S. F. BRIGGS.

SWITCH.

APPLICATION FILED MAY 11, 1914.

1,232,650.

Patented July 10, 1917

2 SHEETS—SHEET 1.

FIG. 3.

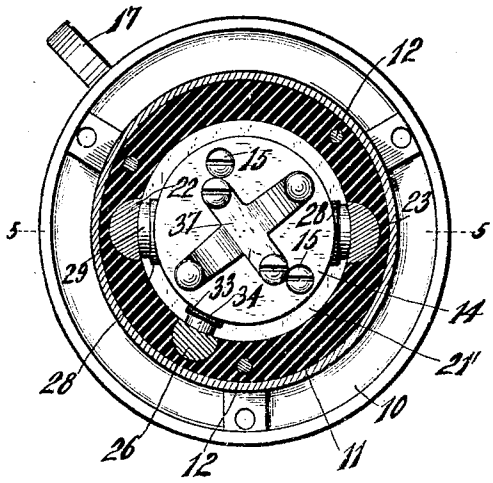


FIG. 1.

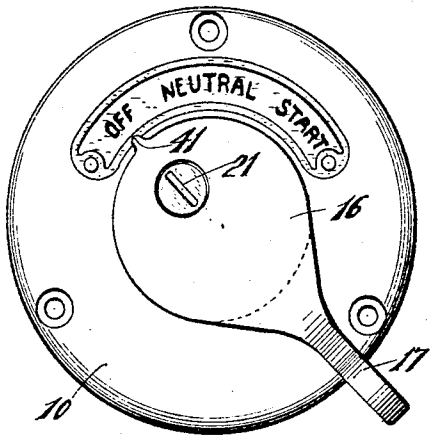


FIG. 2.

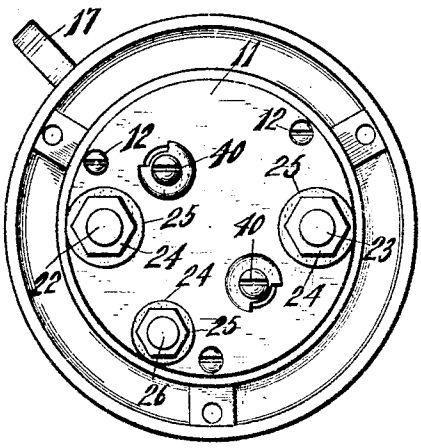
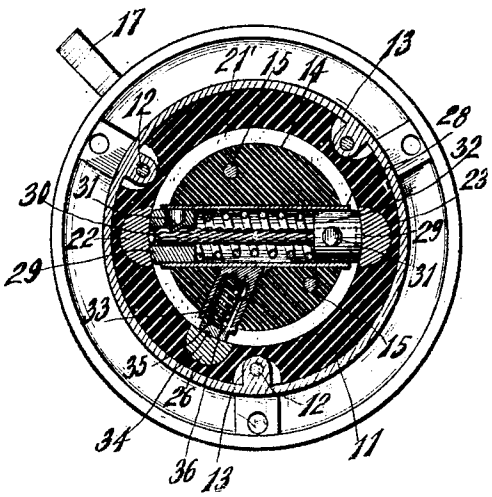


FIG. 4.



WITNESSES.

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2 SHEETS—SHEET 2.

FIG. 5.

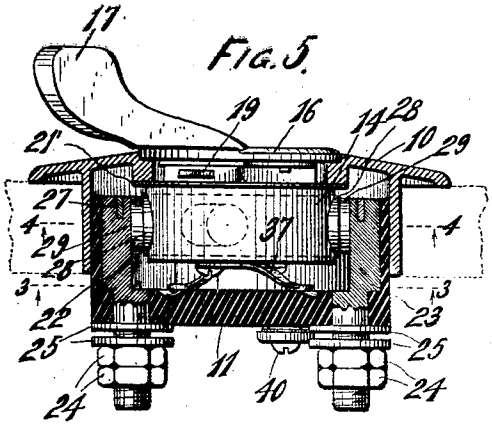


FIG. 6.

