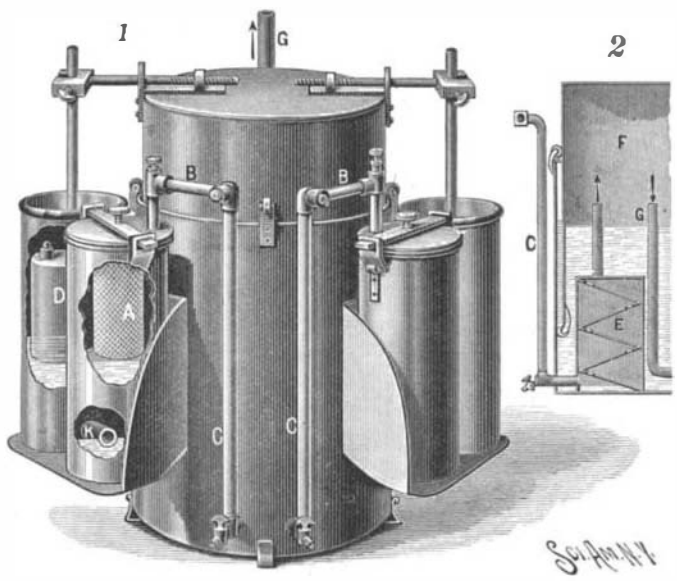
AN AUTOMATIC ACETYLENE-GENERATOR.

The apparatus which we illustrate herewith is an acetylene-generator of improved form, invented by Mr. Oliver D. Fry, of Altoona, Pa. Fig. 1 represents the apparatus in perspective. Fig. 2 is a section of the gasometer. Gas is produced in two generator-casings, *A*, containing water to decompose the carbide supported in a removable basket within the upper end of the casing. The removable lid of each generator-casing is held on a valved pipe, *B*, connected with a pipe, *C*, to conduct the gas to the gasometer, *F*. The pipe, *C*, as Fig. 2 shows, opens into a separator, *E*, submerged in the water of the gasometer tank and provided with a zig-zag partition, by which the gas is sufficiently retarded to condense any moisture. From the gasometer, *F*, a stand-pipe, *G*, conducts the gas to the service-pipes. On the top of the gasometer, bearings for horizontal screw-rods are secured, which rods are adjustably clamped to vertical rods, each carrying at its lower end a displacer, *D*, in the form of a vessel inclosed in an outer receptacle connected by a pipe, *K*, with the generator-casing, *A*. Normally, each carbide-basket is arranged with its lower end above the water in the generator-casing. But when the supply of gas is withdrawn from the gasometer, the bell, *F*, falls, carrying with it the displacers, *D*, thereby forcing the water in the generator-casings into contact with the carbide. As the bell rises again under the pressure of the fresh supply of gas, the displacers are raised out of the water, the level of which falls away from the carbide. The operation is entirely automatic.

By means of the screw-rods, the displacers can be adjusted up or down to regulate the supply of gas to the desired number of burners. The displacers can be filled with water to increase the weight on the bell, if it be so desired.



FRY'S ACETYLENE GENERATOR.

PARIS EXPOSITION—MODELS IN HUNGARIAN SECTION, ILLUSTRATING ENGINEERING WORK ON LOWER DANUBE.

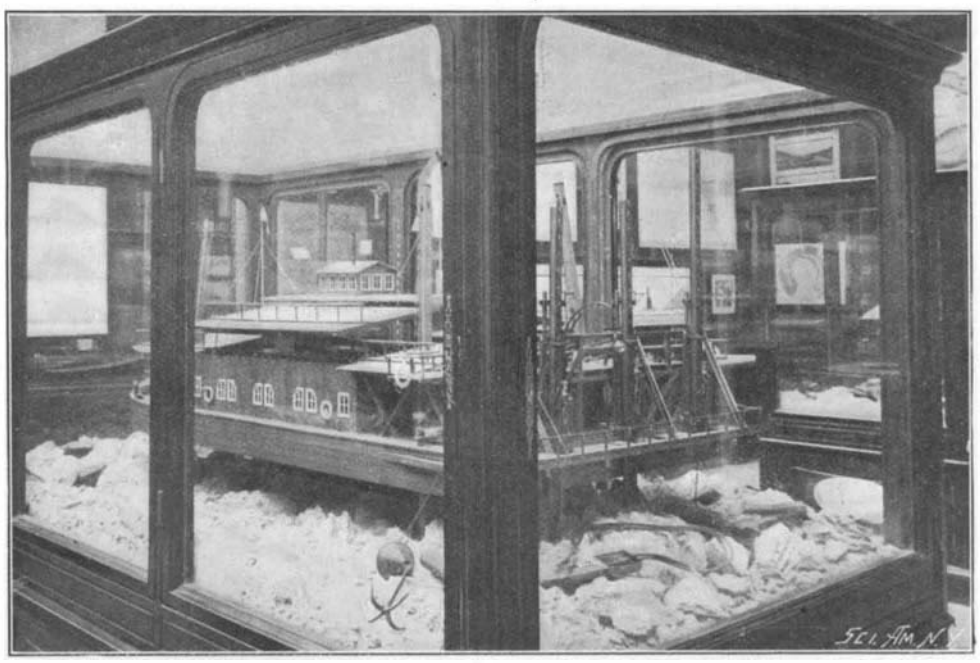
The Hungarian section of the Civil Engineering Palace contains a number of models and plans which illustrate a very important piece of engineering work, carried out by the Hungarian government; by this means, the lower portion of the Danube, in which navigation has been heretofore almost impossible, has been brought to the condition of a navigable river. The extent of this great work is shown by the numerous plans and views, and by the models of the various boats used, some of which are shown in the illustrations.

