

of the positive, disperses the light and renders it uniform for all three transparencies.

The light passes through the camera in the opposite direction to what it did at first, and shows to the eye a single image, composed of the three positives superimposed upon one another, and each furnishing its own color. The result is a picture in natural colors.

To produce a perfectly clear, distinct image, it is necessary to have the three images register with one another exactly, and the inventor has provided for regulating this, if, for any reason, the coincidence should not be exact. For this purpose he has pivoted, just in front of the red and green glasses, two movable screens of plain glass, operated by the little lever arms, shown in the illustration. By moving the screens slightly, two of the images will be refracted and made to coincide exactly with the other one.

The importance of clearness and sharpness in each separate image in order to produce a good picture cannot be too greatly emphasized. This trouble is avoided in this camera to a great extent, since the picture is viewed through the same optical system that was used in obtaining the negative.

A trial of one of these cameras proved its excellent qualities.

We are indebted to La Nature for the foregoing description and illustrations.

#### STEAM ELECTRIC LIGHTSHIP FOR CAPE HATTERAS.

Among the vessels which are engaged in the Atlantic coasting trade and all that have occasion to pass by the coast line of North Carolina, there is a wholesome dread of the dangers of navigation off Cape Hatteras. Scattered throughout the oceans and seas of the world are to be found several localities whose fatal list of casualties to steam and sailing vessels, has caused them to be regarded as the graveyards of the deep. One of the most notorious of these is that region of dangerous shoals and storms which lies off the wedge of the coast line which forms the easternmost point of North Carolina. Cape Hatteras reaches further out into the Atlantic than any other point of land south of the capes of the Delaware, and the Gulf stream in its eastern and western variations is liable to flow at times within twenty miles of Cape Hatteras, with the result that coasting vessels and others whose course brings them near the cape, are crowded, in their endeavor to avoid the northeastern current, close to the shore. The set of the tides up and down the coast, the existence of shoals, and the constant opposition of tide and wind, produce a strong tidal race off the cape. At the same time the difference of temperature between the hot winds of the Gulf and the cooler breezes along the shore and from off the land, result in atmospheric disturbances of great severity, and there is no point of the Atlantic coast where storms are so frequent and dangerous. For the protection of shipping there is a lighthouse about a mile and a quarter from the outermost point of the cape, whose focal plane is 190 feet above the level of the sea. A few miles off the shore are the justly dreaded Diamond Shoals, on which futile attempts have been made to erect a lighthouse. Something over a decade ago the contract was let to a large and experienced contracting firm in this city for the sinking of a huge caisson into the sandy bed of the shore upon which to carry the proposed structure. The caisson, however, was wrecked and the failure seems to have discouraged any further effort. It would seem as though the only practicable way to protect shipping is to moor a lightship above the shoals and this has been attempted. The last vessel to be placed there was recently torn from its moorings during a heavy gale, and it became evident that a ship of special design was necessary to meet the exceedingly trying local conditions. Such a vessel has been designed and is now nearing completion at the yards of the Fore River Engine Company, of Massachusetts. She will be steam-propelled and electric-lighted, and when completed she will be one of the first, if not the only one, of her kind ever launched. The government contract calls for a vessel 112 feet between perpendiculars, with a molded beam of 28 feet 6 inches, and a depth of 14 feet 10½ inches measured from the main deck beams to the top of the keel amidships.

