Nov. 8, 1932. B. E. GETCHELL 1,886,477

ELECTRIC SWITCH

Filed March 23, 1931 3 Sheets-Sheet 2

Fig. 9.

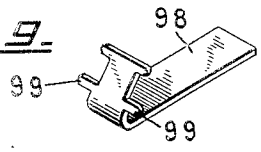



Fig. 6.

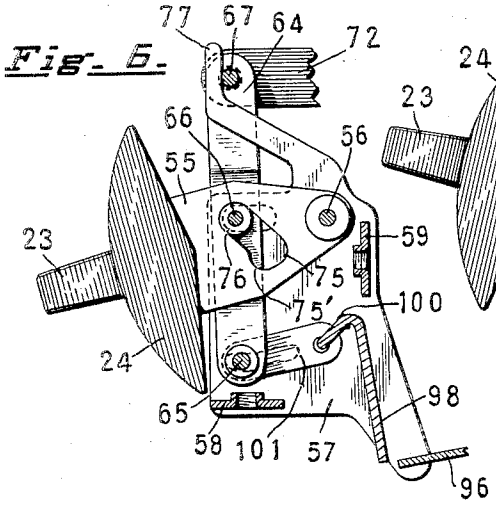



Fig. 5.

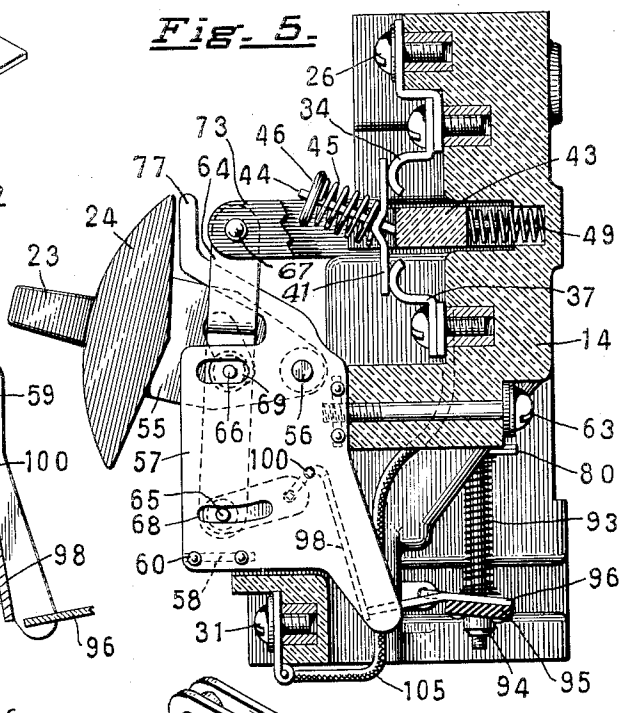
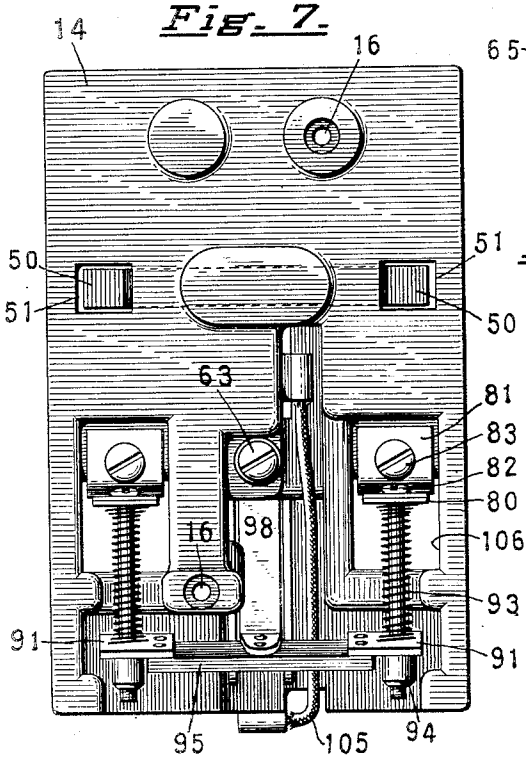



Fig. 7.



