T. E. BARNUM.

ELECTRIC SWITCH OR CONTACTOR.

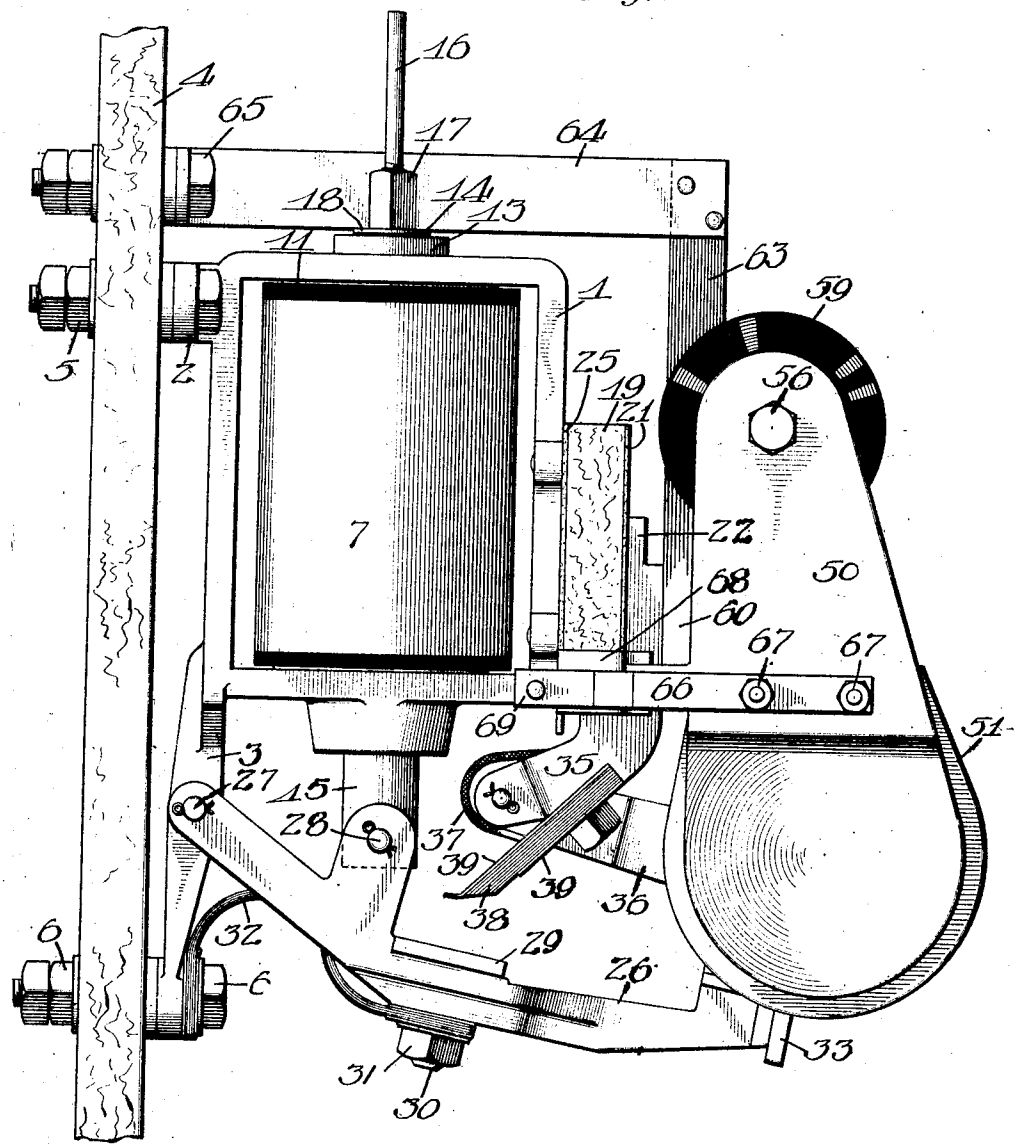
APPLICATION FILED AUG. 27, 1907.

1,156,201.

Patented Oct. 12, 1915.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses

Robert H. Weir

Alexander W. Liddera

Thomas E. Barnum, Inventor

By his Attorney Edwin B. H. Towne, Jr.

