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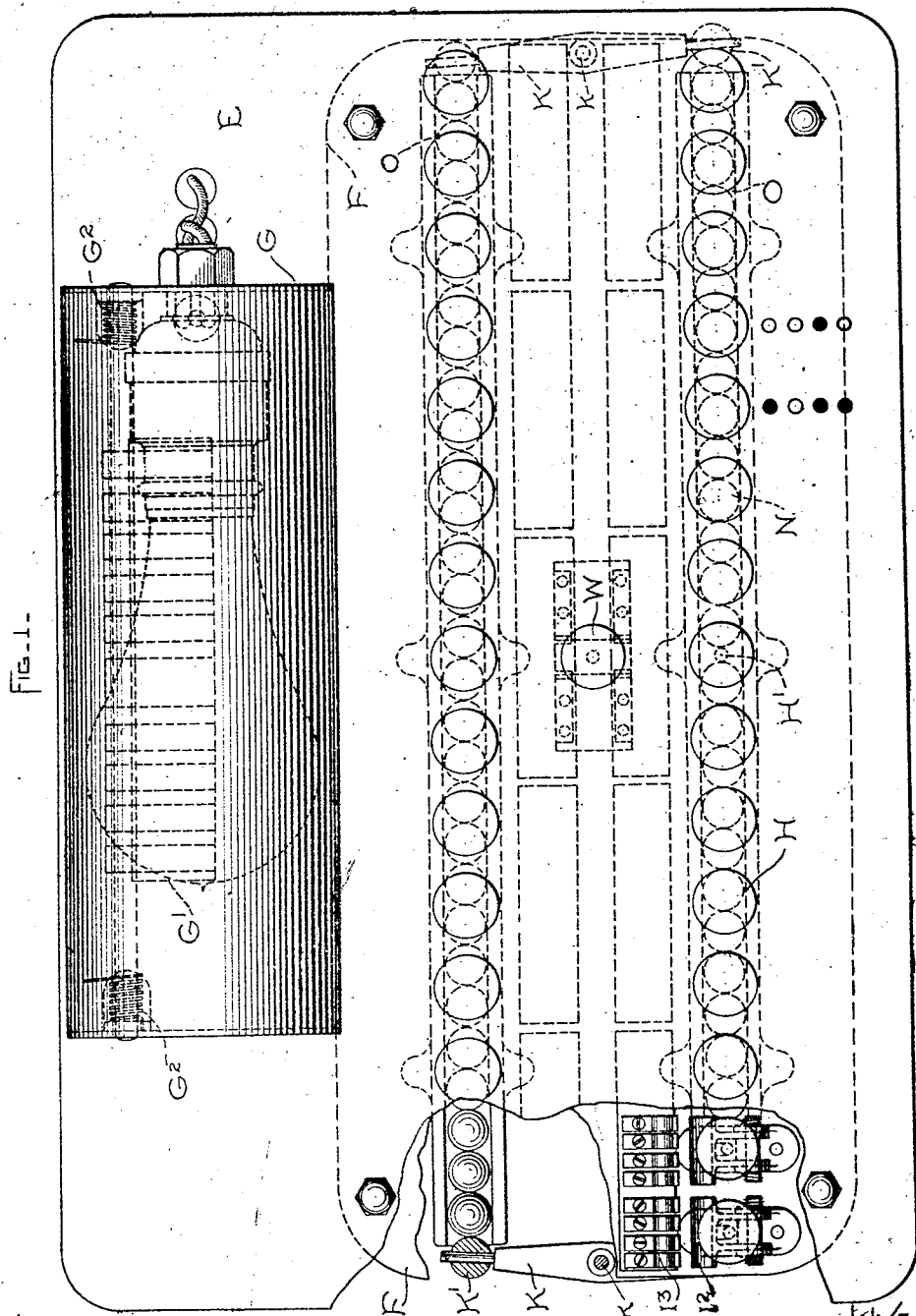
Patented July 30, 1901.

