

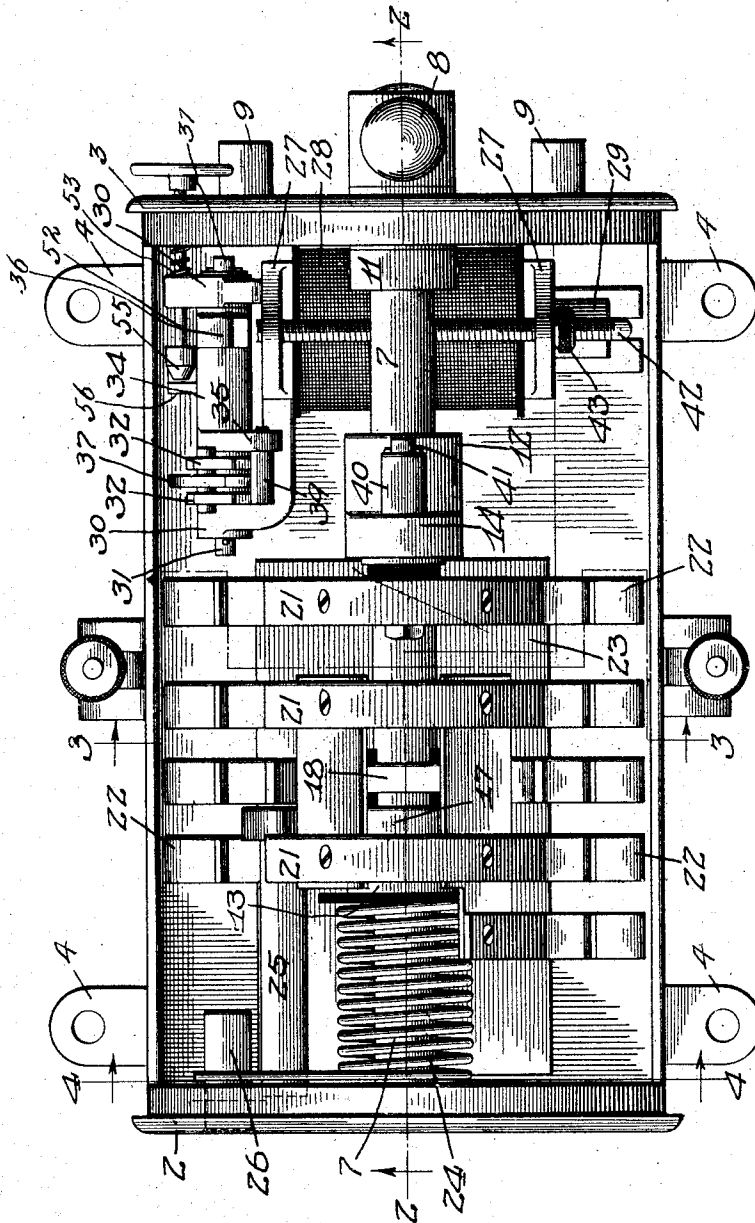
T. E. BARNUM.
OVERLOAD REVERSING SWITCH.
APPLICATION FILED JULY 25, 1906.

949,874.

Patented Feb. 22, 1910.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
Robert H. Wein
G. S. Donnan.

