

June 3, 1924.

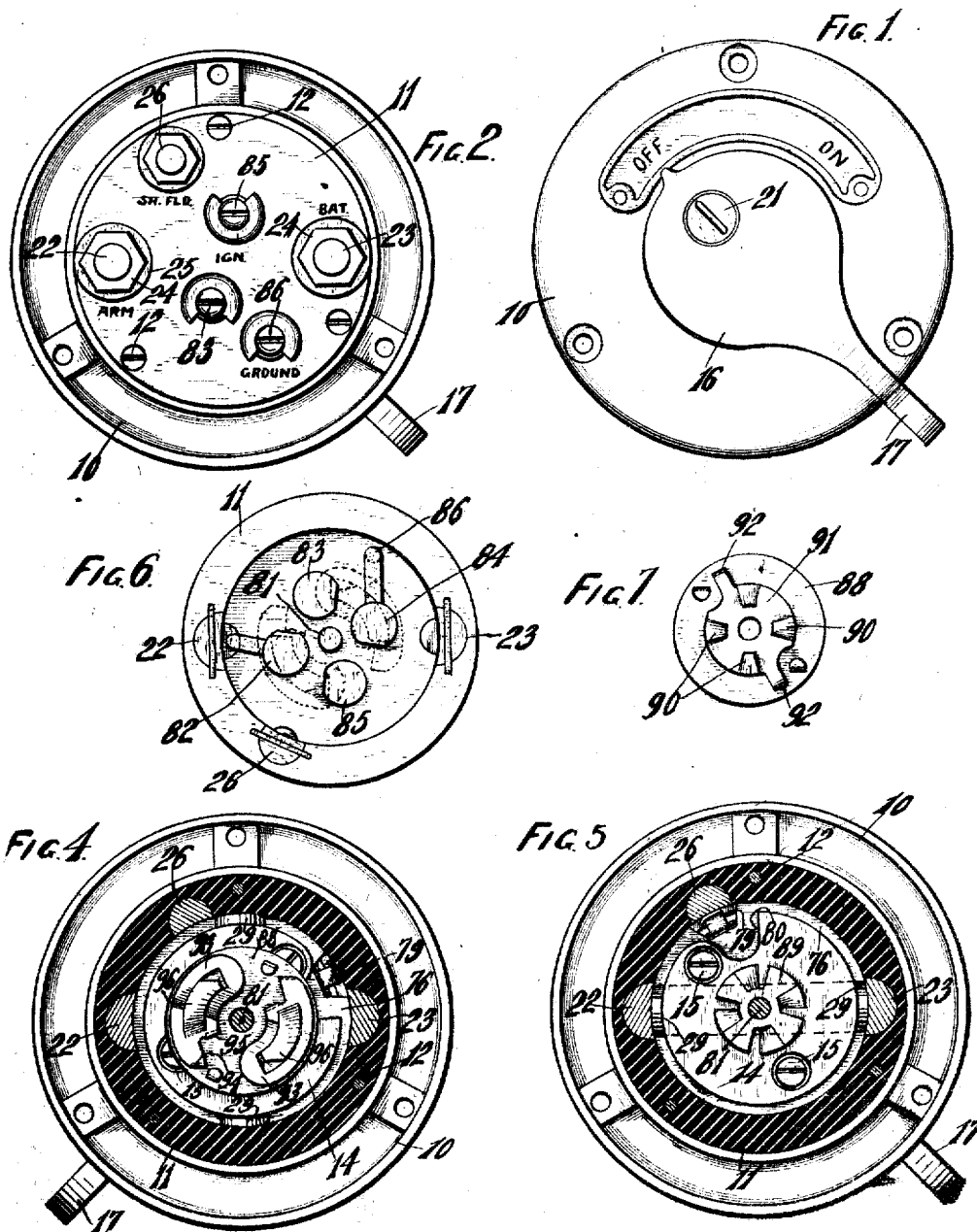
1,496,445

S. F. BRIGGS

POLE REVERSING SWITCH

Filed Feb. 27, 1915

2 Sheets-Sheet 1



WITNESSES

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Fig. 9

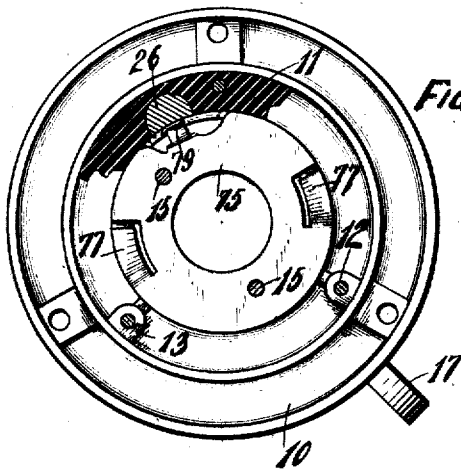
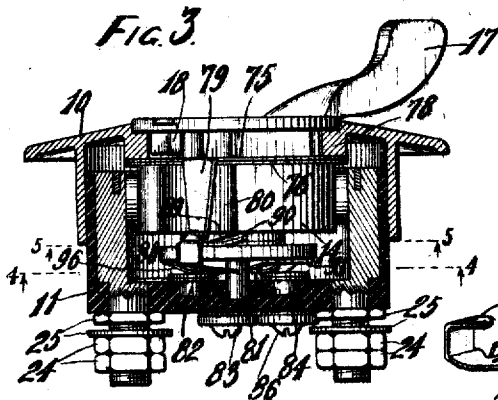
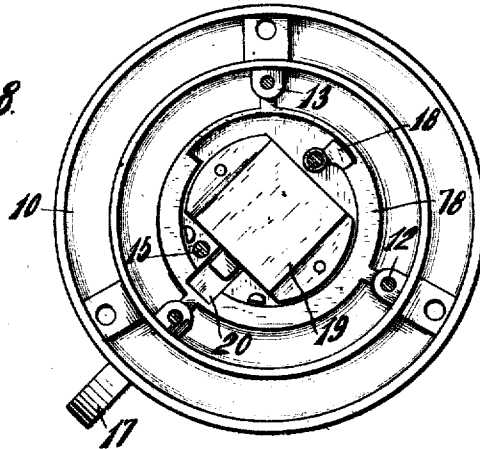


Fig. 8



Patented June 3, 1924.

1,496,445

UNITED STATES PATENT OFFICE.

STEPHEN F. BRIGGS, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO BRIGGS & STRATTON COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

POLE-REVERSING SWITCH.

Application filed February 27, 1915. Serial No. 10,883.

To all whom it may concern:

Be it known that I, STEPHEN F. BRIGGS, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Pole-Reversing Switches, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention has for its object to provide a switch for controlling an electrical circuit, such as the ignition circuit of a gas engine, and so constructed that the direction of flow of current will be changed by the successive operations of the switch so that the tendency of pitting the contact points at which the circuit may be broken temporarily, as at the make and break of an induction coil or other contact maker, will be neutralized by the current flowing in one direction and then in the other direction with the successive operations of the switch.

Another object of the invention is to incorporate such a pole reversing switch as a part of a switch for controlling other circuits, such as the circuit of a dynamo electric machine used as a generator for charging a storage battery of an automobile when driven from the gas engine and used as a motor for turning the crank shaft of the gas engine for starting the gas engine in operation.