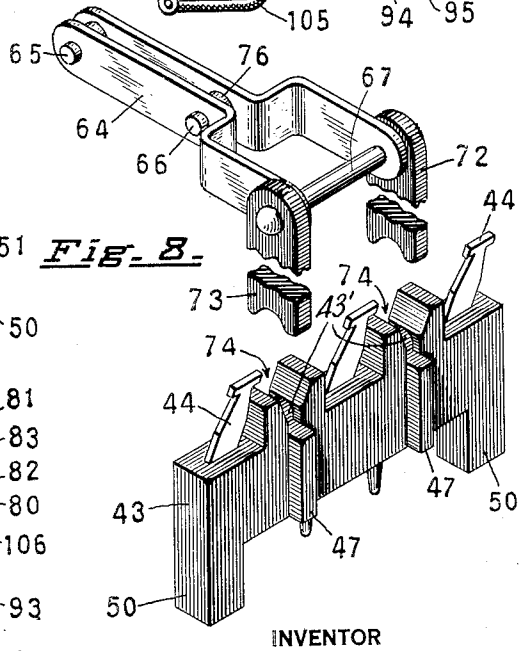




Fig. 8.

INVENTOR

Benjamin E. Getchell,

BY

ATTORNEY

Nov. 8, 1932. B. E. GETCHELL 1,886,477

ELECTRIC SWITCH

Filed March 23, 1931 3 Sheets-Sheet 3

Fig. 10.

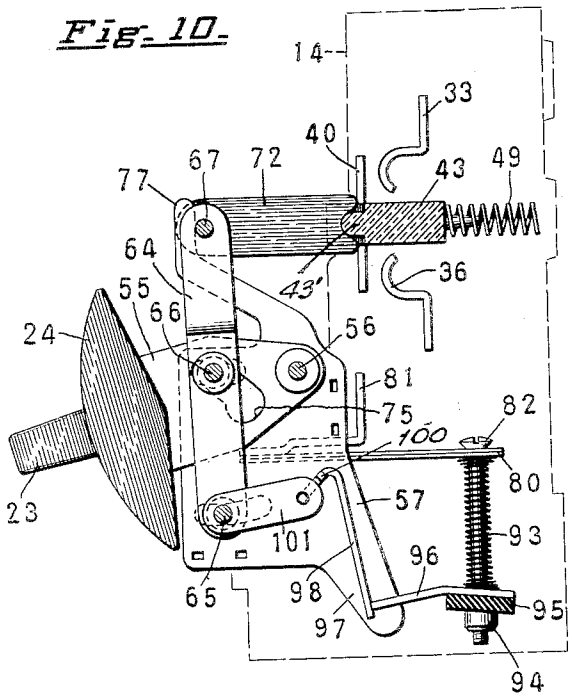



Fig. 12.

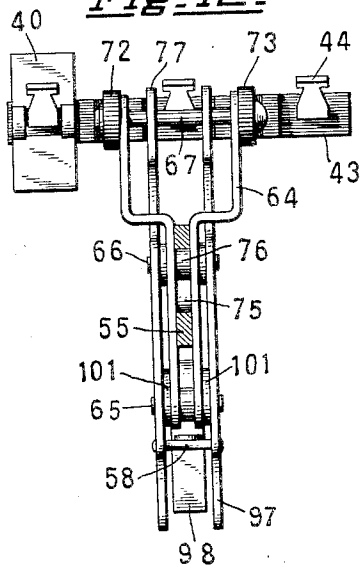



Fig. 11.

