prime mover; and it has also in a remarkable degree contributed to better the condition of the labourer; these contrivances having raised man from a machine to the rank of an intellectual being. From being the mere source of power, he has become the director of power. It was not unusual in former times for men to be employed in the drudgery of turning a wheel from morning to night: mechanical power has rendered such degradation no longer necessary, except in those modern machines known by the name of the tread mill. And I have authority to state that in a large manufactory in the neighbourhood of this city, its able conductors set no individual to turn a wheel excepting for the purpose of inflicting a punishment. By means of the Steam Engines now in use, the power of 300,000 horses has been superseded; equivalent to the labour of two millions of human beings; not working merely from morning to night, but through the 24 hours, without interruption and without repose. What has become, it may be asked, of these human beings? Are they all reduced to the condition of "hewers of wood and drawers of water?" They are either inventing and constructing machinery, or they are watching and correcting its movements; witnessing the astonishing creation of produce under their eyes, not by the labour of their hands. If of those I have the honour to address, any one should introduce into the manufactory of Spitalfields a striking improvement, it would instantly occasion an increased demand, and therefore although saving labour, would require a greater number of hands: it would render the occupation of the operative less toilsome and difficult, converting him into a director of labour, rather than a labourer. If superior looms for example, were to be introduced into your department, it would not occasion any to be unemployed; for they would require nearly as many hands to direct their operation: they would probably extend and improve the manufacture, and thus as in the cotton trade, increase the demand for human intelligence.

The great intention of the institution now about to be formed, is to make you acquainted with the principles of the several arts which you practise; and they who are interested in its formation have wisely determined to give you an opportunity of estimating previously the value of that which they intend to offer. They wish to lead you to think as well as to toil: to present to you the principles of science collected from every accessible source; and to put you in possession of every doctrine in theory, which may tend to enlighten your practice. How far theoretical views in mechanics may be applicable to your particular avocations, I do not profess exactly to know; but to some part of them, the process of dying, chemical principles might I apprehend, be immediately applied with advantage. The production of certain colors of peculiar hues, has been known only to a few, and the secret has been carefully kept from the trader. The occasion of such superiority would have been detected, if practical men had also been scientific. The discovery was probably stumbled upon by chance, and consisted of some very trifling circumstance. In France chemistry has been very successfully applied to the art of dying; and at Manchester the late Mr. Henry was of singular service, by simplifying the process of dying Turkey red, which, as previously conducted, involved a number of tedious and useless manipulations. By this institution the inventive powers will be excited and fostered; and whereever genius exists, it will obtain that kind of cultivation which will ensure its development and success. And at length if these institutions flourish, as I trust they will, countless multitudes being enlightened by their influence, whatever may be the case in the external world, the beautiful language of the poet will here no longer remain applicable:

"Full many a gem of purest ray serene,
The dark, unfathomed caves of ocean bear;
Full many a flower is doomed to blush unseen,
And waste its sweetness on the desert air."

At the conclusion of Dr. Birkbeck's excellent address, Mr. Partington commenced his lecture in nearly the following terms:—

The advantages which are likely to arise from the establishment of an institution such as we are about to form, have been so admirably illustrated, as well as eloquently pourtrayed by my learned and excellent friend who has just addressed you, that I will not mar their effect by again passing over ground which has been so carefully trodden, but proceed at once to the more immediate business of this lecture; in which I purpose, in the first instance, to call the attention of my auditory to the more *elementary* parts of the science of Mechanics; so that having acquired a knowledge of the simple mechanical arrangements, we may then proceed to a practical application of their use, in some of the most important of the useful arts. Thus then we shall be enabled to shew how the massive blocks which form that stupendous monument of early superstition, *Stone-henge,* were raised to their required elevation; and how, aided by the genius of a Smeaton or a Rennie, we have been enabled to set bounds to the ceaseless dashings of a stormy ocean, or to light the weary mariner on his return to the metropolis of the commercial world.

It may, however, be here worthy of remark, that the great names to which I have alluded were indebted in a much more eminent degree to their own transcendant genius, than to any fortuitous advantages arising from early education. Their first steps in life were not devoted to mathematical investigations—for them the figured volume of a Euclid, or the elaborate disquisitions of a Newton, were published in vain; and they explored their arduous way by the unguided light of genius alone.

If then so much may be accomplished by the mere force of intellect, what, we may ask, would have been the result of such talents, aided by such perseverance, upon a soil previously nurtured by the fostering hand of academical learning? or had there been established such institutions as those in which I have now the honour to address you? But I am addressing an auditory, many of whom are practically acquainted with the labours of a Watt, a Smeaton, or an Arkwright; and it may only be necessary to observe, that had the latent germs of talent exhibited in the minds of these benefactors of mankind, been properly fostered and nurtured, they would, in all probability, have arrived at maturity at a much earlier period, and the arts and commerce of this country have been carried to a still higher state of perfection, than that of which we now so triumphantly and so justly boast. As however, brevity united with clearness, are our principal objects upon the present occasion, I shall not trespass upon your time by any extraneous remarks, but proceed to an examination of the simple mechanical powers; leaving their application to the construction of the steam-engine to form the subject of a future lecture.

Mr. Partington then observed, that the first and most simple of the mechanical powers was the *lever.* It is a curious fact, that the celebrated Ferguson, who commenced his splendid career in humble life, dated his progress in science from an examination of this simple instrument at the cottage of his father. The lecturer here exhibited a lever, the fulcrum, or axis of which was placed in the center, in which situation it represented a scale beam, and no mechanical power was gained; but if we suppose it divided into three equal parts, and the fulcrum placed at one of the divisions, a force of 100 pounds acting at the end of the long arm of the lever will then raise 200 pounds at the opposite extremity; but in this case, the longest arm must travel through twice the distance described by the short one; for in this, as well as in all the mechanical powers, it is an invariable principle, that what is gained in *power,* is lost in *time,* and vice versa.

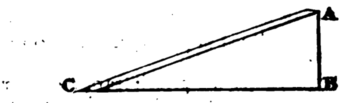
After explaining the principles of the other varieties of the lever, Mr. Partington described the second mechanical power, the *wheel and axle,* which raises great weights by means of a cord coiling round an axis, and thus acts as a *continued lever.* The tread-mill was adduced as an example of the application of this power, and the lecturer exhibited a model of an improved tread-mill, one end of which was much larger than the other, by which contrivance the degree of labour might be advantageously varied, as it was evident that the individual who was placed at the largest extremity, must pass through the greatest distance in any determinate period.

The *pulley* is the next mechanical power, and its operation also depends on the principle of the lever. In using a single fixed pulley, two equal weights exactly balance each other; but to gain a mechanical advantage a *moveable pulley* must also be employed.

by which means the power is doubled, and a body may be balanced by half its own weight. In this, however, as in the former case, the additional power is gained at the expense of additional time, as the weight to be raised passes through only half the space described by the force employed to raise it. Mr. Partington illustrated this subject by exhibiting the operation of several combinations of pulleys provided for that purpose, and elucidated the increase of power obtained by increasing their number. Pulleys, by this augmentation of number, are liable to the inconvenience of becoming, what is technically denominated *block and block*, to obviate which, a contrivance has been adopted by which they are made to pass each other, side by side; but in this combination, some disadvantage arises from the cords not being equally strained.

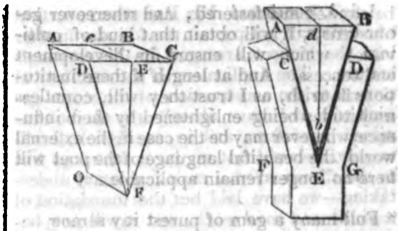
The lecturer then explained the application of these powers to the construction of a machine for winding silk, and also to the loom, a model of which was exhibited to the audience; after which, he proceeded to the fourth mechanical power, viz. the *inclined plane.*

The use of this power is evident from its general application to the purpose of raising great weights into carts or waggons, by placing a board or ladder at the tail of the vehicle. It is easy to roll or slide a weight up an inclined plane of this description, by a much less force than would be required to lift it perpendicularly. The principle of the inclined plane, and the power gained by its employment, will be understood by the following diagram:



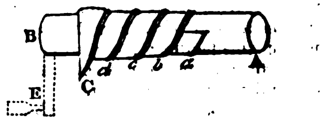
The mechanical power obtained by the inclined plane, is proportionably as the length of its surface C A, is to its perpendicular height A B; so that if the former line is three times the length of the latter, a weight may be raised by one third of the force necessary to raise it perpendicularly. The audience would be able to conceive in what manner our Druidical ancestors, (if Stonehenge was the work of the Druids) were enabled to raise immense blocks of stone, by conveying them up mounds of earth, formed upon the principle of the inclined plane.

The next in rotation of the mechanical powers is the *wedge*, which is composed of two inclined planes, as represented in the following figures.



The first of these figures shows that the wedge A B C F O may be separated into the two inclined planes D E F and F E C by dividing it in the line *e* E F; and the second represents the effect of the wedge A B, when driven into the block C D F G in the perpendicular direction *d' b*; the cleft made in the wood extending to E, at some distance beyond the point of the wedge.

The sixth and last of the mechanical powers is the *screw*, the principle of which the lecturer elucidated by coiling a piece of paper, in the form of an inclined plane, round a cylinder, in the manner represented in the following diagram.



When the inclined plane C is coiled round the cylinder A B, its edge represents the threads of the screw, as at *d c b a*, and the mechanical power of the screw is increased in proportion as these threads are nearer to each other. Its power is further augmented by the addition of the lever, either in the form of the handle E, or by a rod passing through the nut of the screw.

Mr. Partington then illustrated the advantages resulting from a combination of the mechanical powers, by describing their application to the construction of the common *crane*, and the *pile engine*. A model of the latter was exhibited, and the lecturer observed that its efficacy in driving piles depended upon the momentum acquired by bodies falling through a considerable space; as a pound weight dropt upon the table from the hand would produce little effect, but if it fell from the top of a house, its increased momentum would render it destructive of those beneath.

From the great increase of power obtained by a combination of the mechanical powers, many persons have imagined it possible to produce a *perpetual motion*. One of the most ingenious of these attempts was the wheel of Orfyreus, which was particularly described by the lecturer, and its fallacy clearly demonstrated, as well as the impossibility of the discovery itself.

I find, continued Mr. Partington, that our time will not permit me to enter further into the subject arranged for this evening's lecture. The application of the mechanical powers to the construction of the steam-engine will, as I have already stated, be examined hereafter; and in conclusion, I will merely observe, that we have advanced but to the threshold of a most important undertaking—we have laid but the foundation of a *great and good work*; and it will now become necessary for you, acting in conjunction with the liberal and enlightened gentlemen who have been instrumental in calling you together, to complete the superstructure. I need hardly repeat to you, that there is a most excellent, though unfortunately but a very limited society for the diffusion of scientific knowledge, already existing in Spitalfields, and the Western part of this Metropolis is now furnishing a practical illustration of what may be accomplished by the means of an institution such as we are now about to form; and I am persuaded that those who have laboured in the same field with a Simpson, a Dollond, and an Arkwright, will not be backward in following so excellent an example. Need I add my full conviction, that our learned Chairman and his colleagues will continue their labours till knowledge shall cover this great city, even as the waters cover the bed of the ocean.

I had almost forgotten to observe, how much we are indebted to the liberal pastor of this place, through whose kindness I am enabled to address you in a temple, dedicated to the worship of "the Living God."—A temple which—thanks to the excellent conduct of my auditory, has not been profaned by this humble attempt to illustrate some of the least important of His works!

Mr. Partington's lecture was received with unanimous approbation, and was followed by enthusiastic cheerings. Mr. Gibson then addressed a few words to the numerous assembly, expressive of his hopes that they had experienced as much gratification from the proceedings of the evening, as the individuals by whom they had been called together. If, after what they had heard to-night, and what would be submitted to them at the two next meetings, they should wish to avail themselves of the opportunity now offered, they would find no persons more ready to lend assistance in establishing the institution, than those who had been instrumental in inviting their attendance this evening.

A letter was then handed to Mr. Gibson by Mr. Sholl, a silk-manufacturer, who observed that he had received it in the course of the day from Mr. Brutton, an individual well known to the meeting. Mr. Gibson then read the letter as follows, at Mr. Sholl's request:—

"55, Old Broad Street,
Thursday, March 10, 1825.

"Dear Sir—If I were not particularly obliged to be at the House of Commons this evening, I should have felt much gratification in attending the meeting at the Gibraltar Chapel (which I understand is to be held to-night) with regard to the Mechanics' Institution: firstly, because I highly approve of the plan in contemplation; secondly, because I should have recognised some of my old friends with whom I was associated in the Silk Committee before the House of Lords; and thirdly, that I might possibly have had the honour of an introduction to that worthy and excellent character, Dr. Birkbeck. I am afraid to venture, for one moment, to suppose that so humble an individual as myself could render the Mechanics' Institution much service; but living as I do at Bethnal-green, almost in the heart of the silk trade, I cannot help feeling a strong interest in whatever concerns the Spitalfields weaver; more especially, when the plan emanates from so distinguished and enlightened a mind as Mr. Brougham's,—Wishing you every success, and lamenting exceedingly that I am unable to attend you this evening,

"I remain, dear Sir,
"Your obedient and humble Servant,
"To Mr. J. Sholl. Robert Brutton."

After a few observations of a very gratifying nature from several of the gentlemen who have interested themselves in originating the institution, the meeting separated; and from the orderly and exemplary conduct of the numerous individuals who attended, and the deep interest they appeared to take in the proceedings of the evening, we cannot but draw an inference, highly favourable to the ultimate success of the undertaking. It is impossible to speak of the exertions of Messrs. Gibson, Bell, Graham, Hale, and other gentlemen who have co-operated with them, in terms of adequate praise; and we anxiously hope that no latent feeling of unfounded jealousy on the part of those for whose exclusive benefit the Spitalfields Mechanics' Institution is intended, will for a moment prevent them from coming forward simultaneously, to complete, by their own exertions, the great and good work which has been thus commenced under such favourable auspices.

MR. PARTINGTON'S SECOND LECTURE.

PNEUMATICS——MATERIALITY, WEIGHT AND PRESSURE OF THE ATMOSPHERE—ITS EXPANSIBILITY AND COMPRESSIBILITY.

TUESDAY, MARCH 15.

Previous to the commencement of Mr. Partington's Lecture, Mr. Gibson, at the request of the gentlemen who are acting with him in the promotion of this undertaking, addressed to the crowded assembly a few appropriate remarks on the nature, objects, and manner of conducting such Institutions as the present. For some time past, the elementary process of education has been conducted upon a system which promises the most beneficial results to the great mass of the community; and in order to enable adults to participate in the advantages arising from the diffusion of knowledge, no plan is so well calculated to effect this object, as the establishment of MECHANICS' INSTITUTIONS. By means of moderate contributions from large numbers, they are enabled to obtain scientific information at a cheap rate; to have access to a Library and Reading Room; and to hear valuable courses of lectures on those branches of science which are best adapted to the situation and circumstances of the members. In this metropolis, we are surrounded by men of talent and liberality, who are happy to give their aid to the accomplishment of objects, which may be carried to any extent by Mechanics' Institutions. But it is not wise to attempt too much at once, and the projectors of the present Institution limit their views, in the first instance, to the formation of a Library, the establishment of a Reading Room, and the delivery of scientific Lectures. A book will be opened on Monday evening next, for the purpose of enrolling the names of those persons who are willing to join the Society, under Rules and Regulations similar to those adopted by other Institutions, and at the same rate of payment, viz. one pound a year, or five shillings a quarter. On the following Monday a General Meeting of all who enrol their names, will be held for the purpose of electing a Committee; twenty of whom, or two-thirds of the whole number, will be working mechanics, chosen by the members themselves, and the remaining ten will consist of those individuals who have assisted in the formation of the Institution. In this particular district its establishment promises one obvious and striking advantage; as it will have the effect of uniting two classes hitherto separated, viz. the *employers* and the *employed*; and by affording them opportunities of understanding one another better, it cannot fail to conduce to their mutual benefit. These remarks apply particularly to the Silk Trade, but it is not intended to confine the Institution to any one class, as its advantages will be extended to all who wish to participate in them, and to all who are desirous of receiving scientific instruction, that instruction will be given most cordially.

Mr. Partington then commenced his lecture by observing that he should this evening direct the attention of his audience to the nature of PNEUMATIC EQUILIBRIUM; and more particularly to a consideration of the weight, pressure, and expansibility of the gaseous fluid which surrounds the globe. It may be shewn by one or two simple experiments that the air is material, tangible, and as capable of being weighed as a piece of metal. To demonstrate the materiality of the atmosphere, a vane, presenting two broad surfaces to the air, was spun upon a pivot, and the resistance it encountered caused it to stop after a few revolutions; but when the two surfaces were placed horizontally, so as to present only their edges, the application of the same force occasioned the vane to spin rapidly for a considerable time. The inversion of a glass in a vessel of water affords another demonstration of the materiality of the air, which prevents the water from entering it; and in short, the gentle breeze that gives motion to the smallest blade of grass, affords as perfect a proof of the materiality of the atmosphere, as the terrific hurricane that carries destruction and desolation on its wings.

If then the air is material, it must have weight, and the manner of ascertaining its weight may be readily shown by the following experiment. Mr. Partington then accurately weighed a flask containing atmospheric air, and having afterwards withdrawn the air from the flask by means of a piston, it was found, upon again attaching the vessel to the balance, that it weighed less than it did before. It is by this means ascertained that a wine quart of air weighs about 17 grains.

Air, like all other fluids, presses equally in every direction. Its *downward* pressure was proved by exhausting the air from a receiver by means of the air-pump, when the vessel became firmly fixed to the pump plate by the pressure of the atmosphere, till the equilibrium was restored by re-admitting the air. That the air also presses *upwards* was shown by filling a tumbler with water, and covering it with a piece of paper; the glass was then inverted, and the upward pressure of the atmosphere kept the water in the vessel, and would have supported in the same manner a column of water upwards of 30 feet in height. To show the *lateral* pressure of the air, a tube, furnished with a jet on the side, was filled with water, and it was seen that when the lecturer kept the upper orifice of the tube closed, the pressure of the atmosphere prevented the water from flowing out at the side. It is upon this principle that the use of the *vent peg* depends, and also the operation of what is called the *conjuring funnel*. This instrument was exhibited and explained by Mr. Partington, who also performed several other interesting experiments illustrative of the pressure of the atmosphere, and its application to the *cup-*

ping-glass, the *sucking-pump*, and the *syphon*.

The lecturer then exhibited a very ingenious apparatus, called the Hydraulic Orrery, constructed by Mr. Busby, the operation of which depends on the syphon. This orrery was put in motion, and displayed a beautiful representation of the motion of the earth round the sun, and the evolution of the moon round the earth during the progress of the latter in its orbit. The construction of the *air-pump* was then explained, which acts upon the same principle as the sucking pump, but is more delicately constructed, and is furnished with two piston rods instead of one. The air-pump was invented by Otto Guericke, but we are indebted to our countryman, Mr. Boyle, for those improvements which have rendered this machine of such great utility. One of the earliest experiments performed with the air-pump was the exhaustion of the air from two hemispheres placed together, when the pressure of the atmosphere on their exterior surfaces attached them so strongly to each other, that it required an enormous force to separate them. The hemispheres employed by Otto Guericke were so large, that the strength of six coach horses applied to each hemisphere, could not drag them asunder. Mr. Partington exhausted the air from a pair of these hemispheres, only a few inches in diameter, and observed, that as the atmosphere presses with a force of about 15 pounds on every square inch, the hemispheres would support the weight of 60 or 70 pounds, though a child might separate them when the air was re-admitted.

The construction of the *barometer* depends upon the downward pressure of the atmosphere, and the mercurial barometer is formed by filling a glass tube with mercury, and inverting it in a vessel of the same fluid metal. The mercury is then observed to sink a certain distance in the tube, leaving a vacuum above it, while the column remaining in the tube oscillates, or varies in height according to the weight of the surrounding atmosphere. As the column of mercury in the barometer exactly counterbalances the pressure of the external air, its height will necessarily vary with every change in the density or weight of that fluid, and thus the changes of weather, which depend upon the state of the atmosphere, are correctly pointed out by the graduated scale attached to the instrument.

After several ingenious experiments, illustrative of the *weight* and *pressure* of the air, the lecturer proceeded to exemplify its *expansibility* and *compressibility*. The former was clearly shewn by placing an egg under the receiver of the air-pump, when it was seen that upon exhausting the air, and thus removing the external pressure, the small bubble of air contained in the upper part of the egg expanded till it filled the shell, and forced nearly the whole of its contents through a small aperture at the bottom. The *compressibility* of the air was elucidated by a description of the *forcing-pump*, which owes its operation to this property of the atmosphere; and also by a number of striking experiments, in one of which the lecturer condensed three or four atmospheres into a hollow brass ball, containing a portion of water. The air thus compressed, when allowed to exert its powerful tendency to expand into its natural bulk, caused the water to rise in a strong jet, which struck against the ceiling of the chapel with considerable force.

Mr. Partington concluded his valuable lecture by observing, that as he had now demonstrated the *materiality*, *weight*, and *elasticity* of the air, he should endeavour to shew the manner in which all these important qualities are combined in the STEAM ENGINE, when he next had the honour of addressing his auditory.

The lecture was rendered extremely interesting by the number and variety of the illustrative experiments introduced by Mr. PARTINGTON, and the unanimous acclamations of the audience afforded sufficient evidence of the gratification they had experienced in listening to his able instructions.

LEEDS MECHANICS' INSTITUTE.

On Thursday evening, Dr. Williamson delivered a lecture in the Philosophical Society's Hall, at Leeds, before the Mechanics' Institute, "On the method of obtaining knowledge by induction, and its connection with the modern improvements of science." The first part of the lecture was occupied by an attempt to show the causes which had impeded the progress of natural science amongst the ancients, who, notwithstanding the mighty powers of genius by which many of them were distinguished, made very few discoveries in the material world. The introduction of superior methods of inquiry by our great countryman, Bacon, was considered, and the influence his views had exerted in every department of science. At the close of the lecture, Dr. W. took a rapid survey of the different condition of the great body of the people at different times, in reference to knowledge; and observed that the establishment of institutions of this nature marked a new and peculiar era in the history of mankind. He concluded by some remarks on their leading objects and their beneficial tendencies.

KEIGHLEY MECHANICS' INSTITUTION.

We are happy to learn, that the number of members in this institution has increased to upwards of forty, that the middle and higher classes of the town begin to take an interest in it, and that a public meeting is contemplated, in the week after next, to establish it in due form.

We have received the following letter on the subject of the invention which we praised in our last numbers. We give Mr. Deane's appeal with pleasure, but we will not on that account withhold from Mr. Roberts the credit which is due to him, for we are quite sure that he never heard of Mr. Deane's patent; and it remains yet to be seen whether the two inventions do not differ materially. Mr. Deane will probably favour us with a drawing of his plan, and enable the public to decide fairly.

To the Editor of the Mechanics Register.

SIR—Having observed in your valuable *Register* of March 5, Roberts's invention to enable persons to enter places filled with smoke or other vapour for extinguishing fire. I have no doubt he will apply to the Society for a premium for the same, on the ground of his giving up his invention for the good of the public. This however, he is not justified in doing, for I beg to inform you I obtained a patent for the United Kingdoms in 1823, for this apparatus, of which he is supposed to be the inventor. I shall be happy to shew any gentleman the exact process of the apparatus.

March 15, 1821. A. DEANE.
2, Charles-st. Deptford, Kent.

To the Editor of the Mechanic's Register.

SIR—Having recently attended a lecture on Electricity, at which its application to the progress of vegetation was discussed, amongst a variety of experiments, the following important one was shewn to us:—

The lecturer had a small tin can which he filled with earth, in which he requested one of the company present to sow some seed. Some mustard seed was accordingly sown in it, and on his presenting the can to the prime conductor of the machine, and taking a few sparks the seed vegetated in the course of a minute to the surprising height of an inch, and bore every appearance of being regularly grown in the garden. I was fortunate enough to get part of it, and could not discover the least difference. When the lecture was over, I waited on the lecturer to ascertain the manner in which this wonderful phenomenon had been produced, but could obtain no more from him than that the earth was previously prepared (and as I understood him to say) by chlorine.

If any of your Correspondents will be kind enough, through the medium of your excellent *Register*, to explain the manner in which the above effect was produced, I, in common with some fellow members, shall feel greatly obliged for the information.

I remain, Sir, your's respectfully,

March 10, 1825. GEORGIUS.

To the Editor of the Mechanics' Register.

METHOD OF OBTAINING POT-ASH (FROM THE STALKS AND LEAVES OF POTATOES—NEW THEORY OF THE AURORA BOREALIS—OPTICAL QUESTION.

SIR,—With every respect for the acknowledged ability with which you conduct the MECHANICS' REGISTER, I will now, agreeably to my promise, address you on the subject of an article that I mentioned in my last paper; the manner of procuring pot-ash from the stalks and leaves of potatoes, which they contain in abundance.

Just when the flower begins to go off, at which time the plant is in its full vigour, the plants are cut with a sharp instrument about five inches from the ground. The stumps soon throw out fresh shoots, which suffice to bring the roots to maturity. The plants after being cut, are left eight days in the field to dry. They are then burned in the same manner as soda manufacturers burn kali, in a hole five feet in diameter, and two feet deep. The ashes are washed and the ley evaporated. By this process, 2,500 pounds weight of the salt is obtained per acre; the author of it, a French chemist, calculates that the potatoes grown upon an acre will produce 225 francs over and above the expense of cultivation, and that the salt from the same acre, deducting the cost of making, will be worth 816 francs, making a total of 1,041 francs, upwards of 43*l.* sterling. This may be more generally known than I am aware of, if so, you will undoubtedly exercise the prerogative of *rejection*.

I shall occasionally trouble you with a paper when I may chance to stumble on any thing that may appear worthy of a place in your Register, which I think the following is:—

The last number of the *Edinburgh Philosophical Journal*, contains a memoir by Professor Hansteen, in which that eminent naturalist has sketched out a very bold and plausible theory of the Aurora Borealis. The connection of that phenomenon with magnetism has been long remarked, and is further confirmed by the observations of the professor. He considers the Aurora Borealis as a luminous ring, surrounding the magnetic pole, with a radius varying from 20 degrees to 40 degrees, and at the height of about 100 miles above the surface of the earth.

It is formed, he thinks, by luminous columns shooting upwards from the earth's surface, in a direction parallel to the inclination of the needle, and to the direction of the earth's magnetism; these columns render the atmosphere opaque while they pass through it, and only become luminous after they pass beyond it. From the outer or convex side of the ring, beams dart forth in a direction nearly perpendicular to the arch, and ascend towards the zenith:—and if they are so long as to pass towards the south, they collect in the south in a sort of corona or glory, which is situated in that part of the heavens to which the south pole of the needle points.

Professor Hansteen finds that the observations made respecting the Northern Aurora are well explained by this hypothesis; and he has collected facts to show that a similar ring exists round the Southern magnetic pole situated in New Holland, the Northern being in North America. He infers farther, though the stock of observations is rather deficient, that similar luminous rings exist above the two extremities of the secondary magnetic axis, in Siberia and in Terra del Fuego.

One of yourc orrespondents, "Fredericus," desires to know why we do not see double? How it happens that impressions made upon our two eyes at one and the same time are represented single to the sensorium, we know as little as why we hear one sound with two ears, and smell one scent with two nostrils.

The mind is incapable of receiving two distinct impressions at one and the same instant. The interval is too small to be measureable, but a simple experiment made by Haller, affords unexceptionable evidence of the fact, that we employ our eyes severally. But we know that if the direction of the two eyes is in conformity, each with the other, objects appear as they are, singly; or that when a certain divergence of the visual axes exists, objects appear double. If the image, for example, is thrown upon a point of the retina of one eye, not in correspondence with the spot impressed on the other, this effect is produced. The double image of a candle is seen when gentle pressure is made on the globe of one eye; and it is either on the horizontal or vertical directions, according as the finger is applied to the side of the cornea or below it.

TYRO.

Rye, March 12.

SPEEDY SUPPRESSION OF FIRES.

We are happy to find, that although the inhabitants of the metropolis maintain an apathy as inconsistent with reason as it is disgraceful on a subject most important to society, the public of Liverpool are evincing a laudable anxiety to diminish an evil which all ought to deplore, and from which too many are sufferers. The *Liverpool Mercury* of Saturday, contains the following:—

"The destruction of property annually, occasioned in a town like Liverpool, by the frequency of fire, and the impossibility in most cases of bringing up the fire-engines, and applying them with effect until the flames have gained a head not to be easily subdued, has, for some time past, induced a number of most respectable individuals to unite in adopting a plan, which, as it promises much greater security to the property of individuals, and of the public at large will, we doubt not, when it becomes generally known, be followed by every considerate occupier of a house or warehouse. When fires are first discovered to have broken out, the rapidity of their progress might often be arrested by the timely application of a few buckets of water: but housekeepers and others are seldom prepared for such emergencies; buckets are not to be found; water too is not attainable in sufficient quantities on the immediate spot, and all is hurry, confusion, and dismay, till the building is perhaps enveloped in flames, and the engines arrive in time to play upon the smoking ruins. It naturally occurred to the gentlemen alluded to, that if every house and warehouse were provided with a few water buckets, and these kept filled, the fire in the first instance might generally be quenched; and on occasion of an alarm, every individual in the neighbourhood might despatch his buckets, filled, to the spot; a service which would be rewarded by the preservation of much valuable property. The gentlemen alluded to are, we understand, canvassing the town in order to extend this admirable measure of security, and orders have already been given for several hundreds of buckets. These buckets are made of leather; but an excellent substitute will be found in tin, for those who prefer the smaller expence. Example is always better than argument—and when we state the following fact, nothing further need be urged in support of this arrangement:—Messrs, Swanwick and Co.'s extensive tobacco manufactory was discovered to be on fire on Sunday week last, and one of the partners on entering the premises, found two of the floors in flames, but the firm having previously provided themselves with fire buckets, instantly applied them, (only six in number,) and entirely extinguished the fire, thus preventing the destruction of property to the amount of many thousand pounds, and this effected by the simple means of a few buckets. In the United States, we understand the householders are compelled, by law, to keep fire buckets constantly on their premises: the same regulation is observed in some of our own colonies, and wherever it has been pursued, the utmost benefit has accrued to the public at large. However fully a man may be insured, the burning of his premises must be a loss, in derangement of business and otherwise, and the workmen he employed inevitably suffer more or less, with all their train of dependants. And it ought to be remembered, that were the frequency of fires reduced the expense attending the measure proposed would be more than repaid in the reduction of premiums of insurance, which in that case would necessarily fall. Besides, whether a house or merchandise be insured or not, the burning of either is exactly so much of a loss to the country at large."

FAMILIAR LESSONS ON MINERALOGY.

(*Resumed from page* 309.)

Limestone, slate, sandstone, and semi-indurated *argillaseious* substances, rarely occur in *gravel,* or amongst the pebbles of a surf-beaten sea-coast; because they are not sufficiently hard to resist the action of attrition, and are soon broken down, forming sand or dust.

A little thought on these substances, after looking at them with attention, will convince the learner, that he is making some progress, and he will feel pleased at being able to proceed with greater facility.

The learner may now be led to inquire—*How he can discriminate ores of copper?*

Ores of copper have commonly a yellow appearance, the poorer ores much resembling pyrites, but are softer to the touch of the knife. Copper ores that are richer, are of a gold yellow, some are irridescent, exhibiting a pretty and variable display of colour, and are called Peacock Copper. These varieties have a deeper and more flame-like tinge than common pyrites.

Copper ores are frequently green, and in delicate fibres; sometimes compact, beautifully zoned, of lighter and darker shades, exhibiting great variety; these are called Malachite, which is not unfrequently mixed with blue.

Copper ores are often of a grey colour, not unlike iron, also brick red, black and even soot-like; but for fear of tiring the learner with prolixity, we will explain the easiest method of detecting them, previously observing that copper is not uncommon in its native state, when it appears foliated, massive, branch-like, &c. pieces of pure copper of this description are often found in veins, particularly in Cornwall; this sort of copper so much resembles the general copper of commerce that it needs no other description.

That the learner may satisfy himself of an ore of copper, let him place a small particle of it upon a piece of charcoal, with a little borax, directing the flame from the blow-pipe upon it, which will soon melt; if it be a rich ore it will be reduced to a bead of pure copper, colouring the slag green or red brown; it is sometimes necessary to repeat the melting. A more easy method of detecting copper is as follows:

Reduce a small particle to powder, put it into a watch-glass, with a few drops of nitrous acid; if no action takes place, apply a little heat, by holding it over the flame of a lamp; the copper will soon be acted upon and dissolved by the acid; then add a few drops of water, and stir it with the point of a knife, or any piece of clean iron, when the copper will leave its solution, and precipitate upon it (coating the knife), covering it, and give it the appearance of copper; or the contents of the watch-glass may be thrown into a glass of water, to which add a few drops of liquid ammonia, and it will become a beautiful blue.

This pretty experiment so convincing in effect, will add considerably to the learner's confidence.

Even water passing through a vein of this metal, often contains a large portion of it in solution, and the water is collected in reservoirs with great care, into which iron of any description is then thrown, and becomes coated with copper, which is scraped off and the iron again plunged into the water; this is repeated as often as any copper remains in solution, and frequently by this method several tons are extracted. The copper thus produced is very pure, and when melted is used for the best purposes.

The before-named substances are amongst those which most generally occur in this country; it is not our intention, nor would it suit the learner in this early stage, to enter into their peculiarities, or more minute discriminations, that may take place hereafter.

As *silver* has been met with in various parts of Cornwall and Devonshire, the learner will naturally inquire—

Question. *How he can know substances containing silver?*

Native, or *virgin silver,* as it is sometimes called, occurs in delicate curled fibres, of almost a white colour, and filling little cavities in quartz, nests; these fibres are tough and flexible, often surrounded by a black earthy, soot-like substance. Silver is frequently branch-like in strong ramifications, or leaf-like, passing through calcareous and other substances, in long serrated wire-like branches, attached or connected, and frequently interwoven, crossing each other net-like. These silvers have often a fine rich metallic lustre, of a tin-white colour, and sometimes tarnished.

Silver in this state (*native silver*) cannot be mistaken after having been once examined, but it may be proved to be so by the touch of the knife, as it yields to it, being little harder than lead; it is malleable, and indented by the smallest blow of the hammer, and melts into a beautiful white globule.

It greatly resembles tin in this state, but may easily be known from that metal by its being much heavier, and by the cracking noise which tin makes when bent, or by its burning away under a continued heat, whereas silver remains unaltered.

By due attention to these remarks, silver may be discovered, and as the ores of silver are frequently combined with other metals the following easy experiment will detect it

If it be a rich ore it will be soft to the knife or hammer, and melt under the blow-pipe with little difficulty, and by repeated fusing with borax, a bead of silver may be produced: the combinations will be driven off by heat, or absorbed by the borax. Or a few particles may be put into a watch-glass, into which drop a little nitrous acid, then hold it over the flame until it is dissolved, after which dilute it with water, and stir it about with a bright copper wire; if any silver is present it will precipitate upon the copper, covering it with silver, in like manner as iron is before described to be covered with copper; or add to the solution one drop of muriatic acid or common salt, and the silver will precipitate in a thick and dull white cloud.

These experiments will open the mind to further investi gation. They may be performed with ease and elegance, by merely possessing the few articles before mentioned.

(*To be resumed.*)

PATENTS EXPIRING NEXT WEEK.

David Stewart, for certain improvements in the method of rendering dwelling-houses, theatres, and every other kind of building, air and water tight, as far as relates to the glazing, by means of a lap made of copper, or any other metal prepared by machinery for that purpose. Expires March 22.

Robert Bell, for a machine to facilitate the washing of clothes. Expires March 26.

Robert Wornum, for an improved upright piano-forte. Expires March 26.

Joseph C. Dyer, for improved methods of splitting hides, and shaving or splitting leather. Expires March 26.

John Craigie, for improvements on waggons, carts, and other wheel-carriages, whereby friction may be saved, labour facilitated, and a greater degree of safety obtained. Expires March 26.

Ann Hazledine, for certain improvements in a plough, for the cultivation of the land. Expires March 26.

John Rose and Thomas Chapman, for conveying vessels of any burthen through the water without the assistance of oars or sails. Expires March 26.

Samuel Kerrod, for a cement or size, for plaistering and stuccoing walls, setting and whitening ceilings, and running and whitening cornices; and colours to be laid on the stucco, as well in oils as distempers; the whole of which are intended for the finishing the inside of houses. Expires March 26.

James Bell, for certain improvements in the manner of cutting, shaving or scraping sugar loaves and lumps, and of pulverizing or reducing to small grains of powder, sugar-loaves, lumps, and bastard sugar. Expires March 26.

Henry James, for an improvement in the mode of navigating vessels upon canals and other navigable waters, by means of machinery to be worked by steam, or other suitable power. Expires March 26.

Erratum in last week's list of Expiring Patents, page 320, column 2, line 15, for *Camp* read *Lamp*.

We learn with pleasure that it is intended to establish a Mechanics' Institution at Huddersfield.

NOTICE TO CORRESPONDENTS.

We have received a communication from Mr. Barton on the subject of his new invention for the speedy extinguishing of fires; we will endeavour to give it next week.

We have been favored with answers to the second Prize Query, (page 107,) by several Correspondents, and upon which the proposer has made his decision. The first query, as far as regards geometrical solution, has not been answered, and therefore the prizes which were intended for the answers thereto will be awarded to others.

The decision which has been made is as follows:—

T. Taylor, for the answer by Algebra, De Lolme on the Constitution.

C. Puttock, for the answer by Arithmetic, Sharp's Algebra.

G. Morley, for the answer by Fractions, Cowper's Poems.

J. N. for answers by Arithmetic and Algebra, Squire's Astronomy.

J. H. B.'s answer by Decimals is not only incorrect (which might have been perceived, had the solution been proved) but he has not shewn the real answer.

These Correspondents will please to send to the Publishers of the Register for their Prizes.

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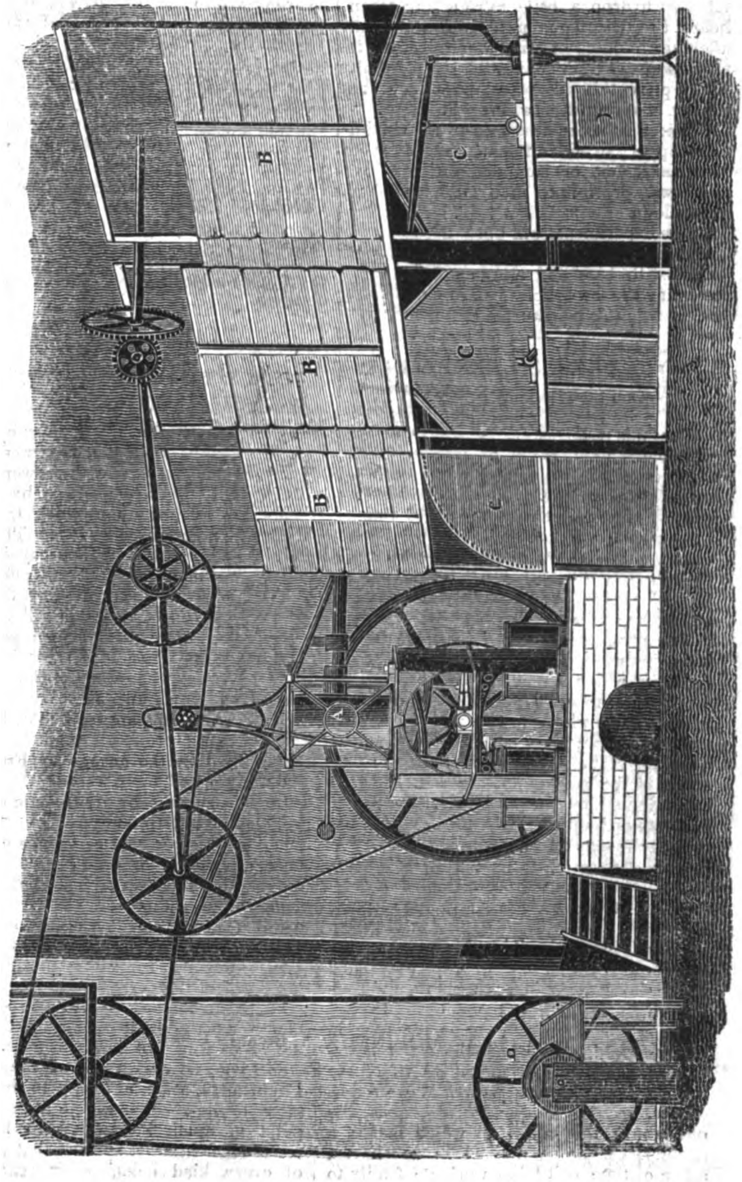
MECHANICS' REGISTER.

No. 22.] SATURDAY, MARCH 26, 1825. [Price 3d.



INTERIOR VIEW OF THE STEAM WASHING COMPANY'S WORKS.

STEAM WASHING COMPANY.

Our curiosity, like that of the public, having latterly been considerably excited by this Establishment, we paid it a visit last week, and are happy to have it in our power to furnish some information on the subject to our readers, for which we are indebted to the politeness of the Patentee.

The Works are pleasantly situated on the banks of the Wandle, a small river, running in the neighbourhood of Mitcham, and about seven miles from the metropolis.

We shall now, as concisely as possible, detail the process of Steam Washing, avoiding almost entirely any description of machinery, which is generally equally difficult to explain or comprehend. The linen having been collected from the various patrons of the institution, is conveyed to its destination in a handsome and guarded equipage, and having been overlooked, sorted, and so effectually marked by the Company, as to prevent the possibility of mistakes, is doomed

> "Like a poor curate's Sunday shirt,
> "To lose its dingy tints of dirt."

For this purpose there are three large wheels, each capable of holding a considerable quantity of linen, and suited, from the materials of which they are composed, partly for heavy, and partly for light things: these wheels are divided into four compartments, the outward circle being what the French term "entrecoupe," or, to use an English expression, are open as the wires of a circular squirrel's cage.

The situation of these pieces of machinery is in immense cases, made air and water tight, in which there is placed prepared soapy water to the depth of about eighteen inches. The wheels are then put in motion, and steam from pipes being let in upon the linen, the clothes, by means of the rotatory action of the machinery, are several times in a minute alternately subject to the power of steam and water. By this process the most stubborn dirt is effectually eradicated in a short space of time, and the substance of the linen in no way deteriorated by friction, whilst the articles come out white as snow.

Completely purified by this process, the linen is then rinsed in clear cold water, and an admirable expedient is used for the purpose of freeing it from the water. Instead of being violently wrung, as is the case in private washing, by which the water is extracted, at the expense of the fibres of the linen, the articles are passed between two rollers, moving in opposite directions, the one above the other, by which means a counterpane can be drained in as short a space of time as it takes a private family to wring a pocket-handkerchief, and every article is left considerably drier than the hand can leave it. This substitute for wringing we consider a most important feature in the process; by saving labour, the expense must be considerably curtailed, and we presume it must be allowed to last no inconsiderable time longer.

Having undergone this process, the linen is conveyed to spacious drying rooms, situated on the upper stories of the works, where they are dried in covered and ventilated apartments, the advantage of which, the Patentee informed us, consisted in not being subject to the caprice of the climate, and in avoiding those dingy particles, which in damp and hazy weather float so abundantly in our atmosphere. From these rooms the linen when dry is carried to a place for folding, where that process is performed after the usual manner. That done, a division takes place, those things which require ironing being taken to the Ironing Apartment, and the remainder to the calendering room.

In describing the first of these, we regret, on account of any fair reader who may devote her time to the perusal of our pages, that we are not sufficiently versed in the art of "getting up fine linen," to enter into any minute criticism upon the subject. It appeared to us that the things looked remarkably well: but that probably is to be attributed to the superiority in washing; it is not, however, unfair to suppose that the ironers are deserving of some credit, for considering that it is their every-day occupation, we imagine they must necessarily understand their business better than those who only attend to it occasionally. In the calendering room, the mangle is entirely cast aside; the linen in the first instance is passed between two rollers, similar to those which we mentioned as a substitute for wringing, and is then subject to the pressure of a beater upon another roller, by which the articles acquire a superior gloss, and are pressed more closely than by the common mangle.

This description will probably convey to our readers a fair idea of the concern; but in dismissing the subject we must say, that we consider the Steam Washing Company as more likely than any other invention or discovery, to put an end in a great measure to that greatest of all family nuisances—domestic washing, by which a whole house, the lords of the creation not excepted, is rendered uncomfortable, for two days in a month, amounting to one fifteenth part of the whole period of their existence.

Having said thus much of the Washing Department, we are happy to bear testimony to the conduct of the Patentee, on a point of much importance to those who serve under him. It appears that provisions of every kind being extravagantly dear about Mitcham, and the highest prices being extorted from the persons employed on the Establishment, from their incapacity to search for them at a distance, the Company have built, at a considerable expense, a spacious dining room, capable of accommodating the whole of their extensive establishment: in this apartment, the poor people are accommodated with a ready-dressed dinner, at about one half the rate at which they could purchase it elsewhere. There is in addition a store, from which bacon, cheese, butter, and in fact most of the necessaries of life, are sold to those employed at such a trifle above prime cost, as scarcely to remunerate the Company for the expense of supplying it.

This plan of keeping a store, though not uncommon in the manufactories in the northern counties, is the first thing of the kind we have witnessed near London. We think, in the present instance, it is as necessary as convenient; for by the work-people not being permitted to take their meals among the linen, the possibility of its being soiled is entirely done away with.

References to the Engraving.

A the Steam Engine.

B Vats for Soap in a solution of hot water, &c.

C Steam Washing Machine.

D Squeezing Machine.

LONDON MECHANICS' INSTITUTION.

LECTURE ON MNEMONICS, BY MR. REYNOLDS.

WEDNESDAY, MARCH 16.

Mr. REYNOLDS observed, on presenting himself to the audience, that it might possibly be considered presumptuous in one who had hitherto been but a humble hearer of the able courses of lectures delivered in that place, to appear before the members in the capacity of a lecturer; especially while the able discourses and experiments of their enlightened President, Dr. BIRKBECK, which had elicited thunders of applause, were still fresh in the recollection of his auditors. But as a body highly charged with electricity communicates the subtle fluid to the nearest surrounding bodies, he had felt anxious to communicate to his fellow members the information he possessed, and though his efforts, in comparison with the scientific labours of others, would be but as a little taper compared with the resplendent beams of the sun, the kind encouragement he had received from the President himself, would be his best apology for coming forward upon this occasion, and the only favor he had to ask, was that the members would extend their indulgence to him, and take the will for the deed.

MEMORY, observes the immortal Locke, is, as it were, the storehouse of our ideas; for the narrow mind of man being unable to bring before its view several ideas at one moment, it is necessary to have a repository wherein to lay up those ideas, till outward circumstances shall call them into action. And this may be easily conceived, when we recollect how often the remembrance of past pleasures or pains has been revived in our minds, by some occurrence which happens to be in some respects similar to that which once impressed us, and which called forth thoughts and ideas till then unknown. And it is also by this faculty that we are said to have all those ideas in our understandings which we can bring in sight, and make the subjects of our thoughts, without the help of those sensible qualities which first imprinted them there. *Attention* and *repetition* contribute essentially to fix ideas in our minds; for ideas but once taken in, and never again repeated, are soon lost; like the idea of colours in those who have lost their sight when very young. Yet it must be admitted, that the memory of some men is tenacious, even to a miracle; for instance, Jedediah Buxton, whose powers of mental calculation and retaining numbers were of the most extraordinary description; so that, according to the phrenological system, he must have possessed the organ of number in a very eminent degree. Indeed, his whole soul appeared wrapt up in this propensity; for it is related of him, that having been once taken to a theatre, he was asked, at the conclusion of the performance, what he thought of it? He replied, that he never met with any thing that puzzled him so much; and upon being questioned as to what it was that puzzled him, to the great surprise of the inquirer, he answered, that he had been endeavouring to count the *number of words* that each of the performers spoke.

Other animals appear to possess the faculty of *memory* as strongly as man; for dogs will recognise persons, places, and things, when the minds of their masters have lost all traces of them. This may be by some attributed to *instinct*; but, observed the lecturer, I have never heard or read any account of that faculty, satisfactorily distinguishing it from *reason* in every instance; and until I have been more fully informed, I am quite willing to allow the brute creation to enjoy certain faculties with ourselves. Birds, too, seem to possess memory, which is evinced by their learning tunes, and their endeavours to hit upon the right notes; for it is impossible that they should endeavour to conform their voices to notes of which they have no idea.

But memory, like all other faculties, when too much harassed or loaded, will very often be impaired, or even have its powers destroyed. And as things that give us the most pleasure and make the most lasting impression, are these which have troubled us the least in the exercise of our ideas that which torments us most to retain, will very often be totally absorbed by the most trifling object that happens to divert our attention. A little fellow, for example, sent by his mother to make a number of trifling purchases at the chandler's shop, comes down the street, chaunting the list of articles to impress it on his memory—he meets with a playfellow—their conversation naturally turns upon tops and marbles, and when his errand recurs to his recollection, he has actually forgotten what quantity of each of the respective commodities he was to buy, and is obliged to return for fresh instructions. Another, more thoughtful, adopts the expedient of putting into different pockets the value of the different articles to be purchased, and on his arrival at the shop, without any burden on his mind, he calls for the several articles he wants, simply by a reference to the cash in each pocket, proving that

> " From simple child-like means
> " Oft manly science grows."

George Bidder was an extraordinary example of the possession of the faculty of memory in an eminent degree; but his memory sometimes failed him after repeated exertions. Mr. Reynolds related an instance of this occasional failure, which came under his own observation, and was fairly attributable to an excessive exertion of his surprising power of calculation.

Simonides, the philosopher, is said to have discovered the art of improving the memory. His method was by a choice of places and images; such as a house, rooms, &c. which were to be rendered in their order, extremely familiar to the imagination and memory, and whatever was to be remembered, was to be connected with some part of the house, in a regular manner. Both Cicero and Quinctilian have spoken of this method; and in modern times we have had several attempted improvements in this artificial memory. Its principal use is in history, chronology, and geography, where the dates and numbers are very numerous, and so difficult to retain, that very few men are able to name them when called upon. The method now adopted, is to form a word, the letters of which are to designate certain figures, so that the numbers may be more easily recapitulated and remembered. This system which I am about to explain, is deduced from Dr. Grey's Memoria Technica, but it is more simple than his; to prove which I will just exhibit a specimen of the doctor's manner, and compare it with that of Mr. Smith.

DR. GREY'S SYSTEM.

a	e	i	o	u	au	oi	ei	ou	y
1	2	3	4	5	6	7	8	9	0
b	d	t	f	l	s	p	k	n	z

DEL-etok, 2348—g, 00— th, 000—m, 000000
ig, 300—ath, 1000—loum, 59,000,000.

