

Feb. 21, 1928.

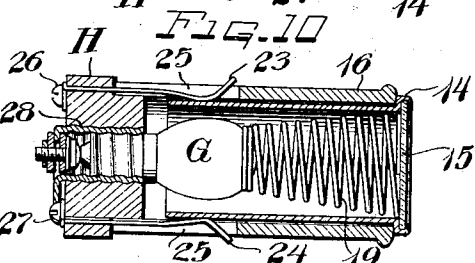
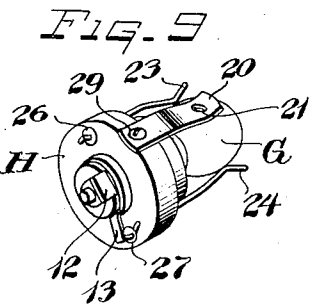
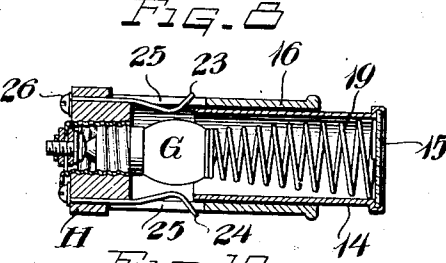
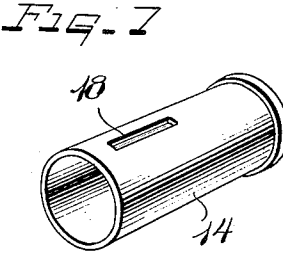
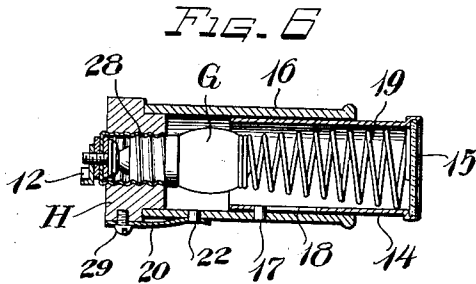
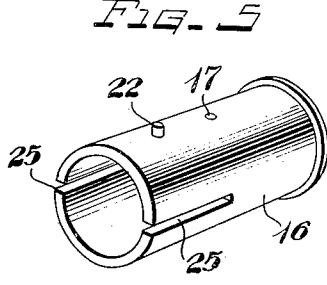
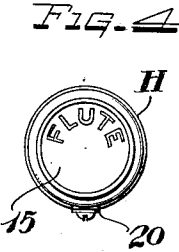
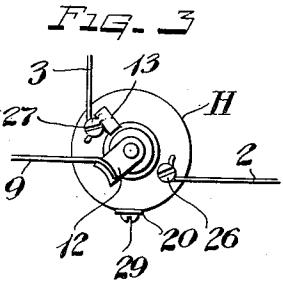
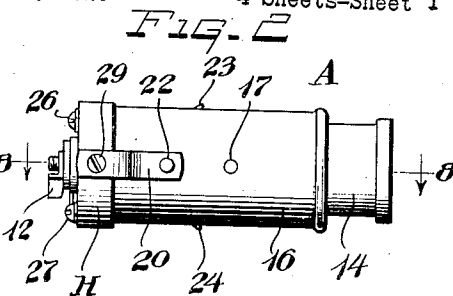
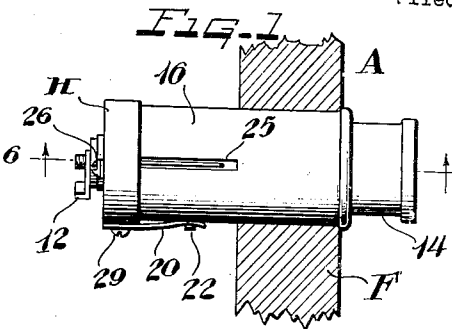
W. E. HASKELL

