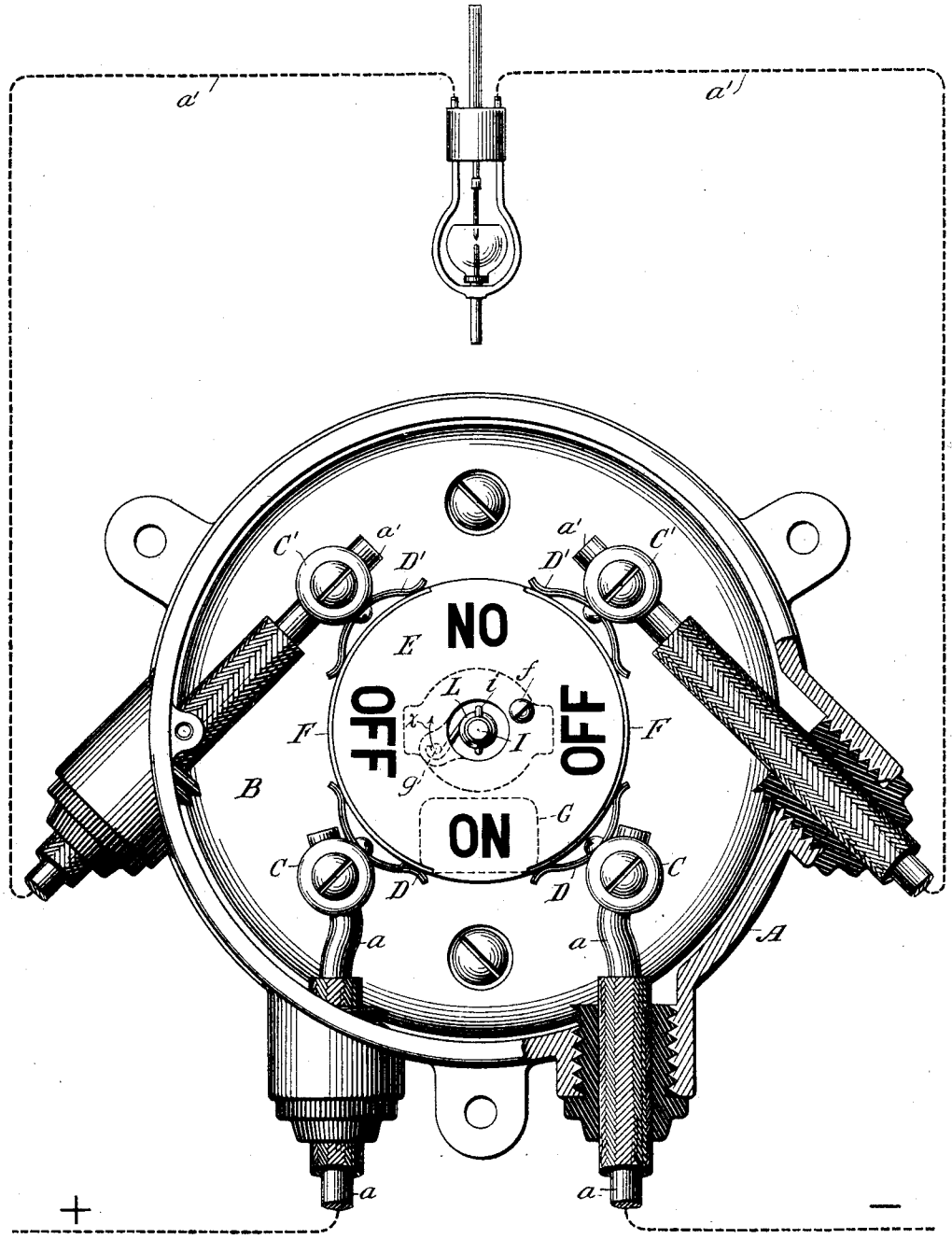
(No Model.) 3 Sheets—Sheet 1.

