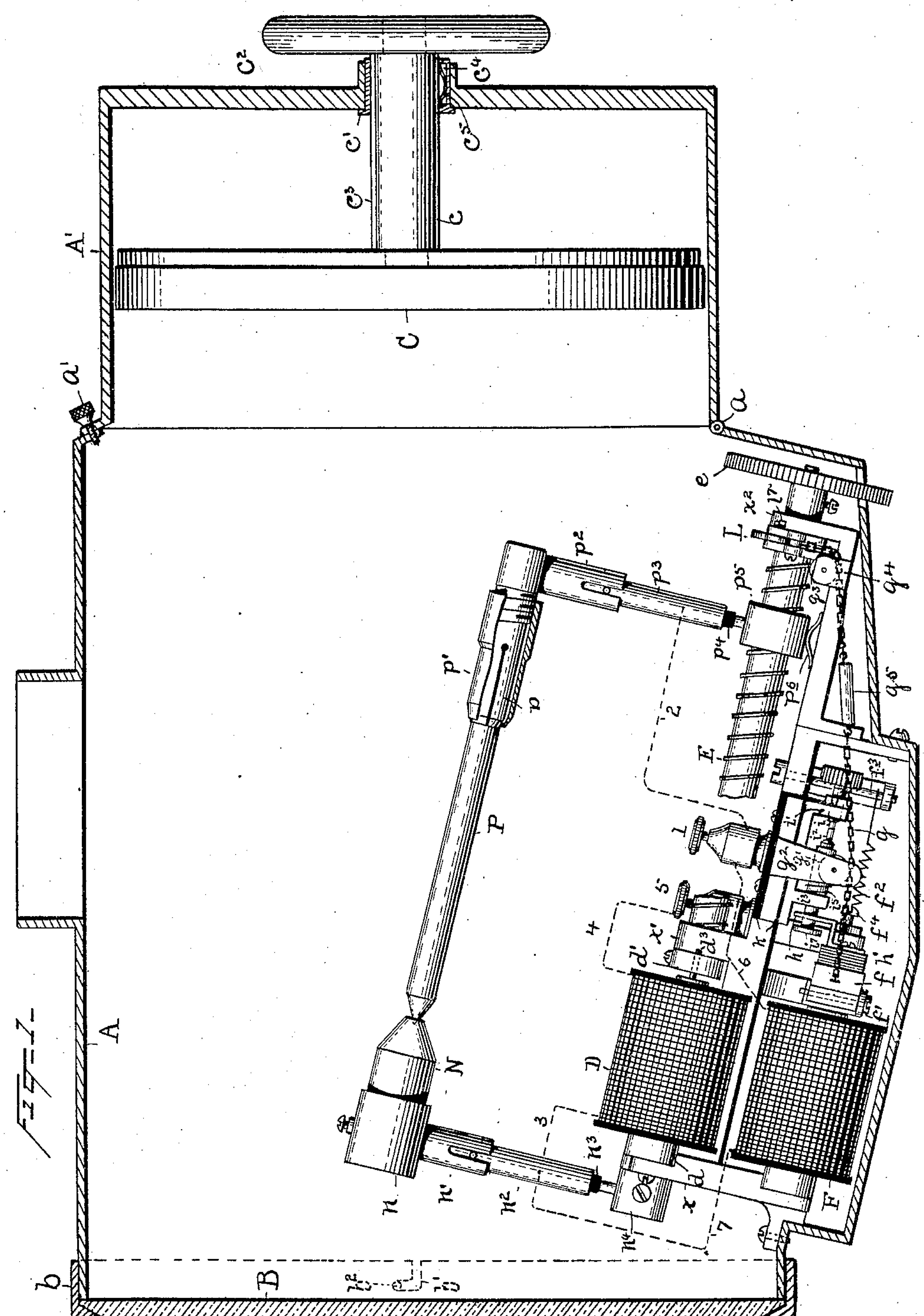
(No Model.)

2 Sheets—Sheet 1.

A. E. COLGATE.
SEARCH LIGHT.

No. 573,962. Patented Dec. 29, 1896.



