## 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 But when the supply of gas is withdrawn from the gasometer, the bell, *F*, falls, carrying with it the displacers, *D*, thereby forcing the water in the generator-casings into contact with the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.

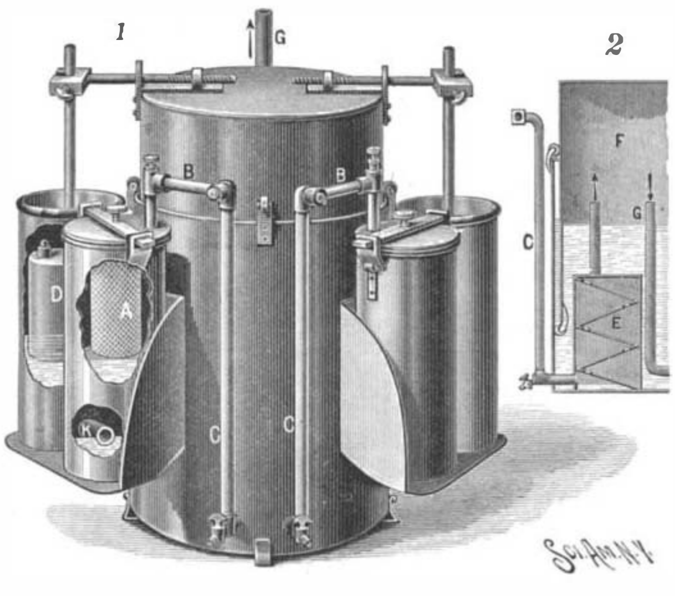
By means of the screw-rods, the displacers can be adjusted up or down to regulate the supply of gas to the desired number of burners. The displacers can be filled with water to increase the weight on the bell, if it be so desired.

## 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




FRY'S ACETYLENE GENERATOR.

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.

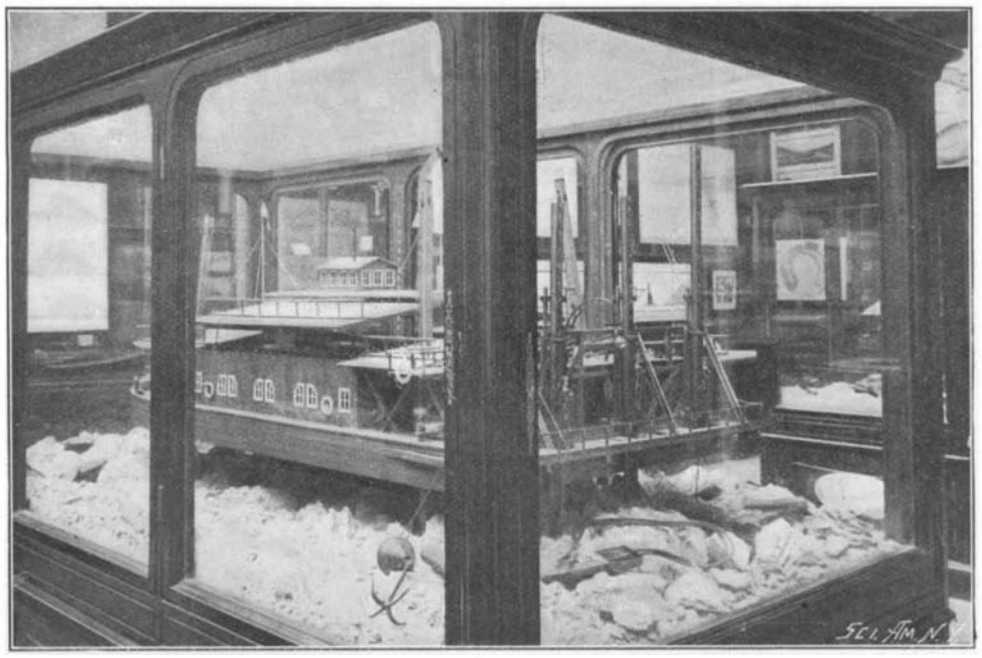
The cataract of Stenka is formed of granite rocks, which bar the Danube throughout its whole width of 4,800 feet, and also of rocky projections which emerge from great depths. To render this section navigable, a channel 5,400 feet long was dug in the middle of the bed, and from this were taken out more 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.

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



MODEL OF DRILL BOAT, USED IN IMPROVING THE DANUBE.