J. L. HALL.
SIGNAL SYSTEM.

(Application filed Feb. 16, 1899.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES.

Edw. Williams, Jr.
A. F. Macdonald.

INVENTOR

John L. Hall,

by *Alfred Davis*

Att. by

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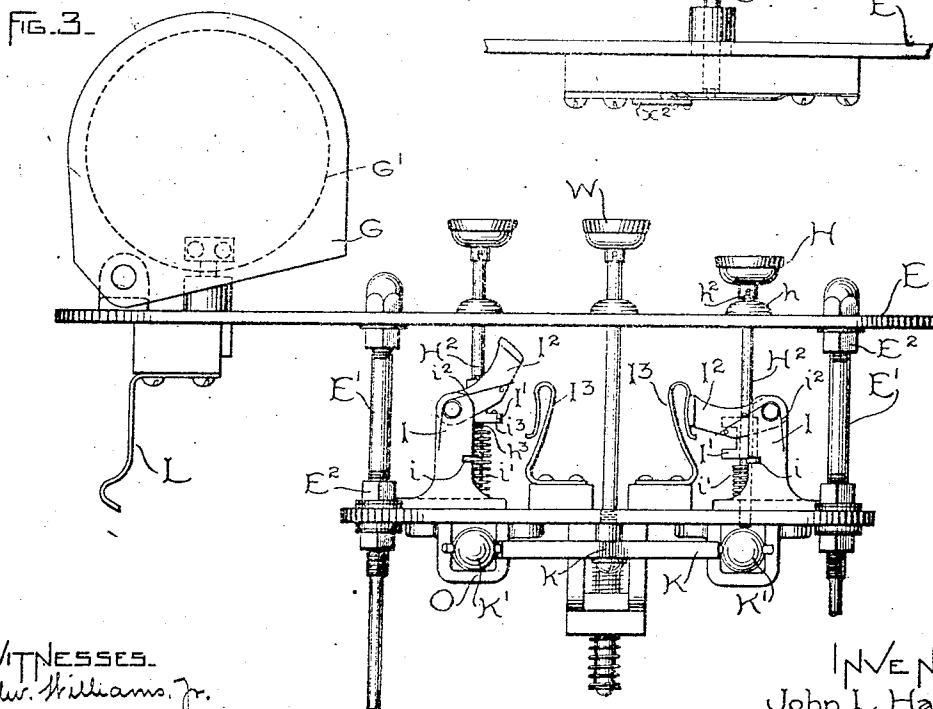