The Lower Danube, in spite of the size and importance of the countries through which it passes, has been heretofore scarcely navigable on account of the rocky obstructions which occur throughout a considerable portion of its length. The question has been considered ever since the time of the Romans, who tried to pass around the rocky bank called the Prigrada by constructing an auxiliary channel at the side; this work, which was commenced under the Emperor Trajan, was afterward abandoned for various reasons. Matters remained thus until the present century, when Count Stephen Szechenyi made some preliminary in this direction, but was not able to proceed with an undertaking of this magnitude. In 1871 it was the subject of the International Conference at London, which named a commission to carry out the project; this was interrupted by the Turco-Russian war and other conflicts. The Congress of Berlin, of 1878, took up the matter, and it was arranged that the Austro-Hungarian nation should execute the project; and by an agreement between Austria and Hungary, the latter took up the work. M. de Baross, the Hungarian Minister of Commerce, had an elaborate set of plans drawn up in 1889 by a technical staff, after which the work was carried out by a company of capitalists and engineers. It was begun in August, 1890, and finished in September, 1898.

The obstacles to navigation of the Lower Danube consist of a series of cataracts which succeed each other in great numbers and different forms. In some of these, rapids are formed by the shallow rocky bed, over which the current passes with great speed; in other cases the projecting rocky banks narrow the bed of the river and form rapids. The object of the work is thus to deepen the shallows and modify the too rapid current so that navigation will be practicable at all stages of water. In the first case, channels were dug in the rocky bottom of 180 feet average width and 6 feet below low water level, this depth being sufficient for boats of 1,000 tons. In the case of projecting banks, the rapidity of the current was diminished by the construction of stone dikes or jetties at high-water level, which distributed the fall of water over a longer section.

The cataract of Stenka is formed of granite rocks, which bar the Danube throughout its whole width of 4,800 feet, and also of rocky projections which emerge from great depths. To render this section navigable, a channel 5,400 feet long was dug in the middle of the bed, and from this were taken out more than 18,000 cubic yards of hard rock. The next rapids are those of Kozla-Dojke, extending over a length of 2½ miles, and are formed by two rocky banks which extend nearly across the bed of the river, here 2,400 to 2,700 feet wide. The two banks obstruct navigation at low water, and to overcome the difficulty a channel 10,500 feet long was dug, which clears both banks; for these, 60,000 cubic yards of rock were removed. The cataract of Izlas-Tachtalia has in one part a bed of rock running across the entire width of the river, which causes rapids of great violence; farther down are the sharp points of the rocky bed called the Tachtalia, then a group of projecting rock, the "Wlasch." Through these rocks has been pierced a channel near the Servian bank of the river, 10,500 feet long. The amount of rock taken out exceeds 32,500 cubic yards. From this cataract a succession of rock-banks continues to the Greben, a high rock which advances into the bed of the river and narrows it to 1,260 feet; below the Greben, the river suddenly enlarges to 6,600 feet, and the water pours into this basin with a speed so great that boats can pass only with the greatest effort. Here the great rock has been cut down to mean water level for a width of 450 feet, thus enlarging the river bed to 1,710 feet with a great diminution of the current, and to render the fall less abrupt a wall has been constructed from the Greben to Milanovac, or 3½ miles, keeping the width constant at 1,710 feet for this distance. From the Greben 330,000 cubic yards of rock have been cut, beside a channel 3,700 feet long, containing 13,500 cubic yards. For the walls over 500,000 cubic yards of rock have been used.

The most important of the cataracts is that called the "Iron Gates"; it is a chain of schistic rock, the Prigrada, which seems to unite the Carpathian and Balkan chains. It traverses the Danube and forms a veritable rocky dam, with broken points, over which the river falls with violent whirlpools. Here has been established a channel, running along one side of the river, and separated from the main bed by an outer wall; the channel is 5,160 feet long and 225 feet wide at bottom, and 9 feet below low water level. The work was executed on a dry bed, or in still water, by the aid of a provisory dam; a channel of the same depth was also dug as far as Orsova, a distance of 6 miles, also an embankment 5,400 feet long to guide the water into the channel. For the whole of the work at the "Iron Gates," 115,000 cubic yards of rock were removed under water and 370,000 cubic yards from dry bed. For the construction 280,000 cubic yards of rock were used and 270,000 of mixed filling material, not counting the revetment of the walls over a surface of 65,000 square yards.



MODEL OF DRILL BOAT, USED IN IMPROVING THE DANUBE.

MODEL OF SOUNDING BOAT, USED ON THE DANUBE.

The models shown in the illustrations give an idea of the different types of boats used in the execution of this great work. It was at first necessary to lay out an exact chart of the river bed, obtained by measurements, so as to calculate the mass of rock to be removed and the best method of operation. The readings were taken by a special boat constructed for the purpose. The rock was removed from the channels by blasting, using boats provided with Ingersoll drills for the mines, or by boats provided with rock-cutters of the Loboritz system. The broken rock was taken out by a large dredge of Scotch make, the "Vaskapu," besides smaller dredges, some of American make. The last operation was made by the "Universal Boat," which explored the bottom and at the same time served as rock-cutter and dredge.

The sounding boat, shown in the illustration, is composed of a platform about 60 feet long and 30 feet wide, mounted on two pontoons. It is provided with six pairs of longitudinal openings, spaced 3 feet apart, each pair of openings lying between two rails. The rails support two carriages which carry vertical graduated bars, these making the four angles of a square 3 feet on a side. The bars may be moved in a vertical direction by pulleys, and are made strong enough not