According to the above system, when any thing is to be remembered in history, chronology, geography, &c. a word is formed, the beginning of which is the first syllable of the thing to be remembered; and by frequently repeating it with the latter syllable or syllables, which are contrived to give the answer, the intended object is effected—thus, the deluge happened 2348, B. C., then write del-etok, as above; del meaning deluge, and etok 2348.

In the diagram, a and b stand for 1, e and d for 2, &c. These letters are assigned arbitrarily to the respective figures, and may very easily be remembered—the first five vowels naturally represent 1, 2, 3, 4, 5; the dipthong au being composed of a 1, and u 5 stands for 6, and so of oi; ei 8, is easily remembered, being the first letters of the word eight. In like manner the consonants where the initials could be retained, are made use of to signify the number, as t for 3, f for 4, and n for 9.

The rest seem to be arbitrary, except that b being the first consonant stands for 1, &c. Although y and z are here assigned to the cypher, yet when there are many occurring together as 1000, 1,000,000 it was thought better to have some other letter or sign to designate them; thus, let g stand for 00, th for 000, and m for ,000,000; then ag will be 100, ig 300, oug 900, &c. ath 1000, am 1,000,000, and loum 59,000,000 as above.

If we wish to remember when Cyrus, Alexander, and Julius Cæsar, founded their respective monarchies, we have only to annex the following syllables to part of their names, thus: Cyr-uts, 536; Alex-ita, 331; and Juli-os, 46; shewing that these three monarchs founded their empires the above number of years before Christ. Upon this principle, a Table of the Kings of England, shewing the year in which they commenced their respective reigns, and in fact, of any chronological events, may be constructed.

We will now take leave of Dr. Grey, but before I introduce you to the Rev. Mr. Smith, I will just observe that, some time ago, a Mr. Feinagle attracted the public attention by the apparently wonderful effects of his system; but a calm and dispassionate enquiry into his method soon proved that it required the powers of a very strong memory to retain the rules, by which he professed to assist and improve a very bad one.

REVEREND MR. SMITH'S SYSTEM.

ORGANICS.		MODIFIERS.	
1	b or c	e final after a Consonant	0
2	d w	w final	00
3	f g	ee or oo between Consonants	0
4	h j k s	s added to words	00
5	l	x or z initial	5
6	m n	x or z elsewhere	0
7	p q	ing terminational	000
8	r y	y final	0000
9	t v		

The above diagram, which represents the Table of Mr. Smith's system, is apparently more extended than Dr. Grey's, but its superior utility will be evident, when I remark, that the whole of the Doctor's system, almost precludes the formation of those words, which are the semblance or names of things or ideas, and consequently his method is more easily forgotten after all.

But Mr. Smith has so modified it that there is hardly any thing in existence that has a name but may be brought into play. The table before you contains the whole of the art; and a quarter of an hour's application will very easily imprint it on your memory. Mr. Reynolds here went regularly through the preceding table, which will be readily comprehended by a reference to his previous explanation of Dr. Grey's system, and he then directed the attention of his audience to the following diagram, to exemplify the practical application of Mr. Smith's method.

ENGLAND, Prot. Mon. gives LONDON.	RUSSIAS, Grk. Despot gives PETERSBURGH.	
LEAD	Nox.	LATITUDE
o	fox	LONGITUDE
top	Beadle	Supr. Contents in Thousands of Sqr. Miles
web	fur	POPULATION in Millions
nail	coal	REVENUE in Millions
fire	boats	LENGTH
gauze	Bennet	BREADTH
—	bad men	DISTANCE from LONDON
—	abide	Difference of TIME from London
ile, loan	ash, meat	LENGTH in DEGREES
Bean, aim	DIDO me	BREADTH in DEGREES
toe	Bes	CLIMATE
bun	cat	LONGEST DAY

Now, it is generally acknowledged that we often retain the remembrance of things that excite our laughter, however foolish they may be, better than those of a more serious cast. If for instance, we turn one of the above lines into a kind of tale, after repeating it two or three times only, we have all the principal geographical facts concerning Russia fixed on our memory. Let us therefore endeavour to connect the words in a manner somewhat similar to the following; "Mr. *Nox* gave a *fox* to the *beadle*; he sent *fur* and *coal* in *boats* to Mrs. *Bennet*, whom *bad men* cannot *abide*; she bought *ash* and *meat* for *Dido, me, Bes* and the *cat*." Nonsensical as these words may appear, they are easily learnt and readily remembered, and thus the geographical facts connected with the story are firmly imprinted on the memory. In like manner, with a little ingenuity, may the dimensions of the terraqueous globe and of the planets be learnt; for although certain words are inserted in the diagrams exhibited, any other words may be substituted, provided their letters exactly agree with the figures wanted.

I assure you, continued the lecturer, that since the introduction of this system at our house, we have grown quite scientific, and quite extravagant into the bargain; for our servant expends the whole revenue of Russia in making her fire—(*coal* 15 millions); nay, the fire itself has undergone a change, for when it is nearly out, we say the length of England is very much diminished—(*fire* 380 miles); and I cannot help laughing when I meet the beadle of our parish stalking up the road, for I say to myself, there goes the superficial content of Russia— (*beadle* 1250 thousand square miles). My *toe* tells me the climate of England (9th); my *leg* the latitude of Berlin, the capital of Prussia (53 degrees). The *cat* or my *coat* stands for the longest day of Russia (19 hours). If I see a smoker enjoying his pipe, I recollect that he is smoking the whole distance of Warsaw, the capital of Poland, from London—(*pipe* 770 miles). When I go to church and am put into a pew, I find myself in the length of France—(*pew* 700 miles). When I have eggs for breakfast, I eat the whole length of Europe at a meal—(*eggs* 3,300 miles). Have we a carpenter here? Let me tell him, that when he is driving a *nail*, he has the total revenue of England under his hammer—(*nail* 65 millions); and that a *brad*, small as it is, contains the superficial content of Turkey—(*brad* 182 thousand square miles). Is there an honest blacksmith present? let me tell him, that his *file* is the length of Portugal—(*file* 350 miles); and the bar that he forges is the longitude of Stockholm, the capital of Sweden—(*bar* 18 degrees). Have we any gentlemen of the law here? their profession is as long as the German states, and as broad as Austria—(*law* 500 miles). In short, there is not a trade or occupation that does not afford ample matter for fixing facts and numbers on the memory. It may be made a source of infinite amusement, and much may be learned in a little time; as the furniture of your room, the tools of your workshop, or the objects that meet your daily view, are only so many books from which you may cull the choicest ideas, and store your minds with the most delightful knowledge.

But, concluded Mr. Reynolds, should what I have said have afforded the least pleasure or profit, the remembrance of this evening will, without the aid of MNEMONICS, be so indelibly impressed upon my mind and heart, as to be erased only by the total extinction of memory itself.

MR. WHEELER'S SECOND LECTURE ON BOTANY.

PHYSIOLOGY OF PLANTS—CIRCULATION OF THE SAP—PERSPIRATION—HEAT—GROWTH OF PLANTS—SEEDS—ROOTS—STEMS, OR STALKS.

FRIDAY, 18TH MARCH.

Mr. WHEELER commenced his illustration of the *vascular construction* of plants, and the circulation of the sap, by remarking that it must be evident to the most superficial observer, that vegetable bodies consist of an assemblage of tubes and cells. By means of the microscope, the manner in which they are arranged, and the different appearances they assume, may be ascertained, but such observations, if pursued no farther, afford but little information respecting the physiology of plants. The different substances secreted by vegetables, such as *gum, sugar, acids*, &c. however various in their properties, are all derived from the common juices of the plants in which they are found. All plants contain *sap*, which is in reality the blood of plants, and the means by which they are nourished, and their secretions carried on. Different opinions have been entertained with respect to the manner in which the sap rises, and some botanists have attributed it to *capillary attraction*, though they could discover no hollows nor tubular vessels adapted to this process. It is however evident that the sap must be forcibly conveyed through vegetables, and as capillary attraction is inadequate to its forcible conveyance, the circulation of the sap must be accomplished by other means.

Dr. Darwin was the first who suggested that what had been taken for *air-tubes*, were in reality *sap-vessels*; and in consequence of this suggestion, a brilliant light has been thrown upon the subject, and an entirely new theory of vegetation established. In the young branches of trees the pith is surrounded by longitudinal fibres of a firmer texture, which, if examined with a microscope, are found to be environed with a spiral coat. To elucidate the construction of these fibres, Mr. Wheeler exhibited a diagram, representing their microscopic appearance, both transversely and longitudinally, and proceeded to state, that Dr. Darwin placed some leaves of a fig-tree in a decoction of log-wood and others in one of madder, and found that the red decoction appeared in the vessels surrounded with the white fluid peculiar to the fig-tree. An experiment of a similar kind was performed with the infusion of the skins of a black grape by Mr. Knight, who carried it much farther, by tracing the coloured fluid to the leaf, but found that the bark, or albernum, never became tinged with the fluid. Mr. Knight therefore concludes that the sap vessels communicate with the leaves, and that as they approach the latter, they become more numerous or subdivided. Exactly the same circumstance occurs in the animal economy, and by this obvious provision of nature, should any of the principal vessels be stopped or obstructed, the circulation of the blood in the limb is carried on by the collateral branches, and mortification is prevented, which must otherwise result from the total stoppage of the circulation. Sir Astley Cooper has even tied the *aorta*, which is the largest artery in the human body, while the circulation has been carried on by the smaller vessels; and the same remarks apply to vegetables, in which, if any one of the sap vessels is obstructed, the circulation is continued by the rest, and the leaf remains in perfect health.

In order to account for the powerful conveyance of the sap, from the roots of the tallest trees to the extremity of the highest branches, the action of heat must be considered, which is a most important agent in the economy of both vegetables and animals. The agitation occasioned by the wind, and various other mechanical causes, may also contribute to the propulsion of the fluid through the trunks and branches of lofty trees; but from whatever causes the effect proceeds, it is certain that the sap reaches every part of a plant. That the tubes through which it is conveyed contain air, was inferred from their not collapsing when empty; but the same thing takes place in animals, for the *arteries*, or vessels which convey the blood from the heart are perfectly empty after death. The word *artery*, in fact, means an *air-tube*, and one of the last acts of life is to empty those vessels through which the circulation has been carried on. Thus in plants, the vessels which *convey the sap* were considered, till the time of Dr. Darwin, merely as *air-tubes*.

If it be asked, what are the *lacteals* of plants, we must again refer to the animal economy for an explanation. The food which is taken into the stomach undergoes digestion, and after being sufficiently modified, it passes into the *duodenum*; here it becomes further reduced and changed into a milky fluid, called *chyle*. This fluid, as it passes on, is taken up by the absorbent vessels and conveyed to the heart; and as chyle resembles milk in its appearance, the vessels which convey it to the heart are called *lacteals*, and are analogous to the sap vessels of plants, by which part of the sap is conveyed to the leaves, and part to the flowers. The leaves being exposed to the action of light, air, and moisture, form various secretions, while the superfluous matter passes off by perspiration. These secretions are returned to the inner layer of bark, when they are brought to perfection, so as to lay down new wood or albernum, while another set of vessels form secretions in the bark itself.

From this general view of the vascular system of plants, the lecturer inferred its close analogy with that of animals; and proceeded to observe, that the sap flows more abundantly by wounding a plant in spring than in autumn. In some instances, a pint of sap exudes in the course of twenty-four hours, but this great motion, which is called the *flowing of the sap*, is only detected in spring and autumn, its effusion, during the greater part of the year, being scarcely apparent. If the plant which produces *asafœtida* is wounded, the hemorrhage that ensues is so great as to destroy the plant, and the gardeners are unable to stop it. The sugar *maple*, or *acer saccharinum*, produces a pound of sugar from every twenty pounds of sap, and the Indians obtain it by boring an auger-hole in the tree during the spring or autumn.

As soon as the leaves of plants expand, *insensible perspiration* takes place, which is very abundant in some plants. The *helianthus annuus*, or *sun-flower*, emits 17 times as much perspiration as the human body, and the *cornelian cherry*, or *cornus masculus*, evaporates in twenty-four hours twice the weight of the whole shrub. This process resembles the insensible perspiration of the human frame, which carries off about five pounds daily, either from the pores of the skin or the lungs.

After a variety of other interesting remarks on the circulation of the sap, and the different secretions of herbaceous and other plants, Mr. Wheeler alluded to the degree of *heat* which is necessary to vegetation, and observed, that the natural heat of plants is indicated by the more speedy melting of the snow from their surfaces, than from the roofs of houses, and other inanimate bodies. The vegetation of most plants is accelerated by artificial heat, by which means many foreign plants are kept in a state of comparitively vigorous health but gardeners have many vexatious difficulties to contend with in cultivating them. Mr. Hunter ascertained the internal heat of plants by applying a thermometer to them when newly opened; and the most extraordinary example of this natural heat occurs in the *cuckoo pint*, or *arum maculatum*, which was found by M. Senebier to be 47° warmer than the surrounding air, when the latter is at 64°.

Having thus illustrated the structure and secretions of vegetables, the Lecturer proceeded to elucidate the process of vegetation, and observed, that when the seed is put into the ground, the moisture which it absorbs, assisted by heat, stimulates the vital principle to action. Air is also essential to the action of this vital principle, for plants will not grow under the receiver of an air-pump, where they cannot absorb oxygen, nor will the seeds vegetate if buried too deep in the earth. It frequently happens in botanical gardens, that seeds are lost for several years, in consequence of having been placed too far beneath the surface of the earth; but if, by digging lower than usual, they are turned up, and brought within the range favorable to vegetation, their power of vegetating is restored, and the plants thus lost are recovered.

The coverings of the seeds having performed their office of defence, burst open, and by an unerring law of nature, the root is sent downwards to fix the plant to the ground. Mr. Hunter, the great physiologist of this country, sowed some seed in a basket, which he caused very slowly to revolve, and found that the roots had made exactly the same number of turns as the basket, in their endeavours to gain a perpendicular direction. The stem rises between the *cotyledons*, or *lobes* of the seed, which ascend with the stem, and appear most conspicuously in the *lupine*. These lobes are subsidiary leaves, and perform the office of leaves till the latter are sufficiently evolved. In the *radish*, the *cotyledons* appear like two oval leaves, which are easily distinguishable from the rest.

The *root* imbibes nourishment for the plant, and fixes it in the earth. It generally consists of two parts, viz. the *caudex*, or body of the root, and the *fibres* or *radiculæ*, but the *caudex* is occasionally wanting. Roots are *annual*, *biennial*, and *perennial*, the former of which die after the first season; *biennial* roots produce herbage only during the first season, and flowers and seeds in the following summer, after which they die; and the third kind of roots, or the *perennial*, flourish for an indefinite period. The *fibrous parts* of the root are, however, in every case strictly *annual*, as the roots, which lie dormant during the winter, throw out new fibres when the proper season returns.

Roots are of several different kinds, the first and simplest of which is the *fibrous* root, which communicates directly with the plant, without passing through the caudex, and is found in most of the grasses; 2. the *creeping* root, as in couch-grass; 3. the *spindle-shaped* root, of which the carrot is an example; 4. the *abrupt* root, which resembles the spindle shaped, but appears as if broken off by accident, of which we have an example in the *scabiosa succisa*; 5. the *tuberous* root, as in the potatoe; 6. the *bulbous* root; and lastly, the *jointed* or *granulated* root, of which the *saxifraga granulata* affords a beautiful example.

Next to the roots, the *stems* or *stalks* of plants require our consideration, and these are of seven different kinds. 1. the *caulis*, or stem, properly so called, which elevates both leaves and branches; 2. the *culm*, which is confined to grasses and rushes; 3. the *scapus*, which springs from the root, and bears flowers, but not leaves; 4. the *pedunculus*, springing from the caulis, and bearing flowers and fruit; 5. the *petiolus*, or stalk of the leaf, bearing leaves only; 6. the *frond*, in which the stems and fruit are united, and grow from the back of the leaf itself, as in the various ferns; and 7. the *stipes*, or stem of the frond, or the stalk of the mushroom.

The lecturer illustrated the preceding observations by exhibiting to the audience large coloured engravings of all the different species of roots and stems; and having explained the manner in which the various seeds are capable of producing particular plants, he observed that *buds* also contain the germs of future vegetables, which are closely enveloped in scales, and assume a variety of forms. Plants which are propagated by means of layers and buds retain all the characters of the plant they are derived from, while those produced from seeds degenerate into the original plant. Thus the *pyrus malus* is the parent of all the varieties of *apples*; and however they may have been improved and diversified by cultivation, if propagated by seed, in a series of generations they will arrive at the original plant, viz. the *pyrus malus*, or *crab-apple*. To produce good apples, it is therefore necessary to propagate them by *cuttings* and not by *seeds*.

Mr. Wheeler concluded his instructive and interesting lecture by a series of appropriate remarks on the influence of the soil, in the propagation of plants. He exemplified his observations by particularizing several instances in which plants with bulbous roots flourish abundantly in their native climate, but baffle the skill of the gardener in this country; and stated that in his next lecture he should direct the attention of his hearers to the consideration of the *leaves*.

Dr. Birkbeck gave notice to the members, at the conclusion of the preceding Lecture, that as the apparatus necessary for the illustration of his Lecture on GALVANISM, introductory to the Lecture on ELECTRO-MAGNETISM already announced, would not be in readiness by the following Wednesday, he purposed on that evening to read to them a translation of an Address, delivered in November last, by the celebrated M. DUPIN, to the Mechanics of Paris, preparatory to the formation of an Institution similar to their own. As that enlightened, scientific, and practical engineer, proclaims to France, in this Address, the superiority of the Artizans of this country over those of his own, and at the same time admirably displays the sources of that superiority, the President conceived that its contents could not be unimportant to the Members.

LECTURE FOR THE ENSUING WEEK.

Wednesday, 30th March, Dr. BIRKBECK on Galvanism.

Friday next being Good Friday, there will be no Lecture.

SPITALFIELDS MECHANICS' INSTITUTION.

Mr. PARTINGTON's third introductory lecture to the operative mechanics of this populous district, having been announced for Monday last, the Rev. Mr. BROWN's chapel was, if possible, even more crowded than upon the former occasions, and the interest excited among the numerous class for whose benefit this institution is intended, appeared to increase as the period approached for the actual commencement of its establishment, by enrolling the names of the members.

Previous to the lecture, the learned President of the London Mechanics' Institution, Dr. BIRKBECK, delivered to the crowded assembly a second explanatory address, which was expressed in the following appropriate and elegant terms:—

This evening you will receive from my ingenious and intelligent friend, who has already been here engaged in your service, an excellent account of the origin, progress, and construction, of a stupendous engine, which has produced a greater effect on man by the interference with human labour, than any machine hitherto discovered. According, therefore, to the view which you may take of the operation of machinery, the steam engine will be regarded, as the greatest friend, or the greatest foe to mankind. It stands, however, you will be pleased to recollect, in the same predicament with the most trifling instrument, which you may now employ for the purpose of accommodating or abridging labour, excepting that these qualities, whether bad or good, exist in it in a much higher degree.

With respect to all machinery when operating very effectually, it has been asserted that it lessens the demand for manual labour, and consequently deprives the working classes of employment. Passing over the occasional temporary operation of such machinery, I will venture to maintain by means of facts abundantly supplied, that the contrary is the real effect; and a little observation will convince every one of you, that the objection is unfounded. Wherever machinery has been introduced, it has increased the capital of the manufacturer, thereby enabling him to employ more hands, upon terms more advantageous to themselves: or in other words, it has created an increased demand for human labour. When the fruits of this labour have been rightly managed, it has demonstrated its increasing value, by converting the labourer into a capitalist also; enabling him to derive, from the better appropriation of the augmenting capital of his employer, the means necessary for his daily support, together with a surplus for future exigencies. The fact of the occurrence of capitalists among the labouring classes, which is comparatively recent, is decisive of the question respecting the operation of machinery upon the demand for labour. Of this fact I shall offer two examples, occurring in places and under circumstances with which I am well acquainted.

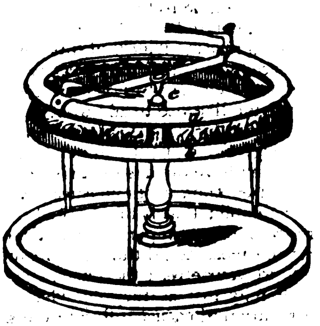
In a remote valley, in the northern part of this kingdom, lived a family, who by knitting obtained not more than ten shillings weekly. They were induced to transport themselves over a series of rugged mountains, amongst which the hand of cultivation has scarcely yet found its way, into another valley where machinery supplied them with occupation. They soon obtained for their services two guineas and a half per week! not by labouring from morning until night, throwing a single thread of woollen yarn round the points of two pieces of wire, but each watching a machine whilst producing sixty threads of worsted, and taking care to piece the end, as it is termed, when the machine is at fault. For the support of this family, two-thirds of their earnings are sufficient; the remainder becomes a little capital. The other example refers to the extent of capital created in the valley last mentioned, and in another of greater population, not very distant from it, where the cotton manufactory prevails. Here, for a few years a saving-bank has been established, and I know through the bankers with whom the money thus collected is deposited, that it amounts to the sum of twenty-three thousand pounds. Formerly the labouring class, if not in a state of pecuniary difficulty, was without a single pound beforehand. This is a capital in the hands of the labourer, or ready to become so whenever he chooses to call for it. One most important effect of this change is to make the labourer prospective, to make him look beyond the passing hour, and provide against those difficulties, which the fluctuations of trade, or sickness, or accidents may produce. For although much good arises from the interference of charity in such cases, yet no one will deny, that if the portion of the surplus of the capitalist distributed in alms, and other modifications of charity, existed in the hands of the people themselves, when providentially disposed, it would be much more satisfactorily appropriated. If for example the millions annually collected as poor's rates, were distributed as a part of the wages of labour, producing a fund to the same class of persons, it would be a much more satisfactory possession. That charitable establishments such as hospitals, are exceedingly beneficial to that portion of the community for whom they are destined, cannot be disputed; yet who, conversant with the sufferings from disease, will say, that if the pillow of sickness be soothed by the hand of affection, a species of consolation is obtained, which the attentions of the hireling can never afford? If the labourer can then be made to partake of the endearing "charities of father, son, and brother," by holding his proportion of the sums devoted to the building and supporting of hospitals, it would be much more satisfactory, than quitting his family to be turned into the public wards of these establishments. These comforts and advantages ought not to be derived from charity, but from our own labour, which, whatever may be its description, ought to furnish to all, a surplus to meet the exigencies which disease, accident, advanced age, or infirmity of any kind, may amidst the vicissitudes of life, bring upon any of us. Until this state of society, in regard to the distribution of wealth becomes general, it can never attain to that respectability which I hope may be witnessed in a period not very remote. To accelerate the attainment of this state, I will venture to assert, is the real and essential operation of machinery. And I may remark, that by none but yourselves can it be introduced. In no instance did your employers introduce it. The operatives all along have been the occasion of its introduction. They have resorted to the power of machinery to meet the emergencies to which they have been exposed. You remember many of you, the time when the swift and the bobbin were one and one; and that when an operative was disposed to improve the process of winding, by employing a four-swift machine, he was obliged to hide himself, not from his employers, but from his fellow labourers who feared the consequences of his discovery. Now without opposition, hundred swift machines are used; and you know well, that if you were to return to the four-swift machine, you would soon have too much of that, which is technically called play, for you to obtain any enjoyment at all; your emolument must be greatly abridged by a return to the imperfect machine.

The effect of this Institution will be to enable the Artizan, whenever the extension of demand for the article which you manufacture, requires additional machinery, to invent and construct it. To make this effort and this necessity more intelligible, I shall introduce to your notice a valuable little work, very lately published, entitled the Economy of Social Life. It costs only sixpence; and contains the cream of all the principal works on the subject, by Turgot, Smith, Quesnay, Ricardo, Mill and others. Of all the works which have been published, nothing, in my opinion, has ever exceeded in brevity, concentration, clearness, and extent of information, the little work which I hold in my hand. Its author, Mr. Marshall, an eminent merchant, and Vice-president of the Mechanics' Institution at Leeds, has rendered by its publication, an incalculable service to mankind. It consists of replies to a series of well-arranged and most interesting questions. The sixth Chapter, which is very pertinent to our present subject, I will read as a specimen: it is in answer to the following question; "what are machines for shortening labour?" "A spade is a machine, &c.

On each of these instructive paragraphs, much might be said; but enough has been advanced to convince you, that every capitalist must desire, in order to enrich himself, to employ the greatest possible number of individuals. And with respect to this Institution, as far as regards machinery, the influence cannot be otherwise than good; because it will improve your knowledge of it, and thereby render you better judges of its fitness, upon all occasions. Were it possible for the Institution to operate injuriously, you would be able to control it, having a decided ascendancy in its affairs in consequence of the committee of management, including a majority of artizans. It has in another quarter been stated as an objection to the Mechanics' Institution, "that it would make the men masters, and the masters fools." Now this it really ought to do, provided the masters do not take care, to advance in an equal proportion: the weak certainly ought not to direct the strong; the wiser party, all must admit, ought to take the lead. Let those who are now considered the superiors, look to this matter, and endeavour to do justice to themselves, by adequately accomplishing their own improvement. The effect of this, and similar institutions, will then be to increase the progress of mind as well as machinery. "Give me," says Archimedes the greatest mechanic of antiquity "a spot upon which I may stand, and I will move the world." Modern mechanics have found this spot, this fulcrum: it is the happy island which we inhabit: for such has been the influence of the machinery here produced, upon the progress of the moral and physical amelioration of man, that it may be said to have moved the human world.

The worthy Doctor's address was received throughout with the strongest marks of applause, after which Mr. PARTINGTON commenced his lecture by observing, that as he had already called the attention of his auditory, to an explanation of those simple mechanical arrangements which the ingenuity of mankind had rendered available to the arts, he should now proceed to point out the application of these principles to the construction of that stupendous machine, the STEAM ENGINE.

Though the discovery of this astonishing effort of mechanical genius is considered of recent date, the application of steam, as a prime mover, was adopted nearly 2,000 years ago by Hero of Alexandria, a model of whose machine made by Mr. Styles, Mr Partington now exhibited to the audience, and having introduced a small quantity of water into it, he applied heat to the apparatus by means of a spirit lamp, when it began to revolve as soon as the water was sufficiently heated to generate steam. For an apparatus operating on precisely the same principles as rate steam. For an exact representation of Mr. PARTINGTON referred his hearers to the wrapper of the MECHANICS' REGISTER, which he very obligingly designated as a MOST VALUABLE and USEFUL PUBLICATION.* As Hero's machine is the first steam-engine upon record, we beg to subjoin the diagram alluded to by the lecturer:—



The upper circumference of the machine *a*, is filled with water and supported on the pillar *d*; at the top of which it turns on the pivot *c*. The water being boiled by the flame of alcohol in the trough *b*, the steam issues rapidly from the small apertures, as at *e* and the opposite extremity of the transverse diameter, and the machine continues to revolve on its axis as long as heat is applied. It is proper to observe, that water throws off vapour at all temperatures, even when it becomes ice; but when heated to 212° of Fahrenheit's thermometer, it is converted into steam, and expands to about 2000 times its original volume.

The lecturer then exhibited and described Branca's machine, consisting merely of a kind of tea-kettle, usually represented in the form of a negro's head, with the steam issuing from his protruded lips, and causing a rotatory motion by striking against the vanes of a float-wheel. In this apparatus the power of the steam must have been considerably diminished by its condensation during its passage through the atmosphere, before it reached the wheel.

Mr. Partington next alluded to the Marquis of Worcester's "Century of Inventions," in the 68th Article of which he describes a method of raising water to a height of forty feet by means of fire. The elastic power of steam is the agent employed by the Marquis; but as no diagram or record exists, beyond the description given in the Century of Inventions, it is left to the ingenuity of his commentators to discover the precise method by which he effected his object. That the elasticity of steam is capable of raising water forty feet high is well known, and this effect might be produced even by the little machine which the lecturer held in his hand, which readily forced a jet of water against the ceiling of the chapel.

The next candidate for the honor of inventing the Steam Engine was Captain Savery, who raised water to the height of thirty feet by filling a vessel with steam, and then cutting off the communication with the boiler and condensing the steam. A vacuum being thus produced, the pressure of the atmosphere on the surface of the well forced the water to the required height, upon the principle explained in the preceding lecture.

Mr. Partington then described the operation of Mr. Brown's Pneumatic Engine, in which the vacuum is formed by the combustion of *carburetted hydrogen gas*, instead of

* We should be wanting in gratitude to Mr. PARTINGTON, if we omitted to offer our sincere acknowledgments to that gentleman for the approbation which he bestowed upon our little work. We cannot flatter ourselves that we have as yet been enabled to merit his kind praises; but so favorable an opinion, emanating from such an authority, will at least have the effect of operating as a powerful stimulus to increased exertions on our part, to share with our contemporaries the good opinion of the public. ED.

the condensation of steam; and after exhibiting a model of Savery's Engine, and particularizing the improvements introduced by M. Papin, he proceeded to a description of the Atmospheric Engine, acting with a piston and cylinder attached to a working beam. In this machine a vacuum is formed by condensing the steam in the cylinder, and the piston is then forced downwards by the pressure of the atmosphere; the force being in proportion to the area of the piston, which is alternately elevated and depressed, by the elasticity of the steam beneath it and the pressure of the atmosphere above it.

After a minute illustration of the preceding engines, by means of appropriate models and diagrams, the lecturer finally arrived at the period when the celebrated Mr. Watt, whose name would always be venerated by his countrymen and the world at large, introduced those important improvements which had formed a new era in the history of this stupendous machine. A model of Mr. Watt's Steam Engine was exhibited to the audience, and his various improvements minutely described; particularly his method of effecting the condensation of the steam in a separate vessel from the cylinder, by which means the latter is constantly kept at the temperature of boiling water, and a considerable saving of fuel is effected. Another valuable improvement introduced by Mr. Watt, was the invention of the *parallel motion*, which, by a combination of levers, preserves the perfect perpendicularity of the motion of the piston; and the application of the centrifugal force, in the construction of an apparatus called the *governor*, completes the improved Steam Engine by regulating the speed with which it moves.

Mr. Partington then briefly adverted to the high-pressure engine of M. Amontons; the construction of the safety valve; and the machine invented by Mr. Masterman, for the purpose of producing a rotatory motion without the use of the working beam; and terminated his able illustrations of this interesting and important subject in nearly the following words:

In concluding the brief course of lectures which I have had the honour to deliver in this place, I must be free to confess, that but little of novelty has been adduced in our present undertaking—an undertaking in which an attempt has been made to enlist beneath the banners of Experimental Philosophy, many of those branches of useful knowledge which had been previously confined to the chamber of the mathematician, or the workshop of the mere practical artizan.

By pursuing this course, a degree of interest appears to have been excited, which has far exceeded my most sanguine expectations.

It is true that if I had undertaken a more extensive series of discourses great additional instruction might have been conveyed—but neither the numberless paths of the extensive field on which we must then have entered—nor the time allotted us for that purpose would admit of our tracing the recesses to which they lead—we have therefore been compelled to confine ourselves to those branches of mechanical science more immediately connected with the business of life; and such as were best calculated to improve the mind, and at the same time unravel some of the least recondite operations of nature.

But before I leave you, I feel it my duty to offer some apology for the recapitulation of many facts, with which the greater part of my auditory must have been previously acquainted. This, however, was inseparable from the plan on which these lectures had previously been arranged. Our object upon the present occasion, has been rather to impart elementary information, than to enter into the more secret though not less valuable departments of mathematical science: should further assistance be necessary, it will be found by an attendance on future lectures, which will be delivered to the Members of this Institution; and in the Library, which will form an important feature in the *Spitalfields Mechanics' Institution*, an acquaintance may be cultivated with the learning and literature of every age and every nation.

At the conclusion of the lecture Dr. Birkbeck, at the request of the provisional committee, again addressed the meeting. "I am deputed to state," said he, "that the satisfaction which you have shewn, during the delivery of the able lecture this evening, as well as when before assembled by way of experiment, entitles the friends of this measure to announce to you, that the Spitalfields Mechanics' Institution is now formed. They wish me likewise to add what has been already done in furtherance of this important undertaking. From about one hundred subscribers, they have obtained betwixt six and seven hundred pounds; to be considered by you as an outfit; that is to say, to begin a library, to purchase apparatus, and the like; leaving the most delightful part, its future support, to yourselves; the current expenses being fully met as they confidently expect, by subscriptions according to the short plan which has been circulated amongst you. I am also directed to say that Mr. Downs, who has been appointed our secretary, will attend at Mr. Brown's house, every evening from 6 till half past 8, to receive subscriptions, and issue tickets; and that they who enter their names on or before next Monday, will be considered original or foundation members

Every person who has thus become a member, is requested to attend in this chapel on Monday next, for the important purpose of electing a Committee of Management; and the plan which has been found so acceptable, and so beneficial in the London Mechanics' Institution, will be adopted in this; that is to say, two-thirds of its number will be chosen from the working classes: thus placing the management of the Institution, in the hands of those for whose advantage the Institution has been formed. Soon, we hope, that we may leave the management entirely to yourselves. I am also instructed to say, that it has been considered eligible to appoint some of the officers previously; and accordingly, suitable persons have been applied to, and they have cheerfully accepted the proposals. The flattering manner in which the distinguished nobleman, whose name appears as one of your patrons, received this application, the letter which I shall now have the honour to read, will sufficiently demonstrate.

"Berkeley-square, March 9, 1825.

"Sir—I have been favoured with your letter of yesterday's date, and being a warm friend to those admirable establishments, called Mechanics' Institutions, which I am happy to say are taking root, not only in England but in Ireland, where they are calculated to produce still greater benefits, I cannot but feel flattered at the desire expressed by the gentlemen who are promoting one in Spitalfields, to name me as its patron.

"If such an establishment is formed, I shall be happy to do any thing in my power to promote its interests, presuming that it is not intended, in any degree, as a *rival* to that established by Dr. Birkbeck; but although in point of distance the objection cannot be considerable, there are other reasons which make it desirable that the Spitalfields mechanics should engage in a separate institution of their own.

"I mention this, because from the great respect I entertain for the founders of the first Institution formed in London, I should be sorry to connect myself with one which could in any degree be considered as opposed to it.*

"Any further explanation I shall be happy to receive from you, either in writing or in person (should it be convenient to call here at an early hour any morning), as may be most convenient to you, and remain your very faithful servant,

"T. Gibson, Esq." "Lansdowne."

That we have sufficient authority for placing Mr. Brougham amongst our patrons, the following extract from a letter which I have received to-day from Lancaster, in answer to one containing an account of our first meeting, will satisfactorily prove. "I rejoice at the Spitalfields' Institution having been so ably begun. If they want my name as Trustee, Vice-president, &c. they are welcome to its use." As to the third name, I need scarcely say, that you may command the services of the individual to whom it belongs, in every way in which you conceive they may be useful to this Institution. For President, my friend and your friend, Mr. Thomas Gibson, has been chosen; and I need not tell you how admirably he is calculated by zeal, activity, and talents, to promote the success of this Society. And the remaining part of the list of officers contains an equally judicious selection. The complete list is as follows:

PATRONS.

The Marquess of Lansdowne; Henry Brougham, Esq. M. P.; George Birkbeck, M. D.

PRESIDENT.

Mr. Thomas Gibson, Milk Street.

VICE-PRESIDENTS.

Mr. William Bell, Cheapside; Mr. Thomas James, Cheapside; Mr. Robert Graham, Artillery Lane; Southwood Smith, M. D. Trinity Square.

TRUSTEES.

Mr. William Hale, Wood-street; Mr. John Ham, White Lion Street; Mr. James Morrison, Fore-street.

TREASURER.

Mr. James Stanger, Junior, Cheapside.

With regard to the appointment of the Committee, the matter to be decided next Monday, I may be permitted to add, that every individual who previously enters, and thus becomes entitled to vote, will do well in the mean time, carefully to turn the matter over in his mind, and consider who may be the persons most suitable for the purpose. On the activity and ability of this Committee, you may rest assured, the progress and prosperity of the Institution chiefly depend."

WARM AND VAPOUR BATHING.

We are pleased to see the efforts which are making to render the custom of bathing more general in this country, because we are fully convinced that the practice conduces more than almost any other thing to

* We are happy to confirm the opinion expressed by the noble Marquis, by stating, that the two Institutions are not in the remotest degree *opposed* to each other. The respective friends of each are mutually anxious for the prosperity of the other, and no *rivalry* can exist between them, except in their exertions to promote the common object of both, the diffusion of science among the working classes.

the preservation and the restoration of health. With respect to the vapour bath, we feel convinced that, in many cases, arising from obstructed perspiration, and in a variety of diseases to which the natives of our ever-varying climate are particularly liable, it is a most efficacious remedy.

Some prejudices, however, still exist, upon the subject of warm and vapour bathing, which operate against their becoming as general in this country as in many other parts of the world. It is a prevailing opinion that it is dangerous to venture into the cold air soon after having used the warm baths. Nothing can be more unfounded, or contrary to experience, than this apprehension; as the fact is, that the human body, after having been subjected to a high temperature of water or vapour, is better enabled to endure a very low one than it was previously to such immersion; and, although it is true that a rapid transition from cold to heat is highly dangerous, and often fatal, it is a well-ascertained fact that the human body can without detriment, or even much inconvenience, pass from great heat to intense cold; and that when inured by habit, it can endure a sudden transition from the temperature of boiling water to that of freezing water.

We shall proceed to adduce some instances in proof of this position, even at the risk of relating what is already familiar to the generality of our readers.

"The Finland peasants (says Acerbi, in his Travels in Sweden, Finland, &c.) pass instantaneously from an atmosphere of 70 deg. of heat (Reaumur) to one of 30 deg. of cold; a transition of 100 deg., which is the same thing as going out of boiling water into freezing water; and what is more astonishing, without the least inconvenience; whilst other people are very sensibly affected by a variation of but five degrees."

In Pontopodon's Natural History of Norway we find the following passage in corroboration of the same phenomenon:—

"The inhabitants of the mountains, in Norway particularly, do the work of horses for nine successive hours, singing all the time; and throw themselves every half hour on the snow, though in a profuse sweat, sucking the snow to slake their thirst, and without the least apprehension of a cold or fever."

We could adduce numerous other authorities in proof of the fact, that it is safe to pass from a very high to a very low temperature; and, although we cannot immediately bring to our recollection the name of the writer who vouches for the fact we are about to state, we distinctly remember that it is from authority of the most unquestionable character, that we add, that in the countries where it is the practice for the natives to pass naked out of the vapour baths, and to roll themselves in the snow, the rheumatism is wholly unknown.—*Liverpool Mercury.*

MR. ROBERTS.

We have more than once offered our opinion of the invention of Mr. Roberts, for entering places on fire, by means of a hood or mouth-piece. And we are now happy in being able to state, that he continues to receive the most cheering assurances of success in his endeavour to render the invention public. He is now in town, furnished with strong recommendatory letters, from several gentlemen of rank and respectability in the immediate neighbourhood, where he made the first experiments of his invention, and also from Insurance Companies, one of which (The Manchester) has liberally rewarded him with a purse of Fifty Guineas. He intends to morrow (the 25th) to repeat his Experiment at the Mechanics' Institution, in Southampton-buildings, Chancery-lane, before about 150 gentlemen, who have been invited to attend for that purpose; the worthy President of the Institution having with great kindness, and a laudable desire to put to the test an invention which promises such public benefit, permitted the use of the building, and ordered every facility to be afforded. We shall not fail to give an account of this Experiment, at present we will merely remind our readers, that the invention consists of a hood and mouth-piece, with a pipe reaching nearly to the ground, and having at its extremity a wet sponge, through which the air which is always purer towards the ground, in places which are on fire, than in a higher situation, is drawn—a decomposition of the air takes place in the sponge, and the air which is taken in becomes comparatively pure, enabling the operator to remain in a foul atmosphere, twenty times longer than a person without the apparatus. The great advantage of such an invention must at once be apparent, as it will in all cases of fire secure the lives, and in a great degree the property of those who are afflicted with such a calamity. How many people have been burned to death from the impossibility of reaching them. How many destroyed, even in their beds? Such a misfortune cannot occur, if this invention be adopted; because in the worst cases of fire, a person using the apparatus can remain in the contaminated and burning air for 15 or 20 minutes, a period of time sufficiently long for the rescue of human life. We have even heard, that Mr. Roberts was once more than 12 minutes in an atmosphere from burning sulphur, wet hay, shavings, &c. at a heat of 240 Fahrenheit, whereas without the hood, a man could not have survived 12 seconds.

MECHANICS' INSTITUTION AT DEVONPORT.

A public meeting was held at the Town-Hall, Devonport, on Thursday the 10th instant, for the purpose of taking into consideration the propriety of establishing a Mechanics' Institution, and of the best means to carry such measure into effect. The meeting was respectably and very numerously attended, there being, we should conceive, upwards of 700 persons present, most of whom were of the operative class, which such institutions are more particularly adapted to benefit.

Mr. Burnet having taken the chair, he proceeded to address the meeting. He began by reading a calculation of the expense that was likely to ensue in establishing an institution, and of the probable means that would arise to meet it. He first calculated 15*l.* per year for the rent of the room to lecture in; 52*l.* per year for a lecturer; he then enumerated several other items, making the total expenditure amount to 120*l.* per year; to meet this he considered that 300 operative subscribers, which was the very lowest that might be calculated on, at 3*d.* per week, would amount to 195*l.*, and which would leave a surplus of upwards of 70*l.*; he then contended that many apprentices might be induced to join such an institution at 2*d.* per week, which would considerably increase the means of the society; this surplus it was intended to lay out in the purchase of apparatus for the purpose of illustrating the lectures, and in a library for the perusal of the subscribers. The Chairman, after observing that he had no doubt but that many more operatives would join than he had now mentioned, and consequently that they would be enabled to expend more money in the purchase of apparatus, books, &c. read several extracts from Mr. Brougham's pamphlet, and said, that according to that gentleman's calculations, drawn from other towns where institutions were established, the promoters of this measure might expect from the population of these towns that 1,500 would join a Mechanics' Institution.—(Hear, hear, and applause.) It was the intention, he said, when the institution was formed, to have a meeting every week, and the lecturer, who should be elected by the institution, should lecture once a fortnight, and the alternate week a lecture they hoped might be supplied by some of the friends or subscribers, and thus native talent would be called into action. The principal object of the institution was the extension of mechanical knowledge among the operatives; after again speaking of its great utility and of his hopes that it would be fully established, the gentleman read the first resolution, and sat down amidst loud applause.

Mr. Harvey (of Plymouth) next addressed the meeting, and at considerable length spoke of the great advantage that would arise from the establishment of the institution. This gentleman also quoted considerably from Mr. Brougham's pamphlet. He observed that it would tend to make the operatives most regular in their habits, give them a love of science, and would prevent them from adjourning to the ale-houses, or any other places of idle resort. He concluded by seconding the first resolution, which was read from the chair, and carried unanimously.

Mr. Ramsey next addressed the meeting, advocating the measure most strenuously.

Mr. Elworthy, Mr. Sole, and Mr. Foster, severally addressed the meeting. The other resolutions were read and carried unanimously; the committee was named, and the list for subscriptions handed round. Mr. Harvey offered to the meeting *Smith's Wealth of Nations*, which was accepted with great applause. Mr. H. may thus be said to have commenced the Plymouth, Devonport, and Stonehouse Mechanics' Institution library. Several gentlemen followed his example and offered several sets of books, which were received with applause. Thanks were voted to Mr. Harvey for his exertions in the cause, and also to the Chairman for his conduct in the chair.

NEW PLAN FOR THE PROTECTION OF THE BLOOM UPON WALL TREES.

To afford adequate shelter from frosts, hail storms, boisterous winds, and heavy rains, without excluding the wholesome influence of the sun and air, at a trifling expense, has long been a most desirable object, and which the many expensive inventions of canvas and other skreens, nets, and other contrivances, too numerous to mention, sufficiently prove; indeed, most of these being worse than useless, has induced many of the best gardeners to discontinue the use of any protection whatever, by which a fine crop of fruit is frequently lost. The following plan is as simple as it is efficacious, and we have no doubt that when it comes to be understood, its merits will ensure its general adoption. The common heath of which besoms are made, forms the principal protecting material; the fineness of its foliage and branches, added to its durability and elasticity when acted upon by wind, are sufficient advantages in favor of its selection, and the manner of its application is as follows:—

A lath of deal is cut two inches broad, one inch and half thick, and ten feet long; this being laid flat on the ground, a layer of heath half a yard in length, is then spread along it thinly, with the root ends on the lath, a few short sprigs of heath are then placed along the lath to fill the vacancies between the stems of this layer, but observing to keep it light and open; this being done another similar layer is spread on the same lath in an opposite direction, that is, with the root ends intermixed with the root ends of the first layer, a thin lath, half an inch thick, is then nailed down all the length, which fastens the heath to the first lath, and keeps it stiff and erect; this thin lath may be in two or three pieces, just as it suits, but must be an inch and half shorter at each end, than the first or principal lath, for reasons which will be seen in placing it before the wall. This then forms an effective screen ten feet long, and three feet high. Poles two inches square are then fixed against the coping of the wall, (and not underneath its projection) two feet distant at the bottom, nine feet eight inches distant apart, and six inches in the ground; a small iron hook is inserted in the top of each pole, to which a brick bat or other weight is tied with a piece of pitched cord, so that it may hang an inch below the coping on the other side the wall, this effectually secures the pole to the wall, without driving iron hold-fasts into the wall, the situation of such being liable to vary a little every year. Small iron hooks in the form of the letter L, are then driven into the centre of the front side of the pole, a yard apart, which form the ledge or shelf for the ends of the skreen laths to lie upon them, square and erect. It takes four of these skreens to a wall twelve feet high, and three to a wall nine or ten feet in height. The top and lower one never require to be taken down during the season of protection, the two middle ones are lifted off or on, by a man on fine days, and laid aside close by the lower skreens, which remain in their proper position, so that the border is never the least incommoded. A man will cover up or uncover a wall 150 yards in length under his protection in 15 minutes. The ends of the poles that are inserted in the earth should be burnt and pitched, and the surface of all the laths and poles should be plained over, and have a coat or two of paint, and they will undoubtedly last thirty years or longer, with the addition of a little fresh heath every two or three years. The thinnings of plantations make very good poles, and are often to be had in great plenty, but when they cannot be procured, we would recommend foreign deal; and we have calculated that to protect a wall 100 yards in length, and ten feet high, the timber, nails, hooks, &c. all to be bought, and including the workmanship and fixing up, will not exceed 5*l*.

NEW BREAD COMPANY.

A Correspondent complains that the new Bread Company sell good *Baker's* bread, and cheap, but he is disappointed that it is not home-made bread. So are we. Genuine bread cannot be sold cheap; it is always dearer than Baker's bread, but it is better in every respect. We fear the inhabitants of London have so long been used to alumized and potatoed bread, which is white, that genuine bread of the natural colour would be littla relished by them at first. We trust, however, that the experiment will be made, and that wa shall soon have genuine bread, genuine beer, and pure water—pure milk we already have, thanks to the spirit of speculation.

PATENTS EXPIRING NEXT WEEK.

Thomas Deakin, for an improvement in kitchen ranges and stoves. Expires April 1.

Thomas William Sturgeon, for certain improvements on a micrometer. Expires April 1.

Samuel Bentham, for a sure and economical mode of laying foundations, and in some cases of proceeding wlth the superstructure of works of stone or of brick, particularly applicable to the projection of wharfs and piers, into deep water, to the construction of bridges, and to the formation or improvement of harbours, as well as to the erection of heavy buildings on bad ground. Expires April 2.

NOTICE TO CORRESPONDENTS.

We regret that the great press of matter prevents our noticing Mr. Barton's letter this week. It shall ceriainly be attended to next week, and we beg to apologize to him for the delay.

So totally void of foundation is the complaint made by "an Old Batchelor," that we are half inclined to suspect, that he is *quizzing* us. If, however, he is really serious, we would with equal seriousness advise him to judge for himself, and continue to ride his hobby, without being at all disturbed by the idle remarks of his officious friends, as it is evident, that they are *no judges*, or have not perused our pages for some months past.

A Description of Mr. Dewhurst's Mode of Propelling Vessels (with an Engraving) will appear in our next Number.

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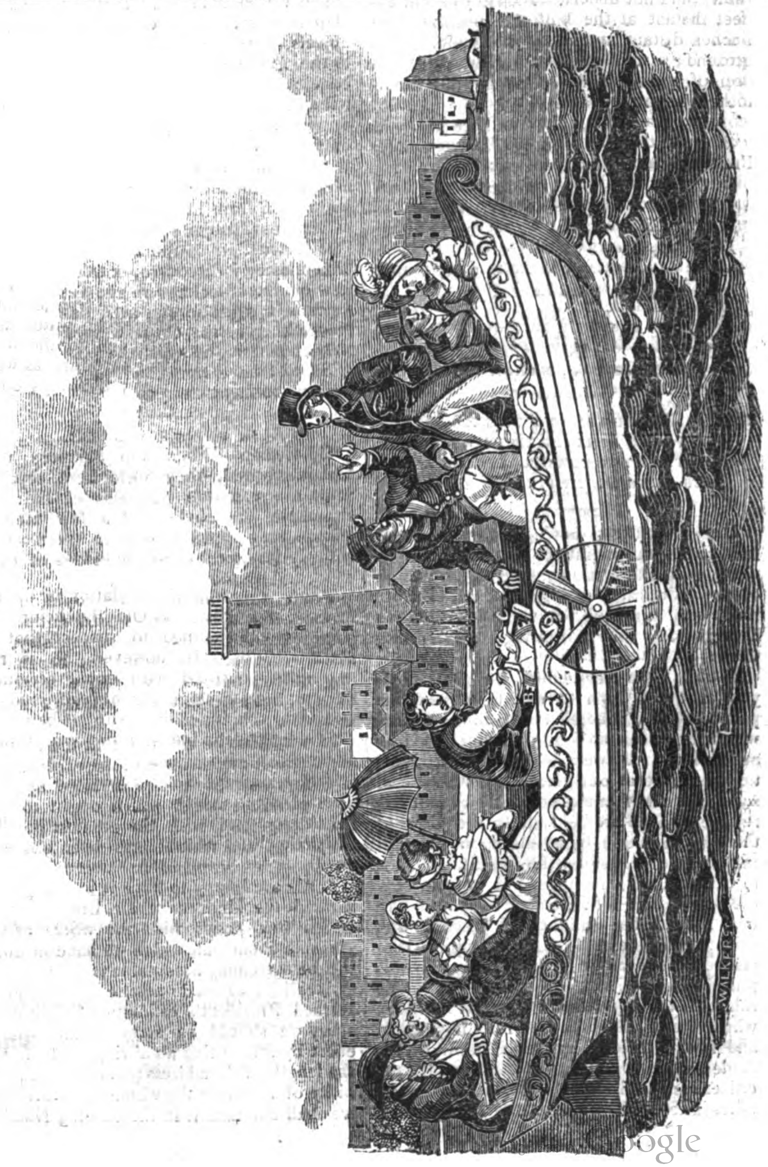
The London
MECHANICS' REGISTER.

"I held it ever,
" Virtue and knowledge were endowments greater
" Than nobleness and riches: careless heirs
" May the two latter darken and expend;
" But immortality attends the former,
" Making a man a god."

