

wire cable twenty feet long. We give a rough sketch of the contest; the electric locomotive is at the right, the steam locomotive at the left.

The Columbus caravels have been officially turned over to the United States government by representatives of Spain and have been formally accepted. They have been towed into the South Canal beyond the reach of possible damage by the waves of Lake Michigan and will remain there until the Exposition closes. The Spanish sailors who have been in charge have re-

wants of fine tool makers, model makers, electricians and watch tool makers. An illustrated catalogue, which will be sent on application, shows the lathe with its different attachments and a variety of samples of the work done therewith. The office of the company is at No. 474 Washington Street, Boston.

A GAS ENGINE EXHIBIT AT THE FAIR.

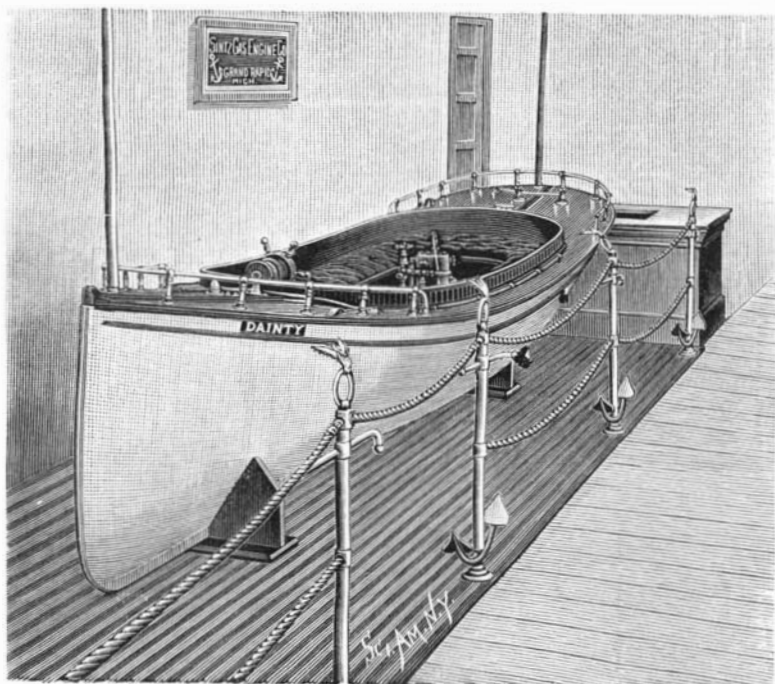
The exhibit at the World's Columbian Exposition of the Sintz Gas Engine Company, of Grand Rapids, Mich., comprising a small boat with a special adaptation therefor of their well known gas and gasoline engines, attracts not a little attention. Their marine engine, shown in a separate view, is the same as the stationary engine made by the firm, except that it has but one small flywheel and has a different base, to suit the foundation in boat. It also has an attachment for changing speed of engine while running. The propeller wheel is of a new design, and in smaller sizes has only two blades. The blades are reversible, and the wheel can be made a right or left hand screw while the boat is running, the pitch of the blades being regulated as desired. The engine makes its own gas from gasoline, as it is used, no boiler, coal, wood, or water being required, except the small amount of water in the jacket of the outside cylinder. The explosive charge is ignited from a small electric battery, obviating the possibility of accidental explosion of the gasoline, and it is said that the expense of running the engine does not exceed the cost of

is set in rotation after filling, or the latter operation may be performed while the table is actually in motion.

There is a modification of the apparatus, in which the rotating table, being smaller in diameter than that previously adopted, can be driven at a higher speed, up to 200 revolutions per minute. There are eight pivoted moulds, each divided by internal walls, so as to give nine small ingots, suitable for wire billets or thin sheets. By means of a central annular funnel, lined with refractory material, and provided with eight feeding spouts, or one for each group of moulds, the whole number of 72 ingots are cast by a single pouring from the ladle, which contains from four to six tons of steel.

Difficulties of Railway Development in China.