J. J. WOOD.

ELECTRIC SWITCH.

No. 537,515. Patented Apr. 16, 1895.

FIG. 1.



WITNESSES:

C. E. Ashley

H. W. Lloyd

INVENTOR:

James J. Wood,

By his Attorneys,

Arthur O. Fraser & Co.

(No Model.) 3 Sheets—Sheet 2.

J. J. WOOD.

ELECTRIC SWITCH.

No. 537,515. Patented Apr. 16, 1895.

FIG. 2.

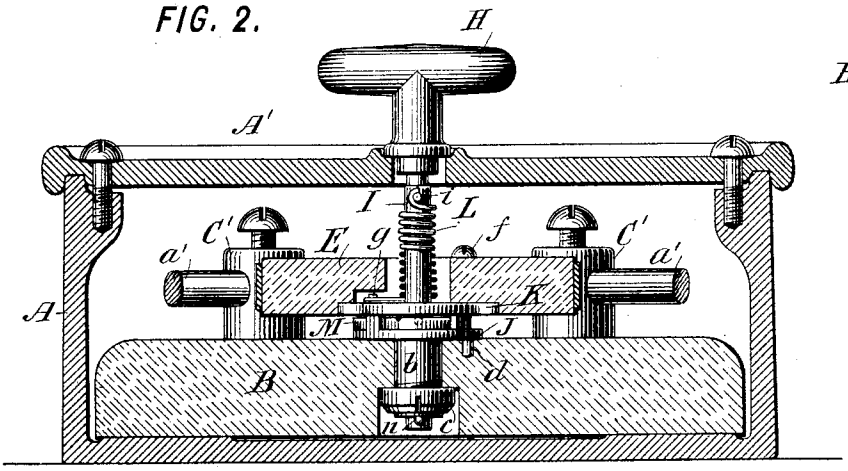


FIG. 3.

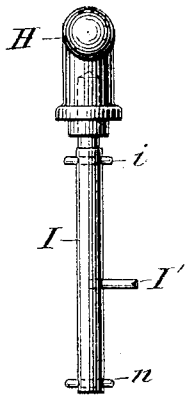


FIG. 4.

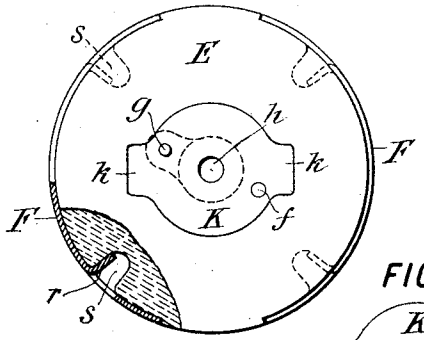


FIG. 5.

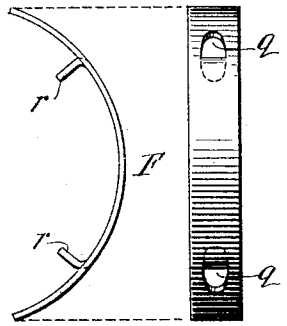


FIG. 4a.

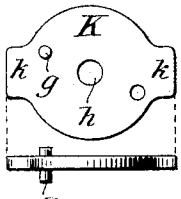


FIG. 6.

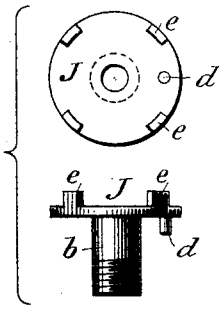


FIG. 15.

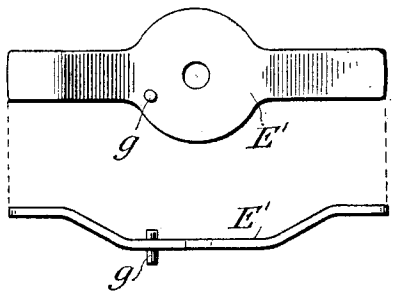
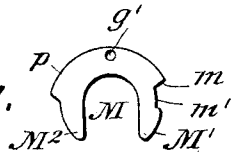


FIG. 7.



