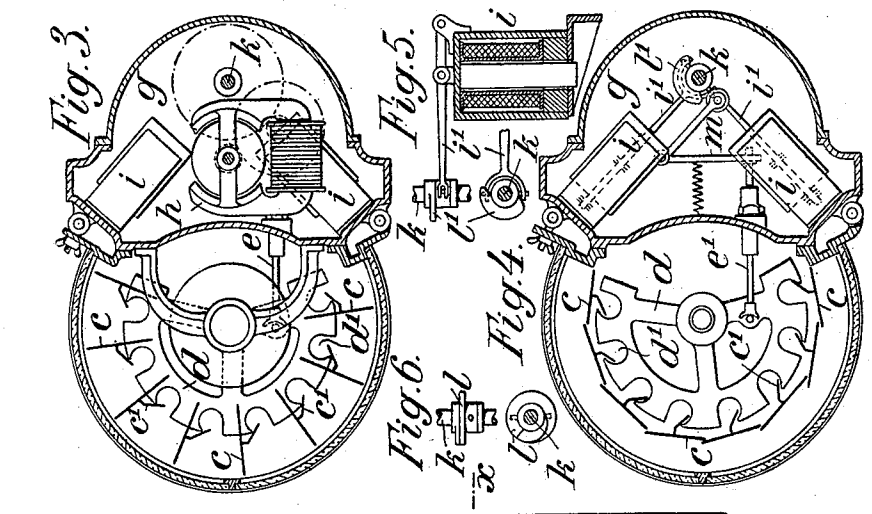
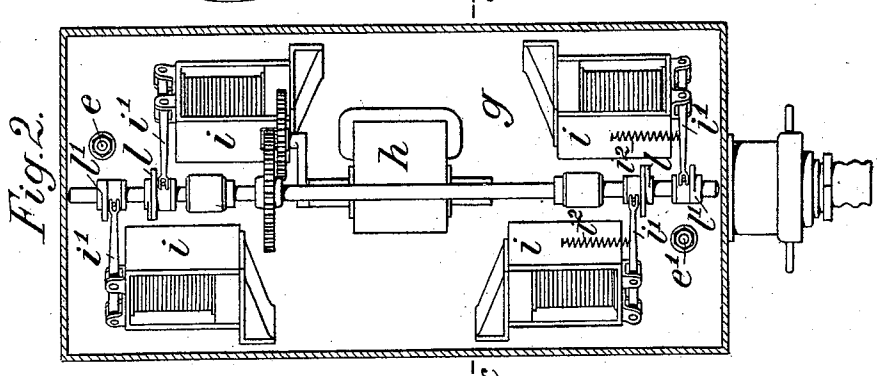
(No Model.) 5 Sheets—Sheet 1

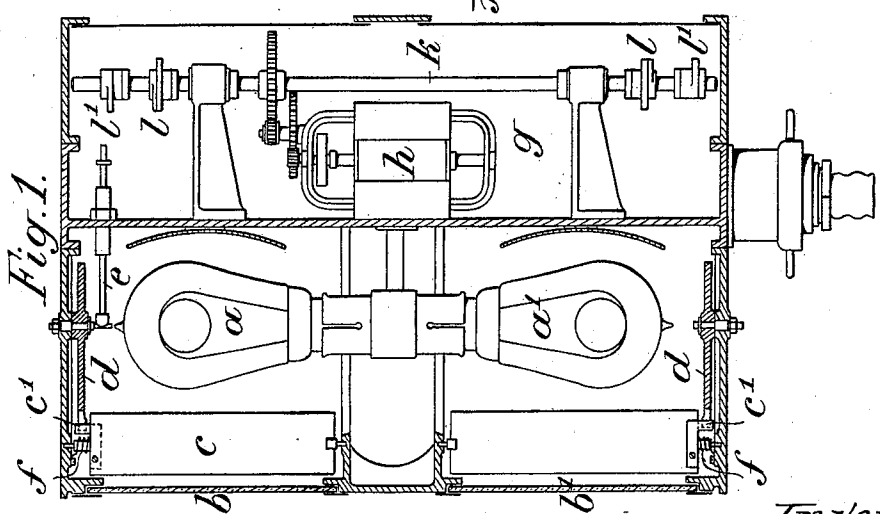
L. SELLNER.

SIGNALING BY MEANS OF LIGHTS.

No. 568,374. Patented Sept. 29, 1896.







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(No Model.) 5 Sheets—Sheet 2.

