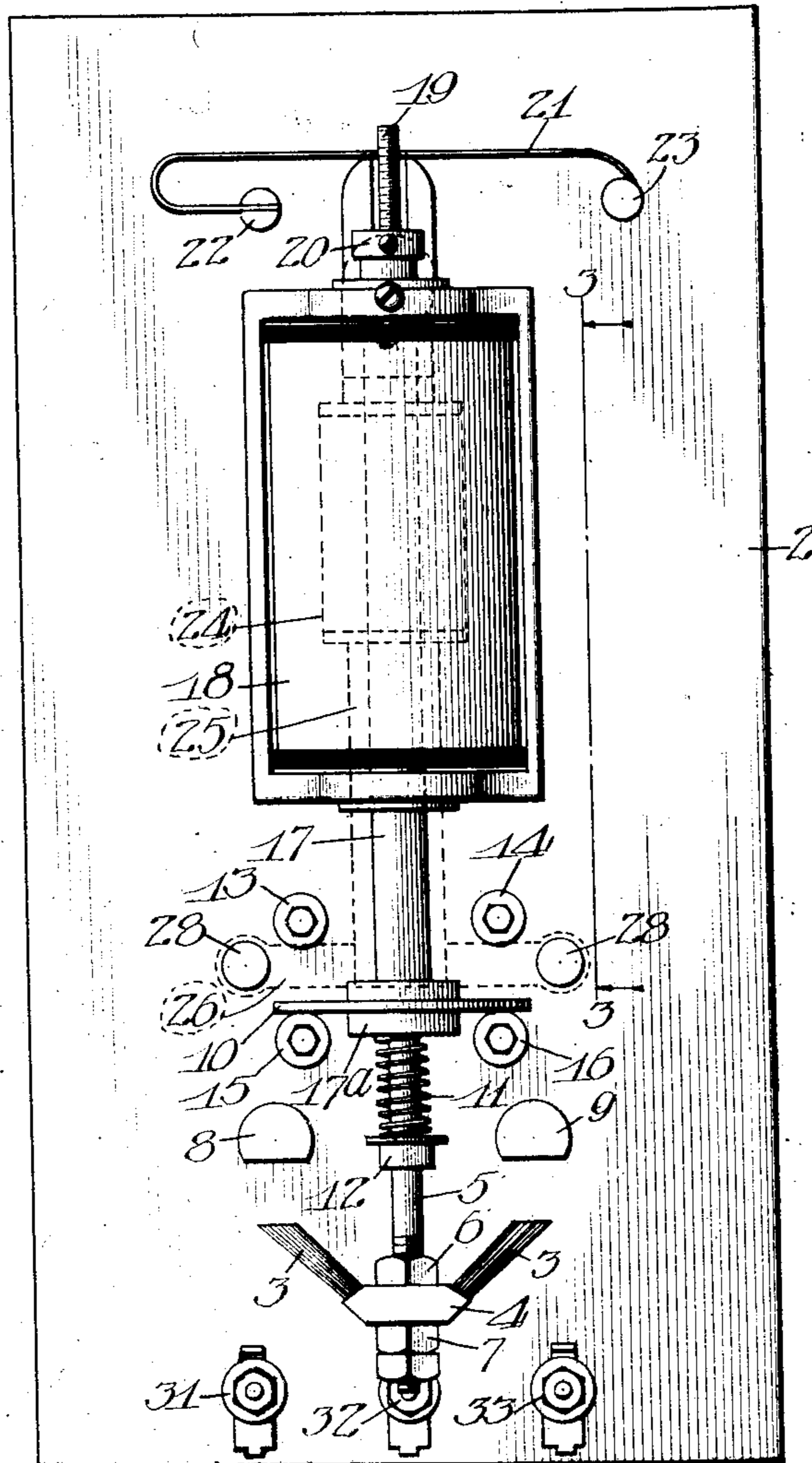


C. E. CARPENTER.  
SWITCH.  
APPLICATION FILED MAY 9, 1907.

996,973.