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(No Model.) 3 Sheets—Sheet 3.

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ELECTRIC SWITCH.

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FIG. 13.

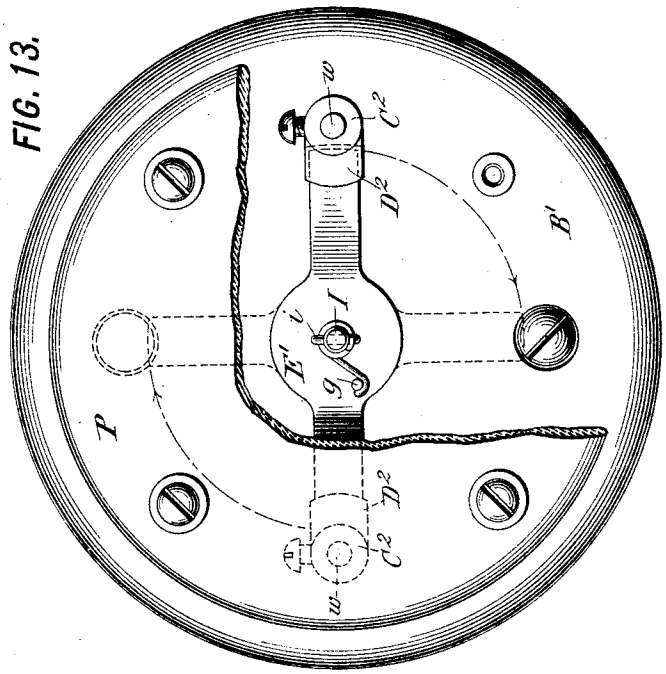


FIG. 14.

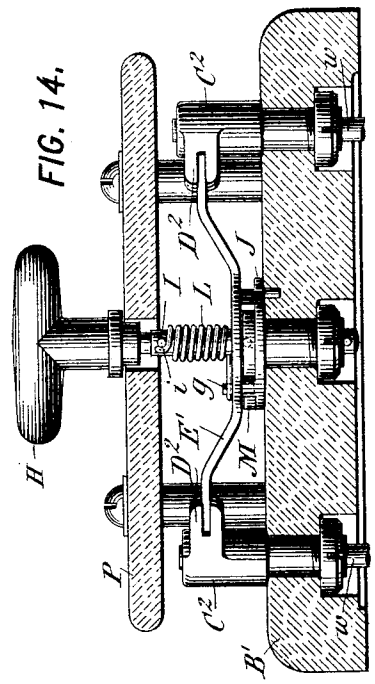


FIG. 9.

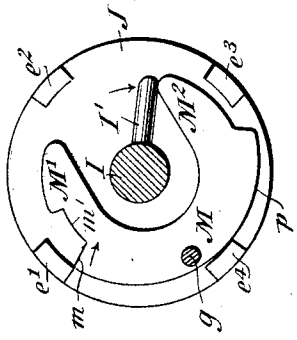


FIG. 11.

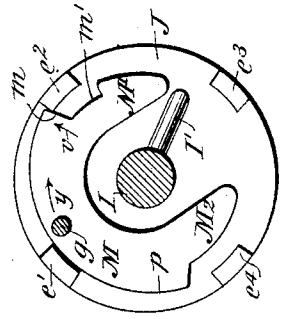


FIG. 12.

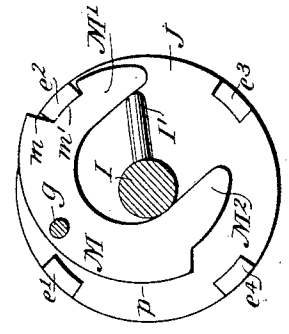


FIG. 8.