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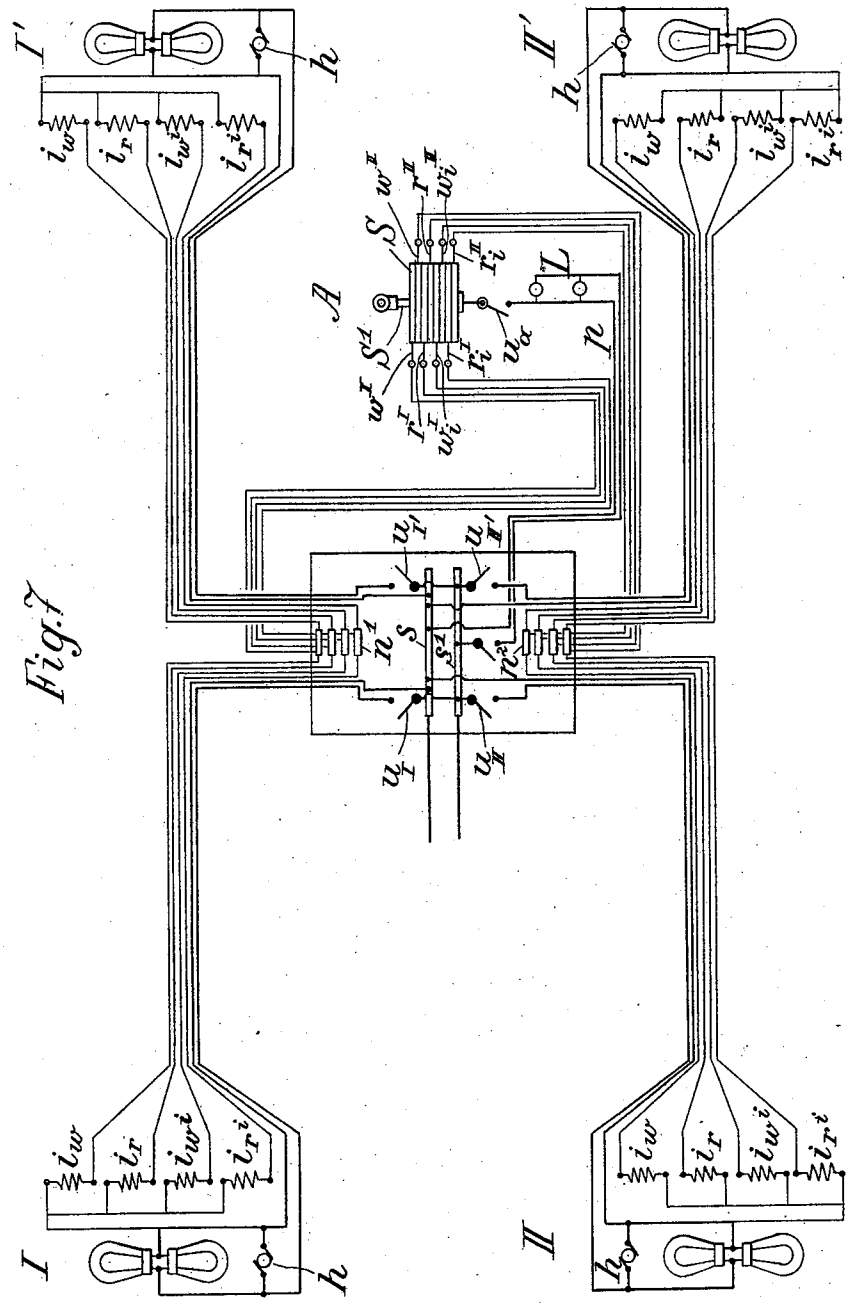

Fig. 1.

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(No Model.) 5 Sheets—Sheet 3.