SHAKSPEARE.

No. 23.] SATURDAY, APRIL 2, 1825. [Price 3d.



DEWHURST'S PLAN OF PROPELLING PLEASURE BOATS.

To the Editor of the Mechanics' Register.

SIR,—Prefixed is a Drawing of a new plan of propelling pleasure boats, by using the paddle wheels instead of oars. A boat on this plan possesses many advantages over the common plan of rowing; the person has only to sit down and turn the handles, which being attached to two tooth wheels on the inside of the vessel, communicates with the paddle on the outside, and thereby propels the boat in a very quick manner and with half the labour. These boats are constructed on a very simple plan. I trust you will excuse the rough sketch of the machinery, as I am no draughtsman or mechanic, but a great friend to the arts and sciences. If you deem this worthy of a place in your valuable work, you will oblige

Your Obedient Servant,
H. W. DEWHURST.

Francis-street, Tottenham-court-road.

References to the Engraving.

A the paddle wheel.
B the upper cog wheel.
C the handle which is the moving power.

LONDON MECHANICS' INSTITUTION,

WEDNESDAY, MARCH 23.

M. DUPIN'S ADDRESS TO THE MECHANICS OF PARIS, DELIVERED IN NOVEMBER LAST, AT THE CONSERVATOIRE ROYAL DES ARTS ET METIERS.

Dr. BIRKBECK having previously announced to the members his intention of reading to them this evening a translation of the admirable Address of M. Dupin, introduced the subject to his numerous hearers in the following appropriate terms:—

It will, I am persuaded, be grateful to you, as it has been to me, to witness the progress of a liberal spirit in a nation, which has been so long our rival in arts and in arms. If we are worthy of admiration, because of our great improvements in science, or in manufactures, we cannot but rejoice that we are held up to the view of the French nation, by an intelligent Frenchman, well qualified for the undertaking, not to excite hostile feelings, but to stimulate the people to benefit themselves by imitating us. Indeed, the enlightened practical and scientific engineer, Charles Dupin, who visited this country in 1817, has, by his publications, directed the attention of its inhabitants, to some important objects, which they had before generally neglected: and has, I believe, by his account of the Andersonian Institution at Glasgow, led the citizens of Edinburgh, distant only forty miles, after a neglect of nearly twenty years, at length to open their eyes, and follow the example which had been set before them. It happened, that about twenty-two years ago, a professor of history in the Lyceum of Paris, spent a few days with me in Glasgow: he had then an opportunity of being present at one of the meetings of my mechanics' class. With this part of the establishment he was so much delighted, that he assured me he would report to Napoleon what he had seen; which he felt certain would occasion its immediate adoption in France. But, even at that early period, Napoleon had become enamoured of the objects of vulgar ambition, and preferred, to the glory of being one of the greatest benefactors of the human race, for which his splendid talents, and still more splendid opportunities amply qualified him, the glory of being one of its greatest destroyers. Nothing therefore was done by him. Seizing a more fortunate moment, M. Dupin, after his return from England about the middle of last year, projected a plan for the scientific instruction of the artizans of Paris.—The masterly discourse, introductory to a new course of lectures on geometry and mechanics, applied to the arts, delivered last November, in the *Conservatoire Royal des Arts et Metiers*, of which he kindly sent me a copy, I have translated, and shall now proceed to impart to you.*

M. DUPIN'S ADDRESS.

Gentlemen—When the Sciences were first cultivated, they were kept separate from the common purposes of life: inclosed in the studies of a few men of leisure, they appeared only as speculations, entirely foreign to the necessities of existence, and to the wants of the arts.

From this moment an opinion was formed, that the sciences had nothing in common with the labours of industry, and that theoretical views could not become of any utility, not to the simple workman merely, but even to the directors of manufactories.

It must also be allowed, that the abstract and difficult appearance of the explanations and demonstrations—the strange appellations given to things which ought to have been designated with the greatest possible simplicity, and which have been obscured

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* We are happy to have it in our power, through the kindness of Dr. BIRKBECK, to enrich our pages with the whole of this valuable document, which we have no doubt will be extremely acceptable to our readers. Coinciding, as we do most cordially, in the learned President's estimate of its importance, we should be sorry to diminish its effect by attempting an abridgment; but as the length of the address precludes the possibility of inserting the whole of it this week, we shall continue it in the ensuing Number.

by Latin, Arabic, and Greek names, have all contributed to render the sciences unintelligible to men who had not engaged in other studies.

From these circumstances arose the belief, that the sciences could not be put within the reach of men, occupied by manual operations, and more habituated to the exercise of their limbs than to the cultivation of their minds.

I shall attempt, gentlemen, to prove on the contrary, that it is possible to reduce the useful parts of science to the language that we employ for the expression of our most simple ideas.

Together with each principle that I shall present to you, I shall set also before you the services which it is capable of rendering, and which in reality it does render; the application even which you often make of such principles without being aware of it.

Often, gentlemen, I shall shew you, that you are already acquainted with that which I am to teach you; and that in your most complicated labours, you obey instinctively, or by observation, or by the nature of things, the rules which science imposes.

Do not conclude, however, from this statement, that you will gain nothing by knowing the clear, defined, and exact expression of these principles: you would fall into a serious error by adopting this conclusion.

The principles of science are truths reduced with exactness into the smallest possible number of words; truths which express the necessary relation existing between the objects of our conceptions, or of our labours.

Each of these truths is susceptible of an immense number of applications; and the mode of making these applications is of primary importance. By this knowledge, in all new cases which present themselves to you, you will know before hand what will be the most advantageous to put in practice; consequently, you will not be obliged to explore, to make trials, and to waste your time, and your materials: you will possess a faithful guide, which will direct you to act better, and to act more surely.

Mechanics, as I ought to teach them in this course, is not merely the science which explains the operation of machines properly so called;—it explains the rules and the laws of every action in which force is employed, whether great or small: of every action in which motion occurs, whether slow or rapid.

As there can be no labour without motion, and without force, you see already, that every sort of labour, applied to every profession, enters into the sphere of mechanics.

Thus we shall explain the principles and the rules which regulate the action of machines, the action of instruments, and of the limbs of man, the most precious instruments with which nature has endowed him.

Perhaps you may offer to me a very natural objection against this design,—Will a professor pretend to teach us how to work, who is a stranger to each of our professions? Will he teach us to hold our tools properly, and to manage them adroitly, who perhaps could not make the most simple article which we produce?

These are manual processes, which each of you can put in practice much better than I can; and so far from wishing to teach you these, it is from you I would seek instruction, if I wished to practise them.

But there are general methods of improving your labours, which do not depend upon any art in particular; methods which it is important for you all to know, and of which a part only is known by each of you. These are the methods of which a professor must take advantage, in order that you may be able to execute in perfection the products of industry. They will accordingly furnish the materials of my course of lectures.

Ought these products to have a certain figure, determined before hand, a fixed size, or weight, or indispensable proportions, &c? You must, in the first place take the measures; you must take them in length, in breadth, and in thickness: in many directions, parallel, oblique, or perpendicular. You work from a model; but sometimes this model is less, sometimes it is greater than the object to be produced: here are reductions to be made, and science gives you the means of making them.

You see already, gentlemen, that in order to execute the work which has been ordered, you ought to have very exact measures: you ought to know the divisions and the use of the metre, of the litre, of the kilogram, &c. I shall explain to you these measures, their use, and the advantages as to facility and uniformity which they present.

Some notions of elementary geometry are necessary, in order to take these measures, and to refer them from an object to a plane, and from a plane to an object. Some other geometrical notions are necessary to comprehend the form of certain products of industry, and the action of machines. I shall explain those which appear to me to be indispensable.

If in the arts every thing were done with the rule and the compass, this knowledge of measures and of geometry would be sufficient. But there are many forms which cannot be thus traced by a mechanical motion. Such are the outlines of vases, the ornaments of some friezes, and some mouldings in architecture; such also are the trees, flowers, &c. which are to be printed, engraved, or sculptured, upon wood, metal, stuff, and the like.

The tracing of these objects requires a knowledge of drawing, which refers sometimes to figure, sometimes to ornament, and sometimes to landscape, according to the nature of the subjects which the artist wishes to represent.

In all these kinds of drawing, there are means of perfecting the eye by the hand, and the hand by the eye: means which are valuable to the artist. These we have studied, and shall attempt to explain them to you.

Hitherto, gentlemen, we have been engaged only with the preparations for the labour employed to execute the products of industry. This labour operates sometimes with the force of machines, sometimes with the force of the workmen, and generally with the two forces combined.

Labour which operates without instruments, is the most confined. Such is that of the porter, who carries burdens upon his head, or his shoulders. Such is that of the baker, who kneads the dough with his hands: of the peasant, who presses the grapes with his feet.

This part of the arts is the most limited in the circle of its occupations: it requires the least intellect, whilst it requires the greatest exertion of our purely animal force. For this reason, the professions which are thus exercised, are regarded as the lowest species of human industry.

Here, gentlemen, I must make you understand, how decidedly Mechanics is a friend to workmen. Its object is to disencumber them of those overwhelming labours, in which man can only perform the part of a horse, of an ass, or of an ox, to drag, or to carry burdens. It is successfully occupied in finding, in behalf of the industrious man, less degrading labours, where the powers of the mind and of the body mutually assist and succour each other.

Let us compare, for example, two great capitals; the one where the inhabitants can procure water only by means of water-carriers: the other which obtains it by conduit-pipes and aqueducts, by steam-engines, and other similar means.

In the first town, a great number of men must be employed, to carry the water in vessels which are inconvenient, from the river to each house. The carrier will soon have recourse to mechanics to assist him a little. He will get two pails of equal size, suspended on each side of a hoop: this hoop keeps them in equilibrio, by means of a rope, which passes over the shoulders. In this manner he will carry the two pails, with less trouble than he could carry a single pail, holding it by the handle. In fact, if he were not to use the hoop, he would be obliged to make painful effort in keeping his arm out of the vertical position, in order that the pails might not strike his legs, by the effect of their weight; the hoop takes off the inconvenient pressure of this weight, by adapting it to the walk of the carrier.

We see already how this labourer can double the quantity of water which he furnishes to his customers, by merely making use of a hoop and a cord. The assistance of machines enables him to obtain much greater results. Let him employ a butt holding thirty-two, or thirty-six times as much as his pail, and let him place it upon a little cart. Thus, without greater labour, he will be able to transport from sixteen to eighteen times as much water through the town, as with the cord and the hoop; and from thirty-two to thirty-six times as much as with a vessel held in the hand. Surely, it appears to me, that a great benefit is here obtained by the use of the most simple of machines.

The water-cart, however, will only serve to bring the water to the doors of the houses. How severe and fatiguing is the operation of carrying two pails up the stairs, and conveying them to the highest floor of the house, in a town where there are seven and eight stories, besides the ground floor.

Let us now transport ourselves into the town, where the water is elevated to the top of the houses, by the means furnished by hydraulics, that is to say, by that part of mechanics in which water is employed.

I see the occupation of many thousand men, before employed as beasts of draught or burden, changed for an occupation much less degrading, and giving employment to a multitude of able artizans.

The bricklayers, the masons, the carpenters, the engineers, execute the canals and the aqueducts necessary for bringing the water to the town. The miners, the founders, the plumbers, prepare, lay down and solder together, the pipes of wood, of iron, and of lead, which are to distribute the water. Lastly, inspectors to survey the distribution, and men whose only labour is to turn cocks at certain hours of the day, take the place of the carriers, and obviate the necessity for their overwhelming labour.

If the water of the canals, and the aqueducts is not naturally sufficiently high, pumps must be constructed to raise it higher: but, instead of fatiguing men by turning in a circle, like the slaves in the time of the Romans, steam-engines are erected; workmen are employed either to take care of the fire, or to turn occasionally some cocks: by these easy and unlaborious occupations, they regulate with facility the greatest mechanical force.

In order to construct these pumps, and these steam-engines, we require engineers, and very able workmen, who exercise invention, and possess practical dexterity; men who know how to plan the different parts of a complicated whole, in order that they may act together, with the advantage produced by exactness. All these workmen, I repeat, will be put in activity, to replace the unartificial butt of the water-carrier, and the fatigues of this labourer.

You see, gentlemen, in the change produced by the science of mechanics, how the animal occupations of man are transformed into others more intelligent, more easy, and more worthy of the human species. You must acknowledge with me, that science, which procures these benefits for society, is essentially the friend of the working classes, and that it nobly raises the occupations of the artist, by seconding the physical efforts, by all the faculties of the mind which science brings to perfection.

The only thing which can afflict the friend of humanity, is the difficulty of producing a great amelioration similar to that of which I have just given you an idea, by Mechanics, without a great number of working men being obliged, for a certain time, to abandon their former occupation, in order to seek a new one. It is then that these poor workmen should be generously assisted; these innocent victims of a change, which is useful to all the rest of society.

Here, gentlemen, genius can make a great and noble employment of its inventive resources, in order to discover new means of employing those classes which are thrown out of work; in order to render the individuals of these classes again useful to themselves, as well as to society, in opening a new course for industry.

Let me be permitted to mention to you a benefit of this kind, which is due to my former master, and my friend, M. de Prony. The name of an engineer so celebrated, must be repeated more than once in a course of mechanics applied to the arts.

Thirty years ago, M. de Prony was commissioned by government to compose an extensive table of logarithms, in order to raise a monument to the science of numbers, more magnificent than any which had been before erected. It was easy to give such an order, but how was it to be executed? How were such a number of learned men and able calculators to be brought together, as would be sufficient for all the operations of this immense enterprise?

At this time, gentlemen, a great change was introduced in the head-dress of men and women. It was reduced, to use the mathematical term, to its *most simple expression*. One hair-dresser was then sufficient for a labour which had employed ten before, and a vast number of *perruquiers* found themselves, at once, without the means of existence.

M. de Prony conceived the idea of transforming these *perruquiers* into calculators, and of making them assist in the execution of his great tables.

He divided and subdivided his labour; he prepared learned forms, which could be filled up by persons who knew only addition; he set his hair-dressers to work: he gave them the means of existence; and by their means fulfilled his purpose, which was to construct the finest tables of logarithms in the universe.

Honour be awarded to science, when it concurs with the progress of the human mind; whilst it stretches out to the unfortunate a succouring and a generous hand.

Let us return to the class thrown out of employment by some great revolution of fashion or of industry. It must employ its activity, its care, its energy, in creating for itself new occupations. Soon, without doubt, the desire so natural and so laudable, of subsisting by its own means, of living by its own labour, and of ameliorating its own existence, will excite the artizans of this class to seek for the means of employing their powers and their understanding, in the pursuit of occupations less troublesome and less mechanical. At last, they will even bless the change which removes them from difficult and debasing trades, to give them professions which recall them to the exercise of thought.

This multitude of robust men, at first deprived of employment, and soon passing into other channels of industry, augment their power of production, and thus the perfecting of a single art contributes, by a species of reaction, to the advancement of a number of other arts.

You see, gentlemen, that in reality, the progress of machinery, of that even which appears directly to interfere with the employment of human power, so far from being justly considered an enemy of the working class, and as taking away the bread of poor families, has for its result, on the contrary, to render their life more comfortable, and to procure more ease to the labouring classes.

These truths, which I am not afraid confidently to advance before you, have received from experience a confirmation which does not admit of the smallest doubt.

When the stocking machine was first introduced, it all at once deprived of their employment, many persons who obtained their support from knitting. These persons made very loud complaints, and proceeding from complaints to actions, began to destroy the machines which took away their labour. But broken machines, by ruining the masters of the manufactories, could not give to these masters additional means for supporting the workmen; and misery prevailed on both sides. Order was at last established; the machines prospered; and the persons who gained a few pence daily by knitting from morning till night, driven from this miserable occupation, found in the progress of industry occupations much more lucrative. Formerly, Normandy was full of people, who passed their time in knitting; and they who made the stockings did not gain even enough to enable them to wear them. Now that there are machines, not a person is to be found who travels stockingless in Normandy.

I may offer you a great example, an irresistible proof, which I derive from the country, wherein the substitution of machines for manual labour has made the greatest and most rapid progress.

You have, without doubt, heard, that England is, of all civilized countries, that which has the greatest number of poor, and that this poverty is owing to the want of employment, caused by machines. The most learned, and the most able men have partaken of this error, in spite of the luminous refutations which have been given by some good observers.

I have exerted myself for some years, to shew, both by reasoning, and by calculation, how far these opinions are removed from the truth; but the most convincing demonstrations, when they are contrary to generally-received opinions, and long-rooted prepossessions, glance over the mind, and are rejected by prejudice. The only argument which it is possible to receive in this case, is that of facts. Happily for us, on the subject of the poor and machines, I can offer you proofs of this species; and I flatter myself, that they will carry to your minds a full and entire conviction. The English Parliament has caused to be laid before them the number of poor, and the total sum which is given under the title of public charity by means of the tax called the poor's rates. These reports have been made in time of war, and in time of peace. Afterwards, it has been calculated for each county; on one side, the total number of poor, and on the other, the total sum which is given to them.

The results of this investigation Parliament has caused to be printed.

(*To be resumed.*)

MR. WHEELER'S THIRD LECTURE ON BOTANY. FRIDAY, MARCH 25.

LEAVES OF PLANTS—THEIR PERSPIRATION AND ABSORPTION—EFFECTS OF LIGHT AND AIR—FRUCTIFICATION—SEXUAL SYSTEM OF LINNÆUS.

Having, in his preceding lecture, illustrated the growth of vegetables, and the various kinds of *roots* and *stems*, Mr. Wheeler this evening proceeded to consider the structure and functions of the *leaves*, which he described as very general, though not universal organs of plants. *Leaves* are of an expanded form, and present a more extended surface than all the other parts of the plant: their interior construction is vascular, and their upper and under surfaces differ in their degrees of roughness. The knowledge of the nature and uses of the leaves of vegetables was acquired more slowly than that of the other parts of Botany, and Cæsalpinus thought that their only purpose was to protect plants against the vicissitudes of the season. It is reported, said Cæsalpinus, that in hot climates scarcely any trees lose their leaves, which are necessary to form a shade, and protect them from the heat of the sun, but protection is only a small part of the utility of leaves. Cæsalpinus was, however, so far correct in his opinion of their utility in this respect, that if plants are deprived of their leaves, the fruit does not arrive at perfection; and this effect is constantly observed in gooseberry bushes, the fruit of which always withers when the leaves are eaten away by caterpillars.

It has long been known that leaves both imbibe and give off *moisture*, and Dr. Hales considered that the same effect occurred with respect to *air*. In his experiments on the *absorption* and *perspiration* of plants, he found that the *helianthus annuus*, or *sun flower*, lost 1lb. 14oz. during a fine dry day, and 3 oz. in the course of a fine night; but that during a rainy night it gained 2 or 3 oz. He also found that the surface of the leaves was to the root as 5 to 2, or in other words that a root presenting a surface of two inches imbibed as much moisture as the leaves, and threw off from a surface of five inches. Similar experiments have been made on other plants, with different results as to the quantity of perspiration, though all agree that it is very considerable. That the perspiration of vegetables depends rather upon the dryness than the heat of the atmosphere, may be inferred from the fact, that haymakers frequently find the hay made sooner on a fine day, when the air is very dry, though the sun does not shine, than on a sunshiny day, when there is more moisture in the atmosphere. Evaporation, therefore, proceeds with greater or less rapidity, according to the degree of moisture contained in the air, and its state of dryness or humidity is ascertained and especially exhibited by the hygrometer, an instrument invented by Mr. Daniell.

The perspiration of plants is of different kinds, being sometimes *watery*, as in the willow, on the leaves of which it appears like drops of water. In plants of some kinds the perspiration is *sweet*, as in groves of oranges; and in others *glutinous*, as in the lime-tree. These qualities generally depend on the peculiar secretions of the plants; but in some instances, the sweetness is owing to disease, particularly in the beech.

Mr. Wheeler then detailed some experiments performed by M. Bonnet, for the purpose of ascertaining the power of absorption possessed by the leaves of herbaceous and other plants, by placing their leaves on the surface of water; some with their upper, and others with their under surfaces in contact with the fluid, and observing which of them remained longest in a healthy state. The result of his experiments shewed that the greater part of the herbaceous plants absorbed the most moisture by means of the upper surfaces of their leaves, while the reverse was the case with other kinds of plants. The perspiration of some aquatic plants is prodigiously great: the *potomogeton perfoliatum*, for instance, dies very soon after it is gathered, in consequence of its rapid transpiration. The leaves of the *nuphar lutea*, another aquatic plant, imbibe water by their under surfaces, while their upper are exposed to the air. Plants of the *sarracenia* kind grow in water, and their construction is worthy of particular notice, as their leaves form orifices which appear to be constructed for the purpose of restraining evaporation. It is a curious circumstance that insects have been observed to drag others of a smaller kind to the leaves of a species of saracenia, the mouths of which are furnished with a kind of hair, pointing inwards like the wires of a mouse-trap, so that when the insect once gets in, it cannot escape; and a foetid smell issues from these plants, in consequence of the number of putrid flies which their leaves inclose.

The lecturer then proceeded to examine the effect of *light* and *air* on the leaves of plants, and after alluding to the microscopic observations of Grew and Malpighi, he repeated the discovery made by Dr. Darwin, that what had been previously supposed to be *air-tubes* were in reality *sap-vessels*, and stated that the sap in vegetables is exposed to the action of the air, like the blood in the lungs of animals. Mr. Wheeler then referred to the researches of Dr. Hales, who had removed the air from plants by means of the air-pump, and found that they would not live under an exhausted receiver. His experiments should however be received with caution, as he appears to have been mistaken in some of his inferences, and the principal result of his observations was to establish the fact that the tubes of plants are pervious. The object of the leaves, he considers, is to perform the same office in the preservation of plants, as the lungs in preserving animals, and may not light, he adds, contribute materially to ennoble the principles of vegetation.

Dr. Priestly has ascertained that vegetables, under peculiar circumstances, absorb *carbonic acid*, and liberate *oxygen*; but that the contrary effect occurs in the dark. A vine leaf placed in a phial converted carbonic acid into oxygen. Mr. Wheeler here explained the nature of carbonic acid and oxygen; the former of which is given out during combustion, and the latter forms about one-fifth of the atmosphere, of which it constitutes that portion which is essential to animal life and the combustion of inflammable bodies. It appears therefore that plants, by the action of the sun, absorb that gaseous substance which is fatal to animal life, and give out that which supports it.

Light is no less necessary to vegetables than air, for though some plants will grow in the dark, they have a sickly appearance under such circumstances. The colour of a lily grown in the dark is not so beautiful as when it is exposed to the light during its production, and the effect of light on the colour of vegetables is evinced by the practice of covering up *celery*, by which means the lower part remains white, while the upper part, which is exposed to the light, becomes green. *Endive* and *lettuce* are blanched in a similar manner. Celery, in its natural state, is extremely acid, and in some cases, even poisonous. It grows naturally on the banks of the Thames, but is so acrid that it is impossible to eat it. Light acts beneficially on the *upper*, and injuriously on the *under* surfaces of the leaves of plants: thus it is observed in hot-houses, that the plants turn the upper surfaces of their leaves towards the light, and if a vine leaf is suspended by a thread, its upper surface will be turned towards the sun. Light not only affects the leaves, but the plants themselves, which is particularly observable in some compound plants, such as the *daisy*, and it has been said that the sun-flower turns towards the sun during the whole of the day, and re-assumes its previous situation at night; but though the lecturer had watched for this phenomenon he could not confirm the fact from his own observation.

After some further observations on the effect of light and air on plants, Mr. Wheeler observed that there was every reason to believe that plants gave out more *oxygen* than they receive from the atmosphere, and that their growth has the effect of purifying it; and by considering the structure and operation of the leaves, we may be enabled to understand the formation of the various secretions of plants, such as gum, sugar, &c. the whole of which are composed of *oxygen*, *hydrogen*, and *carbon*, combined in different proportions.

Having thus illustrated the general structure of vegetables, the lecturer proceeded to their more transitory organs, viz. *flowers* and *fruit*, and observed that the parts of fructification are seven in number, some of which are essential to every plant, while the others are frequently dispensed with. These seven parts Mr. Wheeler particularized as follow, exhibiting in succession a number of coloured representations of those plants in which the various parts are particularly conspicuous.

1. The *calyx*, or *flower-cup*, which is generally green, as in the *night-shade*, or *atropa belladonna*; 2. the *corolla*, or more delicately coloured leaves of the flower: the corolla, like the calyx, is not always present; 3. the *stamens*, which appear in a thread-like form, bearing a knob at the top, and are essential in every flower; 4. the *pistils*, which are as essential as the stamen itself, and consist of three parts, which will be examined presently; 5. the *pericarpium*, or *seed-vessel*, which is not always essential; 6. the *seed* itself; and 7. the *receptacle*, which must be present in all plants in some form or shape.

Mr. Wheeler then observed that it was sufficient for his present purpose to have named the various parts of fructification, without entering minutely into the whole of them, and he should therefore confine himself to a description of the structure and uses of the most important, viz. the *stamens* and *pistils*. The *stamens* vary in number from one to some hundreds, and consist of two parts called the *filament* or *thread*, and the *anther*, the latter of which is supported by the former. The *pollen* is a fine powder contained in the *anther*, and appears as though it might be wafted away by every motion of the air. The *pistil* consists of three parts, viz. the *germen*, the *style*, and the *stigma*, the first and last of which are essential organs of the *pistil*, but the second is sometimes wanting.

The lecturer then gave a minute and explicit account of the experiments of Linnæus, on the *stamens* and *pistils* which are the social organs of plants. He stated that the access of the *pollen*, or fine powder of the former to the *stigma* of the latter, is invariably essential to the fertility of plants, and that this object is generally accomplished without seeming to depend on accident, as the *stamens* and *pistils* are usually found in the same flower. In other cases, where these parts occur in separate plants, or in different flowers on the same plant, the effect s produced by the agency of insects, and other concurrent causes; but in every case, the analogy between the propagation of plants and that of animals is striking and complete.

Mr. Wheeler elucidated this important branch of the science of Botany in a very able and satisfactory manner, and concluded by stating that in his next lecture, which would be delivered on Friday the 8th of April, he should direct the attention of his hearers to the diseases of plants and the Linnæan system of classification.

Lectures for next Week.

Wednesday, 6th April, Dr. Birkbeck on Electro-Magnetism; the lecture to be illustrated experimentally by Mr. James Marsh of Woolwich, already known to the scientific world by his ingenious apparatus, connected with this novel and curious branch of science.

Friday, 8th April, Mr. Wheeler's Fourth Lecture on Botany.

SPITALFIELDS MECHANICS' INSTITUTION.

The first General Meeting of the members of this Institution (amounting at the present time to about 300) was held on Monday evening last at Gibraltar Chapel, for the purpose of electing a Committee of Managers, agreeable to the Notice which had been given after Mr. Partington's lecture on the preceding Monday.

Mr. Thomas Gibson,

The President of the Institution, having taken the Chair, opened the business of the evening by explaining the objects proposed to be accomplished by its establishment, and after detailing to the meeting the exertions which had been made, and the degree of success with which they had been attended, he laid before the members the list contained in our last Number, (page 349) of the officers already nominated by the original promoters of the institution.

The President then read the following letter from the Marquess of Lansdowne, which was received with unanimous applause:—

"Berkeley-square, March 26, 1825.

"Dear Sir—Understanding that the preliminary steps have been taken for establishing the New Mechanics' Institution in Spitalfields, I must trouble you with the inclosed cheque for 100*l*. to be applied to the purposes of the establishment.

"I feel a peculiar pleasure in contributing to this object, not only on account of its general utility, but because having some time ago formed a strong opinion as to the expediency and importance of a change in the regulations and duties affecting the silk trade, I had some share in recommending it to the public attention; I am persuaded that nothing can more effectually promote the favourable operation of that change, than an institution calculated to excite the inventive powers, and thereby raise the character and condition of the very meritorious and industrious class of persons immediately engaged in the manufacture.

I remain, Dear Sir,
Your faithful and obedient servant,
"T. Gibson, Esq." "Lansdowne."

The names of the members of the society were then read by the secretary, Mr. Downes, after which the following resolutions were proposed in a very able speech by Mr. S. Amory, and carried unanimously:—

Resolved—That we avail ourselves of the first General Meeting for business of this Institution, to acknowledge the condescension of the Most Noble the Marquess of Lansdowne, in connecting himself with it as one of its Patrons; and to express our gratitude for his munificent present of One Hundred Pounds to the Funds. For this instance of his kindness and liberality, and for the interest he has always manifested for the welfare of the mechanics in Spitalfields, we request him to accept the sincere thanks of the members of the Spitalfields Mechanics' Institution.

Resolved—That the thanks of the Spitalfields Mechanics' Institution be presented to Henry Brougham, Esq. M. P. for his ready consent to become one of its Patrons.

Resolved—That the thanks of the Spitalfields Mechanics' Institution be given to George Birkbeck, M. D. for his consent to become one of its Patrons, and for the assistance he has already afforded to its formation.

Resolved—That the President be directed to sign these resolutions, and that the Secretary do forward them to the Marquess of Lansdowne, Henry Brougham, Esq. M. P. and George Birkbeck, M. D.

The following resolution was proposed by Mr. Bell, seconded by Mr. Graham, and unanimously adopted:—

Resolved—That the cordial thanks of this meeting be presented to the Rev. Wm. Brown, for the liberal manner in which he granted the use of his Chapel for the three introductory lectures which have been given, and for his active co-operation in the formation of this Institution.

Mr. Brown rose and said, that he felt himself complimented by the unexpected mark of respect which the gentlemen present had just shown towards him; and he could assure them, that he felt highly gratified to witness so numerous and respectable an assembly in that place on such an occasion. He had long wished to see something of the kind established in this neighbourhood, and he would have attended its meetings at any moderate distance. He had heard that some persons had said, that he ought to be ashamed to have lent his chapel for such a purpose. He acknowledged that he, in conjunction with the trustees, during his residence here for the last eighteen years, had granted the use of the chapel for many, yea, almost all charitable purposes; and he could say for himself, and the trustees of that place, and the school-rooms connected with it, that they will feel great pleasure in seeing the Spitalfields Mechanics' Institution established. Mr. B. also said, that if any present had any doubts or objections to this institution, he would be glad to see them either at his house, or at any other place they would appoint, and he had no doubt but that he could easily remove their prejudices. He also observed, that he was persuaded in his own mind, that notwithstanding the advanced period of life with many of them, if they only attended the meetings proposed by the institution, they would receive much profit, pleasure, and gratification, to which they had hitherto been strangers. He concluded by saying, that the inhabitants of this district ought to feel greatly obliged to the promoters of the institution; and whether we ourselves are profited by it or not, yet he was confident that "our children will rise up and call them blessed."

Mr. Stanger, the Treasurer, reported that he had that day paid into the hands of the Bankers of the Institution, the sum of 535*l.* and that he had a further sum of about 260*l.* to collect.

The Secretary then read the Rules and Regulations of the Institution; after which the meeting proceeded to the election of 30 members, to form, with the officers previously nominated, the Committee of Managers of the Society's Affairs, when the choice of the meeting fell on the following persons:—

Rev. W. Brown, Gibraltar-place, Bethnal-green; Mr. Chas. Stanley Masterman, 41, Bacon-street, Bethnal-green; Mr. George Cooper, wheelwright, 32, Coal Harbour-st. Hackney-road; Wm. Monks, wire-drawer, 3, Old Nicholls-st. Bethnal-green; Geo Gow, clerk, Messrs. Hanbury and Co.'s; Samuel Amory, solicitor, 25, Throgmorton-st.; David Reid; Thos. Feild Gibson, manufacturer, Milk-st. Cheapside; Rev. J. W. Morren, Brunswick-st. Hackney-road; Wm. Young, linen-draper, 76, Church-st. Bethnal-green; John Litchfield, carpenter, Bethnal-green; Hugh Tate; Richard Heaps, plumber, &c. 6, Willow-walk, Curtain-road; Wm. Luvic, print cutter, 3, Belmont-row, Bethnal-green; John Hughes, weaver, Pleasant-row, Mile End New-town; Wm. Woodall, schoolmaster, School House, Spitalfields; J. P. Ferry, working-jeweller, 11, Norwill-place, Bethnal-green-road; J. D. Kineard, manufacturer, 28, Spital-square; W. Curtain, pattern-drawer, 12, Hague-street, Bethnal-green; Jas. Williams, weaver, 23, Steward-street, Spitalfields; Robert Gammon, jun. coal-merchant, 22, Runderson's-place, Bethnal-green-road; Thomas Collin, weaver, 4, Shacklewell-street, Bethnal-green; Wm. Perrien, pattern-drawer, 81, Bethnal-green-road; John Harris, weaver, 2, Fleur-de-lis-court, Spitalfields; Francis Richards, carpenter, Paradise-row, Bethnal-green; Wm. Gandy, manufacturer, Princes-street, Spitalfields; John Clark, wheelwright, Brick-lane, Bethnal-green; Samuel Dean, weaver, 2, Globe-terrace, Bethnal-green; James Howard, weaver, 16, King Edward-street, Mile End New-town; Joseph Dean, weaver, 3, Globe-terrace, Bethnal-green.

The following gentlemen, viz. Messrs. W. Ellis, J. Buttress, and James Hill, were unanimously appointed auditors for the ensuing year, upon the motion of Mr. Stanger, seconded by Mr. James.

It was also proposed by Mr. James, seconded by Mr. Masterman, and resolved unanimously, that Messrs. William Bembury and John Ballance, be appointed trustees.

The President announced to the meeting that arrangements would be made for the delivery of a lecture on Monday, the 11th of April; after which the cordial thanks of the members were voted to him for the able manner in which he had presided over the business of the evening.

Mr. Gibson acknowledged his obligation for the mark of respect which the members had conferred upon him, and concluded by dissolving the meeting.

The proceedings of the evening were conducted with the greatest regularity, and appeared to afford general satisfaction to the members assembled. From the auspicious manner in which the preliminary transactions of the Institution have been conducted, we cannot but anticipate its favourable progress; and we are happy to conclude this sketch of the proceedings of the First General Meeting, with our sincere and cordial good wishes for the ultimate prosperity of the SPITALFIELDS MECHANICS' INSTITUTION.

EXPERIMENT,

MADE ON THE PREMISES OF THE LONDON MECHANICS' INSTITUTION, TO SHEW THE EFFECT OF ROBERTS'S HOOD AND MOUTH PIECE.

We stated, in our last publication, that a number of scientific gentlemen had been invited to witness the utility of the apparatus invented by Mr. JOHN ROBERTS, and we now proceed to fulfil our intention of laying before our readers some account of the experiment, which, by the kind permission of Dr. BIRKBECK and the Committee of the LONDON MECHANICS' INSTITUTION, took place on Friday in last week, in the area of the New Lecture Room now constructing on the premises in Southampton Buildings.

Among the spectators assembled upon this occasion, we observed SIR ROBERT WILSON, Dr. BIRKBECK, ARTHUR AIKIN, Esq. secretary to the Society of Arts; W. H. PEPYS, Esq. F.R.S. late honorary secretary to the London Institution; Mr. COOPER, whose able lectures on Chemistry have afforded such general satisfaction; Mr. J. T. BARRY, also an eminent chemist; Mr. TATUM, lecturer on Electricity, &c.; ROBERT M'WILLIAM, Esq. Mr. HUBERT, of the Sun Fire Office; Mr. HODGSKIN; and several other gentlemen of distinguished scientific attainments.

A temporary room, 16 feet square, having been constructed under the direction of the Building Committee of the Institution, a fire was lighted in the center of it about one o'clock; and in order to fill the apartment with dense and noxious smoke, a quantity of wet hay and shavings were placed on the fire, to which were added about two pounds of sulphur, and a shovel full of resinous cement. The vapour arising from these combustible substances was so insufferably noisome, that the spectators who stood near the building were obliged to remove to some distance, to avoid the small portion which escaped through the crevices. Roberts having put on his Hood and Mouth Piece, the construction of which we have already described, entered the room at exactly 28 minutes past one o'clock, at which time the temperature of the exterior atmosphere was 48°, and within the chamber 68°. The proximity of the thermometer to the building caused it to rise to 53° as the experiment proceeded.

Roberts was furnished with three bottles, filled with mercury, which were to be emptied at different periods, and the vapour which supplied the place of the mercury preserved for subsequent examination. During the time the operator was confined in the apartment, he appeared to suffer no inconvenience, except from the heat, which became more and more intense, till the thermometer placed against the inside of the window reached 118°. He employed himself in supplying the fire with additional fuel, and as its occasional flashes for a few moments broke through the dense cloud which enveloped him, we could see Roberts walking about the apartment, and sometimes ascending a ladder to the top of the room, where the atmosphere was intensely hot. After the lapse of 20 minutes, a candle which stood near the window went out, and was soon afterwards melted by the increasing heat. The door being opened now and then for the purpose of supplying more combustibles, Mr. BLUETT, keeper of the apparatus, and one or two of the workmen employed on the premises, entered the chamber on their hands and knees, but after remaining in it only a few moments, were driven out, apparently half suffocated by the fumes of the burning materials; though the atmosphere near the floor of the room was, comparatively, but slightly charged with the noxious vapours. One of the men who had attempted to breathe the pestiferous atmosphere, on emerging from its influence, expressively and elegantly observed, "*Its good luck for them as can stand it.*"

At four minutes past two, Roberts left the apartment at the request of his friends, having remained in it exactly 36 minutes. Upon removing the hood, he appeared in a strong perspiration, but was by no means exhausted. His pulse, which was at about 170, in a short time recovered its serenity, and after partaking of suitable refreshment, he felt no unpleasant effects from the ordeal he had passed through. He is 38 years of age, has been a miner from his earliest youth, and we understand, was once struck by the damp in a mine which he assisted in opening, about 200 yards below the surface of the earth, when he was 18 years old. He enjoys good health, and appears to possess a strong constitution.

The success of the experiment gave very general satisfaction to the company, and several gentlemen who had expressed doubts of the utility of the apparatus and the practicability of its application, were completely cured of their scepticism, and convinced of the importance of the invention.

Of the three bottles which Roberts had emptied of mercury in the closed chamber, in order that their gaseous contents might be removed for examination, one was opened by Mr. Barry, who afterwards communicated to Dr. Birkbeck the result of his analysis as follows :—

The phial was very damp internally, and contained a few drops of water. When opened under mercury at 53 deg. a quantity equal to one-fifteenth of the whole entered the phial. A portion of the gas being admitted into contact with lime-water, gave only the slightest trace of *carbonic acid*; other portions treated with nitrous gas indicated the presence of fully 19 per cent. *oxygen*. Hence barely two per cent. of the oxygen had disappeared.

The following valuable report was also transmitted to Dr. Birkbeck by Mr. Pepys, after his examination of the contents of another bottle.

"March 25, 1825.

"A bottle was filled with atmospheric air, which had been exposed to a temperature of 118 deg., and also to the combustion of a considerable quantity of deal shavings and other combustible substances, in the room where John Roberts was inclosed with his new safety hood. The volume of the bottle, with its stopper in, was 315. Upon opening it under quicksilver, a volume equal to 32 entered. The barometer at that time was 29,83, thermometer 56.

"One hundred parts of this air was exposed to lime-water, in which it occasioned no precipitate, neither was there any absorption of the volume of air.

"No *carbonic acid*.

"It was treated with the sulphat of iron, charged with nitrous gas, and also with the green sulphat of iron, by which it was reduced to 80 parts.

"*Oxygen* therefore 20!

"The 80 parts were examined as to inflammable air or *hydrogen*, but not any was detected: therefore they must be considered as *azote*.

"Therefore the change on atmospheric air in the room was

Loss of oxygen . . 1
Increase of azote . . 1

(Signed) "Wm. Hasledine Pepys.

"P. S. The slow combustion of *phosphorus* gave me also 80 per cent. of *azote* in the same air on the 26th March."

From conversation subsequently held with Roberts, it appears that the three bottles, of the examination of two of which the report has been given, were filled with air in three different parts of the room; one near the floor; another on a level with his mouth; and the third at the top of the room, where the temperature was nearly equal to that of boiling water. Hence it is probable that the two bottles examined contained air from the lower strata, and that analysed by Mr. Pepys from the atmosphere nearest to the floor. Had this information been imparted immediately after the experiment, and the bottles marked by Roberts, to point out the places where they were filled, the examination would have been more satisfactory.

IMPORTANT ANATOMICAL INVENTION.

We have been favoured with the following by a Paris Correspondent.

Paris, March 27, 1825.

M. Ouroux, a physician, has presented to the Academy of Sciences, a piece of artificial anatomy, representing the body of a man according to its natural dimensions. The solidity of the material employed, permits the taking to pieces and putting together again, all the various pieces of mechanism in their very fullest details, and with such scientific accuracy, that a student may, with a book of anatomy in his hand, find out and trace into its most minute particulars any or every portion of the human frame. Immediately under the skin are exhibited the veinous system, and the superficial coat of muscles; each muscle may be separately detached, and with it the vessels and nerves that run along its surface, or go through it. The succeeding coats of muscles, &c. may, in like manner, be detached and studied separately, or in selection with the other organs of the system, until the student at length arrives at the bare skeleton. A portion of the last coat of muscles and of the vascular, and nervous system, the separation of which offered no advantage, remain attached to the bones. In the cavities are found all the organs proper to them. The cranium may be opened, and the brain taken out. In this, by means of a cut through its entire mass, may be seen the minutiæ of its organization.

The eye detached from its orbit, may be studied apart. The muscles, the vessels, the nerves, and the membranes of this delicate organ are represented with scrupulous accuracy; the transparent parts are imitated in glass. The organization of the throat may be examined by means of this piece of mechanism with greater precision than on a natural subject. In the thoracic cavity is seen the heart and the vessels that branch off from it, and which may be followed to their remotest ramification. One portion of the lungs is divided in two, in order to exhibit the pulmonary circulation. In the abdominal cavity, separated from the preceding, by the diaphragm, are found an exact representation of the *viscera*. On removing the intestinal mass, the veins, the spleen, the liver, &c. are disclosed to view. The preparation of the organs contained in the cavity of the *pelvis*, is particularly worthy of attention. The removal of all these parts leaves open to inspection the azigos, the thoracic canal, and the grand lympilhetre nerve attached to the vertebral column. This piece of mechanical anatomy, has, over all other representations of the human system, great advantages. From the solidity of its materials it can be taken to pieces, and handled and examined in its minutest details without suffering any injury; it is not liable to be influenced by the variations in the temperature of the atmosphere; besides its offering the student the greatest possible facility for the examination of even the remotest part of the body, not only in relation with the whole, but separately,it is the least expensive succedaneum for the human subject that has been yet discovered. The price set upon this very ingenious and eminently useful piece of mechanism, is 3000 francs. Now it is well known that the wax figure of a man, in the natural proportions, exhibiting merely the outward coat of muscles (the skin being taken off) cannot be had for a less sum than between 30 and 40,000 francs. The Academy of Sciences has named a commission to draw up a report upon this invention of M. Ouzoux. The Royal Academy of Medicine, and the Society of Emulation, have already made such favourable reports upon M. Ouzoux's first essays in this way, as to secure to him the countenance and encouragement of government.

ON THE PRODUCTION OF SILK.

The following article which has been forwarded to us by a friend who is on the continent, possesses considerable interest just now that attempts are making by a public Company of great respectability with the Earl of Liverpool at their head to introduce the Silk Manufacture more generally in this country, and to produce the raw material.

The education of silk-worms, so abundant a source of riches for many of the southern departments of France, though having been greatly improved of late years, has not yet reached that degree of perfection which might enable the French cultivators of silk-worms to supply sufficient silk for the French manufacturers. Consequently French capital to the amount of 20.000.000 of francs is every year sent out of the country to procure a supply of this article. To relieve his country from this tribute, M. Toyzeleur des Longchamps has made several experiments upon the means of augmenting the produce of the silk-worm. He has presented a memoir on this subject to the Academy of Sciences, of which the following is the substance:—One of the most obvious means, he thought, to procure this augmentation, was by producing, if possible, several crops of silk in the year. The author goes on to state, that having observed that the hatching of silk-worms took place naturally a month or six weeks later in Paris than in the southern departments, he was thence led to conclude, that this protracted development in the north of France, was owing to the more rigorous temperature and longer duration of the winter; and that it was probable that by putting towards the end of the winter, silk-worms' eggs in a place where the temperature should remain fixed at a certain degree, and where there should be no light, it might be possible to retard their development, and allow them to come to perfection only when desired, by removing them from the cool place in which they had been kept, and making them pass successively through the intermediate degrees till they gradually reached the temperature usual in the months of June, July, and August. By this simple means, several crops might be made in the year. In order to bring this hypothesis to the test of experiment, M. des Longchamps, having on the 24th March, 1824, enclosed in a glass vessel well corked, some silk-worms' eggs, he placed them in a cellar, the temperature of which was 5,45° F. where they were left till the 10th May. On that day he commenced feeding some silk-worms which had come forth spontaneously. On taking the eggs from the cellar, he made them pass successively in two days through the temperatures of 54° 5, 56° 5, and 63° 5 F. In the last temperature they remained twenty days, when they began, but in small numbers, to come forth. On the 2nd of June, he began their regular education, which lasted till the 16th July. The first worm began spinning the 41st day, and the last on the 46th day. A hundred of the *cocons* or webs, produced by these worms, weighed only four ounces 3 drachms, whilst the same quantity of *cocons* produced by the worms hatched in the natural way weighed 7 ounces, 4 drams, and 48 grains. This great difference in weight M. des Longchamps thinks was caused by the first *cocons* not having been weighed until after eight days exposure to the sun for the purpose of destroying the moths. He adds, that from the moment the moths are destroyed, no matter by what cause the weight of the *cocons* continues to diminish daily. At the end of a month it is less by one third, and after three months by two thirds. By leaving some of the eggs for a longer period in a cold place, M. des Longchamps was enabled to retard their development till the 20th June. This third education lasted till the 28th July; the temperature during this time varied from 74° 7, to 81° 5 F. A hundred of the *cocons* produced by these silk-worms, weighed 6 ounces, 7 drachms, and 42 grains. The heaviest *cocons* weighed 52 grains, and what was remarkable, the worm that spun it was put on the 28th July at 4 o'clock in the evening, into a paper box, and was carried a distance of 20 leagues during the night, on the outside of a Diligence, and yet the *cocon* was as accurately finished on the third day, as if the little spinner had not been shaken by the motion of the coach. But a temperature of 45° 5 F. may not always be sufficient to retard the development of the silk-worms more than two or three months beyond the ordinary period, but if they be kept in a place the temperature of which is from 34° to 36° 5 F. they may be retarded a longer time. By this means M. des Longchamps was enabled to carry on a fourth and a fifth education. The first of these latter attempts commenced the 17th July, and lasted till the 29th August. The weight of a hundred of the *cocons*, was 5 ounces, 4 drachms, and 50 grains. The second began the 19th of August, and was prolonged to the 4th of October. During the interval, the temperature varied between 68°, and 74° 7 F. until the 8th of October, when it diminished gradually to 54° 5 F. owing to which diminution the last silk-worms had considerable difficulty in finishing their *cocons*. A hundred of these weighed only 4 ounces, 3 drachms, and 12 grains. These experiments sufficiently prove the probability of having several crops of silk in the year, and agree with what it is asserted takes place in some parts of India, where it is said there are as many as twelve crops of silk gathered in the year. This, however, the author takes to be an exaggeration. M. des Longchamps then proceeds to refute the objections that may be made to the possibility of these successive educations. In order not to exhaust the mulberry trees, or destroy them altogether by repeatedly stripping them of their leaves, he proposes to have a double, and even triple number of these trees, so that no one tree shall be deprived of its leaves more than once. The mulberry leaves, a month or two after their appearance, become too hard to serve as food for the young silk-worms. This inconvenience he proposes to remedy by giving them the young and tender leaves of trees, which he should cut in such a manner as to retard the putting forth of the leaves, and make it coincide with the successive educations of the silk-worms. He also employs the leaves of very young trees, which he thinks may be gathered without injury to the tree twice a year. He states that the great heats and the thunder storms of July and August, are not an obstacle, as has been feared. The author has found, by experience, that the silk-worms are never in better health than during a temperature of 77° to 81° 5 F.' and the thunder exercises no detrimental influence whatever on them. In a *note* to this memoir, the author gives an account of some interesting experiments made to shew what species of mulberry leaves besides those of the white and black mulberry tree may be used in feeding silk-worms. Duhamel had recommended the leaves of the mulberry, but only when the silk-worms had become fat. M. des Longchamps tried the experiment, and found that the silk-worms not only eat the leaves without repugnance, but even shewed no preference for the leaves of the white mulberry, both being equally within their reach. But he remarked, that after feeding on the leaves of the red mulberry, a much greater number of the silk-worms perished, and that the *cocons* proved considerably lighter. Silk-worms fed upon the leaves of the mulberry tree of Constantinople, gave him during two consecutive years, *cocons* much heavier than those produced by the silk-worms fed upon the leaves of the white mulberry tree. But the *brousonetia papyrofera*, which had been recommended as a substitute for the white mulberry, is prejudicial to silk-worms. It has been said, that in China the mulberry leaves are dried and kept from one year to the other. The author has tried the experiment, and declares them to be totally unfit for the purpose of feeding those valuable little creatures. The author then speaks of the number of females which the male silk-worm may impregnate. He states having seen a male perform this act of duty 17 times, without any appearance of his ardour being diminished. He has reared worms resulting from a sixth propagation by the same male, which appeared in no way less strong or healthy than those resulting from a first copulation. It becomes necessary then to set aside only a fourth or a sixth of the number of the males contained in the *cocons* for the purpose of propagation, in which case the labours of the superfluous males would materially augment the quantity of silk. The author concludes this very interesting and important memoir, by some observations upon the culture of silk-worms in northern countries. Henry IV. had caused to be planted a great number of mulberry trees in the gardens of the Tuilleries to serve as food for the silk-worms kept in that part of the edifice called the orangery. Since that time repeated attempts have been made to rear silk-worms in and about Paris, but at present there exists here no such establishment of that kind, and it is a general belief, that success in such an attempt is impossible. However, M. des Longchamps' experiment has succeeded, and he states his conviction, that the failure of his predecessors has been owing to their want of knowledge on the subject. In support of this opinion, he brings forward the very productive culture of silk-worms which is made more to the north in Germany, and even in Russia; and on this occasion he gives some details which had been communicated to him by M. Tzcherniaeff, a travelling botanist employed by the Russian government. From these details, it appears that 12 or 15 years ago, Marshal Bribentein, author of the *Flora of Caucasus*, introduced the culture of the white mulberry tree, and the education of silk-worms into several districts of the Ukraine, as far as the 50th degree of north latitude. These have succeeded so well that there are already several silk manufactories established in those countries, which are in a rapidly progressing state of prosperity.

FAMILIAR LESSONS ON MINERALOGY.

(*Resumed from Page* 336.)

Ores of iron. Iron presents itself in abundance, and exhibits a great variety of appearances.

