

the piece has cutting angles, a grain of emery for instance, the outer angles cut or scratch the eyelid, causing very severe pain; though it may be only as large as a pin's point, the sufferer feels it to be as large as a pea, and expresses considerable surprise at its minuteness upon examining it after its extraction, and wonders how so small an object could have given him so much pain and uneasiness. In extreme cases it becomes necessary to have a couple of assistants, one at each side, one to hold the head steady, the other to hold the eyelids open, so as to allow the operator a fair opportunity of making a sure stroke with the knife each and every time, for sometimes it will require many attempts to remove before it is effected, and in many cases the piece is broken off bit by bit until all is removed. One of the most eminent surgeons in this section, in passing one of our machine shops a short time ago, stopped and witnessed just such an operation as has been described, and was so much pleased with it that he remarked it was more skillfully and speedily performed than if he himself had done it, but he was not aware of the fact that the person doing it was an old hand at the business. In conclusion, I would recommend the immediate removal as indicated of any foreign substance in the eye, and if the eye becomes inflamed shield it from the light and apply cold water for a short time; nature will soon finish the rest.

MECHANIC.

Pittsburg, Pa., April 12, 1878.

The Byrne Galvanic Battery.

To the Editor of the Scientific American:

In your issue of the 13th of April, I notice a description of a "Remarkable Galvanic Battery," as having been exhibited at a meeting of the Royal Society of Telegraphic Engineers, in London, and though the name of the inventor is not correctly given, there can be no doubt as to whose invention reference is made. This is an error of very trifling importance, however, and would hardly be deemed worthy of notice; but the description of the little apparatus referred to is faulty and imperfect in other respects, and likely to convey wrong impressions regarding its construction. I observe also that great diversity of opinion exists, and various theories have been advanced touching the causes of its extraordinary power. Under these circumstances, and as this voltaic novelty is now exciting considerable interest and no little philosophical speculation among British scientists, I feel called upon to furnish a more accurate description of its mechanism, and at the same time to submit what I deem the most reasonable interpretation of certain striking phenomena peculiar to its operation.

The accompanying woodcut will serve to give a correct notion of the general appearance of the battery.

A A, conducting cords; C, suspension rod and set screw combined, to connect between second and third cells in series; a a, poles of battery; b b, two set screws to couple for quantity; d, an extra binding post, not essential, but convenient when two cells only of the battery are required; e e, air tubes.

The composition of the fluid has been correctly stated, namely, one measure of commercial sulphuric acid to five of water, and to each pint of such dilution two ounces of bichromate of potash, though chromate of calcium, if substituted for the potash salt, will give a much higher electro-motive force, and, consequently, a much greater thermal power.

In order to guard against splashing, the quantity of fluid put into each cell should not exceed seven and a half fluid ounces, but, when the zincs become thin from use, eight ounces may be accommodated.

To connect the battery for intensity, turn down C firmly and raise b b; and for quantity, reverse the operation by turning down b b firmly and releasing C from its contact with the lower metallic connection.

In galvano-cautery, the main purpose for which this little battery was first devised, and is now being extensively used, and more particularly during certain difficult and complicated surgical operations, this simple means of changing the entire character of the current to meet emergencies is of the utmost importance.

For obvious reasons, the pneumatic agitator should be worked by quick and short impulses, and not by slow or prolonged compression of the bulb, and the battery should not be kept immersed except when in action.

Finally, and in order that the aim contemplated in devising this voltaic organization, the lessening of internal resistance, may be correctly understood, I shall indicate, in a few words, the manner of preparing my patent negative plates, the distinctive feature of the battery, and the main source of its great power.

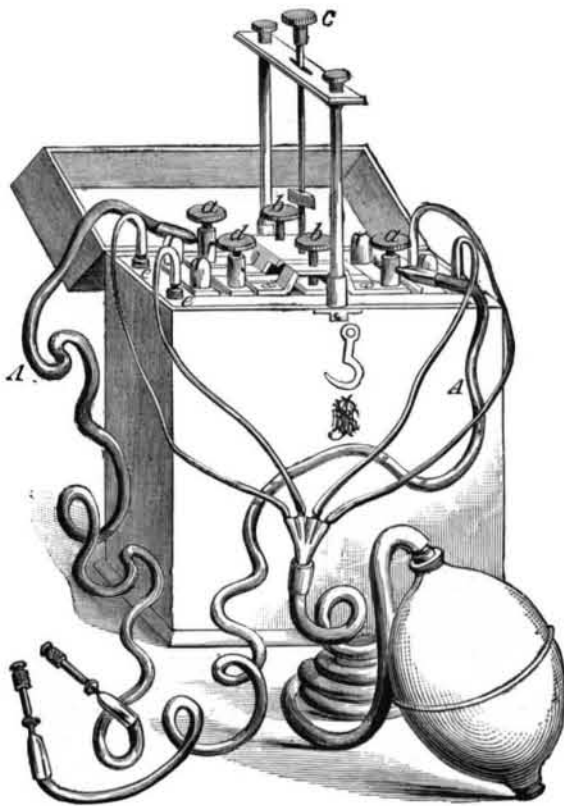
Each negative element consists of a plate of copper, to one surface of which, as well as to its edges, a sheet of platinum foil, compact, and free from pin holes, is soldered, and to the opposite surface or back a sheet of lead, the three metals being so united that the copper shall be effectually protected from the action of acids. The lead back and edges are then coated with asphaltum varnish, acid-proof cement, or any other like substance; and, lastly, the platinum face, being first rubbed over gently with emery paper, is to be thoroughly platinized in the usual manner.

