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THE ENGINES OF THE STEAMER CONNECTICUT.

We illustrate in the present issue the engines of the Connecticut, a new steamer built for passenger traffic on Long Island Sound. These engines are notable as well from their size as for their type, one hitherto little used for this particular service. The engine is a compound oscillating engine, with one high and one low pressure cylinder. The two cylinders, as will be seen from our drawings, work upon a single crank, and form an angle of 90 deg. with each other. The high pressure cylinder is 56½ inches, and the low pressure cylinder 104 inches in diameter. The stroke, necessarily the same for both, is 11 feet. Each cylinder is provided with two piston rods. Those for the high pressure cylinder are 9 inches in diameter; those for the low pressure cylinder are 10 inches in diameter. The arrangement of the piston rods is peculiar. Those of the low pressure cylinder lie one above the other in a vertical plane, and at their ends are united to a single journal box inclosing the crank pin. The piston rods of the high pressure cylinder lie in a horizontal plane, and at the crank pin are connected to two journal boxes, one lying on each side of the journal box of the low pressure cylinder. The steam enters the engine through the trunnions of the high pressure cylinder, the inside diameter of whose stuffing box sleeve is 24 inches. The steam pipe connecting its valve chests is 18 inches inside diameter. A 26 inch pipe connects the exhaust of the high pressure cylinder to the low pressure trunnion. This pipe is surrounded by a steam jacket with two inch space. The final exhaust pipe from the low pressure cylinder is 33 inches diameter. This pipe runs to a grease extractor, seen on the left of the diagram, page 56, and thence to a surface condenser, still through the 33 inch pipe. All the steam pipes are made of copper with brazed joints and flange connections. The steam ports for the high pressure cylinder measure 6 × 41 inches, those for the low pressure cylinder 8½ × 100 inches. They are of the gridiron type, which accounts for the very large area indicated by these figures.

The general arrangement of the valve gear is shown as clearly as possible upon the scale adopted in the diagram of the engine construction. For each cylinder an ordinary link is worked by means of two eccentrics. According to the position of the link block, a large secondary link is moved up and down parallel to a line connecting the center of the main shaft with the trunnion of the cylinder to which it belongs. This link is slotted in an arc whose curve is struck from the center of the trunnion. A block moves in the slot and is carried from end to end by the oscillations of the cylinder.