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Fig. 8a

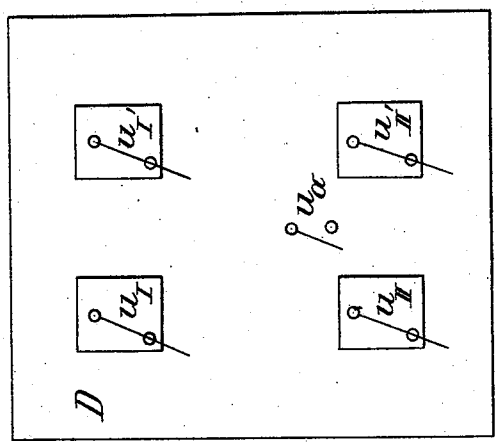
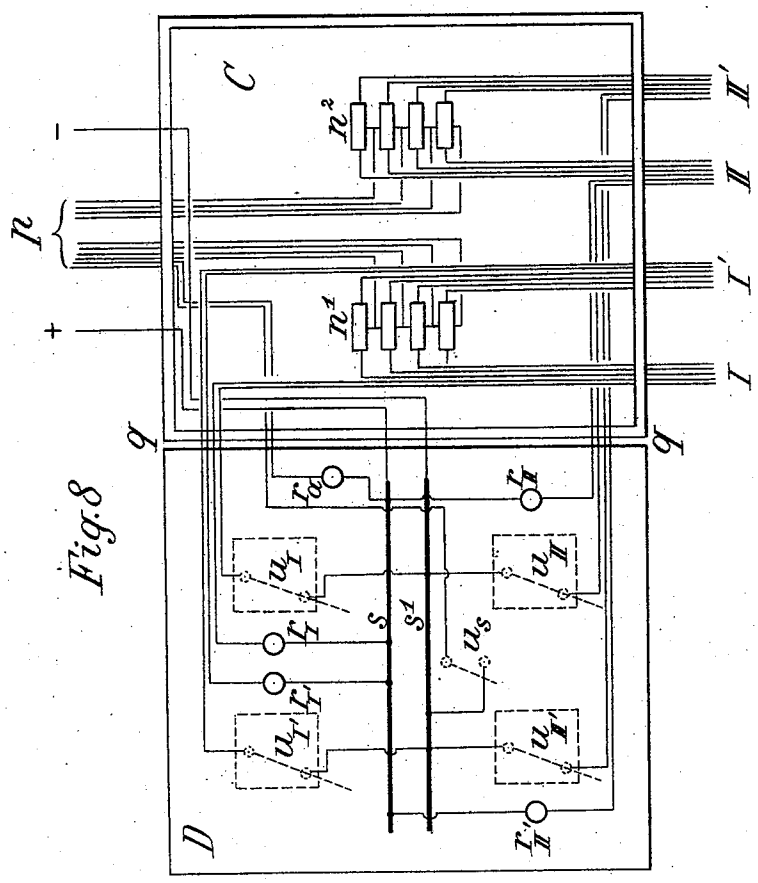


Fig. 8



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(No Model.) 5 Sheets—Sheet 4.

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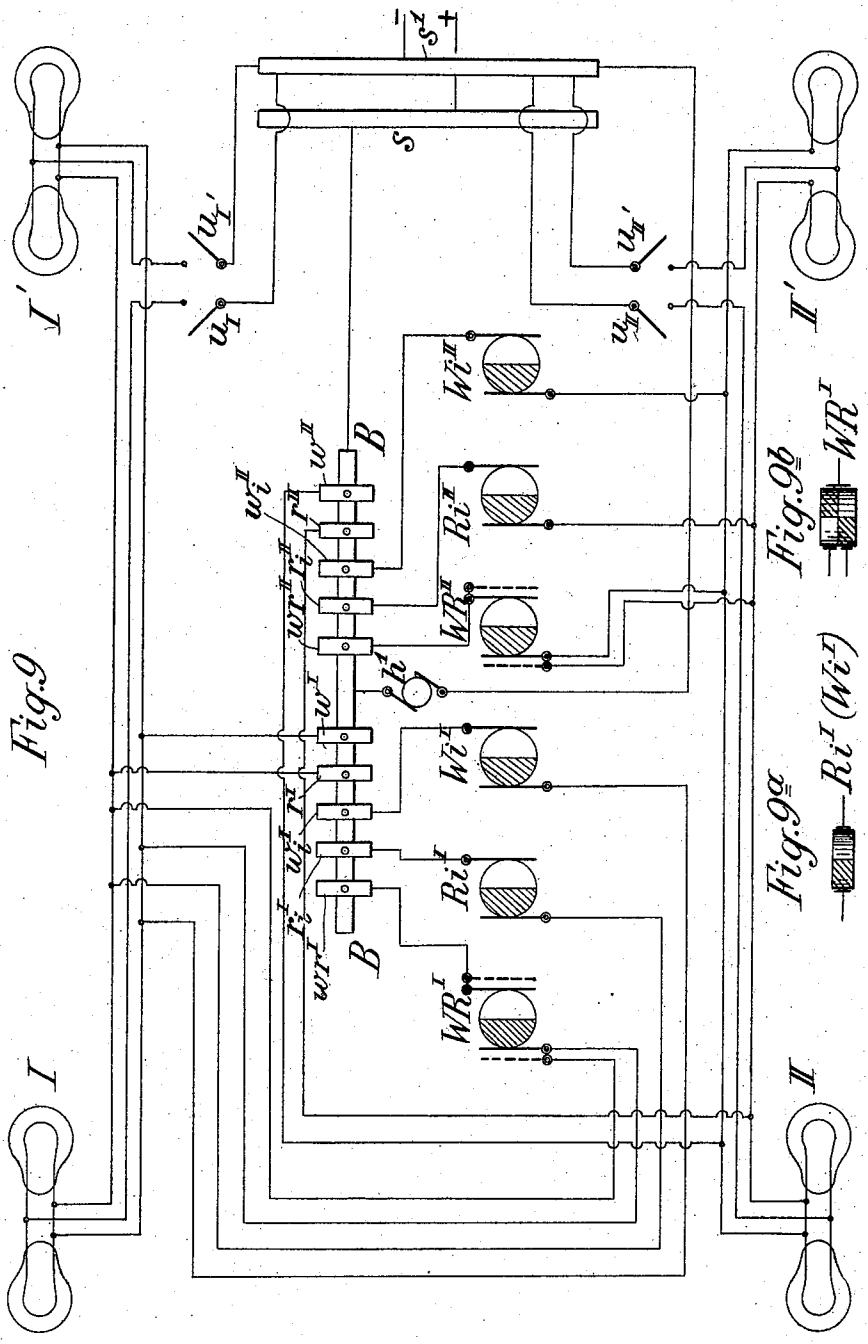

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(No Model.) 5 Sheets—Sheet 5.