MODEL OF SOUNDING BOAT, USED ON THE DANUBE.

to be deviated by the rapid current. Upon the carriage is a vernier for each of the bars, placed at a determined height, 4·8 feet above the head of the rail. The boat being solidly fixed in the bed of the river by vertical posts, the rail-level is taken with reference to a given point on the bank, and then by the vernier readings of each of the vertical bars, the exact depth of the bottom is known, and the amount of rock to be removed is calculated. For each position of the carriage four points are thus obtained, and the boat has a capacity for fifty positions of the carriage. After the plans have been thus drawn up and the calculations made, the rock is removed by blasting or by vertical cutters.

The boat shown in the illustration is used to carry the drills for the mines; the holes are pierced in the rock from 1 to 2 yards deep. The boat is solidly fixed by four vertical supports, two in front and two in the rear. It is kept in place by steam or hydraulic pressure, the boat being lifted a little above the water level. This boat is made in two types. In the model shown at the Exposition the drills are placed in the rear in a single line, moving upon rails, and thus one line of holes perpendicular to the channel are pierced in one position of the boat. In another type, all the drills are placed upon a movable carriage which may be displaced at will. A section of the cartridge used for the blasting is shown in front of the boat. When the mines of one line of holes are charged, the vertical supports of the boat are lifted and the boat retires a certain distance. All the mines are exploded at once, and the boat then comes back to drill a second set of holes from 5 to 10 feet from the former. The rock is also removed by rock-cutting boats, which carry a heavy cutter in the form of an iron bar of square section, terminating in wedge-shaped form. The cutting edge is formed of a steel piece inserted in the middle. The bar is lifted to a certain height by a steam windlass and let fall to cut the rock. It is supported upon a derrick 40 feet high.

The Hungarian government has thus successfully accomplished the work entrusted to it, and has received expressions of satisfaction from all the sovereigns of Europe. The navigation of the Lower Danube, which before was carried on under great difficulties, has now been rendered easy, and boats may pass even at low water. As an example, before the work was carried out, the boats of the Lower Danube, loaded generally to a draught of 5½ feet, could not pass the "Iron Gates" during the season, March 1 to November 30, but for 91 days on an average. At present they are able to pass for 271 days, a gain of 180 days for navigation. This has naturally resulted in an enormous increase of traffic and a corresponding benefit to the surrounding countries.

### PILOT BOAT WRECKED BY A WHALE.

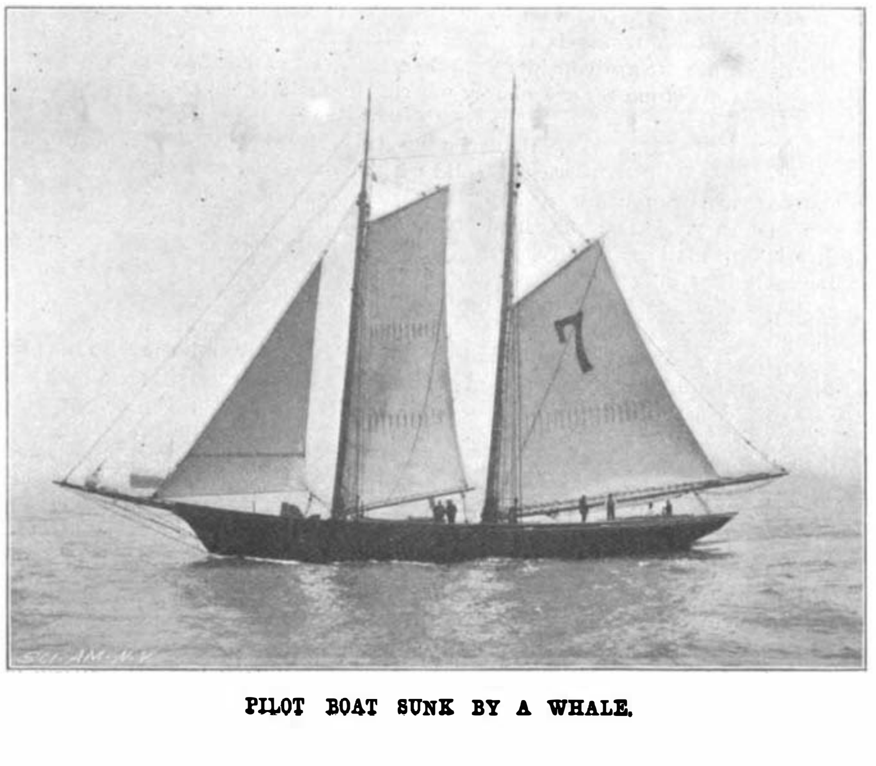
The wreck of the pilot boat "Bonita," on the night of July 20, off San Francisco Bay, was an incident, if not unparalleled in maritime annals, sufficiently rare to make it worthy of record.