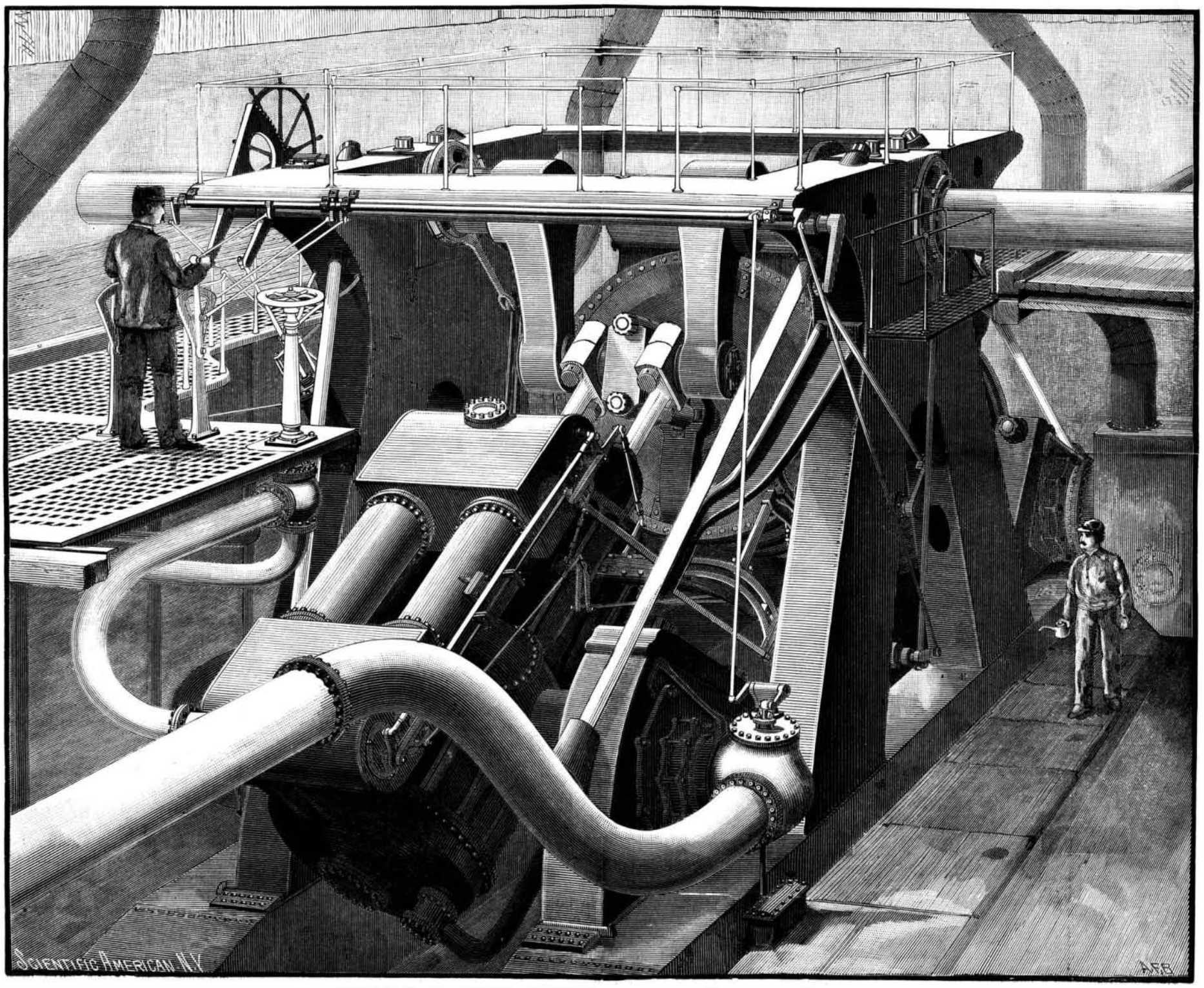
If this secondary link is held stationary, the block undergoes no movement in the direction of the cylinder axis. This block marks the end of a bell crank lever which is journaled to the cylinder, and which, by other bell crank connections, works the valves. If the secondary link, however, is forced to reciprocate backward and forward in the direction of the axis of the cylinder, then the bell crank lever will be forced to vibrate and the valves will be caused to operate. The movements of the secondary link are controlled by the eccentrics which actuate the first link.

To start the engine, two throttle valves are provided. One is on a small pipe which admits enough steam to start the engine slowly. When thus started, a second throttle valve can be opened, admitting the full amount of steam. The link motion for controlling the valve can be actuated either by hand or by steam. A large hand wheel, with projecting handles, is provided for actuating the link motion. When it is desired to do it by power, steam is admitted to a special cylinder, which can be seen at the side of the high pressure cylinder.

The pistons are packed with cast iron rings, with steel springs for setting out the rings. The cylinders are cast without heads, both upper and lower heads and the steam chest being bolted on.

By the use of this engine in a steamer of the type of the Connecticut, several important ends are attained. A low center of gravity, insuring high stability, is one feature; as there is no walking beam above the deck, with its pitman and connecting rod, a great deal of room is saved for the upper saloons. As the cylinders are placed at right angles, there is no dead point, so that the motion of the wheels will be much smoother than

(*Continued on page* 56.)



COMPOUND OSCILLATING ENGINES OF THE STEAMER CONNECTICUT.

different parts of the country. Prof. Stone also edits the *Annals of Mathematics*, one of the few mathematical journals published in this country.