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SIGNALING BY MEANS OF LIGHTS.

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Fig. 10.

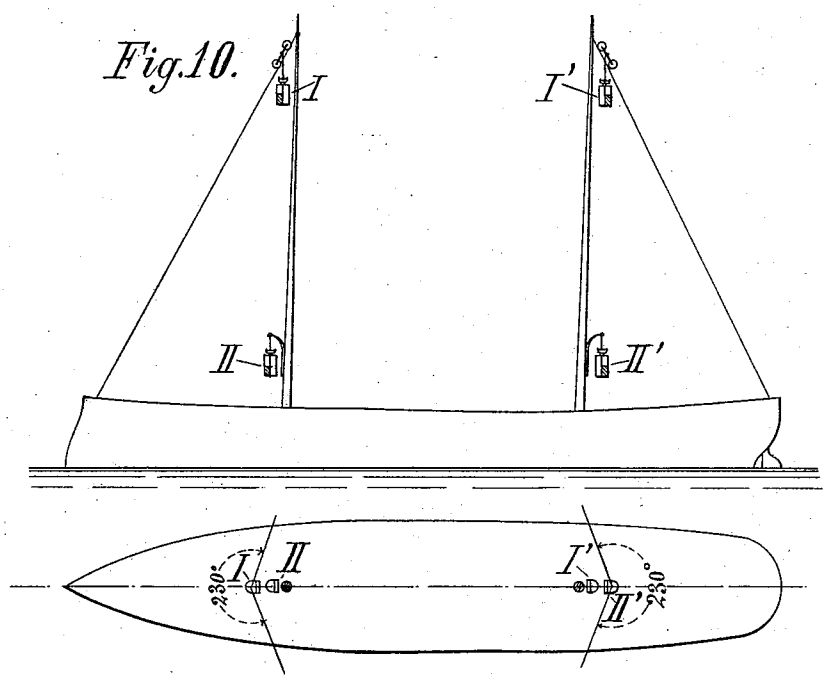
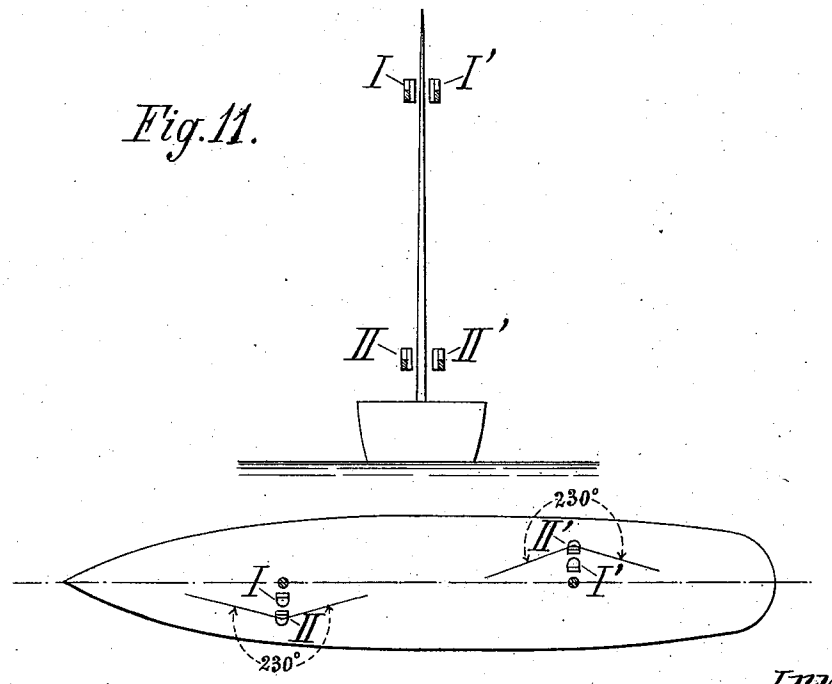


Fig. 11.



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UNITED STATES PATENT OFFICE.

LEOPOLD SELLNER, OF VIENNA, AUSTRIA-HUNGARY.

SIGNALING BY MEANS OF LIGHTS.