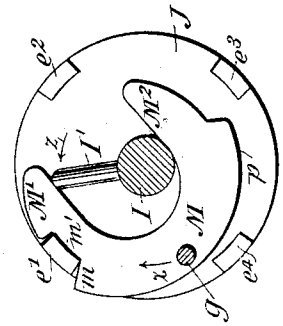
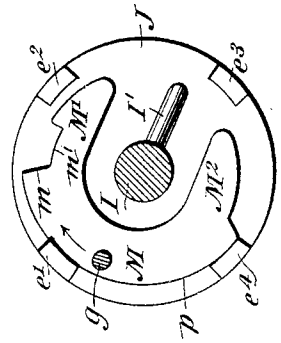


FIG. 10.



WITNESSES:

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INVENTOR:

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UNITED STATES PATENT OFFICE.

JAMES J. WOOD, OF FORT WAYNE, INDIANA.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 537,515, dated April 16, 1895.

Application filed November 12, 1894. Serial No. 528,517. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. WOOD, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvemements in Electric Switches or Cut-Outs, of which the following is a specification.

This invention relates to what are known as snap switches, or those which move with a quick action to avoid drawing an arc. In such switches it is usual to provide an operating handle, and a spring which is compressed by the initial movement of the handle, and the compression of which stores up power tending to move the conducting member or bridge of the switch, the movement of which is resisted by a latch or catch, until by a further movement of the operating handle this latch or catch is withdrawn, thereby releasing the movable bridge and permitting it to fly quickly under the impulse of the compressed spring to the opposite position. It is to switches of this character that my present invention relates.

The improved switch provided by my present invention comprises a fixed base or support, stationary circuit connections or terminals mounted thereon, and a rotatively movable circuit-closing or breaking member which I will call the bridge, and which according to its position, makes or breaks electric connection between the opposite circuit terminals. This bridge is capable of rotating in only one direction, moving an aliquot part of a revolution at each movement. An operating handle is provided having an axial spindle, and connecting with the bridge through the medium of a spring which tends constantly to turn the bridge forward. To resist this tendency and lock the bridge in position, a fixed ratchet is provided attached to the stationary base, and to the bridge is pivoted a pawl engaging this ratchet and provided with a tail constructed to serve the double purpose of insuring the engagement of the pawl and of receiving the thrust from an arm on the operating spindle for disengaging the pawl.

My invention resides chiefly in the peculiar and novel construction of this ratchet and pawl or locking device, and the means for disengaging it.

It also relates to other features in the construction of the switch, as will be hereinafter set forth.

Figures 1 to 7 illustrate a switch or cut-out for arc lamp circuits embodying my invention, and Figs. 13 to 15 illustrate a field-magnet cut-out for dynamos embodying part of my invention. Fig. 1 is a front elevation partly in vertical mid-section, the front plate or cap and the operating handle being removed. The view also shows diagrammatically the connections with the main line circuit and with the loop, including the arc lamp or lamps which are to be cut out by the switch. Fig. 2 is a transverse mid-section through the switch. Fig. 3 is an elevation of the operating handle and its spindle removed. Fig. 4 is a rear view of the rotary bridge partly broken away in section. Fig. 4^a shows in face and edge view the central plate or hub of this bridge. Fig. 5 shows in edge and side view one of the conducting strips of this bridge. Fig. 6 shows in plan and side view the ratchet or stationary locking plate. Fig. 7 shows the locking pawl detached. Figs. 8 to 12 are enlarged views showing the successive positions of the ratchet and pawl and operating spindle on a larger scale. Fig. 13 is a face view of the field-magnet switch, the top plate being partly broken away and the operating handle being removed. Fig. 14 is a transverse section thereof. Fig. 15 shows a face and edge view of the rotary conducting bridge.

Referring to Figs. 1 to 12, let A designate an inclosing case, designed to protect the operative parts from the weather, and having a close fitting cover A′.