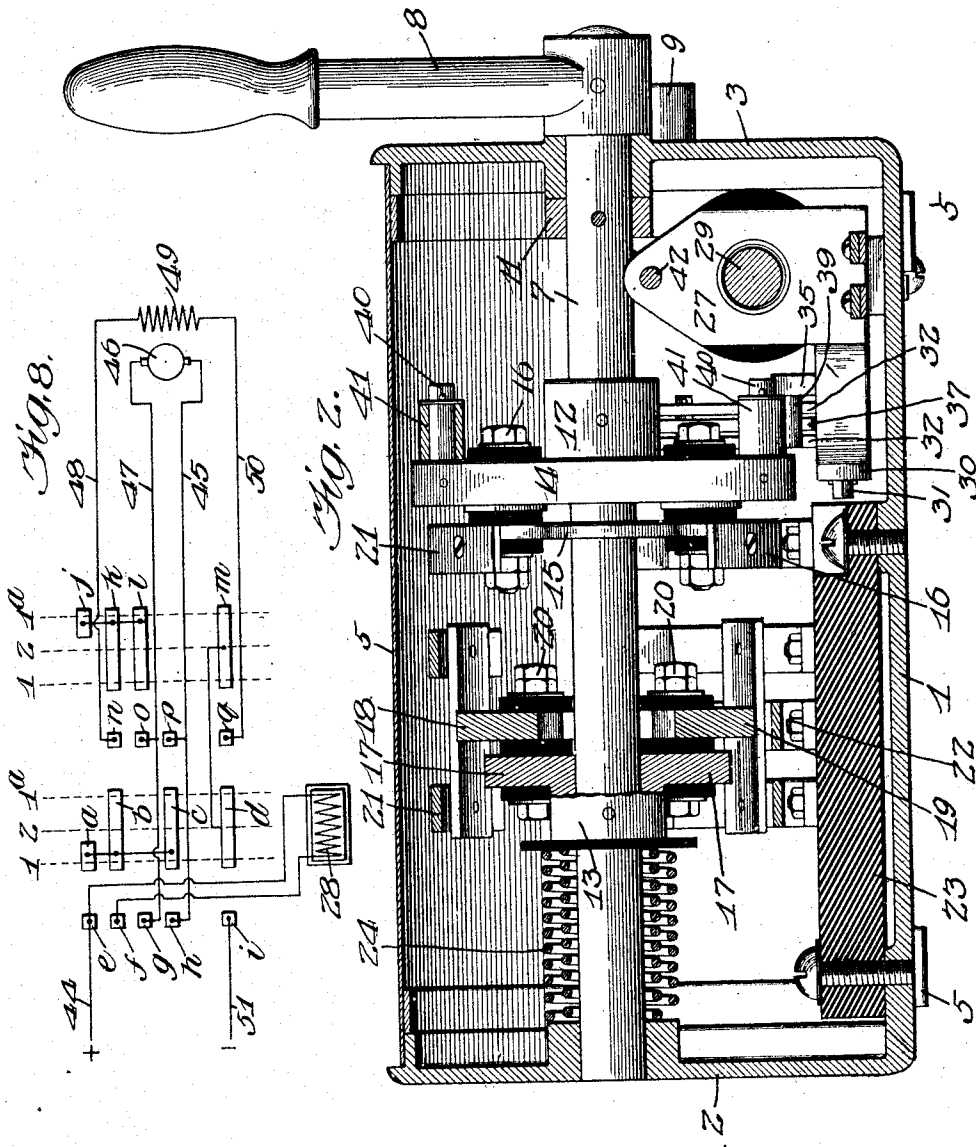
Inventor:
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4 SHEETS—SHEET 2.



Witnesses:
Robert H. Weir
H. V. Donnan.

