LAUNCH OF THE COLUMBIA.

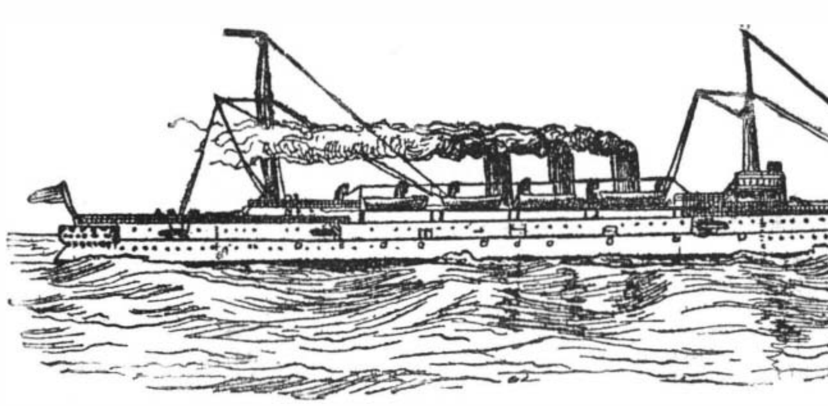
Cruiser No. 12, popularly known heretofore as the Pirate, was launched from the Cramps' shipyard at Philadelphia, July 26, and was christened Columbia. The launch was in every way a success, and was witnessed by many thousand people, including Secretary Tracy, Vice-President Morton, and others prominent in the navy and in public life.

This new vessel is designed to be swifter than any other large war vessel now afloat, and she will have a capacity possessed by no other war vessel yet built, in that of being able to steam at a 10 knot speed 26,240 miles, or for 109 days, without recoaling. She also possesses many novel features, the principal of which is the application of triple screws. She is one of two of the most important ships designed for the United States navy, her sister ship, No. 13, now being built at the same yards.

The dimensions of the Columbia are: Length on mean load line, 412 feet; beam, 58 feet. Her normal draught will be 23 feet; displacement, 7,550 tons; maximum speed, 22 knots an hour; and she will have the enormous indicated horse power of 23,000. As to speed, the contractor guarantees an average speed, in the open sea, under conditions prescribed by the Navy Department, of 21 knots an hour, maintained for four consecutive hours, during which period the air pressure in the fire room must be kept within a prescribed limit. For every quarter of a knot developed above the required guaranteed speed the contractor is to receive a premium of $50,000 over and above the contract price; and for each quarter of a knot that the vessel may fail of reaching the guaranteed speed there is to be deducted from the contract price the sum of $25,000. There seems to be no doubt among the naval experts that she will meet the conditions as to speed, and this is a great desideratum, since her chief function is to be to sweep the seas of an enemy's commerce. To do her work she must be able to overhaul in an ocean race the swiftest transatlantic passenger steamships afloat.

The triple-screw system is a most decided novelty. One of these screws will be placed amidships, or on the line of the keel, as in ordinary single-screw vessels, and the two others will be placed about fifteen feet further forward and above, one on each side, as is usual in twin-screw vessels. The twin screws will diverge as they leave the hull, giving additional room for the uninterrupted motion upon solid water of all three simultaneously. There is one set of triple-expansion engines for each screw independently, thus allowing numerous combinations of movements. For ordinary cruising the central screw alone will be used, giving a speed of about fourteen knots; with the two side screws alone a speed of seventeen knots can be maintained, and with all three screws at work at full power a high speed of from twenty to twenty-two knots can be got out of the vessel. This arrangement will allow the machinery to be worked at its most economical number of revolutions at all rates of the vessel's speed, and each engine can be used independently of the others in propelling the vessel. The full steam pressure will be 160 pounds. The shafting is made of forged steel, 16½ inches in diameter. In fact, steel has been used wherever possible, so as to secure the lightest, in weight, of machinery. There are ten boilers, six of which are double-ended—that is, with furnaces in each end—21¼ feet long and 15½ feet in diameter. Two others are 18¼ feet long and 11⅜ feet in diameter, and the two others, single-ended, are 8 feet long and 10 feet in diameter. Eight of the largest boilers are set in water-tight compartments.

