THE GASOLINE MOTOR IN SHALLOW-DRAFT VESSELS.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

An interesting experiment in the application of the gasoline motor in regard to marine propulsion is being carried out by the Sir John I. Thornycroft Company, of London. This firm has just completed the construction of two shallow-draft vessels for freight service upon the waterways of southern Nigeria. Hitherto the propulsion in such craft has been by the ordinary type of reciprocating marine steam engines, modified and adapted to fulfill the exigencies of this class of vessel.

The Thornycroft Company are employing two distinct types of propulsion in these two vessels, though the motive power will be identical. The dimensions are practically the same in each case. In one boat screw propellers of the ordinary type are employed, while in the second vessel a stern paddlewheel is to be adopted, driven from the engine through clutch and chain gearing. By this means comparative data are to be obtained concerning the two systems of propulsion, so that the most advantageous method for this class of vessel, so far as regards internal-combustion engines, may be ascertained.

The first of the two craft, the "Spider," in which the ordinary type of twin screws in a tunnel is employed, has passed through its trial trips with complete success. The vessels have been largely designed and built to the order of Sir Edward Reed, formerly chief naval constructor to the British government, and many distinctive features have been incorporated. The craft is constructed of galvanized steel, and measures 56 feet 3 inches in length over all, by 9 feet beam, and with a load of four tons has a draft of 12 inches. The hull, which is open, with a short deck over the fore peak, is divided by bulkheads into six watertight compartments. The stern is perfectly square, and to provide a level deck the bottom is floored with ¾-inch pitch pine. Above the vessel, almost throughout its full length, extends a light wooden awning the full width of the boat, of ½-inch pine, covered with asbestos, to shelter the crew from the heat of the tropical sun, while side protection is afforded by green canvas curtains.

The engine, which is placed almost amidships, and is of the ordinary Thornycroft, four-cylinder, vertical, marine type, is capable of running on either gasoline or kerosene though normally intended to operate with the latter type of fuel. The engine is fixed to a baseplate secured to the steel framework of the hull. In order to minimize vibration and to deaden noise, a piece of hardwood packing is interleaved between the baseplate and the steel framework. The cylinders have a bore of 6 inches with a stroke of 8 inches, and the engine is fitted with mechanically-operated inlet and exhaust valves placed on opposite sides. The Simms-Bosch, low-tension magneto ignition system is used, though the ordinary high-tension method with accumulators and coil can be employed in case of emergency. The engine is governed by a ball governor, operating upon the throttle and thereby regulating the quantity of the gaseous mixture for the cylinders, the fuel supply being under a pressure of 4 pounds, maintained by a small air pump, which is operated from an eccentric keyed onto the governor spindle.

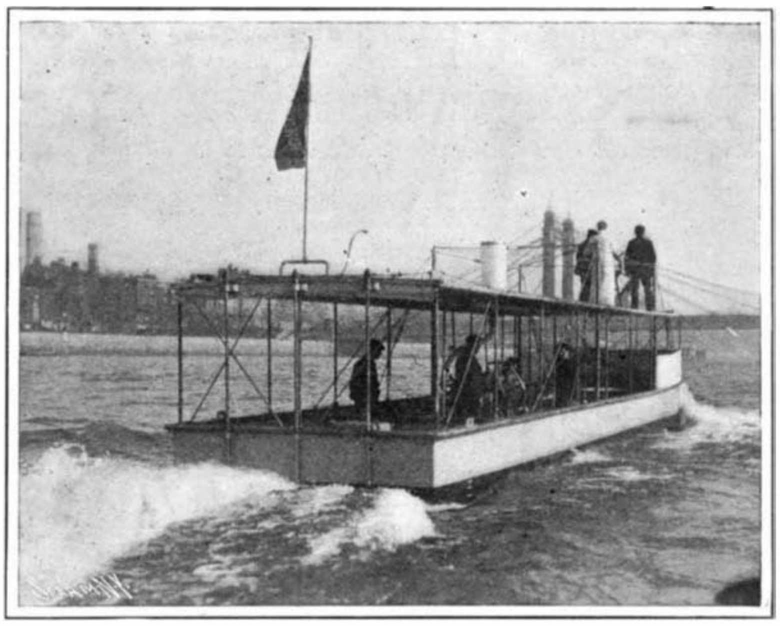
Attached to the bulwarks on either side of the engine compartment are carried two fuel tanks, each having a capacity of 40 gallons. As two classes of fuel can be utilized they can be carried in the respective tanks. If gasoline is being used, the supply is carried to the ordinary type of vaporizer; but in connection with the heavier kerosene a special vaporizer is employed. This comprises a metal box, into which the exhaust gases from the engine are carried, and in this box is a U-shaped tube, through which the kerosene passes and is gasified by the heat from the exhaust gases. The vapor then passes into the engine cylinders. There is a series of cocks, which enables the engineer to switch off from one class of fuel to the other as desired. All the levers controlling the various mechanisms are conveniently placed in front of the engineer, who has thus complete control over the engine from one position. In starting, the motor is run on half compression.