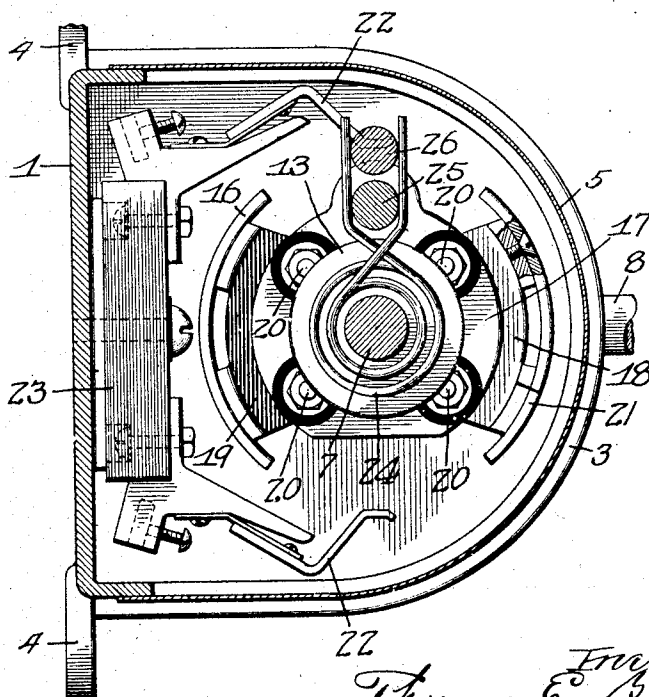
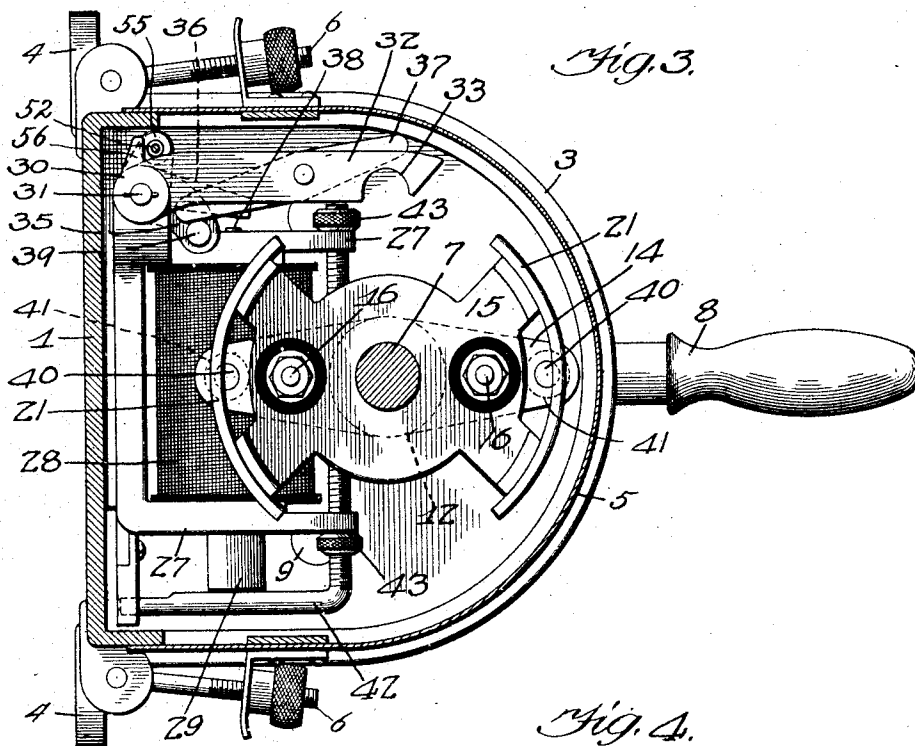
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4 SHEETS—SHEET 3.



Witnesses:
Robert H. Weir
G. V. Domarus

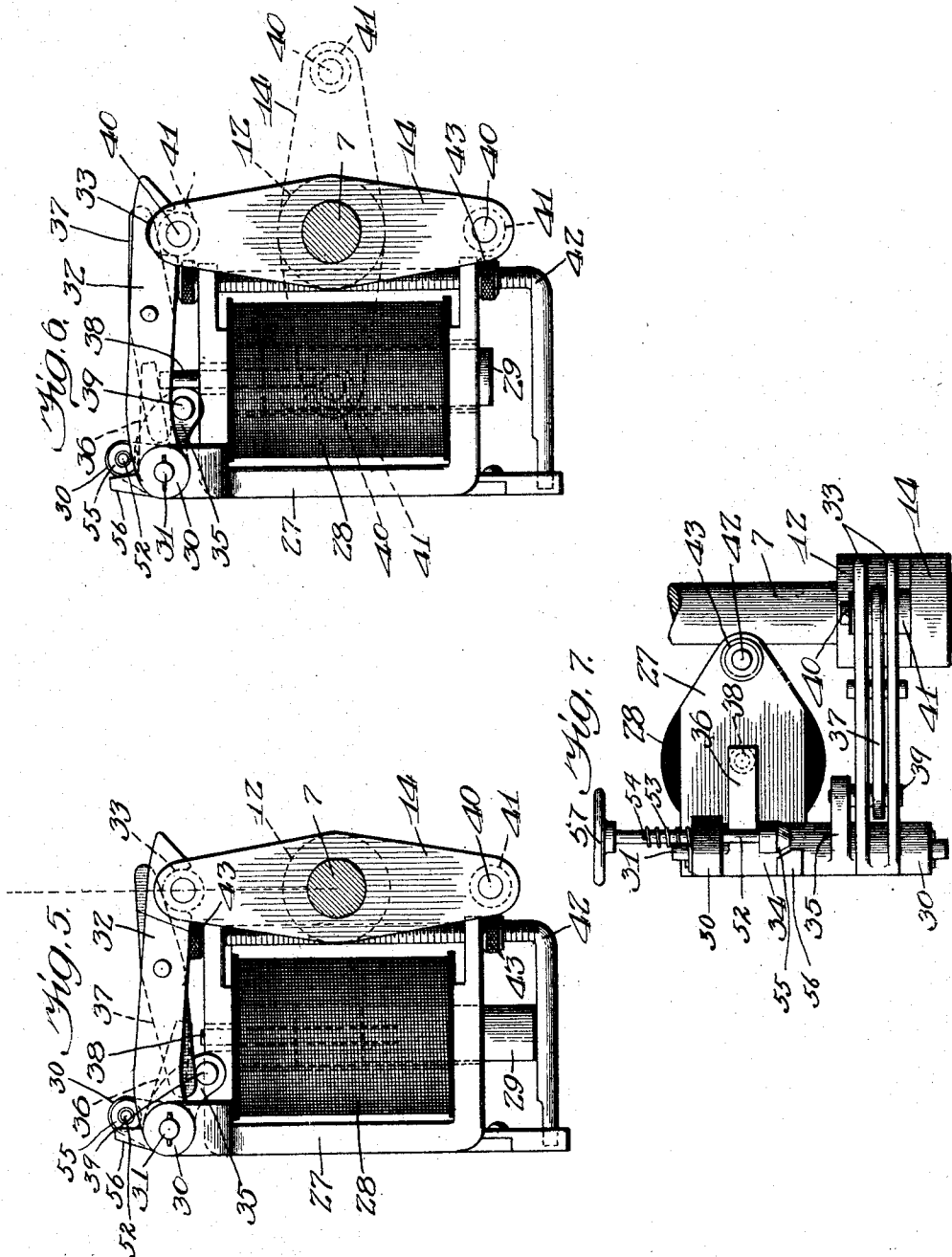
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T. E. BARNUM.
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4 SHEETS—SHEET 4.