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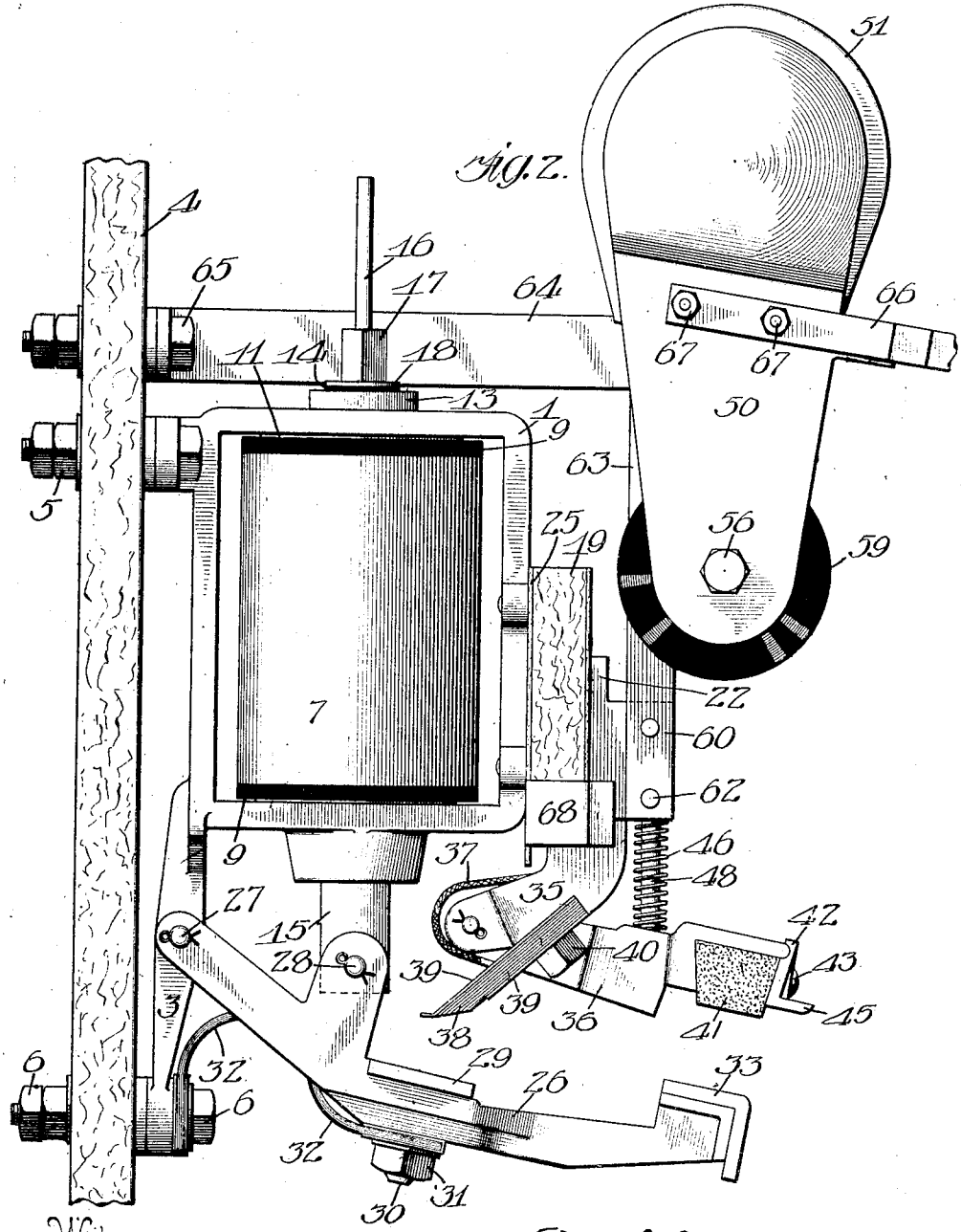
5 SHEETS—SHEET 2.

Fig. 2.