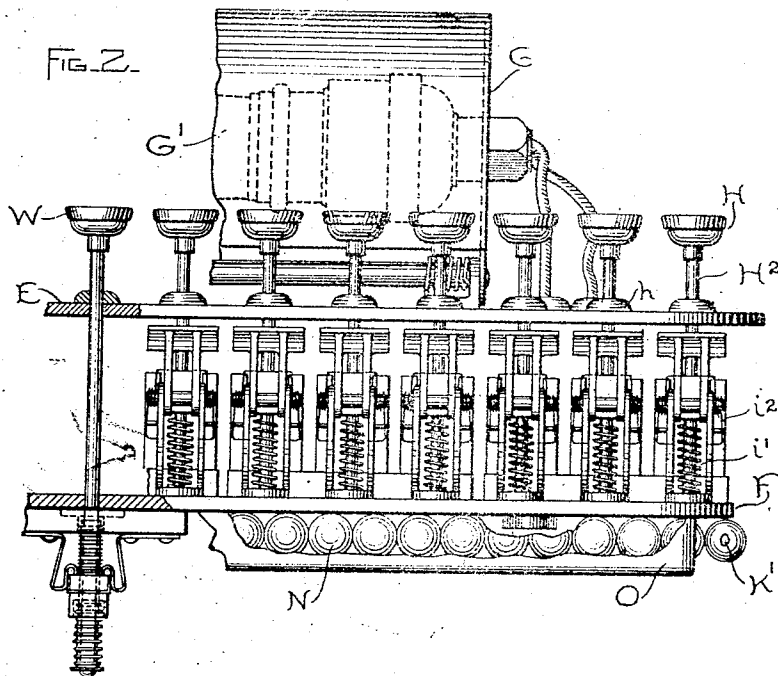
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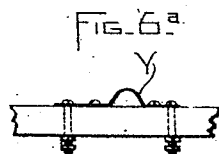
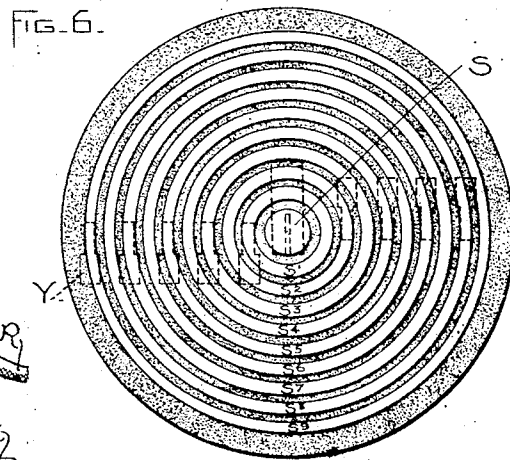
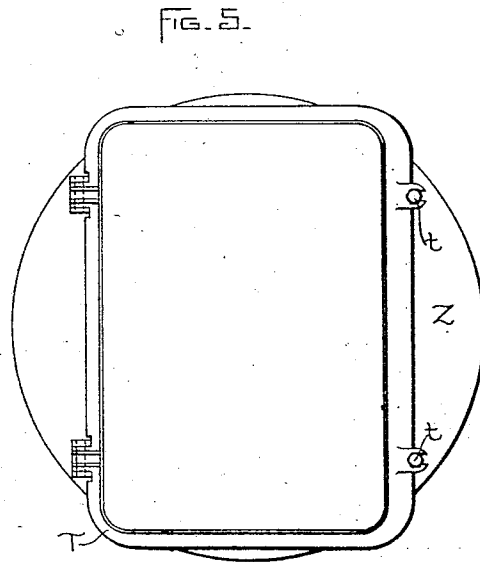
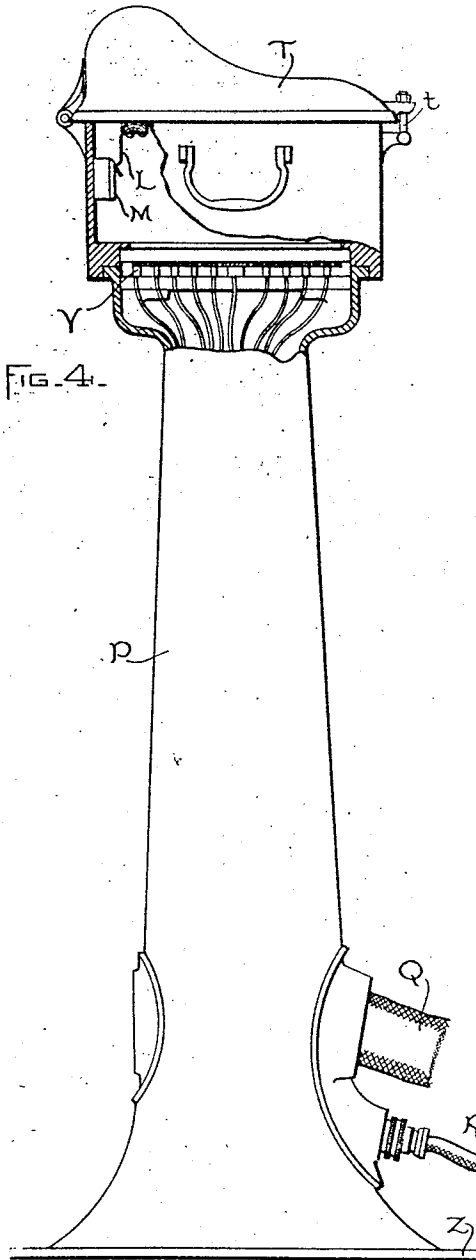
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4 Sheets—Sheet 3.