SPECIFICATION forming part of Letters Patent No. 568,374, dated September 29, 1896.

Application filed November 19, 1895. Serial No. 569,441. (No model.) Patented in Germany August 9, 1894, No. 81,144; in France August 11, 1894, No. 240,693; in Austria November 27, 1894, No. 44/6,119, and in Italy December 31, 1894, XXIX, 37,743, and LXXIV, 75.

To all whom it may concern:

Be it known that I, LEOPOLD SELLNER, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Apparatus for Signaling by Means of Sources of Light, (for which Letters Patent have been obtained in the following countries, to wit: In Austria, dated November 27, 1894, registered Vol. 44, Fol. 6,119; in Germany, dated August 9, 1894, No. 81,144; in France, dated August 11, 1894, No. 240,693, and in Italy, dated December 31, 1894, Reg. Gen. Vol. XXIX, Fol. 37,743, Reg. Att. Vol. LXXIV, Fol. 75;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Hitherto there have been employed for signaling at night, and in particular for signaling-stations that change their locality, such as ships, one or more sources of light, and in the latter case always more than two, which are so arranged that in the case of a single light long and short flashes of white light, or for better and easier legibility flashes of white and red light, are transmitted to the observer, while in the case of several sources of light groups of white and red lights are employed, which latter method has the great advantage that the signals can be kept visible for any desired length of time, on which account they are termed "continuous" signals. For producing such signals, for example, with white and red lights according to a particular code, there are required at least three, but generally four or more, signal-lights. This larger number of lights on the one hand renders the signaling more or less complicated, and on the other hand renders the reading of the signals more difficult, because as not only the strength of the source of light but also the distance of these from each other determine the legibility of the signals, while under existing conditions of space, such as occur, for example, on board ship, there is seldom more than about twenty yards height available, which when divided among the number of signal-lights will at most give about six yards distance between them, so that the distance at which such signals are clearly distinguishable is, for the naked eye, about two nautical miles and with a telescope at most four miles.

My present invention relates to a method of signaling by means of sources of light of any kind, in particular those which are available on moving signal-stations, such as ships, whereby the above-mentioned disadvantages are entirely obviated by the employment of only two signal elements or signal-lanterns placed at the greatest possible distance apart, each of such signal elements being adapted not only for giving white and red light, but also for giving intermittent white and red light, that is to say, lights that are obscured for any desired length of time. Thus in using only lights of two colors, such as white and red, there can be produced in each element for signaling purposes five fundamental or main signals, namely, white, red, intermittent white, intermittent red, and alternate white and red, so that with a single element five different signals can be given, while with two such thirty different combinations suitable for signals can be given. If in certain cases it be desired to still further increase this number of signals, this can be done without increasing the number of elements by using a third color for the lights, or with only two colors by longer or shorter obscurations with the intermittent lights, or by longer or shorter intervals with the alternate white and red lights. The distance apart of such signals can (as there are only two signal-lanterns) be increased to the greatest available extent. Thus for ships it may be equal to the entire available height of the masts, as the one lantern can be at the mast top while the other is at the bottom. The five signals producible by one such signal-lantern are produced in such manner that each signal-lantern, which can contain one or more sources of light, is so divided that the one half serves for giving white light and the other half for giving red light. Both parts

of the lantern can be provided with shutters actuated by mechanical or electrical appliances, and which, according to the position given them by a commutator or transmitter, allow or prevent the passage of the light from the parts of the lantern or cause the same to be transmitted intermittently or alternately, or there may be interposed between the sources of light of each signal-lantern and the commutator semiïnsulated disks, which in rotating produce the signals consisting of intermittent or alternate light effects.

Two such signal-lanterns constitute a signaling-station, and, as before stated, the one is situated at the top of the mast and the other near the deck in the case of ships. The lanterns are preferably arranged rotatable, so that the signals can be rendered visible over the entire horizon or only over part thereof. In the latter case it is advantageous to employ two signal-stations at one and the same locality.

On the accompanying drawings, Figures 1 to 4 show a signal-lantern or signal element for operating according to the above-described method. Fig. 1 shows a vertical longitudinal section of the lantern, and Fig. 2 shows a back view showing the actuating mechanism of the shutter devices. Figs. 3 and 4 show horizontal sections through the lantern on line $x\,x$, Fig. 2, viewed, respectively, upward and downward from the plane of section, as sources of light are taken—for example, electric glow-lamps, which for signaling are provided with shutters actuated by electricity. Figs. 5 and 6 show separate views of parts of the actuating mechanism of the shutters. Fig. 7 shows the diagram of the electrical connections of two signal-stations provided with the described signal elements. Figs. 8 and 8^a show the switchboard arranged for signaling according to this diagram, respectively, in the open and in the closed position. Fig. 9 shows a diagram of connections for those lanterns in which the signals are produced by intermediate rotatable contact-disks in place of the shutters. Figs. 9^a and 9^b are plan views two of these disks. Figs. 10 and 11 show diagrammatically two signal-stations on a vessel in elevation and plan, respectively, each station comprising two cooperative signal elements.

