

THE LARGEST FERRYBOAT IN THE WORLD.

BY H. E. WRIGHT.

The steamer "Solano," the largest ferryboat in the world, crosses the Straits of Carquinez, carrying the trains of the Southern Pacific between Port Costa, Contra Costa County, and Benicia, Solano County, California. She was built in 1879 and launched in November of the same year. Her construction resembles that of a huge scow, stiffened lengthwise by four wooden trusses, one under each of her four tracks. Her hull measures 64 feet 10 inches in beam and 116 feet 8 inches over the guards. She is a double-ender, with four balanced rudders at each end, controlled by hydraulic steering gear. The "Solano" is propelled by two simple walking-beam engines of low pressure. Each engine has a 60-inch cylinder with an 11-foot stroke, and its horsepower is 2,252. Each engine drives one wheel, and works independently of the other. The wheels are 30 feet in diameter, and each has twenty-four buckets.

The steamer has eight steel boilers, 24 feet 10 inches long and 84 inches in diameter, and carrying 40 pounds steam pressure. Six of these boilers are in use every day. Once in three weeks two are laid off, when the scale that has accumulated is removed with crude soda. Petroleum is used for fuel. Every twenty-four hours 3,200 gallons are consumed. The tanks hold 8,300 gallons. It takes 50 minutes to fire up.

The "Solano" has 424 feet of deck length and is 406 feet 7 inches on her keel. Her registered tonnage is 3,549 tons. Approximately, she has been handling 115,000 freight cars and 56,000 passenger cars a year. She is double-crewed, with seventeen men in each crew, and runs night and day, making from thirty-six to forty-six crossings in twenty-four hours.

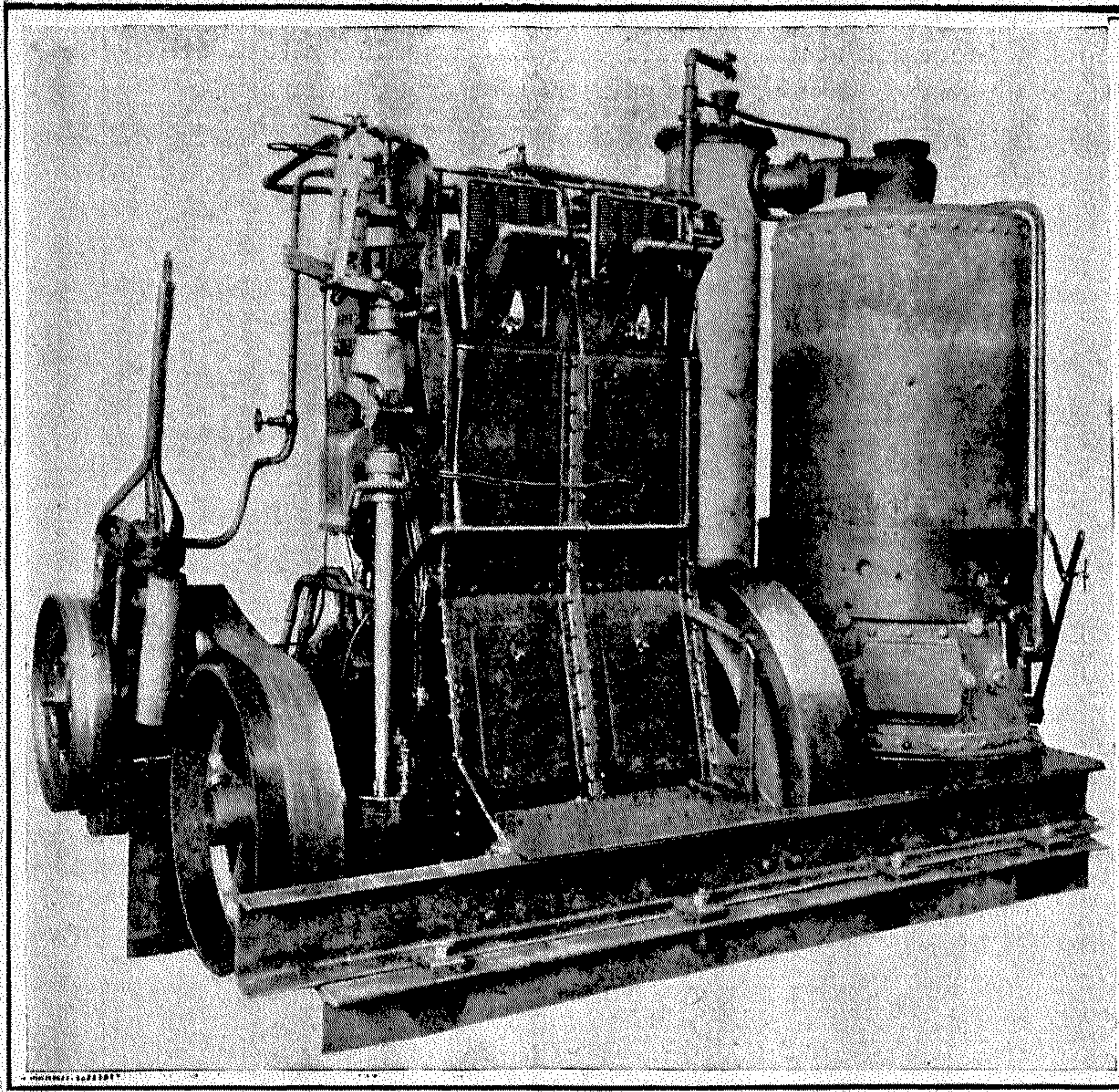
The length of her trip is one mile. The average time of transfer including time required to cut trains, place them on the boat, cross the straits, unload, and couple on the other side, is about eleven minutes. Road engines handle one cut on and off the boat; a switch engine handles the other cut. The boat draws, light, 6 feet 4 inches, but draws 10 feet 7 inches when loaded.