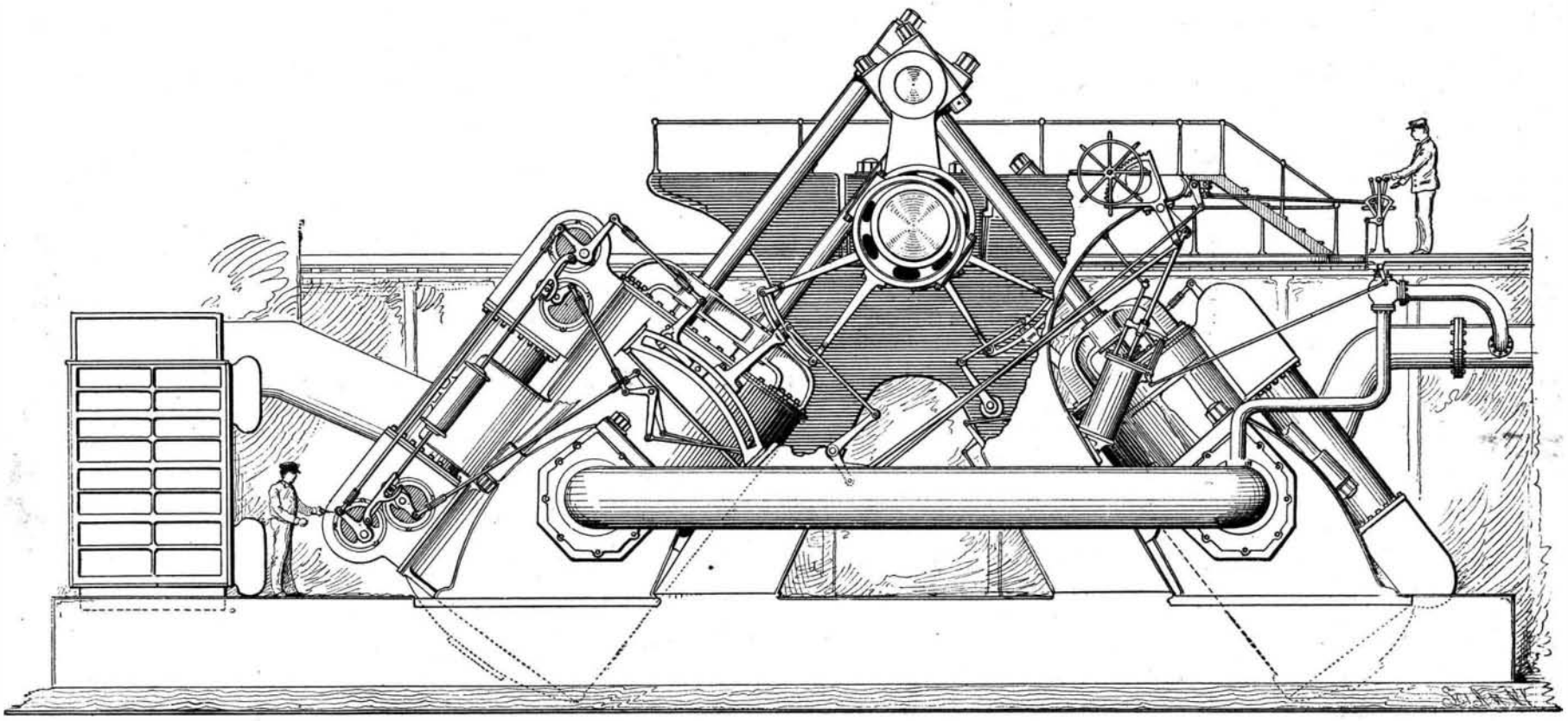
THE ENGINES OF THE STEAMER CONNECTICUT.

(*Continued from first page.*)

in the single cylinder construction. The wheels are of the feathering type.

The engine is carried by two parallel keelsons made of steel. These in their turn rest on yellow pine keelsons which rest upon the cross timber and are bolted to the hull timber. The surface condenser is carried on the after end of these steel keelsons. It contains 3,916 brass tubes ¾ inch in outside diameter. The distance between the tube sheets is 16 feet, giving a condensing surface of 12,150 square feet. A second condenser of 750 square feet is provided for use if necessary. The crank pin, whose bearings are 18 inches in diameter and 49 inches long, is shrunk into place, as are also the crank arms. Each of the shafts thus constituted is 33 feet 6 inches long, and has 23 and 25 inch journals. The steam is generated in six boilers 12 feet 6 inches in diameter and 20 feet 1¾ inches long, carrying 120 lb. pressure. They are of steel, with drilled rivet holes, and machine-riveted throughout. The engine will develop about 4,500 horse power, and may be driven 1,000 horse power higher. The steamer is 358 feet 6 inches in length over all, and 87 feet in width over the guards. Its width of hull is 48 feet 2 inches, and its depth of hold 17 feet 3 inches.