1,659,914

STOP ACTION FOR ORGANS

Filed Feb. 7, 1923

4 Sheets-Sheet 1



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STOP ACTION FOR ORGANS

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4 Sheets-Sheet 2

FIG. 11

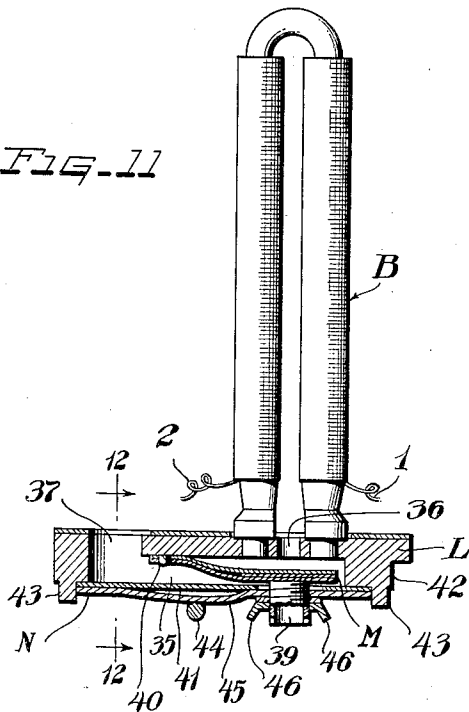


FIG. 12

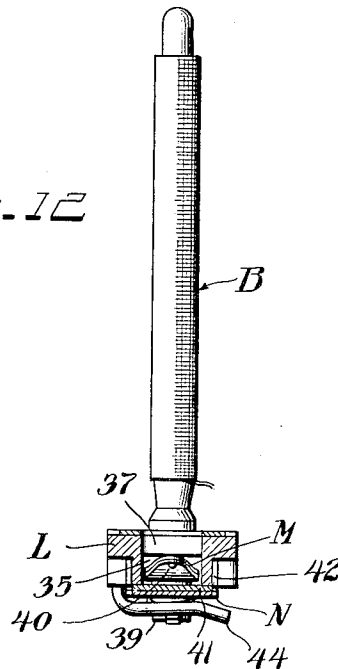


FIG. 14

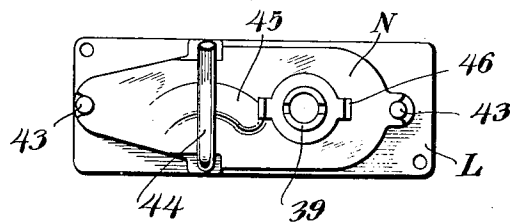


FIG. 13

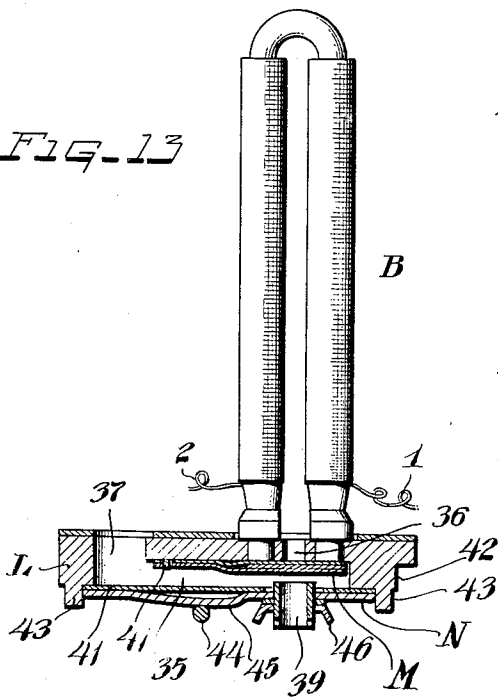
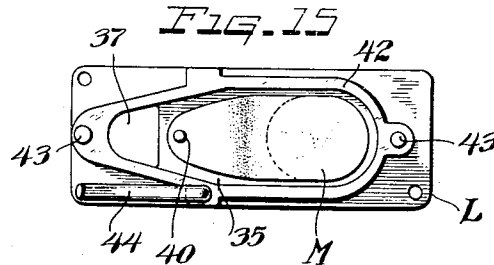


FIG. 15



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STOP ACTION FOR ORGANS.

Application filed February 7, 1923. Serial No. 617,551.

The improved stop action for organs is electro-pneumatic and, instead of the stop touches being draw knobs, keys, or swinging tablets as is the customary practice, they are electrically illuminated switches, and automatically restored to normal position when released by the organist. When the organist wishes to render a particular organ stop active, he pushes the corresponding illuminated switch with the result that the organ stop is rendered active and the switch is electrically illuminated. On relieving the switch from pressure, it automatically resumes its normal position but remains illuminated. When the organist then wishes to render this organ stop idle, he again pushes upon the switch with the result that the light is extinguished and the organ stop is rendered idle and both remain so after the switch resumes its normal position upon the organist releasing the switch.

Also, the organization is such, that a switch is illuminated whenever its particular stop is rendered active irrespective of the movement of the switch itself as, for example, when the stop is rendered active through the combination action of the organ.

