[For the Scientific American.]

THE NATURE OF THE PHENOMENA DISCOVERED BY MR. EDISON.

BY P. H. VANDER WEYDE, M. D.

Two of your recent issues contain interesting articles on Mr. Edison's recent discovery. One is by Mr. W. E. Sawyer, page 36, and the other by Dr. G M. Beard, page 57. The writers take directly opposite views of the matter, and therefore some comments may be welcome to such readers as look with interest on new discoveries in electricity, a field remarkably fertile with subjects of purely scientific importance, and also with facts capable of useful practical application.

Mr. Sawyer claims that there is no novelty in the alleged discovery, that two years ago he experimented in the same way, having learned the existence of the identical phenomenon from others, that he considered the spark to be the effect of molecular magnetic vibration, "not, however, purely magnetic, but magneto-dynamic," and "practically of no value."

Dr. Beard was at first inclined to the same view as that taken by the SCIENTIFIC AMERICAN, by myself, and by others, namely, that the phenomena were simply due to electric induction, produced in the atmosphere surrounding any vibratory electro-magnet: but now he appears to have deserted this rational view, and to have gone over to Mr. Edison's idea that it is a new force; and he bases his conclusion on some new experiments, of which he gives an account, and the results of which appear to him to be irreconcilable with the attributes of pure electricity.

I cannot but disagree with both gentleman, as I do not see how the view of Mr. Sawyer, who considers it to be a "molecular magnetic vibration," can convey any definite idea in harmony with what we know of the behavior of the magnetic and electric forces. His assertion that it is practically of no value is bold and hazardous in the extreme; it is always very imprudent to maintain, because we do not succeed in solving a problem or finding the practical application of a phenomenon, that nobody can, and thereby to deny that the problem or phenomenon may some day become a most fruitful source of discovery. For proofs, I point to the fields of physics and chemistry, which abound with illustrations showing the caution which we should observe in pronouncing a verdict.

Dr. Beard's conclusions are tinged with some disregard of the laws of static electricity. I have noticed this frequently to be the case with some electricians of the present day, many of whom have studied exclusively the laws governing voltaic currents; and from such I have often heard assertions, proving that they were total strangers in the field of static electricity, and entirely unacquainted with the characteristic experiments with the old-fashioned frictional electric machines, Leyden jars, etc. I do not say this to throw any reflection upon the capacity of Dr. Beard, whom I know to be a thorough electrician; but still, if he were more familiar with the inducing action of the conductors (not those of the style now used with Rhumkorff coils, but the old style, consisting of two paraliel tinfoils or their equivalents placed at a distance), he would not come to the conclusion that the electricity (or whatever it is) passed from one tinfoil to the other through the air between them; but he would see that inductive influence only reaches from the one to the other, the + — + —, etc., condition of the one exciting inversely a — + — +, etc., condition in the other plate.

It is now more than a century since the Abbé Nollet, in France, made a similar mistake by maintaining that the electric current passed through the glass of the Leyden jar. He saw that, when such a jar was insulated, for every positive spark with which the inside coating was charged he could draw also a positive spark from the outside, and therefore he concluded that the positive electricity passed through the glass. This otherwise eminent investigator never obtained in his whole life a clear idea of induction; he could not conceive that a positive electric charge of the inner coating of the jar could, while retained there and without being lost, induce a positive electric charge to leave the outer coating.

The very experiments mentioned by Dr. Beard are to me a most convincing proof that the phenomena are due to induction. Frictional electricity will, when the conducting wire is cut, if the ends are separated beyond the distance that the spark can leap, be totally arrested at the separation; but if we attach large conducting flat surfaces, like tinfoil, to the ends of the wire, so that the charge can diffuse itself over one surface, it will, by induction, cause electric phenomena in the other flat surface and the wire attached thereto. This is not an overleaping of the electric current through the air, but simply an inducing action, exciting the other plate by a destruction of its neutrality, and a separation of its + and — electricities. In fact, the arrangement of the parallel tinfoils, described by Dr. Beard, is nothing but one of the forms of the old-fashioned condenser.

I see no reason why all the phenomena observed by Mr. Edison cannot be considered as: 1. Induced electric currents constantly reversing polarity, so rapidly changing and neutralizing each other that it is very difficult to determine any polarity at all. 2. Induced electric currents, of very low intensity, but enormous in quantity, which at once explains their lack of physiological action and the needlessness of a perfect insulation.