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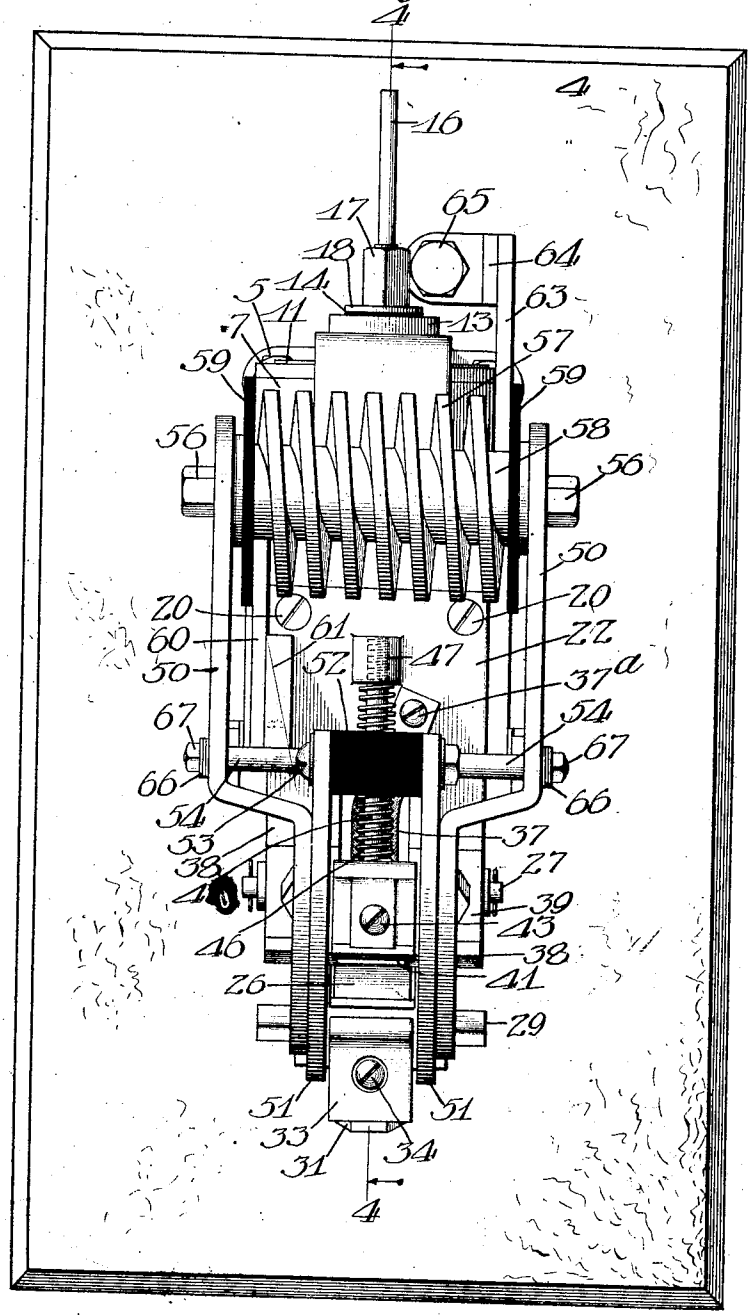
5 SHEETS—SHEET 3.

Fig. 3.