Witnesses:

Robert H. Weir
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Inventor:
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UNITED STATES PATENT OFFICE.

THOMAS E. BARNUM, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO THE CUTLER-HAMMER MANUFACTURING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

OVERLOAD REVERSING-SWITCH.

949,874.

Specification of Letters Patent.

Patented Feb. 22, 1910.

Application filed July 25, 1906. Serial No. 327,731.

To all whom it may concern:

Be it known that I, THOMAS E. BARNUM, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Overload Reversing-Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in overload switches.

The object of my invention is to provide a switch of the drum type with means which will cause the same to open whenever an overload occurs.

My invention is especially applicable to reversing switches. According to the preferred form thereof, I provide a shaft or rotatable member, upon which contacts are arranged cylindrically. These contacts are adapted to engage brushes or fingers which may be suitably connected in the circuit of an electric motor. I thus produce a switch which may be employed as a reversing switch for a motor. It will be understood however that my switch may be adapted to other purposes. When the switch stands in its initial or normal position it is open. It may be turned in either direction, from its initial position, to close the same. The position to which the switch will be brought if it be turned in one direction will be designated the forward position, and the position to which it will be brought if it be turned in the opposite direction will be termed the reverse position. The switch is preferably provided with a centering spring, which tends to keep it in its initial position. Whenever the switch is turned to either the forward or the reverse position it is caught by a latch which serves to hold it against the tension of the centering spring. The latch is suitably associated with the overload magnet so that whenever an overload occurs, it will be tripped to release the switch. The centering spring serves to return the switch to its initial position, after it is released.

It will, of course, be understood that my invention may be embodied in various ways and used for different purposes, and that it

is not limited to the particular apparatus which I shall herein particularly set forth in full explaining the various features thereof.

The preferred form of my invention is illustrated in accompanying drawing.

Figure 1, is a front view of the interior mechanism of a reversing switch which embodies my invention; Fig. 2, is a partial sectional view on the line 2—2 of Fig. 1; Fig. 3, is a cross-sectional view on the line 3—3 of Fig. 1; Fig. 4, is a cross-sectional view on the line 4—4 of Fig. 1; showing only the parts in the foreground. Fig. 5, is a detail view of the latch when it is set. Fig. 6, is a detail view of the latch when it is tripped; Fig. 7, is the plan view of the latch; and Fig. 8 is a diagrammatic view showing one of the circuit arrangements of my device.

The reversing switch is preferably mounted upon a supporting frame which is adapted to be attached to a suitable support. The frame is preferably provided with a back 1, and ends 2 and 3, which are integral with the back. The back is preferably provided with lugs 4, by means of which the frame may be fastened in place. The ends 2 and 3 preferably carry a sheath 5, which is held in place by bolts 6, connected to the back. The structure which is thus formed by the frame and sheath serves as a casing.