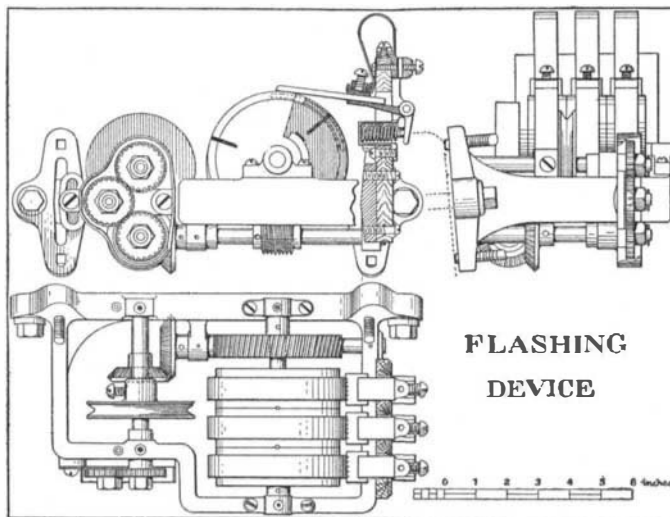
The vessel will have three decks, the main and spar decks running full length of the ship, while the lower deck is broken by the forward coal bunker and the after bulkhead of the engine room. The hull will be divided by watertight steel bulkheads into five compartments, and the quarters and storerooms are so arranged as to meet all requirements of safety and comfort. The dynamos and engines for the electric light plant will be located on the main deck, as shown, and within the engine and boiler casing. The accommodations for the crew are forward on the main deck. There will be two hollow steel masts, through which the wiring for the masthead flashlights is to run. These lights, three in number on each mast, are to be adapted for electricity or for oil lamps. The cluster mast-

headlights will be 59 feet above the waterline, the measurement being taken from the 12-foot waterline to the focus of the lamps.

The electric plant will be driven by two non-condensing, double-cylinder engines, running under a steam pressure of 80 pounds to the square inch. The vessel will be lighted by eighty 16-candle power 100-volt lamps, which will be placed where necessary throughout the ship. The masthead cluster will consist of six 100-candle power 100-volt lamps, and these lights will be controlled by an automatic flashing device, of which we present three views. It is driven by means of a belt from the dynamo shaft, and a worm and worm wheel which serve to give the proper rotary speed to a circuit-breaker. The lightship will be propelled by an inverted, surface-condensing, single-cylinder engine of 250 indicated horse power, with a cylinder 23 inches in diameter by 22-inch stroke, driving a cast iron propeller 7 feet 3 inches in diameter. Steam will be supplied by two straight, cylindrical, tubular boilers, 9 feet by 16 feet 7½ inches, with a working pressure of 100 pounds to the square inch. The deck fittings of the vessel, as shown in the two engravings, are flush, with a view to presenting as little surface as possible to the action of wind and water.

When No. 72 is on her station off the treacherous Hatteras shoals her mooring tackle will consist of a heavy mushroom anchor, shackled to a chain which leads through the main hawser hole in the stem of the ship to a steam windlass. In addition to this mooring tackle, the vessel will have a 2,000-pound harbor anchor, a kedge weighing 340 pounds and 120 fathoms of 1½-inch stud-link chain, with a breaking strength of 79,100 pounds. Amidships, on either beam, will be swung two whale boats of about 26 feet length and 6 feet beam.

The spar deck is protected by a gradually rising steel waist, which starts flush a little forward of abreast the foremast, flaring somewhat at the knightheads until



FLASHING DEVICE FOR THE NEW CAPE HATTERAS LIGHTSHIP.

at the stem proper it has a depth of 5 feet. In addition to the steam whistle, the lightship is provided with a steam siren which is fitted just forward of the smokestack, as shown in the drawing, for use in thick and foggy weather.

#### A Vessel for Antarctic Exploration.

A wooden vessel, 172 feet long by 33 feet beam and 16 feet draught, is about to be built by a Dundee concern for Antarctic exploration purposes for the Expedition Committee of which Sir Clements Markham, president of the Royal Geographical Society, is chairman. The vessel's displacement will be 1,570 tons, and the hull is to be constructed of oak, with an outer sheathing of greenheart, says The Engineer. It will be specially strengthened to withstand ice pressure, and a magnetic observatory is to be fitted up on the upper deck, amidships, to obviate any magnetic interference. The deck is to be lined with asbestos, and the machinery will be placed aft in order that the observatory may be free from any undue magnetic influence. The vessel will be completed by March, 1901, and the cost, exclusive of machinery, will be \$163,500.