Clay, Sandstone, and Jasper, frequently contain a considerable proportion of iron which gives to them their red colour. In some stages it is more subject to decomposition than in others, and the more iron they contain, the more coloured (generally red brown), the substance becomes. Many clay-like stones appear ochreous on their exterior; on breaking them, two or three stages of decomposition are often instructively and beautifully marked, elucidating its change; whereas the centre remains perfect, unaltered, and hard, not having yet been affected by either water or air, the action of which has given the surface so different an appearance.

Other ores of iron, as those called *hematites*, are red, often black red, and fibrous: they are heavy, and frequently appear as if polished; they are also sometimes encrusted with red dusty matter, which soils the fingers.

There were yet others, as *loadstone,* and shining *specular iron ores;* some have the appearance of aggregated granular particles of iron or steel, but this series so interesting to the uses of man, is leading us beyond the bounds we had prescribed ourselves.

Iron may generally be detected by placing a small particle (of iron ore) under the flame of the pipe; it will not melt, but after it has been kept red hot for a few moments, the magnet will exert its unerring power, and attract it; or reduce the particles to powder; put it into a watch-glass, to which add a drop or two of sulphuric acid, and expose it to the flame of a lamp, and throw the contents into a glass of water, into which pour a little tincture of galls, and you will have ink; or a beautiful blue, if prussiate of potash be used instead of the tincture of galls.

The common iron ore of England is *clay iron stone.* It is almost always found near coal, which is so necessary for reducing the ore to a state of purity. So common as iron is, yet how few know any thing of the process it undergoes, before it becomes malleable. It is one of the most difficult metals to melt, and more art and labour is requisite to conduct a small iron furnace, than to melt all the gold produced in Brazil.

Here is a substance of a dark colour, which I am told is *manganese. How can I assure myself that it is so?*

Manganese, like the preceding article, (iron) forms many varieties, and is distributed in great abundance. It may generally be known by its earthy black appearance, and is commonly called *black wad,* which often contains fibres embedded in it, of a metallic lustre. Other varieties are composed of acidular fibres, sometimes aggregated, and have a bright iron-like splendour. It is very frequent in Devonshire, and when examined, may be distinguished from iron, or any other substance. Exposed to the flame of the blow-pipe, with borax, a purple glass is produced.

Manganese may also be known by putting a little muriatic acid to a small quantity of the powder, and on holding a piece of printed cotton, &c. over the fumes, the colour will be destroyed; dilute the substance with water, and on immersing a coloured cotton, the same will be bleached.

We cannot sufficiently recommend an acquaintance with the preceding substances, and the different methods of discrimination. For if the learner has once familiarized himself with the characters of mineral, and with the means of detecting what they are, he will then have gained the first steps to the knowledge of mineralogy as a science, from which too many have started back, and could not prevail upon themselves to proceed.

We have therefore endeavoured to introduce the subject, under such appearances as may invite the learner to further exertions. For as our chemists, our artists, and our manufacturers, at least equal, and in most cases excel those of neighbouring nations, why should we not equal them in the knowledge or science of mineralogy, which partakes so largely of the great recommendation of all science, *utility.*

The common use of *tin* naturally presents itself to the notice of the teacher; it is not so generally distributed as many other minerals, but exists in abundance where it has hitherto occurred. It is one of the heaviest minerals and one of the lightest metals. It consists of few varieties; its ores may generally be known by their great weight; it is sometimes of a resinous colour, but commonly approaching black, and its crystals occur in clusters, presenting planes in different directions. It is hard and difficult to be scratched with the knife. It occurs in veins, some of which are so delicate, as not to be thicker than the blade of a knife. It also occurs in small massive pieces, radiated, and striated; hence called wood tin.

The ores of this metal may, after having been pulverized, and mixed with borax, be reduced to malleable tin, but care must be taken not to continue the heat too long, as it will burn away; a little morsel of soap, melted with it, may assist the operation.

Ores of tin, cannot be described, so as to give a perfect idea of them; they resemble ores of iron in many cases; also ores of blende; but after their difference is explained and pointed out to the learner, he will be enabled to distinguish them.

(*To be resumed.*)

To the Editor of the Mechanics' Register.

SIR,—Noticing in the public journals of the last year the melancholy burning of two vessels and latterly that of the Kent, East Indiaman, with the destruction of many of the crew, and likewise the numerous fires in various parts of town, which must not only excite the sympathy and feeling of all ranks of society, but ought also to induce every scientific man to think of some means whereby such unfortunate occurrences may in future be prevented, I beg, through the medium of your valuable Register, to inform the public, that I have invented an apparatus, which is by far the most powerful ship's pump and fire engine at present known—to both of which purposes it is alike applicable. As a ship's pump it is found to perform double duty of any pump used for that purpose, and being nearly without friction, it is worked with little more than half the labour, and is not liable to get out of repair; as a fire engine it is equally valuable, and can be applied to both objects, (raising water and extinguishing fire) at the same time without the least difficulty or delay. It has been inspected and approved of by several of the most eminent and scientific men who have given it their decided approbation, and I have no hesitation in asserting that if this apparatus were properly constructed, and of sufficient dimension, it would be almost impossible for accidents similar to the dreadful ones before alluded to, to take place.

I herewith send you a copper-plate engraving and description thereof pointing out its applicability and advantages over all other hydraulic machines.—I am, &c.

38, Seward-street. J. BARTON.

*** We have received the engraving to which Mr. Barton refers, and we feel thankful for his attention, but as this engraving has already been published, it is not necessary for us to give it. Our own opinion is decidedly favourable to his invention, and we therefore recommend an inspection of his apparatus.—EDITOR.

HYDROPHOBIA.

Several journals have recently asserted that the use of vinegar in the treatment of hydrophobia is a specific remedy. It would be useless to repeat here the names of all those authors who have recommended its use upon such occasions, to prove that the opinion entertained of its efficacy, is by no means a lately adopted one. It is nevertheless certain that its effects have been exaggerated in attributing to it the powers of an infallible specific. The following case, of the authenticity of which there is no doubt, deserves to be made known, as it proves the utility to a certain degree, of this very simple means, and which has moreover the advantage of being almost always at hand. On the 15th of last June, at *Bolesme*, in the *arondisement* of *Meaux*, a farmer's boy, aged 14, was bitten by a sporting dog, which animal had already bitten several dogs in the village. The wound was upon the wrist and a few lines in extent. Eight hours after the accident, the boy was seen by Doctors' Cassan, father and son, who enlarged the wound and cauterized repeatedly with a red hot iron. There was afterwards placed upon the part affected a blister, the suppuration produced by which, was kept up during a month. Until the commencement of August the general health of the boy remained unaltered, he preserved his usual gaiety and shewed no inquietude as to the wound. But in the month of August a very visible change took place in his character naturally mild. He became sombre, taciturn, indocile, and surly. On the 6th he complained of a painful weariness. On the morning of the 7th he was taken with nervous convulsions, he was unable to eat, but he drank off a large glass of light cider; soon after the symptoms became more alarming, the patient asked again for drink, but on the liquid being brought near his mouth he involuntarily repelled it, and was immediately seized with a violent spasm in the muscles of the neck. On the morning of the 8th the Messrs. Cassan were called in, they found the boy in a state of extreme anxiety, complaining of burning thirst, his breathing very difficult, and his pulse extremely irregular and rapid. At the sight and even at the bare mention of liquor he fell into the most terrible convulsions, accompanied with gnashing of the teeth. The consciousness he had of not being able to swallow liquids appeared to be the sole cause of the augmentation of the nervous affection. His intellectual faculties were in no wise troubled, he submitted very willingly to the examination of his mouth. There were none of those pustules visible about the bridle of the tongue, which M. Marochetti and others say they have invariably discovered in similar cases, and which they look upon as a certain sign of the presence of hydrophobia. The cicatrice of the little wound was of a bird colour. Doctors Cassan convinced that the boy was attacked with hydrophobia, resolved to try the effect of vinegar; they first moistened the lips and tongue of the patient with a linen rag dipped in vinegar, but he was unable to bear more than two or three times this application. They then gave him some soft bread saturated with vinegar, he succeeded in swallowing some mouthfuls but the rest was rejected with incredible efforts. This crisis was only momentary, but immediately after the boy was taken with a continued ptyalism; vinegar injections were then administered, and in the course of four hours he had taken a pound and a half of vinegar, diluted with three pounds of water. His pulse lost its rapidity, but became extremely hard. A transparent glass filled with limpid water was then placed before his eyes, but he seemed to take no notice of it, until it was proposed to him to drink a spoonful. He swallowed some drops which caused him a burning sensation. Insensibly the deglutition became easier and hopes were entertained of the happy effect of the vinegar, but in the absence of the physicians the patient was allowed to drink repeatedly and in large quantities, undiluted vinegar, at the same time that the vinegar injections were continued, so that in the space of five hours he had taken about two quarts of vinegar. As the nervous symptoms diminished, those of an inflammation of the abdomon declared themselves, and the boy expired in a few hours afterwards. Though the patient in this case perished, it yet appears placed beyond a doubt, that the vinegar had contributed most powerfully to allay the nervous symptoms. The horror of liquids disappeared altogether, the faculty of deglutition was completely restored immediately after the first doses of vinegar. It is then very much to be desired that a similar experiment should be often repeated and with more care to avoid the accidents resulting from the action of too great a quantity of this acid upon the organs. And even should the application have no other effect than to allay and remove the horrible symptoms accompanying this disease, it must still be considered as a signal service to humanity. For what is it that renders hydrophobia so terrible? it is not the almost inevitable mortality that attends it—mortality is incident to many other maladies: no, it is the series of frightful symptoms, dreadful sufferings, and indescribable agonies, that render the unfortunate being afflicted with this most hideous of visitations an object of horror and alarm.

PATENT EXPIRING NEXT WEEK.

Cornelius Varley, for a telescope for viewing distant objects, with a suitable table or stand for the same. Expires April 5.

NOTICE TO CORRESPONDENTS.

The Editor has received the pamphlet on a General Way, which one of the readers of the MECHANICS' REGISTER had the kindness to send to him. He has perused it carefully without finding any new fact stated in it of general interest to the public, but as it was probably written before Mr. Gray's, and other books on that subject, the Author is entitled to some credit.

We are greatly obliged to Mr. Hollands for the design which he has favoured us with; and regret that we are compelled, from want of space, to delay the insertion of many of his valuable communications.

S. E. A. on an Explosion by Gas, has been received. We really think this gentleman attaches more importance to the subject upon which he writes than it deserves.

We are very much obliged to "Projector Abundans," for his suggestions and good-wishes.

D. Q. requests us to give publicity to his desire to have a Mechanics' Institution established in the Borough, in order that others who have the same wish may communicate with Dr. Birkbeck on the subject.

Many favours have been received, which are under consideration.

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The London MECHANICS' REGISTER.

" whose combustible
" And fuelled entrails thence conceiving fire,
" Sublimed with mineral fury, aid the winds,
" And leave a singed bottom all involved
" With stench and smoke." MILTON.

No. 24.] SATURDAY, APRIL 9, 1825. [Price 3d.

ROBERTS's HOOD AND MOUTH PIECE.

SECOND EXPERIMENT WITH ROBERTS'S NEW-INVENTED HOOD AND MOUTH PIECE, ON THE PREMISES OF THE LONDON MECHANICS' INSTITUTION.

We have this week the satisfaction of presenting to our readers a correct and spirited representation of the admirable invention of Mr. ROBERTS, illustrative of the beneficial results which may be confidently anticipated from its adoption, in those lamentable instances of conflagration which are of such frequent occurrence, particularly in populous and extensive cities. Hitherto, the absolute impossibility of breathing in the midst of dense volumes of smoke, has occasioned the destruction of much valuable property, and of many still more valuable lives, which might have been preserved by means of some simple contrivance to enable individuals to resist, even for a few minutes, the suffocating influence of the noxious vapours. This desirable object is completely accomplished by Roberts's valuable apparatus, and we are happy to add, that every trial of its utility confirms our favorable opinion of its merits.

Several gentlemen who were unable to witness the former experiment, having intimated a wish for its repetition, Saturday last was appointed for that purpose, upon which occasion a number of scientific individuals attended in the unfinished lecture room of the Institution, among whom we observed the learned President, with his son, WM. LLOYD BIRKBECK, Esq. (to whose kindness we are indebted for the drawing from which our Engraving is taken) and his brother WM. BIRKBECK, Esq. Mr. OGG, who recently delivered an able course of lectures on Geology to the Members of the Institution, Major General OGG, Professor VAN BREDA, of Ghent, Sir PETER LAURIE, Mr. PETTIGREW, surgeon to His Royal Highness the Duke of Sussex, DAVID POLLOCK, Esq. barrister, &c. &c.

The fire having been previously prepared, and an ample supply of combustibles placed in the temporary room used on the former occasion, ROBERTS put on his apparatus, aud entered the apartment at eight minutes after two o'clock, at which time the thermometer on the outside stood at 54°. About three pounds of sulphur, in addition to other combustibles, were consumed during the experiment, the sulphur being placed in an iron pan, to prevent it from escaping combustion by falling to the floor of the apartment. The density of the cloud of noxious smoke, and the heat of the room increased as before, till the temperature indicated by the thermometers fixed in different places was as follows:—

At the ceiling	158
In the center	101
Near the floor	68

The heat of the apartment was not quite so intense as on the former occasion, but the vapour appeared to be more insufferably noisome. One of the workmen entered the room upon his hands and knees during the experiment, but on attempting to raise his head higher than about a foot from the ground, the suffocating sensation compelled him to quit the chamber with precipitation, after remaining there only two or three minutes. Roberts in the mean time traversed the room in an erect posture, supplied the fire with additional combustibles, and occasionally ascended the ladder, without feeling any inconvenience, except from the heat; and after having been enveloped in the Stygian atmosphere exactly thirty-nine minutes, and afforded to every spectator a satisfactory demonstration of the efficacy of his invention, he quitted the apartment at thirteen minutes before three o'clock, and disencumbered himself of his apparatus in one of the lower rooms of the Institution. Mr. Pettigrew here examined his pulse, which was at 160, but subsided to 114 in about twenty minutes, and soon afterwards resumed its ordinary motion.

Roberts had been supplied with several bottles filled with mercury, in order that he might empty them in the room at stated periods, and preserve their gaseous contents for subsequent chemical examination. Three of these bottles were accordingly examined by Mr. Pepys, and it is a remarkable circumstance that they all appeared to be full of atmospheric air; as no mercury rose into them when opened beneath that metal, which, from the expanded state of the atmosphere of the apartment, must have been the case, if the bottles had been perfectly stopped. The air taken from the middle of the room, as to elevation, appeared to contain the largest quantity of *carbonic acid*, and the smallest quantity of *oxygen*; the following being the result of Mr. Pepys' very accurate analysis of that portion:—

Middle of the room	2	carbonic acid.
	18	oxigen.
	80	azote.
	100	

In the course of the present week, Roberts has exhibited his apparatus to the Lords of the Admiralty, to whom he was introduced by JOHN BARROW, Esq. the Secretary, in consequence of a letter kindly written to that Gentleman by Dr. BIRKBECK. Their Lordships, we understand, were greatly surprised at the simplicity of its construction, and much interested by the unadorned description of its operation given by the inventor. Sir SAMUEL HOOD, as well as other Gentlemen, expressed a very favourable opinion of its merits.

The first experiment in Southampton-buildings has been noticed in terms of considerable approbation in the *Journal des Debats*; and as we feel a strong conviction of the great utility of the apparatus, we sincerely hope that the introduction of the unassuming inventor to the LONDON MECHANICS' INSTITUTION, will be the means of procuring efficient patronage to his invention, and ultimately secure for him that remuneration to which his native talents, unassisted by the advantages of education, have justly entitled him.

M. DUPIN'S ADDRESS.

(*Continued from our last.*)

In examining these results with attention, I have remarked with great surprise, that the counties the most burthened by the poor's rates, are principally employed in agriculture: whilst the least burthened are principally devoted to manufactures; and are those in which are to be found the most of those great machines, which appear to render useless a crowd of workmen.

During the war in 1811, nine of the counties most engaged in agriculture paid for the poor a tax equivalent to *twenty-nine francs* (twenty-four shillings) a head; supposing this sum to be levied upon all the inhabitants of the nine counties.

At the same time nine counties most devoted to manufactures, paid for the poor a tax equal only to *twelve francs* (ten shillings.)

During the peace in 1821, the nine agricultural counties paid *twenty-one francs* (seventeen and sixpence) a head for the poor; and the nine manufacturing counties only paid *ten francs* (nine shillings.)

These facts speak loudly, gentlemen; they demonstrate to you the great utility of machines to the workmen, and to the poor themselves: they shew still better, that for a long time, the workmen and the poor of the manufacturing counties have not gone to gain a livelihood in the agricultural counties; but on the contrary, that it is the labourers who go from the country to the towns, in order to seek the means of subsistence, which agriculture is not sufficient to procure for them.

It is necessary, I allow, to give you these proofs, and to advance them to myself. I should blush to profess a science, the progress of which would injure the least fortunate part of society: and I would cease from extending those discoveries, which do the greatest honour to the genius of their authors, if such discoveries were not favourable to the happiness of the human species.

On the contrary, I feel myself animated by a new influence, when these truths offer themselves to me, as sure and powerful means of adding to the comfort and dignity of men of every rank.

It is not sufficient for me to have shewn to you, that in England, the whole number of the working class, although it has increased prodigiously since the commencement of the present century, has had less and less occasion to be assisted by the opulent part of the country. You must also be shewn in what consist the changes which have taken place in the condition, and the morals of men, who are engaged in mechanical operations. I hope by this, to stimulate those amongst our citizens who live by labour; to awaken a generous emulation, and a desire not to remain behind our rivals, in the career of improvements. The facts that I shall lay before you, will offer besides to the heads of great establishments, who honour this first lecture with their presence, examples worthy of being put in practice in their work-shops, and their manufactories.

Formerly, in Great Britain the working classes, as well as the superior classes of society, were addicted to excessive drinking. This vice infested and degraded all ranks, from the general to the private soldier, and from the nobleman to the artizan.

At present this vice is much diminished, not merely in the more elevated ranks; it has disappeared almost entirely from those professions in which the artizan has felt the necessity of being instructed.

Such is the amelioration, which is evident, especially amongst the workmen employed in making machines: workmen who generally can read, write and cypher: and who, for the greater part, are acquainted with the first elements of geometry, as well as many of the principles of mechanics.

A crowd of moral advantages have followed the disappearance of the single vice of drunkenness. By becoming temperate, the artizans have acquired the power of becoming economical; the future enters into their thoughts; they feel that labour can be made sufficient for their present and future subsistence. They have accustomed themselves to place in savings'-banks, the overplus of their salary, during the time when labour is abundant and well rewarded; in order to assist their wants, during the times when work is scarce, and unproductive; and on other occasions when they are ill, infirm, or weak. Thus it is seen, that they are better clothed than formerly: their dress is neater, and their linen cleaner. Their morals are equally improved. They have formed themselves to habits of prudence, and of moderation, as well as of foresight. In other words, they are become in every respect better men. Animated by a more elevated spirit, they have quickly acquired the noble determination to become able to maintain themselves, and to free themselves for ever from the degrading assistance of mendicity, or of charities granted by a tax for the relief of the poor.

Attentive observers have remarked, that in London, no individual of the working classes ever debases himself by asking alms: he neither suffers it in his wife, nor in his children. He is influenced by that pride, which can endure indigence, and all the privations of life, rather than stretch out a hand, to obtain help without having earned it. One may thus easily explain how it happens, that in a city such as London, where food is so dear, and rent so extravagant; where so many sources of misery are accumulated with so much luxury, the poor-rates for the city do not amount to half of the tax collected in the richest agricultural counties.

A parliamentary enquiry which is not yet finished, but of which a part is already known to the public, presents to us respecting the amelioration of the industrious classes, facts authentically established, and worthy of all our attention.

Behold the result of the examination of one of the principal mechanists in the city of London. "Within the last thirty years," says Mr. Galloway, "the character and tone of the English artizans and mechanics have undergone a decided improvement: not only in knowledge, but in conduct.—This is the fact," continues this skilful mechanician, "in my manufactory, and I will state the practice which I adopt. I have found, from the mode of managing my business, by drawings and written descriptions, a man is not of much use to me, unless he can read and write. If he apply for work, and says he cannot read and write, no more questions are asked. But if he can read and write, the next question is, where do you come from? and what are you? and can you produce a character? Unless he conforms with these enquiries, I cannot employ him." By which means, full of wisdom, this manufacturer has rendered general among the workmen under his direction, a degree of good conduct, and a deportment such, that any person visiting his manufactory, will see as much good order and regularity in the men, as in the better classes of society. He does not admit obscene and vulgar language to be used in the manufactory. The men themselves fine those who behave improperly, and their general character has improved; and he has found invariably, that the men who are best educated, have always conducted themselves the best, and have most completely conformed to the regulations of the factory; whilst the ignorant have been invariably refractory, obstinate, and difficult to manage."

"My workmen," says he, further, "do not recur to parochial aid; they would consider it the greatest indignity that could be offered to them while in health and employment."

This tax is further useless in the manufactory of this skilful mechanician, because a fund is there formed for the assistance of the sick: a fund which procures for them, in the most economical manner, certain assistance under every possible accident. One shilling is retained weekly from the wages of each workman. When one of them becomes ill, he receives immediately from this fund, one pound weekly. The simple labourers pay only half, and receive only half the sum last mentioned, when they are indisposed. Every year, at Christmas, the workmen appoint inspectors, who audit the accounts of the association. Soon afterwards, if the receipts exceed the expenditure, the surplus is divided amongst all the workmen, according to the proportion of the sums which they have placed in this bank for their support. The existence of this bank is sufficient to render the manufactory of which we are speaking, preferable to those of the same description which do not possess one.

Should we wish to form an idea of the advantages which the manufacturer who, with so much zeal interests himself in the condition of his workmen, in their instruction, and in their prosperity, has derived from his care, so truly honourable to human nature, it will be sufficient to quote one of the questions which were addressed to him by the Committee of the House of Commons, before whom he was called to give evidence. —"What is your summary mode of enforcing performance of a contract, if any men decline fulfilling it?" "We have not had, in twelve years, one single dispute, although I have employed, within that period, from one thousand to fifteen hundred men." This answer is the most beautiful apology for the principles adopted by Mr. Galloway for directing his labours and instructing his workmen.

Many other manufactories of machines are conducted with the same wisdom as that of the engineer, whose views and opinions we have already exhibited. This wisdom produces every where the same satisfactory results.—There still exist, however, some establishments imperfectly regulated in this respect: they have preserved, until this period, the routine, and the numerous defects which have been noticed in the English manufactories for the last thirty or forty years; but their number diminishes with rapidity, partly by their want of success, and partly by the force of good example. The era will soon arrive when British industry will govern its labourers with feeling and intelligence only, and no longer by fear or by prejudice.

Let us now examine the labouring class under the point of view which the progress of its instruction presents.

In the year 1817, when I visited Scotland, I was every where struck with the instruction generally diffused amongst this interesting class of men. I have cited numerous and remarkable examples of this diffusion. I have endeavoured to direct the public attention to an institution of which I have so sensibly felt the importance. It is a school for teaching the theory of the mechanical and chemical arts; intended not only for the directors of the workshops, and the rich manufacturers, but intended particularly for the simple workman. I have delineated the advantageous effects produced by this institution upon the industry of the city of Glasgow.

The plan offered by the Andersonian institution of Glasgow, is now imitated in London, in Edinburgh, in Aberdeen, in Leeds, in Manchester, in Birmingham, in Newcastle, in Liverpool, in Lancaster; and it will be followed successively in all the towns of Great Britain.

Already the English mechanics feel a profound conviction of the great utility of scientific knowledge for directing them in the conduct of the operations which they ought to perform. Let us say, and repeat it incessantly, the greatest part of them know how to read, write, and cypher. Many even are prepared to draw correctly the machines or the objects which they construct; and to give geometrical elevations, plans, and sections of them. They read periodical works published respecting the arts which belong to them, and technical works published in numbers, for three-pence, four-pence, and six-pence, weekly. I shall notice particularly the Mechanics' Magazine, of which sixteen pages appear weekly, and the journal called the Chemist, which appears also in similar numbers, sold at the same moderate price.

It is to Dr. Birkbeck, professor of mechanics in the Andersonian Institution, that Great Britain is indebted for the extension of scientific instruction to the working classes. The first prospectus of the course of lectures, which he opened with this intention in the city of Glasgow, contains views and reflections equally just and profound: their utility induces me to communicate them to you. I shall endeavour to realize for you, what the learned Scotch professor has so happily accomplished for his pupils.

"In the prosecution of this design," says he, "I shall deliver a series of lectures upon the *mechanical properties of solid and fluid bodies*, abounding with experiments, and conducted with the greatest simplicity of expression and familiarity of illustration, solely for persons engaged in the practical exercise of the mechanic arts: men, whose situation in early life, has precluded even the possibility of acquiring the smallest portion of scientific knowledge, and whose subsequent pursuits, not always affording more than is necessary for their own support, and that of their dependant connections, have not enabled them to *purchase* that information, which curiosity too active for penury wholly to repress, or the prevailing bias of their natural genius, might prompt them to obtain. I am by no means sanguine in my expectation, that by a course of instruction, such as I have now proposed, one artist will be directed to the discovery of any thing which is essential or important in his particular department, how much soever it may be connected in principle with the subject to be discussed. I am too well aware that the best contrivances in every branch of the mechanic arts, have resulted, and must still continue to result, from the observation of practical defects, and from the gradual application of suitable means, dictated by practical maxims, to obviate or remove them. But whilst my slight acquaintance with the subject has afforded this information, I have become convinced that much pleasure would be communicated to the mechanic in the exercise of his art; and that the mental vacancy which follows a cessation from bodily toil, would often be agreeably occupied, by a few systematic philosophical ideas, upon which at his leisure he might meditate. It must be acknowledged too, that greater satisfaction in the execution of machinery must be experienced, when the uses to which it may be applied, and the principles upon which it operates, are well understood, than where the manual part alone is known, the artist remaining entirely ignorant of every thing besides. Indeed, I have lately had frequent opportunities of observing, with how much additional alacrity a piece of work has been undertaken, when the circumstances were such as I have now stated.

"Perhaps to some it may appear that the advantages derivable from these lectures will be inconsiderable, or even, that they will be disadvantageous, on account of the extent of the subjects they embrace, and because those to whom they are addressed do not possess the means or enjoy the opportunities, calculated for engrafting upon the elementary truths which they learn, the extensive researches of the illustrious philosophers, by whom the boundaries of science have been enlarged. Whatever the arrogance of learning may have advanced in condemnation of superficial knowledge, and however firmly I may be persuaded that the people cannot be profound, I have no hesitation in predicting, that vast benefit will accrue to the community, by every successful endeavour to diffuse the substance of great works, which cannot be perused by the people at large, thereby making them reach the shop and the hamlet, and converting them from unproductive splendour, to useful though unobserved activity."

The experience of twenty-four years has fully demonstrated the excellence of these views, and the justice of these thoughts: the workmen of Glasgow possess at the present moment a practical knowledge and a dexterity celebrated in the whole of Great Britain.

I am persuaded that in employing analogous means for the industrious people of France, an improvement still greater and more rapid will result. Who can doubt the intelligence of the French artist, and his capability of promptly seizing the objects which are presented to him. In the works that I have long directed, in the midst of our most active arsenals, I have had the opportunity of convincing myself of its truth.

The workmen that I have instructed have assisted me in executing the scientific experiments upon the strength of timber, that I have made in pursuing my individual researches, or by the command of government at Toulon, at Corfu, and at Dunkirk. These workmen perfectly comprehended the geometrical methods and the parts of mechanics which I explained to them: they learnt to use their intellectual faculties, and very often they perfected the practical methods which I pointed out to them. They have contributed to the success of my experiments, as well as to that of the labours of many other engineers whom I could mention. This proves to us, that the French workmen do not yield to those of any other nation in their aptitude to seize and to apply the principles of science.

The workmen that my colleagues and myself thus instructed, during the last war, were not men chosen from their infancy to give them a particular and careful apprenticeship: they were artizans furnished at hazard by conscription—house carpenters, smiths, joiners, and blacksmiths; for the most part accustomed only to the rough works of small towns, or of the country. In the evening we taught them to read and write, and in the day time to draw vessels.

Do you know, gentlemen, the results of these endeavours, conducted by the former scholars of the Polytechnic School?

At the time of the last war which France has sustained against England, the engineers of the marine had received from the conscription six thousand workmen, for the most part uneducated, and only capable of performing rough works. A year afterwards, thanks to the instruction we had given them, they were no longer the same men: they were equal to the execution of the greatest labours. In the single port of Anvers, they constructed an entire fleet: they had at the same time on the stocks twenty, two and three-decked vessels; and four years afterwards, they had at the same time twenty vessels at sea, and twenty others on the stocks to replace these.

The army had need of our services; and these same workmen constructed over the Danube, opposite to Essling and Wagram, under the fire of the enemy, bridges sufficicient for the passage of an immense army. This vast labour was completed with the coolness, the mathematical precision, and the rapidity, which could only have been expected from the most able men, working in perfect security, and in undisturbed leisure.

Gentlemen, what the engineers of marine have done, to instruct in the nautical arts, six thousand workmen taken by conscription from all the departments of the lowest professions, we can do with equal success for the civil arts.

We shall now survey the probable results of such a state of perfection, introduced into the education of the industrious classes of society. And here we shall not only speak of what may probably occur, by means of the facilities offered to many men who have received from nature a superior genius, but likewise exhibit the salutary influence which, by means of mechanical discoveries, these men may exercise upon their country.

To change the face of a great branch of industry, to open to the commerce of a people new sources of riches and of prosperity, it has often been sufficient to perfect a single instrument, or a single machine.

Two Dutch workmen invent the telescope, and soon new heavens are discovered; the satellites belonging to the most distant planets are perceived; the system of the world is known, as to its laws; means of observation are given to the navigator; and science, and the arts, and commerce, make an unexpected effort, in consequence of a former mechanical discovery. Watt improves the steam engine, and this single improvement causes the industry of England to make an immense stride. This machine represents, at the present time, the power of three hundred thousand horses, or of two millions of men, strong and well fitted for labour, who should work day and night, without interruption and without repose, to augment the riches of a country, not more than two thirds the extent of France.

A hair dresser invents, or at least brings into action, a machine for spinning cotton: this alone gives to British industry an immense superiority. Fifty years only, after this great discovery, more than one million of the inhabitants of England are employed in those operations which depend, directly or indirectly, on the action of this machine. Lastly, England exports, for four hundred millions of francs, cotton spun and woven by an admirable system of machinery. The Indies, so long superior to Europe—the Indies inundated the west with their products, and exhausted the treasures of Europe—the Indies are conquered in their turn. The British navigator travels in quest of the cotton of India, brings it from a distance of four thousand leagues, commits it to an operation of the machine of Arkwright and of those which are attached to it, carries back their products to the east, making them again to travel four thousand leagues, and in spite of the loss of time—in spite of the enormous expense incurred by this voyage of eight thousand leagues, the cotton manufactured by the machinery of England becomes less costly than the cotton of India, spun and woven by the hand, near the field which has produced it, and sold at the nearest market. So great is the power of the progress of machinery.

Now, gentlemen, I will venture to say to those men, who look upon the working classes as nothing but mere machines, I know a machine still more powerful than that of Watt—more intelligent than that of Arkwright, and capable of attaining much higher perfection. The whole world does not possess ten thousand of the machines of Watt, and twenty thousand of the machines of Arkwright. Ah well! I am acquainted with a description of machine, of which the earth possesses copies to the amount of two thousand millions. The steam engines throughout the world do not represent a force superior to that of four hundred thousand horses, and I know one which represents by its multiplication the force of a hundred millions of horses. What, then, is this machine? Must I pronounce it, and adopt language so revolting?—It is man.

These statements alone suffice to demonstrate the material and pecuniary advantage of improving the productive and labouring faculty of the human species, even in the eyes of those proud beings, who look upon the individuals of the manufacturing classes as nothing but machines or beasts of burthen.

But other considerations more vast and more noble ought to direct the statesman, ought to inspire the generous friend of humanity, and ought to influence religious minds, which see, in every rank of society, simple mortals, called by the author of the universe to future destinies, eternal and sublime.

Among so many nations, so different in their character and in their possessions, whether intellectual or physical, the French nation is one of those which nature has favored the most. Her activity has enabled her promptly to execute enterprises the most difficult and the most complicated. In all classes the understanding is extensive and rapid; the courage is ardent and enterprising, increasing by the difficulties to be surmounted, as well as by the dangers to be overcome; if we are deficient in any thing, it is, perhaps, in perseverance, particularly when success advances slowly to reward our efforts. But in this respect even, it would be exceedingly unjust to overlook and to deny the progress which our national character has made during forty years. The people in this respect, like individuals, are matured by great circumstances and great misfortunes, and of this we may be sure, that when a nation becomes illustrious, it has ceased to be frivolous.

At this day, France possesses in the intelligence of its inhabitants, as well as in the resources of its territory, every thing which can place it amongst the industrious, enlightened, powerful, and civilized nations. But to obtain this high rank, we have occasion for labours the most extended, and exertions of mind and of body distributed through all classes of society: amongst the learned, to discover the means and to give directions; amongst artists, for the application of abstract discoveries, and to trace the new paths which inventors describe.

In pursuing this career, let us never cease to remember, that we shall have constantly to contend against a people, eminently industrious, active, and persevering; against a people, who will not easily yield to us the victory, and who will regain from us all our advantages, if we remain inactive a single instant. I have already said much to you respecting this rival nation; I must however say more of it still, in order to shew you the nature and extent of those labours which it will compel you to undertake and to achieve. Let us compel ourselves to contemplate that which constitutes the true power of a kingdom, which in war as well as in peace, is destined incessantly to contend against us: and let us especially protect ourselves against that false patriotism, which would make us practice deceit upon ourselves, respecting both ourselves and our antagonists.

It has been considered a great injustice to England to declare that she achieved her victories by her treasures, which subsidized a multitude of strange people, and not by the valour of her own defenders. This was at once indeed to confess, that gold itself is a military force: and how had England acquired this gold? had she procured it from her mines? She has none which produce this metal. Had she wrung it from conquered people in her foreign possessions? This we have believed, and by it we have deceived ourselves. Neither India nor America has ever enriched, by their tributes or their spoils, the public treasury of Great Britain. What then has been during all this time the source of this treasure? It is the industry of the people, and the labour which is its element.

(To be concluded in our next.)

LONDON MECHANICS' INSTITUTION.

DR. BIRKBECK'S LECTURE ON GALVANISM.

INTRODUCTION—DISCOVERIES OF GALVANI—CONSTRUCTION OF THE PILE OF VOLTA—EFFECTS OF VOLTAIC ELECTRICITY—EXPERIMENTS OF SIR HUMPHRY DAVY—DECOMPOSITION OF ALKALIES, &c.

WEDNESDAY, 30TH MARCH.

Dr. BIRKBECK introduced the subject of the evening's discourse by a series of observations on the extraordinary action of *atoms* or particles of matter on other particles of matter to which they may be applied. In the course of the various lectures delivered to the members, frequent opportunities had been presented to them, of observing the changes effected by the action of these atoms upon each other. They had seen, for example, that the particles of lime floating in one fluid, immediately disappeared upon the addition of another fluid, such as nitric acid: or if the particles of lime were previously dissolved in the fluid, they became apparent by the addition of another acid, the carbonic. Similar changes had been witnessed in many other instances, and in every case the effects were produced by the mutual action of such atoms, though the researches of science had not yet arrived at a knowledge of the atoms themselves, and their existence was therefore only hypothetical.

But the effect of these atoms is sometimes more strikingly exemplified: as particles of gaseous matter are occasionally found to act on a solid substance, so as to produce, not merely an inert chemical change, but an evident and visible influence. Thus, if the gaseous fluid contained in the vessel now produced, is brought into contact with the metallic substance exposed to its influence, the latter will be ignited. The Doctor exemplified this remark by causing a stream of *hydrogen gas* to flow through an orifice, and fall upon a portion of spongy *platinum*, which immediately acquired a bright heat, sufficient to inflame the jet of hydrogen. Thus it was seen that the gas in its cold and simple state, flowing on a cold metallic oxide, occasioned it to commence ignition, and gave rise to that sort of motion which rendered it capable of inflaming a combustible body. If we employ another combination of the particles of matter, and expose it to the sudden pressure occasioned by the fall of a hammer, a considerable chemical change is produced, and immediate ignition ensues. The lecturer here exhibited a small pistol upon Manton's percussion principle, furnished with a copper cap of a conical form, containing *chlorate of potash* and *sulphur*, which instantly exploded upon receiving the blow of the hammer, and was therefore employed to produce ignition in pistols and guns. From these examples it appears that it is only necessary to bring these atoms into action upon each other, to produce light, caloric, and combustion.

The effects of these influences of matter are not however confined to simple chemical changes, or the evolution of light and caloric; for if two pieces of metal of different kinds are brought into contact, they exhibit electrical phenomena, and no longer remain in a neutral condition. Thus the effects of *zinc* and *copper* on the electrometer show that the former possesses *positive*, and the latter *negative* electricity, and the mere contact of these two metals, from a *redundancy* of electricity in the one, and a *deficiency* in the other, occasions a mutual disturbance of their particles.

After these preliminary observations, Dr. Birkbeck proceeded to illustrate the subject of GALVANISM, which he characterised as one of the most remarkable discoveries that ever occurred in the annals of science, and as arising entirely from accident, if that term could in any case be applied with propriety. In the year 1790, the wife of Galvani, professor of philosophy at Bologna, found it necessary to use frogs as an article of diet in consequence of their supposed utility; a number of these frogs, which had been prepared for cooking, were lying in the laboratory, when one of his pupils was drawing sparks from the prime conductor of an electrical machine; and happening to touch the exposed nerve of one of them with his scalpel, he observed that a sudden contraction of its limbs occurred. Similar contractions took place in the limbs which were hung upon iron hooks, and it was found that by placing one part of a frog upon one metal, and another upon a metal of a different kind, and connecting them by a metal, a still more active motion of the limbs was produced.

Dr. Birkbeck exemplified these remarks by placing the lower extremities of a frog in contact with a piece of *zinc*, the crural nerve of the animal being armed with a coating of *tinfoil*; and it was seen that the moment the tin was made to touch the zinc, the limbs began to move as if the animal was living. The same effect was produced by touching the tinfoil and the zinc at the same time with an arched piece of silver wire, and thus they may be made to occur even twenty-four hours after the death of the frog. Now this convulsive action occurring in the limbs of a cold-blooded animal, was called by Galvani *animal electricity*; which he considered as a property of living matter, and conceived that something in the nerves or muscles themselves occasioned their contraction.

The celebrated Volta, however, finding that the employment of two metals was always requisite to produce the effect, and also that it was necessary to bring them into contact, thought it merely an electrical phenomenon, and attributed the effect to a disturbance of the electrical equilibrium. He considered that though this disturbance of equilibrium might not always be indicated by the electrometer, the frog itself was a singularly excellent electrometer, and afforded a similar indication of the electrical effect of the metals.

Volta, Fowler, Robison, and other philosophers have differed in opinion as to whether the effects produced by galvanism are to be considered as *nervous* or *electrical* phenomena, and very singular discoveries have resulted from their contests upon these points. The human body has been subjected to similar excitations, and it is found that if a plate of *silver*, such as a half-crown, be placed upon the tongue, and a plate of *zinc* below it, upon bringing the anterior edges of the two metals into contact a sharp and peculiar taste is experienced; the tongue in this case appearing to act as an electrometer. If the *zinc* be placed beneath the tongue, and the *silver* between the lips and gums near the eye tooth, a distinct flash of light is seen when the metals touch each other. If they are applied to a part of the body, from which the cuticle has been removed by means of a blister, the sense of touch, like that of taste, indicates the presence of this active power. Some connoisseurs in porter consider that it has a superior flavour when drunk from a pewter pot, and the pewter being composed of two different metals, the effect has been attributed by Professor Robison to galvanic influence. Robison has also observed that snuff, when taken from a tin box, in which part of the *iron* has become exposed, has a different flavour from that which it possesses when in contact with *tin* alone. *Solder*, which consists of an admixture of metals, corrodes and tarnishes sooner than the pieces of metal it is used to unite; and in the same manner, when the *copper sheathing* of vessels is fastened with *iron bolts*, the sheathing corrodes, and becomes loose; for which reason, it is found necessary to fasten copper sheathing with bolts of copper instead of iron.

In this state the subject remained till Volta, in the year 1800, communicated to Sir Joseph Banks, in a letter from Como, the extraordinary discovery which had resulted from his endeavours to increase the activity of galvanic influence, by combining several pieces of metal. He took a number of pairs of *zinc* and *copper*-plates, which he placed upon each other, separating the pairs by discs of moistened paper, and found that by applying a moistened finger at each end of the series, he immediately received a smart shock. This apparatus, which is called the *Voltaic pile*, led to many discoveries in England; and though its principle is like that of galvanism, the range of power obtained by its means is so extensive, that in honour of Volta, the science in which its agency is employed, has been denominated *Voltaic Electricity*, or *Voltaism*, while the term *galvanism* has been limited to that part of the subject which relates to mere animal motion.

Dr. Birkbeck then described the mode of constructing the *voltaic pile*, by commencing with a plate of zinc, then one of copper, then one of moistened paper, and proceeding in the same order, viz. zinc, copper, paper, &c. to any extent at which the pile can be supported. Several of these piles may be connected together, by means of wires, provided care be taken that each pile commences with the contrary metal to that which terminates the adjacent pile, and that the whole series begins and ends with different metals. If a large piece of metal, such as a key, or a mason's chisel, be now presented to the two extremities of the series of plates, a distinct shock will be instantly felt in both arms.

The first important result of the accumulation of galvanic power by the voltaic pile, was the decomposition of water, which effect was observed by Messrs. Nicholson and Carlisle, to take place when the wires were made to communicate with that fluid. They also observed that one end of the wire became *oxidated*, and furnished no gas, while it was freely supplied by the other end; and they found it difficult to conceive in what manner the oxygen was communicated through the water from one point to the other, when the wires were two or three inches apart.

As a more convenient method of constructing the pile, Volta placed his discs in cups of water; and Mr. Cruickshank, of Woolwich, introduced the plan of soldering the plates of zinc and copper together, and fixing them in grooves in a mahogany trough; each division containing two metallic plates, the plates of zinc being thicker than those of copper. Between each of these cells a fluid was introduced, generally containing a portion of *nitric*, *sulphuric*, or *muriatic acid*, or two of them; and by this arrangement, the galvanic action, when once commenced, might be continued to a great extent. It was afterwards thought an improvement to make the pairs of plates moveable, so that they could be raised from the cells when they were not in use, and sunk into their places when necessary. The Wollaston arrangement consisted in surrounding the single plates of zinc with copper; the power of the zinc being obviously increased by placing the plates of copper on each side, and a corresponding increase of effect was by this means obtained.

After observing that the methods of arranging the metallic plates were susceptible of considerable variety, the Learned President proceeded to explain the arrangements adopted by the celebrated Sir Humphry Davy, and referred to the following diagrams, which exhibit the important results of his scientific experiments on the combinations of various metals in the formation of the voltaic battery:

Most oxidable Substances.	*Less oxidable Substances.*	*Oxidating Fluids.*
Zinc . . .	With gold, charcoal, silver, copper, tin, iron, mercury	Solutions of nitric acid in water, of muriatic acid, of sulphuric acid, &c. Water holding in solution oxygen, atmospheric air, &c.
Iron . . .	With gold, charcoal, silver, copper, tin . .	
Tin . . .	With gold, silver, charcoal	
Lead . . .	With gold, silver . .	
Copper . . .	With gold, silver . .	Solution of nitrat of silver and mercury. Nitrous acid, acetous acid.
Silver . .	With gold . . .	Nitric acid.

This diagram exhibits the different arrangements by which the simple galvanic circle is formed; the highest metal (*zinc*), being *positive* to all the metals below it: and any of the metals below it being *negative* to all above them. The best arrangement is the combination of *zinc* with *copper*, and the employment of water mixed with *nitric acid* and a small quantity of *sulphuric acid*. In the apparatus on the lecture table, the proportions of the acids mixed with the water, were eight parts of nitric to one of sulphuric acid, of strength, therefore much greater than is commonly employed.

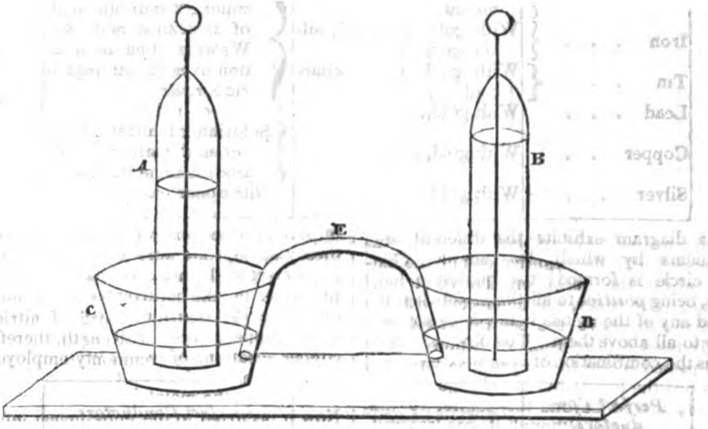
Perfect Conductors.	*Imperfect Conductors.*	*Imperfect Conductors.*
Charcoal . .	Solutions of alkaline hydro-sulphurets, capable of acting on the first three metals, but not on the last.	Solutions of nitrous acid, chlorine, muriatic acid, &c. capable of acting on all the metals.
Copper . .		
Silver . . .		
Lead . . .		
Tin . . .		
Iron . . .		
Zinc . . .		

The other arrangements adopted by Sir Humphry Davy are shewn in the second diagram, as above; and the lecturer observed that any one of these metals, with two of the fluids, produced galvanic action, though not so powerful as the preceding combinations.

Having thus elucidated the general principles of the science, and the different arrangements of metals by which galvanic influence may be excited, Dr. Birkbeck proceeded to perform some interesting experiments with the voltaic battery, for the purpose of bringing this powerful influence into action, and exhibiting the effects produced by it. For this purpose he employed a battery of the first construction, consisting of three troughs of twenty-four pairs of square plates each, of four inches. When the wire from the positive or zinc end of the battery was brought into contact with the wire from the negative or copper end, a vivid combustion ensued; the wire burnt like a piece of thread, and became ignited through its whole extent; thus proving that a simple galvanic apparatus was capable of producing a heat sufficient to burn a considerable portion of metallic wire. A piece of *gold leaf* was then laid upon the surface of some mercury in a flat vessel, and the wires being properly applied to it, the gold leaf was instantly consumed. The energy of the electrical power excited by the battery, was thus proved to be intense enough to burn the most untractable and incombustible substance with which we are acquainted, for the gold was no sooner brought within the voltaic circle, than it was ignited and consumed, A thin sheet of *silver* was then exposed to the action of the battery, when it burnt with a beautiful green hue, throwing a delicate tint of lucid green upon every object on the lecture table, while the *oxide of silver* rose in a white film on the galvanic wire. *Dutch metal* was still more readily consumed, and during its combustion, streams of variegated light with the projection of numerous ignited globules ran through the whole extent of the sheet.

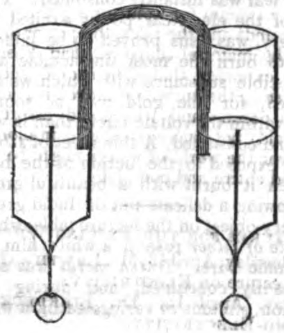
If a portion of *water* be made part of the voltaic circle, it will be found that a change will instantly occur, and the water will be decomposed into its original elements. Dr. Birkbeck here performed a most interesting experiment, by placing within the galvanic circle a vessel of water, furnished with two perpendicular tubes; and upon connecting with the platinum wires of the apparatus, the wires proceeding from the two extremities of the battery, bubbles were seen rising in the tubes, and displacing the water they contained. One of the tubes received *hydrogen* from the *negative pole*, while the *oxygen* which proceeded from the *positive pole* rose in the other tube; and thus the decomposition of the water was proved, by the exhibition of its two constituents in the separate tubes, according to their relative proportions of volume.

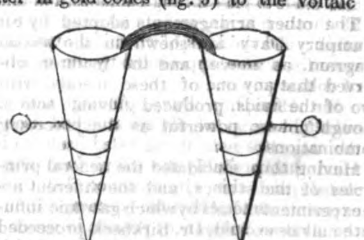
Fig. 1.



To explain this decomposition, a diagram of which fig. 1st is a copy, was described. The tubes A, B, containing the water to be decomposed, are immersed in the cups C, D, which are connected by means of asbestos, or the bent tube E filled with water or a colored fluid. On connecting the wires with the poles of the battery, decomposition takes place.

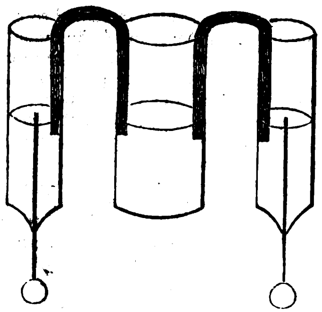
In many of these experiments an acid and an alkali were observed to appear, and Sir H. Davy, who first succeeded in obtaining the gases separate, and also noticed these productions, suspecting that they arose from impurities, repeated the experiment in agate cups (fig. 2) connected by moistened asbestos. The decomposition took place in the same manner, but with less impurity, the water having been carefully and repeatedly distilled in silver vessels. But the demonstration of the source of these impurities, the alkali of the glass vessels, and the atmospheric air dissolved in the water, was completed by exposing the same distilled water in gold cones (fig. 3) to the voltaic





action. Oxygen gas and hydrogen gas were then obtained separate, without the slightest trace of either acid or alkali.

Dr. Birkbeck here observed, that the four *supporters of combustion* are *electro-negatives*, and the 48 *combustible bodies*, together with *azote*, are *electro-positives*. If some compound fluids are subjected to an operation similar to that which had been performed on *water*, a further decomposition will take place, of which examples were quoted; and the mode of exhibiting the transference of parts of the decomposed substance, through matter of different kinds with which it would otherwise have combined, yet without any combination occurring, was particularly described. We shall however only quote two experiments performed with the apparatus represented by fig. 4th. The first of the three vessels con-



taining a solution of sulphat of potash, was connected with the negative end of the battery, whilst the vessel on the right hand holding pure water, was connected with the positive extremity: the central vessel was partly filled with infusion of litmus. The acid passed across to the positive wire, and reddened the litmus, but the change of color did not extend beyond the centre, so that the negative side, although it was transmitting the acid, was not affected by it. An experiment of precisely an opposite kind was performed with the infusion of turmeric, with a similar result; and afterwards the two operations were combined in the same experiment, so that soda passed through turmeric and muriatic acid through litmus, each without changing their colour. Acids were also made to pass through alkalies, and alkalis through acids, without interrupting each other; and the laws of chemical attraction, were for a time superseded by the exertion of voltaic power.

