IMPROVED CAR TRUCK.

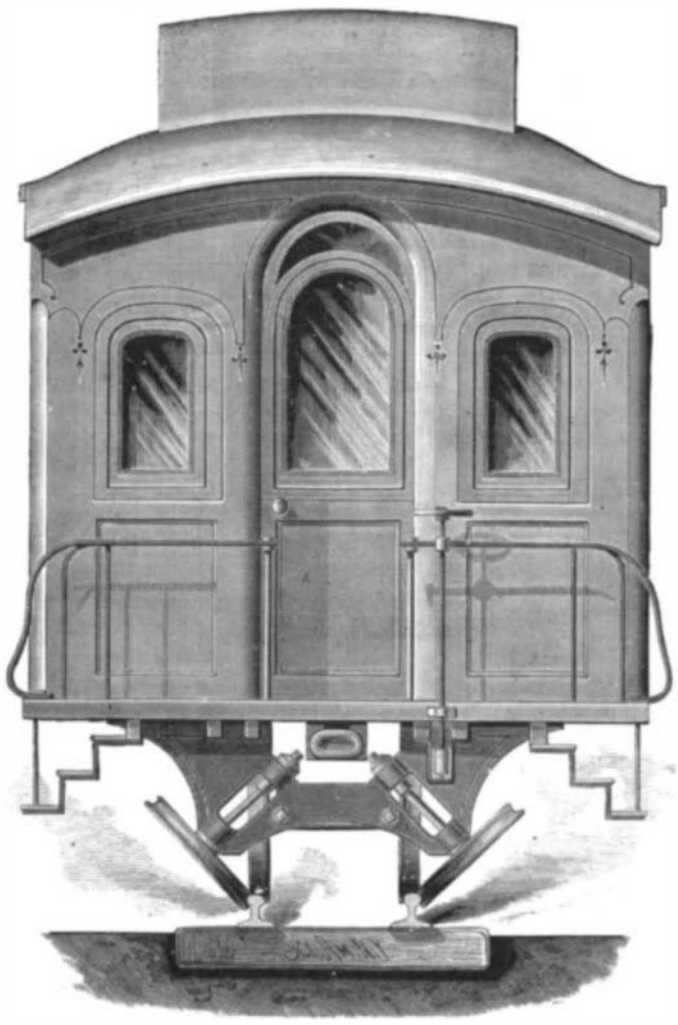
The annexed engraving represents an improved car truck recently invented by Mr. F. Beaumont, Jr., of San Antonio, Texas, which admits of greatly reducing the gauge of the road without diminishing the width of the car. It is easy to show that an immense saving can be made by using the narrow gauge instead of the broad gauge system of railroad building. With the narrow gauge all the heavier work of grading, embanking, tunneling, etc., costs far less, and an important proportion of land damages is avoided. Half the expense of rails is saved and shorter curves are practicable, which makes the constructive engineering both easier and cheaper. Roads of the ordinary narrow gauge of three feet cost about five-eighths as much as the broad gauge roads. And an equal degree of speed is also attainable with greater safety, as from the shortness of the axles the wheels slip less on the outer sides of curves, thereby diminishing the torsional strain on axles, which, as is well known, destroys the fiber of the iron, making the car axles useless after a time, and is frequently the cause of railway accidents.

A much larger saving in the cost of construction can be attained by the use of the improvements illustrated, without proportionately diminishing the size of the cars, as shown in the engraving, representing an end view of a car seven feet in width (usual width of narrow gauge cars) on a track of only eighteen inch gauge. The engraving so well explains the nature of the invention that but little need be said further, than that the improvement consists of the lateral wheels placed upon axles, inclined upward and inward at an angle of about forty-five degrees to the axles of the ordinary transporting wheels. These inclined axles have their bearings in the bolsters, one of which is placed at each end of the car truck. The inclined wheels run on the outside of their respective rails, their flanges projecting under the rail head, tending to keep the car in equilibrium, and permitting a much larger part of it than usual to overhang the rails in perfect security, thus enabling the gauge of the track, and consequently the road bed, to be greatly diminished in width, as shown in the engraving. When the car is seven feet the gauge is eighteen inches, and the tie is three feet long.

The inventor is fully aware of the necessity of some important modifications in switches, turnouts, etc., and has also invented a system of these, especially adapted to his method of narrow gauge, which makes it entirely practical.

