THE ENGINE AND BOILER OF THE STILETTO.

We herewith present engravings of the engine and boiler of the Herreshoff steam yacht Stiletto, which was illustrated in the SCIENTIFIC AMERICAN of last week. The boiler corresponds in general principle with those of the ordinary Herreshoff type, but differs most essentially in the arrangement of the tubes. By means of a pump the water is forced through the boiler, which consists of series of pipes so placed and connected as to form, practically, one continuous length of tube, into the upper and cooler portion of which water is admitted, and from the lower and hotter portion of which the steam is led away.

The fire box is 6 feet 3 inches square. The sides terminate in a cone-shaped top leading to the smoke stack. Just below the conical portion are seven sets of tubes placed alternately across and parallel with the length of the vessel, the lowest set being athwartships and only a short distance above the fire. These sets are made up of tubes graduated from 1½ inches in diameter to 3½, the smallest being at the top, the largest at the bottom. The alternate ends of the separate tubes in each set are united by U-shaped or return bends, and at one end one set is united to the set above it. The steam is thus compelled to pass successively through each tube in each set. The tubes are spaced far enough apart to permit the products of combustion to pass between them.

The boiler circulation is kept up by means of a pump feeding into the upper set of tubes and taking its supply from a surface condenser, and when necessary, as will be explained shortly, from the separator, which is located in front of the boiler between the feed doors, as shown in the view of the boiler room. Steam is led from the lowest set of tubes to the separator, which consists of a cylindrical shell ⅜ of an inch thick, 18 inches in diameter, 4 feet long, and formed with conical tops; this is jacketed. The separator allows the steam and water coming from the boiler to divide, the latter, of course, collecting in the bottom, which is provided with a glass gauge to indicate the amount. The bottom is connected with the pumps, so that when necessary the excess of water can be removed and returned to the boiler.

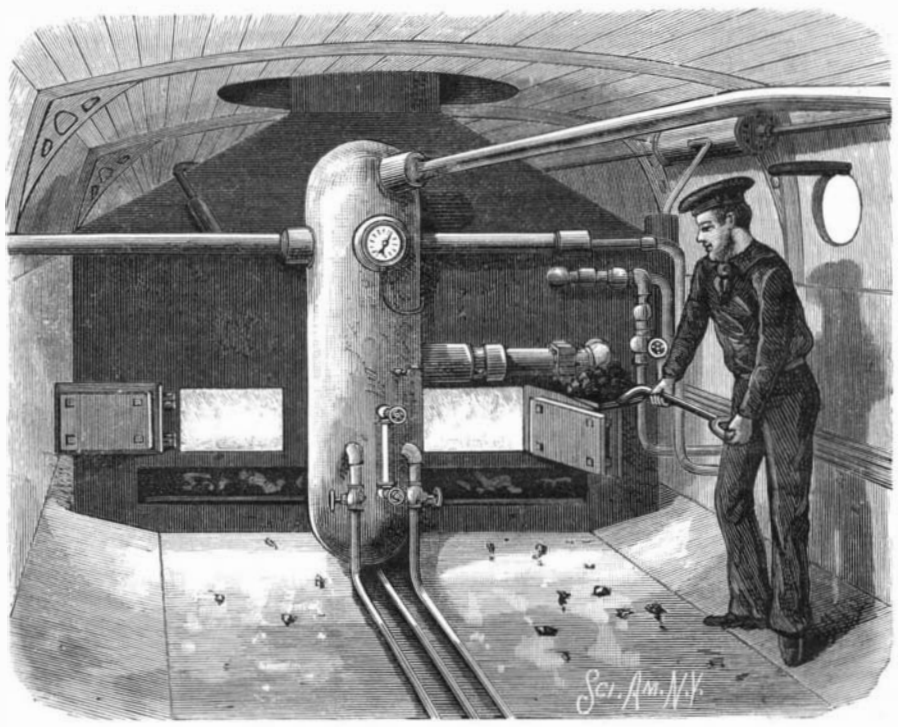
In the ordinary pattern of this boiler the steam from the separator is led to a set of tubes placed in the upper part of the furnace, the steam being thereby superheated; but in this case steam is led direct from the separator to the engine. Artificial draught is obtained from a blower.