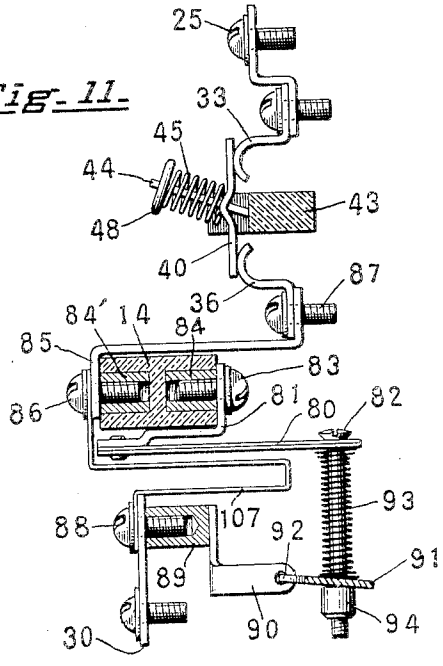
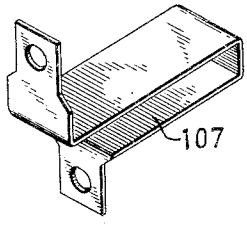



Fig. 13.




INVENTOR
Benjamin E. Getchell,
BY
ATTORNEY

Patented Nov. 8, 1932 1,886,477

# UNITED STATES PATENT OFFICE

BENJAMIN E. GETCHELL, OF PLAINVILLE, CONNECTICUT, ASSIGNOR TO THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, OF PLAINVILLE, CONNECTICUT, A CORPORATION OF CONNECTICUT

## ELECTRIC SWITCH

Application filed March 23, 1931. Serial No. 524,652.

My invention relates particularly to the class of enclosed switches in which provision is made for the manual operation of the switch under normal circuit conditions and additional means is provided for causing the automatic operation of the switch under predetermined overload conditions.

One object of my invention is to provide an extremely compact but a very rugged and reliable switch of the enclosed type.

Another object is to provide a normally hand operated switch with a very simple but dependable form of automatic thermostatic release.

Another object is to provide a thermostatic overload mechanism which normally automatically resets the latching mechanism after being tripped by an overload and in which the latching mechanism may also be reset by means of the manually operable handle.

Another object is to provide an automatic thermostatic overload mechanism which is trip-free from the manual operating means and which cannot be prevented from operating by holding the manual operating handle.

Another object is to provide a double-break switch construction with which it is possible and perfectly safe to "jog", "edge" or "inch" a motor by momentarily closing the contacts of the switch.

Another object is to provide an automatic switch construction having a bi-metallic thermostatic element which is influenced by a separate heater element and in which the heater element is readily removable without disturbing any other part of the construction, and readily replaceable.

Another object is to provide a switch of the forementioned type in which practically all of the parts may be cheaply made of molded material and sheet metal stampings and which may be readily assembled at a minimum cost.

Another object is to provide an automatically operated thermostatic switch mechanism which may readily be calibrated at the factory and in which the pre-determined calibration may be permanently set by means of solder or an equivalent.

In the embodiment of the invention illustrated herein the switch includes an insulating base which supports the line and load terminals, the stationary switch contacts and the thermostatic elements. It also supports a frame which carries an operating lever and toggle mechanism of a special type which is adapted to be secured to the base by a single screw. The base is provided with grooves, pockets and barriers for locating the various conducting and actuating members. The switch is of a compact form adapted to be mounted in a protective box or casing, having a hinged cover and a latch. The handle or operating lever of the switch extends through this cover.

Fig. 1 is a front view of an enclosed switch embodying my invention.

Fig. 2 is a side view of the same, a part of the cover being broken away.

Fig. 3 is a front view of the interior mechanism on a scale representing full size.

Fig. 4 is an end view of the same showing part of the thermostatic release.

Fig. 5 is a longitudinal section showing the parts of the switch in the closed circuit or on position.

Fig. 6 is a fragmentary view of parts of the mechanism in one of the positions they would occupy just after the switch has been tripped or released by action of the thermostatic device.

Fig. 7 is a rear view of the construction shown in Figs. 3 and 4.

Fig. 8 is a perspective view showing the movable carrier for the switch plates and coacting parts of the operating mechanism.

Fig. 9 is a perspective view of the latch member which coacts with the thermostatic device.

Fig. 10 is a side view and partial section showing parts of the switch mechanism in the position they occupy when the switch is "off" and the circuit is open by reason of manual operation.

Fig. 11 is a side view and section showing a thermostatic element and its connections.

Fig. 12 is a front view of the frame and section of the operating lever.