The improvement is well calculated to cheapen the construction of railroads, so that they may be built in many instances where now it is impossible to build the present narrow gauge for lack of sufficient capital.

The invention has lately been patented by F. Beaumont, Jr., and Jno A. Fraser, assignee, of San Antonio, Texas, who may be addressed for further information.



BEAUMONT'S CAR TRUCK.

EXPANSION VOLTAMETER.

BY GEO. M. HOPKINS.

In the ordinary voltameter in which acidulated water is decomposed by electrolysis, and by which the strength of the current is determined by the volume of gas accumulating in a given time, there are several objectionable features which prevent it from coming into general use for the measurement of the strength of electric currents.

In the first place the electrolytic voltameter is incapable of indicating the strength of the current at any particular moment, and cannot, therefore, yield anything but a mean result. It offers considerable resistance in the circuit, its indications depend upon the acidity of the water, and the size and distance apart of the electrodes; and to secure accurate results the temperature and barometric pressure must be taken into consideration.

The voltameter shown in the engraving depends on the heating effect of the current on a thin wire of platinum or copper, the lineal expansion of the wire giving the index more or less motion, according to the strength of the current.

This instrument, like the electrolytic voltameter, is adapted only to strong currents, and, although it has one source of error to be compensated for—that is, the increase of the resistance of the wire with the increase of temperature—no account is taken of the environing temperature nor of barometric pressure, and the indication may be read at any moment; and, moreover, the increase of resistance due to increased temperature may be disregarded, since the normal resistance of the wire is almost nothing.

This voltameter finds its principal application in connection with the stronger currents, such as are employed in electric lighting, in electro-metallurgy, and in telegraphy, and it is a convenient adjunct to the dynamo-electric or magneto-electric machine. It must be adapted within certain limits to the current which is to operate it, but when the instrument is properly proportioned to its duties its indications may be relied upon.

A vertical plate of vulcanite supports a horizontal stud, upon which are placed two metal sleeves having a glass lining. To one of these sleeves is attached a counterbalanced arm, carrying at its upper end a curved scale, having arbitrary graduations determined upon by actual trial under approximately the same conditions as the instrument will be afterward subjected to in actual use. The other sleeve carries a light counterbalanced metal index, which moves in front of the curved scale. Each sleeve is provided with a curved platinum wire arm, dipping in mercury contained in an iron cup secured to the base. Two platinum or copper wires are stretched along the face of the instrument, and attached at one end to hooks passing through an insulating post, and after passing once around their respective sleeves on the index and scale, are attached to spiral springs, which in turn are connected with wire hooks extending through an insulating post projecting horizontally from the vulcanite plate.

Under each wire there is a horizontal meta bar communicating under the base with one of the binding posts. The two other binding posts are connected separately with the two mercury cups. It will be seen that with this construction the expansion of the rear wire will move the scale, while the expansion of the front wire will move the index. In order to apply the current to any required length of wire, there is upon each of the horizontal bars a clamp, which may be placed anywhere along the bar and screwed up so as to clamp both wire and bar.