#### Strength of Alloys of Nickel.

According to Rudeloff, the strength of alloys of nickel with iron containing little or no carbon increases with each rise in nickel up to 8 per cent, while the ductility decreases up to 16 per cent; beyond this point, and up to 60 per cent, the increase of nickel causes an increase both in ductility and strength. The effect of nickel on the elastic limit of steel increases as the carbon increases, says The Engineer. In 0.20 carbon steel, the gain on elastic limit due to 1 per cent of nickel is 5,714 pounds; while in 0.50 carbon steel, the gain on elastic limit, due to 1 per cent of nickel, is 10,570 pounds. These figures are abstracted from a table of figures given by the Bethlehem Steel Company on oil-tempered annealed forgings.

#### Acetylene Notes.

ACETYLENE SIGNALS.—English military men have passed acetylene-gas signals from Corfe Castle to Bournemouth West Cliff, a distance of twelve miles, the message being clear to the naked eye, says The Acetylene Gas Light Journal.

VELOCITY OF DETONATION OF ACETYLENE.—Berthelot and Le Chatelier. (Comptes Rendus, 129, pp. 427-434, August 28, 1899.) The acetylene was exploded in horizontal glass tubes about 1 millimeter long and of 2 to 6 millimeters in diameter, and was operated with at various pressures between 5 and 30 kilogrammes per square centimeter. The velocity was registered by a falling photographic apparatus, released at the moment of detonation. The image of the horizontally moving flame in the tube, combined with this vertical movement, gave a curve on the photograph, from which, at any point, the velocity could be found. In some cases the trace was almost a straight line, but in others it showed a velocity increasing to a maximum. The results indicate that the velocity depends upon the initial pressure of the gas, from about 1,000 millimeters per second at 5 kilogrammes per square centimeter to 1,600 at 30. The differences in character between the case of acetylene and the explosion of, say, oxygen and hydrogen, is pointed out. In their case bodies are formed which dissociate at temperatures reached in the explosion, so that the action is not so uncontrolled as when the products are those of decomposition only.—Science Abstracts.

THE PURIFICATION OF ACETYLENE.—Dr. F. B. Ahrens, of Breslau, has lately investigated the causes which occasionally produce much heating and a large yield of free or combined chlorine when chloride of lime is adopted as an acetylene purifier, says Feilden's Magazine. He finds that chloride of lime alone does not heat in the gas; the rise in temperature is due to the presence of sawdust and water, which are employed to increase the bulk of the material or its power of absorbing impurities. He concludes that chloride of lime must either be mixed with a large quantity of sawdust or with a very small quantity of water; but it is preferable to omit the sawdust entirely, using in its place kieselguhr (infusorial earth), powdered coke, powdered brick, or chromate of lead, as recommended by Wolff. Incidentally he explains the complaints made by Vertess about the Veszprim acetylene, for he says the gas was treated with chloride of lime (presumably without a second vessel, charged with slaked lime only), and periodically smelt so strongly of chlorine, and annoyed the consumers so much, that the whole process of purification had to be temporarily abandoned. Yet another investigation of acetylene purifying processes has been carried out by Dr. G. Benz, of Heilbronn. He says that Frank's and Ullmann's materials are very similar in their action, and are both satisfactory, especially in dealing with the phosphoreted hydrogen. Chloride of lime, however, is cheaper and simpler, but it must be used with a second vessel, containing slake lime alone. In order to prevent overheating, he agrees with Ahrens that sawdust must not be added, powdered slag or coke being better.