B is an insulating base, preferably of marble, and fastened within the casing A.

C C are the main line binding posts, the main line wires *a a* being introduced through bushed openings in the case in a well known manner.

C′ C′ are the binding posts of the branch line or loop, the wires of which, lettered *a′*, enter the case obliquely through bushed openings as shown. The loop or branch circuit *a′* contains one or more electric arc lamps which it is desired to cut out of the main circuit by means of the switch arranged as usual. Connected with each of the binding posts C C is a terminal contact spring D, and with each

of the binding posts C′ is connected a terminal contact spring D′. These four springs press against the periphery of a disk E, which constitutes what I call the bridge. This disk is made of insulating material, preferably porcelain, and has conducting strips F F let into it on opposite sides, each strip extending far enough around on the periphery of the bridge to form a connection between any two adjoining springs D or D′. When in the position shown in Fig. 1, the strips F F each connect one of the springs D with one of the springs D′, so that the loop circuit a' is cut in serially with the main line; but by turning the bridge E a quarter revolution, the strips F are moved to such position that the lower one will form a direct bridge or short-circuit between the two line terminal springs D D, thereby cutting out the loop a'. On the face of the bridge are marked the words "On" and "Off," so that when the switch is so turned that the loop line is on the circuit, one of the words "On" shall when the cover A′ is in place be exposed through an opening shown by the dotted lines G in Fig. 1, and when the switch is turned to cut out the loop circuit, one of the words "Off" will show through this opening, in the well known manner.

The switch is turned by an operating handle H (Fig. 2) of insulating material, fixed on the end of a rotative spindle I (Fig. 3) which passes through the center of the bridge E, and has a bearing in a sleeve b. This sleeve b constitutes the shank of a ratchet disk or plate J, which is shown detached in Fig. 6. This ratchet disk is fixedly attached to the base B, being clamped thereto by a nut c (Fig. 2) screwing on the threaded end of the sleeve b. To insure against the rotation of the disk, it has a pin d which is seated in a hole drilled in the base B. The disk J is formed with ratchet teeth or locking projections e e of any suitable number, preferably four, and equidistantly arranged. The earthenware bridge E is molded with a socket in its under side, into which socket fits a plate K, shown detached in Fig. 4ª. To insure that this plate and the bridge shall turn together, the plate is formed with end projections k k which fit in corresponding recesses in the socket. The plate is fastened to the earthenware by a screw f passing through the earthenware and screwing into a threaded hole in the plate. The plate has a pin g fixed in it and projecting to both sides. The plate is formed with a central hole h fitting the spindle I, so that the bridge is guided upon the spindle in its rotative movements. Coiled around the spindle is a spring L, one end of which engages a pin i in the spindle, and the other end of which engages the pin g projecting upwardly from the plate K. The direction of the spring is such that it tends to rotate the bridge forward (see arrow in Fig. 1), the spring reacting with a backward thrust against the spindle. A pawl or movable locking plate M, shown detached in Fig. 7, is mounted between the plates K and J, being pivoted on the downwardly projecting portion of the pin g, which enters a hole g' in the pawl. The pawl has two arms, one of which M′ may be called the locking arm, and the other M^2 the releasing arm. These arms project beyond the rotative center and on opposite sides of the spindle I, as shown in Figs. 8 to 12.

Referring to Fig. 7, the locking arm M′ is formed with a notch m' for engaging one of the teeth e, one side of the notch constituting the locking face m of the pawl. The other arm M^2 has a cam face p. Between the two arms projects a radial arm or pin I′ projecting from the spindle I. The lower end of the spindle I has a pin n put through it after it is inserted in place, which projects beneath the nut c and prevents the lifting or pulling out of the spindle.