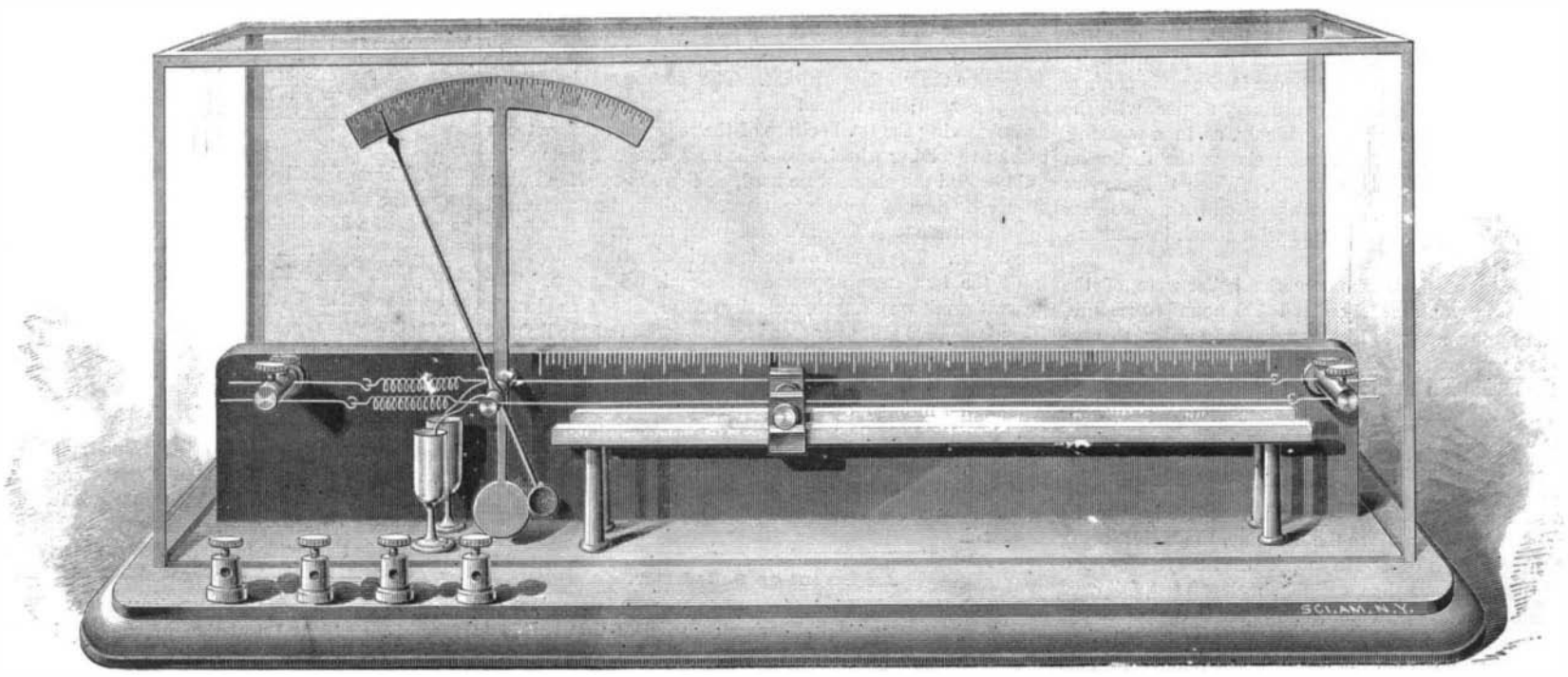
Usually the current to be measured will pass from the battery or machine to one of the binding posts, thence to the forward horizontal bar, thence through the expansion wire connected with the index, through the sleeve of the index, and finally through the mercury cup to the other binding post.

It will be observed that both scale and index will be moved in the same direction by the expansion of their respective wires, and that the atmospheric temperature affects both alike. This being true, it is unnecessary to take any account whatever of external temperature. The apparatus is inclosed in a glass case to prevent the cooling action of the draughts of air.

By connecting the index expansion wire with a battery having an electromotive force of one volt, the deflection is very slight, even with a very fine wire, but in a stronger current from a battery having an electromotive force of five volts and upward, slight variations will be readily indicated.

As mentioned before, the instrument must be adapted to the conditions under which it is to be used. For use with a moderate current, a No. 36 platinum wire, about the length of that shown in the engraving, answers a good purpose, but for heavier currents from a dynamo-electric machine, a larger and longer wire of copper will be required. It should be small enough to be heated somewhat by the current, but not so small as to offer any material resistance in the circuit. When the larger wires are used they are not wound about the sleeves of the index and scale, but are bent downward before reaching the sleeves, and the mercury cups are placed so as to receive their lower ends. Cords or small chains are attached to the angles of the wires and wrapped once around the sleeves and attached to the springs.

This instrument, placed directly in the circuit of a dynamo-electric machine, or in a branch circuit, will indicate the amount of current passing. When it is desired to compare two currents the expansion wire of the index is placed in one circuit, and the expansion wire of the scale is placed

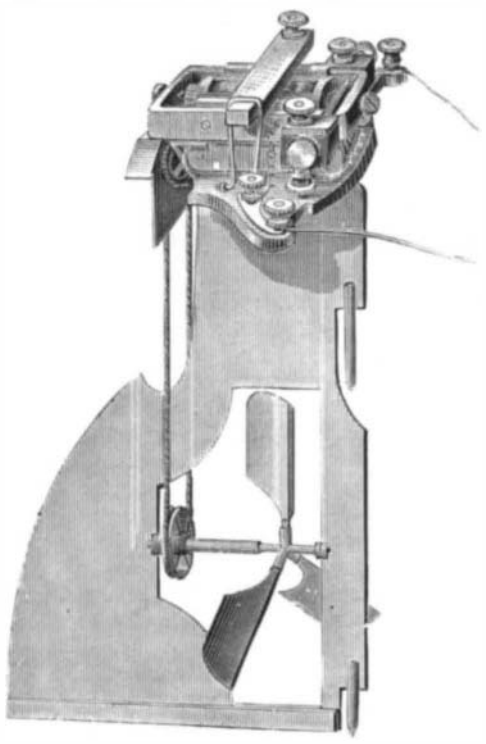


EXPANSION VOLTAMETER.