Another object of the invention is to provide such a switch mechanism of a simple, yet durable and efficient construction which will be inexpensive to manufacture.

With the above and other objects in view the invention consists in the pole reversing switch as herein claimed and all equivalents.

Referring to the accompanying drawings in which like characters of reference indicate the same parts in the different views:

Fig. 1 is a front view of a switch constructed in accordance with this invention;

Fig. 2 is a rear view thereof;

Fig. 3 is a transverse sectional view thereof;

Fig. 4 is a rear sectional view on the plane of line 4-4 of Fig. 3 with the switch in its "off" position;

Fig. 5 is a similar view on the plane of line 5-5 of Fig. 3 with the switch in its "on" position;

Fig. 6 is a front view of the switch base with the position of the pole reversing switch contacts shown in dotted lines;

Fig. 7 is a detail view of the ratchet face of the pole reversing disk;

Fig. 8 is a view similar to Fig. 5 with all but a fragment of the base removed, and showing the contact disk in its bearing on the casing and on the insulated contact respectively;

Fig. 9 is a similar view with the contact disk removed and showing the lock for locking the switch in its off position;

Fig. 10 is a sectional view through the cylindrical switch member and showing the plunger switch contact members carried thereby;

Fig. 11 is a detail view showing the manner of engagement of the pole changing switch contacts with two adjacent contact buttons; and,

Fig. 12 is a diagram showing the wiring connections for a switch of this character.