The result is that the organist can at all times tell at a glance which stops are active since the switches of all active stops are illuminated while the switches of the idle stops are not illuminated. A switch is moved by a mere touch of the organist so it is manipulated with minimum effort and in minimum time.

The electric light circuit of each stop is independent of the stop controlling circuit so that if the illuminating lamp burns out the activity of the stop is not affected.

The improvements are illustrated in the accompanying drawings in which—

Figure 1, is a side view of one of the illuminated primary switches. Fig. 2 is a bottom view. Fig. 3, is an inner end view. Fig. 4 is an outer end view. Fig. 5, is a perspective view of the casing of the switch. Fig. 6, is a vertical section in the plane indicated by the line 6—6 in Fig. 1. Fig. 7, is a perspective view of the manipulated push button of the switch. Fig. 8, is a horizontal section in the plane indicated by the line 8—8 in Fig. 2. Fig. 9, is a perspective view of the inner base end of the switch. Fig. 10, is a

section in the same plane as Fig. 8, but is on an enlarged scale and shows the push button of the switch pushed inwardly to close the electric circuit controlled thereby. Fig. 11, is a front view partly in vertical section of an electro-magnet which is controlled by the illuminated switch and which itself controls a pneumatic action governing a secondary switch which controls the illuminating circuit and the stop circuit. Fig. 12, is a side view partly in vertical section of the electro-magnet. Fig. 13, is a view similar to Fig. 12 except that it shows the electro-magnet energized and its armature lifted whereas Fig. 11, shows the magnet idle with the armature down. Fig. 14 is an underside view of the electro-magnet base. Fig. 15, is an underside view of the base of the electro-magnet with the bottom lid removed. Fig. 16, is a view illustrating the connections between one of the electro-magnets and the corresponding secondary switch. Fig. 17, is a perspective view of one of the secondary switches. Fig. 18, is a diagram illustrating the electric circuits between generator and one of the primary illuminated switches, one of the electro-magnets, one of the secondary switches and one of the stops. Fig. 19, is a view showing the reversing yoke in a position different from that shown in Fig. 16.

The mode of operation will be understood from Fig. 18 which diagrammatically illustrates an illuminated switch A, an electro-magnet B, a secondary switch C, and an electro-magnet D controlling one of the stops. There are as many of these units as there are stops, couplers and the like in the organ. When the organist pushes upon the primary switch A, shown in Fig. 18, a governing circuit is closed which includes the electro-magnet B and the generator E, the electric current then flowing from the generator through wire 1 to the electro-magnet B; thence by wire 2 to the primary switch A; thence by wire 3 to bus-bar 4; and thence by wire 5 back to the generator, thus completing the circuit. The result is that the electro-magnet B is energized and the effect is to move the secondary switch C to the position shown in Fig. 18 in which it closes two circuits, one a working circuit governing the stop controlling magnet D, and the other a lighting circuit governing the electric lamp

of the illuminated switch A, both of these circuits being independent of the electro-magnet B. The stop governing or working circuit is from the generator E to wire 1; thence through wire 6 to bus-bar 7; thence by wire 8 to the secondary switch C; thence by wire 10 to the stop controlling magnet D; and thence by wires 11 and 5 to the opposite pole of the generator, thus completing the circuit. The effect of energizing the stop magnet D is to render the stop active in a known way. For example, the magnet D and the means whereby it controls the stop chamber may be identical with the corresponding mechanism shown in Fig. 24 of United States Patent, No. 1,323,530, granted to me December 2, 1919.

The lamp governing circuit is from the generator E through wires 1 and 6 to the bus-bar 7; thence through wire 8 to the secondary switch C; thence through wire 9 to one terminal 12 of the lamp socket, thence through the lamp to the second terminal 13 of the lamp socket; thence by wire 3, bus-bar 4 and wire 5 to the opposite pole of the generator, thus completing the circuit. This circuit is parallel to the stop magnet circuit, so that if the lamp burns out the stop governing circuit is not affected, and the stop can be utilized though its indicating lamp is out of commission.

When the organist releases the primary switch, it is automatically returned to its normal circuit-opening position thereby breaking the circuit through the secondary switch controlling magnet B. This however, does not result in any movement of the secondary switch so that the illuminating circuit and the stop governing circuit remain closed and active. Hence the primary switch remains illuminated so long as the stop is in action.

When the stop is to be put out of commission, the organist again pushes upon the primary switch, again closing the circuit through the electro-magnet B. The result of this is to move the secondary switch C to a position in which it breaks both the stop circuit and the lamp circuit, this opposite circuit-opening movement of the secondary switch being effected by the reversing mechanism shown in Figs. 16 and 19.