The screws are placed in a tunnel and fixed on one shaft, in accordance with the Thornycroft practice in vessels of this type. The power is transmitted from the engine to the propeller shaft through a friction clutch. A peculiar feature of the vessel is the position of the steering wheel, which is carried on the awning deck in front, being connected by flexible cables to the three, single-plate, balanced rudders, which appreciably facilitate steering on such a light draft.

The "Spider" on the official trials developed a mean speed of 8 knots per hour, which is 2 knots in excess of the contract speed—a highly satisfactory result. Gasoline fuel was used; though with the heavier fuel the decrease in speed was only one knot. The motor running at a normal speed of 800 revolutions per minute with kerosene fuel developed approximately 48 horse-power; but with gasoline at the same number of revolutions, 52 horse-power is developed. The contract, however, is for a low number of revolutions—approximately 380 revolutions per minute, at which speed about 25 horse-power is developed.

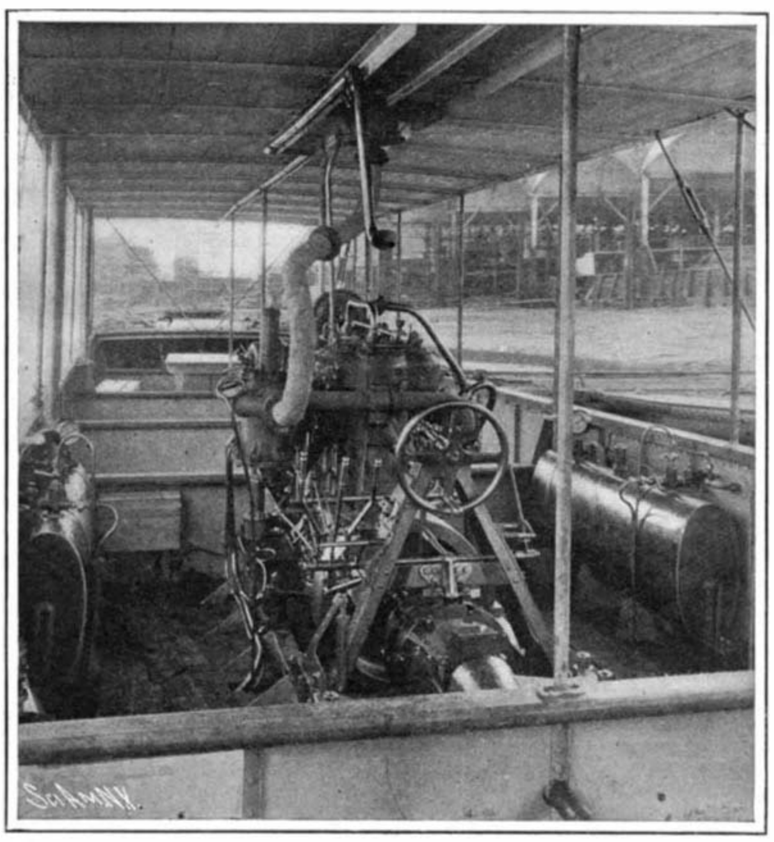
The economy effected in weight by the employment of an internal-combustion engine as compared with the ordinary marine steam engine is more than fifty per cent, since a steam engine developing 50 horse-power at 400 revolutions per minute, complete with condenser and locomotive type of boiler, would weigh 2.85 tons, whereas the four-cylinder motor in the "Spider," complete with the reversing gear, and developing at its normal speed 52 horse-power, weighs only 1.25 tons. A great saving in space in connection with the machinery is also obtained, thereby rendering available greater area for the stowage of freight.