Fig. 13 is one form of a heater element

to break the circuit quickly with a snap action.

For the automatic release of the switch I provide two thermostatic devices, which are connected in the two outer branches or lines of the circuit. Each of these thermostatic devices consists of a bi-metallic arm 80 having one end secured to the bracket 81 and the other end connected to a threaded rod 82. The bracket 81 is connected by a screw 83 to a bushing 84, embedded in the insulating base. The bracket 85 is connected by a screw 86 to another embedded bushing 84′ and by a screw 87 to one of the stationary contacts such as 36. The terminal plate 30 is connected by a screw 88 to the bushing 89, which is moulded in the base and has a projecting bearing 90. A plate 91 has a finger 92 pivoted in the bearing 90 and a spring 93 is mounted on the rod 82 between the thermostatic strip 80 and the plate 91. The rod 82 is preferably in the form of a screw with a nut 94 on its outer end which may be adjusted and soldered in place to regulate the device to act at the proper overload condition. The two plates 91 on opposite sides are connected by an insulating bar 95, and this in turn carries an abutment catch 96 which is positioned between the two extensions 97 of the frame where it is adapted to coact with the tail of a latch lever 98.

A heater element 107 is interposed in the circuit between the bracket 85 and the load side terminal plate 30 and is detachably secured in position by means of screws such as 86 and 88.

A similar heater element is also interposed in the opposite leg of the circuit between the bracket corresponding to bracket 85 and the terminal plate 32.

The heater elements may be made in various capacities or ratings by using wider, narrower, thicker or thinner metal or by substituting a wire which may be coiled or otherwise formed but, in all forms, the elements are provided with end portions suitable for interchangeable attachment by means of screws 86 and 88.

The moment of action of the bi-metallic thermostatic element is determined by the rating or capacity of the heater element and, obviously, the moment of action may be changed if so desired by substituting suitably marked heater elements of the desired capacity.

It will be readily apparent from Figs. 3 and 11 that the heater elements are readily removable from the front of the base without disturbing any other part of the construction. It will also be apparent from Fig. 11 that the contacts 33 and 36, the movable contact plate 40, spring 45 and spring cap 48 are all readily removable for replacement or repairs.

In manufacturing practice, these switches are calibrated at the factory with standard heater elements, the calibrations being accomplished by adjusting the nut 94 on the screw 82 so that the switch will automatically trip to open position under certain conditions and, when so calibrated, the nut 94 is soldered to the screw 82 so that any variation from the moment of action may be predetermined by the substitution of suitably marked heater elements.

The lever 98 has lugs 99 which are pivoted in holes 100 in the side plates of the frame. The other end of this lever 98 is pivoted to links 101 which are connected to the pin 65 previously described. In the normal off or open circuit position of Fig. 10, the arm 96 is interposed in the path of possible movement of lever 98 so that the link 101 and the pin 65 are, in effect, stationary or fixed.

In case of an overload which heats a heater element which in turn causes a thermostat strip 80 to warp to a sufficient extent the inner end of the strip 80 moves upwardly and thus rocks the plate 91 and the attached cross bar 95 so that the arm 96 is tilted downwardly out of the path of the movement of the lever 98. This leaves the lever 98 free to swing on the axis of the pins 100, under the pressure of the spring 49, exerted through the cross bar 43, rods 72, 73, bars 64 and the pivot 66, (which is now stationary so that the pin 65 moves toward the base in the slots 68), and exerting pressure on the short arm of the lever 98, tilts the lever to the position shown in Fig. 6. As soon as the bars 64 have moved sufficiently to release the rollers 76 from the notches 75′ the action of the spring 49 moves the parts to open circuit position with a snap action.

The handle then drops to its off position by its own weight and this, in turn, restores the lever 98 to its original position and as soon as the strip has cooled sufficiently, arm 96 returns to its original position and automatically latches the lever 98.

If the handle is held in the on, or closed circuit position while the switch is being automatically tripped by an overload. arm 96 gets into the path of the lever 98 and prevents the weight of the handle from automatically relatching the mechanism and to re-set the latch, it is merely necessary to press downwardly on the handle 23 and move the handle to fully off position whereupon the lever 98 moves to the latched or re-set position as shown in Fig. 5.

