

joicings. A late article on the subject which accords in its facts with other statements which I have, contains the following statements.

“The whole number of steam boats which have been built upon the western waters is about three hundred seventy five. Some of them are of five hundred tons burden, and from that down to one hundred, and their average not over two hundred tons. The number now in commission is something over two hundred. Their annual expense for fuel is estimated at one million one hundred and eighty one thousand dollars, and the other expenses at one million three hundred thousand, making an aggregate of nearly two million five hundred thousand dollars.

“The value of steam navigation to the United States, and particularly to the great valley of Mississippi, is incalculable; it defies the power of calculation. We doubt whether the citizens of the United States, who duly appreciate its importance, would be willing to part with it for the amount of the debt of Great Britain of eight hundred millions of pounds sterling. But for the introduction of steam navigation into the United States, and its bringing, as it were into juxtaposition, the extreme regions of her widely extended borders by “conquering time and space,” and but for its happy influence in promoting international commerce, and social intercourse by the ties of interests it creates, in a thousand different ways, the Atlantic and Western states would soon have become alienated from each other, and a separation would have been the consequence.”

ART. XVII.—*On a Reciprocating motion produced by Magnetic Attraction and Repulsion; by Prof. JOSEPH HENRY.*

TO THE EDITOR.

Sir,—I have lately succeeded in producing motion in a little machine by a power, which, I believe, has never before been applied in mechanics—by magnetic attraction and repulsion.

Not much importance, however, is attached to the invention, since the atricle, in its present state, can only be considered a philosophical toy; although, in the progress of discovery and invention, it is not impossible that the same principle, or some modification of it on a more extended scale, may hereafter be applied to some useful purpose. But without reference to its practical utility, and only viewed

as a new effect produced by one of the most mysterious agents of nature, you will not, perhaps, think the following account of it unworthy of a place in the *Journal of Science*.

It is well known that an attractive or repulsive force is exerted between two magnets, according as poles of different names, or poles of the same name, are presented to each other.

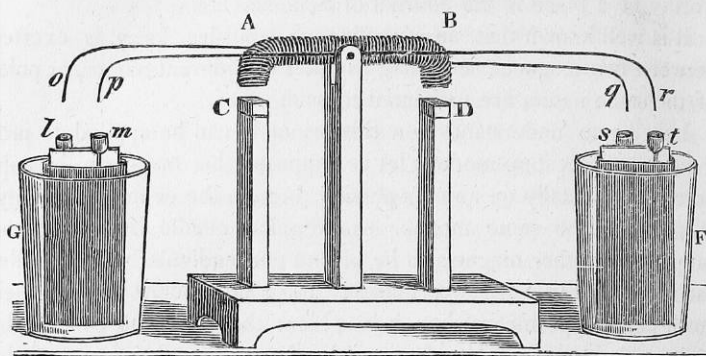
In order to understand how this principle can be applied to produce a reciprocating motion, let us suppose a bar magnet to be supported horizontally on an axis passing through the center of gravity, in precisely the same manner as a dipping needle is poised; and suppose two other magnets to be placed perpendicularly, one under each pole of the horizontal magnet, and a little below it, with their north poles uppermost; then it is evident that the south pole of the horizontal magnet will be attracted by the north pole of one of the perpendicular magnets, and its north pole repelled by the north pole of the other: in this state it will remain at rest, but if, by any means, we reverse the polarity of the horizontal magnet, its position will be changed and the extremity, which was before attracted, will now be repelled; if the polarity be again reversed, the position will again be changed, and so on indefinitely: to produce, therefore, a continued vibration, it is only necessary to introduce, into this arrangement, some means by which the polarity of the horizontal magnet can be instantaneously changed, and that too by a cause which shall be put in operation by the motion of the magnet itself; how this can be effected, will not be difficult to conceive, when I mention that, instead of a permanent steel magnet, in the moveable part of the apparatus, a soft iron galvanic magnet is used.*

The change of polarity is produced simply by soldering to the extremities of the wires which surround the galvanic magnet, two small galvanic batteries in such a manner that the vibrations of the magnet itself may immerse these alternately into vessels of diluted acid; care being taken that the batteries are so attached that the current of galvanism from each shall pass around the magnet in an opposite direction.