PHOTOMETRY OF ACETYLENE.—An account of the photometry of acetylene is given by L. W. Hartman (Phys. Rev. 9, pp. 176-188, September, 1899). It treats of the photometric study of mixtures of acetylene and hydrogen burned in air. The results are exhibited by means of curves. From these it appears that the acetylene-hydrogen flame is richer in the short wave lengths than the flame burning acetylene alone used as a secondary standard. Moreover, the color properties of the flame appear to be independent of the amount of hydrogen in the mixture. Upon going to the limit this statement would not hold true. Lava tip and brass tip burners were used. In the case of the brass tip it is shown by curves giving the relation between percentage of acetylene and candle-power, that the candle power reaches a maximum and then falls away with increasing percentage of acetylene. This is due to the incomplete combustion of the gas after a given percentage of acetylene in the mixture has been reached. In the case of the lava tip, the flame with low percentages of acetylene appears very like the flame of burning hydrogen; at first it slowly increases in candle power with increasing percentage of acetylene, and does not reach the stage of incomplete combustion.—Science Abstracts.

#### California's Big Trees Protected.

On March 6 the Senate passed a House joint resolution directing the Secretary of the Interior to open negotiations for the requisition of land in Calaveras and Tuolumne Counties, Cal., containing the mammoth tree grove and the South Park grove of the big trees. This will head off a plan for converting the trees into lumber, an option having been obtained on them by a Western lumber dealer. We have already referred on several occasions to the importance of keeping these remarkable groves of trees intact.

## Science Notes.

There were 533 deaths from the plague in Bombay during the week ending February 16.

A department of prints will be established by the New York Public Library, and will cover the entire range of graphic arts, like the collections at Paris and London.

The Doge's Palace, Venice, is being endangered by the weight of 200,000 volumes which have been in it since 1812. The Italian government has appropriated funds for their removal.

Frederick L. Olmstead has been appointed by Harvard University as instructor in the course of landscape architecture, which will be offered next year by the Lawrence Scientific School.

At one place in England, at least, slates are washed twice a day with a disinfecting fluid. The slates of children should be carefully inspected and great attention should be paid to the sponges with which they clean them.

A botanical garden has been established at Coquilhatville, Congo Free State, by the Belgian government. It will be called the Kew gardens, and it will probably be very important to the rubber and other tropical industries.

The Geographical Society of Philadelphia is to continue its work of setting wooden casks adrift on the ice north of this continent, to demonstrate the currents of Arctic waters north of Behring Strait. Each cask will contain a blank to be filled in by the finder.

In order to facilitate traffic along the shores of the Dead Sea it has been decided to establish regular intercourse by means of small steamers, and the first steamer has been purchased. It will certainly be a shock to many to hear of a steamer on this historic body of water.

The deepest ocean temperature which have been recorded were taken by the United States steamer "Nero," which is sounding for the cable between Guam and the Midway Islands. At a depth of 30,420 feet the water had a temperature of 35.9 degrees Fahr., and at 9,060 feet it was 36 degrees Fahr.

Prof. Stewart Culin has been appointed lecturer on archaeology and ethnology in the University of Pennsylvania. Prof. Culin has been connected with the Museum of the University and is curator of the Section in Asia, and General Ethnology in the Free Museum of Science and Art which now offers for inspection an almost unrivaled collection.

Henry Cabot Lodge has introduced a bill to secure for books from public and incorporated libraries second-class rates, that is one cent a pound. This would, of course, add largely to the postal deficit, as books cannot be transported for a cent a pound, but at the same time it would probably not be used to such an extent that it will entail a very serious loss, and it will undoubtedly be a boon to many individuals.

There is one article of American manufacture which is not exported to any great extent and, that is the American umbrella. They are the best in the world, the design being excellent and they are light in appearance, and owing to labor-saving machinery they can be produced at very low prices. A considerable portion of umbrella cloths, however, are imported from Europe as well as a considerable amount of the wooden sticks.

In 1881, says The London Lancet, Liverpool possessed no ambulances of any kind, except a two-wheeled conveyance something like what we term a "push-cart," and an instance is cited in which two gentlemen, who had their legs fractured on ocean steamers, arrived at that port, and great crowds were attracted by the spectacle of their removal to a hotel, and their progress was much impeded by the people. The system in operation in the United States is again recommended.