WITNESSES.
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No. 679,310.

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4 Sheets—Sheet 4.

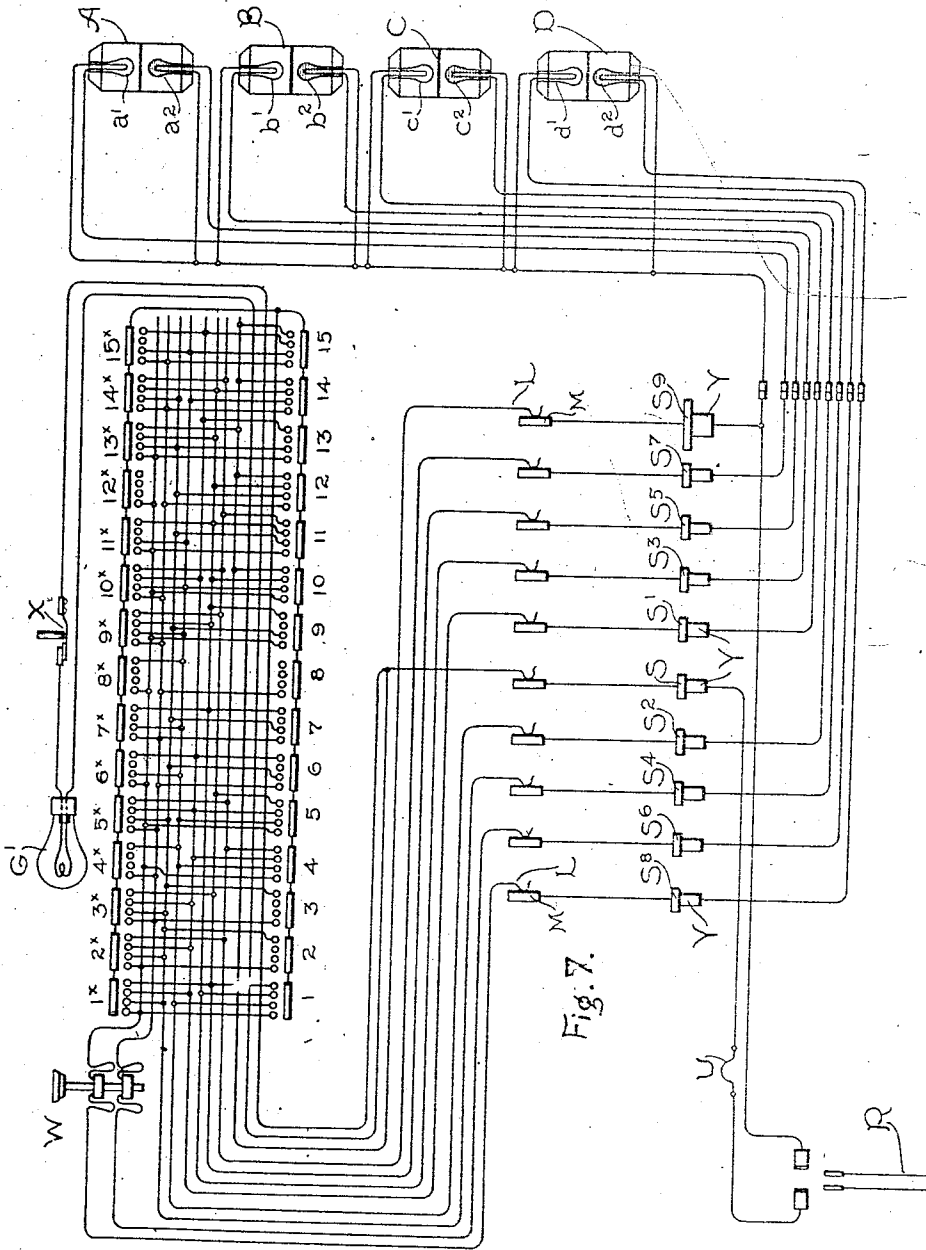


Fig. 7.