Sir Humphry Davy, finding that an *alkali*, like a *metal*, always attached itself to the *negative pole*, it suggested itself to his mind that probably the *alkali* was also a *metal;* and this circumstance led to his experiments to effect the decomposition of the alkaline substance, potash, in which he availed himself of a powerful voltaic battery in the Royal Institution, consisting of 500 pairs of plates. A piece of *potash* being placed on an insulated disc of platinum, the influence of this extensive apparatus was exerted upon it, when portions of gas were thrown off in bubbles, and a substance which instantly inflamed was also observed, now known to be its base, the extraordinary metallic body *potassium.* Thus the agency of this powerful instrument of analysis, directed by the powerful mind of Davy, effected the decomposition of a substance which had been considered for ages as *simple* and *undecomposable,* and thus were completed the three grand discoveries in the science of galvanism. 1. Its influenee on animal bodies; 2. Its extensive power as a chemical agent; and 3. the phenomena of transference and decomposition effected by Sir Humphry Davy.

Dr. Birkbeck further illustrated this subject by exposing a solution of *silver* in *nitric acid,* to the action of the battery, which precipitated the silver in a metallic state, in the form of a coating round the negative pole. This was sufficient to shew in what manner metallic salts were separated, and *metals* attached themselves to one pole of the battery, while the *acids* were attached to the other. The lecturer shewed the effect in a still more striking manner by inverting the apparatus, when the silver was still precipitated towards the same wire, though it now occupied the upper part of the apparatus.

In the hands of Sir Humphry Davy, such important discoveries were not confined to theory alone, but were directed to the improvement of the arts. He has applied these principles to the contrivance of a mode of obviating the injurious effect of sea water upon copper. It is well known that the copper sheathing of vessels becomes covered with a green coating, which is succeeded by another, till the metal is entirely corroded. Now it occurred to the enlightened mind of Davy that if he could render the copper *electro negative* by the addition of another metal, he should deprive the ocean, which is *electro-positive,* of its corrosive power, and render it inert and innocuous. He succeeded in preserving the copper bright and uncorroded by covering a small portion of its surface with tin, zinc, or cast iron, and thus, by a simple application of scientific knowledge, this illustrious chemist protected our vessels against an evil for which no remedy had been previously discovered.

The worthy President concluded his admirable lecture by observing, that as the researches of science had made us acquainted with the mode of governing the lightning, and placed at our disposal the irresistible agency of steam for controuling the power of the winds and the tides, the power of man over the material universe had been so greatly extended, that if he should succeed in arresting the turbulent movements of the restless ocean—and who could assert that he would not succeed—the dominion of man over the world of waters might be pronounced entire and complete.

LECTURES FOR THE ENSUING WEEK.

Wednesday, April 13, Mr. LEWTHWAITE'S First Lecture on ELECTRICITY.

Friday, April 15, Dr. BIRKBECK on THERMO-ELECTRICITY.

SPITALFIELDS MECHANICS' INSTITUTION.

We understand the Committee of this Institution have arranged with Mr. WALLIS for a course of lectures on ASTRONOMY, to commence on Monday evening next. This measure deserves the highest commendation, as lectures on that sublime and interesting science cannot fail of exciting the attention of the mechanics of that populous district, and of directing them to the consideration of the principles of science which *must* eventually prove highly beneficial to them. We believe the Committee contemplate, after these lectures are concluded, the regular delivery of courses of lectures on Mechanical Philosophy and Chemistry, comprising Mechanics, Hydrostatics, Pneumatics, Optics, Astronomy, Electricity, Galvanism, Magnetism, and Electro-Magnetism. We hope they will possess themselves of the necessary apparatus for the illustration of the principles to be explained in those lectures, previous to their commencement. As we are aware of their disposition to encourage any ingenious mechanic who may have any article of that description of his own manufacture, should any of our readers have any piece of apparatus to dispose of, he would be serving the Institution by making it known to the Secretary.

LECTURES FOR MECHANICS AT PARIS.

M. Dupin finished, on Saturday, March 26, the course of Lectures on Mechanics and Geometry, which he delivered at Conservatoire des Arts et Métiers. for the instruction of the working classes. More than five hundred persons, chiefly of these classes, attended his lectures; and no doubt can be entertained of their utility, for they were listened to with profound attention. The progress of industry will become incalculable, when she is guided by science.—*Courier Francais.*

NEW DISCOVERY.

A French chemist has recently invented a composition which effectually preserves iron and all other metals from oxydation, or other injury. He has applied this discovery in several instances, and always with success; and one of its great merits is, that its cheapness renders it applicable to the most ordinary purposes.

A NEW DANDY HAT.

A Hat-maker in the Strand has obtained a patent for a new hat, which is well suited to our Opera House Dandies, as by means of a spring it may be suddenly made quite flat, and carried under the arm pleasantly. When the spring is loosened, the hat returns to its original shape. The invention is clever enough, and will, we dare say, remunerate the patentee.

HIGH PRICE OF PROVISIONS.

A correspondent in Paris, from whom we have had many valuable communications, informs us, that upwards of fifty mechanics and journeymen manufacturers had arrived in that capital within the last month in search of employment, which they obtained without difficulty; and that on being asked why they left England, they replied, that the price of provisions had increased so considerably that they were unable to remain in it. This information is of a nature to command the attention of our political economists, and that of the Government; for it never can be judicious to allow the effective part of our population to quit us, and carry their industry and talents to our rivals, merely because there is some vice in our system, which might be removed without much difficulty. It is argued that the present high price of provisions is a proof of the prosperity of the country; but we do not understand how that state can be called prosperous, in which the great operative body derive only the disadvantages of a change of things without any of its benefits. If it can be shown that in the same proportion as the price of provisions has risen, the wages of the mechanic and manufacturer have been increased, or rather that the latter has been a gainer by the rise, for we contend that to a certain extent he ought to be so, there will be an end of our objection; we fear, however, that it will be found that the operative classes are sufferers by this change, and that too in a very considerable degree.

The price of butcher's meat has risen, within a period of three years more than forty per cent.; and bread, which was at 8d. the quartern loaf in 1822, is now at 11d. We understand that bread is selling at 8d. in many parts of the metropolis; but these being exceptions to the general rule, we must still assume the regular market price to be what we have stated it. So it is with many other articles of food, and yet the wages of the operative classes remain nearly as low as they were three years ago, in many instances quite as low, or even lower. We do not profess to understand the cause of this, or to point out a remedy; but it is probable that having called the attention of the public to the subject, we may be favoured with some communications, which will answer the object that we propose to ourselves in touching upon it, viz.—the welfare of the most deserving part of our fellow-creatures. We had written thus far, when a recent number of a Nottingham paper was put into our hands with the following paragraph:—

"The journeymen tailors and stone-masons in Nottingham have turned out this week for an advance of wages; and the workmen employed in the manufacture of drawers, shirts, caps, and pieces are also seeking for an advance of priest. The high price of provisions is assigned as the cause."

FAMILIAR LESSONS ON MINERALOGY.

(*Resumed from Page* 367.)

We shall now proced to describe the *ores of zinc.*

Ores of zinc form two distinct substances, as blende, or *black jack*, and *calamine.*

Ores of blende are commonly black, brown, or yellow, of different shades, often appearing in clusters (confused crystallizations) upon the surface of specimen, and may be known by the touch of the knife, being soft; and by scratching it a lighter colour is produced: the yellow variety, when strongly rubbed, yields phosphorescent sparks. These ores are always light and soft when compared with tin, by means of which they may be readily distinguished; and under the flame of the blow-pipe zinc evaporates in white fumes.

Calamine.—This ore of zinc has generally a stone-like appearance, commonly porous, not unlike burnt bones, and of a brownish yellow colour; it is heavy, and some pieces when struck have a metallic sound; some varieties are electric, and give fire like steel. Like blende, it is in great abundance in Derbyshire, and is used to convert copper into brass; on being exposed to great heat, and the vapour made to pass below (condensed) into water, metallic zinc is formed, which, until some years past, was imported into this country from China and Holland.

A very pretty experiment is performed with a small particle of this metal, which, though generally known, we will detail for the purpose of showing the great affinity of metals.

Example, Lead is acted upon by vinegar, and forms acetate or sugar of lead, which when dissolved in water forms a white precipitate, and a perfectly transparent solution. If a piece of zinc, suspended by a thread, be immerged in the fluid, it will be covered almost instantly by the finest flakes of lead, regenerated in its metallic state, which may be seen approaching the zinc in all directions.

This beautiful, amusing, and instructive experiment, cannot sufficiently be admired; it is a lesson upon attraction and affinity, which cannot fail to please the learner, who has not heretofore seen it performed.

When mercury, commonly called quicksilver, occurs in the state of ore, how can it be known in its rough and natural appearance?

Quicksilver exists in semi-indurated clay, in sand stone, and other earthy productions; it often occurs in small and large fluid globules, commonly attended with a red substance; large quantities are obtained in a fluid state. The ores from which the greatest quantity of mercury is obtained, are called cinnabar, which, when rich, are extremely heavy, compared with iron. They are of a red and brown-red colour; some varieties are dull, others bright and shining, they may always be known if rich, by their great weight, or from the knife leaving a full red streak upon them; or by exposing a particle to the flame of the blow-pipe, white fumes will arise, and a piece of gold, as a sovereign, or a piece of bright copper, as a halfpenny, held over the vapour, will be coated with mercury, which condenses upon it; and the more it is rubbed, the more it will have the appearance of silver, which cannot easily be removed, but by burning it off. Quicksilver, as a metal, is always fluid in our atmosphere; it may be rendered solid by producing artificial cold.

Perhaps the learner is not acquainted that the metal called *cobalt* forms the beautiful blue colour on china, also earthenware, and may be desirous to know how to distinguish ores of that metal.

The ores of Cobalt, are not confined to one peculiar sort: they, like many of the preceding, consist of several varieties, some of which are rich, and yield a great quantity of colouring matter, which is highly valuable; others are too poor to pay the expence of being worked. The ores are generally combined or accompanied with arsenic. They have a whitish grey colour, and metal-like lustre; sometimes tarnished and approaching to black.

On examination, some of these ores have more or less intermixture of peach-red efflorescence; others are dark, earthy, and sometimes of various colours, as black, blue, and green, the latter varieties often occur in sandstone.

A very small particle placed under the flame of the blow-pipe, generally emits fumes of arsenic; after which, if a little borax be melted with it, a deep coloured blue glass will be produced; *Cobalt*, melted with silex, is called smalts. Many amusing experiments may be made with Cobalt, which Parks's excellent chemical catechism explains.

Ores of this metal have lately been found in the alluvial soil in Cheshire.

Antimony is much used in making printers' types, in medicine, &c. It does not form so many varieties as several of the preceding. It is generally of a lead colour, but lighter than lead ore. It frequently occurs in long thin crystals, like needles, diverging from a centre, and of beautiful colours, irridescent. It is also shining bright; this variety resembles lead ore; but it more commonly is of a dull lead grey, compact, or appears composed of fibres striated. The massive variety is sometimes covered with a yellowish heavy ochre from the decomposition of the metal, which is not the case with lead. After having been closely examined, it will not be mistaken for lead ore; but the flame of the blow-pipe will immediately detect it, as it melts the instant it is exposed to heat, and appears as a dark coloured slag or scoria, swelling and evaporating in white fumes.

(*To be resumed.*)

COMBINATIONS.

It is with considerable pain that we have read in many of the Provincial Papers, accounts of combinations of workmen, for a rise of wages. It is certainly true that the price of provisions has risen in many parts of the country, in a proportion with which the earnings of the mechanic or labourer have not kept pace, and that they have a right, upon every principle of reason and justice, to increased wages; but that there are fair means of obtaining this right no man can deny, and the parties who combine would do well to consider, that the very act of combination takes from them that claim to attention which they would otherwise possess. We sincerely trust that some of the true friends to the operative classes, Dr. Birkbeck, Mr. Brougham, or Mr. Hume, will endeavour to lay down some plan for the consideration of the legislature, which would have the effect of rendering justice, without affording an excuse for such an illegal and dangerous practice as combination.

To the Editor of the Mechanics' Register.

SINGLE VISION, &c.

SIR—The subject of single vision with two eyes may, I think, be rendered more clear to most of your readers, by stating succinctly all the circumstances that are necessary to its production, and some of the cases in which double vision is produced: and at the same time the remark of Dr. Birkbeck, respecting hearing singly with two ears, may be as satisfactorily answered.

1st. A healthy state of the brain and nerves, both in their structure and function, is necessary; for in diseases affecting either their structure or function, double vision is produced.

2d. A proper adjustment of the humours producing a correspondence in the optic axes, and forming images of objects on corresponding points of the two retinæ; for pressure on the globe of the eye produces double vision.

3rd. An effort of the mind, *attention*, is necessary; for if I fix my eyes on an object, and then divert my mind completely from the object (as by reflecting on some obscure process of thought), it appears double.

The theories Dr. Birkbeck mentions of Dr. Reid and Dr. Wells, are both calculated to explain this action of the mind in producing single vision. That of Dr. Reid is, that the images in the two eyes proceeding from the same external place, they are referred by the mind to one object; while Dr. Wells contends, that the two appearances are seen in one direction, or in two directions which coincide with each other.

If the theory of Dr. Reid be received, we may apply the same explanation to the case of hearing singly with two ears; while Dr. Wells's theory appears to me incapable of being so applied. If the mind refers to one object two distinct sensations in vision, because they proceed from the same place, so may the mind refer to one and the same cause two distinct sensations conveyed to the ear, because they occur in the same *time*, the sensations of vision having the same relation to place, as those of hearing have to *time*. In some affections of the nerve of hearing, double sounds are produced, probably in consequence of a difference in the time the diseased nerve requires to convey the sensation.

There are many other curious circumstances in the sensations of the other senses, which would form an interesting subject of inquiry, particularly the feeling of two objects, when a single one is placed between two fingers of the same hand when they are crossed.

I remain, Sir, your humble servant.

J. G——.

To the Editor of the Mechanics' Register.

London March 29, 1825.

SIR—I shall feel much obliged to any of your Correspondents in informing me of the best Life Preserver extant, in cases of shipwreck, bathing, &c. The simpler and more portable the better.

I am, Sir, &c.

HENRY.

To the Editor of the Mechanics' Register.

SIR—Can any of your Correspondents inform me of the best method for making Percussion Powder, to be water-proof, and not to corrode the steel, and how to prevent explosion in the manufacture.

A constant reader and admirer,

FULMINATOR.

To the Editor of the Mechanics' Register.

SIR—I shall be much obliged by your informing me whether the piston of a Steam-engine works with equal advantage in an horizontal as a perpendicular position; if it does then a drag pole applied to the horizontal piston of a Steam-engine fixed in a carriage on a rail-way, toothed, would act as a punt pole, and would I think, move the carriage with greater velocity, and at a less expence than the methods now in use.

If the idea is new, and you think it worth inserting in your useful publication, by so doing you will oblige X. Y. Z.

NEW SMOKE-JACK.

In a recent number of the REGISTER we gave an account of a smoke-jack by Mr. Thin. The following is a more detailed account from the *Scotsman*:—

"The common smoke-jack consists of a fly about two feet diameter, formed of four or six vanes, exactly like the sails of a windmill, but moving horizontally. It is fixed in the chimney, and is moved by the ascending current of heated air. The motion is communicated to the spit by a wheel and pinion also working in the chimney. It cannot be put into a chimney unless the latter is adapted for the purpose in the building. It is, besides, very expensive, needs frequent cleaning, consumes much oil, and is every way so troublesome, that in our country, where time and money are much valued, we believe it is very little used. Mr. Thin's jack, however, is entirely different in its construction, and will cost only about half as much. It consists of a wheel or fly formed of eight thin plate iron leaves (exactly like the float-boards of a steam-boat's paddle wheel), whose diameter is about 30 inches, and its width about a foot. An opening of this size (30 inches by 12) is made in front of the chimney, four or five feet above the fire. The fly is placed in this opening, with its leaves projecting into the vent, so as nearly to close it up; a space of about two inches only being left between the extremity of its leaves and the back of the vent to create a draught. When the heated air acts upon its leaves, it revolves vertically, like the wheel of a steam-boat or water-mill. The diameter of the fly is not invariable, but is made larger or smaller according to the thickness of the wall and depth of the vent, so that its axis is always not only out of the vent, but a little beyond the plaster of the wall, and perfectly accessible to the hand. Its outer half projecting into the kitchen, is covered by a semi-circular box or case, which opens at the bottom with a joint, so that by the fly, it can at any time, be turned back from the vent, cleaned, and replaced in its position by a servant. The motion of the fly is communicated by a pinion to a wheel, on the axis of which is a pully, over which the chain passes, as in the common winding up-jacks. The machinery being simple, and the axis and wheels entirely out of the smoke, very little oil and very little cleaning is necessary. Hence the jack requires no particular care, and can scarcely go out of order, and it may be put into any chimney."

To the Editor of the Mechanics' Register.

SIR—Noticing in one of your former Numbers that some of your Correspondents desired to be informed of a simple mode of painting on glass, I beg to submit the following method to them, which in some of my experiments has succeeded entirely to my satisfaction:—The artist is to have his glass ground, and then to mix his colours with a solution of acacia gum (arabic) in distilled water; and then paint his design. Afterwards when 'tis dry, let him give it one or two coats of clear mastic varnish carefully laid on (the varnish I make after the manner directed by your fair Correspondent Emma R. in No. 9 of your valuable Register) and which, when thoroughly dry, will bear cleaning, which is to be done with very soft rags. If you think this worthy of insertion in your next Number, you will oblige

Your obedient servant, H.W.D.

To the Editor of the Mechanics' Register.

SIR—I shall feel obliged by being informed through the means of your instructive miscellany, the best method of preparing silk to receive water colours.—Yours, &c.

LOUISA.

To the Editor of the Mechanics' Register.

SIR—I shall be much obliged if any of your Correspondents can inform me of the exact process of preparing Iodine from the refuse of the soap pans, as described by Mr. Cooper in one of his lectures at the Mechanics' Institution.—Yours, &c. H.R.W.

PATENTS EXPIRING NEXT WEEK.

John Blenkinsop, for certain mechanical means, by which the conveyance of coals, minerals, and other articles, is facilitated, and the expense attending the same is rendered less than heretofore. Expires April 10.

Wm. Finch, for a method of making nails of wrought iron. Expires April 11.

John Taylor, for improvements in the construction of wheels for carriages of different descriptions. Expires April 11.

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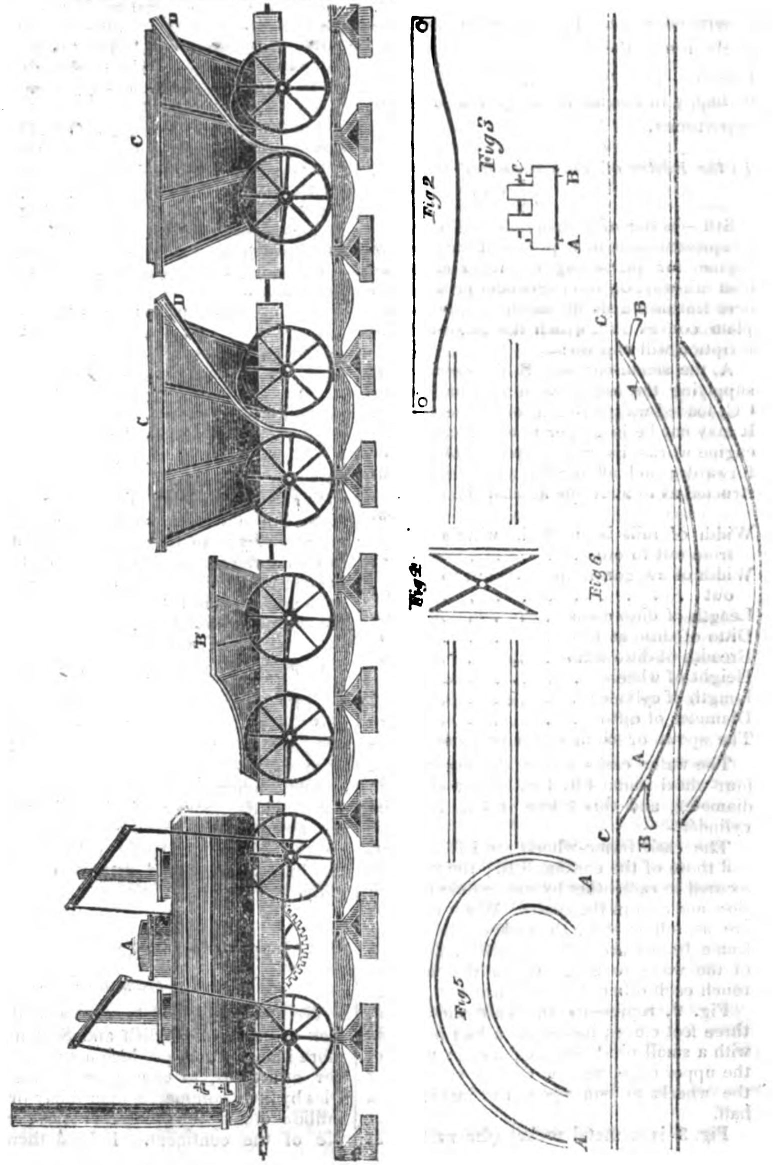
The London MECHANICS' REGISTER.

"Knowledge is praised and desired by multitudes whom her charms could never rouse from the couch of sloth; whom the faintest invitation of pleasure draws away from their studies; to whom any other method of wearing out the day is more eligible than the use of books, and who are more easily engaged by any conversation, than such as may rectify their notions, or enlarge their comprehension." DR. JOHNSON.

No. 25.] SATURDAY, APRIL 16, 1825. [Price 3d.

PLAN OF A RAILWAY ON THE PLAIN CONVEX PRINCIPLE.



RAIL ROADS.

We have already devoted a considerable portion of our columns to the subject of Rail Roads; but its importance at the present period, in a national point of view, induces us to attend to any suggestions which may tend to improve their construction, or to confirm the practicability of their general adoption. For this reason, we willingly insert the following communication from an intelligent correspondent, and shall be happy to resume the subject at a future opportunity.

To the Editor of the Mechanics' Register.

Tunbridge Wells.

Sir—In one of your numbers I observed a representation of a proposed loco-motive engine, for propelling carriages along an iron rail-way, on the cog-wheel principle: I here transmit a slight sketch of one on the plain convex rail, which the following description will explain:—

A, the steam-engine; B, the carriage for supplying the engine with fuel and water; CC, loaded waggons following the engine. It may not be improper to observe, that the engine works its way either backwards or forwards; and all the waggons are so constructed as to abut one against the other.

	Ft.	In.
Width of rails between the wheels from out to out	5	1
Width of waggon-frame from out to out	3	9
Length of ditto ditto	11	0
Ditto of ditto at top	9	10
Breadth of ditto ditto	6	6
Height of wheels	3	0
Length of cylinder	9	0
Diameter of ditto	4	8

The spout or chimney 10 or 12 feet high.

The water casks follow the engine on a four-wheel frame 4 ft. 3 in. long, and 3 ft. in diameter, and this frame is 7 ft. from the cylinder.

The cask frame-wheels are 1 ft. asunder, and those of the engines 3 ft.; the waggons secured to each other by strong links on each side, and also in the centre. When the links are at full stretch, the ends of the bottom frame beams are a foot asunder, and tops of the waggons 2 ft. When the waggons touch each other, their tops are 1 ft. apart.

Fig. 2, represents the cast metal rail, three feet eleven inches and a half in length, with a small pin-hole at each end: width of the upper edge, with a convex surface for the wheels to run upon, two inches and a half.

Fig. 3 is a metal socket (the surface at the bottom three inches and a half by eight inches and a quarter) to support the end of the rail. A square stone on which the socket rests, called a sleeper, for a foundation, is fastened down by two wooden pins, A and B. C is a pin to confine the end of the rails.

Breadth of wheel to run on rail ten inches, with the end next the carriage raised half an inch above the surface, to form a ledge or rim to guide the wheel as it works along the inside of the railway, the opposite wheel acting in the same way. Thus both wheels being fast on a revolving axle, each moves at the same time when the carriage is put in motion.

A lever of wood or iron, D (Fig. 1) to regulate the speed of the waggon, by the lower end passing under the fore and above the hind wheel, working on a pivot.

Fig. 4, a moving rail for instantly turning to a different direction. This works on an iron pivot in the centre, and when the waggon comes upon it may be turned with the greatest ease.

The passing rails (Fig. 5) with a moving conductor, which works on a pivot as at A, and by passing the point B to C on the railway, the wheel of the carriage comes in contact, and immediately turns its position to the off rail.

To effect a short round turn, the rail-way A must have, on the inside, an edge or rim, about an inch high.

For ascending and descending hills, a small house should be built, in which a wheel pulley is to be erected; then a rope from the waggon at the bottom of the hill passing round the wheel, and made fast to the waggon ready for descending, will cause the ascending one to rise rapidly, provided the descending one is of sufficient weight. This plan is plain and simple; and where it is practicable, there might be balance waggons to assist as occasion requires; and by a slight attention to regulate the balance waggons, not the least stoppage would arise from the disproportionate loads ascending and descending.

Should the above method fail in effecting the ascent and descent of the waggons, a steam-engine might be erected at the top of the hill, which would remove every difficulty.

EFF ESS.

M. DUPIN'S ADDRESS.

(*Concluded from our last.*)

We are compelled to confess that fourteen millions of English and Scotch have more industry and produce a greater number of articles, to convey to distant countries by their commerce, than thirty or forty millions among the greatest part of the people of the continent. Behold then why fourteen millions of English and Scotch have been able to contend with advantage, both during peace and war against adversaries so much more numerous.

Let me not be accused of placing too high British industry, and too low the industry of other people. I leave you to judge, gentlemen, if I am the friend of my country, by the considerations themselves which I now submit to your examination, and by the motive which animates me. Far be from us the empty declamations of those writers and those orators, who sacrifice truth to render themselves popular in our assemblies, in our saloons, in our manufactories. They speak to us decidedly of our superiority in every thing: they repeat to us, even until we are disgusted, that we are the first people in the world. Without doubt we have every thing which enables us to become so; but at this instant, so far from being in the first rank, I fear that we are surpassed, and very much surpassed, by England.

England has arrived at a remarkable epoch, which has prepared for her a destiny new and more magnificent than all her prosperity hitherto obtained during war and during peace. Now in Great Britain the whole industrious class is awakened to a new existence: it is snatched from routine, and withdrawn from ignorance. The principles and the applications of the useful sciences are unfolded to it. This class receives with avidity the fruitful lights which are presented to it. It is not as a pensioner and by way of a gratuitous favor that it receives these inestimable gifts. So well does it appreciate the value of them, that it pays for obtaining an education, the great importance of which it has fully recognised.

Let us pause a moment to contemplate a spectacle which no other people on the face of the earth has ever before presented. Let us direct our eyes to the future,—we have no occasion to advert to times very remote. It is superfluous to ask us now what the new instruction conveyed to the British nation will produce in fifty or a hundred years. Let us ask only what this instruction will have produced in twenty years.

Let us suppose that the scientific instruction of the artisans should not take a greater range, although every month offers to us a new progress made in this career. I see schools of industry open to the working class in the great cities of London, Edinburgh, Glasgow, Aberdeen, Manchester, Birmingham, Lancaster, Leeds, and Newcastle; let us suppose that these towns furnish instruction to only five thousand artificers yearly.

In twenty years, Great Britain will reckon a hundred thousand artisans, of every kind, who will have acquired a knowledge of the scientific elements useful to industry.—Among these hundred thousand men, many will forget what they have learned; be it so. Many will be incapable of making an advantageous application of them; granted likewise. But the artisans to whom nature hath given qualifications favorable for the combination of number, of forms, or of forces, will have in their hands an instrument, which will serve as a lever for their genius; and we shall be astonished by the effects which this instrument will produce.

Three cities less extensive than Rouen, than Lyons, than Nantes, than Bourdeaux, than Marseilles, than Strasburgh, Athens, Florence, Geneva, in spite of the numerical weakness of their population, have become in ancient times, in the middle ages, and in modern times, just objects of admiration, for the prodigious number of their men of science, of their men of letters, and of their artists. Not because human nature exhibited herself more productive of superior minds, upon the shores of the Ægean sea, of the Arno, or of the Leman lake, but because instruction was there more widedly diffused.

But in Athens, Florence, and Geneva, this instruction was never completely developed amongst the lowest classes of society. It was only amongst about a thousand select citizens that knowledge was allowed to exercise her benefits.

In Great Britain, industry includes in her manufactories, at least four millions of individuals who are all equally invited to partake of this new scientific instruction. Among these four millions, every man who shall feel within himself a peculiar disposition to apply the principles of knowledge to the practice of the arts may, at the present time, with the most moderate sacrifice, acquire during the hours in which he has ceased to labour, means of rendering this labour less deteriorating to the mind, and more productive.

I dare venture to predict that in the greatest branches of industry, unexpected, incalculable advances will be the immediate consequence of the new instruction furnished to the British people. Let us judge of that which will happen, by that which has already happened.

Until lately in Scotland, popular instruction was confined to reading, writing, and arithmetic; but these elementary parts of knowledge were general. Well; they have sufficed to enable a multitude of illustrious talents to separate from the crowd; to immortalize their country, and at last to place it in the foremost rank among the nations which accelerate the progress of the sciences, of literature, and of the arts.

A professor of Glasgow, Black, creates pneumatic chemistry, and prepares those immense benefits which this science confers on industry.

A professor of Edinburgh, Smith, produces a complete change in political economy, and prepares for the commercial regulations of his country, the great revolution which is taking place at this moment.

A mathematical and philosophical instrument maker, Watt, a Scotch engineer, proceeds to make of the steam engine the most powerful and the most useful prime mover for the service of modern arts.

Observe, gentlemen, that these modern inventors have all sprung from the industrious class; whilst before the higher classes of laity and the clergy could alone furnish men who were sufficiently instructed to add by their discoveries to the progress of the human mind. The monk Roger Bacon invented gunpowder: Lord Napier invented logarithms: two great discoveries which have changed the labours of mathematics, and the moral state of society.

I dare to predict, that in the next twenty years, the conquests of science and industry in Scotland and England will surpass those of the generations which have given so much prosperity to the British people.

The only question we have to ask is, whether we shall remain behind in this immense progress; or whether we will proceed upon the same line, in order to outstrip, if it is possible, a people, whom nature has made our rival in every species of glory?

The facts which I have stated, respecting the dispositions of the working classes in France, leave no doubt of the facility of instructing the simple workmen, in the happy country where natural intelligence is so lively and so penetrating; where the memory is susceptible of such various and numerous impressions.

Now, gentlemen, all of you who are united in this league—it is to you to whom I address myself. I make you the depositaries of the great expectations which your country must form of you. I ask you in its name, to render it more happy and more opulent, in adding to your comfort and your welfare; to render it stronger and more splendid, by making a more intelligent use of your moral and physical powers.

May my voice excite in your minds those generous emotions, and those profound impressions, from which energetic and durable determinations arise. It is you on whom the industry of France calls to set her the example: you are the chosen of the labouring classes of the capital of a great and powerful kingdom: become for all the nations of the world the chosen of all the labouring classes, by adding the powers of the mind to those of the body. A new contest is to be begun. Often have you seen the conquerors of the most war-like people upon the field of battle, shew that the children of our workmen know how to excel also in wielding against the enemies of their country, the arms of war, and the instruments of glory. At present, let us seek only to handle and direct well those of opulence and of peace.

You see united in this league, in order to encourage you by their presence, the most eminent of geometers, of astronomers, of chemists, and of philosophers, who have gained in the career of science, prizes which are also the glory of France. Behold your masters and your fathers: those great founders of our finest establishment of industry, of whom the greatest part have begun to live like yourselves by the labour of their hands. Now, thanks to the power of their understanding, they employ your hands by thousands, and shew you the path to which an honest and just ambition directs you. All these men, eminent in their various pursuits, accord with me in their wishes and in their hopes, it is for you—it is for us, to realise their generous desires, and their patriotic hopes. I will on my part do all that my studies and my limited experience will enable me to accomplish.

At this time, gentlemen, France possesses engineers or officers, provided for the civil and military departments by the Polytechnic School; the principal part of these are in a situation to deliver courses of lectures for the service of the artisan, according to the plan which I have chalked out for this Institution. The greatest part would be able to add to it the fruits of their observation, and of their experience in the important public services which they have directed, or which they do still direct.

Amongst these four thousand engineers, it will be sufficient to find only one or two well disposed towards this undertaking, in each of the industrious cities of Rouen, of Lille, of Saint-Quentin, of Lyon, of Saint-Etienne, of Toulouse, of Bordeaux, of Marseilles, of Nantes, of Montpellier, of Nimes, of Grenoble, of Colmar, of Strasbourg, of Metz, to enable the industrious class to enjoy an education, similar to that which we this day commence. By this combination of efforts and instruction, the lights of science propagated at once through all the centres of our industry, will supply processes enabling us to obtain for our productions forms more exact and more perfect, for our tools, for our instruments, for our machines, applications more easy and more powerful. By every where familiarising our artists with the principles which ought to direct them in their labours, we shall furnish them at once with methods for perfecting the objects formed, and the practice of their formation. Let us leave to the future the care of disclosing to us the happy fruits of these new elements of prosperity.

If these ideas, which I delight in entertaining, are soon realised, I shall feel one source of pleasure, in which you will participate: it will be, to see the new era of this prosperity, bearing for its date, the first year of a reign, of which the dawn smiles upon the generous hopes of every enlightened Frenchman.

LONDON MECHANICS' INSTITUTION.

DR. BIRKBECK'S SECOND LECTURE ON VOLTAIC ELECTRICITY AND ELECTRO-MAGNETISM.

CONNECTION BETWEEN ELECTRICITY AND MAGNETISM—OERSTED'S EXPERIMENTS ON THE MAGNETIC NEEDLE——MR. MARSH'S APPARATUS—COMMUNICATION OF MAGNETIC ATTRACTION—ROTATORY MOTION—POPE'S IMPROVED STEERING COMPASS, &c.

WEDNESDAY, 6TH APRIL.

Dr. Birkbeck commenced the lecture of this evening by observing, that it was a favorite object of recent philosophical speculation, to reduce the varied energies which are traced in the events of material nature, to the influence of one all-pervading power; and that the philosophers of antiquity also entertained an opinion, which was sanctioned by Sir Isaac Newton, that there is in reality only one kind of matter in the universe, and that all the diversified appearances it assumes, result from different arrangements of its particles. If the existence of the former principle be admitted, the latter follows as a necessary consequence. Some have endeavoured to discover this principle by examining the nature of the various kinds of attraction, such as the attraction of cohesion, of gravitation, &c. while others have maintained that all the approximations thus characterized, have resulted from peculiar applications of the same force, or have succeeded the operation of matter, visible or invisible, in the exercise of appropriate impulses during ordinary motion. The late Professor Playfair, of Edinburgh, observes, " if we consider how many different laws seem to regulate the other phenomena of the material world, as in the action of impulse, cohesion, elasticity, chemical affinity, crystallization, heat, light, magnetism, electricity and galvanism, the existence of a principle more general than these, and connecting all of them with that of gravitation, appears highly probable. The discovery of this great principle may be an honor reserved for a future age: and science may again have to record names which are to stand on the same levels with those of Newton and Laplace. About such ultimate attainments," he adds,—and they are the concluding words of the last treatise which science received from his enlightened mind,—" it were unwise to be sanguine, and unphilosophical to despair."

Since the period when these observations were made by Playfair, two of the powers particularised by him, viz. Electricity and Magnetism, have been more closely linked with each other. It has been for several years supposed that the two imaginary fluids producing their respective phenomena materially influence each other. Lightning has been found to reverse or destroy the polarity of the magnetic needle, and also to communicate polarity. In consequence of these observations, the identity of electricity and lightning having been established, attempts have been made to communicate magnetism by means of ordinary electricity, but these attempts may be considered to have been imperfect, as the resulting effect was merely analogous to that produced on pieces of steel by twisting, filing, &c.

Ordinary electricity having thus failed to produce the desired effect, recourse was had to galvanism, and an ineffectual attempt was made with the gigantic battery of Mr. Children, to affect the magnetic needle. This failure was attributable to the mode of making the experiment, for if the needle had been brought near his platinum wire, instead of being placed betwixt the poles of the battery, electro-magnetism would have been, in all probability, more early developed.

Other attempts were made to establish the identity between *Electricity* and *Magnetism*, but the discovery of the fact was reserved for Professor Oersted, of Copenhagen, who, by this discovery, laid the foundation of Electro-Magnetism. Dr. Birkbeck here proceeded to exhibit to the audience the experiments made by M. Oersted, illustrative of the effects of voltaic electricity on the magnetic needle. The first experiment consisted in placing horizontally between the two extremities of the voltaic arrangement, an uniting, or *connecting wire*, with which the wires from the opposite poles of the battery were subsequently brought into contact A magnetic needle was then brought *below* this connecting wire, and being allowed to arrange itself in its natural position, pointing north and south, the wire above it was arranged in the same direction; but when the apparatus was connected with the poles of the battery, the needle was instantly thrown into active motion; its natural position was disturbed, and the extremity nearest the negative pole of the battery was forcibly turned towards the *west*, till it formed an angle of nearly 90° with the polar meridian.

This was Professor Oersted's first experiment, and in the next, which was also repeated by Dr. Birkbeck, he suspended the needle *above* the connecting wire, instead of *below* it. The effect of this arrangement was seen by the audience to be exactly the reverse of the former, as the deflection of the same end of the needle was towards the *east* instead of the *west*, its magnetism being as forcibly disturbed as in the first experiment, the moment a communication was formed with the poles of the battery.

If the needle be placed on either side of the wire, and exactly parallel to it, no effect takes place, except a slight depression of one of its poles; but this depression occurs at the contrary extremities of the magnet, according as it is placed on the *east* or the *west* side of the connecting wire. If the wire be placed perpendicularly, the effect produced is analogous to the former.

These are the principal early phenomena exhibited by ELECTRO-MAGNETISM, and it is of importance to remember the directions assumed by the magnet in these experiments, because upon these depend the hypothesis offered by Dr. WOLLASTON, and their application to the production and explanation of rotatory motion which the lecturer was now about to illustrate. The discovery of M. Oersted has also engaged the attention of M. Ampere, Sir Humphry Davy, Farraday, Biot, Barlow, Marsh and others, whose investigations have produced the most surprising results.

Previous to his experiments illustrative of the effects of electro-magnetism in producing rotatory motion, the worthy Doctor begged to mention a few particulars respecting Mr JAMES MARSH, of whose ingenious apparatus and able assistance he was about to avail himself. Dr. Birkbeck then read an extract from a work published recently by Professor Barlow, of Woolwich, in which he acknowledged himself highly indebted to the ingenuity of this young man, who according to the Doctor's statement, was employed as a wheelwright in the Royal Arsenal at Woolwich, at 12s. a week, but had lately been advanced much higher by the force of his own talents, and had been publicly acknowledged as an inventor in this interesting branch of science. The kindness and discernment of Mr. Barlow led him to notice and employ Mr. Marsh whilst he was conducting his valuable series of magnetical experiments; and thus the attention of this ingenious young man was directed to the construction of a portable collection of apparatus, to enable the possessor to extend his researches in electro-magnetism; and he succeeded in comprising his apparatus within a convenient and portable compass, and at a very moderate price.

Mr. MARSH now ascended the platform, and was received with considerable applause. His apparatus, the construction and arrangement of which evinced considerable ingenuity, was inclosed in a neat mahogany case about fifteen inches high and a foot each in the other dimensions; and included two plates of *zinc* as large as the interior surface of the case, with an intervening plate of copper. These plates being introduced between *copper* surfaces, the effect of the apparatus was that of two plates of *zinc*, and three of *copper*, upon the principle of the Wollaston arrangement. The remainder of the apparatus, for the performance of experiments in electro-magnetism, was contained in another division of the case, and as the various parts were required for the illustration of the learned lecturer's remarks, they were selected and arranged by Mr. Marsh, who performed the different experiments with the greatest facility and success.

Part of the apparatus was then arranged for the purpose of shewing that magnetism was communicable by means of the voltaic battery. A piece of iron, previously proved to possess no magnetic properties, was supported by a spiral wire attached to the apparatus, and the plates being immersed in diluted acid, the two poles were brought into contact with the arrangement, when the application of pieces of wire to each end of the piece of metal, instantly shewed that it had become magnetic; but this effect ceased the moment the communication was interrupted by detaching the wires. A large sewing needle was then immersed in a vessel filled with iron filings, and withdrawn without any of the particles adhering to it, in order to shew that it possessed no magnetic attraction. The needle being placed within the convoluted wire of the apprratus, was subjected to the action of the battery, and afterwards again introduced into the iron filings, with which it was immediately covered; thus clearly demonstrating that it had acquired the attractive properties of the magnet. That it had also acquired *polarity*, was proved by presenting its extremities successively to the poles of a magnetic needle, which it either repelled or attracted, as similar or dissimilar poles were brought within the sphere of each other's influence.

Thus it was seen that the mere contact of the wires connected with the poles of the voltaic battery, was sufficient to communicate magnetism to pieces of iron or steel; and this effect takes place even through glass, porcelain, water, and other substances which ordinary electricity cannot penetrate. The lecturer also shewed by experiment, that a piece of *copper* placed in the galvanic circle became a magnet, though this metal was always considered incapable of magnetism, and attracted iron filings, which dropped off the moment the communication with the poles of the battery was interrupted.

Dr. Birkbeck now directed the particular attention of the members to the spiral form of the wire by which the needle was supported in the previous experiment, and which suggested to Mr. Farraday the application of the voltaic battery to the production of rotatory motion. This was illustrated by a beautiful experiment with an apparatus consisting of two cups filled with mercury, between which rose a brass pillar, supporting a horizontal arm. From one extremity of this arm a loose wire was suspended, reaching to the surface of the mercury in one of the cups, and in the center of the cup a fixed magnet was placed. The wires communicating with the poles of the battery were then attached to the apparatus, when the pendant wire was instantly put in motion, and its lower extremity revolved rapidly round the fixed magnet in the cup of mercury. The lecturer here observed that no other single force was capable of producing rotation, as it was necessary, in order to produce this effect by other means, to connect the *projectile* with the *gravitating* force. The experiment was then varied, by causing the magnet to revolve, while the perpendicular wire proceeding from the other extremity of the horizontal wire remained at rest; and by adopting a different mode of communication with the battery, the magnet and the wire were both made to revolve round each other, but in opposite directions.

This was the first example of rotatory motion produced by electro-magnetism. In another experiment however, invented by Mr. Marsh, a pendent wire had a tendency to start out and fall back again, when placed betwixt the poles of a horse-shoe magnet, and a voltaic connection formed; and it soon occurred to Mr. Barlow, that as in this instance the wire formed only one radius of a circle, the employment of a succession of radii would produce rotatory motion without the effects which attended the previous mode. Mr. Marsh accordingly attached to the apparatus a thin piece of brass in the form of a star, each of the radii of which touched the surface of the mercury. This experiment was now performed, and as soon as the wires of the battery were placed in communication with the apparatus, the star revolved rapidly on its axis. The poles of the battery were then changed, and the revolution of the star took place with equal velocity in the contrary direction. The experiment was further varied by employing at the same time two of these revolving stars, fixed on the same frame, with two horse-shoe magnets, both of which were made to revolve on their axes with equal velocity, and in either direction, according to the manner in which the magnets were placed, or the apparatus was connected with the poles of the battery. Dr. Birkbeck then pointed out the advantage of using the fluid metal, mercury, to complete the connection with the battery, and proceeded to observe, that in these experiments, the motion of the whole might appear to be accelerated by some degree of leverage, but it would be seen, that by simply applying the same influence to a cylindrical magnet, it would be made to spin rapidly upon its own axis.

This effect having been successfully produced, the Doctor stated that Mr. Barlow, from an attentive consideration of all these experiments, had suggested an opinion on the subject of the rotatory motion resulting from voltaic influence, combined with magnetic power, which, though merely advanced hypothetically, had the advantage of being a good hypothesis. He presumed that in whatever direction the voltaic energy is exerted, the forces proceeding from the opposite poles always act as *tangents* to each other; and that wherever *rotatory motion* can occur, it will always result from the operation of these *tangential forces*. This hypothesis affords an illustration of the motions of the magnetic needle, its declination, dip, &c. which phenomena may probably be accounted for on the principle of tangential force.

It soon occurred to M. Ampere that a rotatory motion might be produced by an arrangement, without any separate voltaic arrangement, called the *revolving machine*. This apparatus, which was now exhibited, consisted of a double cylinder of *copper*, between the interior surfaces of which a cylinder of *zinc* was introduced. Diluted acid was then poured into the cylindrical space, and the apparatus being accurately suspended upon a pivot, a magnet was passed up within the cylinders, and upon placing them on this magnet, they immediately began to revolve in opposite directions. The cylinder of zinc, being lighter than those of copper, revolved with the greater rapidity; and the lecturer added, that in the experiment of M. Ampere, only the copper cylinders were put in motion, but that Mr. Marsh had succeeded in suspending them in such a manner, that the revolution of the cylinder of zinc was effected at the same time. The poles of the battery were then reversed, and the cylinders again revolved, but in the contrary directions.

Dr. Birkbeck then exhibited another mode, introduced by Professor Barlow, of producing a similar revolution. In this experiment a cylinder of brass was made to revolve in either direction, in a vessel of wood containing mercury. A small apparatus, of a cylindrical form, consisting of a convoluted wire, was next floated in a basin of water, and the voltaic combination which was immersed in a small vessel holding the wire and floating likewise, acted distinctly as a magnet, being attracted or repelled as the opposite poles of a magnet were presented to it by the experimenter.

The usual time being expired, Dr. BIRKBECK deferred for the present the extension of the experiments to the subject of THERMO-ELECTRICITY; but requested the attention of the members, before he concluded, to an important improvement in the Steering Compass, introduced by Mr. Pope, of Ball Alley, Lombard Street. This ingenious individual was a hair-dresser, who by some peculiarity of circumstances, had been induced to devote his attention to magnetic phenomena. The Doctor here alluded to the fact stated by M. Dupin, in his able Address to the Mechanics of Paris, of his having directed the attention of a number of hair-dressers to the improvement of the interior of the head, after they had ceased to be employed in the decoration of the outside.*

Mr. Pope's improved Mariner's Compass was here exhibited to the audience, and the principle upon which it acted, was explained by the Lecturer. Its mechanism was extremely ingenious, and it was constructed in such a manner that the card was balanced independent of the magnet, remaining always horizontal, and was free to move upon its centre, without the sluggishness which sometimes occurs in the ordinary compass; while the needle was at perfect liberty to *dip*, even in the highest northern latitudes, where its position would be nearly *vertical*, without disturbing the *horizontal* position of the card.

Dr. BIRKBECK passed a high encomium upon Mr. Pope's improved compass, which he hoped would be universally adopted by nautical men; and concluded his very interesting and instructive lecture by observing, as the moral of his tale, that genius, the intellectual sun, like the material luminary, "of this great world the eye and soul," sheds its beams on every individual, without regard to rank or occupation; that genius is indeed "no respecter of persons;" "if" he remarked, "you promote intellectual cultivation, which by means of these institutions you, and the mechanics of this empire can now accomplish for yourselves, you will hereafter place thousands in exalted activity, who might otherwise, notwithstanding the natural powers with which they are blessed, remain for ever humble and obscure."

MR. WHEELER'S FOURTH LECTURE ON BOTANY.

DISEASES OF PLANTS—MORTIFICATION—GALLS—LINNÆAN SYSTEM OF CLASSIFICATION—CLASSES—ORDERS—CONCLUSION.

FRIDAY, 8TH APRIL.

Agreeably to the intimation given at the close of his preceding lecture, Mr. WHEELER commenced the present by some observations on the diseases to which the vegetable productions of nature are exposed. The more succulent plants are subject to a disease resembling *mortification*. This disease attacks the leaves of the *cochineal* plant, which are very bulky, and like the leaves of aloes, abound in juicy matter. It first makes its appearance in the form of a black spot, which continues to spread till the leaf drops off, or the plant dies. There is another disease which produces dissolution in plants, in a manner analogous to the effect of a powerful shock of electricity on animals. In cases of this kind, the flesh is reduced to a state of putridity much sooner than under ordinary circumstances; and by cutting into the leaves of a plant destroyed by this disease, it is observed, that though perfectly verdant but a short time before, a sudden and rapid decomposition of its parts has taken place. A similar effect takes place in the human body, for if mortification commences in one of the limbs, it becomes dead in a very short time; and in such cases, in the vegetable creation as in the animal system, the only effectual remedy is a speedy amputation beyond the diseased part. It is necessary, however, to ascertain whether the adjacent parts possess sufficient vitality to repair the injury inflicted by removing the seat of the disease; as a surgeon never decides upon the amputation of a limb, except he is of opinion that the vital power is sufficiently energetic to support the effect of the operation. It sometimes happens, when plants are attacked by these diseases, that the vital principle makes a stand against them, and the infected part is thrown off without injury to the rest of the plant. In fact, every tree exhibits similar phenomena, as the leaves decay when the buds become sufficiently healthy to throw them off as useless, and the fruits assume the appearance of dead substances, when they are no longer serviceable to the vegetable economy. In poor soils, plants bear only a small portion of what they ought to produce, and it appears to require an effort on the part of nature to complete the production of even one or two seeds, instead of the numerous progeny which, under more favorable circumstances, would attend her exertions. Thus *barley*, if grown in an unfavorable soil, will only ripen one or two seeds.

Strange effects are produced on plants by insects, which occasion those tumors or protuberances denominated *galls*. These excrescences arise from punctures made by the parent insects, for the purpose of depositing their eggs; and the part in which the eggs are lodged becoming irritated, expands itself with extraordinary luxuriance, frequently assuming the most whimsical shapes. From this cause the oak derives the spongy bodies

* Vide page 357.

called *oak-apples*, and the galls imported from the Levant, which are used in the manufacture of ink, are produced in the same manner. Vegetables appear to be subject to other diseases of the skin, the nature of which is not so clearly ascertained as the origin of galls. The stems of some plants, for instance, become covered with a white powdery substance, but it is difficult to determine whether this proceeds from disease, or from the growth of minute fungi, &c.

After the preceding observations on the diseases of plants, Mr. WHEELER proceeded to illustrate the *systematic* part of the science of BOTANY. When we observe the vast number of different species which occur among vegetables, the necessity of some specific arrangement is obvious. The arrangement adopted by the ancients was very indefinite, as they merely divided the vegetable creation into *trees*, *shrubs*, and *herbs*; while some of the more modern botanists divided vegetables into *grasses*, *bulbous* plants, *medicinal* plants, &c. Other modes of classification were introduced by Gesner, Cesalpinus, &c. the latter of whom arranged plants according to their modes of fructification alone; but his system, which was promulgated in 1583, was infinitely too deep for the botanists of his day. The next botanist of celebrity was Tournefort, whose arrangement depended upon the structure of the flowers and fruit of plants; but all these systems were laid aside, upon the promulgation of the Linnæan system of classification, by which all kinds of plants were arranged according to the number of their *stamens* and *pistils*.

