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.

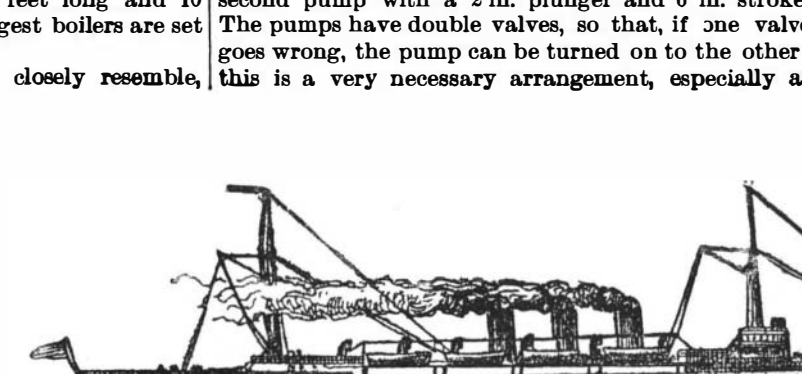
This new vessel is designed to be swifter than any other large war vessel now afloat, and she will have a capacity possessed by no other war vessel yet built, in that of being able to steam at a 10 knot speed 26,240 miles, or for 109 days, without recoaling. She also possesses many novel features, the 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 11⅝ 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.

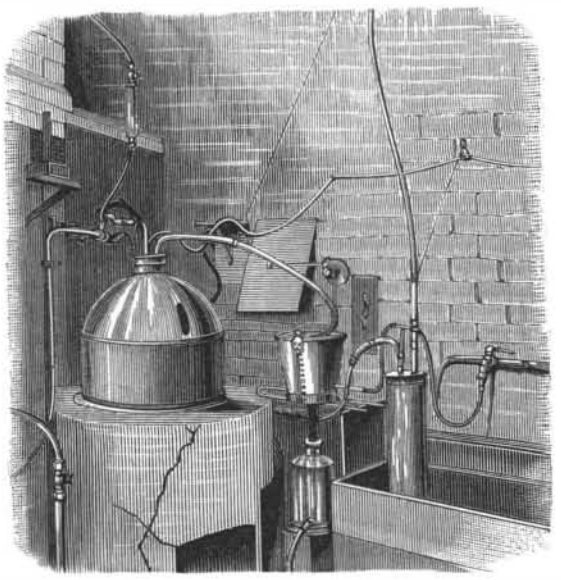
The vessel will carry no big guns, for the reason that the uses for which she is intended will not require them. Not a gun will be in sight, and the battery will be abnormally light. There will be four 6 inch breech-loading rifles, mounted in the open and protected with heavy shields attached to the 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.



THE COLUMBIA, OUR NEW U. S. WARSHIP.

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. (133·8° 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.

THE VESSELS OF COLUMBUS.

(*Continued from first page.*)

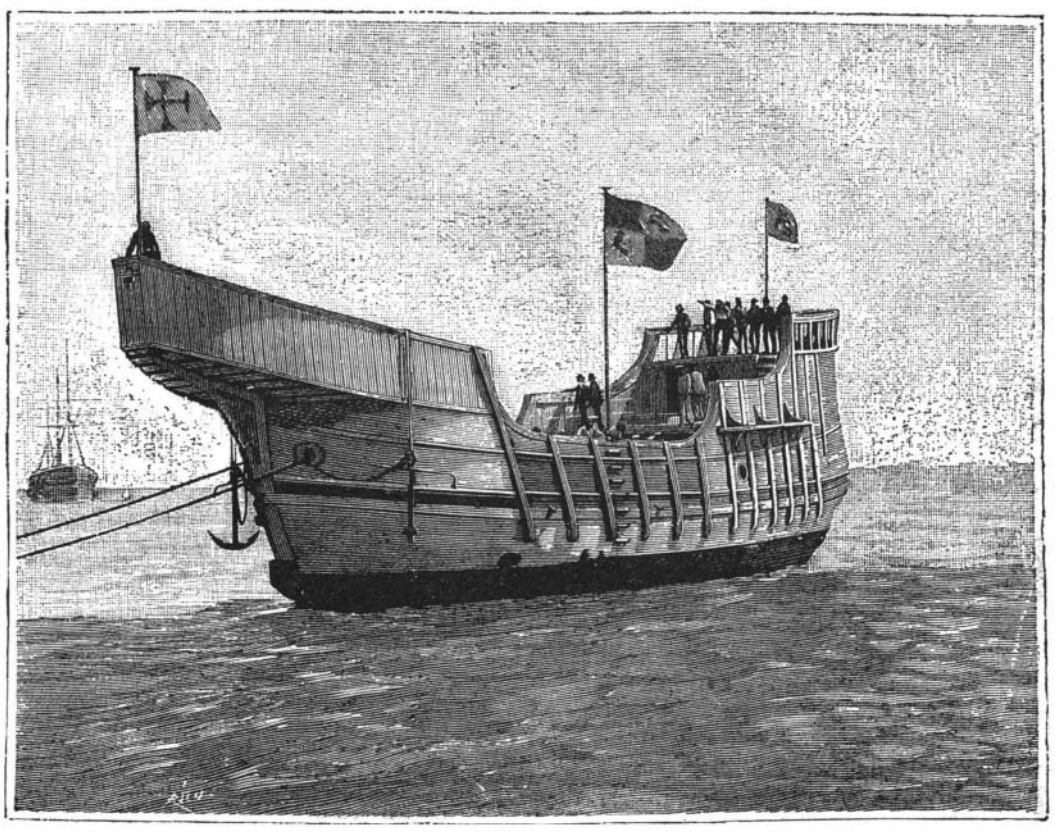
take part in the celebration which is to take place in October next. After that the vessels will sail *via* the St. Lawrence River and the lakes to Chicago, where they will constitute a feature of the Columbian Exposition.

