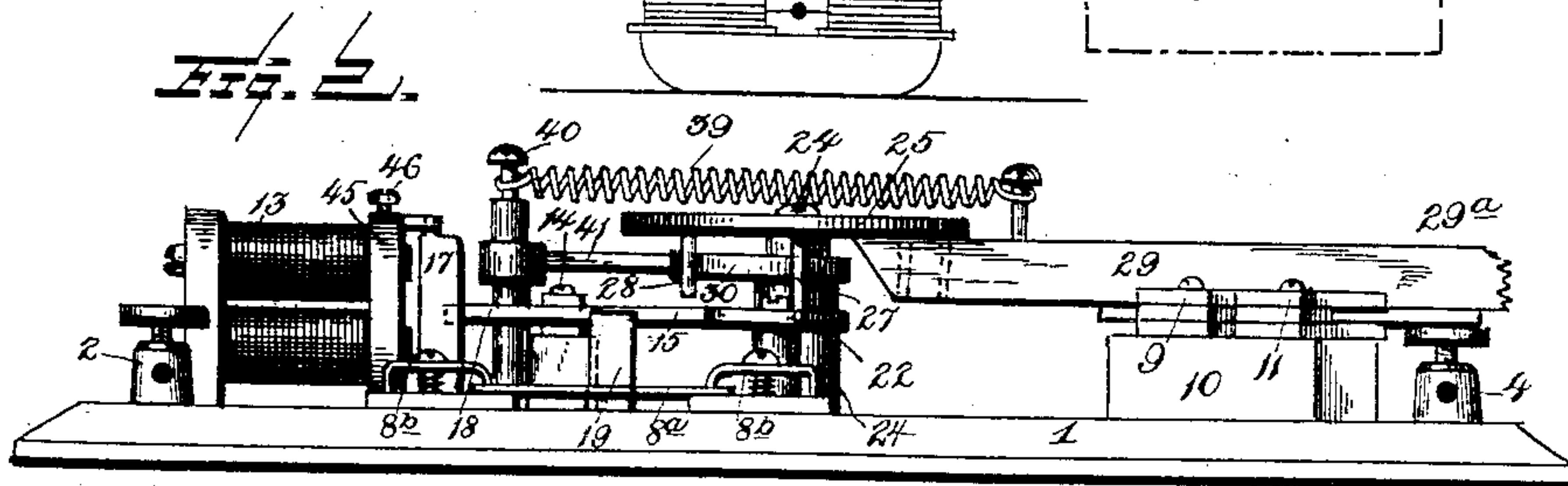
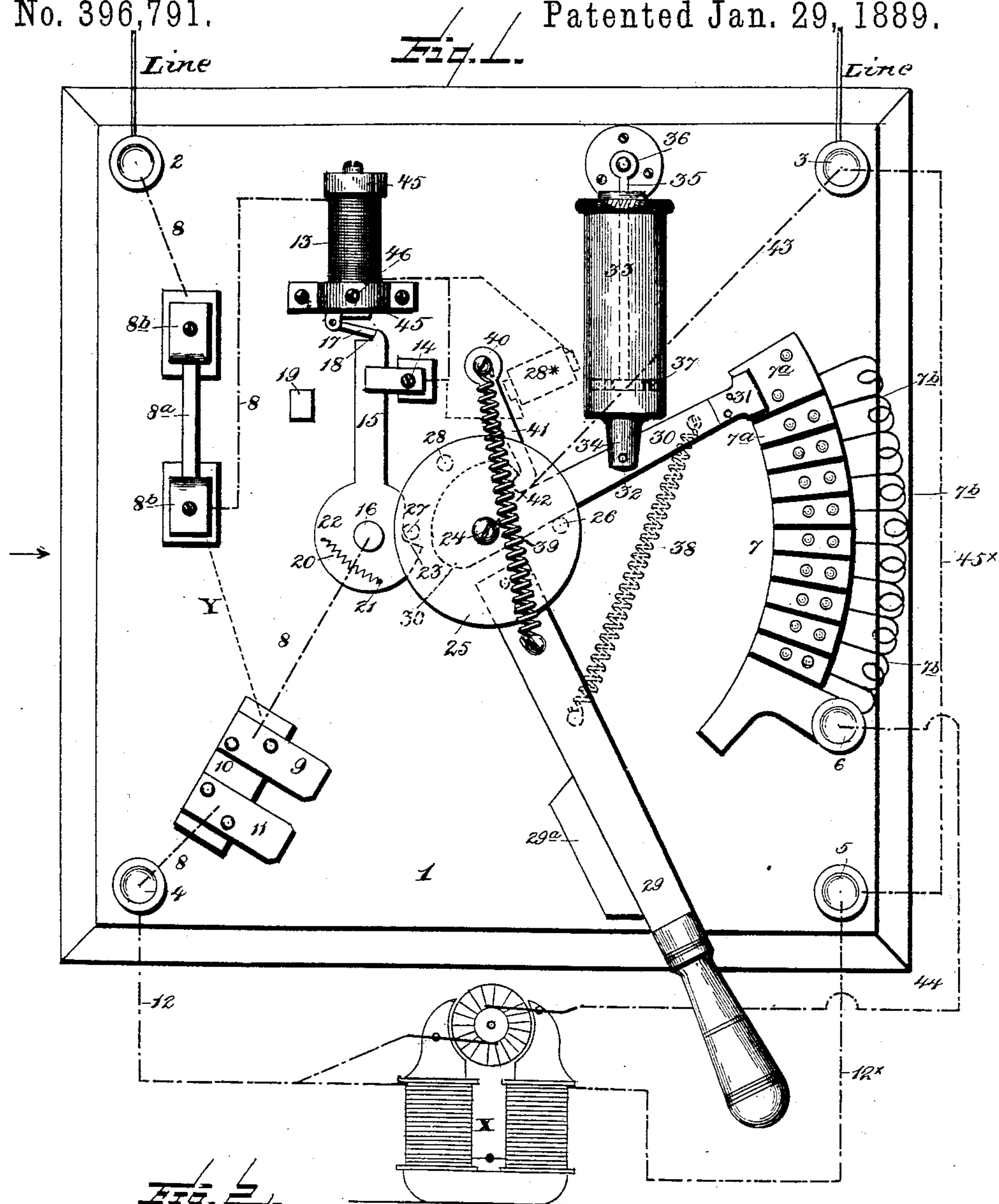