Instead of soldering the batteries to the ends of the wires, and thus causing them at each vibration to be lifted from the acid by the power of the machine; they may be permanently fixed in the vessels,

* For a method of constructing the galvanic magnet on an improved plan, see my paper in Vol. XIX, p. 329 of this *Journal*.

and the galvanic communication formed by the amalgamated ends of the wires dipping into cups of mercury.



The whole will be more readily understood by a reference to the annexed drawing ; *A B* is the horizontal magnet, about seven inches long, and moveable on an axis at the center : its two extremities when placed in a horizontal line, are about one inch from the north poles of the upright magnets *C* and *D*. *G* and *F* are two large tumblers containing diluted acid, in each of which is immersed a plate of zinc surrounded with copper. *l, m, s, t*, are four brass thimbles soldered to the zinc and copper of the batteries and filled with mercury.

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

To the wires *q, r*, two other wires are soldered so as to project in an opposite direction, and dip into the thimbles *l, m*. The wires of the galvanic magnet have thus, as it were, four projecting ends ; and by inspecting the figure it will be seen that the extremity *m*, which dips into the cup attached to the copper of the battery in *G* corresponds to the extremity *r* connecting with the zinc *F*.

When the batteries are in action, if the end *B* is depressed until *q, r* dips into the cups *s, t*, *AB* instantly becomes a powerful magnet, having its north pole at *B* ; this of course is repelled by the north pole *D*, while at the same time it is attracted by *C*, the position is consequently changed, and *o, p* comes in contact with the mercury in *l, m* ; as soon as the communication is formed, the poles are reversed, and the position again changed. If the tumblers be

filled with strong diluted acid, the motion is at first very rapid and powerful, but it soon almost entirely ceases. By partially filling the tumblers with weak acid, and occasionally adding a small quantity of fresh acid, a uniform motion, at the rate of seventy five vibrations in a minute, has been kept up for more than an hour : with a large battery and very weak acid, the motion might be continued for an indefinite length of time.

The motion, here described, is entirely distinct from that produced by the electro-magnetic combination of wires and magnets ; it results directly from the mechanical action of ordinary magnetism : galvanism being only introduced for the purpose of changing the poles.

My friend, Prof. Green, of Philadelphia, to whom I first exhibited this machine in motion, recommended the substitution of galvanic magnets for the two perpendicular steel ones. If an article of this kind was to be constructed on a large scale, this would undoubtedly be the better plan, as magnets of that kind can be made of any required power, but for a small apparatus, intended merely to exhibit the motion, the plan here described is perhaps the most convenient.

ART. XVIII.—*Description and History of a new Plant, Tüllia Pycnánthemoides* ; by MELINES CONKLIN LEAVENWORTH, M. D. of Augusta, Ga. (With a drawing.)

TO THE EDITOR.

Waterbury, Ct. May 17th, 1831.

Dear Sir,—I transmit to you a description and drawing of an American plant, which hitherto appears to have evaded the researches of botanists. The generic name which I have bestowed upon it is commemorative, and in compliment to my friend, William Tully, M. D. Professor of Botany, Materia Medica, and Therapeutics, in Yale College, I believe, (with a single exception,) the earliest cultivator of scientific botany, under the Linnæan method, in the state of Connecticut.

Yours Sir, very respectfully, etc.

M. C. LEAVENWORTH.

DESCRIPTIO UBERIOR.

Caulis bi vel tripedalis, quadrangularis, subpubescens, supra medium ramosus ; rami numerosi, axillares, subfastigiati, incano-tomentosi.

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