A special proclamation has been issued by President Harrison, setting apart October 21 next as a general holiday, this date corresponding with that of October 12, O. S., 1492, when the first land of the New World was sighted by the discoverer. The President in his proclamation says: "On that day let the people, so far as possible, cease from toil and devote themselves to such exercises as may best express honor to the discoverer and their appreciation of the great achievements of the four completed centuries of American life. Columbus stood in his age as the pioneer of progress and enlightenment. The system of universal education is in our age the most prominent and salutary feature of the spirit of enlightenment, and it is peculiarly appropriate that the schools be made by the people the center of the day's demonstration. Let the national flag float over every schoolhouse in the country, and the exercises be such as shall impress upon our youth the patriotic duties of American citizenship. In the churches and in other places of assembly of the people let there be expressions of gratitude to Divine Providence for the devout faith of the discoverer and for the divine care and guidance which has directed our history and so abundantly helped our people."

The Spanish committee having the matter in charge have made careful examinations of all obtainable data to insure that the vessels shall be, in every detail which can be definitely determined, exact copies of the original Columbus vessels. In connection with this subject *La Ilustracion Nacional* of Madrid, to whom we are indebted for our first page illustration, says:

"A great deal of data of very varied character has been obtained, but nothing that would give the exact details sought, because, doubtless, the vessels of that time varied greatly, not only in the form of their hulls, but also in their rigging, as will be seen by an examination of the engravings and paintings of the fifteenth century, and as there was no ship that could bear the generic name of 'caravel,' great confusion was caused when the attempt was made to state, with a scientific certainty, what the caravels were. The word 'caravel' comes from the Italian *car a bella*; and with this etymology it is safe to suppose that the name was applied to those vessels on account of the grace and beauty of their form, and finally was applied to the light vessels which went ahead of the fleets as dispatch boats. Nevertheless, we think we have very authentic data, perhaps all that is reliable—and this data has served for the basis of operations in making the drawing which is produced in our issue of to-day—in the letter of Juan de la Cosa, Christopher Columbus' pilot. Juan de la Cosa used many illustrations, and with his important hydrographic letter, which is in the Naval Museum, we can appreciate his ability in drawing both landscapes and figures. As he was both draughtsman and mariner, we feel safe in affirming that the caravels drawn in said letter of the illustrious mariner form the most authentic document in regard to the vessels of his time that is in existence. From these drawings and the descriptions of the days' runs in the part marked 'incidents' of Columbus' log, it is ascertained that these vessels had two sets of sails, lateens for sailing with bowlines hauled, and with lines for sailing before the wind.

"The same lateens serve for this double object, unbending the sails half way and hoisting them like yards by means of top ropes. Instead of having the points now used for reefing, these sails had bands of canvas called bowlines, which were unfastened when it was unnecessary to diminish the sails."



COLUMBUS' SHIP, SANTA MARIA, RECENTLY LAUNCHED AT THE ARSENAL OF CARRACA, SPAIN.

PROFESSOR BROOKS, director of the Smith Observatory, at Geneva, N. Y., successfully observed the recent occultation of Mars by the moon. Excellent photographs were also secured of the moon and planet before and after the occultation, with the equatorial telescope.

Patents—Death of Inventor.

The United States Circuit Court for the Northern District of Illinois held, in the recent case of The De la Vergne Company *vs.* Featherstone, reported in the Chicago *Legal News*, that all the rights and remedies of inventors to the exclusive property in their inventions comes from the statutes; that the statutes of the United States recognize only three classes of persons to whom a patent can issue for an invention, viz., to the inventor himself, to the assignee of the inventor, when the assignment is made before the issue of the patent, and to the executor or administrator of the inventor, if the inventor dies before the patent is granted; and that upon the death of an inventor before the grant of a patent the right to a patent descends to his personal representatives, and if they fail to suggest his death and take the necessary steps under the statute to perfect the patent, there is no person to take the thing granted, hence the grant never can take effect.

An Acoustic Method whereby the Depth of Water in a River may be Measured at a Distance.