in the other circuit. In a delicate instrument of this kind the tension of the expansion wires should be only sufficient to keep the wires taut, as they are readily stretched when considerably heated.

THE ELECTRIC BOAT.*

Mr. G. Trouvé has just constructed an electric motor specially adapted to be used in a row boat or canoe. He made his first public experiment on the 26th of May, in Paris, on the Seine, in the presence of MM. Berger, Commissioner



THE ELECTRIC BOAT—DETAILS OF PROPELLING MACHINERY.

General of the Exposition Universelle d'Electricité, Antoine Breguet, editor of the *Revue Scientifique*, and numerous other spectators, who were greatly astonished to see the boat moving against the current without oars or the smoke generally inseparable from the steam engine.

This electric motor is furnished with a Siemens armature connected by an endless chain with a screw having three paddles, and placed in the middle of an iron rudder. The motor is placed on the upper part of the rudder, so that both the motor and propeller follow the movements of the rudder.

This motor, with all its accessories, only weighed five kilogrammes, and was placed in the rear of a little barge about five meters fifty centimeters long, by one meter two centimeters in breadth, and weighing eighty kilogrammes.

In the middle of the boat were placed two secondary batteries weighing twenty-four kilogrammes. Mr. Trouvé prefers two batteries, as they are more easily managed and have the advantage that they can be used either together or separately; also that in the evening one can be used for propelling and the other for lighting the boat.

The secondary piles are connected with the motor by two cords that serve both to cover the conducting wire and to work the rudder, and are furnished with handles that can be used to regulate the electric current.

This electric motor is complete in itself, and can be placed on a small boat. It is arranged in such a way that it does not interfere with the action of the boat or the use of the oars.

The ingenious inventor, before deciding on the endless chain, made various experiments with the different ways of propelling by cog-wheels by an endless screw and by friction. He found the two first too complicated and too easily clogged by the sand, branches, etc., floating in the water to be advantageously used, while the latter system, though perhaps the better, presented numerous practical difficulties. The endless chains are the best adapted for actual use, as their slower movement is more than compensated by their greater strength and regularity.

Besides her experimental trip, this electric boat has at six different times easily navigated the Seine for a distance of 200 meters. It is found that the boat, containing three persons, stemmed the current at the rate of one meter a second, and descended with a speed of two meters five centimeters. The current of the Seine at this place runs about twenty centimeters a second.

These trials are very interesting from an experimental point of view, and will, we hope, be an incentive to more important works. These will assuredly take place when the supply of electricity is more easily procured, for it cannot be denied that the present electric pile is not an advantageous arrangement, as it is difficult to mount and its power is limited.

Three experiments recall those made by Jacobi in 1829 to navigate the Neva by electricity. We reproduce from the *Merveilles de la Science* the account of this interesting attempt, which well deserves to be called the origin of electric navigation.

The voltaic apparatus that furnished the electricity to Jacobi's motor was composed of two Grove batteries, each containing sixty-four pairs of cells, the whole covering thirty-two square feet. This furnished so powerful a current that a piece of platinum wire, 2 m. long and as thick as a piano string, was immediately heated to a red heat on being exposed to the electric current.

There was so much nitrous gas liberated by the pile that the operators were seriously incommoded, and were several times obliged to interrupt their experiment.

The spectators, who stood on the banks of the Neva, were also forced to retire on account of the suffocating odor of the liberated gas that the wind blew on to the shore.

