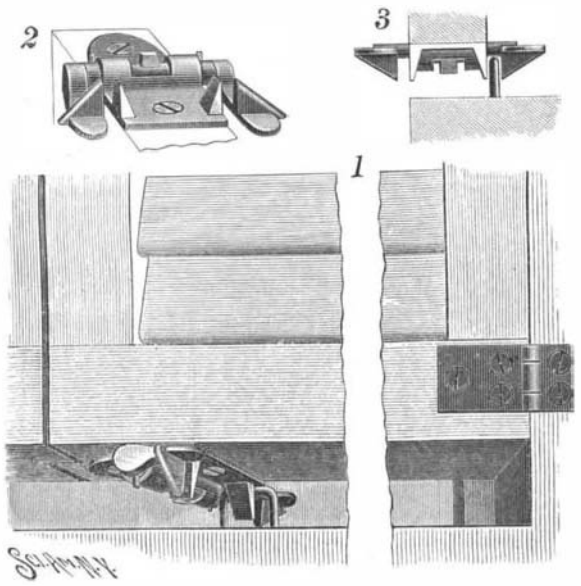
A SIMPLE SHUTTER-FASTENER.

The shutter-fastener which we illustrate herewith is a simple and ingenious device for locking a blind to the window-sill or to the outer wall of a building. The fastening means operate entirely by gravity, no spring being included in the construction. The patent on the fastener is the property of Mr. Ubert K. Pettingill, of 22 School street, Boston, Mass.

Fig. 1 shows part of a blind and window-sill, with the fastener in locking position. Fig. 2 is an inverted bottom view of the device. Fig. 3 represents a section of the blind and sill, with the fastener in elevation.

The fastener is attached to the under surface of the



PETTINGILL'S SHUTTER-FASTENER.

blind and is composed of only two parts—a plate held in position by screws, and a rod or spindle rotating in a socket in the plate.

The plate is provided at its sides with stops, one of which is designed to engage the staple on the window-sill, and the other of which is designed to engage a corresponding staple or fixture on the wall of the building, both stops serving the purpose of limiting the swinging movement of the blind.

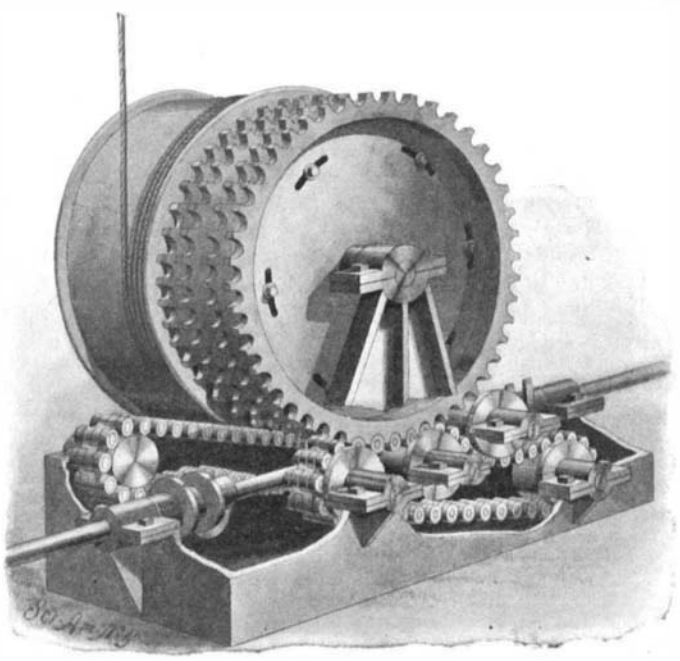
The rotating rod or spindle is provided at its ends with arms carrying on their under surfaces lugs, beveled so as to ride over the staples. The arms and lugs are heavy enough to swing the spindle downwardly, to permit their engagement with the staple.

As the blind is swung inwardly, the lug on the inner arm strikes the staple on the window-sill, rises as it rides over the top of the staple, and falls by its own weight and that of its arm to the position shown in Figs. 1 and 3. The inner stop at the same time engages the staple and arrests the blind. The blind is now locked by the stop on one side and the lug on the other. To release the shutter it is necessary merely to lift the arm and turn the spindle upwardly. To limit the drop of the spindle, the socket in the plate is recessed (Fig. 2) to receive a stop on the spindle, of smaller width than the diameter of the recess.

The device can be cheaply made, consisting as it does of but two pieces of cast metal. From a working model loaned to us by the patentee, the device seems to be very efficient in its operation.

A WORM AND CHAIN DRIVING-GEAR FOR ELEVATORS.