In the case of the stern-wheel vessel, the disposition of the machinery will be different. A special platform is to be provided at the stern of the boat, upon which the four-cylinder motor is to be set transversely, thereby bringing the driving sprocket on the engine gearing in alignment with the sprocket on the paddle-wheel, the transmission being effected through chains. By this arrangement the whole of the deck of the boat will be left clear and open, thereby affording a greater area for freight. This latter vessel will be 6 feet 9 inches longer than the "Spider"; but in every other respect it will be identical. These two boats will be running side by side, and thus some interesting data concerning the respective merits of screw and stern-wheel propulsion for vessels of light draft in connection with the gasoline motor will be obtained.



The "Spider," a Shallow-Draft Vessel Propelled by a Gasoline Motor.

Note the broad square stern and triple rudders.



The 4-Cylinder Motor of the "Spider" Developing 52 Horse-Power.

Showing control levers, the fuel tanks for gasoline and kerosene respectively on bulwarks at side and the small air pump on the engine driven by the governor spindle for maintaining pressure in the fuel tanks.

AN INTERESTING APPLICATION OF THE GASOLINE MOTOR TO SHALLOW-DRAFT VESSELS.

The Recovery of Tin from Tin-Plate.

By far the largest proportion of the tin used in the arts is employed for making tin-plates, and these, in turn, are mainly used for making the tins in which various comestibles are preserved. The total weight of the tin on the plating is said to average five per cent of the total weight of the sheet; and there has been in the past great difficulty in recovering this tin by a commercially profitable process, in spite of the high price of the metal. That contained in the solder used in making the joints of the tin can be, and is, recovered by simply heating the tins sufficiently hot to cause the solder to flow; but this process is useless as a means of recovering the rest of the metal. According to the Electrotechnische Zeitschrift, however, this feat is now being successfully accomplished at Copenhagen by the Bergsoe process. In this a solution of stannic chloride is passed over the tinned surface, when it takes up further tin forming the stannous salt. The latter is then electrolyzed, the additional tin dissolved is deposited, and stannic chloride reformed. The tins can, it is stated, be treated without requiring a preliminary cleansing. A hole is punched in the bottom of each, and a number are then placed in a basket, in which they remain during the whole of the subsequent treatment. When filled, the baskets are placed in a series of tanks, through which flows a two per cent solution of stannic chloride. As this solution flows from tank to tank it gradually becomes richer and richer in tin by forming the stannous salt of the metal, as explained above. From the last tank of the series it is raised into the electrolytic vats by a pump constructed entirely of brass, so as to be unacted on by the fluid passed through. Here the stannous chloride is again reduced to stannic chloride, which is returned to the dissolving vats, whence it picks up more tin, to be again regenerated by electrolysis. The process is therefore a cyclical one. The tin is deposited in small crystals measuring about 1/50 inch long. Being perfectly pure, it is salable at the same price as Banca. The energy expended in the electrolysis is said to be 47 kilowatt-hours per ton of the metal recovered. Though, as stated, the process is a cyclical one, the same solution cannot be used for more than three or four rounds of the vats, since it becomes charged with chloride of iron.

Enormous Growth of the Portland Cement Industry.

The production of Portland cement in this country has increased in thirty-five years from 3,000 barrels a year to 4,000,000 barrels last year, and this with the prospect of an increase during next year of twenty per cent. Without being in the hands of a trust, the prices have increased in the past eighteen months from fifteen to twenty per cent from legitimate demand.

This enormous output for 1906 would be sufficient to build a first-class cement sidewalk five feet wide three and six-tenths times around the world, or build a sidewalk 456 feet wide reaching from Chicago to New York.

The uses to which this material, mixed with sand or crushed stone, is put are almost unlimited. They range from the smallest culvert to the enormous concrete arches spanning our largest streams; from the humblest cottage made of concrete blocks to the finest skyscraper and office buildings built of reinforced concrete.

To the farmer alone, Portland cement concrete presents an enormous range of possibilities. With it he makes his fence posts, drain tile, culvert pipe, well curbing, feeding floors, watering troughs, stable floors, silos, granaries, stables, residences; in fact, he can almost make it take the place of everything heretofore made of wood.

There is said to be an increasing demand for dredgers in Egypt, on account of the drainage works contemplated by the Egyptian Public Works department. Machines suited for use on the small canals will be chiefly in request, and manufacturers of these are recommended to bring them forward. A steam water-weed cutter would also sell well.