At Bicknoller St. George, near Taunton, England, there is a vigorous yew tree growing on the top of the square church tower, and though it has been cemented around, it still flourishes. There is an old yew tree in the churchyard, and it is probable that the birds have, after eating the fruit, left the seeds on the tower, while the mortar was soft, and one of these germinated. The yew tree is 2 feet 8 inches high with a girth of 12 inches. It is thought to be at least a hundred years old.

A unique institution for the treatment of sufferers of tuberculosis is being built near Palermo, Sicily. Its site is a magnificent one, and the edifice itself will be beautiful, and will be surrounded by temples, grottoes and marble benches, and at night the grounds will be illuminated by thousands of lamps. The medical director has made a special study of the fresh air and ample diet system of dealing with phthisis in Germany, says The New York Tribune. A French chef will be an important member of his staff. A yacht of 300 tons will also be at the service of those who desire it. Accommodations for a hundred will be afforded. After current expenses, and the expense of repairs have been earned, all surplus receipts are to go to sanatoriums for the poor.

## Engineering Notes.

The Roebling Company, of Trenton, have made a model of the Brooklyn Bridge for exhibition at the Paris Exposition. The length will be 28 feet.

There are now 214 transports engaged by the British government. They aggregate 1,050,359 tons, the largest is the "Cymric," of the White Star line which is of 12,552 tons.

The famous Kinzua viaduct on the Erie Railway is to be replaced by a newer and stronger structure. Its total length is 2,050 feet and its height above the surface of the water is 302 feet.

The Ordnance Bureau of the United States Navy is experimenting with a new explosive called "marsite." It is supposed to be a nitrate compound and can only be exploded by the combined force of percussion and concussion.

It is said that the largest belt ever made was turned out by a Canadian concern. It measures 3,529 feet long and is of rubber, its weight being 9 tons. It is made for the grain elevator of the Intercolonial Railway at St. Johns, N. B.

Some years ago the Union Steamship Company's vessel, "Norman," was fitted with appliances for reducing the temperature in the library and reading room, says The Engineer. This was appreciated by the passengers who flocked into the spaces cooled at every available opportunity their comfort during their passage through the tropics being greatly enhanced thereby.

A curious accident recently occurred in Germany. An express train ran into the rear of a freight train, and in the rear car was a tank filled with spirits which, exploded as the locomotive ran under it. Three men in the mail car were burned alive and the engine, tender, mail car, baggage car, dining car and three freight cars were destroyed by fire, says The Railroad Gazette.

A curious accident occurred in Dublin on February 14. It was somewhat similar to one which occurred in Paris a few years ago. The rails were slippery, and the result was that the locomotive dashed through the walls of the terminus, smashing stationary buffers at the end of the platform and boring a hole through the wall itself. The engine was suspended in midair on a portion of the wall, 30 feet above the street.

Congress is to be asked to appropriate a considerable sum for the Philadelphia mint, including boilers, engines, dynamos, pneumatic tools, lifts, telephones and machine tools, coal handling machinery motors, etc., as well as a fine equipment of machinery connected directly with the coinage of money. It is thought that in a few years the mint may be relied upon to produce most of the machinery and appliances for all the United States mints.

A fire in a large spice mill adjoining the Chicago Public Library gave the first opportunity for testing the water curtain, the apparatus for producing which, forms a part of the equipment of the building. Tubes are arranged on the outside of the building on the top through which water can be turned, and the arrangement proved perfectly satisfactory. Streams of water poured out of the tubes covering the walls, and owing to the temperature they were coated with ice in a few minutes.

Some of the conveniences of a modern railroad station are mentioned in Mr. Francis' paper on the South Terminal Station at Boston, delivered before the American Society of Civil Engineers. It includes in addition to the usual ticket selling booths, dressing rooms, newspaper booths, etc., private telephone exchange for the use of the terminal station, bicycle racks, speaking tubes, a stand for the sale of emergency articles such as rubbers, umbrellas, etc., shoe-cleaning facilities for women, dressing and checking rooms for passengers, employees, etc.