As shown at Figs. 1, 3, and 4, the signal-lantern, which, for example, has two electric glow-lamps, is divided into two halves, of which the one serves for giving white and the other for giving red light. For this purpose the upper lamp a is partially surrounded by a white glass b and the lower one a' by a red glass b'. Around each of the two lamps are arranged in a circle blades c, like louver-boards, forming the shutter device. These blades, which are held in the closed position by springs f, Fig. 1, attached to their axis, project with pins c' into notches d' of an actuating-ring d, which when turned by means of the rod e or e', after overcoming the tension of the springs f, brings the blades into a radial position relatively to the light, so that the latter is then visible to the observer, as at Fig. 3, while by the reverse motion the blades fold over each other and obscure the light, as at Fig. 4.

By suitably actuating the shutter-blades of each light of the one signal element I am enabled with a red and a white light to produce five main signals, namely, as before stated, white, red, white intermittent, red intermittent, and red and white alternately, while in combination with a second signal element thirty combinations available for signals are obtainable.

The movement of the blades can be effected mechanically by means of pulling-cords attached to the rods $e\,e'$, or electrically by the arrangement shown at Figs. 1 to 6, in which case the rods $e\,e'$ are led into the lantern-chamber g at the back, which contains the electromotor h, and four electromagnets i, of which one is shown at Fig. 5. The electromotor rotates by means of toothed gearing an actuating-shaft k, which at its upper and lower ends carries two actuating-cams l and l', the bosses of which are connected with the shaft by feather and groove, so as to rotate with, but at the same time can slide longitudinally upon the same.

The cams l are, as shown at Fig. 6, concentric, while the cams l', Fig. 5, are eccentric to the shaft k, these being shifted in position one hundred and eighty degrees relatively to each other. Each of these four cams is embraced by the forked end of a lever i', carrying the armature of the corresponding electromagnet, and can be shifted on the shaft k on actuating the electromagnet in such manner that the cam is made to act upon a transmission-lever m, pressed by spring action against it, which acts upon the rod e or e'.

The pushing back of the cams out of the reach of the corresponding lever m is effected as soon as the action of the electromagnet ceases by means of the springs i^2, which draw back the armature-levers i'.

The concentric cams l, on the actuation of their electromagnets, hold the shutter-blades open, whereby at top a white light and at bottom a red light can issue from the lantern.

The upper eccentric cam l' produces the white intermittent light by causing the shutters at each revolution of the cam to open and close once. The lower cam l' produces in a similar manner the red intermittent light. If, lastly, both eccentric cams l' are actuated simultaneously by their electromagnets, then, in consequence of their being shifted one hundred and eighty degrees, the alternate white and red light will be obtained as fifth signal. The shutter-blades of the white light are in this case closed, while those of the red light are open, and vice versa.

The current supply to the electromagnets i is effected according to the signal-key chosen by means of a current-distributer, which, ac-

cording to one of the two connection-diagrams at Figs. 7 and 9 for two signal-stations I II, I′ II′, can be a signal-transmitter A, of known construction, and according to the other diagram can be a simple stopper contact device B.

As shown at Fig. 7, the signal-transmitter A consists of separately-insulated contact-rings S, rotatable in their common axis S′, the contact-plates of which, on bringing the signal-transmitter into position for a certain signal, make electric contact with the corresponding spring-contact w^{I} r^{I} $w^{I}{}_{i}$ $r^{I}{}_{i}$ and w^{II} r^{II} $w^{II}{}_{i}$ $r^{II}{}_{i}$. The spring-contacts of the first group are connected to the clamps n', from which the conductors to the upper lamps of the signal-stations I and I′ are branched off, and the spring-contacts of the second group are connected with the clamps n^2, to which are connected the conductors from the two lower lamps of the signal-stations II II′.

The signal-transmitter A is connected by switch U_a and a conductor p, containing an illuminating-lamp L in a shunt, with the collecting-bars S S′, which are connected with the source of electricity by supply and return conductors, and which are in communication with the conductors leading to the signal elements of each station through switches u_I u_{II} u_I' u_{II}', by which these connections can be either made or broken. h is the electromotor in each lantern for actuating the shutter devices, and i_w i_r $i_w i$ $i_r i$ are the electromagnets (indicated in Figs. 1 to 5 generally by i) for actuating the cams l and l'. If, for example, it be desired to produce in both signal-stations I II and I′ II′ the signal combination in the upper lantern white and in the lower one white and red alternating, all the switches u_a u_I u_{II} u_I' u_{II}' are first closed. By this means the two lamps in each signal-station are made to show light and the motors h are set in motion.