Each cell of the battery above described contains two such plates, between which a single zinc is suspended, and when the elements are immersed so that the exciting fluid reaches within an inch of the top, a negative surface of 20 square inches is brought into action. It will thus be seen that the platinum alone is the negative metal, and the copper core a conducting body merely, while the lead, being almost passive,

serves no other purpose than to protect the copper, so that any other, and, best of all, a non-metallic, substance capable of resisting the action of bichromate solutions, might, with advantage, be substituted for the lead.

By this device the fixed and well known electro-motive energy of a platinum-zinc pair, which, I need hardly say, is much higher than that of platinized silver, and, combined therewith, the conductivity of copper, are insured in one and the same compound element. As might be supposed, therefore, the practical result is that the only internal resistance to be encountered is that of the fluid, which, in the apparatus under consideration, must necessarily be quite small, since the zinc and platinum surfaces are no more than three sixteenths of an inch apart. As to the electro-motive force in bichromate fluid, repeated and carefully conducted tests, by General H. L. Abbot, U. S. A., and others, prove this to be from 1.95 to 1.99 volts. Now, as this battery will show, during agitation, on a tangent galvanometer, with no external resistance, a deflection of 82°, or nearly 50 webers, it follows that the internal resistance cannot be much over 0.04 of an ohm.

This, then, is the basis of what has been justly claimed for and accorded my battery, namely, "a remarkably high electro-motive force, with an almost immeasurably small internal resistance." Nor is this most desirable condition limited to the particular form of battery herein described, for these conducting negative plates have proved to be infinitely superior to carbon in a porous cup with concentrated



THE BYRNE GALVANIC BATTERY.

bichromate of potash and sulphuric acid. As compared with platinized silver, also, with sulphuric acid and water, say one to ten or eleven, as an exciting liquid, not only will the electro-motive force be found to be twenty-five per cent or more higher and the resistance less, but, there being no internal currents due to a platinum-silver pair, and comparatively little tendency to polarization, the action will be steadier than that of the most perfect Smee battery. Hence these plates are admirably adapted, and have been successfully tried, for operating electro-motors, for electro-plating and other purposes.

With regard to the heating capacity of my battery, and the *modus operandi* by which pneumatic agitation increases its power, I have but a few words to add, suggested by reading the report of what took place at its exhibition in London.

It has been stated that "ten of my cells heated a stout platinum wire, thirty inches long and No. 14 B. W. G., to a glowing heat on pumping," and as evidence of the surprise created by this demonstration, the report goes on to say that "some idea will be formed of the great heating power here displayed, when it is remembered that it takes seventy or eighty Grove's elements to heat a similar length of No. 18 or 24 B. W. G. platinum wire." Now, inasmuch as I have often shown that four of these cells will heat to an equal degree from fifteen to eighteen inches of such wire, ten cells ought to, and would, I know, bring to a like condition considerably more than thirty inches. I am disposed, therefore, to surmise that the amount of this thick wire within reach at the time may probably have been limited to thirty inches, or there must have been some imperfection in the plates or cells used. At all events, the little battery of four cells will heat to a bright cherry-red twenty inches of No. 16 platinum wire.

As to the "development of heat within the cells," and "why the pumping of air into the cells should increase its current strength so much," it seems to me the distinguished electricians who are reported to have been present at this exhibition will, after a little reflection, find no difficulty in settling both questions to their entire satisfaction. I may state, however, that if a plate of amalgamated zinc, say 2 1/2 x 5 inches, and 1/8 thick, be immersed, alone, in 8 fluid

ounces of strong bichromate fluid, the temperature of said fluid will rise to nearly 140° F. in about half an hour, or within a few degrees of the highest point reached during prolonged electro-chemical action and agitation. Whether the slight retardation of the current by the fluid may add a fraction to the heat produced by chemical decomposition, I am not prepared to say; but it is quite certain that the development of heat within the cell is due in a great measure, if not entirely, to chemical action of the fluid on the zinc, and this is one among other reasons why the plan of suspending one zinc between two negative surfaces has been adopted.