In these drawings 10 indicates a front plate which is designed to be let into the dash of an automobile and forming a cylindrical housing for the switch base 11 of insulating material which telescopes therewith from the rear and is held in place by means of counter sunk screws 12. said screws threading into bosses 13 of the front plate. The switch of this invention is of the type of switch covered by my co-pending application for switches, Serial No. 837,669, dated May 11, 1914, patented July 10, 1917, No. 1,232,650. The base 11 is hollow and a cylindrical switch member 14 which in this case is preferably of metal, instead of insulating material as before, is held by screws 15 surrounded by insulating bushings to the back of a turning plate 16 and is contained within the recess of the base and is rotatable through an arc of approximately 90°, said turning plate 16 having a suitable guide seat in the front plate 10 to permit of such movement, and carrying a projecting handle 17 by means of which the turning may be accomplished. A stop lug on the back of the turning plate 16 engages shoulders of the front plate 10 to limit the turning movements of the switch. A lock 19 may be interposed between the turning plate 16 and the switch member 14 to engage a notch 20 in the front plate 10 for locking the switch mechanism in its off position, the

swivel boss 21 of such lock bearing the key-hole projecting through the front plate 10, as shown in Fig. 1, to receive the key not shown.

A pair of shouldered studs 22 and 23 are set in openings provided for them in the base 11, said studs originally projecting part way into the recess or cavity of the base, but later being turned or reamed out to conform with the cylindrical inner wall of the base to form stationary contacts diametrically opposite each other, and nuts 24 and washers 25 on the threaded projecting ends of the studs form binding posts for connection with the armature of the motor generator and the storage battery respectively. Another stud 26, similar to the studs 22 and 23 though desirably somewhat smaller, is positioned intermediate of the other studs and the nuts and washers thereon form a binding post for connection with the skunt field winding of the motor generator.

An opening 28 passes diametrically through the switch member 14 and has a pair of spring pressed switch contact members 29 fitting therein which are in the form of plugs slidably mounted in the opening and are electrically connected by a flexible conductor 30, commonly known as a pigtail. The contact members 29 are firmly secured to the ends of the flexible conductor 30 by having openings drilled longitudinally therein into which the ends of the conductor are inserted and by having transverse openings drilled nearly to the longitudinal openings, leaving a thin partition of metal between the openings which is then struck with a punch at the edge thereof near the outer end of the contact member so as to drive the partition inwardly as a tongue to bite into the yielding flexible conductor, as covered in my co-pending application referred to. This means of connecting the contact members on the ends of the flexible conductor forms a strong mechanical connection firmly connecting the parts and assuring an electrical connection of low resistance between them. The flexible conductor is surrounded by a coil spring 32 bearing at its ends against the contact members 29 and forcing them apart in close contact with the inner walls of the base and particularly with the stationary contacts 22 and 23 to form an electrical connection between them in the starting or "on" position of the switch. In order that the contact members 29 may not fit too freely within the opening 28 the coil spring 32 is preferably bent or bowed at its middle portion so as to bear against the walls of the opening.

Instead of a spring contact or brush connection from the contact members 29 and stud 26 as before, provision is made for grounding the stud 26 on the casing when the switch is turned to its closed or "on"

position. For this purpose a metal disk 75 is interposed between the switch member 14 and the lock 19 with a sheet of insulating material 76 between it and the switch member 14, said metal disk 75 having one or more spring tongues 77 cut therefrom and bent outwardly to bear with spring pressure against the inwardly projecting flange 78 around the central opening of the front plate 10, and a projection from the edge of the disk 75, bent inwardly approximately at right angles to the plane of the disk, forms a contact arm 79 lying within a recess 80 in the edge of the switch member 14 and bearing with spring pressure against the walls of the base 11 and adapted in the closed position of the switch to engage the contact stud 26. This serves to establish a ground connection for the contact stud 26, for the arm 79 of disk 75 engaged therewith has electrical connection with the casing by the spring tongues 77 of the disk bearing on the flange 78 of the front plate which is provided with a suitably ground connection not shown.

