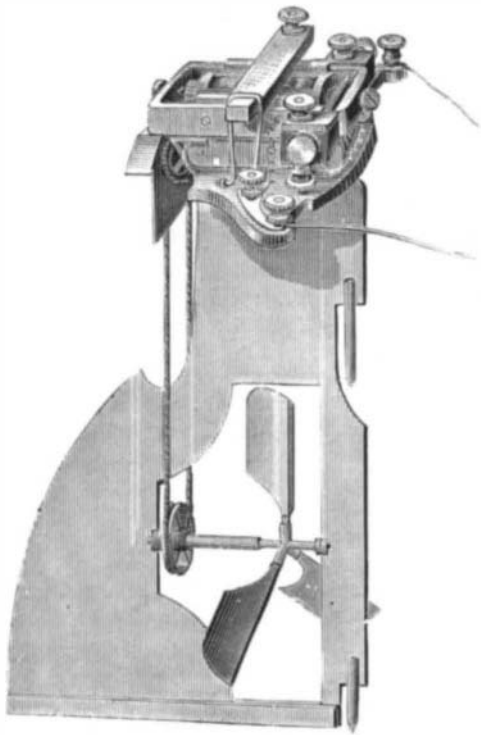


in the other circuit. In a delicate instrument of this kind the tension of the expansion wires should be only sufficient to keep the wires taut, as they are readily stretched when considerably heated.

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 move-

ment 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.

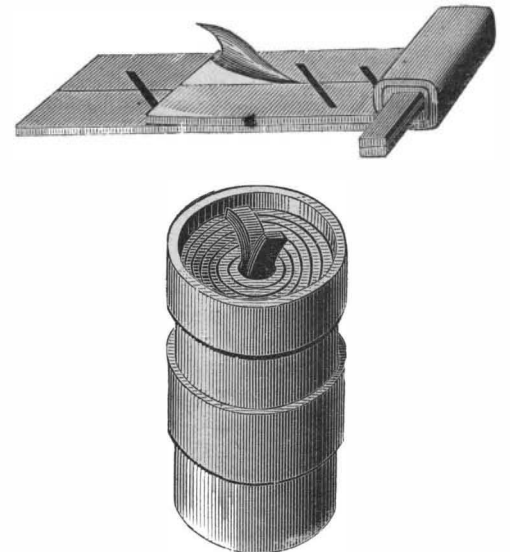
It is said that the largest flagstone ever cut was laid in Chicago before the great fire. It measured 16x25 feet and was 12 inches thick. Lately one 15x25 feet was cut at Waterville, Oneida County, N. Y., and \$5,000 have, it is said, been offered for it delivered in this city. The problem is to get 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,

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."

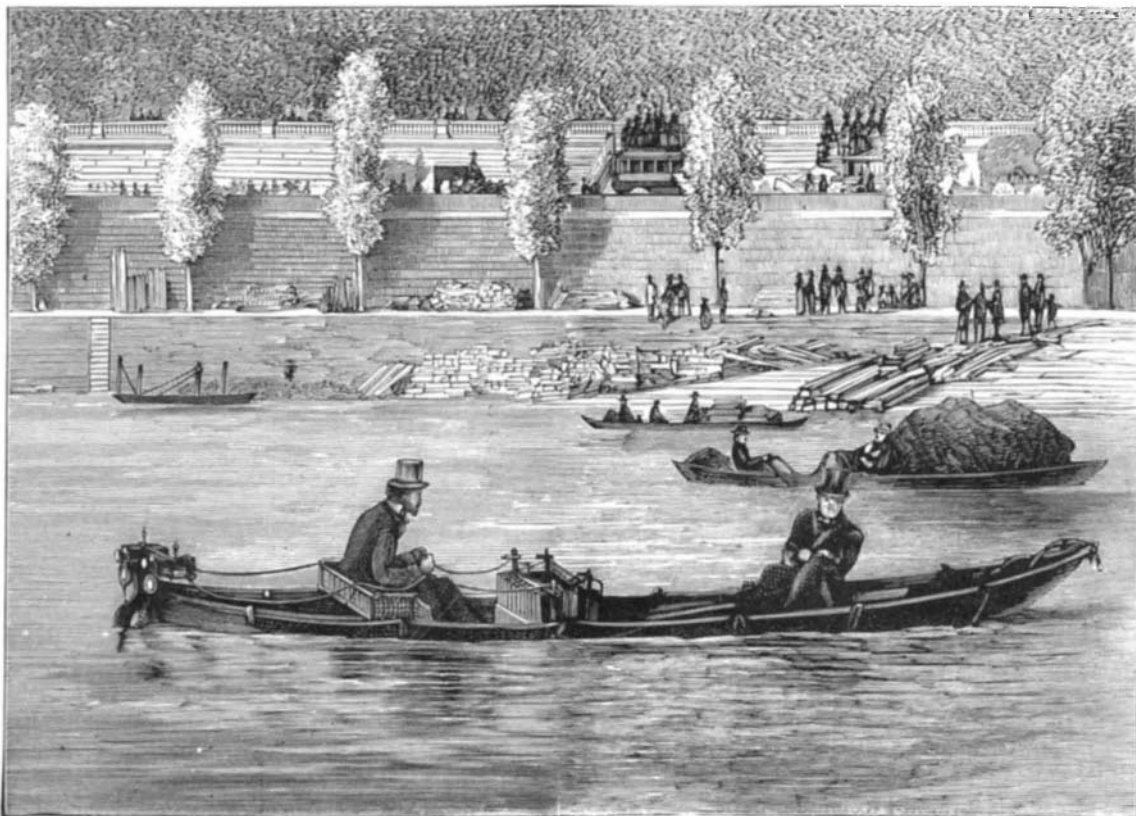


THE FAURE BATTERY.

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,



THE ELECTRIC BOAT

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.

* 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'Académie des Sciences."