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UNITED STATES PATENT OFFICE.

JOHN L. HALL, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 679,310, dated July 30, 1901.

Application filed February 16, 1899. Serial No. 705,664. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. HALL, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Signal Systems, (Case No. 912,) of which the following is a specification.

The present invention relates to signal systems such as are in use upon warships or ships of the merchant marine.

The system which I have devised is an improvement upon those which have been heretofore used, particularly for night signaling. In common with prior devices it employs incandescent lamps arranged in different combinations of position and color to indicate arbitrarily letters of the alphabet or other signs according to a prearranged code.

My invention improves upon all existing systems with which I am familiar in several respects. It is compact, simple, not liable to get out of order, and certain in its operation, all of which are great desiderata.

In the form herein illustrated it consists of the usual combination of four lanterns, in each of which is a red and a white lamp. The circuit-wires of the lamp are led in a cable to a stand and are there connected to a set of collector-rings arranged horizontally, with suitable interposed insulation. A box incloses a set of keys controlling switches, which are connected to the collector-rings by brushes, so that the whole apparatus may be revolved conveniently upon the top of the stand. The switches serve to arrange the lanterns in the predetermined connection. The keyboard resembles in general a typewriter keyboard, except that each key controls a switch and an interlocking means is used, so that when one key is depressed no other combination can be formed until that key is permitted to resume its original position and open its circuits, thus greatly reducing the risk of displaying erroneous signals by improper manipulation. The keyboard is removable and can be lifted out of the box, having automatic separable contacts by which proper circuits are established and broken. The keys are arranged in a number of parallel rows, of which in the present embodiment of the invention there are two. The inter-

locking means which I have devised consists of the now well-known device commonly used in cash-registers and such appliances—namely, a number of balls or disks in a race-way so arranged that they fill the entire race except just sufficient space to permit the depression of one of the plungers actuated by the keys. In order to make the arrangement compact, I have added to this device for transferring the motion from one row of balls to the other, so that as those in one row are spread apart by the depression of the plunger those in the other are brought together. This is conveniently effected by one or more levers, which will be more fully described hereinafter. In this particular my improved keyboard differs from all with which I am acquainted, all those which have used this form of interlock heretofore having been arranged in a circle or otherwise, so that only a single set of balls might be used. The circular form is unduly large and does not lend itself to ready and rapid manipulation, such as is often required. In combination with this apparatus I employ an incandescent lamp so arranged within the lid that it sheds light directly upon the keyboard. With this is connected a suitable switch, so that when the lid is closed the lamp is cut out of operation, avoiding waste of current and risk of overheating.

The whole apparatus is portable and is so arranged that it may be lifted from the stand intact, sliding contacts being provided which when the keyboard is put in place in any one of a number of stands, which may be located in different parts of a ship, the connections are automatically established in determined order. I also provide in addition to the usual keys a "winker" or auxiliary key, by means of which one or more of the lamps may be extinguished and relighted, thus indicating a repetition of any given signal as may be desired, at the same time holding the key which establishes the signal in its depressed position. Each of the keys is so arranged that the signal established by it may be held for as long as is necessary by simply locking the key. Heretofore this has been accomplished by various mechanisms which it was necessary to shift in order to hold the

key in its depressed position. I have improved, however, upon these devices by so arranging the key that when rotated slightly it will be held down for as long as may be necessary.