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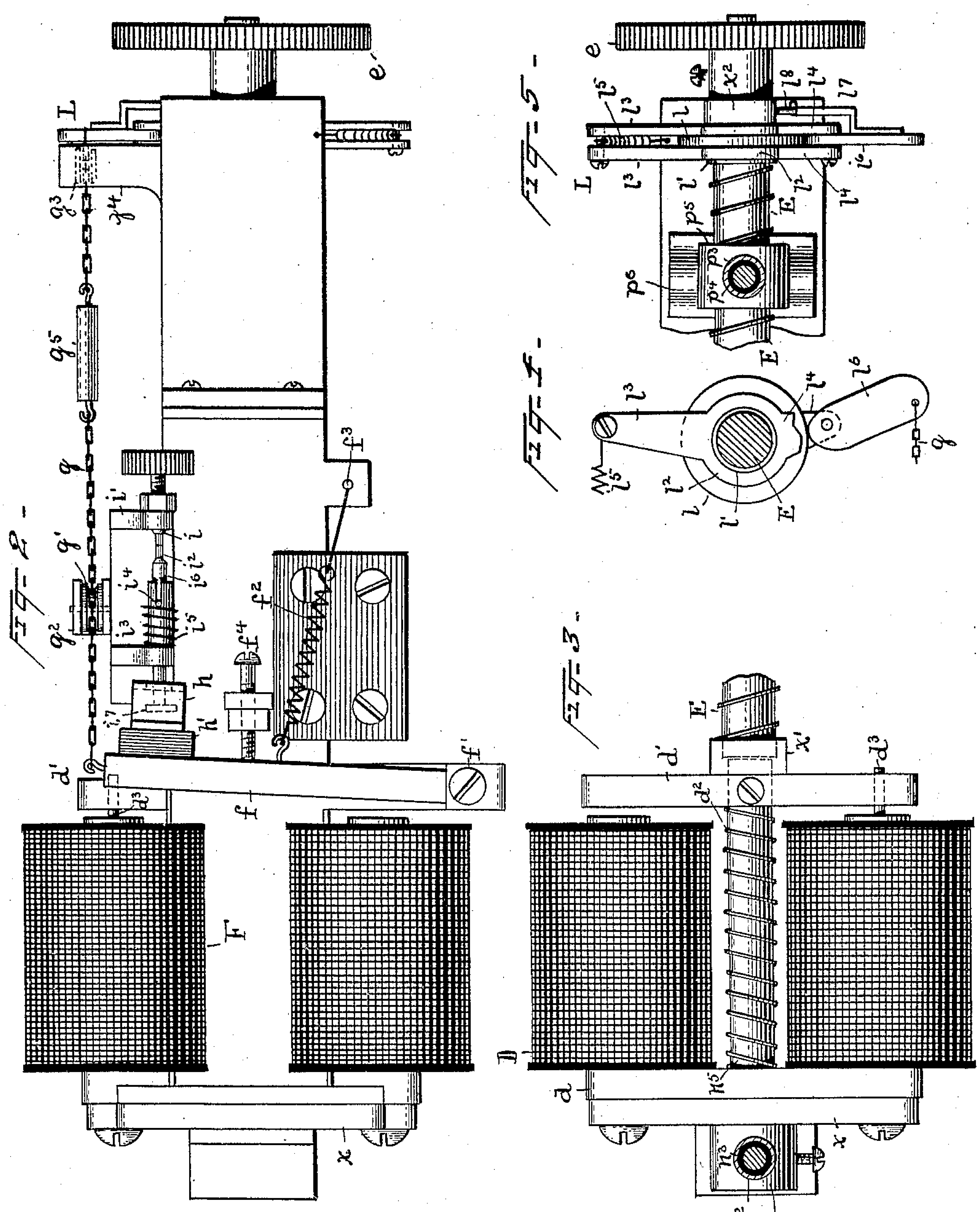

Witnesses
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ARTHUR E. COLGATE, OF NEW YORK, N. Y., ASSIGNOR TO GEORGE J. SCHOEFFEL, OF BROOKLYN, NEW YORK.

SEARCH-LIGHT.

SPECIFICATION forming part of Letters Patent No. 573,962, dated December 29, 1896.

Application filed December 24, 1895. Serial No. 573,178. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR E. COLGATE, a citizen of the United States, residing at New York city, in the county and State of New York, have invented a certain new and useful Improvement in Search-Lights, of which the following is a specification.