This movement of the lever 98 is caused by the engagement of the upper right hand inclined edge of the slot 75 in the lever 55 with the roller 76 carried by the floating lever or bar 64. As the upper end of the floating lever is held in position by the cross pin 67, the lower end of the lever with the pin 65 is forced outwardly which pulls on the link 101 and thus swings the lever 98 about its pivot 100.

No thermostatic device is required in the central or neutral line but the contact 37 of the switch in this line is connected by a wire 105 to the load terminal 31.

It will be seen that the thermostatic strips 80 are located in passages 106 which extend through the base so that there is room for considerable circulation of air to permit the strips to cool off in normal operation and prevent overheating.

The parts of the switch are designed to operate normally with the base 14 in a vertical position as on a side wall. It will also operate in the usual manner manually when the base is horizontal. If the switch is mounted with its base horizontal and it is tripped thermostatically, gravity will cause the lever 98 to fall out of engagement with the arm 96 in which event the pin 65 will fall to the bottom of the slots 68 and the pin 66 will remain in the lower part of the slot 75. To reset the switch it is then merely necessary to force the operating lever 23 to the off position whereupon the lower edge of the inclined slot 75 will raise the roller 76 and the pin 66 so that the bars 64 will swing about the pin 67 as a pivot and the links 101 will swing the lever 98 about its pivots 100 until the outer end of the lever arm 98 re-engages the end of the latch arm 96 provided of course the thermostat has cooled off sufficiently to permit the arm 96 to return to its normal position. The switch however can not be reset until the thermostat has cooled off to a sufficient degree.

In case the switch is in the on position and the cover is opened the upper edge of the opening 21 will engage the lever 23 and move it sufficiently to throw the switch to the fully off or open circuit position automatically.

I claim:

1. An electric switch including an insulating base having sets of stationary contacts, an insulating cross bar mounted between opposed contacts, switch plates carried by said cross bar for engagement with the stationary contacts, an operating lever supported by the base, a floating lever having means of connection to said cross bar and with said operating lever, a thermostatic device having a heater connected in circuit with at least some of said contacts, a latch lever connected to said floating lever and a catch coacting with said latch lever to hold the same in latched position under normal load conditions, means of connection between said operating lever and said floating lever for manually actuating the movable switch plates independently of the thermostatic devices, said thermostatic devices being adapted to release the switch independently of said operating lever.

2. In an electric switch, an insulating base, stationary contacts mounted thereon, movable switch plates for engagement with said stationary contacts, a supporting frame mounted in said base, an operating lever pivoted to said frame, a floating lever having slotted connections with said frame and having means of connection with said movable switch plate, a latch lever hinged to said frame and connected to said floating lever and a thermostatic element having a catch coacting with said latch lever, said frame, floating lever and operating lever being detachable as a unit and independently of said thermostatic device.

3. In electric switch including an insulating base having a set of stationary contacts, a cross bar mounted adjacent thereto, contact plates carried by said cross bar for engagement with the stationary contacts, an operating lever supported by the base, a floating lever having means of connection to said cross bar and with said operating lever, thermostatic devices having heaters connected in circuit with some of said contacts, a latch lever connected to said floating lever and a catch coacting with said latch lever to hold the same in latched position under normal load conditions, said thermostatic devices being connected to automatically actuate said catch, and means of connection between said operating lever and said floating lever for actuating the movable contact plates independently of the thermostatic devices.

4. In an electric switch, an insulating base, stationary contacts mounted thereon, a movable switch plate for engagement with said stationary contacts, an insulating carrier for said plate, a supporting frame detachably mounted in said base, an operating lever pivoted to said frame, a floating lever having slotted connections with said frame and having means of connection with said carrier, a latch lever hinged to said frame and linked to said floating lever, a thermostatic device having a catch coacting with said latch lever, and a single screw for securing said frame, said floating lever and said operating lever as a unit to said base independently of said thermostatic device.

