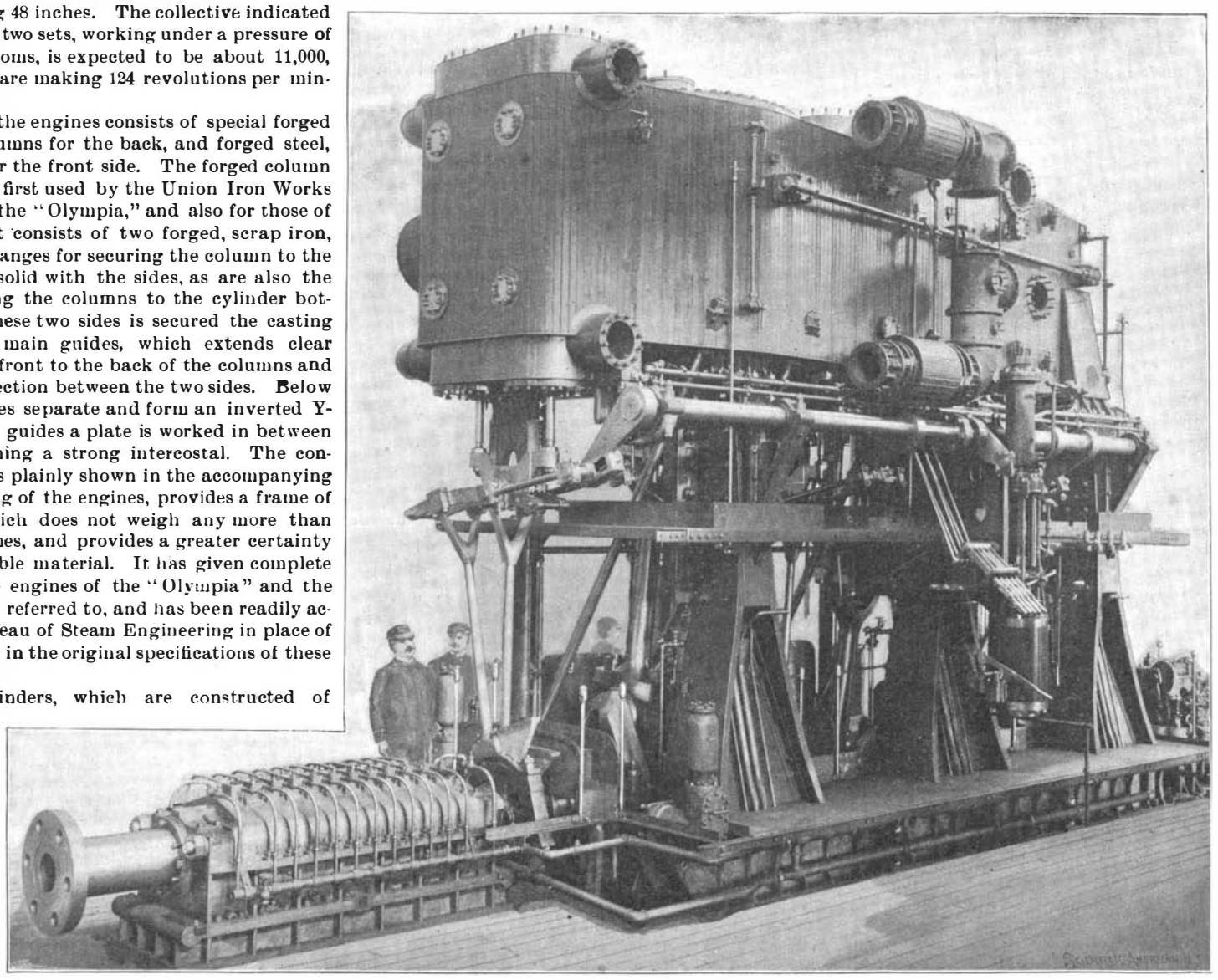
THE ENGINES OF THE FIRST-CLASS BATTLESHIP "WISCONSIN."

