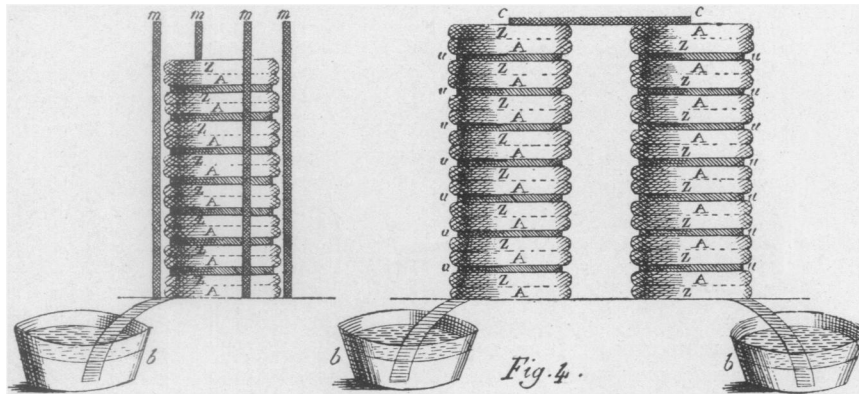


Classics of Science: The Voltaic Pile



Columns of zinc and silver plates

In reading the following account of the formation of the first chemical battery for producing electricity, in which Volta clearly describes the way to make one, it must be borne in mind that the author was writing in a language foreign to him. The Leyden jar and the apparatus which Volta calls a "battery" are in reality condensers; the torpedo is a living fish from which electric shocks may be obtained. Blotting paper will be found a more satisfactory modern substitute for the discs of cardboard or leather which Volta used.

COLLEZIONE DELL' OPERE DEL CAVALIERE CONTE ALESSANDRO VOLTA, [by] Patrizio Comasco, Firenze, 1858. On the electricity excited by the mere contact of conducting substances of different kinds. In a letter to the Rt. Hon. Sir Joseph Banks Ba. K. B. P. R. S. Read June 26, 1800 (letter originally in French, specially translated for the SCIENCE NEWS-LETTER).

Electricity From Conductors

At Como in Milan March 20, 1800.

After a long silence, for which I shall not try to excuse myself, I have the pleasure to communicate to you, Sir, and by means of you to the Royal Society, some striking results at which I have arrived, in pursuing my experiments on electricity excited by the simple mutual contact of different sorts of metals, and similarly of other conductors, also differing among themselves, whether liquid, or containing some moisture, to which they properly owe their power as conductors. The chief of these results, and the one which comprehends nearly all the others, is the construction of an apparatus which resembles in its effects, that is to say, in the sensations which it is able to make one feel in the arms, etc., the Leyden jars, and still better than feebly charged electric batteries, which nevertheless works without stopping, or of which the charge,

after each discharge, will re-establish itself; which enjoys, in a word, as inexhaustible charge, a perpetual effect on the electric fluid, or impulse; but which furthermore differs essentially, and by this continuous action characteristic of it, and because instead of consisting, like the ordinary electric jars and batteries, of one or more isolated plates, in thin beds of the bodies supposed to be the only electrics, protected from conductors or bodies called non-electrics, this new apparatus is uniquely formed of many of the latter bodies, chosen indeed from the best conductors, and so the further removed, from what has always been believed of the nature of electricity. Yes, the apparatus of which I speak to you, and which without doubt will surprise you, is only the assemblage of a number of good conductors of different sorts, arranged in a certain manner, 30, 40, 60 pieces, preferably, of copper, or better silver, each touching a piece of tin, or, which is better, of zinc, and an equal number of layers of water, or some other liquid which should be a better conductor than simple water, like salt water, lye solution, etc., or pieces of cardboard, leather, etc., well soaked in these liquids; of which pads interposed between each couple or combination of the two different metals, alternating with each set, and always in the same order, of the three sorts of conductors, that is all there is to my new instrument; which imitates, as I have said, the effects of the Leyden jar, or of electric batteries, in giving the same effects as they; which, in truth, remain well below the activity of the said batteries charged to a

high point, so far as the force and noise of the discharge, the spark, the distance at which it is possible to make the discharge, etc., equalling only the effects of a battery charged to a very weak degree, of a battery having nevertheless an immense capacity; which besides surpasses infinitely the power and the ability of those same batteries, in that it does not need, like them, to be charged in advance, by means of external electricity; and in that it is capable of giving the same effect, every time that it is suitably excited, however frequently this is done. . . .

Building the Battery

I will give you here a more detailed description of this apparatus, and of some other similar ones, also of some related experiences even more remarkable.