A complete understanding of the invention requires explanation of the primary switch A; of the secondary switch C; of the electro-magnet B; and of the mechanism through which the said electro-magnet controls the to and fro movement of the secondary switch. These explanations will be made seriatim.

Primary switch.—This switch is illustrated in Figs. 1 to 10 inclusive. The switch is mounted on the stop jamb F of the console where it is in convenient reach of the organist with its exposed end in plain sight. The primary switch has a tubular slidable

push button 14 shown separately in Fig. 7. The tube of the button 14 is of electro-conductive metal. The outer end of the tube is closed by a head 15 consisting of a disk of translucent material, such as celluloid. This disk is lettered, as indicated in Fig. 4, to identify the particular stop to which it belongs. The translucence of the head 15 enables it to be visibly illuminated by the electric lamp G behind it.

The push button 14 is slidably mounted within a surrounding tubular casing 16 shown separately in Fig. 5. This casing is fixedly mounted in the jamb F of the console and is composed of insulating material. The casing 16 has an inwardly projecting stud 17 (Figs. 5 and 6) which enters a longitudinal slot 18 (Figs. 6 and 7) in the push button, thus limiting the extent of sliding movement of the push button. A coiled spring 19 within the casing and the tubular push button, bearing at opposite ends respectively against the electric lamp G and the head 15 of the push button, normally holds the push button in its outer circuit-opening position as illustrated in Figs. 6 and 8, the extent of this outward movement being determined by the inner end of the slot 18 and the stud 17. The stud 17 is put in place after the push button has been inserted within the casing.

The inner end of the casing 16 is closed by the lamp socket base H. The socket base is locked to the casing by means of a spring catch 20 secured to the base by screw 29, as shown in Figs. 6 and 9, near its free end. The catch has an aperture 21 (Fig. 9) which is adapted to engage an outwardly projecting stud 22 on the casing (Fig. 5) as shown in Fig. 6. The socket base is readily moved by moving the spring catch 20 so as to disengage it from the holding stud 22, as is from time to time necessary in order to replace a burnt out lamp.

The socket base H is of the same insulating material as the casing 16. The socket base H carries two electro-conductive resilient terminals 23 and 24, as shown in Figs. 8 and 10. These terminals occupy longitudinal open-ended slots 25 in the casing 16 which permit the ready detachment and replacement of the socket base and extend within the casing into the path of the push-button. The terminal 23 is electrically connected by a binding screw 26 with the circuit wire 2 as shown in Figs. 3 and 18. The terminal 24 is electrically connected by binding screw 27 with the circuit wire 3 as shown in Figs. 3 and 18.

When the organist presses the push button inwardly to the position shown in Fig. 10, it makes electrical contact with the terminals 23 and 24 thereby bridging them and completing the electrical circuit which governs the secondary switch controlling mag-

net B. That is to say, the complete push button controlled circuit thus closed starts with the generator E (Fig. 18); thence by wire 1 to magnet B; thence by wire 2 to binding screw 26; thence, as shown in Fig. 10, by terminal 23 to the tubular push button 14; thence through said tube to terminal 24; thence by binding screw 27 to wire 3; and thence by bus-bar 4 (Fig. 18) and wire 5 to the generator E.

When the organist releases the push button from pressure, the spring 19 moves the push button outwardly to its circuit breaking position shown in Figs. 6 and 8, where it no longer contacts with the terminals 23 and 24.

The return circuit, as just described, is through the bus-bar 4, which is common to all the primary switches employed in the organ.

The socket base H has an internally screw threaded socket 28 of known type into which screws the electric lamp G in a well known way. When the lamp is screwed home in the socket, the electric circuit through the lamp filament is by way of two terminals 12 and 13 connected in the customary way. The lamp terminal 13 is electrically connected with the binding screw 27, being preferably soldered thereto as indicated in Fig. 3. The circuit wire 9 (Fig. 18) is soldered to the opposite lamp terminal 12, as indicated in Fig. 3. When the secondary switch C is moved to its circuit closing position shown in Fig. 18, the lamp circuit is closed since the current in passing from wire 9 to wire 3 goes through lamp terminal 12, through the lamp filament and thence to terminal 13 and binding post 27 connected to the wire 3, as shown in Fig. 3. Accordingly, so long as the secondary switch C occupies its circuit closing position, shown in Fig. 18, the electric lamp circuit is closed and the lamp shines, as visibly apparently through the translucent head 15 of the push button of the primary switch.