The engines were designed by Mr. George B. Mallory, of New York, and were constructed by the William Cramp & Sons Co., of Philadelphia, Pa. The steamer is of wood, and was built by Robert Palmer & Co. at Noank, Conn.



VALVE MOTION AND GENERAL CONNECTIONS OF THE ENGINES OF THE CONNECTICUT.

TRIAL TRIP OF THE VESUVIUS.

The new dynamite gun cruiser Vesuvius, built by Wm. Cramp & Sons, Philadelphia, was put to a trial test on January 11, off the Delaware Breakwater, and she proved herself fully equal to the government requirement, developing a speed exceeding that of any war vessel of or above her size in the world.

The Vesuvius is 252 ft. long, 26½ ft. beam, 9 ft. draught, with displacement of 725 tons. She has a four-cylinder triple-expansion engine, and developed 4,295 I. H. P. on her trial trip, or nearly 6 horse power to a ton of displacement, and not 17 H. P. per ton, as stated by some of the city papers. This ratio of power to tonnage far exceeds the power of any vessel of over 200 tons that has yet been built for war purposes.

The run was made, commencing at 9 A. M. January 11, each way over a course of 2·543 knots, laid off outside the Delaware Breakwater, marked by two buoys placed by government officials, and the trial was made under inspection by U. S. naval officers.

The speed of 22·947 knots with wind and tide, and of 20·346 knots against wind and tide, was easily accomplished; the mean of the two runs being 21·646 knots per hour, or an excess of 1·646 knots over the government stipulation, which makes the Vesuvius acceptable to the government on her first trial test, something we think unheard of in American naval accomplishments.

The after run of 90 miles from the Breakwater to Philadelphia was easily made under low steam at a speed of 16 knots per hour, about all that could be attained in the shallow waters of the Delaware without causing a drag wave.

The speed attained by the Vesuvius has only been exceeded by the following small vessels: A twin-screw torpedo boat, built for the Italian government by Yarrow & Co., with a displacement of only 100 tons; length, 140 ft.; beam, 14 ft.; with which a trial speed of 25 knots was attained (the developed horse power not being given). The Courier, a French torpedo boat, built by Thornycroft, of about 150 tons displacement; length, 147½ ft.; beam, 14½ ft.; draught, 5 ft.; which in a trial trip developed 1,550 I. H. P., or 10 horse power to a ton of displacement; attained a speed of 26 knots per hour. And also a small torpedo boat for the Dutch government, for which a speed of 27 knots per hour is claimed.

The relative horse power per ton of displacement plays so important a part in the performance of all vessels propelled by steam that we give the proportions in a number of war vessels of exceptional speed, as far as known: The Wattignies, a French cruiser of 1,273 tons displacement, having engines of 4,000 I. H. P., or 3·2 H. P. per ton. Just finished. Speed not yet tested.

A twin-screw naval steamer (English); length, 220 ft.; beam, 34 ft.; draught, 15 ft.; 1,560 tons and 3,115 I. H. P., or 1·99 H. P. per ton displacement. Speed on trial, 16·91 knots per hour.