The hinged steel aprons, weighing 190 tons, over which the cars are transferred from the dock to the boat, are four-track spans, 100 feet long. These are controlled by air-tight pontoons and counter-weights which are handled by hydraulic power from pressure pumps located on the boat itself, connection being made by means of pipes and ordinary air-hose coupling.

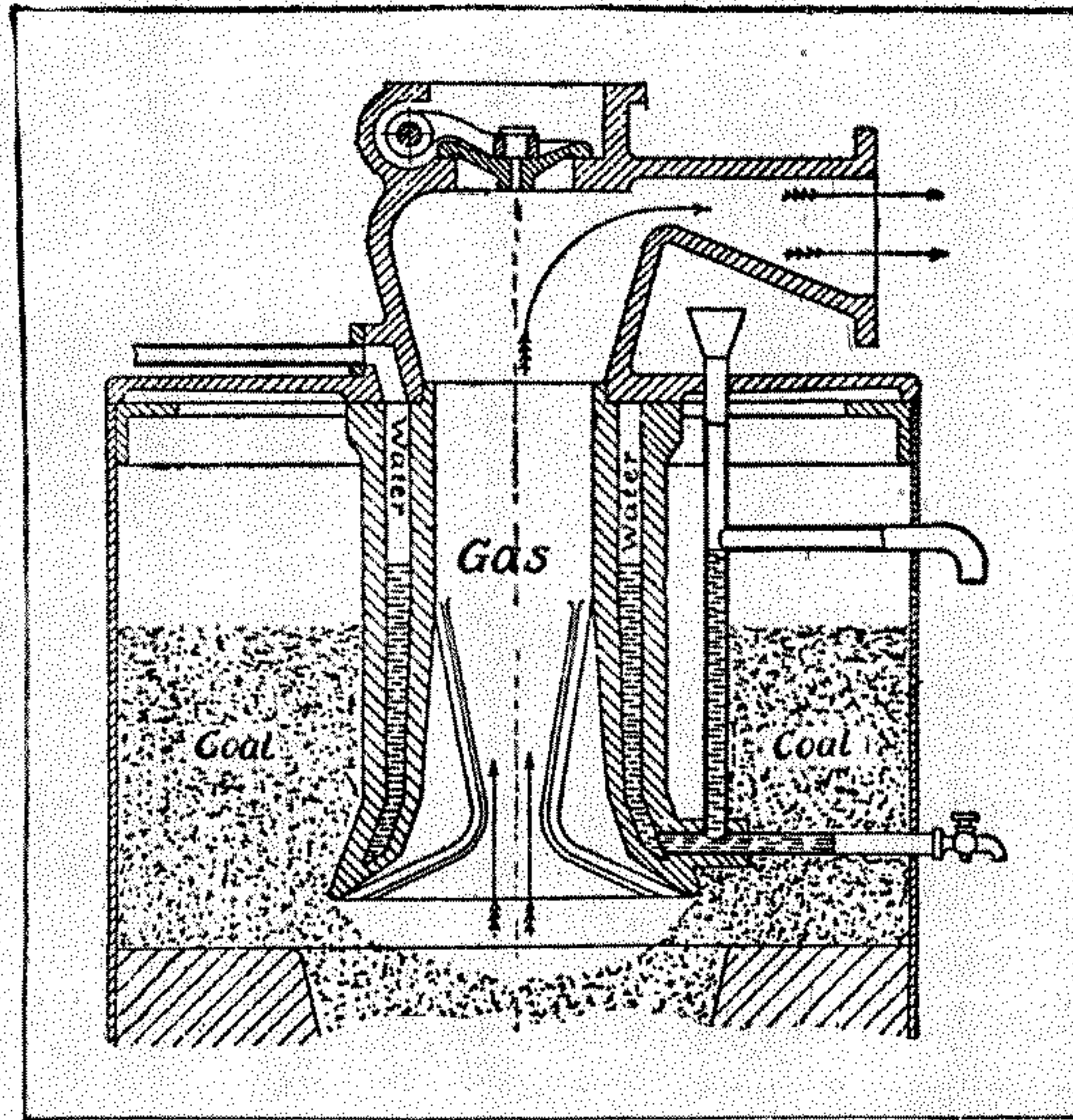
As the boat enters the slip, the counter-weights are raised by hydraulic power, leaving part of the apron unbalanced. This sinks the pontoon. The apron descends to the level of the deck, the end fits into a recess on the boat and is firmly latched down. The counter-weights are released, and the apron and the boat are free to rise and fall with the tide.