Linnæus, after proving that the *stamens* and *pistils* were the most important organs of vegetables, conceived the idea of arranging them according to the number, situations and proportions of those parts. Mr. Wheeler here explained the difference between a *natural* and an *artificial* arrangement of plants. Some descriptions of vegetable productions naturally arrange themselves together, such as *mushrooms* and *toad-stools*, *sea-weeds*, &c. and if the whole of the vegetable creation was marked as distinctly, there would be no difficulty in dividing plants into different tribes by a *natural* arrangement, which Linnæus considered desirable; but this is not the case, as many plants approach so nearly in appearance to others whose nature is essentially different, that the adoption of an *artificial* method of arrangement has been found indispensible.

The system of Linnæus is professedly *artificial*, and teaches the division of vegetables into *classes* and *orders*; and also the comparison of their *generic characters* with those of the classes and orders to which they respectively belong. The *classes* are twenty-four in number, and are founded on the number, situation, and proportions of the *stamens*; while the *orders* are distinguished according to the number of the *pistils* or other circumstances.

Mr. WHEELER then particularised the twenty-four classes in succession, exhibiting to the audience as he proceeded, a number of large coloured representations of various plants, and describing the peculiar characteristics which attach them to each class.

1st Class. MONANDRIA, having only one stamen. The common *water-starwort* is one of the examples of this class.

2. DIANDRIA, two stamens, as in the *veronica*.

3. TRIANDRIA, three stamens. This class includes a variety of *grasses* of different forms, but which resemble each other in the number of their stamens.

4. TETRANDRIA, four stamens.

5. PENTANDRIA, five stamens.

6. HEXANDRIA, six stamens. To this class belong the various species of *lilies*, *tulips*, &c.

7. HEPTANDRIA, seven stamens.

8. OCTANDRIA, eight stamens.

9. ENNEANDRIA, nine stamens, as in the *butomos*, or flowering rush.

10. DECANDRIA, ten stamens, as in the *stellaria holostea*, or common stitchwort.

11. DODECANDRIA, from twelve to nineteen stamens.

12. ICOSANDRIA. In this class the *situation* of the stamens is considered, as well as their number, which consists of twenty or more. They are not fixed into the usual *receptacle*, but are inserted in the *calyx*. It is an important circumstance connected with this class, that the fruit borne by any plant, containing 20 or more stamens inserted into the *calyx*, are infallibly wholesome; so that a traveller in any unknown part of the world need be under no apprehension of partaking of the fruit of any plant possessing these characteristics. To this class belongs the genus *rosa*, including all the various kinds of roses, sweet-briar, &c.

13. POLYANDRIA, twenty or more stamens fixed into the receptacle, as usual. The *poppy*, the *tea-plant*, and the *lime* belong to this class.

14. DIDYNAMIA. In this class the relative *proportions* of the stamens are considered, as the plants which it includes have two long and two short stamens, whereas in the class *tetrandria*, the four stamens are of equal length. The *lamium*, or dead nettle is an example of this class.

15. TETRADYNAMIA, six stamens, four long and two short; which distinguish it from the class *hexandria*, with the same number of stamens of equal length.

16. MONADELPHIA; in which the stamens are all united together, as in the *marsh-mallow*.

17. DIADELPHIA. The stamens in this

class form two distinct bodies, containing unequal numbers, and the corolla is *papilionaceous*, or resembling a butterfly. The *pea* is included in this class.

18. Polyadelphia. The stamens in this class are divided into three or more distinct parcels or bundles.

19. Syngenesia. In this class the anthers all unite, so as to form a tube through which the pistil passes. The *dandelion* furnishes an example, in which all the anthers coalesce.

20. Gynandria. The stamens grow from the substance of the pistil itself, as in the *genus orchis.*

21. Monœcia. Plants belonging to this class, both *staminiferous* and *pistilliferous*, have blossoms the stamens and pistils appearing in separate flowers, and the former being placed uppermost to contribute to fertility.

22. Diœcia. In this class the stamens and pistils grow upon the flowers of two individual plants of the same species. *Herb-mercury* is an example of this description; one kind being constantly *barren*, and the other constantly *fertile*, and the access of the two plants to each other being essential to fertility.

23. Polygamia. Plants of this class produce three different kinds of blossoms, which in some instances are all found on the same plant; some of the blossoms producing both stamens and pistils; while some bear only the stamens, and others only the pistils.

24. Cryptogamia. In the 24th and last class, the stamens and pistils have never been accurately counted, and their fertility occurs in a manner not yet precisely ascertained. To this class are referred the *mosses*, *ferns*, and the various descriptions of *fungi*.

Mr. Wheeler having thus explained the distinguishing characteristics of all the classes into which the vegetable creation is divided, according to the Linnæn system of classification, proceeded to state that all these classes are subdivided into a number of different *orders*, which are distinguished by the terms *monogynia*, *digynia*, *trigynia*, *tetragynia*, *pentagynia*, *hexagynia*, &c. &c. according to the number of their *pistils*, whether one, two, three, four, five, or six, &c.

Of these numerous subdivisions the lecturer, without going through the whole of the classes, selected several of the most striking examples from the classes PENTANDRIA, DIDYNAMIA, TETRADYNAMIA, POLYGAMIA, and CRYPTOGAMIA; and pointed out the classes to which any plant belongs, according to the number of its stamens and pistils. Thus the *carum carui*, or carraway, containing *five* stamens and *two* pistils, is referred to the class PENTANDRIA and the order *digynia*; in which order all the numerous *umbelliferous* plants are included.

Such, concluded Mr. Wheeler, is a general outline of the Linnæan system of classification, and having thus completed the sketch of the science of Botany which I proposed to delineate in these lectures, I have only to thank my audience for the honor they have conferred upon me, by the great attention which they have paid to my remarks, and to express my sincere wishes that this excellent Institution may continue to flourish.

Lectures for next Week.

Wednesday, April 20, Mr. Lewthwaite's second lecture on Electricity.

Friday, April 22, Mr. Ogg on the nature of Heat.

SPITALFIELDS MECHANICS' INSTITUTION.

On Monday evening last, Mr. Wallis delivered to the members of this Institution the first of a course of Lectures on the sublime science of Astronomy. From the appearance of the Chapel, we should imagine that nearly the whole of the members were present; and from the deep interest they appeared to take in the proceedings of the evening, it was evident that they experienced great satisfaction in listening to the instructions of the lecturer, whose explanations were extremely clear, and his illustrations strikingly appropriate.

A very gratifying treat was afforded to the audience by Mr. J. D. Kineard, a member of the Committee, who played Luther's Hymn on the organ of the Chapel in a very admirable manner, prior to the commencement of the lecture.

We understand that upwards of twenty new members joined the Institution on Monday evening, and as Mr. Wallis will continue his lectures on Monday and Thursday in next week, a further addition to the number of members is anticipated.

ORIGIN OF AN ALMANAC.

Our Saxon ancestors began their important business according to the course of the Moon, that is with the increase and not with the wane. They counted time by the nights, in consequence of which we yet retain our expressions *sennight* or *fortnight*, for seven nights and fourteen days. The ages of their own lives they always counted by winters, and the reason why they did so, seemed to have been, because they had passed over so many seasons of cold and sharp weather. And by winters they always counted their terms of years. They used to engrave upon certain squared sticks about a foot in length, or shorter or longer as they pleased, the courses of the moons of the whole year, by which they could always tell to a certainty when the new moons, full moons, and changes should happen, together with their festival days, and they called the carved stick an *al-mon-aght*, that is, *al-moon-heed*, which is, the regard or observation of all the moons, and hence is derived the name ALMANAC.

NEW DIGGING MACHINE.

M. Michael Barry, of Swords, in Ireland, has invented a machine, simple in its construction and principle, by which with two horses and one attendant an acre of potatoes can be dug out in one hour—also, an acre of ground, previously ploughed for oats or other grain, can be harrowed by it in an hour with two horses and one attendant, thereby effecting in the branch of harrowing a saving of upwards of 93 per cent.; or, in other words, doing the work of thirty-two horses and sixteen attendants with two horses and one attendant. This machine, if brought into general use, under proper regulations, would soon effect wonderful and happy changes in the world. The farmer at the different seasons of sowing wheat, oats and barley, has his work often impeded by the inclemency of the weather, and is frequently obliged to sow his seed whilst the ground is wet and unfit to receive it; but when he can reckon this machine among his stock of husbandry implements, all such inconveniencies, and the probable and consequent losses, will be obviated, as in a few days of fair weather the harrowing in of the seed on the largest farm can be completed. The saving effected on the article of horse labour and feeding horses under such circumstances would be immense. The certainty of being able at the different seasons of the year to get the seed sown whilst the ground is in good order and in proper season, must be a source of great gratification.

With regard to the rapidity with which potatoes can be dug out by this machine, its good effects must be incalculable, as in no season, however inclement, can there be any apprehension entertained that any considerable portion of the crop will be destroyed, either by wet or frost—and as many persons are deterred from extending the cultivation of potatoes from an apprehension of greater loss in digging out, and by bad weather before digging, the certainty of getting them out of the ground without loss or danger will materially promote the cultivation of this important product.—*Wexford Herald.*

BOTANICAL EXPERIMENT.

Two young beech trees, planted at the same time, in the same soil, at a small distance from each other, and equally healthy, were pitched upon as the subjects of the following experiments. They were accurately measured, and as soon as the buds began to swell in the spring, the whole trunk of one of them was cleansed of its moss and dirt, by means of a brush and soft water. Afterwards it was washed with a wet flannel twice or thrice every week till about the middle of summer. In autumn they were again measured, and the increase of the washed tree was found to exceed the other nearly in the proportion of two to one.

NEW FIRE ENGINE.

Our friends the Scotch are really a very ingenious and industrious people, and prove to us that the old adage of "a burnt child dreads fire," is equally correct in Scotland as in England, and that it there excites the respect due to a proverb so old and so valuable. In London, the inhabitants are like so many salamanders, the more they roast the more they relish the fire. Burn a man out of one house one day, and ten to one but he will burn himself out of another the next. Not a week passes without fires, and yet week after week we see men just as careless in exposing themselves and their property to destruction from this most terrible of all calamities, and just as indifferent to the means which might be devised to prevent a recurrence of the evil. The Scotch however, although they are naturally a colder people than the English, do not like the idea of being roasted alive, and therefore take warning by the past to provide security for the future. The *Scotsman* of a recent date, says:—

"Our townsman, Mr. Ruthven, whose mechanical genius is indefatigable, has been applying his eliptical wheels to various new purposes. One of his latest improvements consists of a combination of two eliptical wheels with one round wheel, by which a reciprocal motion (like that of a pump rod) is converted into one that is circular, and *vice versa*, a circular motion into one that is reciprocal. This combination deserves the attention of the mechanician for its singularity, as well as for its probable utility. It approaches to the nature of an equalised crank; that is to say, it operates on the principle of a crank, but with a power nearly uniform, instead of one that is constantly varying. Without diagrams we could scarcely render the mechanism intelligible. We may state generally, however, that the three wheels are placed above one another, having their axes all in one line; that the round wheel is placed in the middle, and turns by its teeth; the two eliptical wheels, each of which having its axis in one of its *foci*, the moveable frame in which these axes work is carried alternately up and down, as the longer or shorter radii are towards the central wheel. This of course converts the circular into a reciprocal motion. He has applied this mechanism to work a fire pump; and in the construction of this pump he has made one cylinder do the office of two, by making the piston suck and propel at the same time, both in ascending and descending. We are not sufficiently acquainted with the construction of fire pumps to say whether this last idea is entirely new; but if it be, it is entirely ingenious, and will, we have no doubt, be extremely useful. We advise persons of a mechanical taste to examine the models."

TIC DOULOUREUX.

"Mr. H., of Southwell, has lately obtained extraordinary success in the treatment of Tic Douloureux, or Nerve-ache, one of the most excruciating diseases that afflict humanity, by giving a regular course of carbonate of iron.

"It is much in favour of the carbonate of iron, that it has been no less successful in the hands of others than of Mr. Hutchinson, a circumstance which (unfortunately) does not always attend new remedies. In proof of this, we may mention several cases. Dr. Crawford, of Bath, attended a lady aged 69, whose face had been affected at intervals for several years. The carbonate of iron cured her in three weeks, and she had no relapse. Dr. Davis, of Bath, was equally successful in curing a lady aged 65, of Tic Douloureux of the face. She took forty grains night and morning, and was well in a fortnight. Dr. Evans, of Magherafelt, in Ireland, gives several cases, both male and female, which he cured with the same remedy; and it has also succeeded with Mr. Thomson, of Sloane-street, Chelsea. In a word, we may consider that, so far as respectable testimony can go, the remedy is established.—*Oracle of Health.*

*** The cases of cure above given are satisfactory as far as they go; but, we believe, that in nine instances out of ten obstinate rheumatic affections are mistaken for, or purposely dignified with, the title of Tic Douloureux, and therefore it savours a little of quackery to call the carbonate of iron a specific. Several confirmed cases of Tic Douloureux have been treated with the carbonate of iron, at Bath, during the present year, without the slightest benefit. In some instances, however, the application of heated laurel leaves to the side of the face has assuaged the agony of the patient, and with proper auxiliaries produced a permanent cure. A young lady, who was afflicted with Tic Douloureux, and who could obtain no relief from her medical attendant, who is one of the leading practitioners of Bath, first applied this remedy; and it is a singular fact, that her physician himself subsequently used it with success under the torture of the complaint. It is probable that the prussic acid contained in the leaves effects the cure; but whatever it be, the success has hitherto been so decided that the remedy seems to be more entitled to the character of a specific than the carbonate of iron.—ED.

FAMILIAR LESSONS ON MINERALOGY.

(*Resumed from Page* 383.)

Perhaps the learner has never heard of the metals called *bismuth* and *nickel;* they are not common, and their use is rather confined.

Bismuth is a metal that is not malleable, though it is found in a native state, as gold and native copper; but it does not resemble either.

Bismuth has a peculiar agreeable metallic appearance of various colours, resembling most the hue of a pigeon's neck, changeable as the light strikes it, which peculiarity may serve to distinguish it from granular lead ore. It is soft, and melts the moment it receives the flame, into a white globule, which if the heat be continued volatilizes, leaving a white deposit upon the charcoal.

Bismuth frequently accompanies ores of silver, cobalt, and nickel, and as its varieties are very few, the learner will be enabled to determine them, after having discerned their peculiarities by comparing them with other metallic substances.

Nickel is a metal less known than the preceding, and it is not likely the learner, who has never seen it, should know it before he has heard its name; however if he has noticed the preceding characters of metals, he will know on seeing it that it is not one of them.

Nickel is massive, and compact, lighter coloured than copper, though approaching to it. It is hard, difficultly scratched by the knife, and is very heavy; any further description could avail little or nothing, but when seen, it would be perceived not to agree with any other substance. It produces a fine apple green colour in nitrous acid. It melts rather difficultly, emitting arsenical fumes that smell of garlic; the above characters are quite sufficient to distinguish it from the metals it is often associated with.

Uranium, Uranite, is more easily known than the preceding.

Uranite cannot be mistaken for another substance, if its characters are carefully examined. It is of a beautiful grass-green colour, rarely yellow-green, and generally appears in delicate quadrangular crystals, many uniting together, forming a cluster often half an inch or an inch across. It sometimes occurs in an ochrous state, both green and yellow; another variety called *pitch ore,* which is black and often accompanied with the ochre, is extremely heavy, and of rare occurrence.

Wolfram is a common mineral in Cornwall, though hitherto of limited use. It is of a dark colour, approaching to black, brittle, and hard. It yields a red-brown streak to the knife, and is extremely heavy. It differs from ores of iron in these particulars, and is one of those minerals of which words cannot convey a perfect idea to the learner. It is rarely met with, except in those countries which produce tin; it is a tungstate of iron.

The following tungstate of lime is nearly allied to the preceding:—

Tungstein is a heavy opaque white coloured mineral, sometimes yellow-brown; it often occurs in fragments, is very compact, and may be known by its great weight.

These minerals are not of common occurrence, and for more particulars the reader had better refer to the new Descriptive Catalogue, or to an Elementary Work.

The same remark applies to the following, viz.:—

Titanium, which is a mineral more generally diffused than the preceding, and appears under a variety of forms, some of which may be known by their beautiful capillary appearance in rock crystal. It is generally of a brown or red-brown colour, sometimes lighter, and as delicate as hair; it also presents itself in regular forms as thick as a quill. Another variety is found imbedded and wedge-like.

Menachinite belongs to titanium; it is found in grains of a black colour, intermixed with sand.

Gold Ore is frequently asked for, and many yellow substances are believed to be ores of gold; but here is a mineral that contains that precious metal, without the smallest appearance of it; it is called *tellurium*.

Tellurium is a whitish coloured shining mineral, disseminated superficially in small and delicate leaves and fibres, of a polished steel colour, often appearing map-like, and from it is named graphic ore.

It is sometimes yellowish, and there is a variety that approaches to black, the latter is rich in gold, and occurs in larger foliæ; they both yield to the knife, and a bead of gold may be obtained from the richest variety, by melting it with borax. The graphic variety cannot be mistaken, and the others may easily be discriminated. Tellurium is of rare occurrence.

Molybdena is a mineral not very abundant, though it occurs in many situations; it is generally in small patches, foliated, of a lead colour; it greatly resembles tellurium, but its leaves are more flexible, and it does not melt under the flame of the blow-pipe; it is generally imbedded in quartz, and has hitherto only been found in rocks of the earliest formation.

(*To be concluded in our next.*)

THE THAUMATROPE.

(*From the Hereford Independent.*)

A curious toy, on revolutionary principles, which bids fair to turn the whole world topsy-turvy, has made its appearance, and caused a prodigious sensation at the west end of the town, more especially among the scavans. It is called the Thaumatrope, as it does wonders by turning, and the contrivance is simply this:—On each side of a round card a different subject is sketched; by twirling a couple of strings the card revolves, and during its revolutions a grotesque or whimsical combination is formed of the two images, which strike the eye as one. The optical illusion is most perfect; the philosophy of it is thus explained in the printed description of the invention:—"This amusing and philosophical toy is founded on the well-known optical principle, that an impression on the eye lasts for a short interval after the object whieh produced it has been withdrawn. During the rapid whirling of the card, the figures on each of its sides are presented with such quick transition, that both appear at the same instant, and thus occasion a very striking and magical effect. If it were necessary to give the reader any further illustration of the principle here adverted to, it might be furnished by appearances which are familiar to every one. If a lighted stick be whirled round in the dark, a luminous circle will appear to the observer; this affords an explanation of the pin-wheel."—The combinations which are effected on this principle are extremely ingenious, and some humorous epigrams give a point to the optical illusions; ungraciously enough, however, these epigrams are, for the most part, levelled against revolutions, though by revolutions all the author's designs are perfected. Perhaps, indeed, these tirades were judged necessary to propitiate loyal people who might not approve of the precedent of perfecting imperfect things by giving them a turn, and for the comfort and satisfaction of such worthies the inventor has very ingeniously contrived to make a king by revolution. This is one of the best tricks on the cards; the head, legs, and arms of a man appear on one side, and the regalia on the other, we give the card a turn, and a king is made out of nobody. This exploit is thus set forth in the accompanying epigram:—

> Legs, arms, and head, alone appear,
> Observe that *no-body* is here,
> NAPOLEON like, I undertake,
> Of *nobody* a king to make.

There are many other highly ingenious devices, but these things, though well worth seeing, will not bear describing.

MUSTARD SEED.

We have received the following letter from a Correspondent at Grantham, inclosing a long but interesting paper under the modest title of "Observations on the Efficacy of White Mustard Seed," illustrating its reputed efficacy as a medicine. Our limits will not permit us to give the Observations entire but we shall do as much justion as we can to our correspondent, who is, if we mistake not, a gentleman as venerable from his profession as he is praiseworthy for his exertions to render a benefit to society.

To the Editor of the Mechanics' Register.

SIR.—Having observed in No. 10 of the REGISTER a query by W. H. for a remedy for worms, and another query by "a hard-working mechanic" for a remedy for asthma, I take the liberty of troubling you with the enclosed tract on the medicinal virtues of WHITE MUSTARD SEED, in the hope that it may afford your Correspondents a satisfactory answer to their respective questions, should you think it worthy of a place in your highly interesting publication. The value of the white mustard seed, as a remedy for disease any way connected with a disorganized state of the stomach and bowels, is now well known in many parts of the empire, and particularly at Nottingham, Newark, Leicester, and Grantham. Through your means the knowledge of it may be still more widely diffused.—I am, Mr. Editor,

With great respect, yours, &c.

Grantham. J. T.

The "Observations" after enumerating various diseases in which mustard seed is found useful—as dropsy, rheumatism, loss of appetite, indigestion, depression of spirits, scrophula, tic douloreux, &c. proceed as follows to state the mode in which it should be used:—

"When the seed is used merely as an aperient, and for accidental or occasional costiveness, it should be taken fasting, about an hour before breakfast; and generally speaking, a table-spoonful is the proper dose. With some constitutions however, a tea-spoonful is sufficient, while others require a second or even a third table-spoonful to be taken in the course of the day. When it is used as a remedy for acute diseases and morbid symptoms, three doses should be taken in the day, the first an hour before breakfast, the second about the same time after dinner, and third either at bed-time, or before, as may best agree with the patient. Those who dine at a very late hour should take the second dose at two or three o'clock in the afternoon, and the third about an hour after dinner. The quantity in each dose must always be regulated by the effect produced on the bowels, which are not to be purged, but in every instance must be uniformly maintained in a perfectly free and open state; an effect to which the patient should always pay particular attention. The quantity therefore in each individual case, can be ascertained only by trial. The patient should begin with a tea-spoonful in each dose; which he must afterwards diminish or increase, as the effect designed to be produced on the bowels may happen to require. With most constitutions two tea-spoonfuls in each dose are found to be sufficient; while others require three times that quantity, or a table-spoonful. In some few cases, four doses in the day, each containing a table-spoonful, have been necessary, and have been taken without the slightest inconvenience. When that quantity fails, (a circumstance which very rarely occurs,) it will be proper to assist the operation of the seed with a little Epsom salt, or other mild aperient, taken in the morning, as occasion may require, instead of the first dose of the mustard seed. Where the patient is much troubled with piles, it may be adviseable to relieve the bowels occasionally with a small tea-spoonful of milk of sulphur and an equal quantity of magnesia, mixed together in a little milk or water, (taken at bed time, either with or after the last dose of the seed. It not unfrequently happens that with the same patient, the seed varies from time to time of its effect on the bowels; and whenever this takes place, the quantity in each dose should be reduced or enlarged accordingly. When it is taken for the expulsion of worms, four doses should be taken in the day, at equal intervals between each dose, and in such quantity as to keep the bowels in a state rather more free and open than in ordinary cases. The seed is to be swallowed whole, (not bruised or masticated,) and either alone, or in a little water or other liquid warm or cold It should be taken regularly every day without intermission, until the disease subsides, or in other words, until health is restored, as far as the age and circumstances of the patient will admit. and in most cases it will be prudent to persevere in the use of it for some weeks or months longer, with a view to the more effectual extinction of the former diseased habit, by the establishment of a healthy one in its stead. This precaution however may not succeed in every case. When the disease has been of very long standing, returns of it may occur; but by having recourse to the seed on such occasions, each attack will probably be less severe than the former, the intervals between them will be successively enlarged, and thus by degrees the disorder will finally disappear."

The writer then goes on to say:—

"The mustard seed is valuable not only as remedy for disease, but as a means of preventing it. Of its power as a preventive, a very extraordinary instance has occurred. A friend of mine had for five or six years previous to the year 1823, been regularly attacked (with hay-asthma in the months of June or July in each of those years. The attacks were always violent, and for the most part accompanied with some danger. And such was the impression made on his constitution by the disease, and the remedies resorted to, (of which bleeding and blistering were the chief) that each illness led to a long confinement to the house, extending to a period of nearly three months. In the early part of that year, he resolved to make a trial of the seed, in order to prevent, if possible, a recurrence of the asthma; and in the month of March he began the use of it, and thenceforward took it regularly every day without intermission; and the result was that he escaped the disease. In November following he informed me, that from the time when he first took the seed, his health had not only never been interrupted by illness of any kind, but had been progressively improving: and he further assured me that he did not recollect that he had ever enjoyed so good a state of health as at that time. It is material to add that he has experienced these beneficial results as well in the last, as in the preceding year."

The writer concludes with the following note:—

"The white mustard seed is very generally sold at the low rate of 6d. per pound; and such is the demand for it at Grantham, in Lincolnshire, that a respectable grocer there who *sells* the seed at that price, and gives a printed copy of the above observations to every new purchaser of it, has sold no less than forty bushels of it within the space of five months."

MAGNETISM.

To the Editor of the Mechanics' Register.

SIR—I have extracted the following from a paper by Mr. Scoresby, on the developement of magnetical properties in steel and iron by percussion. After adverting to the general results of his former inquiries, the author observes, that his principal objects on the present occasion were to endeavour, by auxiliary rods of iron, to increase the degree of magnetism, and to ascertain on what circumstances, as to the magnitude of the iron rods, and the quantity, size, and temper of the steel wires, the utmost success of the method depends. He formerly used a single iron rod, upon which the steel bars were hammered, both being in a vertical position. He now places the steel wire between two rods of iron, and subjecting it through the medium of the upper rod to percussion, derives the advantage of the magnetism of both rods of iron acting at the same time upon both its poles.

The rods he used were of the respective lengths of three and one foot, and an inch diameter; and the upper end of the large rod and the lower end of the small rod were made conical, there being an indentation in each to receive the ends of the steel wire. Some magnetism was then elicited by percussion in the larger rod, and the steel wire being properly placed between its upper extremity and the lower one of the small rod, the upper end of the latter was hammered, and magnetism thus communicated to the wire; while the lower rod receiving same influence from the percussion, performed a similar office. The author calls this proceeding the *compound process*, to distinguish it from mere hammering of the wire upon the rod, as practised by him formerly, and which he termed the *simple process*. He then goes into extended details of his several experiments, of which the following are the principal results:—That the *compound* process is more effectual in the production of magnetism than the *simple* one, though the ratio of augmentation does not appear determinate.

In one experiment the maximum effect of the simple process was an attractive force, capable of lifting between 186 and 246 grains, while the compound process augmented the lifting power to 326! In another, the simple process gave a lifting power of 246, the compound 345. Moreover, the efficacy of the compound process is much less manifest upon long than short wire; and the softer the wire the more susceptible it becomes of this magnetic condition.

Rye, April 12. TYRO.

To the Editor of the Mechanics' Register.

SIR—That bread and bread-flour manufactured for sale have been, and still continue to be, adulterated to a very injurious extent, are facts now too well established to be doubted; and to remedy these evils many unsuccessful attempts have been made, particularly in and near the metropolis. It appears to be a common grievance, in the aggregate too formidable to be overcome; but may be corrected, or mitigated, by individuals disposed to promote their own and the public good. Under such circumstances, it evidently becomes a desideratum in the system of political and domestic economy, not only of this, but of all other civilized nations, to obtain a corn-mill, which, on a small or more extended scale, could be made to command the power to pulverise by hand labour, or more powerful machinery, wheat-flour in the manner required, retaining, at the same time, all the nutritive properties and flavour which nature has given to the corn. By chemical analysis wheat, and indeed all other corn and grain, is found to contain a saccharine matter, or vital spirit, and which, by further and more recent experiments, is found to be injured and frequently destroyed by heat, arising from excessive and redundant friction in grinding. Corn ground in the usual way, with large mill-stones, having to traverse the radii of a multitude of inches, at the rate of 1,560 feet in a minute, and to pass over a space of 9,000 feet before it is delivered, is exposed to a degree of friction injurious, and in some cases destructive, to the quality of the flour.

A metallic vertical mill, of a conical form, is now however constructed, commanding, on a small as on the largest scale, a power in a manner unlimited, will, if required, reduce the entire of good bread corn to flour; and by its mechanical construction and form, and consequent quick delivery, the operative labour, or mechanical power, is reduced to one-third of that required to drive mill-stones; and to prove the more material fact of a decided superiority of quality of bread-flour thus produced by this improved progress of grinding, a reference may be made to a multitude of the best authorities, and by the simplest experiment may be demonstrated in ten minutes. They may be extended to any diameter, attached to any kind of machinery, and applied to all purpose of pulverizing, granulating, or splitting of bones, &c. to any extent.—I am, &c. S. T.

ANSWERS TO QUERIES.

To the Editor of the Mechanics' Register.

SIR—I shall be obliged by your inserting the following answers in your REGISTER, which, I hope, you will find correct:—

In the tenth number is this query—"In what manner are 24 trees to be planted, so that there may be 20 rows, and three trees in each row?" I propose the following:

```
o     o     o
   o  o  o
    o o o
o o o   o o o
    o o o
   o  o  o
o     o     o
```

To the sixth query of T. Wilson, in No. 13.—Sounds, I shall first state, exist not in the bodies usually termed sonorous, or in the several apparatus of art from which they appear to originate. They are, in fact, only perceptions of the sentient mind, originating in impressions on the tympanum of the ear, and which impressions are communicated to that organ by certain pulses of the atmospheric air thrown into agitation by percussion, or vibrations of some impelling implement, which may be regarded as the remote cause of such impressions.

Vocal sounds are the effect of specific vibrations, produced, in the first instance, by the action and re-action of certain organs of the animal throat on portions of the atmospheric air, expelled by specific impulse from the lungs.

This is, I believe, the simplest form of definition that can be applied to the origin and nature of the sounds of voice; but it is, in fact, too simple to be instructively accurate in the explanation of the complicated phenomena to which it refers.

The tunable voice does not depend upon the organs of the throat alone: the vibrations in their passage to the ear are complicated, and modified by the more minute vibrations of certain other organs, to which, either from necessity or volition, the primary impulses are communicated; as also by the responses of certain other vibratory portions of the animal frame, brought into unison (by their tension and position) with such impelling organs.

Rye, April 12. TYRO.

To the Editor of the Mechanics' Register.

SIR—I beg to inform your correspondent, HENRY, in your twenty-fourth number, of a very simple life-preserver (see *Hamilton Moore's Epitome of Navigation,* article Ships in Distress). Let him take 800 new wine-bottle corks, which are to be put on a string, and which, when so done, is to be sewed up in strong but light canvass (and to be made up in circles round the body), and when so done it is to be well painted, so as be water proof. It may have shoulder-straps or buckles, or it may be fastened on a canvass jacket, for convenience; and which, I think, is well calculated to answer the purposes of your correspondent, or in any case where a life-preserver is required.

HENRY WM. DEWHURST.

NOTICE.

In return for the very liberal patronage with which the LONDON MECHANICS' REGISTER has been honoured, and in compliance with the wish expressed by many of their Subscribers, the Proprietors intend to present them with an excellent likeness of DR. BIRKBECK, elegantly engraved on steel, as the most appropriate and acceptable Frontispiece to the FIRST VOLUME of the Work, which they propose to conclude with the 28th Number and 7th Part. The Engraving has been for some time in the hands of the Artist, and no expense will be spared to finish it in a style of elegance worthy of the distinguished individual whom it represents.

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The London
MECHANICS' REGISTER.

"To break the sleep of elemental fire:
" To rouse the power that actuates Nature's frame,
" The momentaneous shock, th' electric flame."
DR. JOHNSON.

No. 26.] SATURDAY, APRIL 23, 1825. [Price 3d.

ELECTRICAL APPARATUS.

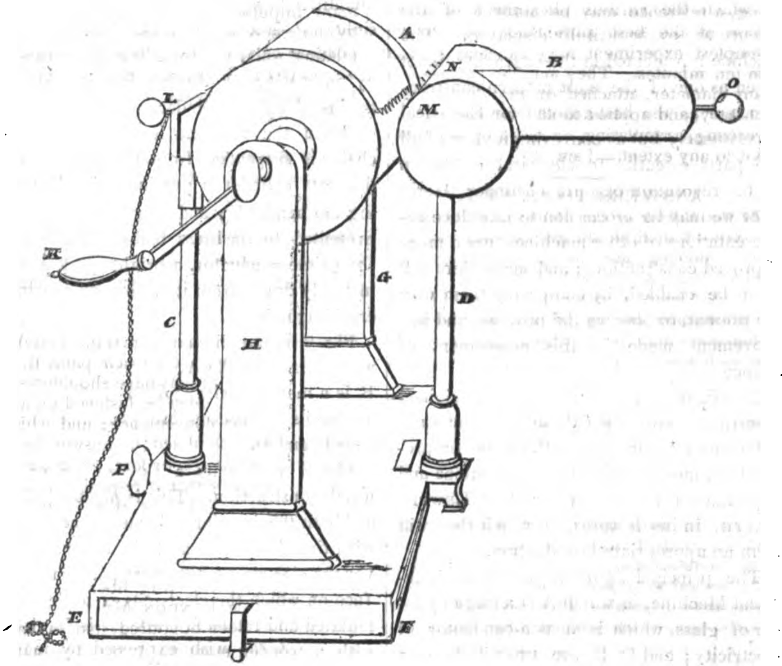
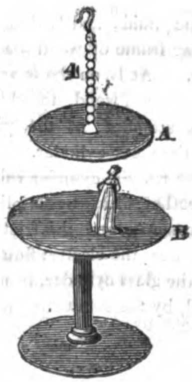


Fig 2

3

4



ELECTRICITY.

The study of this science is so interesting in itself, and furnishes so inexhaustible a source of instruction and amusement to the student, that no apology is necessary for prefixing to our present number a representation of part of the diversified apparatus employed in its experiments, particularly the Electrical Machine, by the operation of which the various phenomena of the science are so beautifully displayed. The machine represented in the engraving, is not given as one of the most modern construction, nor as the best adapted for Electrical experiments; but as conveying a view of all the parts essential to electrical excitation by the revolution of a glass cylinder. Hereafter we may have occasion to introduce representations of other machines, upon more approved construetions; and onr readers will then be enabled, by comparing them with the present, to observe the progress and improvement made in this department of science.

The figures, together with the subjoined description, will assist those who have not witnessed electrical operations, in comprehending, more readily, the observations and experiments introduced by Mr. Lewthwaite, in his lectures, to which they will form an appropriate introduction.

The principal figure represents an Electrical Machine, in which A is a large cylinder of glass, which is a non-conductor of electricity; and C D are two pillars, also of glass, to insulate the machine, or cut off its communication with the earth, which is the great repository of the electrical fluid. B is a metallic cylinder, which is a conductor of the fluid; and E F G H represents the strong frame of wood that supports the cylinders. At L, on the top of the pillar C, is a piece of wood, to which a stuffed leather is attached, at the place where it touches the glass cylinder. Upon turning the handle K, the cylinder rubs against the stuffed leather, which by its pliability, yields to the pressure, and the friction thus produced excites the electric fluid on the surface of the glass cylinder, from which it is conveyed, by the conducting metallic points N to the metallic cylinder M; and to prevent the dispersion of the fluid before it arrives at the points N, a piece of black silk (an insulating substance) is loosely attached to the glass cylinder. From a metal ball on the cushion L, a chain is suspended, for the purpose of forming a communication with the earth, without which it wonld be impossible to accumulate the fluid in sufficient quantities to render its effect obvious to the sight. P is a screw, at the bottom of the insulating pillar C, to adjust the cushion, by increasing or diminishing its friction against the glass cylinder.

When the machine is to be used, the chain is suspended from the cushion, and the glass cylinder is put in motion by turning the handle K; and if the finger be now presented to the brass ball O, attached to the prime conductor, a bright spark will be instantly drawn from it, accompanied with a crackling noise.

Fig. 2 is the discharging rod, furnished with a glass handle A, to insulate the body. B is a metallic wire, joined in the center, and at its extremities are placed the brass balls C and D.

Fig. 3 represents a Leyden jar of the usual construction. This is made of glass, and both the interior and exterior are coated with tin-foil as high as B, in order to convey the electric fluid to every part of the surface on which the electricity is to be accumulated and retained. The jar is furnished with a wooden stopper, A, through which passes a strong wire, with a ball, C, at the top, and communicating with the interior coating. To discharge the jar, the wires of the discharging rod are extended till the balls are brought into contact with the exterior coating of the jar and the ball at the top; by which means a communication is formed between the interior and exterior coatings, and the fluid passes through the discharging rod, without communicating with the body, which is protected by the glass handle.

Fig. 4 is an apparatus affording an amusing example of the effects of the electric fluid on light substances, as exhibited in Mr. Lewthwaite's first lecture.

LONDON MECHANICS' INSTITUTION.

MR. LEWTHWAITE'S FIRST LECTURE ON ELECTRICITY.

HISTORY OF ELECTRICITY—ELECTRICAL EXCITATION—CONDUCTORS AND NON-CONDUCTORS—INSULATION—POSITIVE AND NEGATIVE ELECTRICITY—ELECTRIC ATTRACTION—EXPERIMENTS.

WEDNESDAY, 13TH APRIL.

Mr. Lewthwaite this evening commenced a course of lectures on the science of Electricity, which he introduced by observing that nothing had contributed more to the establishment of truth, and the advancement of general science, than the transition from metaphysical reasoning to experimental philosophy. Mere conjecture, however plausible or fondly embraced, affords but little satisfaction to the mind. We are constantly wishing for the evidence of facts, and finding but few speculative points which are not liable to be controverted, we are obliged to seek for demonstrative proof by adverting to practical investigation. This is eminently true with respect to Electricity; a field of enquiry in which fancy has sufficiently exhibited her luxuriance. It is a branch of science in which pleasure and utility are happily united; and were the subject to be considered in no other than a philosophic light, with a view of extending our knowledge of a fluid which appears to have almost an unlimited agency and universal extent, it would be found an inexhaustible source to the man of leisure and speculation; or if we consider the variety of entertaining experiments and curious phenomena that may be produced by an electrical machine, we shall find it a most agreeable relaxation to every mind that is capable of virtuous and rational pleasures. But if, at the same time, it can be rendered subservient to more essential purposes in life, it must strongly demand the attention of every ingenious enquirer.

The term Electricity is derived from the Greek word *electron*, which in that language signifies *amber*; but with us it properly designates the science which treats of the phenomena of *attraction* produced by the *friction* of that substance. As similar and analogous appearances were afterwards observed during the friction of *sealing-wax*, *glass*, and a vast number of other bodies, and were developed by various other means and under various circumstances, the purport of the term *electricity* has been extended so as to embrace all the numerous and diversified phenomena which appear to have the same origin as those of excited *amber* or *glass*.

The property exhibited by amber in attracting light bodies seems to have been known in the very infancy of philosophy. Thales, of Miletus, the founder of the Ionian school, endeavoured, about 600 years before Christ to explain this remarkable effect, by ascribing to this fossil the functions of an animated being. The attractive power of amber was afterwards noticed by Theophrastus; and several detached and unsatisfactory notices respecting the same substance occur in the writings of Pliny; but the ancients seem to have been acquainted with nothing more than the meagre fact which was known in the time of Thales; and although the electrical property of amber was noticed by several modern writers, such as Digby, Sir Thomas Brown and others, it does not appear that any experiments were made upon the subject till the time of Dr. Gilbert, of Colchester, about the year 1600. This eminent philosopher may indeed be justly regarded as the founder of the science of Electricity.

The ingenious Mr. Boyle, to whom some of the other physical sciences are under lasting obligations, directed much of his attention to this subject, and has left us an account of his experiments in a small work entitled "Experiments and Notes about the mechanical origin and production of Electricity." The existence of *electric light* was discovered by Dr. Wall, who procured a long and tapering piece of amber, and upon drawing it through a piece of woollen cloth, he heard a prodigious number of little cracklings, each of which was accompanied with a small flash of light; but by holding his finger at a little distance from the amber, he heard a loud snap. "It strikes the finger" says Dr. Wall, "wheresoever applied, with a push or puff like wind." This subject, as well as other branches of natural philosophy, was about this time assiduously cultivated by Mr. Hawksbee.

After a considerable interval, during which electricity received no accessions, the subject was taken up by Mr. Stephen Grey, a pensioner at the Charter-house, who enriched the science with the most important discoveries. He was led to the division of all substances into *electrics*, or those which can be excited by friction, and *non-electrics*, or those which cannot be so excited. He also discovered this important general law, that *non-electrics*, such as the metals, are *conductors* of electricity; while *electrics*, such as glass, silk, hair, resin, &c. are non-conductors, and may be employed to insulate conductors. Doctor, afterwards Sir William Watson, began his successful career as an electrical discoverer about the year 1745. His attention appears to have been directed to the subject by the discoveries of the Germans, whose experiments he carefully repeated. He succeeded in firing inflammable air and gunpowder by the electric spark, and his attention was next occupied by the Leyden phial, which was invented about this time for the purpose of accumulating considerable quantities of electricity. He obtained a number of curious results, but endeavoured in vain to give a theory of its operations. Dr. Watson was at the head of a small party of English philosophers, who associated themselves for the purpose of making a series of experiments on the *distance* to which the electric shock could be carried, and on the *velocity* of its motion. On the 14th and 18th of July, 1747, they conveyed the shock across the Thames at Westminster Bridge by an iron wire, the water of the river forming part of the chain of communication. On the 24th of July, at two different places, they forced the electric shock to make a circuit of two miles on the New river at Stoke Newington. At one of these places the distance by land was 800 feet, and by water 2000; and in the other 2800 by land, and 8000 by water. On the 14th of August in the same year, in the driest weather, the association assembled on Shooter's Hill, for the purpose of performing a very magnificent experiment. The wire which communicated with the iron rod that made the discharge, was supported on rods of baked wood, and was 6732 feet long. The wire communicating with the phial was supported in a similar manner, and was 3868 feet in length; the distance of the observers being above two miles. Although the circuit was four miles, two of water and two of dry ground, yet no time appeared to elapse during the passage of the shock; so that there was every reason to consider it instantaneous.

While electricity was making such progress in England, Dr. Franklin was busily occupied with the same subject in America. The extent and brilliancy of his discoveries gave a form and dignity to the science which it had never before possessed, and raised their author to a high rank among the distinguished philosophers of the eighteenth century. His earliest discoveries were communicated to his friend Mr. Collinson of the Royal Society, on the 28th July, 1747, and were speedily translated into the different languages of Europe. These discoveries related to almost every branch of electricity; but the most important may be reduced to three. 1st, his discovery of *plus* and *minus* electricity; 2nd, his explanation of the *Leyden phial*; and 3rd, his discovery of the identity of *lightning* and *electricity*.

Having thus given a hasty sketch of the great body of facts which constitute the history of electricity, Mr. LEWTHWAITE proceeded to that branch of the subject which professes to connect together, by one general principle, the various phenomena which constitute it a science. He observed, however, that this principle is merely *hypothetical;* and that while our attention is occupied with the *electric fluid*, and with the properties it is assumed to possess, we must never forget that we are speaking of a substance, the existence of which is yet undetermined, and which we know merely from its effects.

Mr. LEWTHWAITE then commenced his illustrations of the science of ELECTRICITY, by showing that a piece of *amber*, when excited by friction, possesses the property of attracting light substances, and that a similar effect is produced by a tube of *glass*, when excited by *silk*, and also by *sealing-wax*, particularly if rubbed upon *fur*, which produces the best effect. Electricity is sometimes produced merely by combing the hair, or pulling off the under garments; but in whatever manner it is developed, its effects are always the same. *Glass* and *sealing-wax*, however, possess electricity of different characters, as will be evinced by their effects on the *electrometer*, or rather the *electroscope;* which term Mr. Lewthwaite considered the most appropriate, because the instrument is not a *meter*, or *measure* of electricity; but is used for the purpose of making the effects of small quantities of electricity visible. The lecturer then presented a stick of excited sealing-wax to the electroscope, when its gold leaves diverged with *negative* or *resinous* electricity, but collapsed on the approach of the excited glass tube, which was *positively* electrified. These two kinds of electricity have a tendency to disturb each other; and the sealing-wax being deprived of part of its electricity by excitation, receives electricity from the electroscope; while the glass, which receives additional electricity by friction, communicates a portion of it to the electroscope. Thus we find that there are two distinct kinds of electricity, viz. *vitreous* and *resinous*, or as they were termed by Dr. Franklin, *positive* and *negative* electricity.

It is necessary to explain what is meant by *conductors* and *non-conductors*, and also the meaning which is conveyed by the term insulation. *Conductors* are those substances through which the electric fluid passes, either through their pores, or along their surfaces. Lists of conducting bodies are given by writers on electricity, which include the metals, charcoal, saline, fluids, water, &c. Non-conductors, on the contrary, are those bodies, through, or over which the fluid will not pass; such as shell-lac, resin and glass, of which the latter is the most useful in electrical experiments. The lecturer exemplified these remarks by shewing that the fluid passed readily through a metallic body, but not through glass, and observed, that a body is said to be *insulated*, when its communication with the earth is intercepted by a *non-conductor*. Thus the wires of the discharging rod are insulated by the *glass* handle, and the conductors of the electrical machine by the *glass* pillars which support them.

Mr. Lewthwaite then explained the construction and operation of the electrical machine, which will be clearly understood by a reference to the engraving, and the description which accompanies it. When the machine is at rest, it remains in its natural state of electricity; but this natural state is disturbed when it is put in motion, and the electricity drawn from the earth is carried round the cylinder to the positive conductor. If there is nothing to receive the electricity thus conveyed to the positive or prime-conductor, the fluid again passes round to the negative conductor of the machine.

In order that the machine may be in good condition for the performance of electrical experiments, it is necessary to prepare the rubber with an amalgam composed of two parts of tin, four of zi c, and seven of mercury. Some electricians use an amalgam of tinfoil and mercury only; but the lecturer considered the former a preferable compound for this purpose. He would now endeavor to make it evident that the machine was capable of producing the two opposite states of electricity which were developed by sealing-wax and glass.

Mr. Lewthwaite then charged two Leyden jars from the *positive* conductor; and two pairs of pith balls being suspended from different frames, upon bringing the knobs of the jars near them, the balls immediately receded from each other. The jars were then charged again, the one *negatively* and the other *positively*, when the opposite effect took place, as the pith balls were strongly attracted towards each other. In the latter case, the two kinds of electricity attracted each other to restore the equilibrium, because they possess a tendency to destroy each other's effects. To illustrate this still further, the jars were again charged with *positive* and *negative* electricity, and upon bringing the knobs together, they were both discharged; and the same effect occurred when a communication was formed between the knobs by means of the discharging rod. The lecturer here observed that he should defer the explanation of the nature of the Leyden jar till a future lecture, as his present object was merely to shew the effects of the two electricities upon each other.

A light substance, in the form of a fish, was then suspended between the knobs of two jars, by which it appeared to be alternately attracted, as it passed backwards and forwards from one knob to the other in a very curious manner, and would in time completely discharge the jars. This experiment, as well as some others in electricity, might appear only fit for children, but it should be remembered, that when instruction is combined with amusement, it is frequently imbibed almost unconsciously.

Having thus made it evident that the electricity generated by the machine, like that of sealing-wax and glass is of two different kinds, he would now proceed to the subject of *electric attraction*. When a charged jar is presented to the pith balls, the latter are said to be attracted by it, as they are evidently drawn towards the knob, but they no sooner approach it than they recede from it. If a leaf of gold be made to float in the atmosphere, it will recede from an excited glass tube. This experiment Mr. Lewthwaite performed very successfully, and the floating leaf evidently seemed to be repelled by the tube, as the latter followed its undulating progress; but the lecturer denied in toto the existence of *electric repulsion*. The gold leaf becoming charged with *positive* electricity by the excited glass, was *attracted* by the atmosphere, which was in the opposite state of electricity, and was therefore kept floating at a distance from the tube. Mr. Lewthwaite then presented the knob of a charged jar to an electroscope furnished with two pith balls, when they immediately diverged; and he observed that, in this case, the balls might be supposed to *repel* each other; but this was not the fact, as their divergence was occasioned by the *attraction* of the atmosphere which surrounded them. To prove this, he would exhaust the air from the electroscope, and if the balls diverged as before, he would be ready to admit of electric repulsion. This was accordingly done, and upon presenting the jar, the balls remained quiescent, from which experiment the lecturer inferred that there was no such thing as electric repulsion; for if this were the case, the balls would have separated as readily in vacuo as in atmospheric air.

Several other experiments, of a very amusing and interesting kind, were then performed for the purpose of elucidating the phenomena of *electric attraction*. An excited glass receiver was placed over a number of pith balls, which being attracted by the upper part of the receiver, gave off their electricity on falling to the bottom, and were thus kept in rapid motion for some time. An apparatus, which is represented in our engraving (fig. 4) was then exhibited, and the metallic plate A, being suspended by a chain from the prime conductor of the machine, the figure of a snake was placed on the lower plate B, and by alternately approaching the upper plate, by which it became charged with electricity, and returning to the lower plate to give it off, the figure presented a correct representation of the convolutions of a real snake. Some little figures of men and women were successively placed between the plates, where they danced about in a very comical manner, and produced a considerable effect on the risible muscles of the audience.

Thus, gentlemen, concluded Mr Lewthwaite, I have endeavoured to prove that the electrical machine, like sealing-wax and glass, gives off two different kinds of electricity, which have a tendency to destroy the effects of each other; and that there is no such thing as *repulsion* in electricity, the various effects you have witnessed being all occasioned by *attraction*. I have also exemplified these principles by a series of pleasing experiments, from a conviction that the more attractive science can be rendered, the more eagerly it will be perused by its admirers.

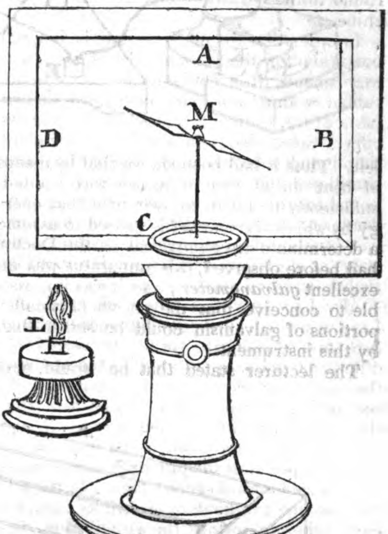
DR. BIRKBECK'S THIRD LECTURE ON VOLTAIC ELECTRICITY, ELECTRO-MAGNETISM, AND THERMO-ELECTRICITY.

DEFLECTION OF THE MAGNETIC NEEDLE—APPARATUS OF DR. SEEBECK, PROFESSOR CUMMING, AND MR. MARSH—FURTHER EXPERIMENTS OF ROTATORY MOTION—DE LUC'S ELECTRICAL COLUMNS—IGNITING AND DEFLAGRATING POWER OF THE VOLTAIC BATTERY—COMBUSTION OF CHARCOAL, PLATINUM, GOLD, ÆTC. ÆTC.—POTASSIUM AND SODIUM—CONCLUSION.

WEDNESDAY, 15TH APRIL.