(No Model.)

G. H. WHITTINGHAM.  
AUTOMATIC SWITCH FOR ELECTRIC MOTORS.

No. 396,791.

Patented Jan. 29, 1889.



Witnesses:

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# UNITED STATES PATENT OFFICE.

GEORGE H. WHITTINGHAM, OF BALTIMORE, MARYLAND

## AUTOMATIC SWITCH FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 396,791, dated January 29, 1889.

Application filed May 12, 1888. Serial No. 273,665. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE H. WHITTINGHAM, a citizen of the United States, residing at Baltimore, in the State of Maryland, have  
5 invented certain new and useful Improvements in Automatic Switches or Starters for Electric Motors, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention has relation to an electric switch designed for use in starting and stopping electrical motors or in starting and stopping the supply of an electrical current to a conductor or conductors employed for trans-  
15 mitting the same for lighting or other mechanical purposes, the object of the invention being primarily to so control the delivery of the electrical current to the motor or to the conductors that the supply shall be gradual  
20 in order that the motor or other mechanism to which the conductors lead shall be prevented from any injurious effects arising from an overcharge of the current.

In the application of the invention for controlling the supply of current to an electric  
25 motor and to a line of supply of, for example, lighting devices, the construction, arrangement, and operation of the several parts, hereinafter described, remain the same; but  
30 in the one instance the supply passes from the line through the switch to the motor, and in the other instance from the line through the switch to the point of work.

The main purpose, object, and advantage  
35 of the invention—that is, the gradual supply of the electric current—involves the interposition of any well-known extraneous resistance and a certain particular construction of mechanical devices for rendering the control  
40 of the said supply automatic.

Other objects and advantages will appear in the following description, and the novel features thereof will be pointed out in the claims.

45 Figure 1 is a plan of a switch constructed in accordance with my invention. Fig. 2 is a side elevation looking in the direction indicated by the arrow in Fig. 1.

Referring to the drawings, 1 represents the  
50 base, which may be the bottom or back of a casing, having a glass in its front to protect

the operative parts of the switch from dust and moisture.

2 and 3 represent binding-posts for the incoming and outgoing lines. 55

4 represents a similar post for the field and armature line 12 of the motor X, 5 a binding-post for the line 12<sup>x</sup>, leading from the field of the motor, while 6 represents the point of connection of the associate armature-line, 44, with  
60 the resistance 7. The resistance 7 comprises a series of insulated plates, 7<sup>a</sup>, connected with the coils 7<sup>b</sup>.