The supporting frame preferably carries an operating shaft 7 which is journaled in the ends 2 and 3. The shaft is preferably provided with a handle 8, which is arranged upon the outside of the end 3. The supporting frame is preferably so placed that the operating shaft is arranged in a horizontal position. The end 3 is preferably provided with lugs 9 which serve as stops to limit the movement of the handle. A collar 11 is preferably fastened upon the operating shaft and arranged upon the inside of the end 3. The collar and the handle serve to prevent axial displacement of the shaft.

The operating shaft preferably carries supporting collars 12 and 13 which are preferably fastened thereto by means of pins. The collar 12 is preferably provided with two arms 14, to which a bracket 15 is fastened by means of bolts 16, said bracket being suitably insulated from said arms. The collar 13 is preferably provided with a flange

17, to which two brackets 18 and 19 are attached by means of bolts 20, said brackets being suitably insulated from said flange and also from each other. The brackets 15, 18 and 19 carry suitable contact rings 21, which are adapted to engage brushes or contact fingers 22, said brushes preferably being mounted upon an insulating base 23, fastened upon the back 1. The left end of the shaft is preferably surrounded by a centering spring 24, between the ends of which are arranged pins 25, and 26, the pin 25 being mounted upon the flange 17 and the pin 26 being mounted upon the end 2.

It will thus be seen that I provide a switch of the drum type which may be turned in either direction from its initial position. The contact fingers or brushes 22 may be so connected to the circuit of a motor, and the contact rings so arranged, that the switch is adapted to act as a reversing switch for the motor. When the switch stands in its initial position, the contact rings are out of engagement with the brushes or contact fingers, and, therefore, the switch is open. If the switch be turned in either direction from its initial position, the contact rings will be brought into engagement with the contact fingers to close the switch. If the switch be turned in one direction, it will be brought to the forward position, in which position it will so close the motor circuit that the motor will operate in a forward direction. If the switch be turned in the opposite direction, it will be brought to the reverse position, in which position it will so close the motor circuit that the motor will operate in a reverse direction.

In order to hold the switch in either position against the tension of the centering spring, I preferably provide a latch, the construction of which I shall now describe. Figs. 5, 6, and 7 show the construction of the latch which I prefer to employ. It will be understood, however, that my invention contemplates a latch of various forms. In order to support the latch, I preferably provide a frame 27, which is adapted to be mounted upon the back 1. The frame is preferably so constructed that it is adapted to support an overload coil or magnet 28. A plunger 29, which is adapted to be attracted by the overload coil, is suitably carried by the frame. The top of the frame is preferably provided with lugs 30, by means of which a pin 31 is supported. A pair of pawls 32, each of which is provided with a notch 33, is preferably pivotally mounted upon the pin. A barrel or hub 34, which is provided with lugs 35 and 36, is also pivotally mounted upon the pin. The pawls 32 preferably carry a lever 37, which is arranged between the same and pivoted thereto at a central point. The plunger 29 preferably carries a pin 38 which is adapted to

engage the lug 36. The lug 35 preferably carries a pin 39 which is adapted to engage the inner end of the lever 37. A mechanical connection is thus formed between the overload coil or magnet and the pawls 32.

The arms 14 are preferably each provided with a pin 40 which carries a roller 41. The notches 33 in the pawls 32 are adapted to receive either of the rollers. If the switch be in the forward position, the pawls 32 will engage one of the rollers, and if it be in the reverse position, said pawls will engage the other roller. The pawls thus serve to catch the switch to hold it in either the forward position or the reverse position. The pawls are preferably so arranged that gravity will serve to keep the same in engagement with either of the rollers. Figs. 5 and 6 illustrate the operation of the latch. Fig. 5 shows the latch when it is set so that the switch is caught by the same. The pawls then engage one of the rollers. Fig. 6 shows the latch when it is tripped to release the switch. Whenever an overload occurs the overload coil will raise the plunger 29, thereby causing the pin 38 to engage the lug 36. The hub 34 will thus be turned, thereby causing the pin 39 to raise the inner end of the lever 37. The outer end of the lever will then press downwardly upon the roller which is engaged by the pawls, thereby causing the pawls to be raised from said roller. It will thus be seen that whenever an overload occurs, the switch will be released and returned to its initial position. The circuit which the switch controls will therefore be protected against damage by an overload.