My invention also relates to a number of details of construction tending to render the device more compact and less liable to be damaged. In addition I have devised an exceedingly simple and convenient snap-switch adapted for the interruption of circuits of moderate potential without arcing and the consequent destruction of contacts, which forms part of the present invention.

The drawings annexed show a signal set constructed according to my invention. It is of course understood that there may be many variations of details without departing from the invention and that many of its features might be used in other combinations.

Figure 1 is a top view, partly broken away, showing the keyboard of the device and the construction of the switches. Fig. 2 is a side elevation of a part of the keyboard, showing also the interlocking means. Fig. 3 is an end elevation of the keyboard, all of these views showing the keyboard removed from its stand. Fig. 4 is a side elevation, partly in section, of the stand upon which the signaling device is placed. Fig. 5 is a plan of the apparatus. Fig. 6 shows in enlarged view the details of the sliding connections between the stand and the keyboard. Fig. 6^a shows a side elevation of one of the brushes used in Fig. 6. Fig. 7 is a diagram of the circuits, and Fig. 8 is a detail of the cut-out for the lamp.

In Figs. 1, 2, and 3, E is the upper bed-plate of the keyboard, and F is the lower plate, carrying the switches, the two plates being secured together by the standards E' with the lock-nuts E². To the bottom of the plate F are secured two raceways O, in each of which is a series of balls N. The keys II have plungers or rods H², any one of which may fit between two of the balls in the raceway, as shown, for instance, at II', Fig. 1. On the ends of the plate are mounted levers K K, (one of which is shown in dotted lines in Fig. 1 and in side elevation in Fig. 2 in full lines,) pivoted at k and carrying upon each end balls K' K'. The operation of this part of the device, though sufficiently well understood, is briefly as follows: When any key is pressed—for example, H' in Fig. 1—the plunger displaces the balls at each side and the expansion in the lower raceway is transferred by means of the levers K K to the other raceway, bringing the balls together, so that no other key than the one already down may be depressed. Each key as it is depressed by means of a lug I', secured to its plunger H², forces down the circuit-making contact I² of the snap-switch into engagement with the contacts I³. (Seen best in Figs. 1 and 3.) The spring I' tends to press up the plunger when it is released and the spring I² forces up the switch-blade I². The lug I' being cut away at i²

leaves a lost-motion connection, and the friction of the spring-contacts I³ is sufficient to retain the switch-blade I² in position until the lug I' engages with the latter to release it. As soon, however, as the friction of the spring-contacts I³ is overcome the spring I² snaps open the switch. The switch is carried upon a standard I, secured to the plate F. Four of the contacts I³ are bridged by each of the contacts I², and each one establishes a different circuit, as will presently be described in considering Fig. 7. If it be desired to hold any signal for a longer period than is convenient to hold down the key by hand, (as when it is intended to leave an order standing until the return of the operator for further instructions or in some such contingency,) any one of the buttons may be depressed until the pin h², passing through the plunger II², is in line with the slot i in the standard I carrying the switch, into which it can pass by turning the button. The button H is sleeved over the head of the plunger, and a slot h² registers with a pin in the plunger, so that the button will turn the latter as desired. A quarter-turn of the button thus fastens down the switch, and the signal remains set until the button is again turned. By making the buttons removable from the plungers it is possible to make changes in the code or cipher system in a convenient way. If desired, letters or numbers may be imprinted upon the buttons, while the lamp combination will ordinarily be shown upon the plate E adjacent to each button. As the buttons bearing the letters or numbers may be shifted from one plunger to another, the set may be thus readily adapted to different codes or ciphers, as may be required. For instance, in naval warfare if a certain signal system has been in use for some time it may become desirable to change it so that it may not be deciphered by the enemy. In this case the buttons may be shifted on the plungers and a corresponding change made throughout the fleet.