Patented July 4, 1911.  
2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Robert H. Weir  
W. Perry Hahn

INVENTOR

Charles E. Carpenter

BY:

E. John B. H. Tower, Jr.

ATTORNEY

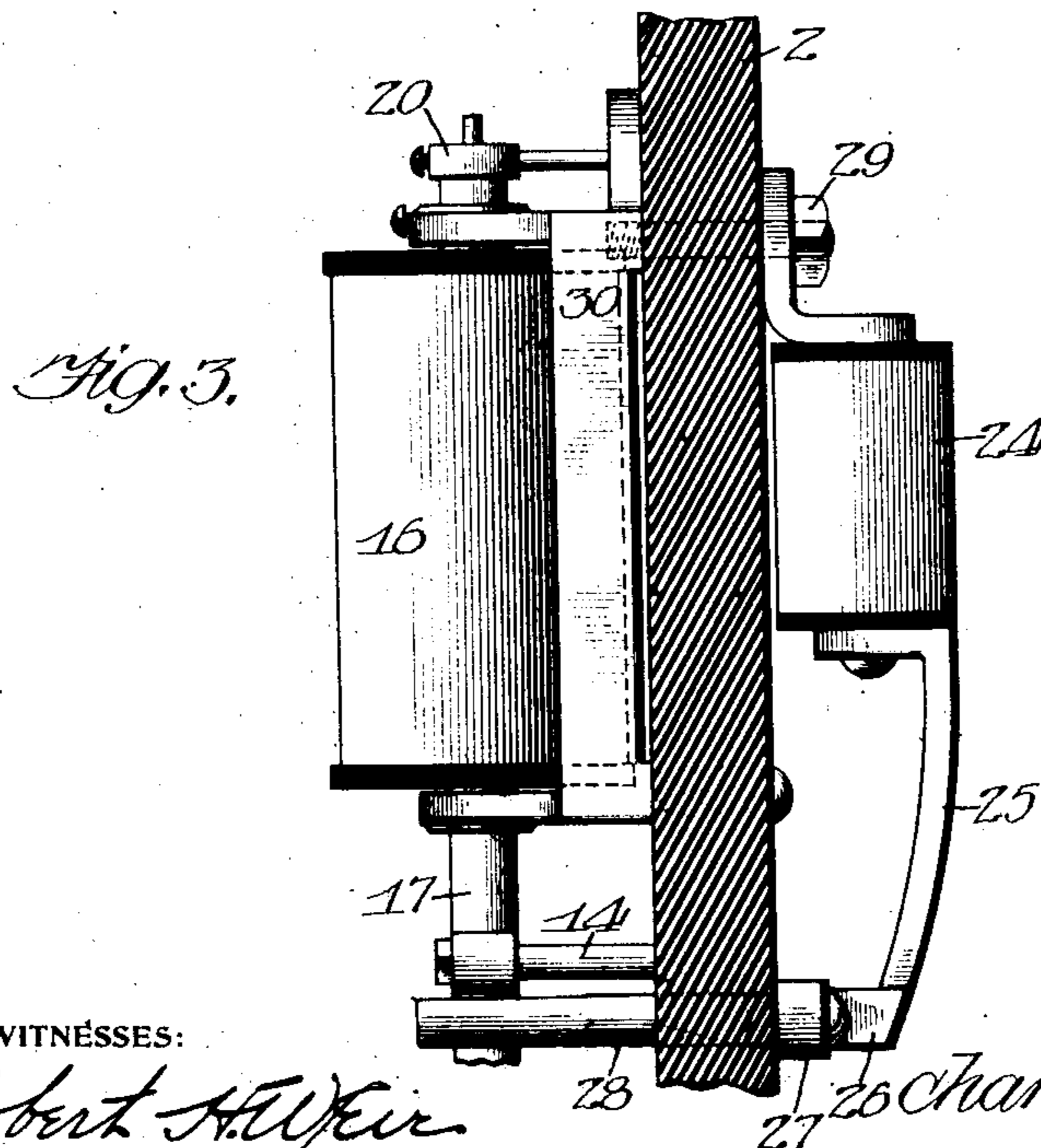
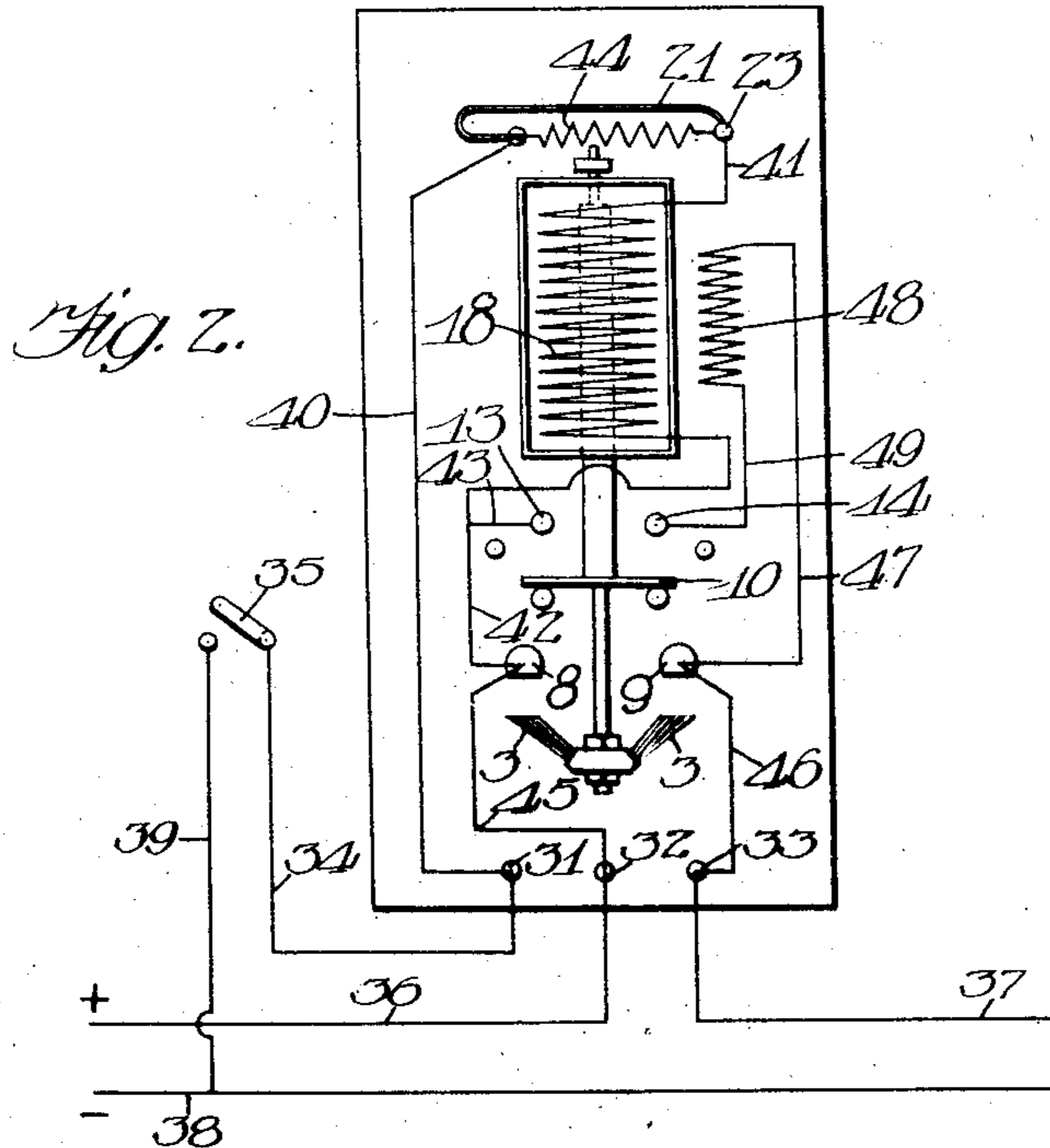
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2 SHEETS—SHEET 2.