In the signal-transmitter, by the rotation of the disks S, the contact is made with the spring w^{I} and also the contact with the springs $w^{II}{}_{i}$ and $r^{II}{}_{i}$, in consequence of which the current will excite the electromagnets i_w in the upper lamps I I′ and the electromagnets $i_w i$ $i_r i$ in the lower lamps II II′. By this means the corresponding shutters for white light will be held open in the upper lanterns, so that such light will be visible, while the two shutter devices of the lower lanterns will be alternately opened and closed, so that the lights will appear alternately white and red.

In place of the signal-transmitter A the stopper contact-switch B of the connection-diagram Fig. 9 can also be used.

Figs. 8 and 8ª show a switchboard suitable for connecting the lanterns of each signaling-station with the signal-transmitter A and the source of current. It consists of a box C, situated near the signaling device, into which are led the conducting-cables from the lanterns I II I′ II′, the connecting-cable p of the signaling device, and the conductors from the source of current, marked, respectively, with "+" and "−."

The four electromagnet-conductors of the lantern-cable of the upper lanterns I I′ are connected to each other by the clamps n' and with the signaling apparatus by the cable p. In the same way the electromagnet-conductors of the lantern-cable of the lower lanterns II II′ are connected together by the clamps n^2 and also with the corresponding conductors of the signaling device.

The cover D of the box, which can open on a hinge q, carries on its inner side the collecting-bars s s', to which are connected the conductors from the source of current. To the bar s are connected the four supply-leads of the lantern-cable, (through the safety-lead fuses r_I r_{II} r_I' r_{II}',) while the return-leads pass through the switches u_I u_{II} u_I' u_{II}' to the collecting-bar s'.

From the bar s branches, through the safety-fuse r_a, the lead to the signal-transmitter, which, by means of its return-conductor with switch u_a, illuminates the signaling device by the lamps L and at the same time also supplies with current through the lantern-cable the lantern-electromagnets that have been put in circuit by the signal-transmitter.

Fig. 9 shows the diagram of connections for two signal-stations, the lanterns of which are arranged to give the before-mentioned main signals and combinations thereof without the use of shutters. In this case the stopper contact-switch B is provided with contacts w^{I}, r^{I}, $w^{I}{}_{i}$, $r^{I}{}_{i}$, and $w^{I}{}_{r}$ for the upper lanterns II′ and with contacts w^{II}, r^{II}, $w^{II}{}_{i}$, $r^{II}{}_{i}$, and $w^{II}{}_{r}$ for the lower lanterns II II′, which contacts give a continuous white, continuous red, intermittent white, intermittent red, and alternate white and red light. The contacts w^{I} r^{I} w^{II} r^{II} are directly connected with the corresponding lamps, so that on stopping the same a white or a red light can be given.

For producing the three other main signals the disks $W^{I}{}_{i}$ $R^{I}{}_{i}$ WR^{I} and $W^{II}{}_{i}$ $R^{II}{}_{i}$ WR^{II}, rotated by the motor h', are introduced into the leads from the corresponding contacts to the lamps. These disks are half made of insulating material, Fig. 9ª, and the disks for alternate white and red light are in addition made double, and are arranged with their conducting parts shifted relatively to each other, Fig. 9ᵇ, so that with corresponding stoppering the current is led through the corresponding disks and the lamp giving red light or that giving white light is intermittently included, or both lamps are alternately included.

The mode of installation of the lanterns, for example, upon a ship can be variously modified for either of the arrangements at Figs. 7 and 9, care being taken that the greatest possible distance between the two lanterns is obtained. The signals can be rendered visible either over the whole horizon or only over a certain part of the same. If the signals are only to be rendered visible

over part of the horizon, each lantern is so arranged that its light is distributed only over a sector of about two hundred and thirty degrees.

For each signaling locality, such as a ship, there are preferably provided two signaling-stations, that is, two pairs of the described signal-lanterns, which, as will be readily understood from the foregoing, can be so actuated that either the same signal can be given in both signal-stations or only the signals of the one station can be worked.

Figs. 10 and 11 show the arrangement of the two signaling-stations for ships with two or more masts, in which the lanterns I II, serving for signaling forward and to one side, say to port, are carried by the foremast, and those I′ II′ for signaling aft and to starboard on the mizzenmast.

I claim—

1. A night signaling apparatus comprising a signaling element composed of two normally-obscured signal-lights of unlike color, and screens adapted to alternately expose said lights to view, or to continuously or intermittently expose the same, for the purpose set forth.

2. A night signaling apparatus comprising a revoluble signaling element composed of two normally-obscured signal-lights of unlike color, and screens adapted to alternately expose said lights to view, or to continuously or intermittently expose the same, for the purpose set forth.