The barge, which was made with paddlewheels, and was large enough to hold twelve persons, succeeded, however, in sailing several hours on the river against both wind and tide.—*La Nature.*

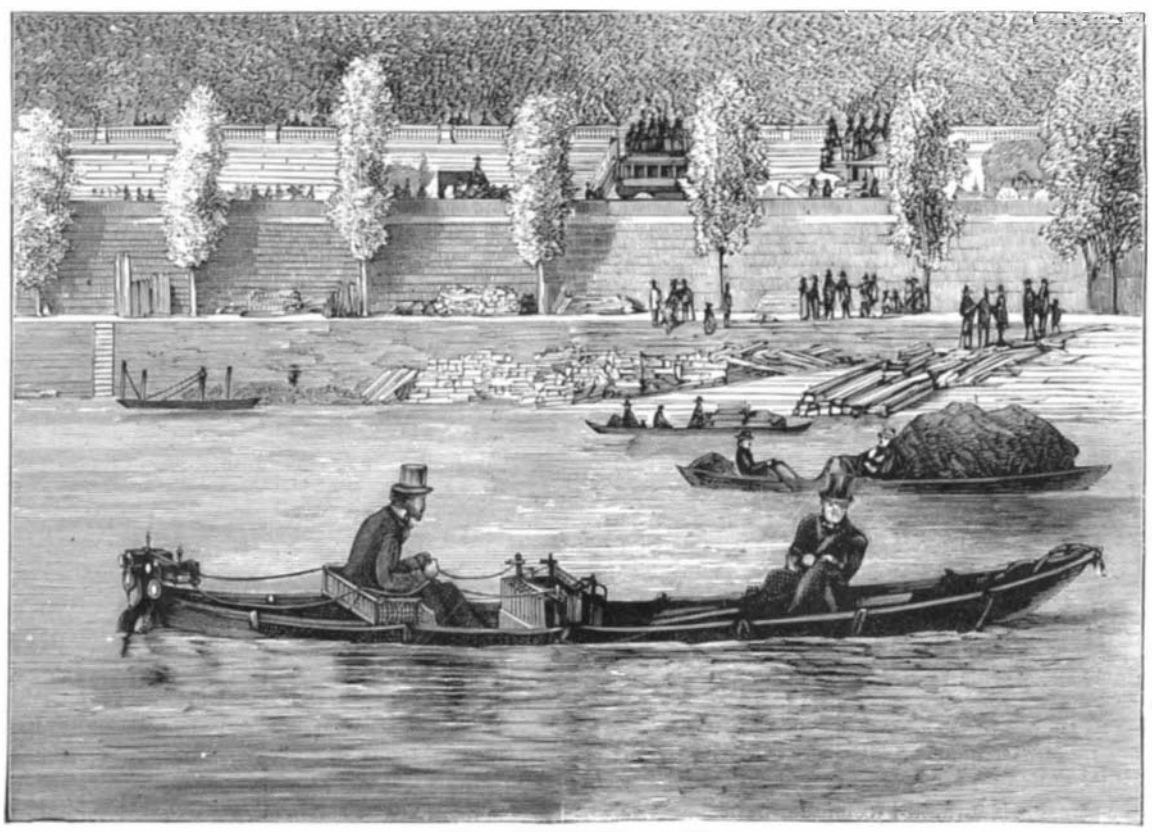
Large Flagstones.

It is said that the largest flagstone ever cut was laid in Chicago before the great fire. It measured 16x25 feet and was 12 inches thick. Lately one 15x25 feet was cut at Waterville, Oneida County, N. Y., and $5,000 have, it is said, been offered for it delivered in this city. The problem is to get it here, since it is too wide to pass railway bridges and tunnels, and would be too high if turned on edge. Equally great are the difficulties encountered by way of the Erie Canal.

Experiments with Binoxide of Hydrogen.

M. Paul Bert, who, in spite of his election into the French Chamber, continues his scientific experiments, found some time ago that oxygen gas at a certain degree of pressure had the property of destroying all kinds of organized ferments, while it was without action on the chemical ferments of the saliva and the pancreatic fluid.