If, after the above explanation, we review the six points which Dr. Beard gives on page 57, against the theory that it is electricity, we find: 1 The various forms of electricity, recognized as such, vary so much among themselves that there is scarcely any one phenomenon that is common to them all. 2. Many forms of the electric force produce no perceptible or demonstrable physiological effects. 3. Induction of electricity is not resisted by air, glass, rubber, or paraffin, as is the case with the electric current itself. 4. The absence of polarity is only a negative proof; and polarity may yet be demonstrated with the proper apparatus, if care be taken in manipulation. 5. The inducing action of electricity passes through non-conductors, such as air, rubber, glass, etc., most readily when the terminals consist of large surfaces. Electricity of low intensity will not pass off at points. 6. Electricity diminishes in intensity with the distance from the exciting cause, in definite ratios determined by the nature of the conductors: while the induction also depends on the distance and the nature of the intervening insulating substances.

To place this supposed new force between heat and magnetism appears to me to be entirely unwarranted. We know that light consist of waves of a velocity of vibration of over 450,000,000,000,000 oscillations per second; nonluminous heat has a less velocity, and its principal effect is to expand bodies, and change their molecular aggregation from solids into liquids, and then into gases; while magnetism manifests itself alone in the attraction and repulsion of a very limited number of bodies; the intrinsic nature of magnetism is still a mystery, and we know little about it, except that it is closely related to electricity, and besides we know the nature of that relation. But of electricity we know more. We know that it may differ greatly in intensity and quantity, that the various forms produce the utmost varieties of phenomena: we know that electric currents induce other currents; that permanent or temporary magnets may induce currents; that this inducing action extends like an atmosphere around electric currents and magnets producing other electric currents or magnetic phenomena. When we look at all this, and at the circumstances under which the assumed "etheric force" is produced, we cannot help considering any attempt to deny its electric nature as a vain endeavor to magnify the importance of the discovery which is, in truth, in itself important enough not to need any such exaggeration.

Another argument that this force is not electricity itself, and is only related to electricity, and not to magnetism, and much less to heat, may be deduced from the new theory of the intrinsic nature of the electric phenomena. This I will reserve for a future occasion.

New York city.

A Hydrothermic Motor.

M. Tommasi, we learn from *Les Mondes*, has recently constructed a so-called hydrothermic motor, from which he has obtained effective results. The dilatation and condensation of oil, caused by the action of heat, transmits motion to mechanism which actuates a piston at the rate of 100 strokes per minute. With M. Tommasi's model, at this speed, about one third of a horse power is developed. It is believed that with large machines an efficiency of several horse power can be realized. The inventor thinks that the chief application of his motor will be its utilization of the heat of the exhaust of steam engines, something after the manner proposed for the bisulphide of carbon and ammonia machines. The alternate dilatation and condensation of oil is, however, not attended by the production of annoying vapors as is the case in the last mentioned motors. This is one advantage of importance, while another is found in the enormous force which exists in the process of dilatation of the oil. The editor of *Les Mondes* states that he saw the cover of the small tubular boiler used by M. Tommasi torn off, and the four heavy screw bolts by which it was secured broken, while the oil infiltrated the apparently hard cast iron as if the latter had been sponge.

From this it will be seen that the motor is apparently capable of yielding almost instantly a powerful force, for a brief period, a quality which might be advantageously utilized on locomotives. In such a case the machine would be operated by the heat of the exhaust, and could be thrown into action whenever a heavy grade was to be ascended, necessitating extra work. By its use, also, after a train had acquired sufficient momentum, steam might be allowed to run down to just sufficient to keep the engine to its duty, with no margin for emergencies or for starting purposes. The hydrothermic motor would start the train or apply the heavy power necessary to increase the speed. This would cause no inconsiderable saving of fuel. The use of the oil as above detailed is not new in principle, as a similar invention appeared in this country twenty years ago. M. Tommasi's application of the power, as near as we can judge from *Les Mondes'* incomplete statement, seems to be novel.

The U.S. Torpedo Boat Alarm.

The *Graphic's* Washington correspondent gives the following particulars of the torpedo boat Alarm, now at the navy yard in that city, in charge of Lieutenant Commander William Bainbridge Hoff.

"It is the first command of this gallant young officer, and by a singular coincidence, next his own is now anchored the Relief, the first command of his father, Admiral Hoff. The contrast between the two vessels is as great in construction as in name, and admirably illustrates the improvements made in our navy. There is much of interest to be seen on the Alarm. She has a single death-dealing turret, a 15 inch gun in the bow, the largest afloat, a formidable prow used as a weapon of attack, and a row of Gatling guns ranged along both her sides. A surprising deal of general utility business is done by an ingenious combination of machinery worked on deck, by means of which the wheel is turned, the ship steered, and torpedoes run out if desired. All this can be directed by one person standing in a small shot-proof enclosure on the deck. The mode of attack of such a vessel as the Alarm is, I am told, first to blind the enemy with an electric light flashed in its face; then to fire the fifteen-incher at the foe; at the same time to run out and explode a torpedo beneath the hostile vessel; next, if there is anything left to attack, to give a *coup de grace* with the incisive prow, and if the enemy still decline to be wiped out of existence, the devastating instruments of the turret are called into requisition, and if they do not suffice the Alarm swiftly turns a broadside to the foe, and brings into range in turn the innocent-looking but fatal rows of Gatlings."