WITNESSES:

*Robert H. Weir*  
*W. Perry Halpin*

INVENTOR

*Charles E. Carpenter*

BY

*E. J. B. H. 1 over 2*

ATTORNEY

# UNITED STATES PATENT OFFICE.

CHARLES E. CARPENTER, OF NEW YORK, N. Y., ASSIGNOR TO THE CUTLER-HAMMER MFG. CO., OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

## SWITCH.

996,973.

Specification of Letters Patent.

Patented July 4, 1911.

Application filed May 9, 1907. Serial No. 372,735.

*To all whom it may concern:*

Be it known that I, CHARLES E. CARPENTER, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented new and useful Improvements in 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 switches and particularly to electro-magnetically operating switches.

One of the objects of my invention is to construct a switch having a double break and means for disrupting the arc formed upon the opening of the switch.

Another object of my invention is to provide a blowout magnet so arranged as to use the iron of the armature of the magnet operating the switch to form a portion of the magnetic circuit of the blowout coil.

Still another object of my invention is to provide a magnetic blowout for disrupting the arc formed by the opening of a switch, at both points of interruption of the circuit.

I have illustrated in the accompanying drawings one embodiment of my invention, and in said drawings:

Figure 1 is an elevation of a solenoid switch embodying my invention. Fig. 2 is a diagrammatic view of the circuit arrangement illustrated in Fig. 1, and Fig. 3 is a sectional view on the line 3—3 of Fig. 1.

In the embodiment of the invention illustrated in the drawings, upon a suitable base or panel 2, preferably formed of slate or like insulating material, are mounted the various parts of the switch. The main switch comprises a pair of brushes 3 formed of laminations or leaves of copper suitably supported in a cup 4, carried by a tail rod 5. The cup is supported upon the tail rod by means of nuts 6 and 7 between which it is clamped. The brushes 3 are arranged to engage and make contact with a pair of stationary contacts 8 and 9, suitably supported upon the face of the panel 2. The upper end of the tail rod 5 carries a disk 10, which is supported upon a coiled spring 11 held in position by a collar 12. The disk 10 forms an auxiliary contact arranged to close the circuit across the pair of stationary contacts 13 and 14. When in open position, the

disk 10 rests upon a pair of stationary stops 15 and 16. These stops may take the form of contacts which may be used for closing a circuit independent of the load circuit, such, for example as applying a dynamic brake to a motor after disconnecting the motor from the line, or they may be used as contacts for closing any other circuit as may be desired by the user.

For operating the switch, I provide a solenoid 18, the core 17 of which is connected with the tail rod 5, whereby as the core is raised, the switch members 10 and 3 will be closed. The upper end of the core of the solenoid is provided with a non-magnetic screw threaded projection 19, carrying an adjustable collar 20 having a projection arranged to open a switch 21 pivoted at 22 and engaging a stationary contact 23.

For disrupting the arc formed when the disk 10 opens the circuit at the contacts 13 and 14, I provide a blowout magnet 24, which is mounted upon the rear of the panel or base 2, and is provided with a pole 25, having bifurcations 26 formed on the lower end. Each bifurcation is provided with an angular extension 27, which projects through an opening in the base 2, and a slight distance beyond the face of the base, forming pole pieces 28, arranged upon either side of the stationary contacts 13 and 14. The opposite pole of the magnet 24 is secured in position by a bolt 29 which extends through the base and into the iron frame 30 of the solenoid 18. By this arrangement, the magnetic circuit of the blowout coil extends from the pole pieces 28, to the plunger 17 of the solenoid 18, through the bolt 29, and back to the pole 25.

In order to assist in collecting the lines of force for the plunger 17 the magnetic gap between the plunger and the pole pieces is reduced by iron washers 17<sup>a</sup> disposed above and below the disk 10. It will be noted that the lines of force passing from the pole pieces 28 to the core or plunger 17 interrupt the arc, formed by the disk 10 leaving the contacts 13 and 14, at right angles and thereby effectually disrupt the same.

The binding posts 31, 32 and 33 of the switch are connected respectively with a conductor 34, leading to a switch 35, a conductor 36, leading to one side of the line, and a conductor 37 leading to one terminal

of the load. The opposite terminal of the load is connected with the opposite side of the line 38, and one side of the switch 35 is connected with the line 38, by conductor 39.

5 The binding post 31 is also connected by conductor 40 with the switch 21, and the contact 23 of said switch is connected by conductor 41 with one terminal of the solenoid 18, the opposite terminal of which is  
10 connected by conductor 42, with the contact 8 and by a short conductor 43, with the contact 13. Interposed between the switch 21 and the contact 23 thereof, is a resistance 44 arranged to be inserted in series with the  
15 solenoid 18 upon the opening of the switch 21. The binding post 32 is connected by conductor 45, with the contact 8, while the contact 9 is connected by conductor 46 with the binding post 33. The contact 9 is also  
20 connected by conductor 47 with one terminal of the winding 48 of the blowout magnet 24, the opposite terminal of which is connected by conductor 49 with the contact 14.