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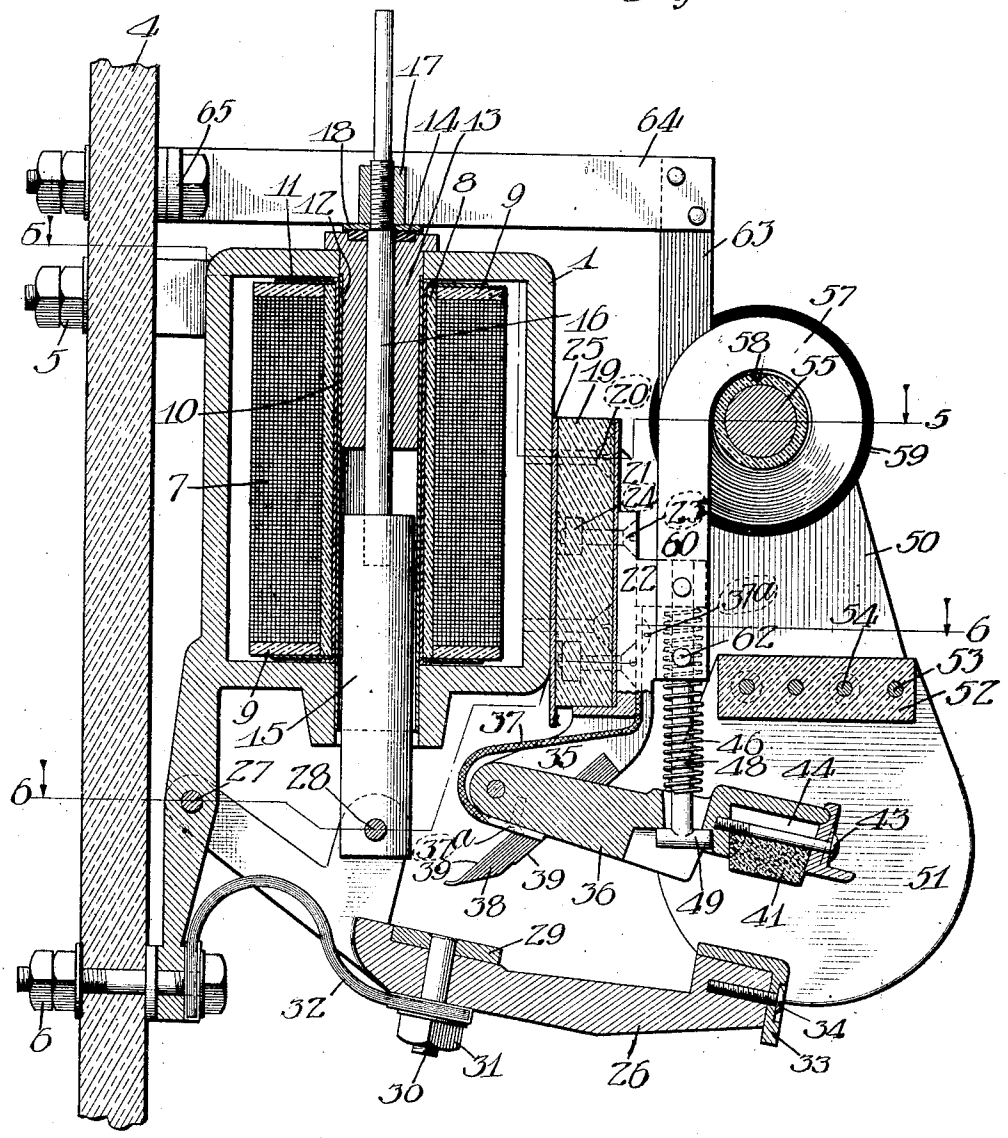
5 SHEETS—SHEET 4.

Fig. 4.



Witnesses

Robert N. Wells

Alexander N. Liddors

Thomas E. Barnum Inventor

By his Attorney Edwin B. H. Young.

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5 SHEETS—SHEET 5.

Fig. 5

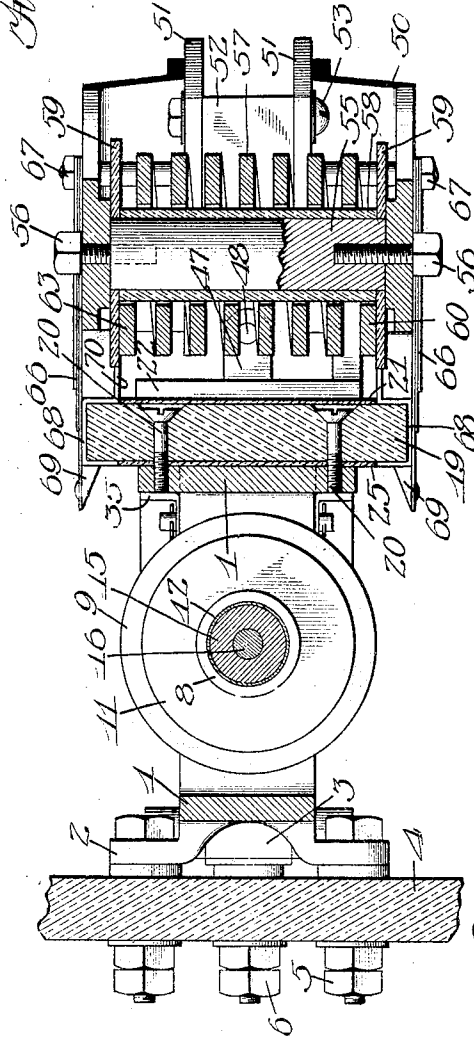
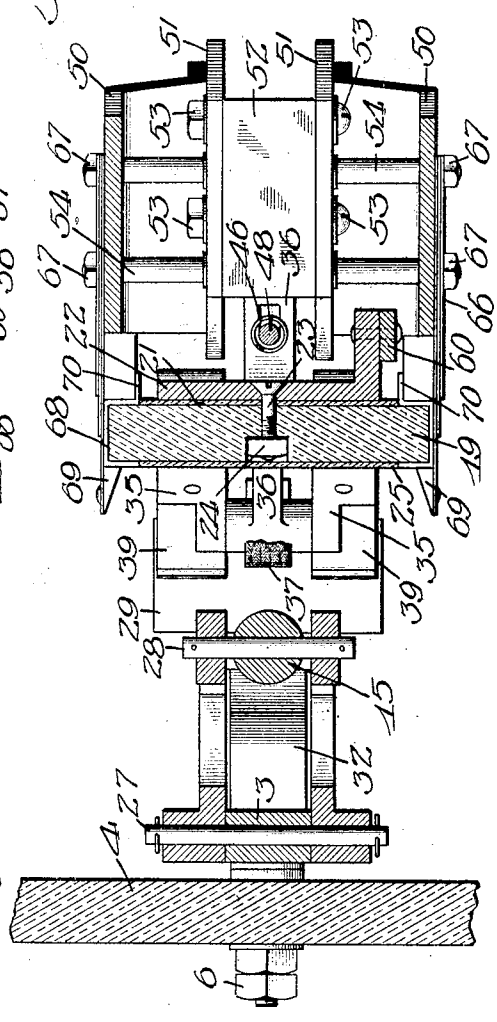