In Fig. 1 I have shown the lamp combinations of one or two of the switches, but have not deemed it necessary to show them all. In this figure, for instance, the open circles adjacent to the selected buttons indicate the white lamps which will show, and the black circles indicate the red lamps. A lamp G' is inclosed within the hood G. A spring G² opens the hood whenever the cover T (see Figs. 4 and 5) is opened. A hood is also so arranged, as clearly shown in Fig. 3, that the operating-spring G² can raise it only to a definite position where the flattened corner (seen at the left of the pivot in Fig. 3) bears against the base, in which position the light of the lamp is shed forwardly on the keyboard, but its rays are obstructed from the eye of the operator. A switch X is provided which open-circuits the leads G² of the lamp whenever the cover of the hood G is pressed down, so that the lamp will not burn. A lug x upon

the inside of the hood coöperates with the plunger x' of the switch and open-circuits the contacts x^2 x^2 when the hood G is lowered. Suitable bushings h are secured in the plate E, and these may be of insulation or of metal, according to the requirements. Where a wire passes through the plate, they would be of insulation, but ordinarily may be of metal.

Referring now to Figs. 4, 5, 6, and 6^a, in addition to Figs. 1, 2, and 3, it will be seen that fixed contacts M are provided upon the back of the box in which the keyboard is disposed and contacts L are attached to the keyboard. By suitable circuit connections, which it is unnecessary in the mechanical views to illustrate, (as they are well understood and would only confuse the drawings,) each of the switches H, which in the diagram of circuits are numbered consecutively from 1 to 15, is connected to one or the other of these contacts. The contacts M are kept in circuit, whatever may be the position of the top of the apparatus upon its stand, by means of the brushes Y, (seen best in Figs. 6 and 6^a,) each of which rests upon one or the other of the collecting-rings S to S². These brushes are of the form shown in Fig. 6^a, where they are illustrated in side elevation, because by this form they may be revolved in either direction with the most facility. Positive and negative wires inclosed in the cable R electrically connect the stand with the source of supply. One of these wires leads to the center contact S of the set of collector-rings and the other to one of the outside contacts S². The other contacts are respectively connected to the different lamps, as will presently be described, the stand P being made hollow to accommodate the wires, those passing to the lamps being collected in the cable Q in the usual manner, and water-tight fastenings of any convenient form being arranged at the base of the stand, which is expanded at Z, so that it may be conveniently attached to the back or other support. The top T is provided with a packing under the flange and may be secured by the bolts t t , thus making the whole stand entirely water-tight. It is designed to have but one of the keyboards for each signal set; but, as is well understood, it is often convenient to have the stand on the bridge or in the master's cabin or any other place. In this event duplicate stands may be erected in any convenient place, and by having only a single removable keyboard there can be no interference or short circuit caused by accidentally and simultaneously operating two different contacts.

Fig. 7 shows the circuits by which the signals are made. A B C D are the lanterns, in which a' a^2 b' b^2 , &c., are the lamps. In the ordinary constructions of such lanterns the lower lamp is red and the upper one white. It will be observed by tracing the circuits that no lantern at any time has both lamps lighted. The rows of contacts shown at S Y are those indicated by similar letters in the