In operation as soon as the switch 35 is  
25 closed, circuit will be established from the positive side 36 of the line by conductors 45 and 42, through the winding of the solenoid 18, thence by conductor 41, across the switch 21, by conductors 40 and 34, across  
30 the switch 35, and by conductor 39, to the negative side of the line. This energizes the solenoid 18 and the same attracts its core, raising the tail rod 5 and causing the disk 10 to engage the stationary contacts 13 and  
35 14. The spring 11 supporting the disk 10 will permit the tail rod to continue to rise until the brushes 3 engage their stationary contacts 8 and 9 closing the circuit from the positive side of the line, by conductors 36  
40 and 45, across the brushes 3, and by conductors 46 and 37, to the load. When the core moves to the limit of its upward travel the collar 20 engages the switch 21 opening the same and inserting the resistance 44 in  
45 series with the winding of the solenoid 18 to prevent said solenoid from over-heating. The winding 48 of the blowout coil being in shunt with the contacts 8 and 9 no current will flow through the winding as long as  
50 the main switch is closed. In event the switch 35 is opened the solenoid will immediately be deenergized permitting the tail rod 5 to drop, which carries with it the brushes 3 and the disk 10. The brushes 3,  
55 however, will disengage from their stationary contacts 8 and 9 before the disk 10 and circuit will be established momentarily through the winding 48 and, as the disk 10 disengages its contacts 13 and 14, the blow-  
60 out magnet will disrupt the arc formed at this point. It will be seen that a very short interval elapses between the opening of the main switch 3 and the auxiliary switch 10 and it is therefore possible to use a com-  
65 paratively small winding for this purpose.

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

1. The combination with a switch, of an electro-magnet for operating the same, a  
70 blowout magnet for disrupting the arc formed on the opening of said switch and having a part of the magnetic circuit thereof formed by the armature of said electro-  
75 magnet.

2. The combination with a switch having a main and an auxiliary contact member, of an electro-magnet for operating said mem-  
80 bers, and a blowout magnet for disrupting the arc formed by the opening of said aux-  
80 liary switch having a part of its magnetic circuit formed by the armature of said electro-magnet.

3. The combination with a base, of a movable member carrying a main switch and an  
85 auxiliary switch, mounted on said base, an electro-magnet for operating said movable member also mounted on said base, and a blowout magnet mounted upon the rear of  
90 said base and having a bifurcated pole piece  
90 projecting through said base in proximity to said auxiliary switch for disrupting the arc formed upon the opening of said switch.

4. In an electric switch, in combination, a longitudinally sliding member, a main  
95 contact carried thereby, an auxiliary contact resiliently supported on said member and adapted to be closed before and opened after  
100 said main contact, and a blowout magnet for disrupting the arc formed upon the opening  
100 of said auxiliary switch, part of the magnetic circuit of said blowout being through  
100 said movable member.

5. In an electric switch, in combination, a solenoid, a plunger therefor, a main switch  
105 contact carried by said plunger, and an auxiliary switch resiliently supported upon  
105 said plunger, said auxiliary switch being adapted to close before and open after said  
110 main contact, and a blowout magnet for disrupting the arc formed upon the opening of  
110 said auxiliary switch, part of the magnetic circuit of said blowout magnet being formed  
110 by said plunger.

6. In an electric switch, in combination, a  
115 solenoid, a plunger therefor, a main switch contact carried by said plunger, and an aux-  
115 iliary switch resiliently supported upon said plunger, said auxiliary switch being adapted  
120 to close before and open after said main  
120 contact, and a blowout magnet for disrupting the arc formed upon the opening of said  
120 auxiliary switch, part of the magnetic circuit of said blowout magnet being formed  
125 by said plunger, said magnet having a  
125 bifurcated pole piece disposed in proximity to said auxiliary switch.

7. In an electric switch, in combination, a solenoid, a vertically movable plunger, a  
laminated main switch mounted thereon, an

auxiliary contact disk loosely mounted on said plunger, a spring surrounding said plunger for resiliently supporting said disk thereon, stationary contacts adapted to be engaged by said main switch and said contact disk, the distance between said main switch and its stationary contacts being greater than the distance between said disk and its stationary contacts, and a blowout magnet, part of the magnetic circuit of said blowout being through said plunger.