The primary switches are practically made of such small size that a large number can be grouped in a small compass within the convenient reach of the organist. The maximum diameter of one of the primary switches through the base block H is one inch.

Secondary switch.—This switch is illustrated in Figs. 16 and 17. It is composed of electroconductive material and is pivoted at 31 to a stationary support 32. Its upper end is pivoted at 33 to a to and fro moving actuator I. The switch C is always in metallic contact with the feed wire 8. Preferably there are two feed wires 8 for each switch C, as indicated in Fig. 17, both being connected to the bus-bar 7, common to all of the secondary switches which may be used in the organ. Each wire 8 is of resilient material so as to hug the switch on opposite faces and hence always maintain metallic contact.

When the switch is in the normal position, shown in Figs. 16 and 17, it is out of contact with a pair of spring terminals 34, so located that the switch can pass between them. This pair of terminals 34 is connected by a binding screw 30 to the wires 9 and 10 which lead respectively to the lamp and to the stop magnet D. When the switch is moved to the position shown in Fig. 18, it enters between the pair of spring terminals 34 and makes metallic contact therewith, acting in this respect as a knife switch. In this way the circuit is certainly closed when the switch is moved into the position shown in Fig. 18.

The switch is moved first in one direction and then in the other at alternate energizations of the electro-magnet B, which has a particular construction and arrangement.

Secondary switch controlling electromagnet.—This magnet is illustrated in detail in Figs. 11 to 15 inclusive. It is also shown in its installed position in Fig. 16. As here shown, it is located within a wind chest J which, when the organ is in action, contains air under constant pressure as indicated by the conventional symbol of a cross within a circle. This magnet controls the air communication between the wind chest and the interior of a pneumatic K.

As shown in Fig. 11, the electromagnet is carried by a channelled base L, which is secured air tight to the underside of the wind chest. The base L has a channel 35 having a port 36 leading to the interior of the wind chest; a port 37 communicating with a channel 38 leading to the interior of the pneumatic K; and a vent 39 leading to the atmosphere.

Within the channel 35 is the armature M of the magnet B. In order that the armature may securely seal either the port 36 or the vent 39 (as the case may be), its iron disk is enclosed adhesively between facings of soft leather such as kid which also serve as a flexible hinge for the armature at the edge where they are adhesively united to a pin 40 (Figs. 11 and 13) carried by the base L. Access is had to the channel 35 for the insertion of the armature through the removable bottom lid N. This lid has a padding 41 to make an air tight fit when the lid is seated against the face 42 (Fig. 15) of the outer surrounding wall of the channel 35. The lid is notched at opposite ends to engage locating pins 43, and it is locked in place by means of a swinging lever 44 which bears against a cam protuberance 45 on the under side of the lid. Thus the lid is firmly held in place but can be readily attached or detached for access to the channel and armature.

The vent 39 is formed by a short threaded pipe screwing into the lid. This pipe has ears 46 by which it can be turned. This

pipe provides a circular edge upon which the armature seats to close the vent as shown in Fig. 11.

When no current is flowing through the magnet B, the padded armature occupies the position shown in Fig. 11, closing the vent 39 and opening the port 36. Accordingly, air under pressure from the wind chest enters the channel 35 and maintains the padded armature air tight against the vent 39. The compressed air thence passes through port 37 and channel 38 into the interior of the pneumatic K, thereby maintaining the double-valve connected therewith in the position shown in Fig. 16. The upper valve 47 closes a port between the wind chest and a passage 48 leading to the interior of a bellows P. The lower valve 49 opens a vent from the passage 48 to the atmosphere. Accordingly, with the armature in the position shown in Figs. 11 and 16, the bellows P is collapsed.

When, however, the magnet B is energized by the closing of its circuit through the primary switch, the armature is lifted to the position shown in Fig. 13 thereby closing the port 36 and opening the vent 39. The opening of the vent 39 relieves the air pressure in the channels 35 and 38 and the interior of the pneumatic K, whereupon the air pressure on the under side of the pneumatic lifts its movable bottom board, thereby lifting the valves 47 and 49. As a consequence the vent of the passage 48 to the atmosphere is closed and this passage is put into communication with the wind chest. Thereupon compressed air flows from the wind chest through the passage 48 into the interior of the bellows P thereby distending said bellows and lifting its top board.