Fig. 6.



Witnesses

Robert N. Weir

Alexander N. Sedders

Thomas E. Barnum Inventor

By his Attorney Edwin B. H. Jones, Jr.

UNITED STATES PATENT OFFICE.

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

ELECTRIC SWITCH OR CONTACTOR.

1,156,201. Specification of Letters Patent. Patented Oct. 12, 1915.

Application filed August 27, 1907. Serial No. 390,306.

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 Electric Switches or Contactors, 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 electric switches or contactors.

The object of my invention is to provide an electric switch which will be compact in structure and efficient in operation, and in which the parts may be readily assembled.

In order to set forth the characteristic features of my invention, I shall describe a switch which I have worked out in practice, which switch is illustrated in the accompanying drawings.

The views in the drawings are as follows: Figure 1 is a side elevation of the switch with the parts thereof in the normal position, Fig. 2 is a similar view with the pole pieces raised, Fig. 3 is a front elevation, Fig. 4 is a sectional view on the line 4—4 of Fig. 3, Fig. 5 is a sectional view on the line 5—5 of Fig. 4, and Fig. 6 is a sectional view on the line 6—6 of Fig. 4.

I preferably provide a rectangular frame 1 which forms the supporting member for the switch. The back of this frame is provided at its upper portion with two outwardly extending lugs, 2, 2, and at its lower portion with a downwardly extending leg 3. The frame may be mounted upon a base 4 to which the lugs 2 are fastened by means of bolts 5. The leg 3 is also fastened to said base by means of a bolt 6, which bolt forms a terminal for connecting the switch in circuit.

The frame 1 carries an electro-magnetic winding 7, which is arranged within the rectangular portion thereof. This winding is arranged upon a spool, formed of a fiber tube 8, which extends through the center of the winding, and has circular disks 9, 9 arranged at the ends thereof. Within the tube 8 is arranged a metallic tube 10 at the ends of which are circular disks 11, 11, which disks are arranged at the ends of the spool and hold the disks 9, 9 upon the tube 8. The tube 10 extends through the disks 11, 11, and is turned over to hold the disks in place.

Within the tube 10 is a tube 12 which is free to be removed from the tube 10. The upper end of the tube 12 surrounds a stationary core or plunger 13 which extends through the top of the frame 1 and down into the winding 7. On the upper end of the core 13 is placed an elastic buffer 14. The lower end of the tube 12 extends into the bottom of the frame 1. A movable plunger or core 15 extends into the tube 12 and is free to move up and down therein. A rod of non-magnetic material 16 is mounted upon the upper end of the movable plunger and extends up through the stationary core. The upper end of the rod 16 is provided with a nut 17 on the bottom of which is mounted a disk 18 adapted to bear upon the buffer 14 when the plunger 15 is in its lower position. The nut serves as a stop to limit the downward movement of the rod 15. This nut may be run up and down the rod to adjust the air gap between the stationary plunger 13 and the movable plunger 15.

