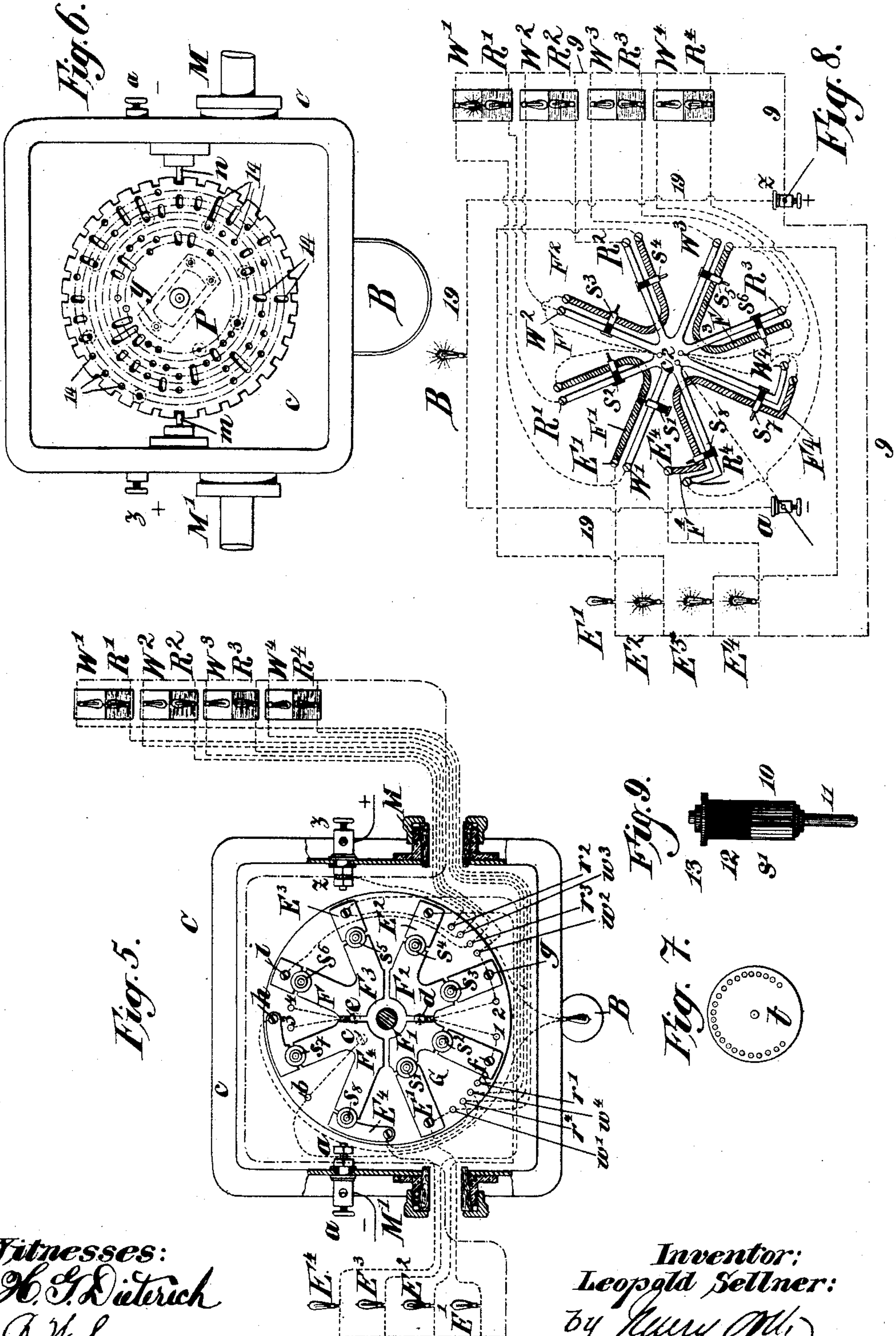


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SWITCH FOR ELECTRICAL SIGNALING APPARATUS.

No. 470,793.

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UNITED STATES PATENT OFFICE.

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SWITCH FOR ELECTRIC SIGNALING APPARATUS.