A curious example of the difficulties of railway construction in China is afforded by the conduct of the Tartar general of Moukden, the capital of Manchuria, in connection with the surveying work for the railway from Kirin, another large Manchurian town, to Newchwang, the seaport of the province. It was proposed to make a junction on this line for Moukden at a place called Lanpien, a short distance outside the city; but the general got a number of geomancers to investigate the effect of this selection upon Moukden. These sages reported that the vertebrae of the dragon which encircles the holy city of Moukden would be broken by driving the long nails of the railway sleepers into them, and accordingly the general vetoed the decision of the engineers, and directed them to carry the railway in a straight line from Kirin to Newchwang without approaching Moukden at all. This was, no doubt, much shorter; but the engineers objected that the country which the line would cross by this route was a low and marshy tract of land, liable to floods during the wet season, and also that it was sparsely populated, so that no traffic would be got. By the route which had been decided upon, the line, though longer, would pass through thickly populated country



THE WORLD'S COLUMBIAN EXPOSITION—THE SINTZ GAS ENGINE COMPANY'S EXHIBIT.

turned to Spain, and sailors from the United States navy are now on board.

FINE WATCH TOOLS AND MACHINERY.

The exhibit at the World's Fair of the Faneuil Watch Tool Co., illustrated herewith, occupies a space of 15 x 20 ft. in Machinery Hall annex, and is shown in two cases of ebony and plate glass which present a fine appearance. The principal feature of the exhibit is the No. 4 Rivett bench lathe, which has a swing of 8 in., length of bed 36 in. and a distance between the centers of 18 in. Four of these lathes are shown. This lathe is used by first-class tool makers and in building fine machinery, and the great feature of the lathe is the many valuable patent attachments. The lathe can be converted into a milling machine in a minute's time, and the quill and the headstock both take the same size chuck. The case contains fifty different shaped cutters—round, oval, and all kinds of irregular shapes made on this machine. The lathes are arranged in the case to show the different attachments in position for work. One shows the patent slide rest, the rigidity of the tool holder of which makes this tool so valuable, another lathe shows the turret attachment, a third the milling attachment, and a fourth the grinding attachment.

With this lathe is used the self-centering split chucks, a set of which comprises all the sizes from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. by 64ths. Two of the No. 3 lathes are shown, of which may be said all that has been said of the No. 4, except in regard to its capacity, which is smaller than the No. 4. Thirteen of the watchmaker's lathes are shown, each arranged to show some different attachment in position for work.

The Rivett lathes, as is well known, stand in the front rank of appliances for executing all kinds of fine, nice work, being especially adapted to satisfy the

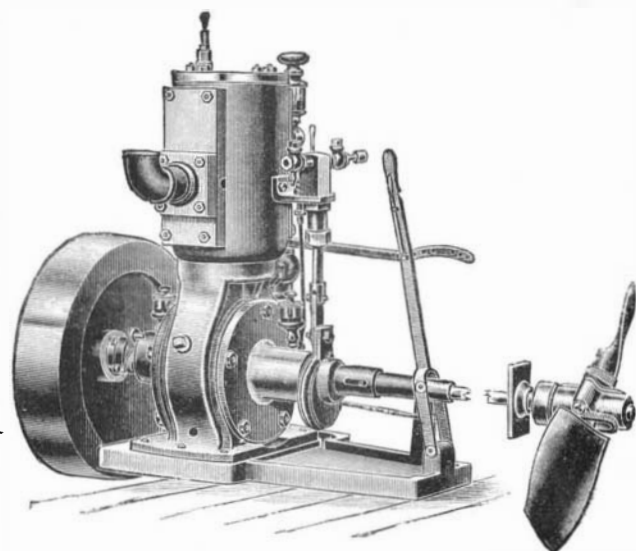
three-fourths of a pint of common gasoline per hour for each horse power. The engine has all the necessary appliances for working automatically, the governor regulating the charge of oil or gas, and thus controlling the speed.

Compression of Steel Ingots by Centrifugal Force.

At the Nykroppa Iron Works, in Sweden, a method of consolidating steel ingots, by subjecting the freshly filled mould to pressure developed by centrifugal action, has been introduced by the manager, Mr. L. Sebenius.

The apparatus consists of an upright shaft in the center of a cylindrical casting pit, carrying a frame of four arms, to each of which is articulated a platform supporting four ingot moulds. While the shaft is at rest the moulds are upright, and are filled in the usual way; but when it is set in rapid rotation they fly up into the horizontal position, and a pressure in the direction of the length of the ingot is developed equal to thirty times that due to the column of liquid metal in the mould, which drives the gases out, and produces a perfect solid casting. Uniformity of composition is also induced, as, on account of the rapid cooling, liquation is prevented. The process, which has now been in use about two years, has been applied to both the Bessemer converter and to the open-hearth furnace. The ingots are free from external defects, and the loss by defective ends has been diminished 40 per cent, the metal being so compact as to bear rolling to finished sizes without the use of the cogging mill. The cost of the apparatus is about \$400 for a three-ton charge and \$800 for a ten-ton charge.