When the circuit through magnet B, is broken the armature M drops by gravity augmented by the high pressure air in the wind chest, thus closing the vent 39, and opening the port 36. Compressed air then enters the pneumatic K, distending it and restoring the double valve to the position shown in Fig. 16. The passage 48 is thus vented to the atmosphere, and the bellows collapses by gravity.

This movement of the bellows P is mechanically transmitted to the actuator I of the secondary switch C.

Transmitting mechanism.—The actuator I extends from the switch C to a rocker Q, as shown in Fig. 16. The actuator I is pivoted at 50 to the rocker, and the rocker is pivoted at 51 to a stationary support 52. The actuator is supported at its opposite ends by the swinging switch C and the swinging rocker Q. The rocker is swung first in one direction and then in the other by successive distentions of the bellows P through a reversing yoke R of known construction. The reversing yoke is adjustably connected

to and supported by the movable board of the bellows P. At its upper end the yoke has two separated fingers 54 and 55, at opposite sides of the rocker axis 51; and these fingers cooperate respectively with notches 56 and 57 at the bottom edge of the rocker and located at opposite sides of the axis 51. A resilient wire 58 fastened at its upper end to the rocker extends near its lower end freely through a hole 59 in the yoke.

The various parts being in the normal position shown in Fig. 16, if the primary switch A is closed by the finger of the organist, the magnet B is energized and the bellows P distends. Thereupon the yoke R is lifted and its finger 54 coming in contact with the rocker Q at the notch 56 swings the rocker Q from its position shown in Fig. 16 to its position shown in Fig. 19. Hence, the actuator I is moved to the right in Fig. 16 and the switch C is swung to the circuit closing position shown in Fig. 18.

When the organist removes his finger from the primary switch, the electric circuit through the magnet B is opened and the bellows P thereupon collapses, thereby lowering the yoke away from and out of contact with the rocker Q. Thereupon the yoke is thrown by the spring 58 from the position shown in Fig. 16 to the position shown in Fig. 19. This is the result of the effect upon the spring 58 by the swinging of the rocker Q from the position shown in Fig. 16 to the position shown in Fig. 19, the spring being thereby put under tension in the opposite direction such as to throw the yoke from right to left. This brings the finger 55 of the rocker yoke into position beneath the notch 57 of the rocker as shown in Fig. 19. Accordingly, when the organist again pushes upon the primary switch A, thereby again closing the circuit through the magnet B, and the bellows P again distends and lifts the yoke, the yoke finger 55 encounters the rocker at the notch 57 thereby swinging a rocker in the opposite direction, that is to say, from the position shown in Fig. 19 to the position shown in Fig. 16 thus moving the actuator I from right to left in Fig. 16 thereby swinging the switch C to the position shown in Fig. 16 thus opening the circuits controlled by it and putting the stop and the corresponding lamp out of action. When the organist then lets go the primary switch the bellows P collapses lowering the yoke away from the rocker; and, since the swing of the rocker has imparted a different order of tension to the spring 58, the yoke is swung back to the position shown in Fig. 16.

Thus the single magnet B serves to move the corresponding secondary switch C first in one direction and then in the opposite direction alternately.

It will be noted that Fig. 19 shows the

bellows P partly distended and the yoke R lifted just enough to bring its finger 55 into contact with the yoke.

In order that the tension of the spring 58 may not impart any false movement to the actuator I, a double acting spring detent S (Fig. 16) cooperates with a doubly inclined cam T carried by the actuator I. Hence, whichever position the actuator may occupy the detent S retains it against the stress of the spring 58. At the same time, the detent does not afford enough resistance to have any deterring effect upon the action of the bellows P.

The actuator I need have no other office than that of a part of the mechanism operatively connecting the bellows P to the switch C. Desirably, however, this actuator I is a stop-controlling trace of the combination action of the organ. It is such a trace as is shown, for example, in the Hutchings United States Letters Patent No. 451,380, April 28, 1891, or such as is illustrated at page 417 of vol. 2 of "The Art of Organ Building", by George Ashdown Audsley, published in New York city in 1905, by Dodd, Mead and Company. Such a trace can be moved not only when its own particular stop touch is manipulated but also when one of the combination touches is manipulated.