THE CAPITAINE MARINE PRODUCER-GAS ENGINE.

An interesting type of marine internal-combustion motor has been introduced upon the European market. The plant comprises the engine itself, together with a producer-gas installation providing the necessary fuel for the motor. The application of this type of engine is a new development in power craft; and though its utilization is to a certain degree limited, owing to restrictions in



Floor Space, $3\frac{1}{2}$ by $7\frac{1}{2}$ feet. Weight, $2\frac{3}{4}$ tons. Horse-Power, 30.
A COMPACT MARINE PRODUCER-GAS ENGINE.



Section of Top of Capitaine Gas-Generator.

space and weight, yet for purposes where weight is not an all-important problem, such as in tugs, barges, and large sailing vessels, it is admirably suited, owing to the low cost of maintenance. This latter fact is the

most salient feature of the Capitaine plant, herewith illustrated, it being possible to operate a 10-horse-power engine at a running cost of two cents per hour.

The plant primarily consists of a generator for the supply of the fuel, cooling and scrubbing apparatus, and the motor. It is due to the inclusion of the scrubber and cooler that the space requisite for the accommodation of the plant as well as the weight are somewhat increased, but their presence is absolutely essential to the satisfactory and efficient operation of the engine. In the first place, the gas supplied from the generator is of such a high temperature that it must be passed through the cooler to condense it sufficiently for complete and proper combustion in the engine. While at the same time, in order to prevent clogging of the latter, it must be submitted to the scrubber, to cleanse the explosive vapor from the particles of dirt and other foreign substances suspended therein.