The posts 2 and 4 are connected by a conductor, 8, having an interposed fusible section, 8<sup>a</sup>, held in position by clamps 8<sup>b</sup>, of conducting material, electrically connected with the conductor 8. The latter ends in clamping contact-plates 9, mounted upon a block, 10, of insulated material, and constitutes one terminal of the circuit. Similar contact-plates,  
70 11, are mounted on the block 10 a distance from the plates 9, and are electrically connected with the conductor 12, which is a continuation of the conductor 8 and extends to  
75 the motor X. From one of the clamps 8<sup>b</sup> the conductor 8 extends to a magnet, 13, and from the magnet to the clamp 14, with which a latch, 15, is adapted to make contact, and, being of conducting material, serves for the passage of the current therethrough and to its  
80 pivot 16, from which to the clamp 9 the conductor 8 extends.

A keeper, 17, is pivoted to swing in front of the poles of the magnet 13 and into a notch, 85 18, formed in the end of the latch. A post or other stop, 19, projects from the base to limit the movement of the latch in one direction, which movement is caused by a coiled spring, 20, secured at one end, 21, to the base and at  
90 the other to a disk, 22, of non-conducting material, secured to the latch and having a notch, 23, in its periphery.

At or about the center of the base is a standard or stud, 24, on which is pivotally mounted  
95 a brass disk, 25, having diametrically-opposite depending lugs 26 and 27 and a third lug, 28. The operating-lever 29 of the switch is secured in any suitable manner to the disk, and is provided with a contact-plate, 29<sup>a</sup>,  
100 which is adapted to reach from one to the other of the clamping-plates 9 and 11 when



brought into contact therewith to complete the circuit. On the standard 30 and below the disk is pivoted independently the resistance-bar 30, which terminates in contact-plates 31, which are adapted to bear against the upper and lower surfaces of the plates 7<sup>a</sup> of the resistance. Between the pivoted and free ends of the resistance-bar, as at 32, is pivotally connected a resistance-bar-governing device, 33, the function and object of which are to control the movement of the plates 31 over and along the resistance. In this instance the governing device is a dash-pot having a rod, 34, extending from its closed end and pivotally connected with the bar 30, while its piston-rod 35 is pivotally connected with the base at 36, and its head is provided with one or more openings or ports, 37, so that oil or other desirable liquid within the pot is caused to pass through said port or opening, and thus to regulate and control the movement of the bar along the resistance. In this instance the dash-pot rod is suspended at 36, so that the weight of its cylinder and of the resistance-bar is the moving force which causes the bar to move along over the resistance, but it is apparent that any convenient arrangement of a spring may be employed instead of the suspended dash-pot. For example, said spring may be connected with the resistance-bar and with the lever, as shown by dotted lines 38.

By the means just described a movement of the bar 30 in one direction is provided for, while its movement in the opposite direction is caused by the depending lug 26 on the brass disk 25, which is brought into operation in that movement of the lever which occurs in breaking the connection with the plates 9 and 11. A spring, 39, extends from a pin on the lever 29 to a stud, 40, arranged with relation to the stud 25 so as to draw the lever after it has passed its center of motion in either direction, thus insuring on the one hand complete connection with the plates 9 and 11 and on the other hand a complete return of the resistance-bar. Now, in order to insure a good contact of the plate 29<sup>a</sup> with the plates 9 and 11 in making the circuit, a hook, 41, is pivoted on the standard 40, and it is adapted to take into a notch, 42, in the bar 30, so that the depending lug 28 on the brass disk 25 must reach said hook and force it out of said notch before a complete contact occurs between the plates 29<sup>a</sup> and 9 and 11. Instead of removing the hook 41 mechanically by the lug 28 it may be accomplished electrically by arranging a magnet, 28<sup>x</sup>, adjacent to the hook, as shown by dotted lines, and placing said magnet in the circuit 8 between the clamp 14 and the magnet 13, so that said hook in that case also will not be removed or released from the bar 30 until the circuit is completed by the lever.

On the right of the switch is shown the conductor 43, extending from the post 3 to the pivot of the resistance-bar, and the current is

conducted along the same through the bar and the resistance to the point 6, where it takes the conductor 44 to the armature of the motor. Another conductor, 45<sup>x</sup>, extends (preferably beneath the base) from the post 3 to the post 5 and from thence to the field-line 12<sup>x</sup> of the motor.