In the center of the base 11 is an upstanding post or stud 81 surrounded by four evenly spaced contact buttons 82, 83, 84 and 85 embedded in the insulating composition of the base, the contact button 82 being connected by wire 87 with contact stud 22, and contact button 84 being connected with a binding post 86, while the other two contact buttons 83 and 85 form binding posts.

Loosely mounted on the post 81 is a disk 88 of insulating material having a ratchet connection with the switch member 14 so as to move therewith only in the movement of the latter toward its "on" position. Such ratchet engagement is afforded by a series of radially disposed ratchet teeth 89 formed on the bottom of the switch member 14 around an opening capable of receiving the end of the post 81 and ratchet teeth 90 cut from a metal disk 91 which is secured to the top of the insulating disk 88 by having arms 92 with their ends passing therethrough and bent over on the other side. The ratchet disk 88 has a ratchet contact engagement with the buttons 82-85 by means of a pair of oppositely placed spring contact members 93 which are curved to follow the path of rotation and are secured at their forward ends to the disk 88 by projections 94 passing through the disk and turned over on the other side thereof, and also by tangs 95 entering openings in the disk without passing entirely therethrough. Thus the spring contact members 93 are carried by the disk 88 but are insulated thereby from the disk 91 and its connection with the switch member 14. Each of the spring contact members 93 itself constitutes a spring tongue for bearing on the heads of the contact buttons, but further has a supplemental

spring tongue 96 cut therefrom and bent downwardly to engage the head of the contact button in advance of the one engaged by the end of the contact member 93. The free ends of the spring contact members 93 and their supplemental spring tongues 96 by engaging the edges of the heads of the contact buttons constitute a ratchet connection permitting the disk 88 to turn only in the one direction so that with each succeeding operation of the switch from the "off" position to the "on" position the disk 88 is given a one quarter turn. As each contact member 93 contacts with two adjacent contact buttons each contact button will be connected thereby, first with the contact button on one side thereof, and then with the contact button on the other side thereof to reverse the polarity of the current flow through a circuit connected between the binding posts 87.

In connecting up the switch the binding post of contact stud 22 is connected by a wire 97 with one terminal of a generator armature 98 whose other terminal is grounded at 99, and the binding post of contact stud 23 is connected by a wire 100 with one terminal of a storage battery 101 whose other terminal is grounded at 102. This last mentioned binding post of contact stud 23 is also connected with a wire 103 forming one line wire of an electric lighting circuit including electric lamps 104, the other line wire thereof being grounded at 105. The shunt field winding 106 of the generator has one end connected with the same armature terminal as wire 97 and the other end connected by a wire 107 with contact stud 26 so that when the spring contact arm 79 engages this contact stud the generator circuit is complete from the grounded armature terminal thereof through the armature and its other terminal through the shunt field winding 106, wire 107, engaged contacts 26 and 79 and disk 75 to the grounded front plate 10 indicated on the diagram by the ground connection 108. The binding post 85 is connected by a wire 109 with the primary winding 110 of an induction coil whose movable armature 111 serves to make and break the circuit therethrough by cooperating with a fixed contact point 112 which is connected by a wire 113 with binding post 83. The binding post 86 which is connected with contact stud 84 has a wire connecting it with the ground at 120. The secondary winding 114 of the induction coil has one terminal grounded at 115 and the other terminal connected by a wire 116 with the arm of a distributor 117 driven by the engine to contact successively with stationary contact points 118 connected with the respective grounded spark plugs 119 of the various cylinders of the engine.

In that position of the switch in which

its parts are shown in the diagram, besides the generator circuit being complete through the engagement of contacts 26 and 79 the working circuit through the electric lamps or other electroreceptive devices and the battery charging circuit are also complete through the engagement of the contacts 29 with the contact studs 22 and 23 respectively. Starting with the grounded armature terminal of the generator the storage battery charging circuit includes the armature 98, wire 97, contacts 22 and 29, connecting wire 30, contacts 29 and 23, wire 100, storage battery 101 to ground 102. The working circuit is the same up to contact 23 and thence through wire 103, lamps or other receptive devices 104, and ground connection 105. The ignition circuit beginning with the grounded armature terminal includes said armature, wire 97, contact stud 22, wire 87, contact button 82, spring contact 93, contact button 85, wire 109, primary winding 110 of induction coil, armature 111, stationary contact 112, wire 113, contact button 83, spring contact 93, contact button 84, binding post 86, and ground 120. The circuit for the induced current of the secondary winding of the induction coil may be traced from the grounded terminal 115 through the secondary winding 114, wire 116, distributor arm 117, one of the contacts 118 and its spark plug 119 to the ground.