3. A night signaling apparatus comprising two coöperative signaling elements each composed of two normally-obscured signal-lights of unlike color, and screens adapted to alternately expose to view the lights of said elements or to expose one or both lights of each element continuously or intermittently, for the purpose set forth.

4. A night signaling apparatus comprising two coöperative signal elements each composed of two normally-obscured signal-lights of unlike color, said elements located distant from each other and adapted to revolve, and screens adapted to alternately expose the lights of each element to view or to continuously or intermittently expose said lights, for the purpose set forth.

5. A night signaling apparatus comprising two coöperative signal elements each composed of two normally-obscured signal-lights of unlike color, and screens adapted to alternately expose to view the lights of each element, or to continuously or intermittently expose to view one or both lights of each element, or a light of unlike color of the two elements, substantially as and for the purpose set forth.

6. A night signaling apparatus comprising two distant coöperative signaling elements each composed of two signal-lights of unlike color, and shutters normally obscuring the lights of said elements, of electrically-controlled shutter-operating mechanisms, adapted to move said shutters to alternately expose to view the lights of said elements or to continuously or intermittently expose said lights for the purpose set forth.

7. In a night signaling apparatus, the combination with distant signaling elements each composed of two lights of unlike color, an automatically-closing shutter for each of said lights, an actuating device for each of the shutters adapted to open the same against the stress of its spring, a revoluble cam-shaft, and intermediate mechanism actuated by the cams thereon to move the shutter-actuating device, and means whereby any one of the shutter-operating devices may be held in a position to keep the shutters operated thereby continuously or intermittingly open, and whereby shutters for lights of unlike color may be alternately opened, for the purpose set forth.

8. In a night signaling apparatus, the combination with distant signal elements each composed of two lights of unlike color, an automatically-closing shutter for each of said lights an actuating device for each shutter adapted to open the same, and an actuating-rod for each shutter-actuating device; of a cam-shaft, an electric motor geared thereto, cams revoluble with and movable vertically on said shaft and normally out of reach of the actuating-rods of the shutter-operating devices, electromagnets operating to move the cams within reach of said rods, an electric generator and suitable electric connections with the motor, the electromagnets and signal-lights, and appliances whereby any one of the aforesaid electromagnets can be continuously or intermittingly energized and whereby two electromagnets controlling the shutters for unlike lights can be alternately energized, for the purpose set forth.

9. A signal element comprising a lantern provided with glasses of unlike color arranged one above the other, an automatically-closing shutter interposed between the lamps and their glasses, a shutter-opening device for each of said shutters, a revoluble shaft, and intermediate cam-operated mechanism adapted to operate the shutter-opening devices, an electric motor geared with the cam-shaft, a pair of cams on said shaft for each light, and an electromagnet for each cam adapted to shift the same into and out of reach of the intermediate cam-operated mechanism, said mechanisms contained in the lantern, for the purpose set forth.

10. A signal element comprising a lantern composed of a signaling and an auxiliary chamber hinged together, the former having superposed lights of unlike color, an electric lamp and an automatically-closing obscuring-shutter for each light, independent shutter-opening devices, located in said signaling-chamber, a cam-operated actuating-rod for each shutter-opening device extending into the auxiliary chamber; in combination with a cam-shaft, an electric motor geared there-

to, two cams for each actuating-rod revoluble with and having sliding motion on said shaft, and an electromagnet for each cam adapted to shift the same into and out of reach of its actuating-rod, said motor, cam-shaft and electromagnets contained in the auxiliary lantern-chamber, substantially as and for the purpose set forth.

11. An arrangement for signaling by means of two signal-stations each comprising two signal elements I, II and I′ II′, and in combination therewith a circuit-closer composed of four contact-rings S, and with the brushes w^{I} r^{I} wi^{I} ri^{I} and w^{II} r^{II} wi^{II} ri^{II} for each station, said circuit-closer by suitably revolving its rings, adapted to be electrically connected with the four signal elements, which latter in conjunction with their electric motors *h* by closing suitable switches u^{I} u^{II} $u^{I'}$ $u^{II'}$, are supplied with electricity which at the same time energizes electromagnets *iw*, *ir*, iw^{1}, ir^{1}, that operate the obscuring devices in such manner that according to the position of the circuit-closer a light of a given color can be continuously or intermittingly exposed to view, or lights of unlike color exposed to view alternately, substantially as set forth.

12. A night signaling apparatus for vessels, comprising two pairs of similar revoluble signal elements, each element composed of two normally-obscured signal-lights of unlike color, and screens adapted to alternately expose such lights to view, or to continuously or intermittently expose one or both lights of said elements, the latter arranged relatively to one another so that a signal can be seen over or substantially over the entire horizon, for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

LEOPOLD SELLNER.

Witnesses:

LÉON SCHMID,

HARRY BELMONT.