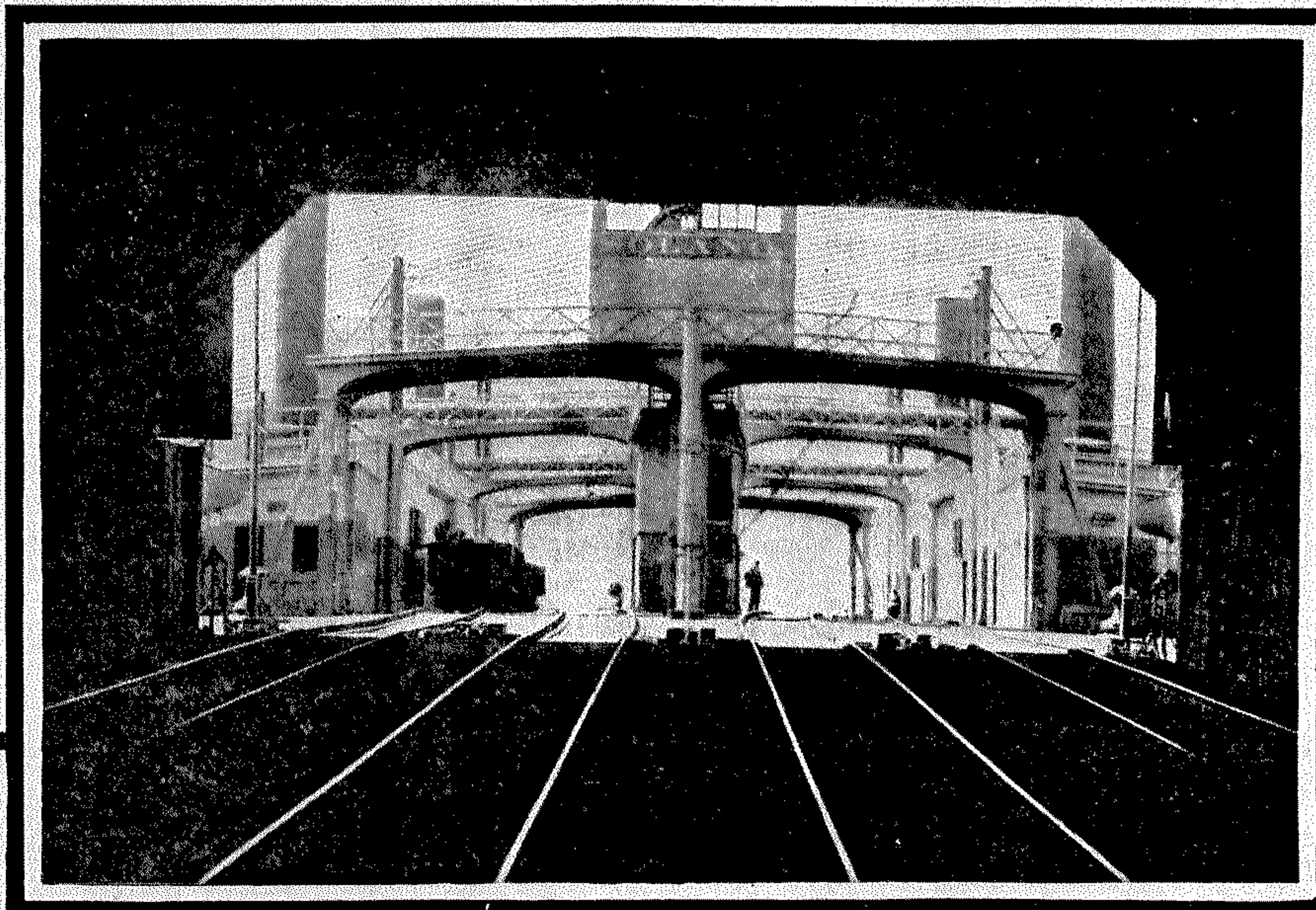
The plant shown in the accompanying illustration is one that is now being subjected to exhaustive experiments by Sir John Thornycroft & Co. It comprises a two-cylinder engine, developing 30 horsepower, and the gas generator, and is designed for installation upon a heavy type of commercial craft. The floor space oc-

cupied by the installation is 7 feet 6 inches in length by 3 feet 6 inches in width, while it weighs 2 tons 15 hundredweight. The cylinders are 8.27 inches diameter and the stroke is 11.02 inches. The normal speed of the engine is 200 revolutions per minute. The pressure of the compression is 175 pounds per square inch; the explosion pressure ranges from 400 pounds to 500 pounds per square inch; while the M. E. P. is about 100 pounds per square inch.