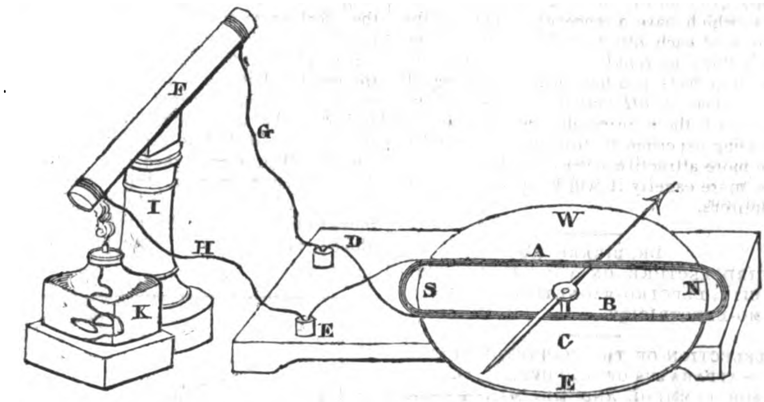
In continuation of his able illustrations of the combined effects of *voltaic electricity* and *magnetism*, Dr. BIRKBECK commenced the present lecture by observing, that so great was the zeal and activity of modern scientific inquirers, that the experiments of the ingenious OERSTED were no sooner promulgated than they were instantly repeated and extended by other individuals, with the production of the curious and astonishing results, which in the last lecture, were detailed.

In the course of the summer of 1823, Dr. Seebeck, of Vienna, by combining metals of different kinds, succeeded in producing deflections of the magnetic needle by an increase of temperature alone, without any assistance from the voltaic arrangement before used. Dr. Seebeck's apparatus was then exhibited: it consisted of a parallelogram composed of the two metals, *bismuth* and *antimony;* one long and one short side being formed of each metal. The lecturer stated that this apparatus, though a voltaic combination, was not in a state of electrical activity; but upon the application of heat, it would produce the same effect on the magnet as had been witnessed in other experiments during the previous lecture. Even the heat of the hand was sometimes sufficient to occasion a deflection of the needle. Dr. BIRKBECK then placed a magnet, turning upon an agate centre, in contact with the apparatus, and after allowing it to assume its natural position, he applied his hand to the parallelogram; but as he had made use of a magnet rather too large, in order to render the effect more visible, the change of temperature produced was not sufficient to cause a perceptible difference in the direction of the needle; but upon substituting a smaller magnet, it soon became considerably disturbed. The application of a spirit lamp rendered the deflection still more obvious, and the Doctor remarked that when Professor Oersted was in this country, he brought with him a parallelogram, which moved the magnet by the heat of the hand alone; when, however, the spirit lamp L



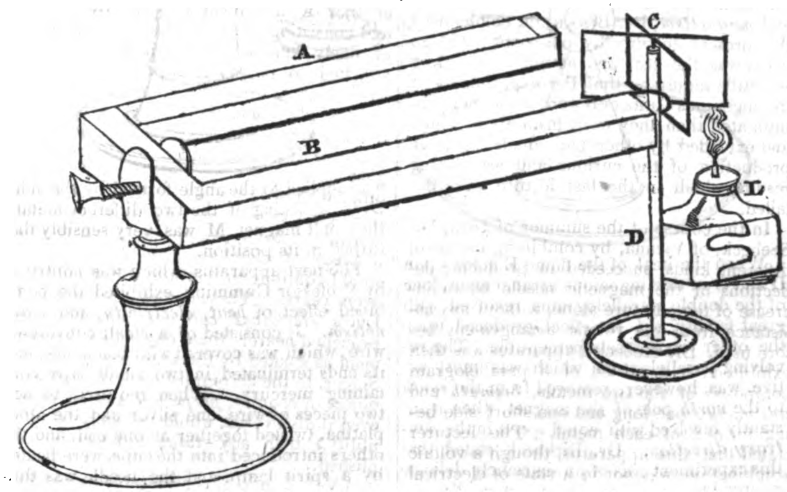
was applied to the angle formed by the sides D, C consisting of the two different metals, the small magnet M was very sensibly disturbed in its position.

The next apparatus, which was contrived by Professor Cumming, exhibited the combined effect of *heat*, *electricity*, and *magnetism*. It consisted of a small convoluted wire, which was covered with black silk, and its ends terminated in two small cups, containing mercury. When required to act, two pieces of wire, one silver and the other platina, twisted together at one end, and the others introduced into the cups, were heated by a spirit lamp, and the needle was thus soon disturbed. The plan of using a cylinder of bismuth or zinc with copper wires twisted round each end, F, G, H, for introducing into each cup, as used by Mr. Marsh, was stated to be preferable. The instant the flame of the spirit lamp, K, was applied to one end of the bar, the magnet was deflected permanently towards the right of the lecturer; but upon heating the other end by changing the position of the lamp, the needle returned towards the convoluted wire, and passing it, exhibited the same degree of deflection on the opposite side, towards the



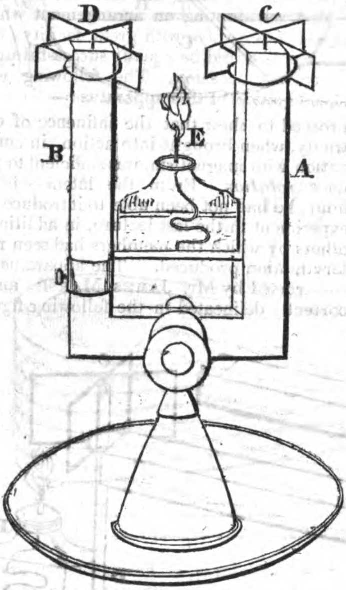
left. Thus it had been shown that by means of heat an electric influence was excited, sufficiently powerful to overcome that energy by which the magnet is caused to assume a determinate direction; and as the Doctor had before observed, this apparatus was an excellent *galvanometer;* and it was impossible to conceive that the effects of smaller portions of galvanism could be shown than by this instrument.

The lecturer stated that he would next proceed to shew that the influence of electricity, when brought into action, in combination with magnetism, was sufficient to produce *rotation.* From the lateness of the hour, he had not been able to introduce this experiment in the last lecture, in addition to others by which the members had seen rotatory motion produced. The apparatus was constructed by Mr. James Marsh, and is correctly delineated in the following figure:



(We should have stated that Mr. Marsh was in attendance, and assisted Dr. Birkbeck in the performance of several of the experiments.) The two parallelograms which cross each other in this apparatus are each composed of two pieces of metal, the lower side being *platinum* and the other three sides *silver.* The apparatus exhibited to the audience was made on a large scale, that its construction might be distinctly visible, but no effect could be produced upon such large portions of metal, and it was therefore necessary to use a much smaller apparatus, in which however the rotatory motion might be distinguished by attentive observation. A horse-shoe magnet A, B, was then placed near the apparatus, as represented in the figure, and upon applying the flame of the spirit lamp, L, to one of the angles of the transverse parallelogram C, it instantly began to revolve with rapidity. Here it was shewn that the energy of the Voltaic power, added to the energy of the magnetic power, was able to produce rotatory motion; though it had been supposed that magnetism was a species of quiescent influence, or was incapable of producing revolution round an axis.

The following apparatus was then exhibited, for the purpose of shewing that a *double revolution* might be produced, by placing two of the little instruments used in the last experiment upon the poles of a horse-shoe magnet:—



When the heat of the flame E acted upon D and C in this ingenious arrangement, one of the double parallelograms revolved with great facility, but the effect produced upon the other was scarcely perceptible. The revolving parallelogram which was most active, was, however, removed from the *south* to the *north* pole of the magnet, when it instantly revolved with equal speed in the *contrary direction*. Dr. Birkbeck stated that this experiment was of an extremely delicate nature, in consequence of the very small quantity of Galvanism evolved; and it was indeed very evident, that the partial failure of the experiment was attributable to some unobserved defect in one of the double parallelograms, which resisted an influence that acted readily on the other, upon whichsoever pole it was placed.

The experiments which have been exhibited are sufficient to prove the remarkable circumstance, that the simple application of two metals of different kinds to each other, causes the evolution of that energy which occasions the occurrence of Voltaic phenomena. Whether the two metals are soldered together, or merely laid in contact with each other, their different states of electricity appear to be disturbed by their juxta-position, and they become *electro-motive*.

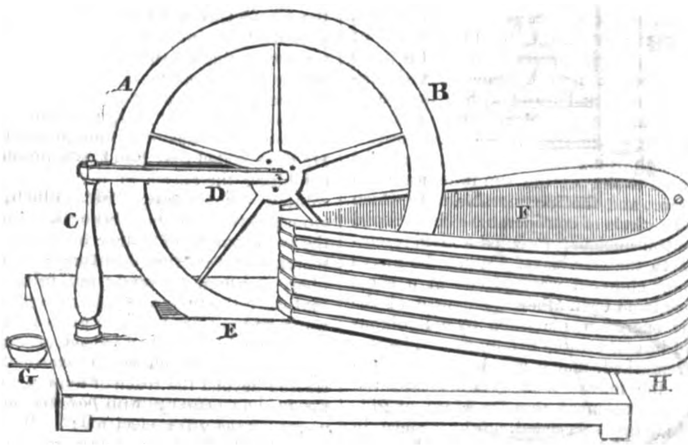
Dr. Birkbeck then observed, that as in his first lecture he had only described the manner in which the Voltaic pile is constructed, he would afford the audience an opportunity of seeing it built, and they would observe that the operator commenced with a plate of *copper*, upon which he placed one of *zinc*, and then a piece of moistened cloth; proceeding in the same order till the pile reached the top of the open frame which supported the plates. They would observe, that a distinct ring was marked upon each of the discs of cloth, which had been previously used in the construction of the pile, and moistened with the *chloride* or *muriate of soda*. These rings are the result of a chemical change produced by the action of the pile, and upon this change depends the permanent effect of the apparatus; for if there were no moisture, though electricity would be evolved, it would not produce a permanent effect.

While the assistant, Mr. Bluett, was building the pile, Dr. Birkbeck exhibited another arrangement adopted by De Luc, and consisting of several hundreds of plates of finely laminated *zinc*, and *Dutch metal* attached to paper, each pair being divided by these discs of paper partially moistened, and the whole inclosed in a glass tube. If this apparatus was placed on two electrometers, one of its extremities would cause the gold leaves to diverge with *positive*, and the other with *negative* electricity. If two of these glass tubes were placed so that their contrary poles were opposite to each other, a piece of metal suspended between them would continue to vibrate for months, or even years. These tubes are called De Luc's *electrical columns*, and have approached nearer than any other arrangement as stuated by the ingenious electrician Singer, to the accomplishment of that great object of enquiry, *perpetual motion*, (which even if discovered, would probably be of no utility,) than any thing hitherto accomplished.

A Voltaic pile of considerable height, having the metallic discs two inches in diameter, being now constructed, Dr. Birkbeck observed, that if any individual touched each of its extremities with a piece of metal or a moistened finger, he would find that the pile was not an *inert substance*, as he would be instantly stunned up to the elbows, or perhaps nearly as far as the shoulders; and this effect was repeated as often as the contact took place, however rapidly it might be repeated. The Doctor subjected himself to the shock, and described the painful effect it produced; and considerable laughter was excited by the circumstance of Mr. Marsh unexpectedly receiving a check, by handling the pile incautiously, though so well acquainted with its effects.

That such an arrangement of portions of apparently inert matter, should produce such an effect, excited astonishment in the minds of all who witnessed it. The Voltaic pile was however very soon applied to other purposes; and Messrs. Nicholson and Carlisle, having observed a slight decomposition of water on the upper surface of the pile, soon completed the effect by inserting into the opposite ends of a tube containing water, two wires communicating with the upper and under surfaces of the pile. This experiment the lecturer now performed, and the decomposition of the water was soon rendered evident by the appearance of numerous bubbles of *hydrogen*, which issued from one of the wires, while the other became corroded by its combination with the *oxygen*.

The assistants now proceeded to prepare a very large trough for the performance of a series of striking experiments to shew the surprising effects, as to ignition and deflagration, which may be produced by Voltaic power; and in the interim, Dr. Birkbeck requested the attention of the members to a rotatory machine, which he had exhibited at the last lecture, and had then stated that the whole force of the extensive Voltaic apparatus of the London Institution, had failed to make it rotate. Mr. Marsh had, however, on the morning after the last lecture, succeeded in adopting an arrangement which caused it to revolve with great facility, and perhaps he would be equally successful upon the present occasion, The following is a representation of this apparatus:—



The wheel A, B, appears to be so constructed that the *tangential force*, before alluded to, can have little opportunity to act; its edge being extremely fine, and barely touching the mercury at the poiut E. Mr. Marsh then placed a large horse-shoe magnet, F, in the situation represented in the figure, and upon connecting the poles of the battery belonging to his electro-magnetic arrangement with the wheel by the cup G, and another cup, not seen, near H it began to revolve with great rapidity. The poles of the magnet being reversed, by placing it upon its upper surfacet the revolution proceeded with equal celerity in the contrary direction.

In this experiment, continued Dr. Birkbeck, it is evident that there must be either one acting force and one passive resistance, or two-active forces; but whether the motion of the whole proceeds from the *voltaic* or *magnetic* force, as the active one, or from both, acting in opposite directions, may perhaps never be discovered. I think, however, from the change of motion produced by changing the position of the magnet, I may venture to infer, that by the active operation of both these influences this rotation is effected.

The large voltaic battery being now prepared, the lecture-room was darkened, and the learned President proceeded to exhibit its electrical effects by a number of experiments, which excited the greatest astonishment in the minds of the spectators, and elicited loud and reiterated acclamations. The arrangement consisted of twenty-four pairs of plates, each a foot square, cemented according to the earliest plan, in grooves formed in the inside of a strong mahogany box. This battery was constructed, he observed, soon after the experiments Fourcroy and Thenard had shewn the very great heating power of large plates compared even with a greater extent of surface, divided into more numerous parts; and constituted, with one of similar magnitude which he had also constructed for using at the same time, the most powerful apparatus that had then been employed. Subsequently, however, Mr. Children had prepared plates much larger, and of much greater energy, and the fine batteries of the Royal Institution and the London Institution also much exceeded them. Still however, if, as is very probable, the battery should have escaped injury from having been long disused, its energy will not be insignificant. Perceiving, said the Doctor, that there is now great action, I shall take advantage of the best condition to exhibit one of its most curious and brilliant effects, the combustion of charcoal and the illumination of the intervening space, in the greatest perfection. The first experiment, therefore, consisted in placing two pieces of *charcoal*, properly prepared and pointed, between the extremities of two pieces of strong copper wire proceeding from the poles of the battery: they became instantly ignited intensely, and burnt with a degree of splendor almost insupportable to the eye. The extreme brilliancy of the light emitted from the burning charcoal, could only be compared to that of the sun in its meridian splendour, and the innumerable radii which formed a circle of considerable extent around the central nucleus, presented a vivid resemblance to that luminary. When the pieces of ignited charcoal were placed at a short distance from each other, the course of the electric energy was marked by a luminous arch of incconceivable brightnesc. The lecturer remarked, that it was by the application of the intense heat generated by the voltaic arrangement, that Dr. Hare, of Philadelphia, had succeeded, not long since, in forming artificial diamonds from charcoal. At a future period, he should have an opportunity of exhibiting the combustion of charcoal by means of the same apparatus, when surrounded by *oxygen gas*, instead of *atmospheric air;* on account of the brilliancy of combustion being added to the present splendour, the Members would witness an effect still more striking.

A piece of thin *platinum wire* of considerable length, was then introduced within the voltaic circle, and was instantly consumed like a piece of thread; though this metal is most infusible and indistructible by every heat that can be produced under ordinary circumstances. Several other pieces of platinum wire, some of them much thicker, and also of considerable length, were then successively exposed to the action of the battery, and were in an instant heated to whiteness, or fused into minute globules. Portions of *gold* and *silver leaf* were also consumed, and exhibited a beautiful spectacle during their combustion. Leaves of *Dutch metal* were then burnt in a similar manner, and exhibited a variety of brilliant colours, from the admixture of metals of which it is composed. Even the *mercury*, upon the surface of which the metallc laminæ had been laid for the purpose of combustion, was ignited by the intense heat generated by the voltaic arrangement, and ascended in white fumes. The very oxidable metals, *zinc* and *iron*, were also fused when placed in the voltaic circle, and fell in numerous globules. It is impossible to describe the intense interest excited in the crowded assembly by these strikingly beautiful experiments, the whole of which, we may emphatically say, were performed with the most *brilliant* success.

The usual time having now elapsed, Dr. Birkbeck observed that a more complete development of the chemical effects of voltaic electricity, and an exposition of the theory of this wonderful action would be presented, when an opportunity was offered for performing all the requisite experiments, and a proper space was provided for the necessary arrangements. All this 'ere long he hoped to be able to accomplish, in a menner which was now quite impracticable. He then stated that he should conclude by exhibiting the effects of that extraordinary substance, *potassium*, which as he had previously observed, had been discovered by the employment of voltaic power in the researches of Sir Humphry Davy; a philosopher, of whom he might say with justice, that since the time of Sir Isaac Newton, the world had not produced so great an experimental genius. He had indeed, accomplished a discovery which was proverbially considered beyond the reach of human abilities, for he had actually furnished the means of "*setting the Thames on fire.*" The doctor exemplified this remark by throwing a piece of *potassium* on the surface of some water in a flat glass vessel, where it instantly burst into a flame of a beautiful red and purple colour, and traversed the surface of the fluid for several seconds. The experiment was repeated with the same result, and the lecturer then threw into the vessel a piece of *sodium*, another singular metal discovered by Sir Humphry Davy, and which is the base of the alkaline substance *soda*. This metal does not usually inflame when placed in contact with water, but in the present instance it immediately took fire, and burnt upon the surface like the *potassium*. Dr. Birkbeck then shewed that the combustion of these substances on the water had converted it into a fluid, having the properties of an *alkali*, as a blue vegetable infusion was instantly changed to a beautiful green by the addition of a portion of the alkalised water.

Though the existence of these substances is only known to the world as the result of chemical processes, their formation may possible depend upon natural operations, and it is probable that large bodies of *potassium* and *sodium* may exist in the earth, and that when water is brought into contact with them, the resulting flame and gazeous evolution, produce heavings of the earth, and the rupture of its crust or surface. Hence it is probable that these very substances are the occasion of *earthquakes* and *volcanoes*, and that the latter act as a kind of chimneys to permit the escape of the vast quantities of gas generated by the internal combustion, and thus prevent as it were, the bursting of the earth itself. This opinion receives confirmation from a circumstance which occurred in 1822, when an eruption of Vesuvius took place, which was accompanied with the discharge of large quantities of *chloride of soda*, one mighty mass of which was employed by the population for a long period, for domestic uses; and it is also probable that the immense collections of *rock-salt* found in the bowels of the earth, are the result of the chemical changes produced in periods long past by the contact of *potassium* and *water*.

Thus, concluded the worthy Doctor, voltaic electricity is not only intimately connected, as I pointed out to you before, with the circumstances of ordinary life, but is connected likewise in the way of explanation with some of those awful phenomena, which by the unenlightened mind, are supposed to threaten the utter destruction of the earth itself: and thus you will perceive, as science proceeds, it mingles completely with occurrences the most trivial and the most momentous, either for the protection or for the illumination of man.

The learned President's admirable lecture was protracted considerably beyond the usual period; but so intense an interest was excited in the minds of his hearers by the importance of the subject, and the splendid experiments by which it was illustrated, that they seemed perfectly unconscious of the flight of time, and at the conclusion of the lecture, the "flow of soul" which dictated their enthusiastic plaudits, testified their gratitude for the "feast of reason" in which they had participated.

LECTURES FOR NEXT WEEK.

Wednesday, April 27, Mr. LEWTHWAITE's third lecture on Electricity.

Friday, April 29, Mr. OGG's second lecture on Heat.

SPITALFIELDS MECHANICS' INSTITUTION.

To the Editor of the Mechanics' Register.

SIR—As you have uniformly taken a deep interest in every thing which relates to mechanics, and instructions for their improvement, I shall make no apology for troubling you with a few observations intimately connected with the institution recently established in Spitalfields. Last Monday evening, as you are no doubt aware, in consequence of arrangements having been made by the newly elected Committee, Mr. WALLACE delivered a most admirable lecture on ASTRONOMY; calculated highly to entertain, as well as instruct, the members present; and to remove the antipathy unhappily existing in the minds of the greater portion of the weavers, to the society. When they find that the institution is really designed for their advantage, and not, as they absurdly imagine, for the emolument of the masters at their expense, they will feel less disposed to stand aloof from all participation in its benefits.* The lecturer's remarks were pertinent; his explanations clear and concise; his apparatus of the most brilliant description; and the illustrations he introduced, for the most part felicitous. Among so many excellencies it is not to be wondered at if some trivial errors, easily corrected, should have gained admission. My design is to notice one or two which occur to my recollection; feeling assured that Mr. Wallace's good sense will dispose him rather to rejoice at an opportunity of correcting any discrepancy that might have arisen in his statements, than to be offended at the notice taken; it will, at least, furnish a proof that his hearers were not wholly inattentive to his observations.

The first which occurs to me was endeavouring to shew that the earth revolved round the sun, and not the sun round the earth. "Such an opinion as the latter," said he, "is contrary to the order of nature. Among all the heavenly bodies with which

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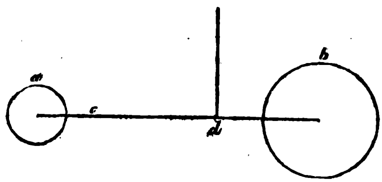
* We are perfectly aware of the existence of the unfortunate and mistaken prejudice alluded to by our intelligent Correspondent, and our acquaintance with this fact may be inferred from the hint we gave at the close of our sketch of Mr. Partington's first lecture, (page 330).—We cannot but indulge a hope, however, that one of the earliest effects of the establishment of the institution will be the complete annihilation of this inimical feeling. It was appropriately remarked by Mr. Gibson, that the institution would be the means of uniting two classes hitherto separated, viz. the *employers* and the *employed*; and we trust that the experience of a few weeks will convince the numerous operatives of this populous district, that no sinister motive on the part of their employers has dictated the establishment of the SPITALFIELDS MECHANICS' INSTITUTION.—ED.

we are acquainted, there is not one instance of a larger body revolving round a smaller." The fact is admitted; but I object to the illustration he employed to enforce it. He took two balls, A and B, connected by the wire C.



If they be suspended by a string at the point D, the smaller ball may be made to revolve round the larger; but the larger cannot be made to move round the smaller; because the centre of gravity is at the point D, near the large ball B. Now this explanation would hold good, if we assume that both balls have the same specific gravity; but if the large ball were made of cork, and the small one of lead, the centre of gravity would be nearer it than B; and consequently, the larger body would revolve round the smaller. Now we cannot be assured that the specific gravity of the sun does not differ as widely from that of our earth, as their distance from each other. We cannot determine of what materials any of the planets, stars, &c. are composed. No one can be more alive to the merits of the Copernican system than myself; but I should be sorry if its correctness rested on such evidence as this. Mr. W. was, indeed, much more fortunate, when, by means of a whirling table, he demonstrated that if we attempted to make a large body revolve round a small one, the centrifugal force would remove the attraction of gravitation, and the large ball would fly off. This is something like satisfactory proof; and, had he not been apprehensive of outrunning the comprehension of his auditors, he might have mentioned others equally conclusive. For instance, if Mercury and Venus revolved round the earth, their motion would appear to be in the same direction, whereas they move sometimes eastward, and at others westward. Sometimes, too, they are beyond the sun, and at others between it and the earth; in which case the side towards us is dark. But Mars, Jupiter, &c., never disappear when in conjunction with the sun. This proves that the orbit of Mars includes the sun and the orbit of the earth; but that Mercury and Venus have their orbits between the earth and the sun. But as this might not have been understood by the generality of his audience, he acted wisely in confining himself to illustrations of a more familiar kind, although he certainly should have taken care that those illustrations were not at variance with the principles they were designed to elucidate.

There is one other point on which I may be allowed to touch, the weight of bodies; or, as he defined it, the mutual attraction subsisting between the particles of matter. He clearly explained the attraction of bodies towards the centre of the earth, by assigning, as the cause, that the greatest number of particles lie in that direction, and he might have added, as a necessary consequence, that the nearer a body approached the centre of the earth, the less would be its weight. The conclusion, however, which he draws from these facts does not appear to be altogether warranted by the premises. "The earth," says he, "has *no weight*. Any part of it taken separately, has gravity in reference to the other part; but, as all weight terminates at the centre, the earth taken as a whole, has none." If the notion I entertain be correct, this does not seem to follow. He might indeed have said in the language of Mr. Newton, at the London Mechanics' Institution, "that as the weight of a body decreases in the exact ratio of its approximation towards the centre, when arrived at that point, it would have no weight at all, because equally attracted in all directions," but beyond this, it is not perhaps safe to venture. It would appear on his own shewing, that the earth, in common with the other planets of our system, has a tendency to approach the common centre, were it not that the centrifugal force retains it in its proper orbit; and should its course be interrupted for a moment, it would *fall* towards the sun. Now this would be occasioned by the attraction of gravitation subsisting between its particles and those of the sun; or in other words, its *weight*. How then can it be said that the earth has none!

In conclusion I would beg leave to say, that I think on the whole, Mr. Wallace has acquitted himself nobly; and that I differ from him, not in the principles which he lays down, but in some of the illustrations he advances.—I am, Sir,

Your obedient servant,

Spitalfields, April 13, 1825. ASTEROID.

To the Editor of the Mechanics' Register.

SIR—Observing in your useful Register a proposal for propelling pleasure boats, by what is termed by the person calling himself the inventor, "*a new plan,*" I take the liberty of informing yourself and numerous readers, that the invention cannot in any wise be stiled *new*, nor can the original idea be claimed by Mr. Dewhurst.

I myself, as well as hundreds of other spectators, in the year 1814, on the Delaware, a noble river which divides the states of Pennsylvania and New Jersey in the United States of North America, saw precisely the same contrivance made use of to propel a small boat, and this in more than one instance. In fact, to judge from the drawing and description accompanying the plan of propelling a pleasure boat, I should say that it was the very fac-simile of one of those I saw navigating the Delaware ten years ago.—I am, Sir,

Your constant reader,

LUDOVICO.

*** Without calling in question the correctness of LUDOVICO's assertions, we beg to observe, in justice to Mr. Dewhurst, that the plan may very possibly have suggested itself to his mind, without his being at all conscious that it had been previously carried into effect. Similar coincidences have frequently occurred in many other sciences besides mechanics, and it does not detract from the merit of a beneficial invention, or the skill of the inventor, that he has been anticipated by another.—ED.

THE CENTURY OF INVENTIONS OF THE MARQUIS OF WORCESTER.

An excellent work, from the able pen of Mr. PARTINGTON, of the London Institution, has just been published under the title of "The Century of Inventions of the Marquis of Worcester, from the original MS., with historical and explanatory notes, and a biographical memoir." In the Transactions of the Society of Arts, the Century of Inventions is strongly recommended to the attention of mechanics, and it is observed, that from the seeming improbability of discovering many things mentioned by the marquis, his hints have been too much neglected, but when it is considered that some of his contrivances, apparently not the least abstruse, have, by close application, been found to answer all that the marquis says of them, and that the first hint of that most powerful machine, the STEAM-ENGINE, is given in the Century of Inventions, it is unnecessary to enlarge on its utility.

The task which Mr. PARTINGTON has undertaken and completed with great ability, is to shew that however impracticable or chimerical some of the marquis's inventions may appear, the greater part of them have actually been reduced to practice by mechanical ingenuity. The various inventions are given separately, and illustrative notes are added to each of them, particularising the numerous instances in which they have been carried into effect, and to the last invention of the series, which refers to the STEAM-ENGINE, and which the marquis calls "*the most stupendous work in the whole world*," is subjoined a clear and concise history of the Steam-engine, from the first application of steam to the production of motion, by Hero, of Alexandria, to the astonishing improvements in the construction of the machine by the late Mr. WATT. It is our intention to lay before our readers some extracts from Mr. Partington's valuable work, to enable them to appreciate its merits; but we have thought it advisable, in the first place, to insert the Century of Inventions complete, together with the marquis's dedication to Charles II., and his address to Parliament.

The merit of the Century of Inventions as a scientific work, entitle it to a place in every publication devoted to the improvement of the mechanical arts; and as many imperfect copies have appeared at different times, we are happy to present the marquis's work to our readers under the sanction of authority which leaves its correctness and authenticity unquestionable.

DEDICATION.

TO THE KING'S MOST EXCELLENT MAJESTY.

Sir,—*Scire meum nihil est, nisi me scire hoc sciat alter*, saith the poet, and I most justly in order to your Majesty, whose satisfaction is my happiness, and whom to serve is my only aim, placing therein my *summum bonum* in this world: Be therefore pleased to cast your gracious eye over this summary collection, and then to pick and choose. I confess I made it but for the superficial satisfaction of a friend's curiosity, according as it is set down; and if it might now serve to give aim to your Majesty how to make use of my poor endeavours, it would crown my thoughts, who am neither covetous nor ambitious, but of deserving your Majesty's favour, upon my own cost and charges; yet, according to the old English proverb, "it is a poor dog not worth whistling after." Let but your Majesty approve, and I will effectually perform to the height of my undertaking: vouchsafe but to command, and with my life and fortune I shall cheerfully obey, and maugre envy, ignorance, and malice, ever appear your Majesty's passionately-devoted, or otherwise disinterested subject and servant,

WORCESTER.

TO THE RIGHT HONOURABLE THE LORDS SPIRITUAL AND TEMPORAL, AND TO THE KNIGHTS, CITIZENS, AND BURGESSES OF THE HONOURABLE HOUSE OF COMMONS, NOW ASSEMBLED IN PARLIAMENT.

My Lords and Gentlemen,

Be not startled if I address to all, and every of you, this century of summary heads of wonderful things, even after the dedication of them to his most excellent Majesty, since it is with his most gracious and particular consent, as well as indeed no ways derogating from my duty to his sacred self, but rather in further order unto it, since your lordships, who are his great council, and you, gentlemen, his whole kingdom's representatives (most worthily welcome unto him), may fitly receive into your wise and serious considerations what doth or may publicly concern both his Majesty and his tenderly beloved people.

Pardon me if I say (my lords and gentlemen) that it is jointly your parts to digest, to his hand, these ensuing particulars, fitting them to his palate, and ordering how to reduce them into practice in a way useful and beneficial both to his Majesty and his kingdom.

Neither do I esteem it less proper for me to present them to you, in order to his Majesty's service, than it is to give into the hands of a faithful and provident steward whatsoever dainties and provisions are intended for the master's diet; the knowing and faithful steward being best able to make use thereof to his master's contentment and greatest profit, keeping for the morrow whatever should be overplus or needless for the present day, or, at least, to save something else in lieu thereof. In a word (my lords and gentlemen), I humbly conceive this simile not improper, since you are his Majesty's provident stewards, into whose hands I commit myself with all properties fit to obey you, that is to say, with a heart harbouring no ambition, but an endless aim to serve my king and country; and if my endeavours prove effectual (as I am confident they will), his Majesty shall not only become rich, but his people likewise as treasures unto him; and his peerless Majesty, our king, shall become both beloved at home and feared abroad, deeming the riches of a king to consist in the plenty enjoyed by his people.

And the way to render him to be feared abroad is, to content his people at home, who then, with heart and handf are ready to assist him; and whatsoever God blesseth me with to contribute towards the incsease of his revenues in any considerable way, I desire it may be employed to the use of his people; that is, for the taking off such taxes or burthens from them as they chiefly groan under, and by a temporary necessity only imposed upon them, which, being thus supplied, will certainly best content the king and satisfy his people, which, I dare say, is the continual end of all your indefatigable pains, and the perfect demonstration of your zelo to his Majesty, and an evidence that the kingdom's trust is justly and derservedly reposed in you. And if ever parliament acquitted themselves thereof, it is this of yours, composed of most deserving and qualified persons—qualified, I say, with affection to your prince, and with a tenderness to his people; with a bountiful heart towards him, yet a frugality in their behalf.

Go on, therefore, chearfully (my lords and gentlemen), and not only our gracious king, but the king of kings, will reward you; the prayers of the people will attend you; and his Majesty will, with thankful arms, embrace you. And be pleased to make use of me and my endeavours to enrich them, not myself. Such being my only request unto you, spare me not in what your wisdoms shall find me useful, who do esteem myself, not only by the act of the water-commanding engine (which so chearfully you have past), sufficiently rewarded, but likewise with courage enabled me to do ten times more for the future; and my debts being paid, and a competency to live according to my birth and quality settled, the rest shall I dedicate to the service of our king and country by your disposals; and esteem me not the more, or, rather, any more, by what is past, but what is to come; professing really, from my heart, that my intentions are to outgo the six or seven hundred thousand pounds already sacrificed, if countenanced and encouraged by you, ingeniously confessing that the melancholy which hath lately seized me (the cause whereof none of you but may easily guess) hath, I dare say, retarded more advantages to the public service than modesty will permit me to utter; and now revived by your promising favours, I shall infallibly be enabled thereunto in the experiments extant and comprised under these heads, practicable with my directions by the unparalleled workman, both for trust and skill, Caspar Kaltoff's hand, who has been these five-and-thirty years as in a school, under me employed, and still at my disposal, in a place by my great expenses made fit for public service, yet lately like to be taken from me, and consequently from the service of king and kingdom, without the least regard of about ten thousand pounds expended by me, and through my zeal, to the common good; my zeal, I say, a field large enough for you (my lords and gentlemen) to work upon.

The treasures buried under these heads, both for war, peace, and pleasure, being inexhaustible, I beseech you pardon me if I say so. It seems a vanity, but it comprehends a truth, since no good spring but becomes the more plentiful by how much more it is drawn, and the spinner to weave his webb is never stinted but further inforced.

The more than that you shall be pleased to make use of my inventions, the more inventive shall you ever find me; one invention begetting still another, and more and more improving my ability to serve my king and you; and as to my heartiness therein, there needs no addition, nor to my readiness a spur. And therefore (my lords and gentlemen) be pleased to begin, and desist not from commanding me, till I flag in my obedience and endeavours to serve my king and country:—

For certainly you'll find me breathless first t'expire,
Before my hands grow weary, or my legs do tire!

Yet, abstracting from any interest of my own, but as a fellow-subject and compatriot, will I ever labour in the vineyard, most heartily and readily obeying the least summons from you, by putting faithfully in execution what your judgments shall think fit to pitch upon amongst this century of experiments, perhaps dearly purchased by me, but now frankly and gratis offered to you. Since my heart (methinks) cannot be satisfied in serving my King and country, if it should cost them any thing: as I confess, when I had the honour to be near so obliging a master as his late Majesty, of happy memory, who never refused me his ear to any reasonable motion; and as for unreasonable ones, or such as were not fitting for him to grant, I would rather to have died a thousand deaths than ever to have made any one unto him.

Yet whatever I was so happy as to obtain for any deserving person, my pains, breath, and interest, employed therein, satisfied me not, unless I likewise satisfied the fees; but that was in my golden age. And even now, though my ability and means are shortened (the world knows why) my heart remains still the same; and be you pleased (my lords and gentlemen) to rest most assured, that the very complacency that I shall take in the executing your commands, shall be unto me a sufficient and an abundantly satisfactory reward.

Vouchsafe, therefore, to dispose freely of me, and whatever lieth in my power to perform—first, in order to his Majesty's service; secondly, for the good and advantage of the kingdom; thirdly, to all your satisfactions, for particular profit and pleasure to your individual selves; professing that, in all and each of the three respects, I will ever demean myself as it best becomes,

My Lords and Gentlemen,

Your most passionately bent fellow-subject in his Majesty's service, compatriot for the public good and advantage, and a most humble servant to all and every of you,

WORCESTER.

A CENTURY OF THE NAMES AND SCANTLINGS OF SUCH INVENTIONS AS AT PRESENT I CAN CALL TO MIND TO HAVE TRIED AND PERFECTED, WHICH (MY FORMER NOTES BEING LOST) I HAVE, AT THE INSTANCE OF A POWERFUL FRIEND, ENDEAVOURED NOW IN THE YEAR 1655, TO SET THESE DOWN IN SUCH A WAY, AS MAY SUFFICIENTLY INSTRUCT ME TO PUT ANY OF THEM IN PRACTICE.

Artis et Naturæ proles.

1. Several sorts of seals, some shewing by screws, others by gauges fastening or unfastening all the marks at once: others by additional points and imaginary places, proportionable to ordinary escutcheons and seals at arms, each way palpably and punctually setting down (yet private from all others but the owner and by his assent) the day of the month, the day of the week, the month of the year, the year of our Lord, the names of the witnesses, and the individual place where any thing was sealed, though in ten thousand several places, together with the very number of lines contained in a contract, whereby falsification may be discovered and manifestly proved, being upon good grounds suspected.

Upon any of these seals a man may keep accounts of receipts and disbursements, from one farthing to an hundred millions, punctually shewing each pound, shilling, penny, or farthing.

By these seals, likewise, any letter, though written but in English, may be read and understood in eight several languages, and in English itself to clean contrary and different sense, unknown to any but the correspondent, and not to be read or understood by him neither, if opened before it arrive unto him; so that neither threats nor hopes of reward can make him reveal the secret, the letter having been intercepted and first opened by the enemy.

2. How ten thousand persons may use these seals to all and every of the purposes aforesaid, and yet keep their secrets from any but whom they please.

3. A cipher and character so contrived that one line, without returns and circumflexes, stands for each and every of the 24 letters, and as ready to be made for the one letter as the other.

4. This invention refined, and so abbreviated that a point only sheweth distinctly and significantly any of the 24 letters, and these very points to be made with two pens; so that no time will be lost, but as one finger riseth, the other may make the following letter, never clogging the memory with several figures for words and combinations of letters, which with ease, and void of confusion, are thus speedily and punctually, letter for letter, set down by naked and not multiplied points. And nothing can be less than a point, the mathematical definition of it being, *cujus pars nulla*. And of a motion, equally as swift as semiquavers or relishes, yet applicable to this manner of writing.

5. A way, by a circular motion, either along a rule or ringwise, to vary any alphabet, even this of points, so that the self-same point, individually placed, without the least additional mark or variation of place, shall stand for all the 24 letters, and not for the same letter twice in ten sheets writing; yet as easily and certainly read and known as if it stood but for one and the self-same letter constantly signified.

6. How, at a window, as far as eye can discover black from white, a man may hold discourse with his correspondent, without noise made or notice taken; being, accord-

ing to the occasion given and means afforded, *ex re nata*; and no need of provision beforehand, though much better if foreseen, and means prepared for it, and a premeditated course taken by mutual consent of parties.

7. A way to do it by night as well as by day, though as dark as pitch is black.

8. A way how to level and shoot cannon by night as well as by day, and as directly, without a platform or measures taken by day, yet by a plain and infallible rule.

(*To be concluded in our next.*)

PATENTS EXPIRING NEXT WEEK.

John Brown, for a machine for the manufacture of bobbin-lace or twist-net, similar to and resembling the Buckinghamshire lace-net and French lace-net, as made by hand with bobbins on pillows. Expires April 24.

John Stockwell, for certain improvements in the art of manufacturing shag-tobacco, whereby the stalks taken out of the leaf may be cut up into shag-tobacco without injuring the quality thereof. Expires April 24.

William Bundy, for an improvement of stringed musical instruments. Expires April 24.

John Bradley, for a method of manufacturing gun-skelps. Expires April 24.

William Everhard, Baron Von Doornick, for an improvement in the manufacture of soap to wash with sea water, with hard water, and with soft water. Expires April 27.

William Caslon, for an improvement in the register belonging to a mould for casting types. Expires April 27.

NOTICE.

We beg to announce to our numerous Subscribers, that the First Volume of the London Mechanics' Register will be completed next week, when a double Number will be published, containing a copious Index to the Volume, and a handsomely engraved Title Page.

With the Supplementary Number will also be given a striking likeness of Dr. Birkbeck, the learned President of the London Mechanics' Institution, which will be accompanied by an interesting Biographical Memoir. The Portrait is engraved on steel in the first style of excellence; and as many of our Readers may be desirous to obtain the Likeness separately, a few proof impressions will be taken on India Paper, price Two Shillings each. The number of proofs will be limited, in order to insure the superiority of the impressions; and it is therefore particularly requested, that those who wish to avail themselves of the opportunity of possessing the Portrait, will communicate their intentions to the Publishers immediately.

TO CORRESPONDENTS.

J. S. will appear in our next.

We have only one objection to S. M.'s plan; viz. that it is impracticable.

Mr. Dewhurst has our thanks for the trouble he has taken. We shall probably avail ourselves of his communication.

Mr. Webb's communication is intended for insertion.

The query of Momi Discipulus is inadmissible.

The queries of A Parent, Mademoiselle G—, G—e, and some of those proposed by Inquisitus, are also incompatible with our present arrangements.

We shall be happy to hear again from our correspondent Asteroid.

Errata.—Page 399, col. 2, line 7 from the bottom, for "inches" read "circles."
Page 386, col. 2, line 27, for "Fig. 6," read "Fig. 5."

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The London
MECHANICS' REGISTER.

"Time's use was doomed a pleasure, waste a pain;
"That man might feel his error if unseen,
"And feeling, fly to labour for his cure;
"Not, blundering, split on idleness for ease." Dr. Young.

No. 27.] SATURDAY, APRIL 30, 1825. [Price 3*d*.

LONDON MECHANICS' INSTITUTION.

MR. LEWTHWAITE'S SECOND LECTURE ON ELECTRICITY.

POSITIVE AND NEGATIVE ELECTRICITY—ELECTRICS AND NON-ELECTRICS—CONDUCTORS AND NON-CONDUCTORS—EXPERIMENTS WITH THE ELECTROSCOPE—PRODUCTION OF ELECTRICITY BY FUSION, CONTACT, CHEMICAL ACTION, &c.

WEDNESDAY, 20TH APRIL.

Mr. Lewthwaite introduced his subject this evening by observing that in his previous lecture, he had demonstrated the existence of *positive* and *negative*, or *plus* and *minus* electricity, as they were called by Dr. Franklin; and he should now add a few other remarks on the same subject. The excitation of *sealing-wax* by *fur* is always said to produce *negative* electricity; and as it is found to attract light substances when thus excited, it may be asked, how its negative electricity is acquired? In reply to this he would state, that all bodies naturally possess an inherent quantity of electricity, and that when the sealing wax is excited by fur, the latter abstracts a portion of this electricity; and the sealing wax being thus left with less than its natural portion, attracts light bodies in order to restore the equilibrium. When a glass tube is excited by friction upon a silk handkerchief, the effect produced is exactly the reverse, as the glass abstracts electricity from the silk, and therefore becomes positively electrified. If either the excited wax or the excited tube be presented to the electroscope, the gold leaves will diverge; but in the former case, their divergence is occasioned by *negative* electricity, because the wax abstracts from the leaves a portion of their electricity; while in the latter, the superfluous portion is thrown into the electroscope by the glass tube, and the leaves diverge with *positive* electricity. For the same reason, when the leaves have *diverged* with positive electricity by presenting the glass tube, they will *collapse* on the approach of the excited wax, and if their *divergence* has been effected by the wax, the excited glass tube will cause them to *collapse*; the effect in both cases being produced by the tendency of the fluid to restore the equilibrium which has been disturbed. From the different effects thus produced by *glass* and *wax*, the two kinds of electricity have been called *vitreous* and *resinous*; but they are now more appropriately denominated the *positive* and *negative*, or the *plus* and *minus* states, as before observed.

The same principle is applicable to the manner in which the Leyden jar is charged by the electrical machine. If it be applied to the positive, or prime conductor, it is said to be positively charged, and if to the negative conductor it becomes negatively charged. In the latter case, however, the electricity is *abstracted* from the interior of the jar; and many persons have contended that the idea of *charging* a jar either with positive or negative electricity involves an inconsistency. The lecturer appeared to admit that there was some difficulty in getting rid of this objection; but he proceeded with his illustration of the manner in which the jars are charged, by shewing that whether they are charged *positively* or *negatively*, the same apparent effect is produced, upon the application of the discharging rod. If, however, the jar is charged to a certain degree of intensity from the *positive* conductor of the machine, and then applied to the *negative* conductor, the revolution of the cylinder will effectually discharge it. In this experiment, it is necessary to count the number of revolutions made by the cylinder, and it is difficult, even with that precaution, to accomplish it with perfect precision. Mr. Lewthwaite then charged the jar from the positive conductor, the machine being turned six times. The knob of the jar was then applied to the negative conductor, and the cylinder was again turned six times; and upon applying the discharging rod to the jar, only a very minute spark passed, so that it was sufficiently evident that the electricity communicated by the *positive*, had been abstracted by the *negative* conductor.

The lecturer performed the same experiment with more accuracy by the assistance of an instrument which, he observed, was properly called an *electrometer*, because it measured the intensity of the charge by a graduated scale. In this case, the jar appeared perfectly empty, as no effect was produced by the application of the discharging rod. Mr. Lewthwaite then shewed that if the jar was *negatively* charged in the first instance, it became discharged in a similar manner on being applied to the *positive* conductor; and from these experiments he conceived that the two opposite states of electricity were clearly demonstrated.

In the lecture of the preceding Wednesday, he had proved that there was no such thing as *electric repulsion;* and had illustrated the subject by an experiment in which he exhausted the air from the electroscope. Since that period, a small work had been put into his hands, the author of which asserts that no substance can be electrifiedin a *vacuum.* This appeared to contradict the lecturer's observations, but he would endeavour to shew by experiment that his remarks were correct. Mr. Lewthwaite here repeated the experiment performed during his last lecture, by presenting the knob of a charged jar to an electroscope furnished with two balls of pith, and their divergence being effected, he extracted the air from the apparatus as before, by means of an exhausting syringe. He then re-admitted the air as gradually and quietly as possible, when the pith balls immediately diverged again; and by this experiment it was proved that bodies are capable of retaining electricity *in vacuo.*

It has been seen that *amber,* by friction, becomes capable of attracting light substances, and has evidently received a power which it did not possess before, which is called *electric attraction.* Mr. Lewthwaite here adverted to the mode of classification adopted by some writers, who divide bodies into *electrics* and *non-electrics;* but the lecturer thought that this division might be dispensed with, and preferred the classification of bodies into *conductors* and *non-conductors.* Some writers consider the metals as electrics, but this Mr. Lewthwaite denied and gave it as his opinion that those bodies only were *electrics,* which were capable of producing signs of electricity by friction when held in the hand. This is not the case with a metallic tube, which, when rubbed with a silk handkerchief in the hand, produces no signs of electricity that we can perceive. He shewed by experiment that a *brass tube,* when insulated, discovers signs of electricity by friction, but in this case the tube is joined to an *electric,* and the electricity generated in the glass is retained and cannot pass off to the earth. Till, however, he could produce signs of electricity in the brass tube by holding it in his hand without insulation, he could not consider metals as electrics. The lecturer added that zinc, when excited by silk, always produces signs of *negative* electricity, and is therefore an excellent test for discovering the kind of lectricity produced by other substances. He thought that if it were allowed that every body in nature possesses its natural state of electricity, the difficulty occasioned by classing them into electrics and non-electrics would be obviated.

Mr. Lewthwaite now introduced a more delicate electroscope for the purpose of shewing that signs of electricity are produced by a number of other substances. *Brown paper,* excited by friction under the arm, caused the leaves of the electroscope to diverge with *negative* electricity, and the same effect was produced upon *writing paper,* by the friction of Indian rubber. The electrical excitation of the writing paper was also shewn by its adhering firmly to a board by electrical attraction, after it had been submitted to the friction of the Indian rubber. Bodies have been termed *positive* and *negative* electrics; but this is an erroneous division, because both positive and negative electricity may frequentyl be produced by the same substance. Sealing wax, when rubbed upon *fur,* becomes *negatively* electrified, but if excited by *tinfoil,* it produces signs of *positive* electricity! Silk produces both kinds of electricity, according as it is rubbed *lengthwise* or *across.* Mr. Lewthwaite here begged leave to mention a domestic circumstance connected with this subject. He was recently sent for into the kitchen to witness an electrical experiment, and found his good lady ironing silk with a flat-iron. He observed that when the iron had been passed once or twice over the silk, it became powerfully electrified, and clung to the fingers with considerable force. He introduced this circumstance merely for the purpose of impressing upon the minds of his hearers that among the ordinary occurrences of life, there were many which, from their connection with science, ought not to pass unnoticed.

When the flame of a *candle,* or of burning *camphor* is placed between the *positive* and *negative* conductors of the machine, the flame is always directed towards the negative conductor on turning the machine; from which circumstance it was concluded that there was a stream of electricity passing from the *positive* to the *negative* conductor. But it is found that if the flame of *benzoin,* or *phosphorus,* is placed in the same situation, it flows towards the positive conductor. Mr. Lewthwaite exemplified these remarks by placing upon the lecture table an apparatus furnished with two brass balls, which were fixed at a short distance from each other, and communicated with the two conductors of the machine. Between these balls, *camphor,* and afterwards *phosphorus,* were ignited; and the opposite directions assumed by the flames during their combustion corresponded with the lecturer's observations.

Some ingenious experiments were then performed for the purpose of shewing that bodies in opposite states of electricity attract each other. Two jars were charged, the one *negatively* and the other *positively*, and a mixture of red lead and sulphur being thrown upon the knobs, it was seen that the knob of the *positive* jar attracted only the *sulphur*, with which it became completely covered; while the knob of the *negative* jar, on the contrary, attracted only the *red lead*. The sulphur was therefore proved to be *negatively*, and the red lead *positively electric*. Some amusing varieties of the same experiment were then exhibited, after which the lecturer observed, that as he had, in the course of his remarks given a succinct view of the electrical phenomena produced by friction, he would now direct the attention of his hearers to some examples of the production of signs of electricity without friction.

An electrical effect may be produced by simply *melting* certain substances; to exemplify which, a conical piece of sulphur, which had been melted into a wine-glass 15 or 16 months before, was applied to the electroscope, and occasioned a divergence of the leaves. The *contact* of two metals of different kinds also produced electricity; thus if *silver* filings are passed through a *zinc* sieve, the leaves of the electroscope diverge with *negative* electricity; and if *zinc* filings are made to pass through a *silver* sieve, signs of *positive* electricity are produced. Mr. Stephen Grey was the first who observed that bodies produce electricity by a mere change of form; its production by the contact of dissimilar substances was pointed out by Messrs. Cavallo, Bennett, Singer, &c.; and the lecturer believed that he himself was the first person who had suggested the production of electricity by direct *chemical action*. Mr. Lewthwaite then placed upon the electroscope a vessel containing *water* and a portion of *granulated zinc*, to which he added *sulphuric acid*, by which means *hydrogen gas* was generated, and the divergence of the leaves which accompanied this chemical operation gave evident signs of the production of electricity.

To exemplify the electrical effect produced by the mere contact of dissimilar metals, Mr. Lewthwaite performed the interesting experiment which occasioned the discovery of Galvanism, by subjecting the limbs of a frog to the action of *zinc* and *silver*. The experiment was very successfully performed, and the limbs of the dissected animal were powerfully convulsed.

Mr. Lewthwaite concluded by observing, that as he had brought the science of Electricity to the point at which he had now arrived, the branches next in succession were voltaic electricity, electro-magnetism, and thermo-electricity; but as these subjects had been so recently and so ably illustrated by their worthy President, he should pass them over, and in his next lecture consider the nature of the electric spark and the production of electrical light.