The frame 27 preferably carries a threaded rod 42, the lower end of which extends beneath the plunger 29, and forms a stop for the same. The position of the rod may be adjusted by means of nuts 43.

The manner of connecting my reversing switch to a motor is illustrated in Fig. 8. In order to distinguish the contact rings 21, as well as the contact rings 22, from each other I shall designate the same by means of reference letters. It may be assumed when the switch is moved to the forward position, that the contact rings *a*, *b*, *c*, and *d* engage the contact fingers *e*, *f*, *h* and *i* respectively, and that the contact rings *k*, *l*, and *m* engage the contact fingers *n*, *o*, and *q* respectively. During the rotation of the switch toward the forward position, the contact fingers, pass through the position indicated by the dotted lines 1—1. In consequence the circuit is first closed from the positive line 44 through finger *c*, ring *a*, contact ring *e*, finger *h*, conductor 45, armature 46, conductor 47, finger *o*, ring *l*, ring *k*, finger *n*, conductor 48, field winding 49, conductor 50, finger *q*, ring *m*, ring *d*, and finger *i* to the negative line 51. It will be

noted that the overload coil 28 is then short-circuited.

When the switch is fully closed the contact fingers are in the position indicated by the dotted line 2—2. The circuit then extends from the positive line 44, through finger *e*, overload coil 28, finger *f*, ring *b*, ring *c*, and thence through the path as has been previously traced. The overload coil is thus placed in circuit. When the switch is moved to the reverse position, the contact rings *j*, *k*, *l*, and *m* will engage the contact fingers *e*, *g*, *h*, and *i* respectively, and the contact rings *b*, *c*, and *d* will engage the contact fingers, *n*, *p*, and *q* respectively. During the rotation of the switch toward the reverse position, the contact fingers will pass through to the position indicated by the dotted lines 1^a—1^a. In consequence the circuit is first closed from the positive line 44, through finger *e*, ring *j*, ring *l*, finger *g*, conductor 47, armature 46, conductor 45, finger *p*, ring *c*, ring *b*, finger *n*, conductor 48, field 49, conductor 50, finger *q*, ring *d*, ring *m*, and finger *i*, to the negative line 51. When the switch is fully closed in the reverse position, the contact fingers are in the position indicated by the dotted lines 2—2. The circuit is then closed from the positive line 44, contact finger *e*, overload coil 28, contact finger *f*, ring *k*, ring *l*, and thence through the same path as has previously been traced.

In order that I may open the switch at will, I preferably provide means which may be manually actuated to trip this latch, and I shall now describe such means. A slidable rod 52 preferably extends through the end 3 of the supporting frame and an upward extension in one of the lugs 30. A retracting spring 53 is preferably placed between said lug, and a collar 54 fastened to the rod. The inner end of the rod preferably carries a wedge shaped piece or cam 55, which is adapted to engage an inclined surface upon a lug 56 extending from the hub 34 of the latch. The outer end of the rod is provided with a finger piece or button 57. In order to trip the latch, manually, this button 57, may be pressed inwardly to cause the cam 55 to engage the lug 56 and thus turn the hub. The pin 39 will then operate the lever 37 to trip the latch in the same manner as has heretofore been set forth.

It will, of course, be understood that various changes may be made in the apparatus which I have illustrated herein, without in any way, deviating from my invention as defined by the claims appended hereto.

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

1. In combination, a switch having contacts thereon, stationary contacts, a projec-

tion on said switch, a pivoted latch for engaging said projection and for holding said contacts in closed relation, a lever adapted to actuate said latch, and a magnet adapted to actuate the lever to disengage the latch from said switch.

2. In combination, a switch, a projection on said switch, a latch adapted to engage said projection when the switch is in closed position, a lever for disengaging said latch from said projection, an electromagnet adapted to respond to abnormal electrical conditions to operate said lever, and means to return said switch to open position when the latch is disengaged.

3. In combination, a switch having cylindrically arranged contacts, a latch adapted to catch said switch and hold it in a predetermined position, an overload magnet adapted to trip said latch, and means for retracting said switch when said latch is tripped.

4. In combination, a switch, a latch adapted to catch said switch and hold it in a predetermined position, a lever adapted to trip said latch, and an electro-magnetic winding adapted when subjected to abnormal electrical conditions to actuate said lever to trip said latch.

5. In combination, a switch, a pawl or detent forming a latch to catch said switch and hold it in a predetermined position, a lever pivoted upon said pawl and adapted to actuate the pawl, and an electro-magnetic winding for operating said lever to move said pawl.