To provide a worm and chain driving-gear for elevators and hoisting machinery which will avoid the objections raised against devices of a similar nature is the purpose of an invention for which a patent has been granted to Mr. Daniel Corcoran, of Yonkers, N. Y.



A NEW DRIVING-GEAR FOR HOISTING-DRUMS.

Mr. Corcoran's gear, as our illustration shows, comprises a right worm and a left worm secured to a common shaft. Each worm is engaged by a chain passing about two flanged guide-pulleys and meshing with toothed disks secured to the hoisting-drum. The links of these two chains are of Z-shape, being composed of two sections offset from each other and pivoted together. The pivot-pins carry rollers which are the portions of the chains which enter the grooves formed by the threads of the worms. The chains are firmly held up against the worms by thrust-disks bearing against the outer edges of the chains and turning on their pivots.

Power being applied to the worm-shaft in any suitable manner, the worms will engage the link-rollers, causing the chains to travel over their guide-pulleys and to rotate the toothed disks to which the hoisting-drum is secured. The chains, it will be seen, are so driven by the oppositely threaded worms and conducted by the guide-pulleys that both are caused to rotate the drum in the same direction. The lower guide-pulley of each chain dips within an oil-box constituting the base of the gear. By this means the chains are thoroughly lubricated.

Owing to the use of right and left worms, the end thrust is taken up by the chains and thereby neutralized. The chains, moreover, are so arranged that they lie on opposite sides of the worm-shaft.

It is desirable that one of the toothed disks be adjustable so as to regulate the strain upon the two chains. For this purpose the inventor has provided segmental slots in one of the disks, which disk is not rigidly secured to the drum-shaft, but is held in place by bolts passing through the slots and fastened to the adjacent disk.

AN AMATEUR'S CAMERA FOR PHOTOGRAPHING IN NATURAL COLORS.

The camera illustrated herewith for photographing in natural colors was devised by M. L. Ducos du Hauron for the use of amateur photographers, and it is said to give very satisfactory results.

The principle upon which it operates is well known, and consists simply of making three negatives through three colored screens, blue, green and red.

To accomplish this, the box, *F*, of the camera is divided into three compartments, one above the other, and each having a separate lens. The box, *A*, containing the three mirrors, M^1, M^2 and M^3, set at an angle of 45°, is slipped into a groove, *L*, in front of the lenses. The mirrors face the lenses, and the image is projected upon them by a fourth mirror, *M*, also set at 45°, but in the inverse direction, in the top of the box. The first two mirrors, M^1 and M^2, are transparent, and reflect only a part of the luminous rays, allowing the rest to pass through and be reflected by the silvered mirror, M^3.

By means of this arrangement, each lens, although receiving only part of the luminous rays emanating from the object being photographed, throws an exact image of it on the sensitive plate at the back. A frame, *E*, slides into the groove, *H*, in front of the plate-holder containing the sensitive plate. In this frame are the three colored glasses, the blue at the top, the green in the middle, and the red at the bottom. The plate-holder shown at the top of the illustration is of the ordinary kind, and made to hold a single plate of the proper size to receive all three images. The use of isochromatic plates is indispensable for this kind of photography and as these plates are very sensitive, it is necessary to take every precaution and not expose them to the red light during development any more than is absolutely necessary.

It will be noticed that the blue screen—the one through which the most actinic light passes—is the one to receive the first reflection of light coming from the object, and consequently the most intense reflection. The red glass, on the contrary, receives only the light that has not passed through the others. As the result of this, the upper image is always too brilliant; but the inventor has remedied this by placing a horizontal yellow screen with a small hole in the center between the first mirror which reflects the object and the first transparent glass. By this arrangement, the greater part of the blue rays are stopped, as they can only pass through the small hole, while the other rays are in no way hindered by the yellow screen, and are reflected by the other mirrors through their respective lenses.

In order to prevent any halation it is well to coat the back of the plates with a special "backing." There are several formulas for this, but, in order to have it easy to apply, M. Ducos du Hauron has invented a slightly sticky composition having all the properties of an efficacious "backing," and which can be spread on sheets of paper. These are cut the proper size and stuck on the back of the plate before placing it in the camera. The "backing" can be removed from the plate before development by taking one corner of the sheet and carefully pulling it off, after which it can be used again on another plate if desired.

The focusing is done very simply, in much the same way as with an ordinary camera. Two of the mirrors are covered, so that but one image is thrown on the ground glass in order to avoid confusion. The ground glass frame is slipped in the plate-holder groove in the regular manner, and the tri-color frame removed.