The battleship "Wisconsin" is being constructed under an Act passed in 1896, authorizing the building of three seagoing battleships, which are known as the "Alabama" class. The "Alabama," which was illustrated in the SCIENTIFIC AMERICAN of September 30, is being constructed by the Cramps, of Philadelphia, the "Illinois" by the Newport News Shipbuilding Company, of Newport News, Va., and the "Wisconsin" is being built at the yards of the Union Iron Works, San Francisco, Cal. It was the last named firm that constructed the "Oregon," whose remarkable trip of 14,000 miles around Cape Horn will be fresh in the memory of our readers. By the courtesy of Mr. G. W. Dickie, superintendent of the Union Iron Works, we are enabled to present the accompanying illustrations of the engines of the "Wisconsin" as they appeared when set up in the erecting shops of the Union Iron Works prior to their being installed in the engine room of the "Wisconsin. There are two sets of these engines, rights and lefts, placed in separate water-tight compartments, separated by a longitudinal bulkhead. They are of the vertical, inverted-cylinder, direct-acting, triple-expansion type. The high pressure cylinder is 33½ inches, the intermediate 51 inches, the low pressure cylinder 78 inches in diameter, the common stroke of all pistons being 48 inches. The collective indicated horse power of the two sets, working under a pressure of 1 inch in the firerooms, is expected to be about 11,000, when the engines are making 124 revolutions per minute.

The framing of the engines consists of special forged and bolted-up columns for the back, and forged steel, turned columns for the front side. The forged column is similar to that first used by the Union Iron Works for the engines of the "Olympia," and also for those of the "Oregon." It consists of two forged, scrap iron, plate sides, with flanges for securing the column to the bed-plate forged solid with the sides, as are also the flanges for securing the columns to the cylinder bottoms. Between these two sides is secured the casting which forms the main guides, which extends clear through from the front to the back of the columns and forms a rigid connection between the two sides. Below the guides the sides separate and form an inverted Y-frame. Below the guides a plate is worked in between the two legs forming a strong intercostal. The construction, which is plainly shown in the accompanying half-tone engraving of the engines, provides a frame of great rigidity, which does not weigh any more than the cast steel frames, and provides a greater certainty of absolutely reliable material. It has given complete satisfaction in the engines of the "Olympia" and the "Oregon" already referred to, and has been readily accepted by the Bureau of Steam Engineering in place of the type called for in the original specifications of these engines.

All of the cylinders, which are constructed of the best quality of cast iron, are provided with working linings, and are steam jacketed. The main steam valves are of the piston type, and they are worked by Stevenson's double-bar links; practically all of the valve gears are made interchangeable.



ONE OF THE TWIN ENGINES OF THE BATTLESHIP "WISCONSIN."

The crank shaft is made in three sections, which are reversible and interchangeable. The crank pins are 14¾ inches in diameter and 17 inches long, and the crank webs are each 16¼ inches wide by 10 inches thick. A 7½-inch hole is bored axially through each shaft and crank pin. The thrust shafts are 14 inches in diameter with 9-inch axial holes. Each shaft has 11 thrust collars, 2 inches wide, placed 3½ inches apart, the outside diameter of the collars being 21½ inches. The propeller shafts are 14¾ inches in diameter, with a 9¾-inch axial hole bored throughout their length, the hole being tapered in the after section, where it passes through the propeller hub. All of the crank line and propeller shafting is of hollow, forged steel, of very high quality.

The reversing gear is of the straight-push type, controlled by a hydraulic controlling cylinder and differential valve gear, and a hand pump is attached to the hydraulic end of the reversing engines for operating by hand. The air pumps, which are of the single-acting vertical type, with inverted steam cylinders, are independent of the main engines. There are two air pumps for the set, which balance each other.

A special feature of the condensers for these engines is the fact that the shells are to be made of steel plate, the water ends being of bronze. This is a feature that may be considered as somewhat experimental, and the result of using steel for the shell will be watched by marine engineers with considerable interest. The main circulating pumps which supply the condensers with cooling water are of the centrifugal type. There are two of them, one being placed in each engine room. When they are used as emergency pumps on the bilge of the ship, they will have a capacity of 12,000 gallons per minute each. Each engine room is also to be fitted with an auxiliary condenser with its air and circulating pumps, fire and bilge pumps, main and auxiliary feed pumps, and hydraulic steering pumps in duplicate.