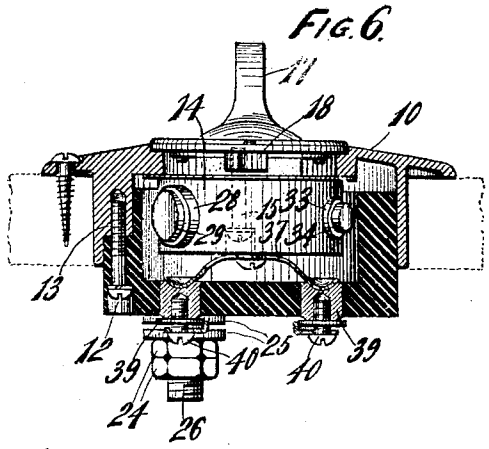


FIG. 10.

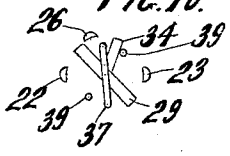


FIG. 11.

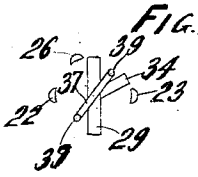


FIG. 8.

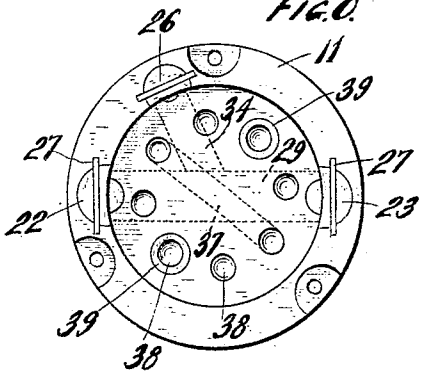


FIG. 7.

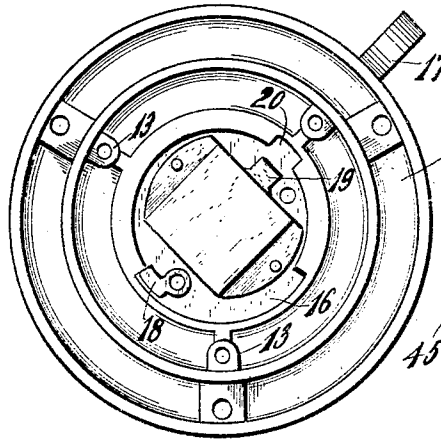
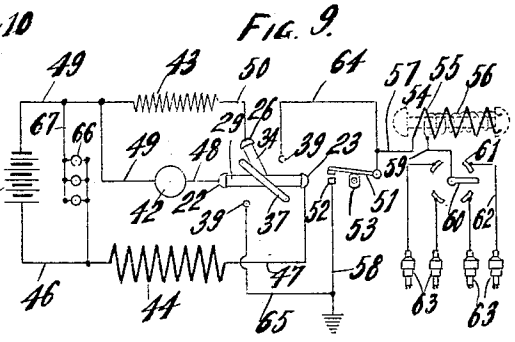


FIG. 9.



WITNESSES.

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SWITCH.

1,232,650. Specification of Letters Patent. Patented July 10, 1917.

Application filed May 11, 1914. Serial No. 837,669

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 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 the circuit of a dynamo electric machine, adapted for use as a generator for charging a storage battery or supplying current for electrical lamps in an automobile when driven from the gas engine and which is also adapted for use as a motor for turning over the crank shaft of the gas engine for starting the gas engine in operation.

A further object of the invention is to control by means of the same switch mechanism, the operation of the ignition means of the gas engine, the two switch functions being so related that it is impossible to open the switch of such ignition controlling system while the circuit is closed through the motor generator.

Another object of the invention is to perfect details of construction of a switch of this character.

With the above and other objects in view, the invention consists of a switch as herein claimed and all equivalents.