6. In combination, a switch, a locking pawl or detent, a part carried by said switch and adapted to be engaged by said pawl to retain said switch in position, a lever pivoted upon said pawl and adapted to engage said part, said lever adapted to actuate the pawl, and an electro-magnet adapted to operate said lever.

7. In combination, a switch, a pivoted pawl, a part carried by said switch adapted to be engaged with said pawl to retain said switch in a predetermined position, a lever pivoted upon said pawl and adapted to actuate said pawl and to engage said part, a pivoted member adapted to engage said lever, and an electro-magnet winding adapted to actuate said member.

8. In combination, a switch, a pivoted pawl, a part carried by said switch and adapted to be engaged with said pawl to retain said switch in a predetermined position, a lever pivoted upon said pawl and adapted to actuate said pawl and to engage said part, a pivoted member, an electro-magnetic winding, means actuated by said winding to turn said member, and means carried by said member for engaging said lever.

9. In combination, a switch, a pawl, a pin having said pawl pivoted thereon, a part

carried by said switch and adapted to be engaged by said pawl, a lever pivoted upon said pawl and adapted to engage said part, a barrel arranged upon said pin, an electro-
 5 magnet, a plunger adapted to be actuated by said magnet, a connection between said plunger and said barrel and a connection between said barrel and said lever.

10 10. In combination, a switch, a frame, a magnet mounted upon said frame, a plunger adapted to be actuated by said magnet, a pivot carried by said frame, a pawl mounted upon said pivot, a part carried by said switch and adapted to be engaged with said
 15 pawl, a lever pivoted upon said pawl and adapted to be engaged by said part, a member mounted upon said pivot, a connection between said member and said plunger, and a connection between said member and said
 20 lever.

11. In combination, a switch, a pawl, a part carried by said switch and adapted to be engaged by said pawl, a lever pivoted upon said pawl and adapted to engage said
 25 part, a magnet, and mechanism adapted to be operated by said magnet to actuate said lever.

12. In combination, a switch, a pawl, a part carried by said switch and adapted to be engaged by said pawl, a lever pivoted upon said pawl and adapted to engage said
 30 part, an electro-magnetic winding, a plunger adapted to be actuated by said winding, and a mechanical connection between said
 35 plunger and said lever.

13. In combination, a rotatable member adapted to be turned in either direction from initial position, reversing switch contacts operated thereby, means urging said
 40 switch member to stand in its initial position, means for holding said member in its final position in either direction it is moved, and a magnet adapted to release the last mentioned means.

14. In combination, a switch, a projection on said switch, a pawl or detent to engage said projection and hold said switch in a predetermined position, a lever pivoted upon said pawl and adapted to bear against
 50 the projection on the switch, and an electro-magnetic device adapted to respond to abnormal electrical conditions to force the lever against the projection whereby the pawl will be disengaged therefrom.

15. In combination, a rotatable member, contacts cylindrically arranged thereon, a pawl or detent, a part carried by said rotatable member and adapted to be engaged by said pawl, a lever pivoted upon said pawl
 60 and adapted to engage said part, an overload magnet, a mechanical connection between said magnet and said pawl, and a spring connected to said rotatable member.

16. In combination, a switch, a projection
 65 on said switch, a pawl or detent to engage

said projection and hold said switch in a predetermined position, a lever pivoted upon said pawl and adapted to bear against the projection on the switch, an electro-responsive device adapted to respond to ab-
 70 normal electrical conditions to force the lever against the projection whereby the pawl will be disengaged therefrom, and means to return the switch to initial position when released by said pawl.

17. In a switch adapted to be turned in either direction from initial position, in combination, a shaft, reversing contacts controlled by the movement of said shaft, a latch, parts on said shaft adapted to be engaged by the latch when the switch reaches
 80 final position in either direction, and an electromagnetic winding adapted to actuate said latch.

18. In combination, a rotatable member, 85 contact rings cylindrically arranged thereon, contact fingers mounted upon a stationary support and adapted to engage said contact rings, a pawl, a part carried by said rotatable member and adapted to be engaged
 90 with said pawl to hold said member in a predetermined position, a lever pivoted upon said pawl and adapted to actuate said pawl, an overload magnet, and a mechanical connection between said overload magnet 95 and said lever.