It will be noted from Fig. 16 that at all times when the magnet B is idle, the trace I is free to be moved lengthwise to and fro when a force in proper direction is applied to it without involving any movement of the bellows, and without affecting in any way the control by the bellows when distended. The reversing mechanism does not interfere with the independent movement of the trace, nor does the independent movement of the trace interfere with the action of the reversing mechanism, nor throw it out of sequential action. The trace can, therefore, be moved through the combination action in the same way as is disclosed in the patent and in the publication just mentioned. Whichever way the trace I is moved, whether by the combination action or under the control of the primary switch A, it has just the same effect upon the secondary switch C and consequently upon the stop governing circuit and upon the lamp governing circuit. It is, hence, not necessary that a primary switch, such as A, should be manipulated in order to render a stop active or to cause the corresponding lamp to glow. Therefore, in whatever way the trace I is moved to cause the secondary switch to close its two circuits, the lamp corresponding to the then rendered active stop glows and the organist is apprised as to just what stop (or stops) is in action. He can thus determine by a glance whether a desired combination of stops has been set.

Of the mechanism shown, the illuminated switch is the only part located on the console which may thus be a switchboard and nothing else. All of the remaining mechanism can be located at any convenient place in the organ chamber itself or elsewhere.

The illuminated electric switch herein illustrated and described constitutes the subject matter of a divisional application filed June 27, 1924, Serial No. 722,750.

I claim—

1. An organ stop-action having, in combination, a primary illuminated switch A; a spring 19 acting to restore said switch to its normal idle position; an electric lamp G co-operating with said switch to illuminate it; a stop-controlling electro-magnet D; two electric circuits governing respectively said lamp and said stop-controlling magnet; a secondary switch C acting to control both of said circuits; a trace I connected with said secondary switch; an actuating rocker Q connected with said trace to move it alternately in opposite directions; a reversing yoke R co-operating with said rocker to move it alternately in opposite directions; a bellows P connected with and moving said yoke; a constant pressure wind chest J; a double valve controlling the passage of air from said bellows to said wind chest and to the atmosphere; a pneumatic K connected with said double valve to actuate the same; a secondary switch controlling electro-magnet B governing the admission of air from the wind chest to said pneumatic and the venting of said pneumatic to the atmosphere; and a primary electric circuit governing said secondary switch controlling electro-magnet B and controlled by said primary switch, said primary circuit being closed when the primary switch A is moved in one direction away from its idle position and being opened when said switch is moved by its spring 19 in the opposite direction to its idle position, and said trace I being movable to control the secondary switch C irrespective of the closing of the primary circuit by the switch A.

2. An organ stop-action having, in combination, a primary illuminated switch, a spring acting to restore said switch to its normal idle position; an electric lamp co-operating with said switch to illuminate it; a stop-controlling electro-magnet; two electric circuits governing respectively said lamp and said stop-controlling magnet; a secondary switch acting to control both of said circuits; a trace connected with said secondary switch; an actuating rocker connected with said trace to move it alternately in opposite directions; a reversing yoke co-operating with said rocker to move it alternately in opposite directions; a bellows connected with and moving said yoke; a constant pressure wind chest; an air-controlling

electro-magnet governing the admission of air from the wind chest to said bellows and the venting of said bellows to the atmosphere; and a primary electric circuit governing said air-controlling electro-magnet and controlled by said primary switch, said primary circuit being closed when the primary switch is moved in one direction away from its idle position and being opened when said switch is moved by its spring in the opposite direction to its idle position, and said trace being movable to control the secondary switch irrespective of the closing of the primary circuit by the primary switch.

3. An organ stop-action having, in combination, a primary illuminated switch; a spring acting to restore said switch to its normal idle position; an electric lamp co-operating with said switch to illuminate it; a stop-controlling electro-magnet; two electric circuits governing respectively said lamp and said stop-controlling magnet; a secondary switch acting to control both of said circuits; a trace connected with said secondary switch; reversing mechanism connected with said trace to move it alternately in opposite directions; a secondary switch controlling electro-magnet governing the movement of said reversing mechanism; and a primary electric circuit governing said secondary switch controlling electro-magnet and controlled by said primary switch, said primary circuit being closed when the primary switch is moved in one direction away from its idle position and being opened when said switch is moved by its spring in the opposite direction to its idle position, and said trace being movable to control the secondary switch irrespective of the closing of the primary circuit of the primary switch.

4. An organ stop-action having, in combination, a primary illuminated switch; a spring acting to restore said switch to its normal idle position; an electric lamp co-operating with said switch to illuminate it; a stop-controlling electro-magnet; two electric circuits governing respectively said lamp and said stop-controlling magnet; a secondary switch acting to control both of said circuits; reversing mechanism connected with said secondary switch to move it alternately in opposite directions; a secondary switch controlling electro-magnet governing the movement of the reversing mechanism; and a primary electric circuit governing said secondary switch controlling electro-magnet and controlled by said primary switch, said primary circuit being closed when the primary switch is moved in one direction away from its idle position and being opened when said switch is moved by its spring in the opposite direction to its idle position.