5. In an electric switch, an insulating base, stationary contacts mounted thereon, movable switch plates adapted to coact with said stationary contacts, an insulating carrier for said plates, a supporting frame mounted in said base, an operating handle lever pivoted to said frame, a floating lever having slotted connections with said frame, push rods connected to said lever and engaging said carrier, a latch lever hinged to said frame and linked to said floating lever, and a thermostatic device having a catch coacting with said latch lever.

6. An electric switch including an insulating base having a set of stationary contacts, a cross bar mounted adjacent thereto, contact plates carried by said cross bar for engagement with the stationary contacts, an operating lever supported by the base, a float-

ing lever having insulating connector bars hinged thereto and for engagement with said cross bar and connected to said operating lever, thermostatic devices having heaters connected in circuit with some of said contacts, a latch lever connected to said floating lever and a catch coacting with said latch lever to hold the same in latched position under normal load conditions.

7. An electric switch including an insulating base, a set of stationary contacts mounted on said base, an insulating cross bar mounted adjacent said contacts, movable contact plates carried by said cross bar for engagement with the stationary contacts, a spring pressing said cross bar outwardly, an operating lever supported by the base, a floating lever, an insulating connector rod connecting said cross bar and lever, a sliding connection between said floating lever and said operating lever, thermostatic devices having heaters connected in circuit with some of said contacts, a latch lever connected to said floating lever and a catch coacting with said latch lever to hold the same in latched position under normal load conditions.

8. In an electric switch, an insulating base, pairs of stationary contacts mounted on said base, movable switch members for bridging said pairs of contacts, a carrier for said switch members, a pivoted operating lever carried by the base, a bar having a sliding connection with said lever, insulating links connecting said bar with said carrier, a pivoted latch member, a link connecting said latch member and said bar, a thermostatic member secured to said base, a catch for said latch connected to said thermostatic member to be actuated thereby, a heater element for said thermostatic member, a circuit terminal connected to one end of the heater element and means of electrical connection between the other end of the heater element and one of said stationary contacts and a circuit terminal connected to a co-related stationary contact.

9. In an electric switch, an insulating base, a pair of stationary contacts mounted on the front of the base at one end thereof, a switch member adapted to connect said contacts, a carrier for said switch member, a pivoted operating lever carried by the base, a bar having a sliding connection with said lever, a link connecting one end of said bar with said carrier, a pivoted latch member, a link connecting said latch member at the opposite end of said bar, a thermostatic member secured to the rear of said base, a catch for said latch connected to said thermostatic member to be actuated thereby, said thermostatic member, said catch and said latch being housed in the end of the base opposite said contacts, a circuit terminal, a heater having one end connected to said terminal, means of electrical connection between the other end of the heater and one of said contacts and a circuit terminal connected to the other contact, said heater serving to move the thermostatic member.

10. An electric switch including an insulating base having pockets, stationary contacts located in said pockets, a cross bar mounted adjacent thereto, contact plates carried by said cross bar and coacting with the stationary contacts, a spring pressing said cross bar outwardly, an operating lever supported by the base, a floating lever, a connector rod connecting said cross bar and lever, a sliding connection between said floating lever and said operating lever, a latch lever connected to said floating lever, a catch coacting with said latch lever to hold the same in latched position under normal load conditions and a thermostatic device for moving said catch.

11. An electric switch including a base having pairs of stationary contacts mounted thereon, a cross bar mounted adjacent to said contacts, contact plates carried by said cross bar for bridging the respective pairs of stationary contacts, an operating lever supported by the base, a floating lever connecting said cross bar and said operating lever, a thermostatic device having a heater connected in circuit with some of said contacts, a latch member connected to said floating lever and a catch coacting with said latch member to hold the same in latched position under normal load conditions, said thermostatic device being connected to automatically actuate said catch, and means of connection between said operating lever and said floating lever for actuating the movable contact plates independently of the thermostatic devices.