The object of my invention is to produce a search-light which will be of comparatively little weight, to enable the apparatus to be readily carried about, and one which will be cheap in construction and simple and effective in operation. One of the main objections to search-lights as heretofore constructed is the heavy weight, making the apparatus necessarily a stationary fixture. Furthermore, they have been very expensive, and mainly on account of these two objections search-lights have not gone into extensive use on vessels outside of naval ships. Vessels engaged in transportation do not require powerful search-lights capable of throwing a beam of light a long distance, as is done by the search-lights at present in use, but what they require is a search-light capable of throwing a beam of light about half a mile, which would be sufficient for all purposes, and particularly in entering harbors. Such a light should also be comparatively light and portable, in order that the apparatus may be readily carried about from place to place on a vessel, as circumstances may require. Such a search-light I have produced, and is illustrated in the accompanying drawings, in which—

Figure 1 is an elevation of the arc-lamp apparatus of my search-light, the casing being shown in section. Fig. 2 is a bottom view of the arc-lamp apparatus. Fig. 3 is a detail view of the magnet for striking the arc, and Figs. 4 and 5 are details of the clutch mechanism for operating the feed mechanism.

Referring to Fig. 1 of the drawings, A represents the casing, and B the glass cap, held in place by a ring b, which is provided with a series of slots b', which engage with pins b^2 on the casing, forming a bayonet-joint for holding the glass B in place. The rear of the casing A is provided with a hinged cap A′, hinged at the under side at a and provided with a screw or catch a' at the top for locking the cap. Within the cap A′ is contained the mirror C, which is carried by a slide c, working through a sleeve c' at the back of the cap A′. On the outer end of the slide c a handle c^2 is provided for adjusting the mirror. The slide c is provided with a spline c^3, which works in a channel cut in the sleeve c' to prevent the slide from turning. The sleeve c' is also provided with a groove c^4, in which is a spring c^5, pressing against the slide. The slide works freely through the sleeve c', and the spring c^5 is provided to prevent the slide from wabbling in the sleeve. By providing the cap A′ the parts of the arc-lamp are made readily accessible.

The arc-lamp mechanism is situated lengthwise in the casing with the carbons at an angle to the mirror, as indicated in Fig. 1, the center of the arc being coincident with the center of the mirror.

P and N are the positive and negative carbons of the lamp, the negative carbon being shown as quite short and considerably larger in diameter than the positive carbon. By providing a negative carbon which is much larger in diameter than the positive carbon the reduction in its length due to the consumption of the carbon is relatively slow, and hence the arc remains practically in line with the center of the mirror. A further advantage in having one carbon larger in diameter than the other is that in the consumption of the larger one a concave surface is produced which acts to reflect the light, and when placed in the position shown in Fig. 1 the larger carbon will be consumed more rapidly on its upper side, resulting in an inclined concave surface which reflects the light toward the center of the mirror. The arrangement of the carbons illustrated also results in a long arc which causes the carbon of smaller diameter to be consumed in such manner as to produce a long slender point, which allows the larger carbon to reflect the light-rays into the mirror with less obstruction. The carbon of smaller diameter is more rapidly consumed by this arrangement, but since their cost is quite small and since it is desirable to have the mirror throw as strong a beam of light as possible this objection is more than counterbalanced.

The negative carbon is carried by the clamp n, which is provided with a split sleeve n', fitting over a stem n^2. The stem n^2 is made in two parts insulated from each other by a sleeve of insulating material n^3, the whole being carried by the collar n^4, mounted upon a sliding rod n^5, Fig. 3. This rod slides through the end piece x of the frame and through the yoke d of the series magnet D, whose armature d' is rigidly secured to the rod n^5. Between the yoke d and the armature d' is a spiral spring d^2, and the free end of the rod n^5 has a bearing in the piece x' of the frame.

The magnet D is in series with the arc, and when the current is turned on this magnet is energized, causing it to attract its armature d', which moves the rod n^5 to the left, carrying the negative carbon with it, separating the carbons and striking the arc. To prevent the armature d' from rotating, I provide a brass pin d^3, which is inserted into the core-piece of the magnet and passes through a hole in the armature, thus acting as a guide and preventing the rotation of the armature, and hence holding the negative carbon in line with the positive carbon.

The positive carbon P is carried by a holder consisting of a split sleeve p and a clamping-collar p', which engages with the screw-thread on the sleeve p, as indicated in Fig. 1. The sleeve p has an extension in the form of a split sleeve p^2, similar to the sleeve n' of the negative-carbon holder, and the sleeve p^2 fits over a stem p^3, insulated by a sleeve p^4, the whole being carried by a collar p^5, provided with an internal screw-thread and traveling on the feed-screw E. To prevent the positive carbon moving laterally and to prevent the collar p^5 rotating on the feed-screw, I provide a spring-foot p^6, which extends crosswise of the frame.