A new breathing apparatus has been invented by an Austrian. It is for use as a rescue apparatus for coal mines. It consists of an India rubber cloth receptacle made in the form of a collar which closely surrounds the wearer's neck, serving as a breathing bag, and at the same time to hold a store of quicklime for absorbing the carbonic acid and water vapor. A mask tightly enclosing the face, is also employed and oxygen can be breathed from an accompanying container, so that a man wearing these appliances can remain in a locality filled with irrespirable gases.

A salt water detector between the condensers and boilers of cruisers has been determined upon by the British Admiralty, says Engineering News. This would obviate a recurrence like the breakdown of the "Pegasus" last February. The condensers of this vessel leaked badly and the salt water in her boilers caused them to prime to such an extent that the cruiser was practically helpless for sixteen hours off Cape Ushant. After temporary repairs to the two boilers it reached Plymouth. The detector is an appliance for chemically testing the water during its passage between the condenser and boilers, at once indicating the admission of salt water.

## Electrical Notes.

\* The local Street Railway Company, of Tokio, Japan, has decided to lay down 200 miles of electric railway.

An electric pneumatic brake has been adopted for the equipment of the Metropolitan Railroad in Paris.

An inventor has recently devised an illuminated sign which is sunk flush in the pavement consisting of a large dead light bearing a sign secured in a metal ring and a conical reflector, at the bottom of which is located an incandescent light.

In Hamburg the policemen on the streets are instructed to watch the cars sharply, and if they find a car which carries a single passenger more than the number allowed by law, the conductor is fined 72 cents. It would be amusing to see the operation of such a law in this country.

There are now 93 German towns or districts with electric railways as compared with 77 of the previous year. There are 30 new lines projected and in progress, and 39 extensions. The total length of the lines is 1,270 miles. The total length of track is 1,750 miles, the number of motor cars is 4,504, with 3,139 trailers.

It is proposed to utilize the River Cellina and part of the River Piave in Italy, for the generation of electrical power for transmission to Venice. The Cellina is capable of supplying 10,000 horse-power at a distance 59 miles. The Piave scheme offers 27,000 horse power conducted 43 miles distant and the amount could even be increased, says The Electrical World.

On December 4 direct telegraphic communication was opened from Budapest to London. This is destined to be of great value to grain dealers, for Hungary is the granary of Europe. Telegraph messages formerly required three or four hours to pass from London to Budapest owing to the number of messages intended for these two places as they had to pass over the same wire used for business with Berlin and Vienna, so that a question and its reply usually occupied six or eight hours.

Mr. Howard B. Little in Knowledge discusses cases of trees shattered by lightning and cites an extraordinary case. A tree was encircled by a rope some 25 feet from the ground, and it so chanced that an end of the rope stood out from the bark of the tree so that during the earlier part of a rainstorm the tree was damp from the top to the rope, while the lower portion of the trunk was kept comparatively dry. The tree was struck in this condition and the lower part only was damaged. The damage followed downward a path which the twist in the fiber of the wood made easiest.

A bill has been introduced in the New York Legislature, requiring the registration of electricians, says The Electric Review. The bill is in the nature of a protection against fire, as it is to prevent incompetent persons from tampering with electric wires in all buildings where electricity is used. The electricians who wire the buildings are now held responsible for their work, but they claim that after they have finished it, in many instances, inexperienced persons are called in to do odd jobs, and leave the wires in such shape that they are a menace. The bill, therefore, would not permit any but registered electricians from touching the wires.

A new system of railway traction has been invented by a New Zealander, in which half of the car is underground and half above. It is proposed to construct a conduit of sufficient capacity to receive the truck and running gear. Attached to the truck and passing up through the slot are thin wide bars of sufficient cross-section to support the body of the car. Special provision is made to facilitate passage around curves. There are, of course, distinct advantages connected with such system, but the Franklin Institute which has investigated it, thinks that the disadvantages of inaccessibility to the truck mechanism, especially in the case of electrical railways where prompt access to the motors and the connections is of the highest importance, would more than offset the advantages claimed for the system. The Street Railway Review concurs in this opinion.