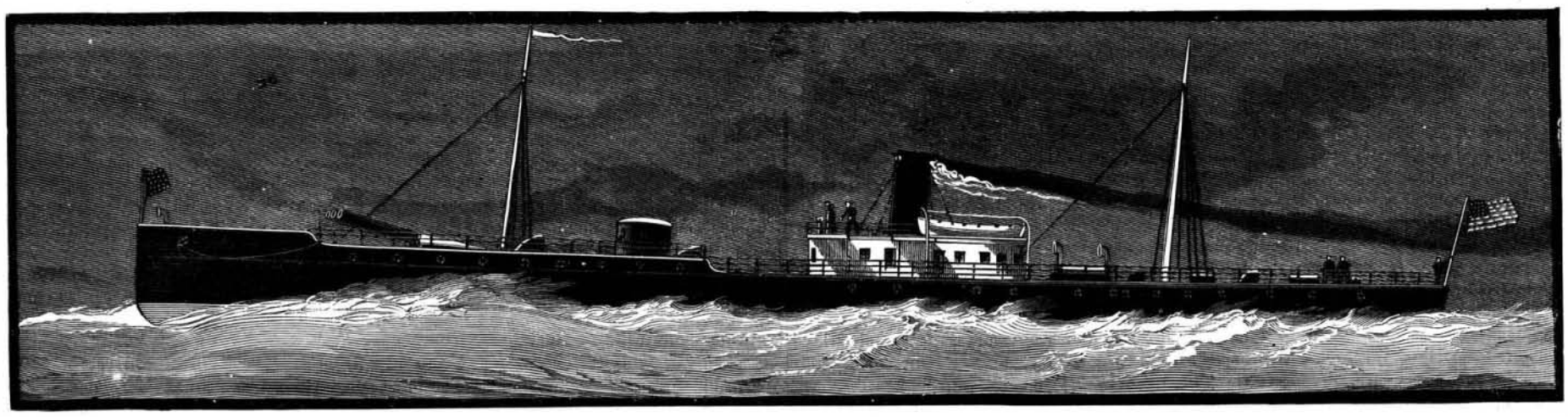
A twin-screw naval steamer (English); length, 300 ft.; beam, 46 ft.; draught, 19½ ft.; 3,584 tons displacement and 6,160 I. H. P., or 1·71 H. P. to a ton. Speed on trial, 18·18 knots per hour.

A twin-screw naval steamer (English); length, 315 ft.; beam, 61 ft.; draught, 25½ ft.; 7,645 tons, with 10,180 I. H. P., or 1·33 H. P. to a ton. Speed, 17·21 knots per hour.

A twin-screw naval steamer (English); length, 325 ft.; beam, 68 ft.; draught, 27½ ft.; 9,690 tons, with 11,610 I. H. P., or 1·2 H. P. to a ton. Speed, 16·52 knots per hour.

The Italia, an armorclad ship, built by the Italian government, probably the largest war ship afloat; length, 400 ft. 6 in.; beam, 73¾ ft.; draught, 30½ ft.; having a displacement of 13,480 tons; has developed 18,000 horse power, with the extraordinary speed of 17·8 knots per hour. Considering that the ratio shows but 1·33 I. H. P. to a ton of displacement, this is an extraordinary speed for an armored cruiser.

Although none of the new unarmored cruisers has developed a speed equal to that of most of the vessels mentioned in the above list, it is expected that most of the cruisers, both armored and unarmored, that are as yet uncompleted will attain speeds that will compare favorably with the European standard. The Vesuvius has taken a long step forward, and marks a well defined line between the slow coaches of the old navy and the long hoped for high speed vessel of the new *regime*. That our American engineers are capable of rising to the emergency of the case has been pretty satisfactorily demonstrated; and that our marine architects have succeeded, with so little experiment and so few failures, in producing a vessel that can compare favorably with such veteran builders of high speed vessels and torpedo boats as the Yarrows and the Thornycrofts is a matter of congratulation.



THE DYNAMITE CRUISER VESUVIUS.

IN a paper lately read before the Academy of Sciences, Paris, on various methods of treating rabies, by M. Odo Bujwid, he said that, since his visit to M. Pasteur's establishment in 1886, he had been treating persons bitten by dogs, either mad or suspected of being mad, in his laboratory at Warsaw. At first he followed the simple processes of inoculation of M. Pasteur, and of M. Frisch, of Vienna, with some failures in both cases. But during the last sixteen months he has adhered exclusively to the intensive or severe treatment, which has been applied to 370 patients without a single fatality.