At times when the generator is not operating these various circuits may be supplied with current from the storage battery through the switch connections, as described, and the battery current thus directed through the generator will cause it to operate as a motor for starting the gas engine.

When the switch is thrown to the "off" position the generator and ignition circuits are interrupted since the generator shunt field circuit is broken by the disengagement of contacts 26 and 79 rendering the generator ineffective for supplying current for any purpose, and the storage battery is disconnected from all circuits except the work circuit so that it is ineffective for causing ignition. Thus with the switch locked in its "off" position and the key removed the storage battery may be used for lighting, but neither the storage battery nor the generator may be caused to produce ignition for starting the engine, and the automobile is effectively locked against theft. With the next closing of the switch to its "on" position the various circuits will be restored as before, with the exception that the spring contact members 93 will be advanced a quarter turn so as to connect contact buttons 82 and 83 on the one hand and contact buttons 84 and 85 on the other, and thus reverse the direction of flow of cur-

rent through the primary circuit of the induction coil. With this new position of the switch the primary circuit of the induction coil may be traced from the grounded terminal 99 of the generator armature through said armature 98, wire 97, contact stud 22, wire 87, contact button 82, spring contact member 93, contact button 83, wire 113, stationary contact 112, 10 armature 111, primary winding 110, wire 109, contact button 85, spring contact member 93, contact button 84, binding post 86 to ground 120. With each succeeding closing of the switch a reversal will be made 15 in the direction of flow of current through the primary circuit of the induction coil from that which prevailed during the preceding connection, and thus any tendency to produce pitting of contact points during one connection will be neutralized or 20 offset by the opposite tendency due to the change in direction of flow of current through the primary circuit of the induction coil during the succeeding connection. 25 The contact points will therefore be kept free from pitting and will remain in an operative condition for a greater length of time than would be the case if no provision were made for the reversal of current 30 by the pole changing feature. This pole changing feature is not confined in use to this particular switch mechanism but is applicable to any switch having an oscillating or reciprocating motion which may be converted by ratchet means to a rotary motion for the pole changing member.

The specific details of construction, while not necessary to the invention in its broader aspect, are very meritorious as being durable and highly efficient for the purpose 40 while being inexpensive to manufacture.

What I claim as new and desire to secure by Letters Patent is:

1. A switch for controlling the ignition 45 circuit of a gas engine, comprising in combination with switch means for opening and closing the ignition circuit, means for reversing the polarity of the ignition circuit, said pole reversing means having a ratchet connection with the switch means.

2. A pole reversing switch, comprising a casing containing switch contacts, an oscillating switch member mounted in the casing to engage the contacts for completing an 55 electrical circuit, and a pole changing means having a ratchet connection with the switch means to be operated by the movements thereof for reversing the polarity of said circuit.

3. A circuit controlling and pole changing 60 switch, comprising a casing containing switch contacts, an oscillating switch member within the casing adapted to engage and disengage the switch contacts to close and 65 open an electrical circuit, contact buttons

within the casing connected with said electrical circuit, a rotatably mounted pole changing member having contacts to engage the contact buttons, ratchet means for permitting the pole changing member to rotate only in one direction, and ratchet means 70 between the pole changing member and the oscillating switch member.

4. A circuit controlling and pole changing 75 switch, comprising a casing containing switch contacts, an oscillating switch member adapted to engage and disengage the switch contacts to close and open an electrical circuit, contact buttons within the casing connected with said electrical circuit, a 80 rotatably mounted pole changing member, spring contacts carried thereby for engaging the contact buttons and forming a ratchet connection therewith for permitting the pole changing member to turn only in one direction, and a ratchet connection be- 85 tween the pole changing member and the oscillating switch member.