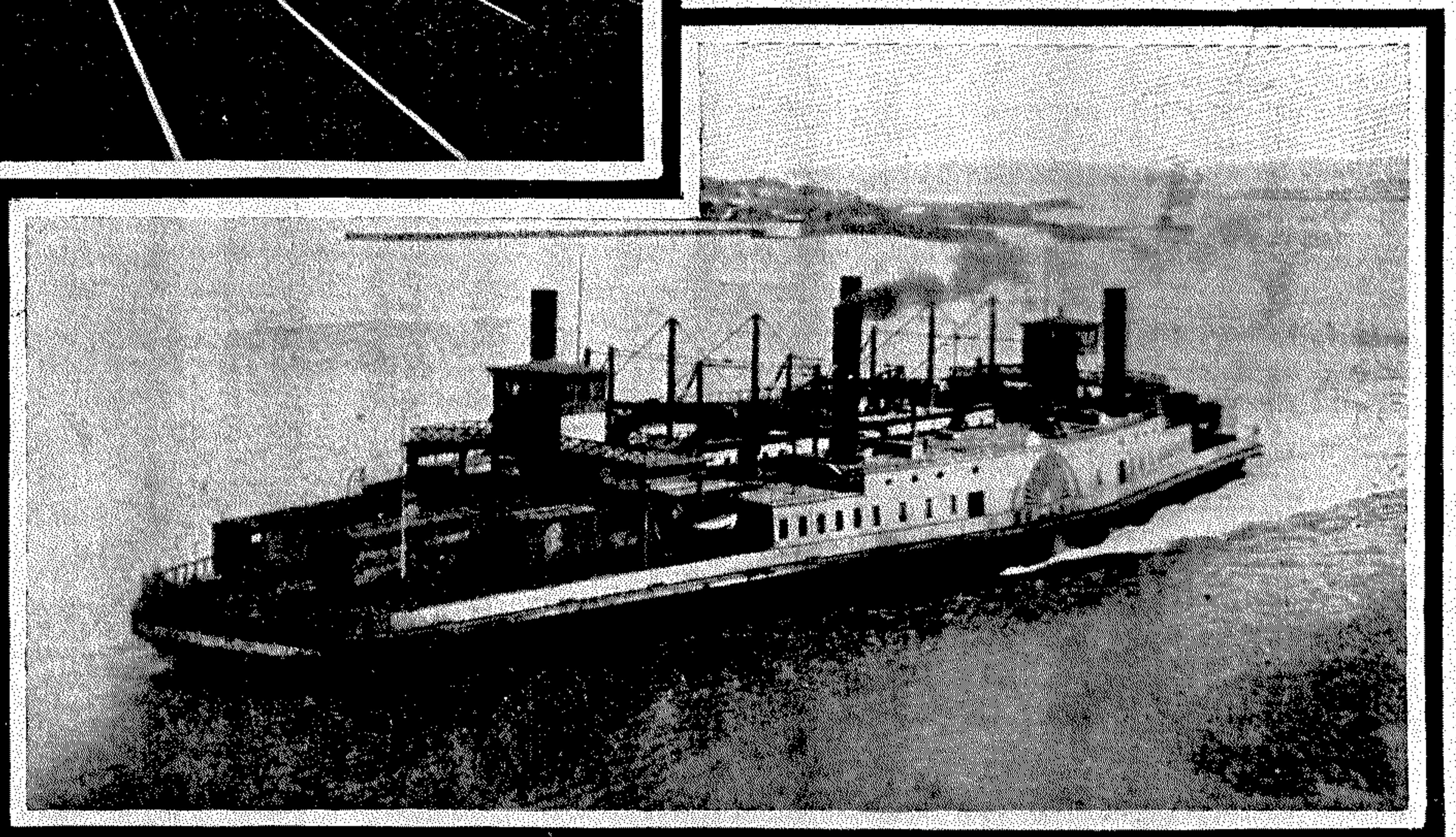
The gas-generating portion of the plant comprises a large drum, and consists of a shell lined with firebrick for a depth of about 4 feet. The space above this section contains a water reservoir. Small coal is placed in the generator from the top, and the coal space is entirely filled. The gas generated is a combination of producer and water gas, which are produced simultaneously. When the fire is started and the steam raised, the latter is directed through the blowpipe on to the grate at the same time as a current of air is injected. The grate is a dished plate somewhat larger in diameter than the brick-lined coal area, and is placed slightly below it, so that a ring of red-hot coal is formed round the edge of the plate and exposed to the jets of steam and air that are injected. The height of this plate can be regulated as desired by means of a rack and pinion actuated by a large lever working on a quadrant. The water reservoir is a conical bell-shaped casting, which is suspended from the cover and is sunk in the coal bed. The gases flow through the center, the water being so arranged as to surround the reservoir.

The grate is provided with two small doors, one on either side of the drum, through which the ashes are withdrawn. To the back of the generating tank are attached two cocks, one serving the functions of an overflow and the other a drain cock to the water receptacle. When the fire is first lighted, more air is required than can be admitted through the orifices provided for this purpose. When the motor is running, this increased supply is in-

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The "Solano" Entering Her Slip.



"Solano," Loaded, in Mid-Stream.

View Looking Along the Deck, Showing the Four Tracks.

A GREAT CALIFORNIA RAILWAY FERRYBOAT.