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Application filed October 17, 1891. Serial No. 409,051. (No model.) Patented in England May 16, 1889, No. 8,157; in France May 16, 1889, No. 198,269; in Germany May 17, 1889, No. 49,822; in Italy June 30, 1889, XXIII, 25,602, and L, 340, and in Austria-Hungary September 5, 1889, No. 21,236 and No. 39,475.

To all whom it may concern:

Be it known that I, LEOPOLD SELLNER, lieutenant of the Austrian navy, a subject of the Emperor of Austria, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Switches for Electric Signaling Apparatus, (for which I have obtained Letters Patent in England May 16, 1889, No. 8,157; in France May 16, 1889, No. 198,269; in Germany May 17, 1889, No. 49,822; in Italy June 30, 1889, XXIII, 25,602 and L, 340, and in Austria-Hungary September 5, 1889, No. 21,236 and No. 39,475;) 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 or figures of reference marked thereon, which form a part of this specification.

The invention relates to switches for that class of electrical, optical, or visual signaling apparatus in which the signals are produced by means of multi-colored incandescent lamps or by means of such lamps of one and the same color intermittently brought to incandescence.

My invention has for its object the provision of a switch for the class of signaling apparatus referred to, of simple construction, efficient in operation, and adapted to be manipulated by any one conversant with the code of signals employed.

The invention has for its further object the provision of means whereby variations in the resistance of the electric circuits are avoided, due to alternate lighting and extinguishing of the signal-lamps, especially in such cases where the generator of electricity is operated by manual power in order to maintain the resistance in the circuit constant.

To these ends the invention comprehends structural features and combinations of co-operating elements, whereby the above results are attained, as will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a top plan view of the switch,

and Figs. 2 and 3 are vertical transverse sectional views taken at right angles to each other, showing the switch-plug-controlling disks in their elevated and depressed positions, respectively. Fig. 4 is a top plan view, the upper portion of the switch-case and the upper controlling-disk being removed. Fig. 5 is an under side view of the switch, the bottom of the casing and parts connected thereto and lower controlling-disk being removed and portions of the casing shown in section to illustrate the lower switch-body and the electrical connections therewith and with the signal and resistance lamps. Fig. 6 is a similar view illustrating the lower controlling-disk, the elastic stop *y*, secured to the said disk, being shown in dotted lines. Fig. 7 is a plan view of the stop-plate *t*, secured to the step for the revoluble spindle, which serves to lock the controlling-disks against rotation. Fig. 8 is a diagrammatic view illustrating the connections of the upper and lower switch-bodies with the signal and resistance lamps, and Fig. 9 is an elevation of one of the switch-plugs.

Like symbols indicate like parts wherever such may occur in the above-described figures of drawings.

The elements of which the switch is composed are contained in a suitable casing *C*, constructed in two sections *c* and *c'*, the lower section *c* being of slightly greater diameter than the upper section *c'*, and having in its top a circular opening whose edge forms a seat for a discoidal switch-support *G*, of rubber or of other suitable insulating material, which disk is held against displacement by the upper section *c'*. To the bottom of the casing is secured a step from which projects a pin *p*, Figs. 2 and 3, that enters a socket in the lower end of a vertical spindle *A*, which passes through a suitable stuffing-box arranged centrally of the top of the upper portion *c'* of casing *C*, and on said top is delineated the code of signals, not only as regards its symbols, but also as regards the combinations of lamps representing said symbols, which are arranged in lines radiating from the axis of the central opening in the top of casing *C*, as shown at *S*. The vertical spindle *A* has

vertical as well as rotary motion in the stuffing-box and on the pin p , and is guided thereby in its movements, said spindle terminating in a handle H and carrying an index or hand Z . To prevent vertical movement of the hand Z with the spindle A the latter has a peripheral longitudinal groove, into which projects a pin secured to the sleeve of the hub of the hand and a second pin projecting from said hub into a circular peripheral groove formed in the stuffing-box B , as shown in Figs. 2 and 3.