5. A circuit controlling and pole changing 90 switch, comprising a casing containing switch contacts, an oscillating switch member within the casing adapted to engage and disengage the switch contacts to close and open an electrical circuit, contact buttons 95 within the casing having connection with said electrical circuit, a rotatably mounted pole changing member within the casing, spring contacts carried thereby with their free ends engaging the contact buttons to form a ratchet connection therewith permit- 100 ting the pole changing member to turn only in one direction, spring tongues projecting from said spring contacts to engage the contact buttons in advance of the contact buttons engaged by the ends of the spring con- 105 tacts, and a ratchet connection between the pole changing member and the switch member.

6. A circuit controlling and pole changing 110 switch, comprising a cylindrical casing of insulating material, switch contacts contained therein, an oscillating switch member within the casing adapted to engage and disengage the switch contacts, an electrical circuit controlled thereby, contact buttons in 115 the bottom of the casing and connected with the electrical circuit, an upstanding post in the bottom of the casing, an insulating disk rotatably mounted on the post and forming a pole changing member, spring contacts se- 120 cured to the bottom of the insulating disk and engaging the contact buttons and forming a ratchet connection therewith for permitting the insulating disk to turn only in one direction, a plate mounted on the top of 125 the insulating disk and having ratchet teeth bent upwardly therefrom, and ratchet teeth formed on the bottom of the oscillating switch member to be engaged by the ratchet teeth of the plate for turning the pole chang- 130

ing member by the oscillations of the switch member.

7. A switch for starting as a motor a gas-engine-driven battery-charging generator, comprising a switch casing having a generator armature contact and a storage battery contact, a switch member adapted to engage and connect said contacts, a generator shunt field contact also within the casing, and a grounding contact arm carried by the switch member and adapted to engage the generator shunt field contact when the switch member is in position to connect the first mentioned contacts.

8. In a switch, a casing, contact buttons projecting from a wall of the casing, a suitably operated member, and yielding contacts thereon engaging the contact buttons to close circuit connections and to form a ratchet preventing the movement of the member in one direction.

9. In a switch, a casing, contact buttons projecting from a wall of the casing, a suitably operated member, and spring contacts on said member each engaging a pair of contact buttons to establish electrical connection between them and to form a ratchet means for preventing the movement of the member in one direction.

10. In a switch, a casing having contact buttons projecting from a wall thereof, a movably mounted switch member within the casing, spring contacts carried thereby with their free ends engaging the contact buttons to form a ratchet connection therewith permitting the switch member to move only in one direction, and spring tongues projecting from said spring contacts to engage contact buttons next to the contact buttons engaged by the ends of the spring contacts.

11. In a switch, a cylindrical casing of insulating material, switch contacts flush with the inner surface of the casing, a cylindrical switch member movably mounted within the casing, spring pressed plunger contacts carried by the switch member and bearing against the wall of the casing and against the switch contacts, and a contact disk secured to the end of the switch member and having a spring arm extending be-

tween the switch member and the wall of the casing and adapted to engage one of the switch contacts.

12. In a switch, a hollow cylindrical casing of insulating material, switch contacts flush with the inner wall thereof, a movably mounted cylindrical switch member within the casing, plunger contacts carried by the switch member and bearing against the wall of the casing and against the switch contacts, there being a recess in the edge of the switch member between the plunger contacts, a contact disk secured to the end of the switch member and insulated therefrom and provided with a spring arm extending into the recess and bearing against the wall of the casing to contact with one of the switch contacts.

13. In a switch, a hollow cylindrical casing of insulating material, switch contacts flush with the inner surface thereof, a metal front plate secured to the casing, a cylindrical switch member movably mounted on the front plate and located within the casing, plunger contacts on the switch member bearing against the inner walls of the casing and against the switch contacts, a contact disk secured to the end of the switch member and insulated therefrom and provided with spring fingers bearing against the switch front plate to make electrical connection therewith, there being a recess in the edge of the switch member, and a spring arm on the contact disk projecting into the recess and bearing against the inner wall of the casing and against one of the switch contacts.

14. A circuit controlling switch comprising in combination a switch means for opening and closing a circuit, a pole reversing means for reversing the polarity of a circuit, and operative connections from said switch means to said pole reversing means.

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

STEPHEN F. BRIGGS.

Witnesses:

R. S. C. CALDWELL,
KATHERINE HOLT.