The engine is a compound condensing, having a stroke of 12 inches, and cylinders 12 and 21 inches. The Herreshoff annular valve is used. This consists mainly of a cap sleeve on each end of the cylinder, which is surrounded by the steam chest, moving in a direction parallel with the axis of the cylinder; the inlet is through the side, and the exhaust through the end of the valve. Under ordinary conditions the cut off is ⅝. The cranks are placed quartering, and the shaft is of steel 4 inches in diameter. The engine exhausts into a surface condenser, from which the water is returned to the boiler by the pump. It will be seen that the pump operates in a continuous circuit, the water entering the upper tubes of the boiler, passing from the lower set in the shape of steam to the separator, thence to the high and low pressure cylinders to the condenser, and from the condenser and separator to the pump. The only water allowed to escape is by leaks and the use of the whistle; this loss, which is inconsiderable, is made good by the use of an injector.

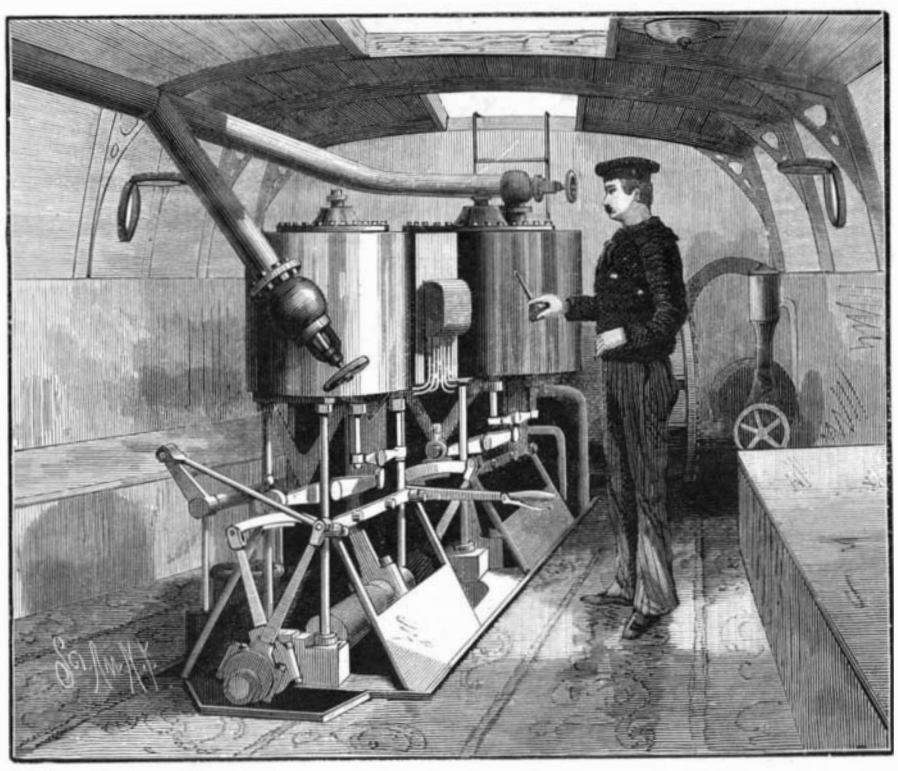
The screw is four bladed, 4 feet in diameter, 6 feet 6 inches pitch, and may be run at 400 revolutions per minute.

The great power of this engine—calculated at 450 horse power—considering the small space it occupies and its remarkably light weight—4,275 pounds—is due to the design and to the material employed in its construction. Steel has been introduced wherever possible, both in the engine itself and its parts and in the bracing.

The boiler weighs 13,637 pounds, and has a heating surface of 615 square feet, and may safely be worked under 160 pounds pressure; but in the race with the Mary Powell it was only necessary to use from 120 to 125 pounds, so that the full power of the engine was not exerted at that time, and the speed attained cannot be considered as the fastest the Stiletto is capable of. The boiler generates steam only as it is needed and utilized by the engine, the only reserve or surplus steam being that contained in the separator, the lower sets of tubes, and in the connecting pipes. This form of boiler, it is almost needless to say, is a most rapid generator of steam, is absolutely reliable and free from all danger from explosion, and most economical in the use of coal, two pounds per hour per horse power being the average.