MR. OGG'S LECTURE ON HEAT.

THEORIES OF HEAT—ITS BENEFICIAL INFLUENCE—EXPANSION OF BODIES BY HEAT—CONSTRUCTION OF THE THERMOMETER—EXPANSION OF WATER BY COLD—DIFFERENT CONDUCTING POWER OF BODIES—LATENT OR COMBINED HEAT—PERSPIRATION, &c.

FRIDAY, 22ND APRIL.

Mr. Ogg introduced the present lecture by expressing the pleasure he felt on appearing again before the members of the Institution, and observed that it had been his wish to deliver a course of mechanical lectures upon this occasion; but as he entertained some doubts whether the apparatus necessary for the illustration of this subject was in a perfect state, and had not sufficient time to superintend such alterations as might be requisite, he thought it advisable to defer the subject of mechanics till a future opportunity, and had therefore selected one which he trusted would not be found deficient in interest. The members had witnessed many important chemical changes which were produced by various agencies, and he intended to submit to their notice some others, which he hoped would all be found to harmonise with what they had already heard. In treating of the subject of Heat, he should be happy to be able to explain its *ultimate nature;* but though it was the natural disposition of mankind to press forward in the pursuit of knowledge, the subtile principle of heat was still concealed from their inquiries, and was only known by its effects.

Two theories have been promulgated respecting the nature of heat; the first of which supposes it to be composed of *material particles*, while the other ascribes its existence to *motion*, or to a *shaking*, or *vibration* among the particles of bodies. The former of these opinions is the most generally received; but whichever is correct, it must be universally admitted that without the presence and beneficial effects of heat, the earth would be bound up in impenetrable ice—the air itself would be frozen—and neither sound nor motion would exist. It is the opinion of scientific men, that without the interposition of heat between the particles of bodies, all the harder substances would become still more dense, and the most attenuated fluids would be solidified.

One of the most familiar effects of heat is *expansion;* for it is known that, with very few exceptions, bodies of all kinds are enlarged in bulk, and occupy a greater space by the application of heat. To exemplify this observation, the lecturer took two pieces of brass, one of them having a long notch in the upper edge, into which the other piece fitted exactly. The latter piece was then heated, and it was immediately seen that it had become so much enlarged in bulk, that upon again applying it to the unheated piece, it was impossible to introduce it into the opening. The flame of a spirit lamp was then applied to a glass vessel containing a fluid, the surface of which coincided with the upper rim of the vessel. Above the rim was a tube in which the fluid gradually rose as it became heated, and thus clearly shewed the increase which had taken place in its volume. To demonstrate the effect of heat in the expansion of aeriform substances, a glass tube, containing only common air, and furnished with a bulb at one extremity, was exposed to the heat of the spirit lamp, by which means the air becoming greatly rarefied, a considerable portion of it was expelled from the glass vessel. The tube was then plunged into water, and as the air which remained in the tube gradually resumed its natural density, the water rose, by the pressure of the external atmosphere, till the whole of the tube, and nearly half the bulb became filled. The great expansion of the air by heat was thus clearly proved, as it was evident that the small portion now remaining in the bulb had previously filled the whole vessel.

By these experiments it appears that *solid*, *fluid*, and *aeriform* bodies are all expanded by heat; and it may perhaps be supposed that substances expand *equally* by the application of *equal portions* of heat? This, however, is not the case; for if the spirit lamp be again applied to the glass tube used in the second experiment, and the degree of expansion acquired by the fluid during the first two minutes be accurately measured, it will be found, upon continuing to apply the same degree of heat, that the fluid expands much more in the next two minutes. The reason of this is, that the heat has first to overcome the *attraction of cohesion*, and as this attraction becomes less and less in proportion to the quantity of heat which is interposed between the particles of the fluid, the degree of expansion becomes progressively greater. On the same principle, the different gases are found to possess the greatest expansive power, and also to expand most equally, because their particles are not kept together by the attraction of cohesion.

Mr. Ogg then observed that various instruments had been constructed for the purpose of measuring the expansion of solid bodies, one of which was now exhibited, and was applied to the measurement of the expansibility of metals. It is found by experiment that the metals increase in expansibility in the following order, viz. platina, steel, iron, copper, brass, tin, lead, zinc; and the lecturer now shewed the different degrees of expansibility possessed by *steel* and *zinc*, as demonstrated by the *pyrometer* on the lecture table. In this instrument, one end of the horizontal bar of metal which was subjected to its operation, pressed against the fixed end of a perpendicular lever, the other extremity of which communicated with a second lever, which acted as the index of a graduated arch. By this ingenious combination of levers, the most minute elongation of the bar of metal might be correctly measured by the motion of the index on the graduated scale. A metallic box, containing water, was situated in that part of the apparatus which held the piece of metal, and the equalization of the heat was insured by boiling the water which surrounded it. A bar of *steel* was first applied to the pyrometer, and after it had reached its maximum of expansion by the heat of the boiling water, the bar of *zinc* was placed in the same situation, and by examining the number of degrees marked by the moveable index of the graduated arch, it was distinctly seen that the zinc had expanded considerably more than the steel by the application of the same degree of heat. Some instruments of a more delicate nature than this have been constructed for similar purposes; and it may be necessary to state that the expansibility of metals by very high degrees of temperature cannot be ascertained by means of the apparatus now exhibited. A knowledge of this property of heat is of great use in the arts, as wheelwrights, for instance, by suddenly cooling the heated iron by which their wheels are fastened, draw all the parts together with much greater force, and the lecturer had even heard that an experiment was once successfully tried upon the walls of a building, which had been forced out of the perpendicular, by extending a strong bar of iron across the building, and attaching plates and screws to the extremities of the bar on the exterior of the opposite walls. The bar being lengthened by the application of heat, the plates were forced to some distance beyond the walls, when they were again closely screwed, and as the bar became diminished in length by cooling, the walls were drawn towards each other, till by repeating the operation, their perpendicularity was restored.

The lecturer now proceeded to give a minute and interesting description of the *thermometer*, the construction of which depends on the principle of *expansion* by heat and *contraction* by cold. To make a thermometer, upon the usual construction, a tube of glass is provided, the aperture of which is, or ought to be, perfectly equal in every part. At one end of this tube a bulb is blown, and the other extremity is left open. The air being exhausted from the tube by heating, it is then inverted in a vessel of mercury, and the pressure of the atmosphere forcing the quicksilver up, the bulb and tube partly become filled, but not sufficiently, and it is therefore found necessary to heat the mercury, and after suffering it to cool, to introduce more mercury by repeating the operation of heating the instrument. When a sufficient quantity of mercury is introduced, the instrument is heated until the mercury expands, so as entirely to fill it, and at the moment it is flowing over the orifice, flame is applied to the extremity of the tube till the glass is melted, and the tube is thus hermetically sealed. The bulb is then placed in water mixed with snow or pounded ice, which is always at the same temperature, and when the mercury in the tube becomes stationary, a mark is made at the particular point at which it stands. The bulb being then transferred to boiling water, a second mark is made, and in this way the *freezing* and *boiling* points are ascertained. Between these points the scale must be applied, and in *Fahrenheit's* thermometer, which it was the lecturer's object to illustrate, this space is divided into 180 equal parts, which comprehend all the gradations of temperature between freezing and boiling, and below the freezing point 32 more of these divisions are marked, which bring the scale down to *zero*. It is not exactly known how Fahrenheit obtained this point, which is the commencement of his scale; but it is supposed that he derived it from a mixture of snow and common salt, which produced the greatest degree of cold with which he was acquainted. Some thermometers have a much more extensive scale, as one which the lecturer produced, descended to 40° below zero, or the point at which mercury freezes. Mr. Ogg here pointed out the admirable manner in which mercury is adapted to the construction of thermometrical instruments, from its susceptibility of expansion by the least application of heat; the equability of its expansion; and also its extensive range, as mercury does not boil till it reaches 656°, while water boils at 212°; and its freezing point is 40° below zero, while water freezes at 32° above it.

There is one remarkable exception to that general law of nature by which bodies *expand* by heat and *contract* by cold, or rather by the *absence of heat*. If a tube be filled with water at 60° of Fahrenheit, and the water is gradually cooled, it will be found that it continues to contract in volume till it descends to 40°, and as soon as it arrives at this point, it again begins to expand as it grows colder; so that at 40° the same expansive effect is produced upon water, whether it be *heated* or *cooled*. This extraordinary deviation from the general law is attended with the most important consequences in the economy of nature; for if water did not expand in bulk as it became converted into ice, the ice would be specifically heavier than the water, and the first film that was formed on the surface would sink to the bottom, and be successively followed by others, till the whole became a mass of solid ice, which the succeeding heat would perhaps be insufficient to melt. But as water expands the moment it begins to freeze, the ice, being specifically lighter, floats on the surface, and protects the subjacent water from the action of the frost.

Mr. Ogg now requested the attention of the members to some experiments illustrative of the different *conducting powers* of various bodies. Some substances conduct heat very readily, while others effectually resist its communication. *Metallic bodies* are the best conductors of heat; *fluids* possess a much less degree of conducting power, and *air* is the worst conductor of all. Perhaps he could not better illustrate the difference between the conducting powers of bodies, than by introducing one of the experiments of the late Earl Stanhope, who was particularly fond of making experiments on heat. Mr. Ogg then took a hollow cylinder of *brass* (a solid one, he observed, would have been better) and wrapping a piece of writing paper very closely round it, he held it for some time in the flame of a spirit lamp, without burning, or even scorching it. A similar operation was then performed with a cylinder of *wood*, when the paper was instantly scorched, and would, no doubt, have been consumed in a very short time. The reason of these different effects was to be found in the different conducting powers of the two substances; for when the flame was applied to a particular part of the brass cylinder, the heat was readily diffused through it, and the paper would not burn till the whole of the brass became sufficiently heated. The wood, on the contrary, being a bad conductor, the whole of the heat acted upon the paper at the point where the flame was applied, and it became scorched aud burnt in a short time.

To prove that *fluids* are bad conductors of heat, the lecturer inflamed some ether on the surface of a vessel of water, when the water, as well as the glass which contained it, soon became extremely hot, while the lower part of the vessel remained perfectly cool. It was evident from this experiment, that water is a bad conductor of heat *downwards;* but it might be asked whether the water would not become heated more readily if the heat was applied at the *bottom* instead of the *top* of the vessel?—Mr. Ogg admitted that this would certainly be the case; but he observed that the effect was produced in a very different manner. When the heat is applied at the bottom of the vessel, the heat acquired by the glass is communicated to the lower portion of the water, which becoming by that means specifically lighter, ascends to the surface, by an unerring law of nature, and is replaced by the descent of colder portions, which are successively heated and driven upwards, till the heat is absolutely *carried*, rather than *conducted*, through the whole volume of the water.

The lecturer then made a number of appropriate remarks on the effects produced throughout nature by the little conducting power possessed by the atmosphere, and the important law by which lighter fluids uniformly ascend in a denser medium. It might appear strange that a trifling difference in the relative weights of two portions of a fluid should cause the one to ascend and the other to descend; but the fact might easily be made evident. If, for example, he took a vessel containing *water*, and another containing *port-wine*, which was a somewhat lighter fluid, it would be seen that the wine would ascend through the water without mixing with it, till it spread itself upon the surface, while the water descended and occupied its place. This beautiful experiment the lecturer performed with perfect success, and the wine in the lower vessel ascended through the narrow tube which connected it with the superincumbent water, and passing through in a thin stream, ascended to the surface till the descending stream of water displaced the whole of it in the lower part of the apparatus.

Another experiment rendered the effect of this principle still more evident; for in this case *water alone* was employed, a part of which had been previously coloured to distinguish it from that portion which was heated. In this experiment, the trifling difference in the relative weights of the two portions of water, produced by the one being expanded into a greater space by heat, occasioned the heated portion to ascend, while the coloured portion, which was cold, descended to the bottom of the vessel.

Hitherto he had only spoken of the effect of *sensible heat*; but heat also exists in a state in which no instrument can measure it, or even indicate its presence. How then is it possible to detect its existence in this state? This can only be effected by chemical means. If half a pint of *sulphuric acid* be mixed with half a pint of *water*, the mixture does not measure a pint; for in this case a degree of *condensation* takes place, and *latent heat* is given out, because bodies when *condensed*, or compressed into a smaller compass, require less latent heat than when *expanded*. If we take a pound of *water* heated to 172° and a pound of *ice* at 32°, its own natural temperature, and after pulverising the ice, suddenly mingle it with the water, the temperature of the whole, when the ice is all melted is reduced to 32°. What then becomes of the 140 degrees of heat which appears to be suddenly lost in this experiment? It enters into the ice to enable it to form water, as ice combines with 140 degrees of *latent heat* before it can be changed from a *solid* to a *fluid* state.

Mr. Ogg performed the experiment of mixing pulverised ice with water for the purpose of illustrating his remarks, but observed that considerable time, as well as more favorable circumstances, were essential to its perfect accuracy. It was difficult to reduce the ice to a fine powder in the lecture room, without its melting before it was put into the water, and if it was not properly pulverised, it would not melt fast enough afterwards. New-formed snow, when it could be procured, was better adapted to the purpose. With these disadvantages, he did not expect that the mixture would reach the theoretical temperature. The thermometer fell, however, nearly as low as 40°, when the water and ice were mingled, and the experiment was amply sufficient to shew an immense loss of sensible heat in the course of a few moments. The lecturer then observed that many instances of heat passing from the latent to the sensible state, and vice versa, occurred in common life, and he mentioned the *slaking of lime* as an example. In this case, the water which is poured upon the lime becomes *solidified*, and not requiring so much heat in a *solid* as in a *fluid* state, its latent heat is liberated, and passes off in the form of sensible heat. From the experiment previously performed, the *caloric of fluidity* is said to be 140°, because *ice* must combine with 140° before it can be converted into *water*.

After particularising the beneficial consequences resulting from this property of ice, by which means, as such large quantities of heat must enter into it before it can be melted, the dangerous consequences of sudden inundations after long continued frosts are avoided, the lecturer further illustrated the effects of latent heat by explaining the principle of a curious little instrument, called the *pulse-glass*; and proceeded to point out the effects of *evaporation* in the production of cold. If he were to range through the whole circle of the sciences, he could not more strikingly exemplify the wisdom of the Creator, and the beneficial effects of evaporation, than by a reference to the human body. Its natural temperature is from 96 to 98 degrees; but it has a constant tendency to rise to a higher temperature during active exertion, from which fever would necessarily result, if this tendency was not counteracted. Whenever the temperature has a tendency to rise above the healthy degree, a watery fluid is brought to the surface of the skin, that by its evaporation the body may be preserved at a regular and healthy temperature. So powerfully are we protected by this perspiration, that it is the means of preserving life under circumstances in which it would otherwise be inevitably destroyed.

Mr. Ogg then adduced the late experiments performed by Roberts on the premises of the LONDON MECHANICS' INSTITUTION, as instances of the protecting influence of perspiration; and concluded his lecture by an account of an experiment on the power of the human body in resisting heat, performed by Sir Charles Blagden and Sir Joseph Banks, who shut themselves into a close apartment, and raised the temperature of the atmosphere to an astonishing degree of intensity. They, however, felt so little inconvenience from the heat, that they imagined there must be some incorrectness in the thermometers suspended in the room, till one of the gentlemen accidentally touching the metal buttons of his coat, *the skin adhered* to it. Eggs were boiled hard; slices of beef were broiled, and water was boiled in a large vessel by the intense heat of the atmosphere, which they supported till it reached 52° above the boiling point of water; thus affording a striking proof of the wonderful power of perspiration in keeping the human body in a healthy state.

THE CENTURY OF INVENTIONS OF THE MARQUIS OF WORCESTER.

(*Concluded from our last.*)

9. An engine, portable in one's pocket, which may be carried and fastened on the inside of the greatest ship, *tanquam aliud agens*, and, at any appointed minute, though a week after, either of day or night, it shall irrecoverably sink that ship.

10. A way, from a mile off, to dive and fasten a like engine to any ship, so as it may punctually work the same effect, either for time or execution.

11. How to prevent and safeguard any ship from such an attempt by day or night.

12. A way to make a ship not possible to be sunk, though shot an hundred times between wind and water by cannon, and should she lose a whole plank, yet, in half an hour's time should be made as fit to sail as before.

13. How to make such false decks as, in a moment, should kill and take prisoners as many as should board the ship, without blowing the real decks up, or destroying them, from being reducible; and in a quarter of an hour's time should recover their former shape, and to be made fit for any employment, without discovering the secret.

14. How to bring a force to weigh up an anchor, or to do any forcible exploit, in the narrowest or lowest room in any ship, where few hands shall do the work of many; and many hands applicable to the same force, some standing, others sitting, and, by virtue of their several helps, a great force augmented in little room, as effectual as if there were sufficient space to go about with an axletree, and work far from the centre.

15. A way how to make a boat work itself against wind and tide, yea, so that the wind or tide, though directly opposite, shall force the ship or boat against itself; and in no point of the compass, but it shall be as effectual as if the wind were in the *poop*, or the stream actually with the course it is to steer, according to which the oars shall row, and necessary motions work and move towards the desired port or point of the compass.

16. How to make a sea-castle, or fortification, cannon proof, and capable of containing a thousand men, yet sailable at pleasure to defend a passage; or, in an hour's time, to divide itself into three ships, as fit and trimmed to sail as before; and even whilst it is a fort or castle, they shall be unanimously steered, and effectually be driven, by an indifferent strong wind.

17. How to make upon the Thames a floating garden of pleasure, with trees, flowers, banqueting-houses, and fountains, stews for all kinds of fishes, a reserve for snow to keep wine in, delicate bathing-places, and the like; with music made by mills, and all in the midst of the stream, where it is most rapid.

18. An artificial fountain, to be turned, like an hour-glass, by a child, in the twinkling of an eye; it yet holding a great quantity of water, and of force sufficient to make snow, ice, and thunder; with the chirping and singing of birds, and shewing of several shapes and effects usual to fountains of pleasure.

19. A little engine within a coach, whereby a child may stop it, and secure all persons within it, and the coachman himself, though the horses be never so unruly, in full career; a child being sufficiently capable to unloose them, in what posture soever they should have put themselves, turning never so short; for a child can do it in the twinkling of an eye.

20. How to bring up water balancewise, so that as little weight or force as will turn a balance will be only needful, more than the weight of the water within the buckets, which, counterpoised and empty themselves one into the other, the uppermost yielding its water (how great a quantity soever it holds) at the selfsame time when the lowermost taketh it in, though it be an hundred fathom high.

21. How to raise water constantly with two buckets only, day and night, without any other force than its own motion, using not so much as any force, wheel, or sucker, nor more pulleys than one, on which the cord or chain rolleth, with a bucket at each end. This, I confess, I have seen and learned of the great mathematician Clavius's *studies at Rome*, he having made a present

thereof unto a Cardinal; and I desire not to own any other man's inventions; but if I set down any, to nominate likewise the inventor.

22. To make a river in a garden ebb and flow constantly, though twenty foot over, with a child's force, in some private room, or place out of sight, and a competent distance from it.

23. To set a clock as within a castle, the water filling the trenches about it; which shall shew, by ebbing and flowing, the hours, minutes, and seconds, and all the comprehensible motions of the heavens, and counterlibration of the earth, according to Copernicus.

24. How to increase the strength of a spring to such a degree as to shoot bombasses and bullets of an hundred pound weight a steeple height, and a quarter of a mile off, and more, stone bow-wise; admirable for fire-works, and astonishing of besieged cities, when, without warning given by noise, they find themselves so forcibly and dangerously surprised.

25. How to make a weight that cannot take up an hundred pound, and yet shall take up two hundred pounds, and at the self-same distance from the centre; and so, proportionably, to millions of pounds.

26. To raise weight so well and as forcibly with the drawing back of the lever, as with the thrusting it forwards; and by that means to lose no time in motion or strength. This I saw in the arsenal at Venice.

27. A way to remove to and fro huge weights, with a most inconsiderable strength, from place to place. For example, ten ton, with ten pounds, and less; the said ten pounds not to fall lower than it makes the ten ton to advance or retreat upon a level.

28. A bridge, portable upon a cart with six horses, which in a few hours' time may be placed over a river half a mile broad, whereon, with much expedition may be transported horse, foot, and cannon.

29. A portable fortification, able to contain five hundred fighting men, and yet in six hours' time may be set up, and made cannon-proof, upon the side of a river or pass, with cannon mounted upon it, and as complete as a regular fortification, with half-moons and counter-scarps.

30. A way, in one night's time, to raise a bulwark twenty or thirty foot high, cannon-proof, and cannon mounted upon it, with men to overlook, command, and batter a town; for, though it contain but four pieces, they shall be able to discharge two hundred bullets each hour.

31. A way how safely and speedily to make an approach to a castle or town-wall, and over the very ditch, at noon-day.

32. How to compose an universal character, methodical and easy to be written, yet intelligible in any language; so that if an Englishman write it in English, a Frenchman, Italian, Spaniard, Irish, or Welchman, being scholars, yea, Grecian or Hebritian, shall as perfectly understand it in their own tongue, as if they were English, distinguishing the verbs from the nouns, the numbers, tenses, and cases, as properly expressed in their own language, as it was written in English.

33. To write with a needle and thread, white, or any other colour, upon white, or any other colour, so that one stitch shall significantly shew any letter, and as readily and as easily shew the one letter as the other, and fit for any language.

34. To write by a knotted silk string, so that every knot shall signify any letter, with comma, full point, or interrogation, and as legible as with pen and ink upon white paper.

35. The like, by the fringe of gloves.

36. By stringing of bracelets.

37. By pinked gloves.

38. By holes in the bottom of a sieve.

39. By a lattin or candlestick lantern.

40. By the smell.

41. By the taste.

42. By the touch.

By these three senses, as perfectly, distinctly, and unconfusedly, yea, as readily as by the sight.

43. How to vary each of these, so that ten thousand may know them, and yet keep the understanding part from any but their correspondent.]

44. To make a key of a chamber-door, which to your sight hath its wards and rose-pipe but paper thick, and yet at pleasure, in a minute of an hour, shall become a perfect pistol, capable to shoot through a breast-plate, commonly of carabine proof, with prime, powder, and fire-lock, undiscoverable in a stranger's hand.

45. How to light a fire and a candle, at what hour of the night one waketh, without rising or putting one's hand out of bed. And the same thing to be a serviceable pistol at pleasure; yet by a stranger, not knowing the secret, seemeth but a dexterous tinder-box.

46. How to make an artificial bird, to fly which way and as long as one pleaseth, by or against the wind, sometimes chirping, other-times hovering, still tending the way it is designed for.

47. To make a ball of any metal, which, thrown into a pool or pail of water, shall presently rise from the bottom, and constantly show, by the superficies of the water, the hour of the day or night, never rising more out of the water than just to the minute it sheweth of each quarter of the hour; and if by force kept under water, yet the time is not lost, but recovered as soon as it is permitted to rise to the surface of the water.

48. A screwed ascent, instead of stairs, with fit landing-places to the best chambers of

each story, with back stairs within the noel of it, convenient for servants to pass up and down to the inward rooms of them, unseen and private.

49. A portable engine, in way of a tobacco-tongs, whereby a man may get over a wall, or get up again, being come down, finding the coast proving insecure for him.

50. A complete light portable ladder, which taken out of one's pocket, may be by himself fastened an hundred feet high, to get up by him from the ground.

51. A rule of gradation, which with ease and method reduceth all things to a private correspondence, most useful for secret intelligence.

52. How to signify words, and a perfect discourse, by jangling of bells of any parish church, or by any musical instrument within hearing, in a seeming way of tuning it, or of an unskilful beginner.

53. A way how to make hollow and cover a water-screw, as big and as long as one pleaseth, in an easy and cheap way,

54. How to make a water-screw tight, and yet transparent and free from breaking; but so clear, that one may palpably see the water, or any heavy thing, how and why it is mounted by turning.

55. A double water-screw, the innermost to mount the water, and the outermost for it to descend more in number of threads, and, consequently, in quantity of water, though much shorter than the innermost screw, by which the water ascendeth—a most extraordinary help for the turning of the screw to make the water rise,

56. To provide and make, that all the weights of the descending side of a wheel shall be perpetually farther from the center than those of the mounting side, and yet equal in number and heft to the one side as the other. A most incredible thing, if not seen, but tried before the late king (of happy and glorious memory) in the Tower by my directions, two extraordinary ambassadors accompanying his Majesty, and the Duke of Richmond and Duke Hamilton, with most of the Court attending him. The wheel was 14 feet over, and 40 weights, of 50 pounds a-piece. Sir William Belford, then Lieutenant of the Tower, can testify it, with several others. They all saw, that no sooner these great weights passed the diameter line of the upper side, but they hung a foot farther from the center; nor no sooner passed the diameter line of the side, but they hung a foot nearer. Be pleased to judge the consequence.

57. An ebbing and flowing water-work, in two vessels, into either of which, the water standing at a level, if a globe be cast in, instead of rising it presently ebbeth, and so remaineth, until a like globe be cast into the other vessel, which the water is no sooner sensible of, but that the vessel presently ebbeth, and the other floweth, and so continueth ebbing and flowing until one or both the globes be taken out, working some little effect besides its own motion, without the help of any man within sight or hearing; but if either of the globes be taken out, with ever so swift or easy a motion, at that instant the ebbing and flowing ceaseth; for if, during the ebbing, you take out the globe, the water of that vessel presently returneth to flow, and never ebbeth after, until the globe be returned into it, and then the motion beginneth as before.

58. How to make a pistol to discharge a dozen times with one loading, and without so much as once new priming requisite; or to change it out of one hand into the other, or stop one's horse.

59. Another way, as fast and effectual, but more proper for carabines.

60. A way, with a flask appropriated unto it, which will furnish either pistol or carabine with a dozen charges in three minutes' time, to do the whole execution of a dozen shots, as soon as one pleaseth, proportionably.

61. A third way, and particularly for muskets, without taking them from their rests to charge or prime, to a like execution, and as fast as the flask, the musket containing but one charge at a time.

62. A way for a harquebuss, a crock, or ship musket, six upon a carriage, shooting with such expedition, as, without danger, one may charge, level, and discharge them, sixty times in a minute of an hour, two or three together.

63. A sixth way, most excellent for *sakers*, differing from the other, yet as swift.

64. A seventh, tried and approved before the late king (of ever blessed memory), and an hundred Lords and Commons, in a cannon of 8 inches and half a quarter, to shoot bullets of 64 pounds weight, and 24 pounds of powder, twenty times in six minutes; so clear from danger, that, after all were discharged, a pound of butter did not melt, being laid upon the cannon britch, nor the green oil discoloured that was first anointed and used between the barrel thereof, and the engine having never in it, nor within six foot of it, but one charge at a time.

65. A way that one man, in the cabin, may govern the whole side of ship muskets, to the number (if need require) of 2 or 3000 shots.

66 A way that, against the several avenues to a fort or castle, one man may charge 50 cannons, playing, and stopping when he pleaseth, though out of sight of the cannon.

67. A rare way, likewise, for muskettoons fastened to the pommel of the saddle, so that a common trooper cannot miss to charge them with 20 or 30 bullets at a time, even in full career.

"When first I gave my thoughts to make

"guns shoot often, I thought there had been "but one only exquisite way inventible; yet "by several trials, and much charge, I have "perfectly tried all these."

68. An admirable and most forcible way to drive up water by fire, not by drawing or sucking it upwards, for that must be, as the philosopher calleth it, *infra sphæram activitatis*, which is but at such a distance. But this way hath no bounder, if the vessels be strong enough; for I have taken a piece of a whole cannon, whereof the end was burst, and filled it three quarters full, stopping and screwing up the broken end, as also the touch-hole; and making a constant fire under it, within twenty-four hours it burst and made a great crack: so that having found a way to make my vessels, so that they are strengthened by the force within them, and the one to fill after the other, I have seen the water run like a constant fountain-stream forty feet high; one vessel of water rarified by fire, driveth up forty of cold water; and a man that tends the work, is but to turn two cocks, that one vessel of water being consumed, another begins to force and refill with cold water, and so successively, the fire being tended and kept constant, which the self-same person may likewise abundantly perform in the interim between the necessity of turning the said cocks.

69. A way how a little triangle and screwed key, shall be capable and strong enough to bolt and unbolt, round about a great chest, an hundred bolts, through fifty staples, two in each, with a direct contrary motion, and as many more from both sides and ends; and, at the self-same time, shall fasten it to the place, beyond a man's natural strength to take it away; and, in one and the same turn, both locketh and openeth it.

70. A key, with a rose-turning pipe, and two roses, pierced through endwise; together with several handsomely contrived wards, which may likewise do the same effects.

71. A key perfectly square, with a screw turning within it, and more conceited than any of the rest, and no heavier than the triangle-screwed key, and doth the same effects.

72. An escutcheon to be placed before any of these locks, with these properties:—

1st, The owner (though a woman) may, with her delicate hand, vary the ways of coming to open the lock ten millions of times, beyond the knowledge of the smith that made it, or of me who invented it.

2d, If a stranger open it, it setteth an alarm a going, which the stranger cannot stop from running out; and besides, though none should be within hearing, yet it catcheth his hand, as a trap doth a fox; and though far from maiming him, yet it leaveth such a mark behind it, as will discover him if suspected; the escutcheon, or lock, plainly shewing what money he hath taken out of the box to a farthing, and how many times opened since the owner had been at it.

73. A transmittable gallery over any ditch or breach in a town wall, with a blind and parapet, cannon proof.

74. A door, whereof the turning of a key, with the help and motion of the handle, makes the hinges to be of either side, and to open either inward or outward, as one is to enter or go out, or to open in half.

75. How a tape or riband-weaver may set down a whole discourse, without knowing a letter, or interweaving any thing suspicious of other secret than a new-fashioned riband.

76. How to write in the dark, as straight as by day or candle-light.

77. How to make a man to fly: which I have tried with a little boy of ten years old in a barn, from one end to the other, on an hay-mow.

78. A watch to go constantly, and yet needs no other winding from the first setting on the cord or chain, unless it be broken, requiring no other care from one man than to be now and then consulted with, concerning the hour of the day or night; and if it be laid by a week together, it will not err much; but the oftener looked upon the more exact it sheweth the time of the day or night.

79. A way to lock all the boxes of a cabinet (though never so many) at one time, which were, by particular keys appropriated to each lock, opened severally and independent the one of the other, as much as concerneth the opening of them, and by these means cannot be left open unawares.

80. How to make a pistol barrel no thicker than a shilling, and yet able to endure a musket proof of powder and bullet.

81. A comb-conveyance carrying of letters, without suspicion, the head being opened with a needle-screw, drawing a spring towards one; the comb being made but after an usual form carried in one's pocket.

82. A knife, spoon, or fork, in an usual portable case, may have the like conveyances in their handles.

83. A rasping-mill, for hartshorn, whereby a child may do the work of half-a-dozen men, commonly taken up with that work.

84. An instrument, whereby persons ignorant in arithmetic may perfectly observe numeration and substraction of all sums and fractions.

85. A little ball, made in the shape of a plum or pear, being dexterously conveyed or forced into a body's mouth, shall presently shoot forth such and so many bolts of each side and at both ends, as, without the owner's key, can neither be opened nor filed off, being made of tempered steel, and as effectually locked as an iron chest.

86. A chair, made *a-la-mode*, and yet a stranger being persuaded to sit down in it, shall have immediately his arms and thighs

locked up beyond his own power to loosen them.

87. A brass mould, to cast candles, in which a man may make 500 dozen in a day, and add an ingredient to the tallow, which will make it cheaper, and yet so that the candles shall look whiter and last longer.

88.* An engine, without the least noise, knock, or use of fire, to coin and stamp 100 lbs. in an hour, by one man.

88. How to make a brazen or stone head, in the midst of a great field or garden, so artificial and natural, that though a man speak never so softly, and even whispers into the ear thereof, it will presently open its mouth, and resolve the question in French, Latin, Welch, Irish, or English, in good terms, uttering it out of his mouth, and then shut it until the next question be asked.

89. White silk, knotted in the fingers of a pair of white gloves, and so contrived, without suspicion, that playing at primero, at cards, one may, without clogging his memory, keep reckoning of all sixes, sevens, and aces, which he hath discarded, and without foul play.

90. A most dexterous dicing-box, with holes transparent, after the usual fashion, with a device so dexterous, that with a knock of it against the table, the four good dice are fastened, and it looseneth four false dice made fit for this purpose.

91. An artificial horse, with saddle and caparisons fit for running at the ring, on which a man being mounted, with his lance in his hand, he can at pleasure make him start, and swiftly to run his career, using the decent posture with *bon grace*, may take the ring as handsomely, and running as swiftly, as if he rode upon a barbe.

92. A screw, made like a water-screw, but the bottom made of iron plate. spade-wise, which, at the side of a boat, emptieth the mud of a pond, or raiseth gravel.

93. An engine, whereby one man may take out of the water a ship of 500 tons, so that it may be caulked, trimmed, and repaired, without need of the usual way of stocks, and as easily let it down again.

94. A little engine, portable in one's pocket, which, placed to any door, without any noise but one crack, openeth any door or gate.

95. A double cross-bow, neat, handsome, and strong, to shoot two arrows, either together, or one after the other so immediately, that a deer cannot run two steps, but, if he miss of one arrow, he may be reached with the other, whether the deer run forward, sideward, or start backward.

96. A way to make a sea-bank so firm and geometrically strong, that a stream can have no power over it; excellent, likewise, to save the pillar of a bridge, being cheaper and stronger than stone walls.

97. An instrument whereby an ignorant person may take any thing in perspective, as justly, and more so than the most skilful painter can do by his eye.

98. An engine, so contrived, that working the *primum mobile* forward or backward, upward or downward, circularly or cornerwise, to and fro, straight, upright, or downright, yet the pretended operation continueth, and advanceth; none of the motions abovementioned, hindering, much less stopping, the other; but unanimously and with harmony agreeing, they all augment and contribute strength unto the intended work and operation; and, therefore, I call this a *semi-omnipotent engine*, and do intend that a model thereof be buried with me.

99. How to make one pound weight to raise an hundred as high as one pound falleth, and yet the hundred pounds descending doth what nothing less than one hundred pounds can effect.

100. Upon so potent a help as these two last-mentioned inventions, a water-work is, by many years experience and labour, so advantageously by me contrived, that a child's force bringeth up, an hundred feet high, an incredible quantity of water, even two feet diameter. And I may boldly call it the most stupendous work in the whole world: not only, with little charge, to drain all sorts of mines, and furnish cities with water, though never so high seated, as well to keep them sweet, running through several streets, and so performing the work of scavengers, as well as furnishing the inhabitants with sufficient water for their private occasions; but likewise supplying the rivers with sufficient to maintain and make them naviable from town to town, and for the bettering of lands all the way it runs; with many more advantageous and yet greater effects of profit, admiration, and consequence. So that deservedly I deem this invention to crown my labours, to reward my expenses, and make my thoughts acquiesce in way of further inventions; this making up the whole century, and preventing any further trouble to the reader for the present, meaning to leave to posterity a book, wherein under each of these heads, the means to put in execution, and visible trial, all and every of these inventions, with the shape and form of all things belonging to them, shall be print-

* Mr. PARTINGTON observes, in his note to this article, that its insertion originated in an ignorance of a similar plan formerly proposed by Antoine Boucher, which appears of all others best adapted for coining with rapidity, and which was not at that period acted upon in England; on the discovery of which the next article (with the same number) was substituted by the noble author; and appeared in the first printed edition of the *Century*.

ed by brass plates. Besides many omitted, and some of three sorts willingly not set down, as not fit to be divulged, lest ill use be made thereof, but to shew that such things are also within my knowledge, I will here in mine own cypher, set down one of each, not to be concealed when duty and affection obligeth me.

In bonum publicum, et ad majorem Dei gloriam.

THE CONTENTS. (25)

COMBINATION LAWS.

Since the period when the philanthropic exertions of Mr. Hume and other enlightened individuals, during the last session of parliament, effected the repeal of the Combination Laws, accounts have been received from various parts of the country, of a number of acts of unjustifiable violence on the part of the operative mechanics, which we have heard with considerable regret. That some degree of re-action might result from such an important alteration in the laws, was doubtless anticipated by the distinguished statesmen who have evinced so deep an interest in the welfare of the working-classes of the community; but the mechanics should remember that violence and outrage are always to be deprecated, and must ultimately defeat the objects of those who have recourse to them. The consequence of these instances of misconduct has been, that those who were adverse to the repeal of the Combination Laws have been furnished with an argument against the policy of the measure, and that a Committee of the House of Commons has been appointed to reconsider the subject. This circumstance has very naturally excited great alarm in the minds of the mechanics, and meetings of the different trades have been held for the purpose of petitioning parliament against the apprehended re-enactment of the Combination Laws. We subjoin a concise account of the Spitalfields meeting, and of the meeting of the delegates from the various trades on Monday week; and for the present conclude by expressing our regret that the indiscretion of a comparatively small number of workmen, should have threatened to defeat measures intended for the general benefit of the whole.

GENERAL MEETING OF THE BROAD SILK WEAVERS.

On Monday week about two o'clock, a general meeting of the Broad Silk Weavers took place in the school room of the Brunswick Chapel, Mile End-road, for the purpose of taking into consideration the intended alarming alterations relative to the Combination Laws, now before the Committee of the Honourable House of Commons.

Shortly after two o'clock the large school room became completely filled, when the Rev. Geo. Evans was unanimously called to the chair. The reverend gentleman was not present at the time; but the secretary and one or two gentlemen retired into the chapel, and apprised him of the unanimous wish of the meeting, when in a few minutes after, he appeared in the school room with the secretary, and was most warmly and enthusiastically received.

Mr. Evans then observed, that however unexpected, and certainly unmerited, as the compliment just paid him was, yet, if an honest and persevering zeal, with a sincere wish for the peace and prosperity of the weavers of Spitalfields, could be received as a compensation for any deficiency of his in the discharge of those duties their confidence had imposed upon him, he would cheerfully tender them in return. The reverend gentleman then apprised the meeting, that he was ready to hear what any individual had to offer upon the subject for which they met.

Mr. Wallace, after apprising the meeting of the great importance of the subject which was the cause of calling them together, stated, that the task devolved upon him of laying such information as he possessed before the meeting. He said that task had been so imposed in consequence of his having been the first weaver who had received information that a general meeting of trades had been determined on, and which preparatory meeting he attended, when it was there agreed to issue an advertisement calling upon the respective trades to send deputies to a general trade meeting to be held this evening at the Jacob's Well, Barbican. Mr. W. further stated, that at the meeting he alluded to, it was forcibly urged—that such steps, on the part of the mechanics, became not only a precautionary but a bounden duty, in consequence of the facility with which Mr. Huskisson obtained a Committee of the Honourable the House of Commons, to enquire into the Combination Laws. Mr. W. then, at considerable length, pointed out the mischief that would arise from a repeal of the Combination Laws as they now stand; and more particularly upon the silk weavers of Spitalfields, who for the last 50 years had a protection in the Spitalfields Act; and, therefore, during that period, had not been liable (like other trades) to come under the operation of the Combination Laws. It was a novelty, no doubt, to see a silk weaver writhing under the operation of such laws. The hand of fellowship was held out by other trades, and it was the duty of the silk weavers to join them in legally and constitutionally resisting the re-enactment of the Combination Laws.

Mr. Wallace then proposed three resolutions, in substance to the following effect:—

"That this meeting views with fear and alarm the readiness with which the House of Commons agreed to the proposals of Mr. Huskisson, for appointing a committee to consider the propriety of altering or re-enacting the Combination Laws. That it is the opinion of this meeting, that any alteration of the Combination Laws would be highly injurious to the welfare of the journeymen, and subversive of the good understanding that exists at present, and ever should exist between the employers and the employed. That the repeal of the Combination Laws, in some degree, satisfied us for the loss of our Spitalfields Acts, and we have never committed any breach that could justify their re-enactment; it is, therefore, expedient to oppose, by every legal means in our power, any alteration in those laws as they at present stand."

Resolutions to the foregoing effect were separately put, and carried unanimously.

Mr. Boulter then moved a resolution—"That two Deputies should be appointed to represent the silk weavers at the meeting of the Deputies of the general trades' meeting."

A long discussion then took place, which terminated in the appointment of Mr. Wallace and Mr. Boulter as their deputies.

Thanks were then voted to the trustees of the Chapel, for their condescension in granting the use of the school room, and afterwards to the Rev. Geo. Evans, for his upright and dignified conduct in the chair, and the meeting then quietly separated.

MEETING OF DELEGATES FROM THE LONDON TRADES.

On Monday se'nnight a meeting of delegates from the journeymen of the different trades in London took place at the Jacob's Well public-house, Barbican, for the purpose of adopting measures to counteract any attempt to revive the Combination Laws. The recent appointment of a Committee of the House of Commons to consider the propriety of altering or re-enacting those laws appears to have created the utmost alarm among the journeymen, who view the attempt as a measure calculated to oppress them, and to destroy the good understanding, which, they say, has subsisted between them and their employers, since those laws were repealed. Several resolutions, strongly expressive of their feelings on the subject, were unanimously adopted by the meeting on Monday, which consisted of about sixty persons, deputed by large meetings of the various trades in the metropolis.

A resolution was proposed 'That the meeting do now form themselves into a general committee, to be called "The Committee of Trade,' for the purpose of watching the proceedings of the select committee of the House of Commons, and that they use their best endeavours, by all legal means in their power, to convince the Honourable House that no grievance exist between them and their employers of sufficient magnitude to warrant any alteration in the laws as they now stand, and that the enacting of any law tending to alter the relative situations of masters and their men would, in all probability, be the harbinger of jealousy, strife, and division."

The deputy from the calico printers expressed his dissent to this proposition. It was the opinion of the body he represented, that it would be the better way for each trade to act for itself, as the combination of so large a body of men excited alarm.

The deputy from the curriers also expressed the same sentiments. They would willingly pay their proportion of any expense which might have been incurred, but he could not promise any thing for the future.

The resolution was adopted by the meeting, and a discussion then ensued as to the formation of the committee. It was urged, that if all the deputies present were appointed, some of the trades would obtain an undue influence. For instance, there were seven sawyers in the room, and from other trades only two deputies present; it was feared, therefore, that if all these sawyers were on the committee they might possess greater preponderance than some of the less numerous deputations, and be more anxious for their own than for the general interests.

It was at length agreed, that two persons from each trade should be appointed as the committee, with power to add to their numbers deputies from any other trade who might present themselves.

It was also resolved—"That each trade separately, and for itself, do petition the House of Commons, praying that no alteration may be made in the law as it now stands."

After some other resolutions of minor importance had been adopted, the meeting, which had been conducted with the utmost order and good temper, was dissolved.

ROBERTS'S HOOD AND MOUTH PIECE.

In our account of the experiments exhibited on the premises of the LONDON MECHANICS' INSTITUTION, for the purpose of demonstrating the utility of this simple and ingenious apparatus, we stated that several gentlemen connected with the Society of Arts were present upon both occasions; and we have now the satisfaction of announcing, that the apparatus has since been minutely examined by the Committee of that Society, who were so fully satisfied of its efficacy and originality, that they recommended the unassuming inventor to the general body, as deserving of an honorary and pecuniary recompense. The Society have accordingly voted ROBERTS the Silver Medal and Fifty Guineas.

To the Editor of the Mechanics' Register.

SIR—Allow me, through the medium of your REGISTER, to suggest to Mr. Roberts what I conceive would be an improvement upon his excellent Hood for breathing in an impure and heated atmosphere. It is merely that it should be furnished with a couple of valves to facilitate the escape of the breathed air.

One of them should be placed in the surface of the tube, as nearly opposite the mouth as may be convenient, and should open outwards. The other should be fixed within and across the tube, a little below the former, and should open upwards.

The effect of these valves would be, that at each *inspiration* the lower valve only would be opened to admit a supply of air from the bottom of the tube; and at each *expiration*, that valve would be closed, and the other opened to allow the escape of the breathed air.

With these valves the apparatus would become perfectly analogous to the common sucking pump; the wearer himself by the act of breathing, performing the office of the piston; but without them it is evident that the breathed air must be returned at each expiration into the tube, and as only a small part of it can be supposed to escape at bottom, the greater part must of course be breathed again and again. This is bad; and to the very laborious respiration which must be the consequence of it, I should be inclined to ascribe the remarkable acceleration of the pulse which has occurred on the occasion of each of the two public experiments recently tried. Fatigue and lassitude must likewise result from the same cause, but all these inconveniences would be removed by the operation of the valves.

To prevent the accidental opening of the upper valve (which opens outwards) it should be provided with a very weak spring, just strong enough to close it, and no more.

I will only add, that the funnel-shaped enlargement of the lower orifice of the tube appears to me useless, and calculated only to encumber the wearer by its unnecessary weight. The tube should be light and flexible: I should think a leather tube, kept open by rings placed at intervals within it, would be suitable; and that it might be found convenient to tie the lower extremity of it to the ankle, and the middle of it in like manner to the thigh of the wearer.

Yours, &c. &c.

Thistle Grove, Little Chelsea, J. S.
April 20, 1825.

FAMILIAR LESSONS ON MINERALOGY.

(Concluded from Page 397.)

The following three varieties belong to *Tantalite*, and may be said to be of late discovery:—

Tantalium. Tantalite generally appears embedded in granite; it is of a black colour, sometimes streaked, and generally resembles wolfram, and ores of iron, but it is not magnetic.

Ytt-atantalite often occurs embedded in angular fragments, but more generally forming concretions of a black colour, it is nearly allied to the preceding, and to the following.

Gadonolite is of a pitch brown colour, often surrounded with a red brown coloured substance, and embedded in quartz.

These substances are extremely rare, and their uses hitherto so very limited, that we did not at the commencement of this work mean to give them a place in it, nor the following.

Cerinum, which is also of late discovery.

Cerite is of a red brown colour, dull appearance, and moderately heavy; it does not melt under the blow-pipe, but changes to a yellowish colour.

REMARKS.

Having given this brief description of metals, it may not be improper to say something relative to the situation they respectively occupy in the earth, before they are brought from it, and afterwards subjected to these necessary operations, in order to become useful.

Gold often occurs in Transylvania and Siberia, in veins of other substances where it is foliated, dendritic, and desseminated; rounded lumps of it have been found in Ireland, Sumatria, South America, &c., but these as well as gold dust, are generally met with in alluvial soil.

Platina (though more rare) is found in the same manner. We have been informed, that throughout the whole district of Brazil, not one vein of gold has been seen; and although that precious metal may sometimes appear in short ramifications, (in specimens) yet we have not seen or heard of any thing like what is understood by a vein of any regular continuance filled with gold.

Silver, native silver, and silver ores, occur with quartz, calcareous spar, &c. filling fissures (veins) in the stratum, also accompanying other metals, and not unfrequently combined with them. Silver is often rich in gold, and gold is frequently alloyed with silver. In the North of England, and more particularly in Devonshire and Cornwall, the lead ore contains a considerable proportion of silver, which is extracted from it. Some varieties of ore have produced above one hundred ounces of silver in the iron of lead. Lead ore is accompanied with fluor spar, filling and forming what are termed veins, in which excavations are made to great depths, and their produce brought to the surface.

Copper ores, iron ores, lead ores, tin, &c. are extracted from veins of large magnitude, also from those of smaller dimensions; some are called strings, generally branching from the principal veins; these ores are frequently very difficult to obtain, and which in many cases require a great deal of skill, and the occupation of the miner. After they are brought from their subterraneous abode, they are dressed, that is broken to small pieces, and separated from other substances which adhere to them, and then submitted to the furnace before they can become useful.

The most instructive collections for beginners, are composed of those varieties, which are in general use, viz. *gold, platina, silver, copper, iron, tin, lead, zinc, cobalt, manganese, antimony,* and *bismuth.* Such is the ingenuity of the present age, that they are offered to our use continually, nay most of them are present on a common dinner table in one shape or other. It is necessary to observe, that these metals present great variety, which must be seen and examined before their true character can be so known as to enable the beginner to discriminate one of them from another.

The other metals, as nickel, arsenic, molybdena, uranium, cerium, titanium, tellurium, irridium, tungsten, palladium, osmium, and tantalium, are of less importance. Several of them may be said to be of rare occurrence, and cannot be so interesting to the learner as the preceding.

MR. DEWHURST'S PLAN FOR PROPELLING PLEASURE BOATS.

To the Editor of the Mechanics' Register.

Sir—In your last Number I perceive a letter signed "Ludovico," the writer of which states, that I have no claim to the invention of *a plan of propelling pleasure boats*, as there are some in America upon the same plan, and therefore the idea is neither new nor original, and he further insinuates that my drawing and description were copied from those of the American vessels.

Now Sir, in answer to this attack, I beg to state, and will verify the same by affidavit if requisite, that the idea, with regard to myself, is entirely *original*. And as I never heard of any vessels being propelled upon a similar principle, I called it, and still call it, *a new plan*. I may further state, that I do not know whether any description of the American vessel has ever been published in any work; if so, perhaps, Ludovico will inform me. After this statement I trust your candid readers will allow me the benefit of a claim to the invention; and with regard to the drawing and description being copied, I repeat in the most unqualified terms, my denial of the charge. Trusting, Sir, to your kindness in allowing this a place in your much-valued Register,

I remain, Sir, your obedient servant,
Henry William Dewhurst.
21, Francis-street, Tottenham Court Road.

PATENTS EXPIRING NEXT WEEK.

George Alexander Thompson, for machinery for the purpose of dragging, locking, and scoiting the wheels of carriages. Expires May 1.

Stedman Adams, for the application of mechanical powers to the propelling ships and vessels of every description through the water. Expires May 1.

John Dobson, for certain improvements in the manufacture of rudder-bands and bolts for shipping. Expires May 1.

John Moore, for a machine for the manufacture of gold and silver twist; silk, cotton, or thread; twisted lace-net, similar to and resembling the Buckinghamshire and Northamptonshire lace, as made by hand with bobbins on pillows; and for making iron, brass, or copper wire-net. Expires May 1.

John Ball, for an improved cooking stove. Expires May 7.

Thomas Cranfield, for an improvement upon machines for spinning and roving of cotton, flax, tow, hemp, wool, and silk, and twisting of thread. Expires May 7.

NOTICE.

The First Volume of the London Mechanics' Register being now completed, we beg to state, for the information of those of our Readers who may be desirous of having their Numbers put in Boards, that their wish may be accomplished for Sixpence only, by leaving them with the Publishers, No. 24, Fetter-lane; where they may also be bound in any manner on the most moderate terms. Many of the early Numbers, which, from the increasing demand, were out of print, have been reprinted, and imperfect Sets can therefore be completed. The Price of the Volume in Boards is 7s. 6d.

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From the very extensive and increasing circulation of the London Mechanics' Register, it is confidently recommended to the Public as an eligible and advantageous medium for the insertion of Advertisements; for which purpose the following very moderate Scale of Prices is submitted, viz.:—

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Mr. Barrett's communication will be inserted in an early number.

One on Loco-motive Engines is also intended for insertion.

Several other communications are unavoidably postponed for want of room.

END OF THE FIRST VOLUME.

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