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

Figure 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 sectional rear view on the plane of line 3—3 of Fig. 5;

Fig. 4 is a similar view on the plane of line 4—4 of Fig. 5;

Fig. 5 is a longitudinal sectional view on the plane of line 5—5 of Fig. 3;

Fig. 6 is a similar view on a different plane showing the ignition switch in its closed position for short circuiting the make and break of the ignition circuit;

Fig. 7 is a rear view of the front plate showing the lock for locking the switch in its various positions;

Fig. 8 is a front view of the switch base showing the position, in dotted lines, of the switch contacts in the starting position of the switch;

Fig. 9 is a diagram of electrical circuits including the switch mechanism in the starting position;

Fig. 10 is an outline view of the switch contacts in the intermediate or "neutral" position of the switch;

Fig. 11 is a similar view of the switch contacts in the "off" position of the switch.

In these drawings, 10 indicates a front plate which is designed to be let into the dash of an automobile and form 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, as seen in Fig. 6, such screws threading into bosses 13, of the front plate, let into suitable openings in the base. The base 11, is hollow and a cylindrical switch member 14, of insulating material, held by screws 15 to the back of a turning plate 16, 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 on 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 18 on the back of the turning plate 16 engages shoulders of the front plate 10 to limit the turning movement thereof. 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 swiveled 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 metal disk 21′ may be placed between the switch member 14 and the lock 19 to prevent the wear of the insulating switch member 14 against the metal front plate 10.

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 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 and series field winding of the motor generator. 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 shunt field winding of the motor generator.

In order that the studs 22 and 23 and 26 may be held in place flush with the inner wall of the base and prevented from turning with the tightening of the nuts, thereon they are slotted across their ends with slots that extend into the base and metal key strips 27 are fitted into the slots as seen in Figs. 5 and 8.

A metal tube 28 passes diametrically through the insulating switch member 14 and forms a sleeve for carrying a pair of spring pressed switch contact members 29 which are in the form of plugs slidably mounted in the sleeve and are electrically connected by a flexible conductor 30, commonly known as a pig tail. The contact members 29 are firmly secured to the ends of the flexible conductor 30 by having openings drilled longitudinally thereof 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 31 to bite into the yielding flexible conductor. 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 position of the switch. In order that the contact members 29 may not fit too freely within the sleeve 28, the coil spring 32 is preferably bent or bowed at its middle portion so as to bear against the walls of the sleeve.

A sleeve or thimble 33 fits in an opening of the switch member 14 at an angle to the sleeve 28 and in contact therewith, the two being preferably soldered together after assembling by pouring the solder through an opening in the switch member 14 where it will unite with both. Within the sleeve 33 is slidably fitted a cup shaped contact member 34 containing a coil spring 35 having its end convolutions connected by a flexible conductor 36 which is thus held in contact with the end of the sleeve 33 and the end of the contact member 34 to maintain an electrical connection between them of low resistance.

On the bottom of the switch member 14 is secured a spring contact 37 with a pair of oppositely extending spring arms bent to a bow shape and convexed at their ends to bear upon the bottom of the base 11 which is provided with a series of sockets or depressions 38 into which these rounded convex portions of the contact arms fit to releasably hold the switch member in its various positions. Two of the sockets 38 which are diametrically opposite each other, are formed in the ends of metal contact plugs 39 fitting in openings in the bottom of the base member 11 and having binding posts 40 for connection with the members of the make and break mechanism, to be later referred to, so that the spring contact arms short circuit the make and break when the switch is turned to the "off" position.

The three positions of the switch are marked on the front plate 10 as "Off," "Neutral" and "Start" and a finger 41 on the edge of the turning plate 16 points to one of these designations in each of the three positions of the switch, the "off" position being the position in which the spring arms 37 connect with the contact plugs 39 for short circuiting the make and break as shown in outline in Fig. 11, the "neutral" position being the position in which this connection is broken and the contact members 29 and 34 are still out of engagement with their stationary contacts as shown in Fig. 10, and the "start" position being the position in which these contacts are in engagement with their stationary contacts as shown in Fig. 9.