THE BOILER OF THE STEAM YACHT STILETTO.



THE ENGINE OF THE STEAM YACHT STILETTO.

The Anerold Barometer.

The name of this barometer is derived from the Greek *a*, privative, and *neros*, moist; no liquid being used in its construction. The working part consists of a cylindrical metal box exhausted of air, the top of which is made of thin corrugated metal, so elastic that it yields to very slight alterations in the pressure of the atmosphere. As the pressure increases, the top of the box is pressed upward by the weight of the atmosphere, whereas when the pressure decreases the top of the box rises. These motions are multiplied by means of levers, and the index moves over a comparatively large arc on the circular scale marked on the dial of the instrument. Each instrument has been, or ought to be, graduated separately, by comparing it with a standard mercurial barometer. The aneroid has the advantage of being portable and very sensitive, aneroids having been made that will show the difference of height between one floor and another; hence its almost universal employment by mountain explorers.

Aneroid barometers, like properly constructed mercurial barometers, should have a thermometer attached to them, as their indications vary with the temperature.

The Electric Railway in Philadelphia.

The electric railway soon to be constructed along Belmont Avenue, Philadelphia, will present the novel sight of cars running without any apparent propelling force, free from annoyance of noise, smoke, and dust. The motive power for the cars, which are to be run according to the Bidwell system, will be furnished from a station located somewhere on Belmont Avenue, outside the park. It could, if necessary, be carried over an indefinite distance. This system differs from other systems of electric railways in not passing the current through the rails. Guards made of lumber run along the inner side of the rails, and a broad covering projects toward the center, leaving a narrow slot in the middle of the track. Beneath this cover and parallel with the rails, properly insulated copper conductors, of a semi-tubular shape, are placed. The current is conveyed from the dynamos supplying the power through wires to the terminus of the railway, where connection is made with the copper tubes, and a current is thus sent through the whole length of the road.

To propel the car a receiving dynamo or electromotor is placed in the center of the car. Connection with the current is made by means of an iron tube passing down through the slot, with branches in either direction in the form of an inverted T. On the end of each branch a small wheel, so placed as to run against the copper conductors, completes the connection, wires being run through the tube from the electromotor in the car to the wheels. The electricity being passed through the circuit of the track, the operator has but to turn a lever to receive the current in the motor, which immediately revolves, and by an attachment with the wheels of the car propels it in either direction, according as the current is reversed or not. Through the reversal of currents the need of brakes is dispensed with. If necessary, the car can be brought to a sudden standstill, but the change can be effected as gradually as may be desired. There will, therefore, be no danger of running over persons on the track.

The avenue will be lighted with the same current by running wires from the tubes to the lamps, as in ordinary street lighting, while the cars will be illuminated by running a wire from the motor to the incandescent lamps in the interior of the car, the whole power coming from the single current supplied by the stationary engines some distance away from the track. If it is desired to heat the cars, another draught is made on the current by passing the electricity through some poorly conducting substance, as German silver, the electrical energy being thereby dissipated in the form of heat. These connections are made by means of switches, so that no current may be made through the branch wires when the light or heat is not wanted.

An important feature of this railway for the park is the utter impossibility of trifling with the conductors and receiving injury from a shock. They are placed beneath the board flooring near the rails, and the only opening is the narrow slot, more than a foot distant, the whole being concealed from view. The road will be about a mile and a quarter long, and ten cars, carrying from fifty to sixty passengers, will be run. To furnish the power for these and to light both the avenue and the cars about 100 horse will be required.

BERTHOUD and BOREL are preparing a new insulating substance in the following manner: Linseed oil is maintained at a temperature of 300 deg. until it acquires a brown color and a sirupy consistence. A quantity of colophane is then added, and the mixture is then stirred for a time. To cover a body with an insulating coat, it is plunged into the mixture at a temperature of 200 deg.

THE engineering firm of Napier Brothers has long been an eminent one in Great Britain, and their success in shipbuilding has made the name well known throughout the world. The senior partner of the house, Mr. Robert D. Napier, died a few weeks since, in Glasgow, at the age of 64. Besides his regular business, he was a frequent contributor to scientific journals, and was the author of an investigation of the laws attending the flow of steam, which has received considerable attention.