The operation may now be understood. Figs. 1, 2 and 8 show the parts in a position of rest. The tension of the spring L is pressing the bridge E forward in the direction of the arrow x in Figs. 1 and 8, which is resisted by the pawl M, the locking face m of which is in engagement with the tooth e' in Fig. 8. The reaction of the spring against the spindle tends to rotate it in a contrary direction, and hence swings its arm I′ around against the arm M′ of the pawl in the direction of the arrow z in Fig. 8. The end of the arm I strikes the tangential inner face of the pawl arm M′, and thereby serves to press this arm outward and hold the notch m' thereof in firm engagement with the tooth e'. Now in case it is desired to throw the switch, the person operating it will turn the handle H to the right, and as soon as he begins to turn it the reaction of the spring no longer presses through the arm I′ against the pawl M, but this reaction comes against the hand of the operator. As he turns the spindle he swings the arm I′ around until it strikes the pawl arm M^2, and upon continuing the movement it thrusts this pawl arm away in the manner shown in Fig. 9, thereby rocking the pawl M until the locking face m is slid past the tooth e' and disengages itself from the latter. It is shown in Fig. 9 at the instant of disengagement, the arrows indicating the direction of motion of the parts up to this instant. Immediately upon the disengagement, the tension of the spring becomes effective to rotate the bridge E forward, and it instantly flies over with a rapid and forcible movement of one-quarter revolution. Fig. 10 shows it in the course of this movement. As soon as this movement begins, the cam face p of the pawl arm M^2 comes in contact with the inner face of the tooth e^4, and since this cam face p is thrust into an eccentric position by the releasing movement as shown in Fig. 9, its contact with the tooth e^4 thrusts this face inward and thereby oscillates the pawl upon its pivot g while it is advancing, so that the locking face

m is thrust outward into position to certainly encounter the tooth e^2, as is apparent from examining Fig. 10. Fig. 11 shows it at the instant when it encounters this tooth. The bridge is still moving, carrying the pivot g around in the arc denoted by the arrow y, which wedges the locking face m against the abutting face of the tooth e^3, and by reason of the obliquity of the locking face relative to the direction of motion, thrusts it outward in the direction of arrow v, which motion continues until the pawl is fully seated with its notch m' in complete engagement with the tooth e^2, as shown in Fig. 12. When thus fully seated, the rotation of the bridge is abruptly stopped. Then when the operator releases the handle, the tension of the spring causes the spindle to turn backward and press the pin I' again against the arm M' of the pawl, as shown in Fig. 12. The parts being symmetrical, any future advance movements may occur in precisely the same manner.

It will be understood that the disk J constitutes essentially a stationary ratchet wheel having internal teeth, the projections e e constituting these teeth, the portions between the most salient internally projecting portions of the teeth being cut way. The pawl in an ordinary internal ratchet would consist of the portion from the pivot hole g' to the locking face m. I have added to this pawl the opposite locking arm M^2 with its cam face p, and also the prolongation or arm M' which receives the thrust of the arm I' to hold the ratchet normally locked. The arm M' may be called the locking arm and the arm M^2 the unlocking arm.

The construction of the earthenware bridge E with its conducting strips F, presents novel features. It would be difficult to find any screw fastenings or similar means for attaching the strips to an earthenware disk, and I have therefore devised the construction shown in Figs. 4 and 5. The strips F are punched out at q q to form ears r r, which turn inwardly as shown in Fig. 5. The earthenware disk is molded with recesses or cavities s s (Fig. 4), four in number, one pair of these cavities being spaced apart just widely enough to receive the ears r r of one metal strip into them. In applying the strip, it is sprung or bowed outwardly to press its ears apart sufficiently to enter them into the cavities s, and upon releasing it the converging form of the ears draws the strip tightly against the earthenware disk. The fastening thus made is very secure, very simple in construction, and the assembling of the parts is very readily effected.