The spindle A may be held in its elevated position against the weight of the lifting and depressing disks D P , hereinafter to be described, by frictional contact in and on its bearings. It is, however, desirable in signaling that the operation of switching the signal-lamps into or out of circuit be effected in as rapid a manner as possible. Hence the spindle has preferably a free motion in and on its bearings sufficient for this purpose, and to prevent the disks D and P from carrying the spindle down after it has been lifted I provide a bell-crank locking-lever x , pivoted in the handle H , the vertical arm of said lever being adapted to bear on the upper face of the sleeve on the hub of the hand Z when the spindle has reached the limit of its upward motion, determined by the upper or depressing disk D , presently to be described, so that said spindle cannot be depressed unless said vertical arm of the lever is moved out of the way of said sleeve, which is done by pressing upon the horizontal arm of the lever which overhangs the upper end of the spindle A , and has at its outer end a pin that is adapted to enter a socket in the handle H . (See Figs. 2 and 3.) The horizontal arm of the lever is actuated by a spring, which tends to throw the vertical arm of the lever inwardly, so that as soon as the spindle A reaches the limit of its upward movement said vertical arm will be caused to snap over the sleeve on the hub of the hand Z and lock said spindle A against downward motion.

To the upper face of the disk G is secured a switch L , which consists of a disk having a series of radial arms, the number of which will depend upon the number of signal-lamps used, said arms being constructed of two parts insulated from each other, (see Figs. 4 and 8)—that is to say, the switch is composed of a switch-body and a number of insulated contacts arranged around said body. The source of electricity is connected with the switch-body or central discoidal portion of the switch L , the conductor passing through a suitable aperture in disk G , as at b , Fig. 4, thence to said central portion of switch, as at c^2 , Fig. 4, said conductor being connected with one of the main-circuit or main-line terminals, in this case the minus terminal a , Figs. 4 and 8. The signal-lamps are successively connected in the order of their arrangement with the several contacts or end sections of the radial

arms of the switch L , the lamp W' being connected with the contact or outer section of arm W' , the lamp R' with the like contact or section of the next succeeding arm R' , the lamp W^2 with the contact W^2 , the lamp R^2 with the contact R^2 , and so on as to the lamps W^3 R^3 and W^4 R^4 , each alternate lamp being intended to represent a colored lamp in this case for the sake of illustration, the colored lamps being indicated by the symbols R' to R^4 , inclusive, as shown in diagrammatic view, Fig. 8, in which the connections can be readily seen and traced.

In practice the wires connecting the signal-lamps with the contacts or outer insulated sections of the arms of the switch L are formed into a cable that enters the switch-casing through a stuffing-box M , Figs. 1, 4, 5, and 6, and in this cable is included a ninth wire 9, that serves as a common return-wire and is connected with the plus terminal of the circuit at z , (see Figs. 1, 4, 5, and 6,) and more particularly Fig. 8. The insulated portions or sections of the radial arms of the switch L are electrically connected by means of pegs or plugs, that are indicated by the symbols s' to s^8 , inclusive, corresponding, respectively, to the contacts or arm-sections W' and R' to W^4 and R^4 , inclusive, as shown in Fig. 8. These plugs are composed of a conductive portion 10, from which projects a pin 11, the upper portion of said plug being covered with or formed of a non-conductive material 12—such as hard rubber—and a head disk or cap 13 to prevent the plug from passing wholly into its opening in disk G between the contact or insulated sections of the radial arms of the switch L .

In order to insure proper contact, the conductive portion of the plug is preferably made elastic or compressible by using a split cylinder or a coil or similar construction, or by providing an elastic filling 16.

Inasmuch as the central or discoidal portion of the switch L is connected with one terminal of a main circuit and the several signal-lamps through branch lines and the contacts or outer insulated sections of the radial arms of said switch with the other terminal of said main circuit, and as said plugs, when in their normal position, have the insulated portion 12 interposed between the contacts or outer insulated arm-sections, so that no current can pass from the central portion of the switch to a lamp, it will be readily understood that said lamps cannot be circuited unless the said insulated sections of the radial arms of the switch are electrically connected. This is effected by lifting a plug or plugs of the lamp or lamps to be circuited to bring the lower conductive portion 10 of said plug or plugs into contact with the arm-sections of the switch. The lifting and depressing of the plugs is effected by means of two disks D and P , secured on the spindle A , above and below the plugs, respectively, (see Figs. 2 and 3,) and as the spindle A can be raised and lowered, as well

as revolved in and on its bearings, as hereinabove described, it is obvious that the said disks D and P can also be raised and lowered as well as revolved by means of the handle H 5 on spindle A.