Upon the front of the frame 1 is mounted an insulating base 19 which is held upon said base by means of screws 20, threaded into said frame and having their heads countersunk in said base. A sheet of insulating material 21 is placed over the front of said base to cover the heads of the screws 20. A contact support 22 is mounted upon the base 19 and is held in position by means of bolts 23, the heads of which are countersunk in said contact support. The nuts 24 of these bolts are countersunk in the back of the base 19. These nuts fit closely within the countersinks therefor so that the same will not turn, thereby making it possible to remove and insert the bolts into the same without removing base 19 from the frame 1. Between the base 19 and the frame 1 is placed a sheet of insulating material 25, which shields the bolts 23 and nuts 24 from the frame 1.

The movable contacts are carried by a movable contact member or arm 26, which arm is bifurcated at its inner end to receive the leg 3 of the frame 1. The arm is pivoted

upon a pin 27 which passes through the leg and is pivotally connected to the plunger 15 by means of a pin 28. The movable plunger 15 and the stationary core 14 and the tube 12 may be withdrawn from the frame 1 if said movable plunger be disconnected from the contact arm 26, as may be done by removing the pin 28. The contact arm 26 carries a main contact plate 29 which is arranged contiguously to the point of connection between the plunger 15 and the arm 26. The main contact 29 is held in position by means of a bolt 30 passing through the arm 26, having thereon a nut 31. The bolt 30 and the terminal bolt 6 are electrically connected by means of a flexible connection 32 which is looped upwardly between bifurcation in the arm 26. The outer end of the contact arm carries an arcing contact plate 33. This contact is preferably in the form of a right-angle plate, one part of which is arranged substantially horizontally, and the other substantially vertically. The horizontal portion serves as a contact face, and the other portion serves as an additional surface down which the arc may run. The contact plate is held in position by a screw 34 passing through the vertical portion thereof.

The contact support 22 has two downwardly and inwardly extending arms 35, to which is pivoted a contact holder 36. A flexible conductor 37 is preferably connected between the contact holder and the contact support by any suitable means such as screws 37ª. On each arm 35 is preferably mounted a flexible laminated brush 38. The laminations of this brush are preferably placed between two reinforcing plates 39. Each brush is held in position by means of a bolt 40 which passes through the same and is threaded into the arm 35. The brushes incline inwardly in order that their inner extremities may engage the contact plate 29 when the contact arm 26 is raised. The contact plate 29 is placed contiguously to the point of connection between the contact arm and the plunger 15, so that said plate will be pressed against the brush 38 with considerable force. Each brush inclines inwardly from its point of attachment so that its laminations may spread and rub upon the contact plate 29 when said contact plate is brought into engagement with said brush. The contact holder 36 carries a carbon contact 41. This contact is wedge shaped and is set in a wedge shaped recess formed between the end of the contact holder and the plate 42, which is mounted upon the end of said contact holder. This plate is preferably provided with a curved recess into which extends the curved portion on the end of the contact holder, so that said plate may swing as though it were pivoted. A screw 43 is threaded into the contact holder having its head bearing upon the outside of the plate 42. The carbon contact 41 is provided with a recess 44 which receives this screw 43. When the screw is turned in, the plate 42 is swung inwardly, thereby firmly clamping the carbon contact 41 in position. The plate 42 is provided with an outwardly extending portion 45 for shielding the head of the screw 43 from the arc. The carbon contact 41 and the arcing contact plate 33 are disposed to engage each other. The carbon contact holder is pressed downwardly by means of a long helical spring 46, arranged between said holder and a lug 47 upon the contact support 22. Through the spring extends a rod 48 which is threaded into the lug 47, and has its lower end passing down through an opening in the contact holder, and provided with a cross piece, which cross piece sets within a recess formed in the bottom of the contact holder to prevent the rod from turning. The normal position of the contact holder may be adjusted by turning the rod 48, which may be done by raising the contact holder 36 to allow the cross piece 49 to protrude below the contact holder in which position it may be grasped and turned. When the movable contact member 26 is raised, the arcing contact plate 33 strikes the carbon contact 41. Then the contact holder 36 is pressed upwardly against the yielding action of the spring until the main contact plate 29 engages and firmly presses against the brush 38. The spring 46 is made long so that its pressure upon the contact holder 36 will remain steady and substantially uniform throughout the range of movement of said holder when the movable contact arm is raised to bring the arcing contacts and the main contacts into engagement.