Figs. 13, 14 and 15 show a construction designed particularly as a cut-out for short-circuiting the field-magnet coils of a dynamo, in order thereby to break down the field of force and render the machine impotent when necessary. The construction of the snap devices is exactly the same as in the switch already described. The sole differences are in the construction of the bridge E, which is here lettered E', and the circuit terminals. There are two binding posts lettered C^2 C^2, each of which is formed with projecting ears D^2 adapted to embrace between them the end of the bridge-piece E', as shown in Fig. 14. This bridge E' is shown detached in Fig. 15. It consists simply of a metal plate pivoted at its middle on the spindle I, in place of the plate K in the previous construction. It has the same pin g, and otherwise operates in the same manner mechanically as the bridge already described. The normal position of the bridge is that shown in dotted lines in Fig. 13, where it stands midway between the binding posts and out of contact with them. To short-circuit the field coil, the operating handle H is turned to cause the switch to snap to the position shown in full lines, where the bridge forms a short-circuit or conductor between the two binding posts C^2. The insulating base B' is preferably of marble, and the switch instead of being boxed in as in the previous construction, is open, with simply a marble top-plate P mounted on four posts. The shunt circuit wires w w enter from the back of the base-plate B' and pass through the tubular fastening shanks of the binding posts.

My invention is susceptible of considerable modification without departing from its essential features. Many constructions of circuit terminals are known in the electric art which might be substituted for those shown, and if necessary the conducting portions of the bridge might be modified to better adapt them to such terminals, or to adapt the switch to any particular action desired.

The "bridge" might be greatly varied in construction, this name having been adopted by me in this specification to designate any intermittently rotative part adapted to effect in connection with suitable circuit terminals the making and breaking of a circuit, or other circuit changes or commutations.

The actuating spring may be otherwise arranged, and the particular construction of the ratchet and pawl may be varied provided the same essential operation be retained, and other changes may be made not inconsistent with the spirit of my invention.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. The combination in an electric switch having an intermittently-rotating bridge, of an operating handle, a spring interposed between the handle and bridge, and a locking mechanism consisting of a stationary internal ratchet, a two-armed pawl pivotally connected to the bridge, having locking and unlocking arms projecting on opposite sides, and an operating arm connected to the handle and arranged between said arms to bear against the unlocking arm to disengage the pawl from the ratchet and to bear against the locking arm to hold the pawl engaged with the ratchet.

2. The combination in an electric switch having an intermittently-rotating bridge, of an operating handle, a spring interposed between the handle and bridge, and a locking mechanism consisting of a stationary internal ratchet, a pawl pivotally connected to the bridge, having locking and unlocking arms projecting on opposite sides, and the unlocking arm formed with a cam-face adapted to engage the ratchet teeth during the forward movements of the bridge and direct the locking arm into engagement with the next ratchet tooth in advance, and an operating arm connected to the handle and arranged to act against the unlocking arm to disengage the pawl.

3. The combination in an electric switch having an intermittently-rotating bridge, a rotative axial spindle, an operating handle thereon, a spring interposed between the bridge and spindle, a stationary ratchet, and a two-armed pawl pivotally connected to the bridge, with its arms projecting to opposite sides of the spindle, and an operating arm projecting from the spindle between said arms of the pawl and adapted to bear against either to essentially the effect set forth.

4. The combination in a switch of a rotative bridge, a spindle I having an arm I′ and handle H, a spring L, a fixed ratchet J, and a pawl M pivoted to the bridge and having a locking face m and a cam-face p coacting with the teeth of said ratchet and actuated by said arm I′, to substantially the effect set forth.

5. The combination in a switch of a rotative bridge, a spindle I having an arm I′ and handle H, a spring L, a fixed ratchet J, consisting of a disk having projecting teeth e, and a pawl M pivoted to the bridge, having two arms projecting to opposite sides of said spindle and acted on by said arm I′, with a cam-face p on one arm and a locking notch m' in the other.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES J. WOOD.

Witnesses:
CHAS. C. MILLER,
WILLARD KNIGHT.