It is desirable that the spindle A and the disk P, which I will call the "distributing-disk," be held against rotation after said spindle has been lifted to circuit one or more 10 lamps. To this end the disk P has a toothed periphery adapted, when the spindle has been lifted, to engage two lugs *m* and *n*, secured diametrically opposite each other to the switch-casing C, as shown in Figs. 2 and 6. 15 The distributing-disk P is, as shown in Fig. 6, provided with a series of systematically-arranged openings 14, into which the pins 11 on the plugs project whenever brought into register therewith, so that when said disk P 20 is in a given position the pin of one or more of the plugs will be out of register with an opening 14 in the disk, and will consequently be lifted to circuit a certain lamp or lamps, while the pin on the remaining plugs will be 25 in register with a hole, and said plugs will therefore remain in their normal position. Thus, if it is desired to produce a signal-symbol by lighting one or more lamps of the same or of different colors, the spindle A, being 30 down or in its normal position, is revolved to bring the hand Z to the desired symbol—as, for instance, the symbol 1, indicated by the lighting of a single white lamp. The distributing-disk will now be in such a position that 35 the pin 11 on plug *s'* will be out of register with an opening in disk P, while the pins of the remaining plugs *s*² *s*³, &c., will be in register with openings in said disk, so that if the spindle is lifted the plug *s'* only will be lifted 40 to circuit the lamp *W'*, which is again cut out of the circuit as soon as the spindle is depressed again by the disk D, moving the plug *s'* back into its normal position, with its insulated portion interposed between the contact *W'* and the switch-body. The operation 45 of signaling consists, therefore, in first positioning the disk P to the desired signal-symbol by revolving spindle A to carry the hand Z to the symbol on the dial, then lifting the 50 spindle A to circuit the lamp or lamps that correspond to the symbol, then depressing the horizontal arm of the locking-lever *x* for purposes hereinbefore stated, and simultaneously depressing said spindle to extinguish 55 said lamps, so that with but little experience the signal-symbols may be produced in a very rapid manner without liability to error.

In order that the dial-indices may be read, I provide a lamp B, included in a branch circuit 19, whose terminals are connected with the terminals *a z* of the main circuit 9, (see Fig. 8,) and will therefore not be effected by the operation of the signaling apparatus itself.

The above-described apparatus is adapted 65 for use with any suitable electric-lighting plant of such power as that the main-line current will not be materially effected by the cir-

cutting or cutting out of four incandescent lamps, which is the greatest number simultaneously brought into use in signaling. The 70 apparatus may, however, be used with any other suitable source of electricity, its successful use depending, however, on the uniformity of the resistance in the main line. For instance, the necessary electricity may 75 be derived from a hand-operated dynamo or from suitable batteries, in which case means must be provided to maintain the resistance in the circuits uniform, and this I effect by means of the following instrumentalities: To 80 the under side of the supporting-disk G is secured an auxiliary switch F, that is composed of a series of plates insulated from one another and indicated in Figs. 5 and 8 by the symbols 85 *F'* to *F*⁴, inclusive, said plates having substantially the form of a horseshoe or a V, whose branches are also composed of two sections insulated from each other, as shown in said Figs. 5 and 8. The sections of the arms of the horse- 90 shoe-plates are electrically connected when a plug or plugs *s'* to *s*⁴ is or are in their depressed or normal position, the lower metallic portion 10 of the plug or plugs then lying in the space between the arm-sections and in contact therewith, as in the case of the sections of the radial arms of the switch L, above described. 95 The central discoidal portion of the switch L is connected by means of four branch wires 1 2 and 3 4, starting, respectively, from binding-screws *d* and *e*, Figs. 4 and 5, with the alternate outer insulated arm-sections of the horseshoe-plates of switch F, so that said alternate arms receive current direct from the body of switch L. The other four outer insulated sections of said horseshoe-plates are 105 respectively connected with resistance-lamps *E'* to *E*⁴, inclusive. These lamps are included in separate branches of the main electric circuit for the purpose of maintaining the resistance constant, as is well known, and are 110 cut out of the circuit whenever a signal-lamp is switched into the same, and vice versa. From what has been said it is obvious that a resistance-lamp will not be switched into the circuit unless electric connection is made between the contacts or outer insulated sections 115 and their respective arms of a horseshoe-plate, so as to permit the current to pass, for instance, from the left-hand outer arm-section of plate *F*² to the right-hand arm-section thereof and thence to resistance-lamp *E'*, and this 120 can take place only when two switch-plugs—as, for instance, the plugs *s*³ and *s*⁴—are depressed, so that the metallic portion thereof will be in contact with the sections of the plate, whereby the resistance-lamp *E*² will be 125 switched into the circuit. Inasmuch as said contact cannot be established except by depressing the corresponding switch-plugs the signal-lamps corresponding to said plugs will 130 be cut out of the circuit, as hereinabove described.