A patent has recently been issued for an invention having for its object the giving of an audible alarm through the agency of smoke or non-flame-supporting gases, such as are ordinarily generated by fire. The device is based upon the principle that a gas flame only burns when supplied with a definite amount of oxygen. The flame is allowed to act upon a thermostatic bar included in the electric circuit in connection with that of an alarm of any approved form. The circuit is normally open as long as the flame continues, and the arrangement being such that when the flame is extinguished the circuit will be closed thereby causing an alarm to be sounded. There is a perforated casing containing a gas flame which supplies heat to the bar. Should the surrounding atmosphere be filled with smoke or non-supporting gases they will be drawn into the casing. The flame will be extinguished from lack of oxygen to support combustion and the thermostatic bar in cooling closes the circuit.



# SCIENTIFIC AMERICAN

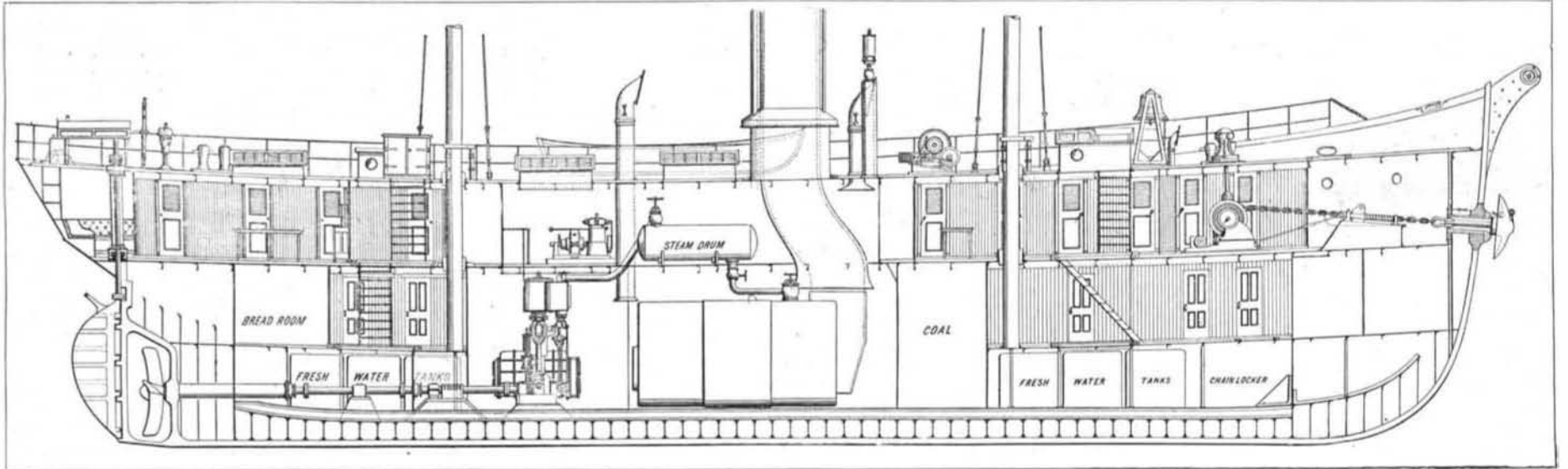
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1900, by Munn & Co.]

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

Vol. LXXXII.—No. 11.  
ESTABLISHED 1843.

NEW YORK, MARCH 17, 1900.

\$3.00 A YEAR.  
WEEKLY.



Longitudinal Section, Showing Interior Arrangements.



ELECTRICALLY LIGHTED, STEAM, LIGHTSHIP FOR SERVICE OFF CAPE HATTERAS. [See page 166].