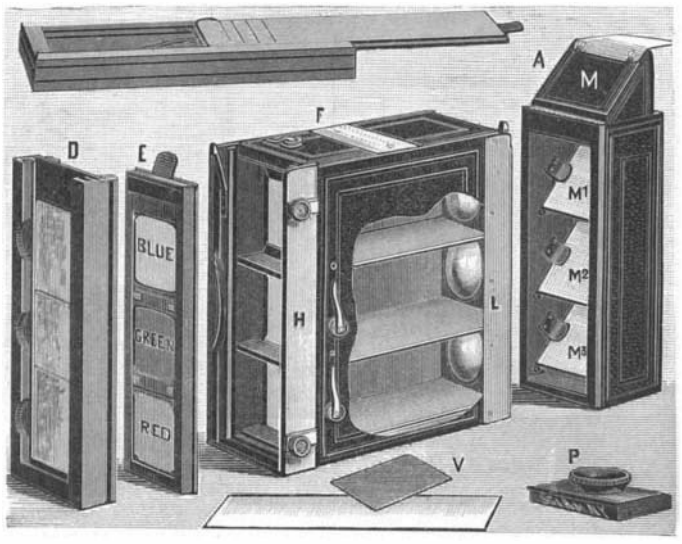
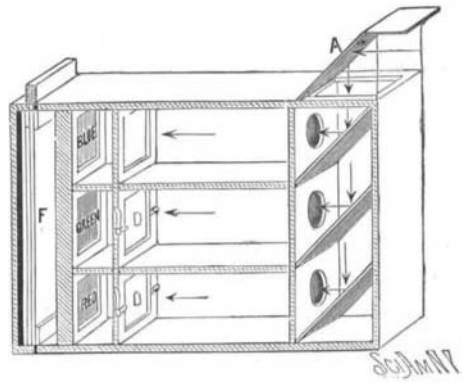


Fig. 1.—M. DUCOS DU HAURON'S APPARATUS FOR PHOTOGRAPHY IN COLORS.

Then the operator can focus as with an ordinary camera, and move the frame, *H*, backward or forward a short distance by means of a rack and pinion.

It will be seen from the above description that the negative can be made as easily as with an ordinary camera, and by any amateur. The positive is obtained still more easily by contact, and any good lantern slide or stereoscopic chloride plates may be used. It is always well, however, to back them while making the exposure, in order to prevent the slightest halation.

Upon developing the positive, three transparencies on one plate will be obtained, in which the clear portions of each correspond to the opaque parts of its respective negative. If the plate thus obtained be slipped into the open frame, *D*, and the latter be placed in the groove which held the plate-holder when making the negative, i. e., the groove just behind the colored screens, each image will be properly colored proportionally to the quantity of light which acted upon the sensitized plate.



SECTION OF THE CAMERA.

To view the image obtained, the receiving mirror, *M*, is removed and replaced by a small eyeglass, *P*, and the camera is held near a window with its back at an angle of about 45° with the horizon, as is shown in Fig. 2. A ground glass, *V*, slipped in a groove in front

Fig. 2.—USING THE CAMERA FOR VIEWING THE POSITIVE IN COLORS.

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.

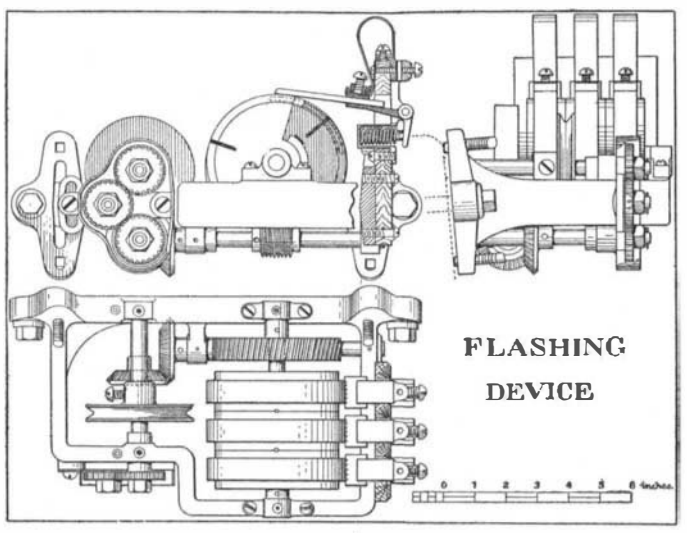
Among the vessels which are engaged in the Atlantic coasting trade and all that have occasion to pass by the coast line of North Carolina, there is a wholesome dread of the dangers of navigation off Cape Hatteras. Scattered throughout the oceans and seas of the world are to be found several localities whose fatal list of casualities 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 furtile 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 masthead lights 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 1⅛-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 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.



FLASHING DEVICE FOR THE NEW CAPE HATTERAS LIGHTSHIP.

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 $168,500.

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 temporararily 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.