5. An organ stop-action having, in combination, a primary illuminated switch; a spring acting to restore said switch to its

normal idle position; an electric lamp co-operating with said switch to illuminate it; a stop-controlling electro-magnet; two electric circuits governing respectively said lamp and said stop-controlling magnet; a secondary switch acting to govern both of said circuits; a secondary switch controlling electro-magnet; and a primary electric circuit governing said secondary switch controlling electro-magnet and controlled by said primary switch, said primary circuit being closed when the primary switch is moved in one direction away from its idle position and being opened when said switch is moved by its spring in the opposite direction to its idle position.

6. An organ stop-action having, in combination, a primary illuminated switch; a spring acting to restore said switch to its normal idle position; an electric lamp co-operating with said switch to illuminate it; an electric circuit governing said lamp; a secondary switch acting to control said circuit; a secondary switch controlling electro-magnet; and a primary electric circuit governing said secondary switch controlling electro-magnet and controlled by said primary switch, said primary circuit being closed when the primary switch is moved away from its idle position and being opened when said switch is moved by its spring to its idle position.

7. An organ stop-action having, in combination, a primary illuminated switch; a spring acting to restore said switch to its normal idle position; an electric lamp co-operating with said switch to illuminate it; a stop-controlling electro-magnet; two electric circuits governing respectively said lamp and said stop-controlling magnet; a secondary switch acting to control both of said circuits; a stop-controlling trace connected with said secondary switch; a reversing mechanism acting to move the trace alternately in opposite directions without interfering with the independent movement of the trace; a secondary switch controlling electro-magnet governing the action of the reversing mechanism; and a primary electric circuit governing said air-controlling electro-magnet and controlled by said primary switch said primary circuit being closed when the primary switch is moved away from its idle position and being opened when said switch is moved by its said spring to its idle position, and said trace being movable to control the said switch irrespective of the closing of the primary circuit by the primary switch.

8. An organ stop-action having, in combination, a primary illuminated switch; a spring acting to restore said switch to its normal idle position; an electric lamp co-operating with said switch to illuminate it; an electric circuit governing said lamp; a

secondary switch acting to govern said lamp circuit; a stop-controlling trace connected with said secondary switch; a reversing mechanism acting to move the trace alternately in opposite directions without interfering with the independent movement of the trace; a secondary switch controlling electro-magnet governing the action of the reversing mechanism; and a primary electric circuit governing said electro-magnet and controlled by said primary switch, said primary circuit being closed when the primary switch is moved away from its idle position and being opened when said switch is moved by its spring to its idle position, and said trace being movable to control the secondary switch irrespective of the closing of the primary circuit by the primary switch.

9. An organ stop-action having, in combination, a primary illuminated switch; a spring acting to restore said switch to its normal idle position; an electric lamp co-operating with said switch to illuminate it; an electric circuit governing said lamp; a secondary switch acting to govern said lamp circuit; a stop-controlling trace connected with said secondary switch; actuating means for said trace which does not interfere with the independent movement of the trace; a secondary switch controlling electro-magnet governing the action of said actuating means; and a primary electric circuit governing said electro-magnet and controlled by said primary switch, said primary circuit being closed when the primary switch is moved away from its idle position and being opened when said switch is moved by its spring to

its idle position and said trace being movable to control the secondary switch irrespective of the closing of the primary circuit by the primary switch.

10. The combination of a primary illuminated electric switch; an automatic means acting to restore said switch to its normal position of rest; a primary circuit opened and closed by said switch; a secondary circuit having a secondary switch alternately opened and closed at successive closures of the primary circuit; and an electric lamp illuminating said primary switch and located in said secondary circuit.

11. The combination of a primary illuminated switch; an automatic means acting to restore said switch to its normal idle position; and an electric lamp cooperating with said switch to illuminate it; a working electric circuit; a lighting circuit governing said lamp; a secondary switch acting to control both said working circuit and said lighting circuit; reversing mechanism connected with said secondary switch to move it alternately in opposite directions; a secondary switch controlling electro-magnet governing the movement of the reversing mechanism; a primary electric circuit governing said secondary switch controlling electro-magnet and controlled by said primary switch, said primary circuit being closed when the primary switch is moved away from its idle position and being opened when said switch is automatically moved to its idle position.

In witness whereof, I have hereunto signed my name.

WILLIAM E. HASKELL.