Extending outwardly from the frame 1, at right angles to the front thereof and parallel to each other, are pole pieces 50 of a blowout magnet for extinguishing the arc that forms between the arcing contacts. The lower portions of these pole pieces are arranged at the sides of the arcing contacts, and form polar faces between which runs the magnetic flux. Between these polar faces is arranged an insulating chute or barrier, having side pieces 51 which shield the arcing contacts from the polar faces. These side pieces 51 are fastened to a top piece 52 by means of bolts 53. The barrier is held in position by means of bolts 54 which pass through the pole pieces 50.

The upper portions of the pole pieces are attached to a core 55 by means of bolts 56. The core 55 is surrounded by a blow-out coil 57. Between the coil 57 and the core 55 is interposed an insulating tube 58, and between the ends of said coil and the pole pieces are interposed insulating disks 59. The end 60 of the blow-out coil is attached by rivets or other suitable means to a lug

61, projecting from the contact support 22. The other end 63 of the blow-out coil 57 is attached to a conducting strip 64, which is fastened to the base 4 by means of a bolt 65, which bolt forms a terminal of the switch. Inasmuch as the blow-out coil is attached to the contact support 22, and also to the base 4, it is rigidly held in position. The core and pole pieces are supported by the blow-out coil. The core 55 with the insulating tube 58 is free to turn in the blow-out coil. The pole pieces normally stand in a downward position, in which position the polar faces are arranged on apposite sides of the arcing contacts. If it be desired to gain access to these contacts, the pole pieces may be swung upwardly into the position shown in Fig. 2, said pole pieces being pivoted upon the blow-out coil by means of the core 55 and insulating tube 58. The pole pieces are preferably provided with spring latches 66, which are attached thereto by means of bolts 67. The base 19 is provided with plates 68, which are bent around the sides of the same and are engaged by projections 69 on the spring latches 66. These plates are provided with outwardly extending pieces 70, which protrude in front of the base 22, and engage the pole pieces 50, thereby holding said pole pieces against lateral movement. Should it be desired to swing the pole pieces upwardly the latches 66 are sprung outwardly, whereby the projections 69 are disengaged from the plates 68 and the pole pieces are free to be moved.

I am of course aware that various changes can be made in certain details of construction, arrangement and combination of parts used in the switch that I have described, without in any way eliminating the features which my invention is intended to cover, and which features are set forth in the appended claims.

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

1. In an electric switch, in combination, a support, a contact arm pivotally mounted thereon, a coöperating yielding contact mounted on said support and projecting in an opposite direction to said arm and toward the pivot thereof and an electromagnetic winding mounted on said support between the supporting points of said contacts to actuate said contact arm.

2. In an electric switch, in combination, a support, a contact arm pivotally mounted thereon, a coöperating laminated brush fixed to said support and extending obliquely with respect to said arm and in an opposite direction thereto or toward its pivot and an electromagnetic winding mounted on said support between the pivot of said contact arm and the point of support of said brush to actuate said contact arm.

3. In an electric switch, in combination, a magnet frame, a pivoted contact arm and a coöperating laminated contact brush mounted on opposite sides of said frame to project in opposite directions or each toward the supporting point of the other, and a solenoid mounted in said frame and having its plunger connected to said contact arm at a point contiguous to the point of engagement between said contact arm and said laminated brush.

4. In combination, a movable contact arm, a pivoted contact holder, a contact carried by said holder and adapted to be engaged by said movable contact arm, a rod threaded into a support, a spring surrounding said rod and exerting a yielding force upon said holder when the contact carried by said holder is engaged by said movable contact arm, said rod being extended through said contact holder and provided with a cross piece which sets in a slot formed therefor in said contact holder.

5. In an electric switch, in combination, a pivoted contact arm, a stationary contact support adjacent to the free end thereof, an auxiliary contact and a laminated brush mounted in a crossed relation on said support to be engaged by said contact arm, said laminated brush being obliquely disposed to project away from said auxiliary contact and toward the pivot of said contact arm.