8. The combination with a base, of a movable member, mounted thereon carrying a main switch and an auxiliary switch, an electro-magnet for operating said movable member also mounted on said base, and a blowout magnet mounted upon the rear of said base and having pole pieces extending through openings in said base in proximity to said auxiliary switch for disrupting the arc formed by the opening of said switch, said blowout magnet having a part of its magnetic circuit formed by the armature of said electro-magnet.

9. The combination with a movable member, of a main switch carried by said movable member, stationary contacts engaged by said main switch, and an auxiliary switch loosely mounted on said movable member, a spring adapted to resiliently support said auxiliary switch on said movable member, stationary contacts engaged by said auxiliary switch, the distance between the auxiliary switch contacts and their cooperating member being less than the distance between the main switch contacts and their cooperating member, whereby the auxiliary switch will be closed before and open after the main switch, an electro-magnet for operating said movable member and a blowout magnet for disrupting the arc formed upon the opening of said auxiliary switch contacts, the circuit of said electro-magnet being controlled by said auxiliary switch.

10. The combination with a movable member, of a main switch member carried thereby, stationary contacts arranged to be engaged by said main switch member, an auxiliary switch member resiliently carried by said movable member, stationary contacts arranged to be engaged by said auxiliary switch member and disposed at a less distance from their cooperating switch member than the contacts of the main switch member, an electro-magnet for operating said movable member, and a blowout magnet for disrupting the arc formed by the opening of said auxiliary switch, said magnet having a portion of its magnetic circuit formed by the armature of the electro-magnet.

11. The combination with a switch, of an electro-magnet for operating the same, and a blowout magnet, a pole piece divided into a pair of members to form a pair of pole

pieces arranged in proximity of said switch for disrupting the arc upon the opening of the same, said blowout magnet having a portion of its magnetic circuit formed by the plunger of said electro-magnet.

12. The combination with a solenoid, of a vertically movable rod carried thereby and carrying a main switch member, an auxiliary switch member resiliently mounted on said rod and adapted to open the circuit after said main switch, and a blowout magnet for disrupting the arc formed on the opening of said switch having a part of the magnetic circuit thereof formed by the plunger of said solenoid.

13. In combination with a solenoid having a movable plunger, of a vertical movable rod carried by said plunger, a main switch contact carried by said rod, an auxiliary switch resiliently mounted thereon, a spring disposed on said rod and bearing against said auxiliary switch, said auxiliary switch having a shorter distance to move to engage its contacts than the main switch, said spring being adapted to maintain the auxiliary switch closed after the main switch opens, and a blowout magnet having pole pieces adjacent to said auxiliary switch, the circuit of said blow-out magnet being controlled by said auxiliary switch.

14. The combination with a base, of a movable member mounted on said base, a switch carried by said movable member, and a blow-out magnet mounted upon the rear of said base and having a bifurcated pole piece projecting through said base in proximity to said switch.

15. The combination with a base, of a movable member mounted thereon, a main switch and an auxiliary switch carried by said movable member, and a blow-out magnet mounted upon the rear of said base, and having a bifurcated pole piece projecting through said base in proximity to said auxiliary switch, part of the magnetic circuit of said blow-out magnet being formed by said movable member.

16. In an electric switch, in combination, a solenoid, a plunger therefor, a frame having portions contiguous to said plunger, a main contact carried by said plunger, an auxiliary contact resiliently supported on said plunger adapted to be closed before and opened after said main contact, and a blow-out magnet for disrupting the arc formed upon the opening of said auxiliary contact, part of the magnetic circuit being through said frame and plunger.

17. In an electric switch, in combination, a solenoid, a plunger therefor, a frame having portions contiguous to said plunger, a main contact carried by said plunger, an auxiliary contact resiliently supported upon said plunger adapted to be closed before and opened after said main contact, and a blow-

out magnet having a bifurcated pole piece disposed in proximity to said auxiliary contact.

18. In an electric switch, in combination, a solenoid, a plunger therefor, a frame having portions contiguous to said plunger, a main contact carried by said plunger, an auxiliary contact resiliently supported upon said plunger adapted to be closed before and opened after said main contact, and a blow-out magnet having a bifurcated pole piece

disposed in proximity to said auxiliary contact, part of the magnetic circuit of said blowout magnet being through the solenoid plunger and frame.

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

CHARLES E. CARPENTER.

Witnesses:

I. J. HORTON,

ROBERT LEWIS AMES.