The electrical connections for the switch are indicated in Fig. 9 wherein the motor generator is represented as a compound wound generator with an armature 42, a shunt field winding 43 and a series field winding 44. The circuit established through the series field and armature windings of the motor generator when the switch is in its closed position or "start" position, is from battery 45, wire 46, series field winding 44, wire 47, contact 23, switch contacts 29, contact 22, wire 48, armature 42, wire 49 back to battery. Also the circuit established through the shunt field winding of the motor generator is the same to the switch contacts 29 and thence through switch contact 34, contact 26, wire 50, shunt field winding 43, wire 49, back to battery. In this diagram an ignition circuit is also indicated, a high tension magneto having been chosen for the purpose though obviously a low tension magneto ignition system or a battery ignition system may be substituted. A make and break is represented by a swing-

ing contact 51 and a stationary contact 52 operated by a cam 53 as usual, while the armature 54 of the magneto is represented by dotted lines with its primary winding 55 and its secondary winding 56 grounded at one end by connection therewith. The primary circuit of the magneto, starting from the grounded primary winding 55, continues through wire 57 to contact 51 and from contact 52 engaged thereby through wire 58 to ground, while the secondary circuit starting from the grounded secondary winding 56 of the magneto armature, continues through wire 59 to the rotating arm 60 and a distributer and thence through one of the contacts 61 of the distributer and wire 62 to one of the spark plugs 63 of the gas engine. A wire 64 connects one of the contacts 39 of the switch with the contact arm 51 of the make and break, while the wire 65 connects the other contact 39 of the switch either with wire 58 leading to the contact 52 of the make and break or to the ground.

In the starting position of the switch as shown in Fig. 9, the motor generator is in connection with the storage battery 45 and may either operate as a compound wound motor for starting the gas engine or as a compound wound generator driven by the gas engine for charging the storage battery or for supplying current to the series of lamps 66 connected by wires 67 and 68 across the terminals of the battery. In the intermediate or "neutral" position of the switch as shown in Fig. 10, the battery connections with the motor generator are interrupted, though the switch arms 37 do not connect with the contacts 39 to interfere with the ignition, while in the "off" position of the switch as shown in Fig. 11, the battery connections with the motor generator are still open but the switch arms 37 by connecting with the contacts 39, forms a short circuit for the make and break and consequently prevents ignition which is due to the opening of the primary circuit of the magneto armature causing an induced current to flow through the secondary circuit including the spark gap of one of the spark plugs 63. In the last mentioned position of the switch it may be locked to prevent the car being started by an unauthorized person.

By means of this switch there is no possibility of the ignition controlling circuit and the motor generator circuit being closed at the same time to waste the battery current in turning the crank shaft without ignition and consequently it is impossible to open the ignition controlling circuit at a time when the motor generator circuit is closed which condition might occasion a back firing of the gas engine by premature ignition. Furthermore, the switch by having its three operative positions determined by the spring contacts 37 fitting in the sockets in the bottom of the switch base may not be left in a false position in which the shunt field winding of the motor generator may remain in connection with the battery with a consequent waste of current and danger to the system.

The various details of construction enable the switch to be manufactured at a low cost though it is efficient for the purpose.

While the switch is shown and described as designed for having three positions, it is obvious that two operative positions only may be provided, the "start" position and the "off" position, though the three position construction is preferable. Also it is understood that the engagement of the switch arms 37 with the contact 39 while shown to be established in the "off" position of the switch in order to short circuit the make and break of the magneto ignition system may be established in the starting position of the switch for closing the primary circuit of the ignition system when a battery ignition system is employed, it being only necessary to rearrange the switch contact arms 37 on the switch member 14 for this purpose.

Obviously the switch member may be of metal properly insulated, and thus obviate the necessity for the metal sleeves 28 and 33.

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

1. A switch, comprising a cylindrical base of insulating material, a switch member mounted to turn within the base and have a transverse opening therethrough, contact members slidably mounted at the ends of the transverse opening through the switch member, a coil spring confined within said opening and bearing at its ends against the contact members to hold them against the walls of the base, a flexible conductor passing through the spring and permanently connected with the contact members to form an electrical connection between them, and contacts in the wall of the base engaged by the contact members.