The "Bonita" was one of the finest of her class, and since 1892 has been stationed off the Golden Gate, intercepting vessels bound for that difficult and fog-infected harbor.

On the night of the wreck the officers and crew, with the exception of the man at the wheel, were just at supper. The fog was so dense that objects a cable length away were invisible. Suddenly a shock of sufficient violence to knock the men off their seats was felt throughout the ship. Supposing that a collision had occurred, the crew rushed to the deck, but no other vessel was in sight. Sounding the pumps, it was discovered that the "Bonita" was sinking, and at the same time one of those enormous gray whales loomed up on the side of the craft and disclosed the cause of the accident. The "Bonita" remained afloat long enough to allow the crew time to secure their effects and launch their boats. They were subsequently picked up by incoming vessels. The wreck occurred about six miles southeast of the Farallones, and now lies in six fathoms depth of water. She may be raised, though the operation will be difficult on account of the strong currents at this point.

The California gray whale is the largest of the species, and is seen on the California coast from November until May. Its favorite haunt seems to be at the entrance of San Francisco Bay, where it is observed often in large numbers. One caught in this vicinity forty years ago measured 97 feet in length. Their weight is prodigious. Their scientific designation is sibbaldius sulfureus.

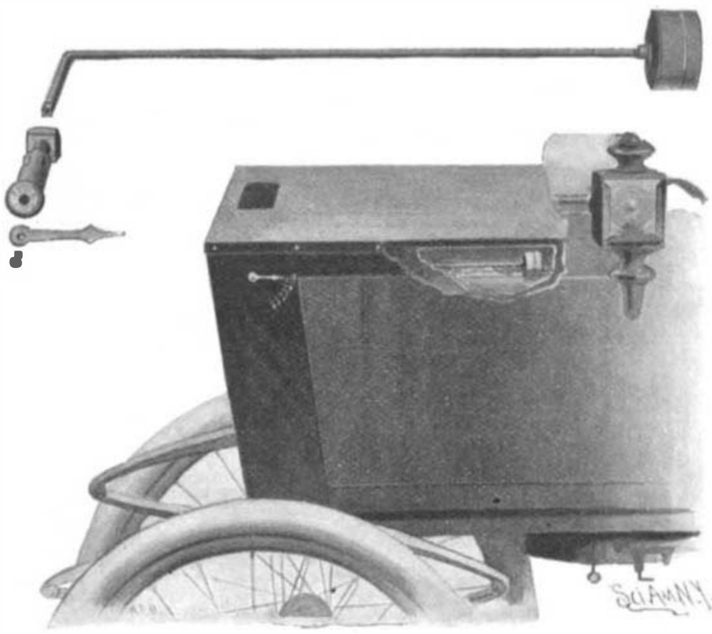
The "Bonita" was built in 1892 and was of 75 tons register. Her dimensions were 88 feet over all, 23 feet breadth and 9·8 depth. Her crew numbered five. Four pilots were aboard when the wreck occurred.



PILOT BOAT SUNK BY A WHALE.

### A SIMPLE INDICATOR FOR LOCOMOBILE WATER-TANKS.

Steam-carriages are unprovided with any means for readily ascertaining the level of the water in the supply tank. The ordinary method of roughly gaging the water by thrusting a stick in the tank has its disadvantages, chief among which may be mentioned the necessity of first removing the hot tank-cover with a cloth. For obviating this difficulty, a member of the SCIENTIFIC AMERICAN staff, who has for some time driven a locomobile, has devised a very simple expedient which has proven remarkably efficient. The accounts of automobile improvements which we have published in past numbers have met with sufficient approval to justify the publication of a brief description of this simple indicator.



A SIMPLE WATER-INDICATOR FOR LOCOMOBILES.

To the longer leg of a brass rod, bent at right angles, a brass float is secured which rises and falls with the water in the tank. The short leg of the rod passes through a brass sleeve which bridges the space between the carriage body and the tank, and which is held in place by a nut screwing upon the threaded end of the sleeve. The short leg of the rod projects from the sleeve, and its squared outer end receives a finger or pointer which plays over a scale graduated in gallons. As the float falls in the tank, the pointer is turned a corresponding distance and indicates on the scale the number of gallons of water still left in the tank.

The indicator can be made even by a man of no great mechanical skill. The float pictured consists merely of an ordinary brass box, 1¾ inches in diameter at the ends and 1¼ inches high, the cover being soldered to the body to form an air-tight joint. The brass rod is likewise soldered to the box. It will be observed that all the parts, including the sleeve, are made of brass to resist the action of the water. The pointer is made preferably removable, so that it can be detached whenever it is found that the float is not absolutely air-tight.