19. In combination, a rotatable member, contact rings arranged cylindrically thereon, contact fingers mounted upon a stationary support and adapted to engage said
 100 contact rings, a spring connected to said rotatable member, a frame, an overload magnet carried by said frame, a pawl pivoted upon said frame, a part carried by said rotatable member and adapted to be engaged by said
 105 pawl, and a mechanical connection between said magnet and said pawl.

20. In combination, a rotatable reversing switch having cylindrically arranged contacts and adapted to be turned in either
 110 direction from its initial position, a spring connected to said switch, a latch adapted to catch said switch, and an electro-magnetic winding adapted to trip said latch.

21. In combination, a rotatable reversing 115 switch having cylindrically arranged contacts, and adapted to be turned in either direction from its initial position, a spring connected to said switch, a pawl adapted to engage said switch, an overload magnet, and
 120 a mechanical connection between said magnet and said pawl.

22. In a reversing switch in combination, a rotatable member adapted to be turned in either direction from its initial position,
 125 contacts cylindrically arranged upon said member, a spring connected to said member, a pawl adapted to catch said rotatable member, and an overload coil for actuating said pawl.
 130

23. In a reversing switch in combination, a rotatable member adapted to be turned in either direction from its initial position, a spring connected to said rotatable member, 5 contacts cylindrically arranged upon said member, a pawl adapted to catch said member, an overload magnet, and a mechanical connection between said overload magnet and said pawl.

10 24. In a reversing switch, in combination, a rotatable member adapted to be turned in either direction from its initial position, contacts cylindrically arranged upon said rotatable member, a spring connected to said 15 rotatable member, a pawl, a part carried by said member and adapted to be engaged by said pawl, a lever pivoted upon said pawl and adapted to engage said part, an overload magnet, and a mechanical connection 20 between said magnet and said lever.

25. In a reversing switch, in combination, a supporting frame, a rotatable member mounted upon said frame, contacts cylindrically arranged upon said rotatable member, contact fingers or brushes mounted 25 upon said frame, a spring connected to said rotatable member, a magnet frame mounted upon said supporting frame, an overload coil mounted upon said magnet frame, a 30 latch mounted upon said magnet frame and adapted to catch said rotatable member, and a mechanical connection adapted to be actuated by said coil to trip said latch.

26. In a reversing switch, in combination, 35 a shaft, a collar mounted upon said shaft, a bracket mounted upon said collar, contact rings mounted upon said bracket, contact fingers mounted in a stationary position and adapted to engage said contact rings, a latch 40 adapted to catch said shaft, and an overload magnet adapted to trip said latch.

27. In combination, a shaft, a collar mounted upon said shaft, a plurality of 45 brackets mounted upon said collar, contact rings carried by said brackets, stationary contacts adapted to engage said contact rings, a spring, a pawl, parts carried by said shaft and adapted to be engaged by

said pawl, and an electro-magnet adapted to disengage said pawl from said parts. 50

28. In a reversing switch, in combination, a shaft, collars carried by said shaft, brackets carried by said collars, contact rings carried by said brackets, contact fingers mounted upon a stationary support and adapted 55 to engage said contact rings, a spring surrounding said shaft, a pawl, parts carried by one of said brackets and adapted to be engaged by said pawl, and an electro-magnet adapted to disengage said pawl from 60 said parts.

29. In a reversing switch, in combination, a shaft, collars carried by said shaft, brackets carried by said collars and insulated from the same, contact rings carried by 65 said brackets, contact fingers mounted upon a stationary support and adapted to engage said contact rings, a spring surrounding said shaft, a pivoted pawl, parts carried by one of said brackets and adapted to be engaged by said pawl, a lever pivoted upon 70 said pawl, and adapted to engage said parts, an overload magnet, and a mechanical connection between said magnet and said lever.

30. In a reversing switch, in combination, 75 a supporting frame, a shaft journaled upon said frame, collars mounted upon said shaft, brackets mounted upon said collars and insulated therefrom, contact rings carried by said brackets, contact fingers mounted upon 80 said frame and adapted to engage said rings, a spring surrounding said shaft, rollers carried by one of said brackets, a pivoted pawl adapted to engage said rollers, a lever adapted to engage said rollers, and pivoted upon 85 said pawl, an overload magnet, and a mechanical connection between said overload magnet and said lever.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses. 90

THOMAS E. BARNUM.

Witnesses:

WALTER E. SARGENT,
OSCAR A. KELLER.