The feed-screw E is carried in the bearings x' and x^2 of the frame and has a thread of long pitch. This feed-screw is provided with a hand feed-wheel e, rigidly secured thereto, and for automatically operating the feed-screw I provide a clutch mechanism, which is operated by a shunt-magnet F, carried underneath the series magnet D and supported by the end piece x of the frame. The armature f of this magnet is pivoted at one end at f', Fig. 2, and at the free end has attached to it a chain g, connecting with the clutch mechanism L, which will be hereinafter described. The chain g passes under a sheave g', carried by the bracket g^2, and under a sheave g^3, carried by a bracket g^4, and in the chain is inserted a turnbuckle g^5 to take up the desired amount of slack in the chain. The armature f is drawn away from the magnet F by a spiral spring f^2, the tension of which is adjustable by means of a screw f^3, to which one end of the spring is attached. The movement of the armature away from its magnet is limited by a stop-screw f^4, and at the free end of the armature is carried a fork h, insulated from the armature by a block of insulation h'. The fork h operates a circuit-controller in the shunt-circuit. This circuit-controller consists of an adjustable stationary contact i, carried by the bracket i', and a spring-pressed movable contact i^2, carried by the bracket i^3, having a sleeve within which the stem i^6 of the contact i^2 slides, and this stem is provided with a pin i^4, between which and the bracket i^3 is a spiral spring i^5, which tends to hold the contacts i and i^2 in contact. At the end nearest the armature f the stem i^6 is provided with a head i^7, with which the fork h of the armature engages. As shown, the fork h is free to move a short distance before it engages the head i^7, when the armature f is attracted by its magnet. The movement of the armature f toward its magnet gradually accelerates, and the object of the free movement between the fork h and the head i^7 is to have the fork engage the head only when the armature is moving quite rapidly. Thus the opening of the shunt-circuit will be with a quick snap, reducing the spark at the contacts. Heretofore in opening a shunt-circuit by the movement of the armature of the shunt-magnet one of the contacts was carried either directly by the armature or operated directly by the armature, so that the contacts separated so soon as the armature began to move, which resulted in a slow separation of the contacts. On the return movement of the armature through the spring f^2 the armature moves very rapidly, and since the tension of the spring f^2 is considerably greater than that of the spring i^5 the fork h and head i^7 will separate, leaving the spring i^5 free to force the contact i^2 against the contact i without interference. Thus the shunt-circuit is closed by a quick snap and independently of the movement of the armature f. The brackets i' and i^3 are insulated from the main frame by sheets of insulating material k, Fig. 1.

The clutch mechanism L (illustrated in detail in Figs. 4 and 5) consists of a flange l, having the hub l' surrounding the feed-screw E and to which it is rigidly attached. On each side of the flange l, and working on the hub l', are two collars l^2, having long arms l^3 on one side of the shaft and short arms l^4 on the other side. The long arms l^3 are connected together by a screw, between which and the frame of the machine a spring l^5 is attached. Pivoted between the short arms l^4 is a cam-lever l^6, to which the chain g is attached. When the armature f is attracted by its magnet, the chain g is drawn forward, which action pulls the lever l^6 downward, tilting the same on its pivot and causing its cam edge to impinge against the flange l, and the continued forward movement of the chain g causes the shaft E to be rotated through the engagement of the flange l and the lever l^6.

This movement tilts the long arms l^3 upward, placing the spring l^5 under increased tension, and when the pull on the armature f is released the spring l^5 returns the clutch mechanism to its normal position. The lever l^6 is provided with a finger l^7, which engages with a pin l^8 on the bearing x^2. The object of finger l^7 and pin l^8 is to throw lever l^6 out of engagement with flange l when the parts are returned to their normal positions in order that the hand-feed may be operated, if necessary.

The circuit connections are as follows: from binding-post 1 by wire 2 to stem p^3 to positive carbon, to negative and stem n^2 and by wire 3 through the series magnet D and wire 4 to binding-post 5. The shunt-circuit is from binding-post 1 by wire 6 to shunt-magnet F and wire 7 to stem n^2.