12. An electric switch including supporting means having pairs of stationary contacts, a cross bar mounted between opposed contacts, contact plates carried by said cross bar for bridging engagement with the respective pairs of stationary contacts, an operating lever supported by the supporting means, a floating lever connecting said cross bar and said operating lever, a thermostatic device having a heater connected in circuit with at least some of said contacts, a latch lever connected to said floating lever and a catch coacting with said latch lever to hold the same in latched position under normal load conditions, means of connection between said operating lever and said floating lever for manually actuating the movable contact plates independently of the thermostatic device, said thermostatic device being adapted to release the switch independently of said operating lever.

13. In an electric switch, a base, pairs of stationary contacts mounted thereon, movable switch plates for bridging engagement with the respective pairs of said stationary contacts, a supporting frame detachably mount-

ed on said base, an operating lever pivoted to said frame, a floating lever having slotted connection with said operating lever and said frame and having means of connection with said movable switch plates, a latch member hinged to said frame and connected to said floating lever and a thermostatic device having a catch coacting with said latch member, said frame, floating lever and operating lever being detachable as a unit and independently of said thermostatic device.

14. In an electric switch, a base, pairs of stationary contacts mounted thereon, movable switch plates adapted to connect the respective pairs of said stationary contacts, a carrier for said plates, a supporting frame mounted on said base, an operating handle pivoted to said frame, a floating lever having connection with said frame and said handle, push rods connected to said lever and engaging said carrier, a latch member hinged to said frame and linked to said floating lever, and a thermostatic device having a catch coacting with said latch lever.

15. In an electric switch, a base, pairs of stationary contacts mounted thereon, a movable switch plate for connecting each pair of said stationary contacts, a carrier for said plate, a supporting frame detachably mounted on said base, an operating member pivoted to said frame, a floating lever having connection with said frame and member and having means of connection with said carrier, a latch lever hinged to said frame and linked to said floating lever, a thermostatic device having a catch coacting with said latch lever, and a single screw for securing said frame with its attached parts as a unit to said base independently of said thermostatic device.

16. An electric switch including a base having a pair of stationary contacts mounted thereon, a cross bar mounted adjacent said contacts, contact plates carried by said cross bar for engagement with the stationary contacts, an operating lever supported by the base, a floating lever having connector bars hinged thereto and engaging said cross bar, said floating lever having a slotted connection to said operating lever, thermostatic devices having heaters connected in circuit with some of said contacts, a latch member connected to said floating lever and a catch coacting with said latch member to hold the same in latched and manually operable position under normal load conditions.

17. An electric switch including supporting means, pairs of stationary contacts mounted on said means, a cross bar mounted adjacent said contacts, movable contact plates carried by said cross bar for electrically connecting the pairs of stationary contacts, a spring pressing said cross bar outwardly, an operating lever, a floating lever having a sliding connection with said operating lever and connected to said cross bar, thermostatic means having heating means connected in circuit with some of said contacts, a latch lever connected to said floating lever and a catch coacting with said latch lever to hold the same in latched position under normal load conditions.

18. In an electric switch, a base, pairs of stationary contacts mounted on said base, movable switch members for bridging the respective pairs of contacts, a carrier for said switch members, a pivoted operating lever carried by the base, a bar having a sliding connection with said lever and a push connection at one end with said carrier, a pivoted latch member, a link connecting said latch member and the other end of said bar, a thermostatic member secured to said base, a catch for said latch member connected to be actuated by the thermostatic member, a heater element for said thermostatic member, a circuit terminal connected to one end of the heater element and means of electrical connection between the other end of the heater element and one of said stationary contacts and a circuit terminal connected to a co-related stationary contact.

19. An electric switch including an insulating base having pockets, pairs of stationary contacts located in the respective pockets, a cross bar mounted in the base, contact plates carried by said cross bar for connecting the respective pairs of stationary contacts, spring means pressing said cross bar away from said contacts, an operating lever supported by the base, a floating lever, a connector connecting said cross bar and floating lever, a sliding connection between said floating lever and said operating lever, a latch lever coacting with said floating lever, a catch coacting with said latch lever to hold the same in latched position under normal load conditions and a thermostatic device for moving said catch, said operating lever being adapted to reset said latch lever.