Useful Recipes for the Shop, the Household, and the Farm.

A well known druggist gives the following directions for coating pills with sugar or gelatin in the shop: Pills which have been thoroughly dried can be coated with sugar as follows: Boil 32 ozs. of best white sugar with 12½ ozs. of distilled water to a sirup, and use enough of this sirup (temperature 120° to 150°) to moisten the pills in a small copper kettle or pan, exposing it to a heat sufficient to dry the pills while kept in motion and worked with the hand. After this first coat is dry, the operation is repeated until the pill is covered with sugar sufficiently. A very soluble coating for pills is the following composition; 1 oz. flaxseed, ½ oz. Irish moss; boil with 8 fluid ozs. water, strain, add 4 ozs. sugar, boil again and use in the same manner as a solution of gelatin is used for coating pills.

To detect fusel oil in whiskey, the readiest process is to shake one or two fluid ounces of the liquor with an equal volume of pure ether, and about one fourth of its volume of water. The supernatant liquid being decanted, will, on being evaporated at the ordinary temperature, leave behind the fusel oil present in the whiskey, together with some of the flavoring ingredients that may have been introduced artificially.

A very pretty amusement, especially for those who have just completed the study of botany, is the taking of leaf photographs. One very simple process is this: At any druggist's get a dime's worth of bichromate of potash. Put this in a two ounce bottle of soft water. When the solution becomes saturated—that is, when the water has dissolved as much as it will—pour off some of the clear liquid into a shallow dish; on this float a piece of ordinary writing paper till it is thoroughly moistened. Let it become nearly dry in the dark. It should be of a bright yellow. On this put the leaf, and under it a piece of soft black cloth and several sheets of newspaper. Put these between two pieces of glass (all the pieces should be of the same size) and with spring clothespins fasten them together. Expose to a bright sun, placing the leaf so that the rays will fall upon it as nearly perpendicular as possible. In a few minutes it will begin to turn brown, but it requires from half an hour to several hours to produce a perfect print. When it has become dark enough, take it from the frame and put it in clear water, which must be changed every few minutes, till the yellow part becomes perfectly white.

To pickle beef for long keeping: First, thoroughly rub salt into it and let it remain in bulk for twenty-four hours to draw off the blood. Second, take up, letting it drain, and pack as desired. Third, have ready a pickle prepared as follows: For 100 lbs. beef use 7 lbs. salt; saltpeter and cayenne pepper, each 1 oz.; molasses, 1 quart; and soft water, 8 gallons; boil and skim well, and when cold pour it over the beef.

Says a correspondent of *Inter-Ocean* who has had much experience with wire fences: "I would not recommend straight wire with patent barbs, as it is liable to break in cold weather. There is a twisted wire with barbs that does well, as it is said the twist will allow it to expand so that it will not break. Of this kind I have some on my own place. It is a perfect fence for any cattle or horses. I have three wires, and posts two rods apart, but on level ground they might be three or four rods apart."

A Chinese Roger Bacon.

A Chinese scientist has established at Shanghai a scientific laboratory, which will strongly recal the famous workshop of Roger Bacon. With an extraordinary energy, in the possession of which he seems to differ greatly from the generality of his compatriots, this wise Celestial, after purchasing the apparatus merely, has taught himself photography. He has likewise studied medicine with a European doctor, and invented a new, and it is said very efficacious, antidote for the opium habit. In his laboratory are electric bells, a printing press, and a large variety of ingenious philosophical apparatus, mainly of his own device and construction. The principal object of his investigations, however, is to find a way of printing Chinese books in movable type. With the aid of the machinery at the Presbyterian mission, he has already begun the manufacture of the matrices or molds for the type, an immense undertaking when it is considered that, for each single sort or variety of character, no less than 6,664 matrices are required. Moreover, there are over 20,000 Chinese characters. Each matrix must be cut from wood and electrotyped. It will require, it is said, fourteen years' work of the mission machinery to make 24,000 different characters. In the six years in which this benefactor of his race has been at work, he has produced 5,000 matrices of little characters and 6,000 of larger ones. With what he has already of small type, he has printed a little volume. He does not expect to live long enough to complete his immense task, and therefore is educating his children to the proper degree of skill in order that they may continue the undertaking.

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