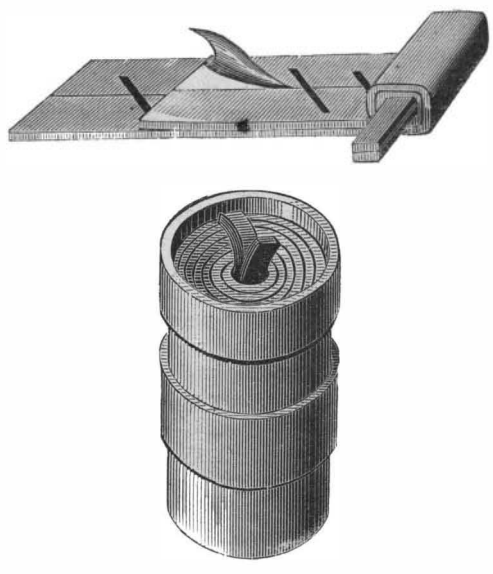
A young French chemist, M. Paul Regnard, has recently renewed these experiments, but instead of using compressed oxygen gas, he has employed binoxide of hydrogen, that is to say, distilled water containing one per cent of the binoxide. He has found that a few drops of this weak solution arrest the fermentation produced by yeast, prevent the production of mycoderms in wine, prevent the putrefaction of milk and white of egg, urine, and saccharated yeast, but have no preventive action whatever as regards the sugar-producing properties of the ferments of saliva and the pancreatic fluid when acting upon cooked starch.



THE ELECTRIC BOAT

THE FAURE BATTERY—STORED-UP ELECTRICITY.

The current number of *Le Journal Universel d'Electricité* contains, says *Engineering*, a very ably written article by M. Frank Géraldy upon the Faure secondary battery, to which we recently referred. From this article we find the space to make the following extracts: "The posters bearing the words 'Power and Light' in enormous letters, are still visible on the walls; the noisy articles that have appeared in certain journals are not yet forgotten; however, the bills are beginning to disappear, the effect of the articles to decrease, excitement is on the wane, and the scientific press can at last be heard. It has, indeed, been difficult to discuss this matter sooner, for it was essentially necessary to have data and information as exact as possible, and these have not been obtained without trouble."



THE FAURE BATTERY.

The author then refers briefly to the secondary battery of M. Reynier, and proceeds to describe the Planté battery, which he states to be almost identical with that of M. Faure, M. Planté having, except in one point, long ago anticipated what M. Faure has recently brought forward, and which has been received with so much popular excitement. He then continues: "We will now proceed to the Faure secondary battery. It is protected by two patents dated October 20, 1880, and February 9, 1881, respectively. In these patents M. Faure describes principally those batteries composed of lead plates laid on frames covered with red lead, and protected by leather, attached by means of lead rivets, an arrangement similar to the rectangular batteries of M. Planté. The actual batteries are not so made, being constructed as follows: Two sheets of lead are taken 7·87 inches wide; one of these plates is 23·62 in. long, and 0·04 in. thick; the other is 15·75 inches long and 0·02 inch thick. Each plate is covered on both faces with a layer of red lead reduced to a paste by water, 1·76 lb. being spread over the larger plate, and 1·54 lb. over the smaller. On each face thus prepared a sheet of parchment paper is placed, and the whole is introduced into a sheath of thin leather. One plate is then put on top of the other and rolled up, strips of rubber being interposed obliquely, as shown in the sketch. The roll is then placed in a cylindrical lead cell, the outside of which is strengthened with copper bands, and the inside covered with red lead and leather, so as to increase the useful surface of the battery. The latter then presents the appearance shown in the sketch, and one of the projecting stems from the lead plates is bent over and soldered to the inclosing cylinder, which is ready for use when it has been filled with water with about 10 per cent of sulphuric acid. The apparatus when charged weighs about 20 lb. It will be seen that this differs from the Planté secondary battery only in the employment of red lead. The material chiefly employed is the same, the mode of construction is precisely similar, the leather takes the part of the cloth previously used by M. Planté; it has no merit in itself; on the contrary, it is a cause of resistance, and is liable to deterioration, being useful only to keep the red lead in place. It is, in fact, this red lead which constitutes the new feature, and gives the special advantage to the apparatus.

"According to the inventor there are two advantages gained. The long and delicate operation necessary to prepare the Planté battery is not required. (This operation consists in passing through the battery an electric current,

* In a note lately presented to the Academie des Sciences, M. Trouvé claims to have improved the Siemens armature. The poles, instead of being portions of a cylinder whose axis coincides with the axis of the system, are so turned that they gradually approach their surfaces to the magnet until the moment when the under side escapes from the influence of the magnetic pole, and the repulsive action commences. By this device, the point of total rest is practically avoided.

M. Trouvé adds that they proved this by constructing two Siemens armatures of the same diameter, one of which he modified in the above manner. He used them successively in an electric motor, and with the same pile he obtained a much greater working power from the modified form. More ample details may be found in "Comptes rendus des Séances de l'Academie des Sciences."