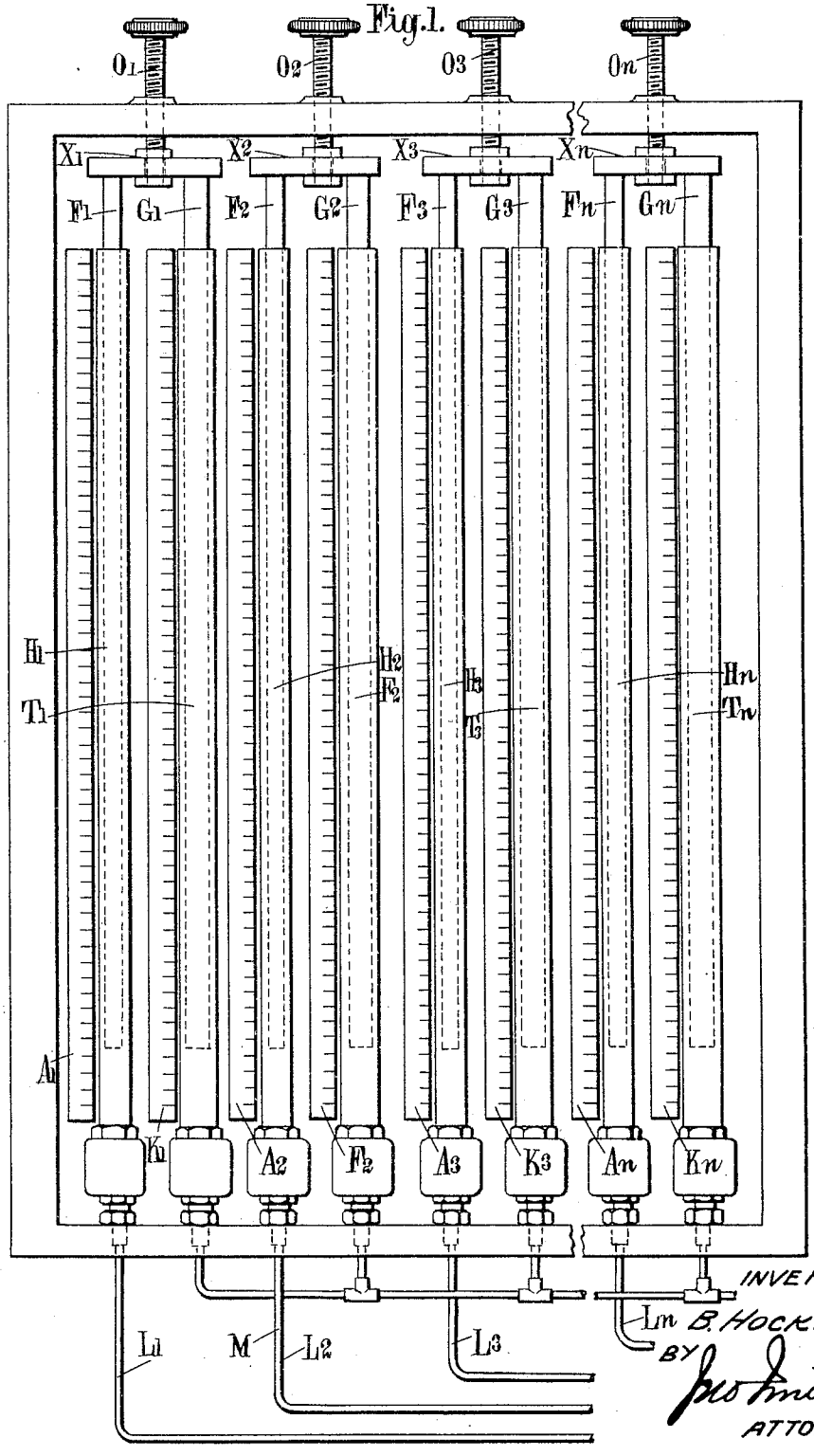
BENJAMIN E. GETCHELL.

Nov. 8, 1932. B. HOCKEN 1,886,482

INDICATING AND CONTROLLING APPARATUS

Filed Nov. 21, 1927 2 Sheets-Sheet 1

Fig. 1.




INVENTOR
B. HOCKEN
BY
ATTORNEY