In Fig. 8 I have shown all of the signal-lamps, except the one *W'*, cut out of the cir-

cuit or extinguished, while all of the resistance-lamps, except the one E' , corresponding with signal-lamps W' R' , are switched into the circuit or lighted. Although it is necessary in order to circuit a resistance-lamp that two switch-plugs be depressed, it will readily be seen that the circuit through said lamp may be interrupted by lifting one of the plugs only.

The signal-lamps are arranged in pairs in separate lanterns, and the electrical connections between the lamps and the switch L are so arranged that the two lamps in the same lantern cannot be simultaneously included in the electric circuit—*i. e.*, simultaneously lighted—in view of the arrangement of the plugs, while the circuit through the horseshoe-plates can be completed only when the two plugs corresponding to two lamps in the same lantern are depressed. Thus, for instance, the plugs s' and s^2 for the signal-lamps W' and R' in the upper lantern when depressed close the circuit through horseshoe-plate F' and resistance-lamp E' , Fig. 8; but inasmuch as only one of these plugs is raised to complete the circuit through either lamp W' or R' it is obvious that when said plug is raised to complete the circuit, the circuit through the corresponding horseshoe-plate and resistance-lamp E' will be interrupted, so that whatever number of signal-lamps from one to four may be lighted or extinguished a corresponding number of resistance-lamps is extinguished or lighted, whereby the resistance in the main-line circuit is maintained constant, and whereby one resistance-lamp only is necessary for each pair of signal-lamps. The conducting-wires for the resistance-lamps are also formed into a cable which passes into the switch-casing through a stuffing-box M' , Figs. 1, 4, 5, and 6, which is closed by a suitable screw-cap when the resistance-lamps are not used, in which case the horseshoe-plates are dispensed with. In practice, however, I prefer to provide all the switches with the auxiliary switch F , so that they may be used under either of the conditions referred to.

Figs. 4, 5, and 8 clearly show the electric connections. The conductors for the lamps W' to W^4 and R' to R^4 are respectively connected to binding-screws w' to w^4 and r' to r^4 on the upper face of the supporting-disk D , and to binding-screws on the corresponding contacts or outer insulated sections of the radial arms of switch L , while the circuit-wires lead from binding-screws 1 2 and 3 4 on the central discoidal portion of said switch to suitable binding-screws on the lower face of said supporting-disk D , and thence to the switch-contacts or outer insulated sections of the arms of each of the four horseshoe-plates F' to F^4 , respectively, the other four arms of said horseshoe-plates being connected, as already stated, with the four resistance-lamps.

Although I prefer the use of lamps as a means for equalizing the resistance in the

electric-lighting circuit, I do not desire to limit myself thereto, as other means well known to electricians may be employed for this purpose.

In order to lock the spindle A , and consequently the disks D and P , against rotation when depressed, so as to determine the position of the hand Z , I secure to the disk an elastic plate or catch y , Figs. 2 and 3 and shown in dotted lines in Fig. 6, said plate straddling the spindle and having at its free end a pin adapted to engage a hole in a plate t , Figs. 2, 3, and 7, which has as many such holes as there are code-symbols producible by the apparatus, so that when the spindle is depressed the pin will enter into a hole in the plate t and lock the same against rotation.