In appearance the Columbia will closely resemble, when ready for sea, an ordinary merchantman, the sides being nearly free from projections or sponsons, which ordinarily appear on vessels of war. She will have two single masts, but neither of them will have a military top, such as is now provided upon ordinary war vessels. This plan of her merchantman appearance is to enable her to get within range of any vessel she may wish to encounter before her character or purpose is discovered. The vitals of the ship will be well protected with armor plating and the gun stations will be shielded against the firing of machine guns. Her machinery, boilers, magazines, etc., are protected by an armored deck four inches thick on the slope and two and a half inches thick on the flat. The space between this deck and the gun deck is minutely subdivided with coal bunkers and storerooms, and in addition to these a coffer dam, five feet in width, is worked next to the ship's side for the whole length of the vessel. In the bunkers the space between the inner and outer skins of the vessel will be filled with woodite, thus forming a wall five feet thick against machine gun fire. This filling can also be utilized as fuel in an emergency. Forward and abaft of the coal bunkers the coffer dam will be filled with some water-excluding substance similar to woodite. In the wake of the four inch and the machine guns the ship's side will be armored with 4 inch and 2 inch nickel steel plates.

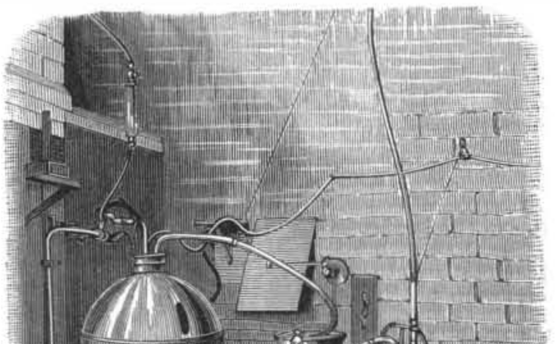


THE COLUMBIA, OUR NEW U. S. WARSHIP.

The vessel will carry no big guns, for the reason that the uses for which she is intended will not require them. Not a gun will be in sight, and the battery will be abnormally light. There will be four 6 inch breech-loading rifles, mounted in the open and protected with heavy shields attached to the gun carriages, eight 4 inch breech-loading rifles, twelve 6 pounder, and four 1 pounder rapid-firing guns, four machine or Gatling guns, and six torpedo-launching tubes. Besides these she has a ram bow. The Columbia is to be completed, ready for service, by May 19, 1893.

ETHYLENE.

The accompanying engraving, for which and the following we are indebted to the *Engineer*, represents



ETHYLENE APPARATUS.

the apparatus at the Royal Institution by which the liquid ethylene is manufactured. It consists of a glass retort, protected from draughts by an iron cover; in this retort sulphuric acid is heated to 160° C., and alcohol, heated also to 160° C., is allowed to drip into it. Ethylene and water are then given off, and run through a condensing worm in a pail of water; the water collects in a jar underneath, and the crude ethylene enters jars, in one of which impurities consisting of alcohol vapor and ether are removed by means of sulphuric acid spread over pumice stone; the sulphurous and carbonic acids also formed are removed, by passing the gas through caustic potash. The ethylene is then taken to the gasholder, in which it is stored for the supply of the pumps. The nitrous oxide used in the cooling operations is not made on the premises but purchased, as it is obtainable compressed in steel bottles in commerce. For compressing the ethylene two pumps are employed, one with a 6 in. plunger and 6 in. stroke, which forces the gas into a second pump with a 2 in. plunger and 6 in. stroke. The pumps have double valves, so that, if one valve goes wrong, the pump can be turned on to the other; this is a very necessary arrangement, especially as some of the gases used attack metal. The pumps and valves are practically without oil; they are lubricated by means of a trace of glycerine. They have Bramah leathers, and, in addition, a stuffing box. If any gas escapes the leathers, it is arrested by the stuffing box, and a pipe conveys it back to the gasholder. Water tanks on the tops of the pumps keep them cool. A splendid exhaust pump is also used on the premises; it will keep up a fair vacuum in a moderately leaky vessel. The refrigerator consists of several concentric cylindrical vessels, the outer one covered with flannel. The whole arrangement is cooled by means of evaporating nitrous oxide in the more exterior vessels; the ethylene is violently evaporated outside the central vessel, which is thus reduced to such a temperature as to liquefy air and oxygen. The nitrous oxide and the ethylene move in closed circuits, and are conducted to and from the refrigerator by pipes. The pipes which carry off the expended gases are of larger diameter than the others. The gases are thus used over and over again.