The operation of the apparatus is as follows: When the current is turned on, the series magnet D is energized, which, as before explained, draws the negative carbon away from the positive carbon and strikes the arc. When the resistance of the arc increases, the shunt-magnet F will become sufficiently energized to attract its armature f, (the shunt-circuit being closed at the contacts i and i^2,) and the movement of the armature f actuates the clutch mechanism which rotates the feed-screw E, feeding collar p^5 forward and advancing the positive carbon. When the armature f is near the end of its forward movement and when its rate of movement is accelerated, the fork h engages the head i^7 and opens the shunt-circuit. The spring f^2 then retracts the armature f, permitting the shunt-circuit to close again through the action of spring i^5, and this action is repeated when the resistance of the arc increases again through the further consumption of the carbons.

What I claim is—

1. In an arc-lamp, the combination with the carbons, one of which is held stationary when the arc is formed and the other being movable, of a feed-screw for said movable carbon, a clutch for said feed-screw, a shunt-magnet for operating said feed-screw through said clutch, a circuit-controller in the shunt-circuit operated by the armature of said shunt-magnet to open the circuit, and means for operating said controller to close the circuit independently of the movement of the armature, substantially as set forth.

2. In an arc-lamp, the combination with the carbons and a feed-screw therefor, of a clutch for said feed-screw, said clutch consisting of a circular flange and a pivoted arm having a cam edge for engaging the periphery of said flange, a shunt-magnet, and a connection between said pivoted arm and the armature of said magnet whereby when the armature moves in one direction the pivoted arm is caused to grip the circular flange and rotate the feed-screw, substantially as set forth.

3. In an arc-lamp, the combination with the carbons and a feed-screw therefor, of a clutch for said feed-screw, said clutch consisting of a circular flange and a pivoted arm having a cam edge for engaging the periphery of said flange, a shunt-magnet for actuating said pivoted arm to rotate the feed-screw, separate means for operating said feed-screw by hand, and means for normally holding said flange and pivoted arm out of engagement to permit the operation of the hand-feed, substantially as set forth.

4. In an arc-lamp, the combination with the carbons and a feeding device therefor, of a clutch operated by a shunt-magnet for automatically actuating said feeding device, separate means for operating said feeding device by hand, and a finger l^7 engaging a stationary stop l^8 for throwing said clutch out of engagement in its normal position to permit the operation of the hand-feed, substantially as set forth.

5. In an arc-lamp, the combination with the carbons and a feeding device therefor, of a series magnet for striking the arc, said magnet having an armature carried by a spring-pressed sliding rod, a carbon-holder for one of the carbons extending out to one side of said sliding rod, and a stationary non-magnetic pin projecting from one of the poles of said magnet and with which said armature engages for preventing lateral movements of the carbon-holders, substantially as set forth.

6. The combination with an arc-lamp, of a shunt-magnet for operating the feeding mechanism for the carbons, and a circuit-controller for the shunt-magnet comprising a stationary contact, a laterally-moving contact engaging therewith operated by the armature of the shunt-magnet when near the end of its movement, and a spring surrounding said movable contact to close the circuit independent of the movement of the armature away from its magnet, substantially as set forth.

7. In carbon-holders for arc-lamps, the combination with the holder or clamp, of a split sleeve upon which the holder is mounted, an insulated stem or rod upon which said sleeve is forced, and a pin carried by said stem which enters slots in said sleeve to prevent the sleeve turning on said stem, substantially as set forth.

8. In carbon-holders for arc-lamps, the combination of a split sleeve p in which the carbon is placed, a clamping-collar p' engaging over said split sleeve p for clamping the same on the carbon, a split sleeve p^2 secured to the split sleeve p, and an insulated stem p^3 engaging within said split sleeve p^2, substantially as set forth.

9. In a search-light, the combination of a casing, a reflector in said casing, an arc-lamp whose carbons are arranged obliquely and lying in a plane at right angles to the reflector, one of said carbons being held stationary

when the arc is formed and the other being movable, of a feed-screw for said movable carbon, a clutch for said feed-screw, a shunt-magnet for operating said feed-screw through said clutch, a circuit-controller in the shunt-circuit operated by the armature of said shunt-magnet to open the circuit, and means for operating said controller to close the circuit independently of the movement of the armature, substantially as set forth.

This specification signed and witnessed this 21st day of December, 1895.

ARTHUR E. COLGATE.

Witnesses:

W. PELZER,

EUGENE CONRAN.