Where cells have been employed to operate electro-magnetic motors, however, and the exciting fluid has been sulphuric acid and water merely, I prefer to use a single negative surface and one zinc. In this case there is little or no chemical action on the zinc, beyond what is represented in current, and the energetic disengagement of hydrogen insures a free circulation in the liquid.

With regard to the method adopted for agitating the fluid, I have only to say that, after many experiments and trials with various other contrivances, this has been found the most simple and convenient. That agitation has no influence whatever on the electro-motive force of the battery is unquestionably true, as Mr. Preece has demonstrated, nor has it much, if anything, to do in the production of heat within the cells. In fact, its action is purely mechanical, and agitation by any other device, if equally practicable, would accomplish the same result.

The suggestion of Professor Adams, as to its effecting a free circulation in the fluid, by which the metallic surfaces are kept constantly clear or, to use a meaningless term, *depolarized*, is, undoubtedly, a hint in the right direction, and in entire conformity with my own views.

JOHN BYRNE, M. D.

314 Clinton St., Brooklyn, April 15th, 1878.

American and English Weather Warnings.

To the Editor of the Scientific American:

I was much interested in the *résumé*, given in your issue for March 23, of Mr. Bennett's report of his storm warnings, which have created so much interest on this side, especially as I had just received from Mr. Scott, Secretary of the London Weather Office, the reprint of his paper upon the same subject, read before the Nautical Society. The comparison given below shows that there is considerable variance between the two reports. Though, as Mr. Scott says, "meteorologists are most deeply indebted to the generous public spirit of the proprietors of the New York Herald for their great liberality in transmitting these warnings gratuitously," it has been found impossible to make much or any practical use of them on our own coasts. The newspapers have naturally noticed them, since even one correct warning, even if a dozen proved incorrect, is seized on and wondered at by the public mind.

The following table refers to the same period (February 15 to December 31). Mr. Scott gives, in a full table, the date and wording of each warning; the actual meteorological conditions at the date indicated, from the returns for Western Europe; the measure of success, shown by the comparison; and a column for comments. Mr. Bennett's results are taken from your columns.

Description.	Bennett.	Scott.	Description.
Entirely correct.....	31	7 or 17.5 per cent.	Absolute success.
Correct in general.....	8	10 or 25 per cent.	Partial success.
Correct in particular parts...	5	6 or 15 per cent.	Very slight success.
Failed.....	2	17 or 42.5 per cent.	Absolute failure.
	46	40	100

The totals represent the supposed distinct storms predicted in 36 telegrams. After his table, Mr. Scott adds: "These figures, therefore, show that not 45 per cent of the warnings can be considered really successful. What is meant by 'really successful' is that the information conveyed by them was of real value to seamen in British ports."

Their chief value, he considers, is for ships crossing the Atlantic, since "storms in winter, like misfortunes, never come single," and they may expect bad weather as they approach the American coasts.

York, England.

J. EDMUND CLARK.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, May 11, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Mercury rises.....	4 36 mo.	Saturn rises.....	2 38 mo.
Venus rises.....	3 01 mo.	Uranus in meridian.....	6 33 eve.
Mars sets.....	10 31 eve.	Uranus sets.....	1 25 mo.
Jupiter rises.....	0 30 mo.		

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Alpheratz rises.....	0 56 mo.	Regulus in meridian.....	6 43 eve.
Algol (2d-4th mag. var.) sets	8 50 eve.	Spica in meridian.....	10 00 eve.
7 stars (cluster) sets.....	7 51 eve.	Arcturus in meridian.....	10 51 eve.
Aldebaran sets.....	8 08 eve.	Antares rises.....	8 43 eve.
Capella sets.....	11 57 eve.	Vega in meridian.....	3 17 mo.
Rigel sets.....	7 21 eve.	Altair rises.....	9 56 eve.
Betelgeuse sets.....	8 55 eve.	Deneb rises.....	7 23 eve.
Sirius sets.....	8 22 eve.	Fomalhaut rises.....	3 36 mo.
Procyon sets.....	10 33 eve.		

REMARKS.

Mercury is now invisible. All the planets, except Jupiter, now have northern declinations. We mention the stars in the order of their right ascensions, this week, for the first, and will do so hereafter. We do not give the ephemerides of Algol, as it sets so early in the evening as to render observation impracticable.