6. In an electric switch, in combination, a pivoted rigid contact arm, a stationary contact support adjacent to the free end thereof, a pivoted arcing contact and a laminated brush mounted on said support to be engaged by said contact arm, said arcing contact extending in the same direction as said contact arm and said laminated brush being mounted between the pivot and the active end of said arcing contact and extending away from the active end of said arcing contact and toward the pivoted end of said contact arm.

7. In an electric switch, in combination, a magnet frame, a contact arm pivoted to one side thereof, a contact support fixed to the opposite side of said frame, a pivoted arcing contact and a laminated brush fixed to said support to be engaged by said contact arm, said arcing contact and said brush being mounted in a crossed relation with the former extending in the same direction as said contact arm and the latter extending in an opposite direction thereto and an operating solenoid for said contact arm mounted in said frame and having its plunger connected to said arm at a point contiguous to the point of engagement between said arm and said laminated brush.

8. In an electric switch, in combination, a rigid arm, a stationary contact support contiguous to the free end of said arm, a contact arm pivoted to said support and pro-

vided with a contact to be engaged by said former arm and a combined biasing and limiting device for said second-mentioned arm having an adjustable part to vary the limit of biased movement.

9. In an electric switch, in combination, a pivoted rigid arm, a flat contact plate detachably secured thereto, said arm having a shoulder abutting one edge of said plate and an obliquely disposed stationary laminated contact brush adapted upon operation of said arm to make an abutting and sliding engagement with said plate, said brush sliding toward the edge of said plate abutting said shoulder on said arm.

10. In an electric switch in combination, a switch arm, a stationary laminated brush adapted to be engaged thereby, said brush being disposed to make an abutting wiping contact with said arm and a flat plate covering the portion of said arm engaged by said brush, said plate being bolted to said arm and removable at will, said arm having a portion abutting an edge of said plate to eliminate strain on the holding means of said plate.

11. In an electric switch in combination, a magnet frame having an open portion for receiving a solenoid winding, a stationary core and a movable core for said winding, both passing through said frame to hold said winding in place, said winding being removable upon removal of said cores, a switch arm connected to said movable core to be actuated by said winding, said movable core having an extension passing through said stationary core and an adjustable device on said extension for limiting the movement of said movable core and said switch arm upon deënergization of said winding.

12. In an electric switch in combination, a supporting base, a magnet frame secured thereto, a switch arm pivoted to said magnet frame below the magnet carrying portion thereof, a contact support secured to said said magnet frame directly above said switch arm and toward the free end thereof, said support having a rearwardly extending portion projecting beneath the magnet carrying portion of said frame, an arcing contact arm pivoted to said extension adjacent to its inner end and extending outwardly into proximity with the outer end of said arm, and a laminated brush secured to said holder in front of the pivot of said arcing contact and projecting rearwardly at an angle to said switch arm.

13. In an electric switch in combination, a supporting base, a magnet frame secured thereto, a switch arm pivoted to said magnet frame below the magnet carrying portion thereof, a contact support secured to said magnet frame directly above said switch arm and toward the free end thereof, said support having a rearwardly extending portion projecting beneath the magnet carrying portion of said frame, an arcing contact arm pivoted to said extension adjacent to its inner end and extending outwardly into proximity with the outer end of said arm, a laminated brush secured to said holder in front of the pivot of said arcing contact and projecting rearwardly at an angle to said switch arm, a device adjustably mounted upon said contact holder for limiting the movement of said arcing contact toward said switch arm, and a spring biasing said arcing contact toward said switch arm.

14. In an electric switch in combination, an insulating supporting base, a magnet frame mounted thereon and disposed at right angles thereto, a rigid switch arm fulcrumed to said frame to project at right angles to said base, a solenoid mounted in said frame and having a movable plunger connected to said switch arm, an insulating member secured to the front of said magnet frame, a contact support mounted upon said insulating plate and having a portion projecting into proximity with the solenoid plunger, an obliquely disposed laminated brush on said portion of said holder and arranged to engage said switch arm contiguous to its connection with the solenoid plunger, an arcing contact carrying arm fulcrumed to said contact support contiguous to the solenoid plunger and projecting outwardly therefrom, an arcing contact carried by said arm to engage the free end of said switch arm and a blowout magnet disposed in front of said magnet frame and having pole pieces disposed on opposite sides of the outer extremity of said switch arm.

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

THOMAS E. BARNUM.

Witnesses:
A. H. BARNICKEL,
CHAS. M. HART.