### Krupp Iron Works.

The annual report of the Chamber of Commerce for the district of Essen contains statements concerning the cast-steel works of Frederick Krupp. These comprise the following: Cast-steel Works, at Essen; Krupp Steel Works, formerly F. Asthöwer & Company, at Annen, in Westphalia; the Gruson Works, at Buckau, near Madgeburg; four blast furnaces at Duisburg, Neuweid, Engers, and Rheinhausen (this latter consists of three furnaces with a capacity for each of 230 tons per twenty-four hours); a foundry at Sayn; four coal mines (Hanover, Saelzer, Neuack and Hannibal), with interest in other coal mines; more than 500 iron mines near Bilbao, in northern Spain; shooting grounds at Meppen, with a length of 10⅝ miles and a possibility of extension for 15 miles; three ocean steamers, several stone quarries, clay and sand pits, etc. In addition, the firm of Frederick Krupp operates the Ship and Machine Stock Company Germania, at Berlin and Kiel, under contract, says Consul General Guenther.

The most important articles of manufacture of the cast steel works at Essen are cannons (up to the end of 1899, 38,478 had been sold), projectiles, percussion caps, ammunition, etc.; gun barrels; armor plates and armor sheets for all protected parts of men-of-war, as also for fortifications; railroad material, material for shipbuilders, parts of machinery of all kinds, steel and iron plates, rollers, steel for tools and other purposes. The steel works in 1899 operated about 1,700 furnaces, forge fires, etc., about 4,000 tool and work machines, 132 steam hammers of from 200 pounds to 5,000 metric tons force, more than 30 hydraulic presses (among them 2 of 5,000 tons each, 1 of 2,000 tons, and 1 of 1,200 tons pressure), 316 stationary steam boilers, 497 steam engines with an aggregate of 41,213 horse power, 558 cranes of from 400 to 150,000 tons lifting power. During the last year, the iron mines yielded an aggregate of 1,877 tons of ore per day. The coal production from the mines belonging to the Krupp Company (excepting the Hannibal) amounted, on an average, to about 3,738 tons for each working-day.

The consumption of coal and coke in 1899 was as follows: In the cast-steel works at Essen, 952,365 tons; in the other works and on the steamers of the company 622,118 tons; in all, in round numbers, 5,000 tons per day. The consumption of water at the cast-steel works in 1899 was 15,018,156 cubic meters, which equals about the consumption of the city of Frankfort, with 229,279 inhabitants. The consumption of gas in the steel works at Essen was 18,836,050 cubic meters in 1899.

The electrical power plant of the works at Essen has three machine houses, with six distributing stations, and supplies 877 arc lights, 6,724 incandescent lamps and 179 electric motors.

For the traffic of the works, railroad tracks of standard gage of about 36 miles are laid, which connect with the tracks of the main railroad station at Essen. Sixteen locomotives and 707 cars are operated on the grounds. In addition, there are narrow-gage tracks of 28 miles, with 26 locomotives and 1,209 cars.

The telegraph system of the steel works has 31 stations, with 58 Morse telegraphic instruments and 50 miles circuit. The telephone system has 328 stations, with 335 telephones and a circuit of 200 miles.

On April 1, 1900, the total number of persons employed in the different works was 46,679, viz., 27,462 at Essen, 3,475 at the Gruson Works of Buckau, 3,450 at the Germania Works at Berlin and Kiel, 6,164 in the coal mines, and 6,128 at the blast furnaces and on the testing-grounds, at Meppen, etc.

### From Europe to America Overland.

Reuter's Agency is informed that Mr. Harry de Windt is leaving for the purpose of crossing Siberia to the Behring Straits, and thence over the straits and via the Mackenzie River to Winnipeg and New York. Mr. de Windt attempted a land journey from New York to Paris in 1896, but was captured and imprisoned by the Tchukehis near East Cape with such results to his health that the project had to be abandoned. This time he will make the journey in the reverse direction. Proceeding from Paris, he will leave Moscow on August 12, and will travel by the Trans-Siberian Railway to Irkutsk. Thence he will go to Yakutsk to make final preparations for his journey, which will occupy about 18 months. The explorer will carefully avoid the natives of Oumvadjek, on the Behring Strait coast of Siberia, who gave him so much trouble on the last occasion, and will proceed direct to the small settlement of East Cape, which is much to the southward of his previous route. There he will remain for four months, when he will be called for by an American whaler and will be conveyed across the straits to the Mackenzie River. Mr. de Windt will be accompanied by his servant, Harding, who has been his sole companion on most of his previous expeditions.