About two years ago I wished to know from time to time the rate at which a river was rising after a fall of rain. The river was at a considerable distance from the spot where its height was to be known. By means of the combination of two organ pipes, and a telephone circuit, described in the following lines, I have been able to make the required meesurement within rather close limits. At the river station, an organ pipe was fixed vertically in an inverted position, so that the water in the river acted as a stopper to the pipe, and the rise or fall of the water determined the note it gave, when blown by a small bellows driven by a very small water wheel. A microphone was attached to the upper end of the organ pipe. This was in circuit with a wire leading to a town station at some distance. At the town station there was an exactly similar organ pipe, which could be lowered into a vessel full of water while it was sounding. By means of the telephone the note given by the pipe at the river was clearly heard at the town station; then the organ pipe at this station was lowered or raised by hand until it gave the same note. The lengths of the organ pipes under water at the two stations were then equal, so that the height of the water in the distant river was known.

The determination can be made in less than a minute by any one who can recognize the agreement of two similar notes. The arrangement when first tested was so placed that the height of water at two places near together might be easily compared. I found that a lad with an average ear for musical sounds was able to get the two heights to agree within one-eighth of an inch of each other, while a person with an educated ear adjusted the instrument immediately to almost exact agreement. The total height to be measured was 17 inches. A difference of temperature at the two stations would make a small difference in the observed heights. For example, taking a note caused by 250 vibrations per second, a difference of 10° C. between the temperatures of the two stations (one not likely to occur) would make a difference of about 0·02 feet in the height—a quantity of no moment in such a class of measurements. The organ pipes were of square section, and made of metal, to resist the action of the water.—*Frederick J. Smith, in Nature.*

Acute Rheumatism.

There is at least one thing about which doctors agree, and that is the drug which acts most surely in acute rheumatism. Dr. M. Baudouin has made a tour of the Paris hospitals and finds that all the physicians use salicylate of soda. Some give also bicarbonate of soda and antipyrin, but salicylate is the sheet anchor. The mode of administration differs, however. Dujardin-Beaumetz gives 15 grains every three hours; Talamon, the same amount every two hours; Straus gives 45 to 60 grains in single doses twice daily; Bouchard, 75 grains of the salicylate and 150 grains of the bicarbonate of soda daily. Barth in some cases gives quinine and antipyrin, while Chauffard uses antipyrin alone, giving 60 to 120 grains daily. Barie gives 30 grains three times a day, and Comby 15 grains every two hours.

In the New York hospitals larger doses than the above are often given. In Bellevue, 20 grains every two hours, for the first day, is usually prescribed. In St. Luke's, oil of wintergreen has been much used. Salol has been given also instead of the salicylate. Nothing has yet approached the salicylates in efficacy in the treatment of acute rheumatism. It is generally the septic and gonorrhœal cases only in which it fails. But there is still a wide divergence of opinion as to how to administer the drug so as to get its effects *cito, tuto, et jucunde.—Medical Record.*

Experience with Metallic Ties in Belgium.

A summary of five years' experience with metallic ties on the Belgian State railroads is given by Mr. Janssen in the June number of the *Revue Generale des Chemins de Fer.* Two patterns, says the *Railroad Gazette*, of metallic ties were used, both of the same weight, 165 pounds, but of somewhat different cross-section. The flange rails, weighing 76·6 pounds per yard, are fastened to the ties by movable clips and bolts and nuts. There are twelve ties to a 9 meter rail. Careful observations were made on four sections of track with metallic ties and one section of track with half log, creosoted, oak ties.

It was found very difficult to keep the metallic tie track in good shape, particularly as the stone ballast was ultimately pulverized by the ties, necessitating the addition of new ballast in 1891. The metallic ties are themselves in damaged condition, owing to cracks which start at the bolt holes. Out of 240 ties of each pattern which were carefully examined, 77·5 per cent of the Braet form were more or less cracked, and 17·9 per cent of the Post type were similarly damaged.

Up to the time of making the report the track with metallic ties has cost for maintenance about nineteen times as much as the track with creosoted oak ties. Beyond this, many of the metallic ties are damaged to such an extent that they must soon be removed.

Artificial Camphor.

Mr. L. Nordheim, of Hamburg, presents the following method of preparing camphor through the action of ozone or of ozonized air upon camphene: Turpentine obtained through the distillation of the crude oil is treated with dry hydrochloric acid gas. The solid hydrochlorate is separated from its liquid isomers by pressure, and is purified and then treated with crystallized carbonate of soda in a distillatory apparatus. The temperature is raised to about 120°. The camphene obtained is so pure as to need no rectification. Ozonized air is made to act upon its vapor, and this converts it into camphor:

$$C^{10}H^{16} + O \text{ (camphene)} = C^{10}H^{16}O \text{ (camphor).}$$

The product obtained is purified by sublimation, like natural camphor.—*Moniteur Scientifique.*

RODINAL, according to the *Chemische Zeitung*, is prepared as follows:

Potassium metabisulphite	30 parts.
Para-amidophenol hydrochlor	10 "
Boiling water	100 "
Soda hydrate	q. s.

Dissolve the first two as far as possible in water and then add slowly a concentrated solution of caustic soda, until the precipitate at first formed is again dissolved, and the solution clear.