As above stated, the latch 15 is thrown in one direction by a spring, 20. Its movement in the opposite direction is caused by the depending lug 27 on the disk 25 when the lever 29 is thrown to the right. Now, it will be seen that, taking the parts shown in the position illustrated in Fig. 1, the circuit is broken at the plates 9 and 11, and that in order to complete the same the switch-lever must be thrown over, so that the plate 29<sup>a</sup> thereof shall connect the two terminals 9 and 11. By this act, instead of throwing the supply of electricity upon the companion line of the circuit to that which is closed by said plate 29<sup>a</sup>, said supply is caused to pass through the resistance 7, and, as the switch-lever is thrown over, the lug 28 removes the hook 41, so that the dash-pot and the resistance-bar fall by gravity, carrying the plates 31 along over the resistance gradually as said bar is allowed to move, or is controlled in its movement by the mechanical resistance of the liquid within the cylinder of the dash-pot as it passes through the port 37 of the piston thereof. At this point it is noted that in case the current should be abnormal to such a degree as to injure the motor the magnet 13 retracts the keeper 17, and the latch 15 is thrown from contact with the plates 14 by the spring 20, thus breaking the circuit and stopping the motor. The poles of the magnet are adjustably supported in the bracket 45 by set-screws 46, so that said magnet may be adjusted to withdraw the keeper only when an excessive amount of current, or one beyond that required for the work to be performed, is conducted to the magnet.

As a further precaution, the fusible strip 8<sup>a</sup> is provided, in order that in case the magnet 13 should fail in its intended operation the current, if sufficiently abnormal, shall melt the strip and thus break the circuit, so that in either case the motor is protected from injury by an excessive amount of current.

In case the latch is released, the current broken, and the motor stopped, the operator has only to move the switch-lever to the right, which will set the latch again in contact with the plates 14, and so as to be held by the keeper, and then to return the switch-lever to again make the circuit. Sparking is prevented by insulating and separating the same and extending the plate 29<sup>a</sup> to reach from one to the other.

I deem it proper to state that several novel features of my invention are capable of successful use without employing the intermediate cut-off involving the magnet 13 and latch 15 and their mechanical connection with each other and with the switch-lever. For example, these may be omitted and the conductor



8 extended directly from the clamp 8<sup>b</sup> to the contact-plates 9, as illustrated by dotted lines Y. In this modified construction the operation of the switch so far as regards the action of the remaining parts, and especially of the governor and resistance-bar connected and co-operating with the switch-lever, as described, would attain the primary objects and advantages of the invention, and I therefore do not limit my invention to the use of all the features herein shown and described.

Having described my invention and its operation, what I claim is—

1. A switch comprising an operating-lever carrying a circuit-closing plate, a resistance, an arm extending from the operating-lever to the resistance and connected with a dash-pot, and a device connected with the operating-lever for maintaining the arm against movement until said operating-lever is connected with the circuit which it is adapted to close, substantially as specified.

2. The combination, with the lever and resistance, of a switch-bar and a latch arranged in the path of the lever to be operated in one direction and a spring for operating the latch in the opposite direction, a keeper, and a magnet for controlling the keeper, substantially as specified.

3. In a switch, and electrically connected with the conductors thereof, a resistance, a resistance-bar, mechanism, substantially as described, for automatically controlling its movement in one direction, the switch-lever proper, a latch having mechanical connection with said lever for movement in one direction, a spring or its equivalent for moving it in an opposite direction, and a keeper and magnet for automatically releasing the latch, substantially as specified.

4. In a switch, and in combination with its lever, a resistance-bar mechanically connected with the lever for its operation positively in one direction, and a governor for automatically controlling the operation of the resistance-bar in the opposite direction, substantially as specified.

5. In a switch, the combination of the lever 29, having at its pivoted end a disk, 25, having the lug 26 depending from the disk, standard 24, for supporting the lever, the resistance 7, and the bar 30, independently pivoted to said standard and extending to the resistance, substantially as specified.

6. The combination of the resistance 7, its bar arranged to move over the resistance, a governing device, substantially as described, connected therewith, and the switch-lever 29, terminating in a disk, 25, and having independent movement relative to the bar 30, and provided with means for moving said bar in the opposite direction to that of the movement produced by the governing device, substantially as specified.

7. The combination of the lever 29, bar 30, and disk 25, having lugs 26 and 28 and hook 41, the bar 30 and hook 41 being arranged in the path of said lugs, substantially as specified.

8. The combination of the lever 29, disk 25, having lug 27, and latch 15, having notched disk 22, arranged in the path of said lug, substantially as specified.

9. The combination of the magnet 13, keeper 17, latch 15, arranged to swing into the path of the keeper, contact-plate 14 in the path of the latch, the non-conducting disk 22 on the latch, the lever 29, and its depending lug 27, in the path of the disk, with conductor 8, substantially as specified.

10. The combination, with the switch-lever 29, a resistance and resistance-bar, and a governing device, substantially as described, of a hook adapted to take into said bar, and means, substantially as specified, for releasing said hook at about the time that the circuit is completed by the operation of said lever, substantially as specified.

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

GEORGE H. WHITTINGHAM.

Witnesses:

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