The use of the switch devices is not confined to signaling with lamps of different colors, but can equally as well be used for producing code-symbols by means of constant and intermittent light—*i. e.*, flash signals. In the latter case a make-and-break device is interposed in the circuit between the switch L and the lamps, and if resistance-lamps are used the said make-and-break devices provided with a second contact-spring that is electrically connected with the shunts of said resistance-lamps in such manner as to close the circuit to a resistance-lamp whenever the circuit to a signal-lamp is interrupted, and vice versa. Of course it will be understood that the plugs should be carefully constructed, so as to insure proper contact with the sections of switch L and the horseshoe-sections of switch F , and in order to attain this I prefer to give the metallic portion of the plugs a certain elasticity, as hereinbefore described, which will insure the good operation of the switch that in all other respects is extremely simple and readily manipulated, and consequently any defect therein, should such occur from any cause, readily remedied. It is further obvious that a greater or less number of signal-lamps may be employed, and that the improved switch may be used for other purposes than those hereinabove described.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. An electric switch comprising a switch-plate having a series of branches extending therefrom, said branches being constructed in two parts insulated from each other by an intervening hiatus, said plate and insulated portions of its branches being respectively connected with the terminals of an electric circuit, and a switch-plug interposed and having motion in the hiatus between the branch sections, said plugs having a non-conductive portion normally in contact with the branch section, whereby the electric circuit through any one or more of the branches of the switch may be closed or interrupted, for the purpose set forth.

2. An electric switch comprising a switch-

plate having a series of radially-arranged branches constructed in two parts insulated from each other by an intervening hiatus, said plate and insulated portions of its branches being respectively connected with the terminals of an electric circuit, a switch-plug interposed in the hiatus between the branch sections and having an upper portion of non-conductive material, and a pin projecting from its lower conductive portion, a longitudinally movable and revoluble spindle, a disk secured to said spindle on one side of the switch-plate operating to move the switch-plugs in one direction, said disk being provided with openings adapted to be brought into register with one or more pins of the switch-plugs, whereby one or more switch-plugs may be displaced in the hiatus between the arm-sections of the switch to close the electric circuit therethrough, and means for returning the displaced switch-plugs into their normal position, for the purpose set forth.

3. An electric switch comprising a switch-plate having a series of radially-arranged branches constructed in two parts insulated from each other by an intervening hiatus, said plate and insulated portions of its branches being respectively connected with the terminals of an electric circuit, a switch-plug interposed in the hiatus between the branch sections and having an upper portion of non-conductive material and a pin projecting from its lower conductive portion, a longitudinally movable and revoluble spindle, a disk secured to said spindle on one side of the switch-plate operating to move the switch-plugs in one direction, said disk being provided with openings adapted to be brought into register with one or more pins of the switch-plugs, whereby one or more switch-plugs may be displaced in the hiatus between the arm-sections of the switch to close the electric circuit therethrough, and a disk secured to the spindle on the opposite side of the switch for returning the switch-plugs into their normal position, for the purpose set forth.

4. An electric switch comprising a switch-plate L, having a series of radially-arranged branches constructed in two parts insulated from each other by a hiatus, said plate and insulated branches being respectively connected with the terminals of an electric circuit, a support for the switch-plate of insulated material and having openings in register with the hiatus between the sections of the switch-plate branches, and a switch-plug interposed in said hiatus and extending through the insulated support, said switch-plug having a conductive and a non-conductive portion, the last-named portion being normally in contact with the insulated sections of the arms of the switch-plate, and an auxiliary switch F, composed of V or horseshoe shaped plates secured to the opposite side of the insulated switch-support and insulated from one another, the arms of said horse-

shoes being likewise constructed of two parts insulated from each other by an intervening hiatus in register with the openings in the support and the hiatus in the switch-plate L, said horseshoe-plates and their insulated arm-sections being respectively connected with the terminals of an electric circuit, whereby the circuit through one of the horseshoe-plates cannot be closed unless two of the switch-plugs are positioned to bring their conductive portions in contact with the insulated sections of the arms thereof, for the purpose set forth.