I obtained about a dozen little round plaques or discs, of copper, of brass, or better of silver, of a thumb's breadth, more or less (for example, some coins), and an equal number of plaques of tin, or, which is much better, of zinc, of the same shape and size, about; I say about, because precision is not a necessary point, and, in general, this size, even the shape, of the metal pieces, is arbitrary: one must take care only of the proper arrangement of one upon the other, in the form of a column. I prepare in the beginning, a sufficient number of rounds of cardboard, leather, or some other spongy material, capable of absorbing holding a great deal of water, or of the moisture which is neces-

(Just turn the page)

ASTRONOMY

Winter Begins Thursday

Though the cold wave which has swept over the country recently has brought with it wintry temperatures, winter has not yet begun, according to the astronomer. Not until 3:18 p. m., on Thursday, December 22, does it actually start.

The event by which astronomers determine the start of winter is concerned with the sun. On the twenty-second it enters the sign of Capricornus. This is one of the ancient signs of the zodiac, the path through which the sun, moon and planets all move.

The day on which the winter solstice occurs is the shortest of the year. On the twenty-second the sun rises, along the parallel of 40 degrees north latitude, at 7:18 a. m., and sets at 4:38 p. m., so that only 9 hours and 20 minutes are provided on that day.

Science News-Letter, December 17, 1927

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The Voltaic Pile

(Continued from page 395)

sary, for the success of the experiment, which should be thoroughly soaked. These slices or wheels, which I shall call wet discs, I make a little smaller than the discs or plates of metal, to the end that interposed between them in the manner I shall immediately describe, they shall not overflow.

Having in my hand all these pieces, in good condition, that is to say, the metal discs all prepared and dry, and the other non-metallic ones well soaked in plain water, or, which is much better, in salt water, and then lightly wiped, so that the liquid does not drip, I have only to arrange them as is necessary; and this arrangement is simple and easy.

I place then horizontally upon a table or other base, one of the metal plates, for example, one of silver, and on this first I fit a second of zinc; on the second I lay one of the wet discs; then another silver plate, immediately afterward another zinc one, after that I put in sequence another wet disc. I continue so, in the same manner, coupling a plate of silver with one of zinc, and always in the same order, that is to say, always the silver below and the zinc above, or vice versa, whichever way I have begun, and interposing between each of the couples, a wet disc; I continue, I say, to build, of many of these stories, a tower as high as can stand without toppling.

Now, if it will stand up to reach about 20 of these stories of metal couples, it will already be capable, not only of making the electrometer signals of Cavallo, aided by the condenser, to as much as 10 or 15 degrees, of charging the condenser by simple touching; to the point at which it will give a spark, etc., but also to shock the fingers with which one tries to touch its two ends, (the head and the foot of one such tower), with one or many little shocks, and more or less frequently, whenever one renews these contacts; every one of which resembles perfectly the slight effect given by a Leyden jar weakly charged, or a battery charged even more weakly, or finally an extremely exhausted torpedo, which imitates even better the effects of my apparatus, on account of the shocks which it can give without ceasing.

To get these light shocks from this apparatus which I have just described, and which is again too little for any large effect, it is necessary that the fingers with which one wishes to touch the two extremities

at the same time, be wet with water, in order that the skin, which otherwise is not a good enough conductor, shall become sufficiently moist. Again, to succeed more surely, and to receive considerably greater shocks, it is necessary to connect, by means of a sufficiently large plate, or a long strip of metal, the foot of the column, that is to say, the bottom plate, with water in a basin, or cup large enough, so that one may plunge into it one finger, two, three, or the whole hand, while one approaches the head or upper extremity (the last or one of the last plates of the column) with the clean end of a strip also of metal, held in the other hand, which should be well moistened, and to touch a large surface of this plate, and to hold it tightly, by proceeding in this manner, I can even get a little pricking, or electric shock, in one or two joints of one finger plunged in the water of the basin, by touching, with the strip held in the other hand, the fourth, or even the third pair of plates; touching afterward the fifth, the sixth, and step by step the others, up to the last plate, which makes the head of the column, it is curious to note how the effect gradually increases in strength. Indeed, the force is such, that I succeed in getting from one such column, formed of twenty pairs of plates (preferably) shocks which take in the whole finger, and affect it quite painfully, if only it is plunged into the water of the basin; which extend (without pain) to the wrist, and even to the shoulder, if the hand is plunged in in great part, or entirely, and make themselves felt again in the wrist of the other hand.

Alessandro Giuseppe Antonio Anastasio, Conte Volta was born at Como, February 18, 1745, and died in the same city March 5, 1827. At the age of 29 he became professor of physics at the gymnasium of Como. Five years later he was chosen to occupy the chair of physics which had just been founded at Pavia. After extensive study of electrical conductors, Volta, in 1799, made the discovery of the electric battery which he announced to the Royal Society of England the next year in the letter quoted in part above. Volta in this discovery opened the field of research in electrodynamics. The experimenters before him had known electrostatic effects only. Volta's surprise at having found a continuous source of electricity is apparent in his letter.

Science News-Letter, December 17, 1927

The giraffe with its long throat and neck can make no sound.

The highest sand dunes in the world are along the southeastern shore of Lake Michigan.