2. A switch, comprising a cylindrical base, a switch member mounted to turn therein and provided with a transverse opening, contact members slidably mounted in the ends of the transverse opening of the switch member, a coil spring confined within the said opening and bearing against the contact members to hold them against the walls of the base, said contact members having openings extending lengthwise thereof and transverse openings extending to near the lengthwise openings leaving a thin partition between them, a flexible conductor having its ends inserted in the lengthwise openings of the contact members and having the thin partitions between the openings of the contact members bent down as tongues engaging therein, a coil spring surrounding the flexible conductor and bearing against the

contact members, and contacts in the walls of the base engaged by the contact members.

3. A switch, comprising a cup shaped base member of insulating material having a series of recesses or depressions within the bottom thereof, a switch member mounted to turn in the base member, contact members carried by the switch member, contacts in the walls of the base engaged by the contact members, and spring arms on the end of the switch member having convex ends to engage the recesses in the bottom of the base for holding the switch member in its various operative positions.

4. A switch, comprising a cup shaped base of insulating material having a series of recesses or depressions within the bottom thereof, a switch member mounted to turn within the base, contact members carried by the switch member, contacts in the walls of the base engaged by the contact members, spring contact arms on the end of the switch member bearing against the bottom of the base, and contact studs in the bottom of the base engaged by the spring contact arms, there being recesses in the contact studs and the bottom of the base and said contact arms having convex ends to engage said recesses for holding the switch member yieldingly in its various operative positions.

5. A switch, comprising a cup shaped base of insulating material, a switch member mounted to turn therein, contact members carried by the switch member, shouldered contact studs fitting in openings through the inner wall of the base and cut away to conform with the inner wall of the base, said studs having slots extending therethrough at their cut away ends which slots continue into the base, and key strips fitting in said slots to hold the studs in proper relation to the inner wall of the base to constitute contacts engaged by the contact members of the switch member.

6. A switch, comprising a cup shaped base of insulating material, a switch member mounted to turn therein, contact members carried by the switch member, shouldered contact studs fitting in openings through the inner wall of the base and cut away to conform with the inner wall of the base, said studs having slots extending therethrough at their cut away ends which slots continue into the base, and key strips fitting in said slots to hold the studs in proper relation to the inner wall of the base to constitute contacts engaged by the contact members of the switch member, said studs extending through the bottom of the base, and nuts threaded thereon to form binding posts.

7. A switch, comprising a cup shaped base of insulating material, a front plate secured thereto, a turning plate, mounted in the front plate, a lock on the turning plate for engaging the front plate, a switch member carried by the turning plate, contact members carried by the switch member, contacts in the inner wall of the base engaged by the contact members, spring contact arms on the end of the switch member engaging the bottom of the base and contacts in the bottom of the base engaged by the spring contact arms, there being recesses in the bottom of the base and in the last mentioned contacts, said spring contact arms having their ends convex to fit in the said recesses to hold the switch member in its various operative positions.

8. In a switch, a contact member having an opening therein and another opening at an angle thereto extending to near the first mentioned opening and leaving a thin partition between them, a flexible conductor having its end inserted in the first mentioned opening of the contact member and having the thin partition between the openings bent down as a tongue engaging therein.

9. A switch, comprising a cup shaped base having a series of recesses or depressions within the bottom thereof, a switch member mounted to turn in the base, contact members carried by the switch member, contacts in the walls of the base engaged by the contact members, spring contacts on the end of the switch member bearing against the bottom of the base in said recesses, and contacts in the bottom of the base engaged by the spring contacts.

10. A switch, comprising a cup shaped base, a switch member mounted to turn therein, contact members carried on the sides of the switch member, contacts in the side walls of the base engaged by the contact members, contacts on the end of the switch member bearing against the end of the base, and contacts in the end of the base engaged by the contacts on the end of the switch member, said end contacts fitting one within another, and spring means for holding them yieldingly in their interfitting relation.

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

STEPHEN F. BRIGGS.

Witnesses:

KATHERINE HOLT,

R. S. C. CALDWELL.