5. An electric switch comprising a switch-plate L, having a series of radially-arranged branches constructed in two parts insulated from each other by a hiatus, said plate and insulated branches being respectively connected with the terminals of an electric circuit, a support for the switch-plate of insulated material and having openings in register with the hiatus between the sections of the switch-plate branches, and a switch-plug interposed in said hiatus and extending through the insulated support, said switch-plug having a conductive and a non-conductive portion, the last-named portion being normally in contact with the insulated sections of the arms of the switch-plate, and an auxiliary switch F, composed of V or horseshoe shaped plates secured to the opposite side of the insulated switch-support and insulated from one another, the arms of said horseshoes being likewise constructed of two parts insulated from each other by an intervening hiatus in register with the openings in the support and the hiatus in the switch-plate L, said horseshoe-plates and their insulated arm-sections being respectively connected with the terminals of an electric circuit, whereby the circuit through one of the horseshoe-plates cannot be closed unless two of the switch-plugs are positioned to bring their conductive portions in contact with the insulated sections of the arms thereof, in combination with a revoluble and longitudinally-movable spindle, a disk secured thereto on the side of the switch F, said disk having openings adapted to be brought into register with a pin projecting from the conductive portion of the switch-plugs, whereby one or more of said plugs may be displaced to close the electric circuit through one or more of the branches of the switch L, and a disk secured to the spindle on the side of said switch L to return the plugs into their normal position, thereby closing the electric circuit through the branches of the horseshoe-plates of switch F, for the purpose set forth.

6. In an electric-light signaling apparatus, the combination, with a plurality of electric lights included in branches of an electric circuit, of a switch comprising a switch-body and a corresponding plurality of insulated contacts adjacent to the switch-body, each contact being connected with one terminal of the electric circuit through one of the lamps,

the switch-body being connected with the other terminal of said circuit, an insulated support for the switch-body and contacts, and switch-plugs adapted to be inserted between the contacts and switch-body, said plugs having a conductive and a non-conductive portion, the last-named portion being normally in contact with the switch and one of its contacts, whereby the circuit through one or more lamps may be closed by displacing a switch plug or plugs to bring its conductive portion in contact with the switch-body and a contact or contacts thereof, as and for the purpose set forth.

7. In an electric-light signaling apparatus, the combination, with a plurality of electric lights arranged in pairs, each light being included in a branch of a main electric circuit, of a switch comprising a switch-body connected with one terminal of said main electric circuit, a contact for each of said lights interposed in the branch lines thereof in the order of the arrangement of the lights, and switch-plugs interposed between the respective contacts and the switch-body, said switch-plugs having a non-conductive portion normally interposed between said contacts and switch-body, and a conductive portion adapted to be similarly interposed, and means for displacing the plugs arranged and operating to prevent the simultaneous circuiting of two lamps of a pair, and whereby one or more individual lamps of the several sets or pairs may be simultaneously circuited, for the purpose set forth.

8. In an electric-light signaling apparatus, the combination, with a plurality of signal-lights included in a corresponding number of branch lines, of a main electric circuit, a switch comprising a switch-body connected with one terminal of said main circuit, a contact for each of said lights interposed in the branch line thereof, switch-plugs interposed between the contacts and switch-body, said plugs having a non-conductive portion normally interposed between said contacts and switch-body, a non-conductive support for the switch and contacts, a series of resistance-lamps included in separate branch lines of the main circuit, and an auxiliary switch composed of a switch-body, and contacts adapted to be controlled by the switch-plugs, said auxiliary switch and its contacts being arranged relatively to the signal-light switch and the switch-plugs, so that when one of said plugs is moved to close the circuit through one of the signal-lights the circuit through one of the resistance-lamps will be interrupted, or vice versa, for the purposes set forth.