Over One Mile Deep.

The bore at Schladebach is now probably the deepest in the world, being 1748·4 meters or about 5,735 feet deep. Boring was commenced in August, 1880, and continued for 1,247 days, not counting holidays and two long interruptions in 1882 and 1883, and was completed in the autumn of 1886. The total cost of the work, the *Railway Review* says, was $53,076, representing about $9.25 per foot. The initial diameter of the hole is 280 millimeters (about 11·2 inches), and the drilling apparatus used was of the well known drop tool form, a casing being carried down as the drilling progressed. After a depth of 570 feet had been reached, boring was continued by means of a diamond drill 210 millimeters (8·4 inches) in diameter, yielding a core 140 millimeters (5½ inches) in diameter. The size of the hole was decreased at intervals, as the depth increased. At 3,510 feet it measured only 48 millimeters (1·62 inches) in diameter, and at 5,655 feet it had decreased to 33 mm. (1·32 inches). When the depth of 5,735 feet, however, had been attained, there was a succession of discouraging mishaps and operations were discontinued. Thermometric measurements in the hole were commenced in 1884 after a depth of 3,936 feet had been marked, and were repeated at every 30 meters (98½ feet) further down. These observations were made with much care, and naturally took up considerable time. The thermometers were fixed in a water chamber and this in turn was inclosed in a wrought iron casing to prevent breakage of the instruments under the enormous pressure at those depths due to the water used in clearing out the bore hole. Three thermometers were used for each reading, the mean of their indications being taken. The thermometers for each observation were left in the hole for from 15 to 16 hours. The observation showed that there was a regular, constant increase in temperature with increase in depth. At 5,628 feet the temperature was 45·3° R. (133·3° Fahr.) and there was an increase of 1° R. for every 46·09 meters (about 151 feet). From the data thus obtained the following formula has been deduced for calculating the temperature, in degrees Reaumur, at any given depth:

$$R = 8{\cdot}3 + \frac{P - 6}{46{\cdot}09}$$

in which P represents the depth in meters.

Enormous Production of Beer.

The *Western Brewer* (Chicago) has just published tables showing the total production of beer in the United States during the special revenue year ended April 30, 1892. It is seen by the official statistics that the total production of beer during the year upon which revenue was collected amounted to 31,475,519 barrels—a net increase of 1,453,519 barrels over the production of the previous year. The average annual consumption is a little less than one half barrel for every man, woman and child in the United States.

First in the list of beer-producing States is New York, with a total of 9,512,549 barrels, or more than one-fourth of the total production in the United States. Pennsylvania comes next with 3,129,733 barrels. Illinois follows with 2,888,364 barrels; then comes Ohio with a production of 2,650,205 barrels, and Wisconsin is closely in the rear with 2,605,688 barrels. Following in order: Missouri produced 2,014,086 barrels; New Jersey, 1,757, 633 barrels; Massachusetts, 1,095,-966 barrels; and California, 776,050 barrels. In six States of the Union only no beer is produced at all, namely: Arkansas, Florida, Maine, Mississippi, North Carolina, and Vermont. Iowa had an output of 114,523 barrels of beer last year, an increase of 8,580 barrels over the previous year, in spite of the prohibitory liquor law. Even Kansas, setting its prohibitory code at defiance, produced 1,650 barrels of beer last year, and duly paid the tax upon it to the United States collectors of internal revenue.

IN one day the human body generates enough heat to melt forty pounds of ice and raise it to boiling heat.