The screw propellers are of manganese bronze and are three-bladed, the pitch being variable from 16 feet 6 inches to 18 feet 6 inches, the designed pitch being 17 feet 6 inches. The diameter of the propellers is 15 feet 6 inches. The starboard propeller will be right, and the port propeller left-handed. Each blade is firmly bolted to the boss by tap bolts of rolled manganese or Tobin bronze, secured by lock plates. An interesting feature is that the hubs and plates for these propellers have been tinned, this being done for the purpose of maintaining a better surface on the propellers, and also with a view to mitigating, to a certain extent, any galvanic action which may arise between the propellers and the adjacent steel structural material.

The ship carries eight single ended steel boilers placed in four compartments, two boilers in each compartment. Each boiler has a mean outside diameter of 15 feet 6½ inches, and an outside length of 10 feet. They have a total grate surface of 685 square feet and a total heating surface of 21,200 square feet; the boiler pressure is 180 pounds to the square inch. Each boiler is provided with four Morrison suspension furnaces of 3 feet 3 inches internal diameter. The thickness of the shells is $1\frac{7}{16}$ inches.

We close our description of the engines with a brief statement of the leading particulars of the "Wisconsin." When this fine ship is equipped with all her guns and is carrying two-thirds of her ammunition and two-thirds of her stores, she will displace 11,525 tons. Her estimated trial speed is 16 knots, although she will probably make about 17 knots. She carries a normal coal supply of 800 tons, but with close stowage her bunkers will accommodate 1,200 tons. She is protected by a water-line belt of 16½ inches thick at the top and tapering to 9½ inches at the bottom. It will also taper toward the ends, being 4 inches thick at the bow. The turrets and barbettes will carry 14 and 15-inch armor. The armament will consist of four 13-inch breech-loading rifles, fourteen 6-inch rapid-fire guns, sixteen 6-pounders, and ten smaller guns. There will be four torpedo tubes. An excellent feature of the "Wisconsin" will be her lofty spar deck, which will raise the freeboard to about 20 feet as against 13 feet in the "Oregon."

A Proposed School for Consuls.

After several long-continued sessions, in which many important papers were read and discussions were had, the special committee appointed by the National Educational Association to inquire into the practicability and advisability of the long talked of National University, at Washington, has adjourned until next February, leaving an unfavorable report in the hands of its secretary. While final action has been deferred, the report, which is in the form of a set of five resolutions, is of such a nature as to clearly show that the committee regard such an undertaking as not within the pale of the government's proper sphere. Coming from such men, among others, as President Eliot, of Harvard, President Schurman, of Cornell, President Harper, of Chicago, President Draper, of Illinois, Prof. Butler, of Columbia, and Superintendent Maxwell, of New York city, this report must carry much weight and is likely to put an effectual damper on the plan for some years to come, at least.

One recommendation of the committee, however, is of special and timely value and must commend itself to every thinking citizen who has had any acquaintance with foreign trade or travel. It is contained in their fifth resolution and reads as follows:

"Fifth—The government, through the State Department, might wisely maintain in Washington a school for consuls, analogous to West Point and Annapolis, and like those schools, leading to a life career in the government service."

If nothing other than this is ever accomplished by this committee, and it can, through its influential membership, get practical politics to recognize that aptitude, special training, and permanency are the three essential keynotes to the upbuilding of a really invincible consular force, placing us in foreign trade where the training at Annapolis has placed us in naval affairs, their labors will have been amply productive and beneficial. It may be added that such a school for training for life as a representative of this country in foreign lands is likely to be even more valuable in furnishing an efficient staff for colonial administration; a civil staff which must soon assume very considerable proportions in our administrative life.

The New Cars of the Third Avenue Line.

The new cars on the Third Avenue line are said to be the largest in use on any street railway in the United States. They are 41 feet long and the body of the car is 32 feet long. The platforms are unusually commodious, and the doors are of extra width. The seats are the same design as the steam railroad coach seat and there are twelve of them on each side. Each seat accommodates two persons, but they are a trifle narrow. The windows are arranged so that they can be dropped down, converting the car into a kind of open car. Each car is provided with air brakes, which can stop a car under full headway in half its length. Four sets of cylinders and brake mechanism, one for each pair of wheels, are furnished, so that the breaking down of one would not impair the efficiency of the system. Ordinary air-brakes are also provided. The weight of the new cars is 40,000 pounds and they are driven by four 30 horse power motors.