9. In an electric-light signaling apparatus, the combination, with a plurality of signal-lights arranged in pairs, each light being included in a branch of a main electric circuit, a switch comprising a switch-body connected with one terminal of the main circuit, a contact for each of said lights interposed in the

branch lines thereof in the order of the arrangement of the lights, and an insulated support for said switch, of a resistance-lamp for each pair of signal-lamps in a separate branch of the main circuit, and an auxiliary switch comprising an insulated two-armed switch-body for each resistance-lamp, and contacts for each of the arms of said switch-bodies, the contact for one of the arms being connected with one terminal of the main line and that of the other with the branch line of one of the resistance-lamps, and switch-plugs having a non-conductive portion normally interposed between the signal-light switch-body and its contacts, and a conductive portion normally interposed between the contacts and arms of the resistance-lamp switch, and means for displacing the switch-plugs arranged and operating to prevent the simultaneous circuiting of two lamps of a pair, to close the circuit of one or more individual lamps of the several pairs, and to simultaneously interrupt the circuit through a corresponding number of resistance-lamps, or vice versa, for the purpose set forth.

10. In an electric-light signaling apparatus, the combination, with a plurality of signal-lights, a main line, and a branch for each of said lights, of a switch comprising a casing provided at top with a signal-dial, an electric light in said main line arranged in proximity to the dial, a switch contained in the casing and comprising a switch-body connected with one of the terminals of said main line and a contact for each signal-light connected with the branch thereof, said contacts being arranged in a circle around the switch-body, and switch-plugs having a non-conductive portion normally interposed between the switch-body and its contacts, of a revoluble and vertically-movable spindle, a hand thereon adapted to be revolved on the signal-dial, a disk on said spindle on one side of the switch, having openings adapted to be brought into register with one or more switch-plugs when the spindle is revolved, whereby any desired number of such plugs may be moved when the spindle is moved longitudinally to interpose the conductive portion of a plug or plugs between a contact or contacts and the switch-body to close the circuit through one or more lights, and a second disk secured to the spindle on the opposite side of the switch for returning the displaced plug or plugs into their normal position and interrupting the closed circuit or circuits, for the purpose set forth.

11. The combination, with the casing C, provided with the signal-dial S, the vertically-movable spindle A, and the hand Z thereon, the hub of which is provided with an upwardly-projecting sleeve, of the handle H, secured to the end of the spindle, and the spring-actuated bell-crank locking-lever α , pivoted in the handle on one side of the spindle, the horizontal arm of which lever extends across the end of the spindle, and the vertical arm

engaging the sleeve on the hub of the hand when said spindle reaches the limit of its vertical movement, for the purpose set forth.

12. The combination of the casing C, provided with two stops *m* and *n*, diametrically opposite each other, the switch-support G, the switch L, and switch-plugs *s'* *s*², &c., with the revoluble and vertically-movable spindle A, stepped within the casing and extending through the switch-support and switch, and the disk P, rigidly secured to the spindle and having a toothed periphery, substantially as and for the purpose set forth.

13. The combination of the casing C, provided with a step and the perforated plate *t*, secured to said step, with the revoluble and vertically-movable spindle A, the disk P, rigidly secured thereon, and the spring-catch *y*, secured to the disk and having a pin adapted to engage a perforation in the plate *t* when said spindle is depressed, substantially as and for the purpose set forth.

14. The combination of the casing C, provided with a signal-dial, the support G, and switch L, having each an axial opening, the stops *m* and *n*, secured to the casing diametrically opposite each other below the switch-support, and the switch-plugs *s'* *s*² *s*³, &c., with

the revoluble and vertically-movable spindle A, the disk P, secured thereto below the switch-support and having a toothed periphery adapted to be engaged by the stops, the disk D, secured to the spindle above the switch, the hand Z, adapted to revolve but held against endwise movement with said spindle, and a locking device to lock the spindle against vertical movement after having reached the limit of such movement, substantially as and for the purpose set forth.

15. The herein-described switch-plug, consisting of a pin 11, conductive and non-conductive portions 10 12, and the cap-disk 13, substantially as and for the purpose set forth.

16. The herein-described switch-plug, consisting of a pin 11, conductive and non-conductive portions 10 12, and the cap-disk 13, said conductive portion being more or less elastic or compressible, substantially as and for the purpose set forth.

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

LEOPOLD SELLNER.

Witnesses:

W. B. MURPHY,
JULIUS GOLDSCHMIDT.