mechanical drawings formed by the collector rings and brushes, while the contacts L M are closed when the keyboard is set into the revolving contacts. At R are the leads from the generating source, shown disconnected. U is a fuse which is employed to protect the circuits against excess of current. The switches are numbered from 1 to 15 upon one side of the keyboard and from 1^x to 15^x upon the other. It will be unnecessary to trace out in full the system of connections, but one of them will be traced, the others being apparent. All of the switches are constantly alive by a connection from the source of current through the fuse U and center contacts S Y. From this connection a branch passes through the lamp, returning to the contact S², and thence out by the negative lead. The switch X in the upper part of the drawings is the cut-out operated by the lid or hood. Assume, for instance, that the key 1^x is depressed. It will be found by tracing the connections that the four lower lamps are connected, so that all four lanterns show red. From the contact on the right (indicated by the right-hand circle) the lead passes by the center wire of the group to contact S⁵, thence through the lamp a^2 , and out at the negative lead, a common negative return being provided for all the lamps. Similarly the lead from the second contact passes through contact S¹, thence through the lamp b^2 , and out. The lead from the third contact at the switch passes through contact S⁴, through the lamp C², and out, and from the fourth contact the lead passes through contact S³, through the lamp d^2 , and out. It will be observed that one contact at least of each of the switches either in the upper or the lower row is connected to one of the wires leading through the switch W on the left of the diagram of circuits. The lower wire through this switch controls the circuit of the lamp d' , the upper wire of the lamp d^2 . Thus it will be seen that if any of the keys be depressed and fastened down its corresponding signal will be displayed until the key can be released. If now the same signal is to be repeated, as when a letter is to be duplicated or an order emphasized by repetition or for any other reason, the winker W will be depressed and the lantern D will blink. The lamps in all of these lanterns are so arranged that they cool almost instantly when extinguished, so that the operation may be performed with considerable speed and still be entirely clear. Of course it is perfectly possible to make all of the lanterns or any selected number act in the same way, if desired, and this would be within my invention.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a marine signaling set, the combination of a fixed stand containing circuit connections with a group of signaling devices, corresponding terminals for the several devices in the stand, a keyboard rotatable on

- the stand, and means for preserving the connections during rotation, an independent set of connections for the signaling devices between the keyboard and the rotatable connection, and a joint permitting the keyboard to be separated at said independent connections.
2. The combination with the removable keyboard, of the separable contacts between the keyboard and the box containing it and an independent set of connections with the signal-stand.
3. In a signal system, a keyboard having two rows of buttons with plungers extending to switches beneath the surface of the board, two sets of balls in raceways, one under each set of keys or buttons, and levers at the end of the keyboard for transferring the motion of one set of balls to the other, the whole so arranged that when any key is depressed, the balls are all pressed into contact in both rows, so that no other key may be depressed until the first one is released.
4. In a signaling system, the combination of a group of signaling devices, spring-retracted keys mounted on a keyboard for connecting said devices in different signaling relations, means for disabling all other keys when one is operated, and a lock at the keyboard for holding any desired key in signaling relation.
5. The combination of a keyboard, a plurality of keys, a plurality of yielding devices permitting said keys to be operated one at a time, each having sufficient lost motion or slack to accommodate the movement of one key, and connections between the several devices whereby the slack in all is taken up when that of any one is taken up by a key corresponding thereto.
6. The combination of a keyboard, a plurality of rows of solid bodies supported loosely

in frames to admit the insertion of a wedge or spacer, means for wedging the bodies in compact relation by the operation of any key, and connections between the several rows for wedging all in compact relation when any one is so wedged.

7. The combination in a signal system with keys for controlling the various circuits so as to connect the signal devices in different orders and interlocking means preventing the operation of more than one of the keys at a time, of an auxiliary key free from the interlocking means, by which one or more of the lamps may be made to blink.

8. The combination with a keyboard, of a signal-transmitter, an electric lamp, for illuminating the same, a tilting hood or cover therefor, and means for lifting the cover to illumine the board when the latter is uncovered.

9. In a signal set, the combination of buttons removable from the key mechanism, a rotatable key-stem controlling a signal device, and a joint between the key and stem permitting both depression and rotation of the latter.

10. In a signaling system, the combination of elastically-mounted depressible keys, a switch controlled by each key comprising a spring-retracted pivoted arm carrying a metallic bridge, a group of terminals connected with the signaling devices and controlled by the bridge, a loose connection permitting return of the key to its initial position independently of the bridge, and means for retarding the return of the bridge.

In witness whereof I have hereunto set my hand this 13th day of February, 1899.

JOHN L. HALL.

Witnesses:

B. B. HULL,

M. E. JACOBSON.