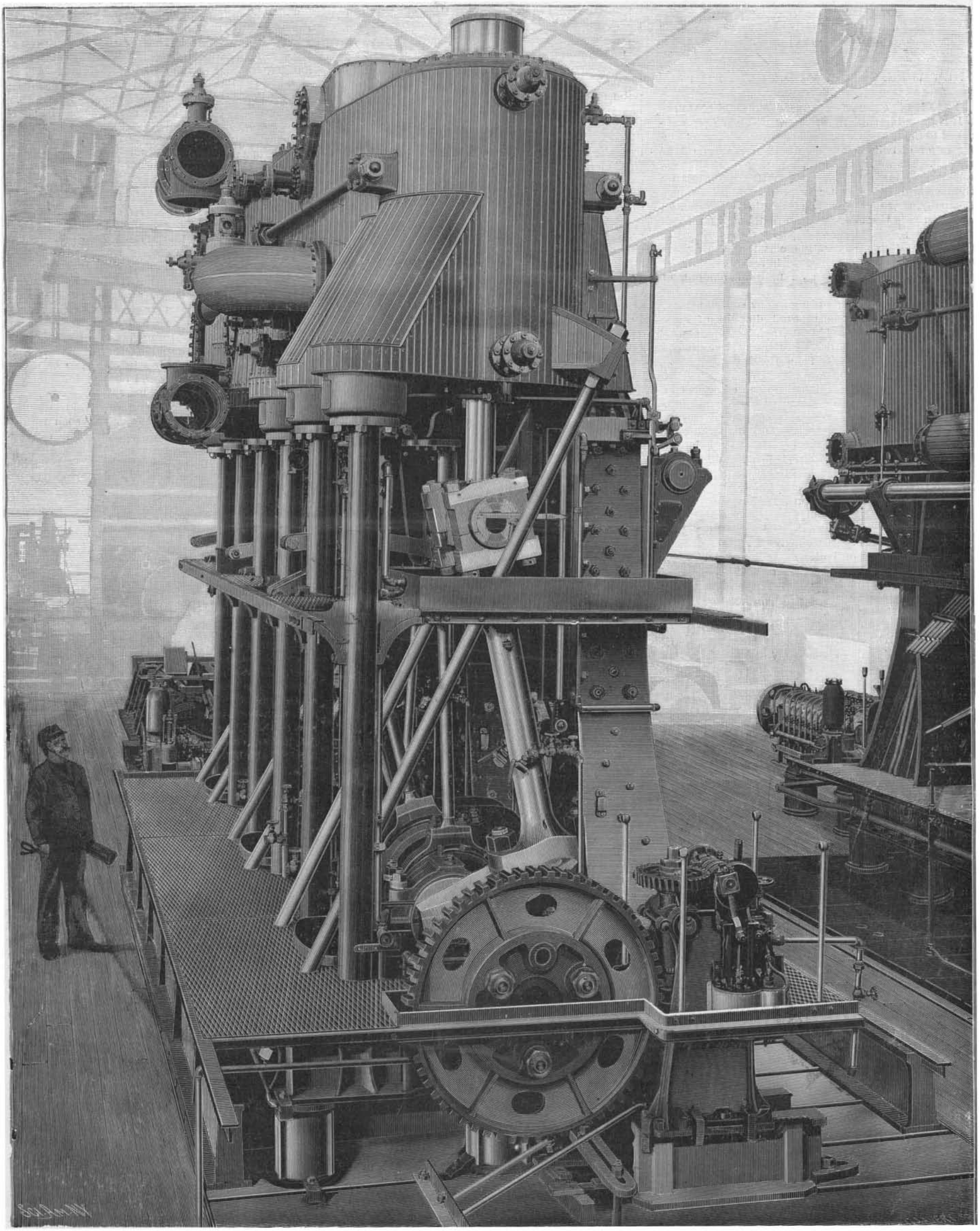
GELOSE is a gelatine obtained from agar-agar and is used for preparing culture fluids for bacteria.

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1899, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXXI.—No. 25. [ESTABLISHED 1845.] NEW YORK, DECEMBER 16, 1899. [$3.00 A YEAR. WEEKLY.



ENGINES OF THE FIRST-CLASS BATTLESHIP "WISCONSIN."—[See page 389.]

Cylinders: HIGH PRESSURE 33½ inches, INTERMEDIATE 51 inches, LOW PRESSURE 78 inches diameter; STROKE 48 inches. **Working Pressure,** 180 pounds. **Horse Power,** 11,000.