The circumference described by the bottom of the moulds, when spun up into the horizontal position, is about 67 feet, corresponding to the working speed adopted of 125 revolutions, to a velocity of nearly 10,000 feet per minute. The pressure on the mould, taken at thirty times the pressure on the ingots, will be about 150 feet of iron, or from 500 pounds to 600 pounds per square inch. In the form of the apparatus intended for smaller ingots, the moulds are arranged in an inclined position, and radially to a central fixed vertical feeding tube up on a turntable, which

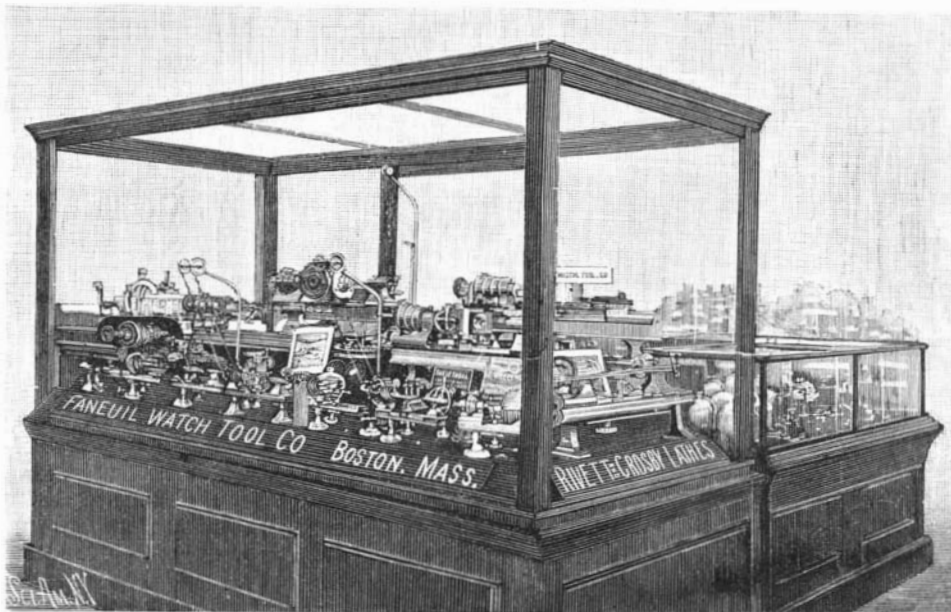


THE SINTZ MARINE ENGINE.

and on high and level ground. The engineers reported the matter to Li Hung Chang, who wrote commending the Tartar general for his anxiety for the geomantic influences of the ancestral home of the reigning dynasty, but adding, as his candid opinion, that these influences would be improved by the junction rather than otherwise. However, the viceroy said, as the general had vetoed the decision of the engineers, the matter must be laid before the Emperor and the works stopped until his Majesty's decision was known. This seriously alarmed the general, who promptly wrote asking that the works should go on, and in the meantime he would think about it. A place a few hundred yards from the former site was chosen, and the geomancers declared that this would not affect the dragon's pulse, whereupon the general wrote to the viceroy that he was now satisfied, and that he trusted no report would be made to the Emperor of the delay.

Origin of Atmospheric Oxygen.

Dr. T. L. Phipson, who has devoted a considerable amount of attention to problems concerning the constitution of the atmosphere, is led to the conclusion that the original atmosphere of the globe consisted of nitrogen alone, and that the oxygen now present is the product of vegetable life. In a paper in the *Chemical News* he states that minute microscopic plants (*Proto-coccus pluvialis* and *P. palustris*) can be easily transformed into manufacturers of oxygen gas. As the result of experiments, some of which we recently referred to (see *ante*, p. 83), he concludes that plants absorb carbonic acid by the roots and secrete oxygen by the leaves, from which it is subsequently given off. Into the primitive atmosphere of nitrogen, the early vegetation would thus pour oxygen during countless years until its composition became practically what it now is.



THE WORLD'S COLUMBIAN EXPOSITION—EXHIBIT OF THE FANEUIL WATCH TOOL CO.