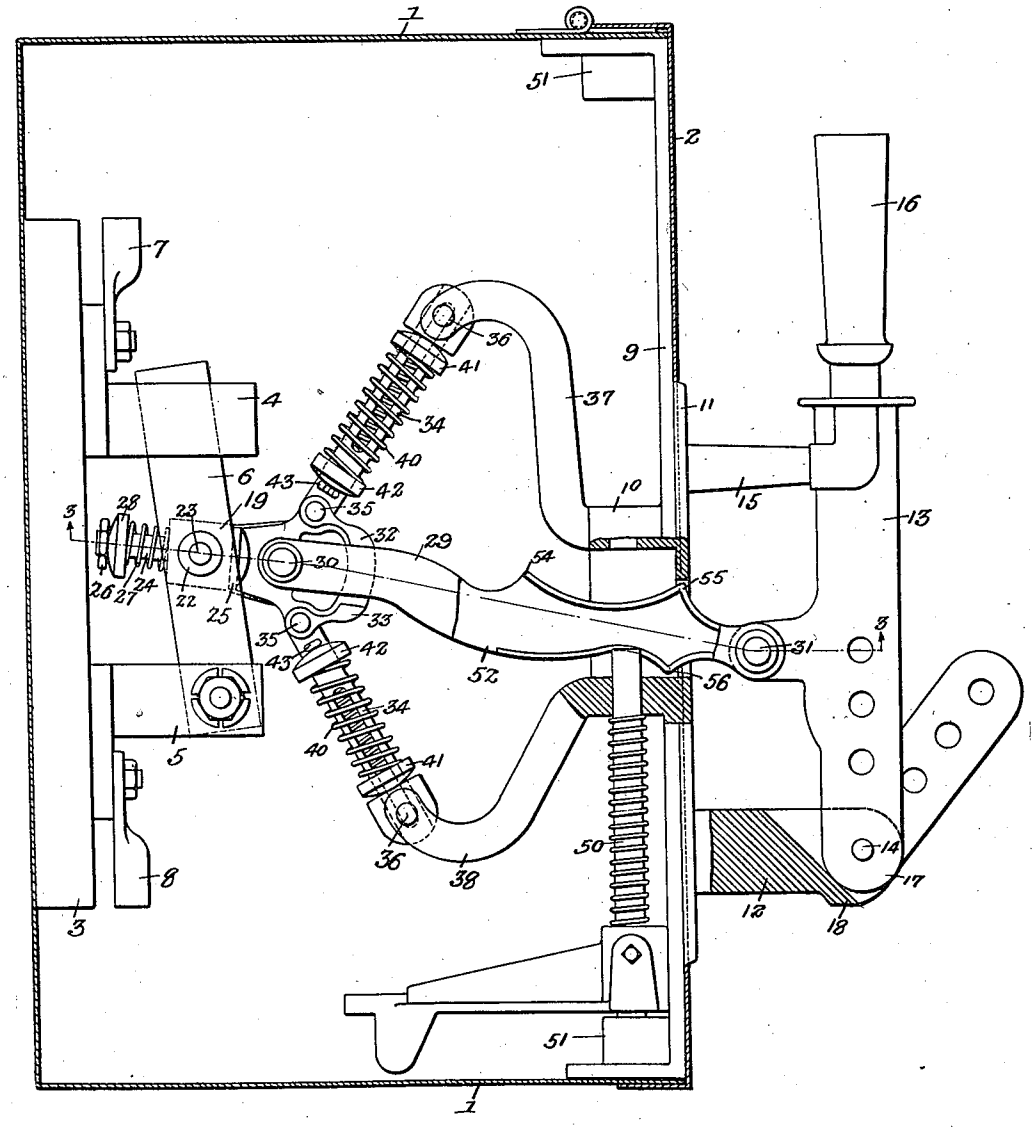
Sept. 11, 1923. 1,467,527

J. F. BURNS

QUICK BREAK SWITCH

Filed Aug. 8, 1918 3 Sheets-Sheet 1

Fig. 1.



Inventor.
James F. Burns.
by his Attorneys
Howson & Howson

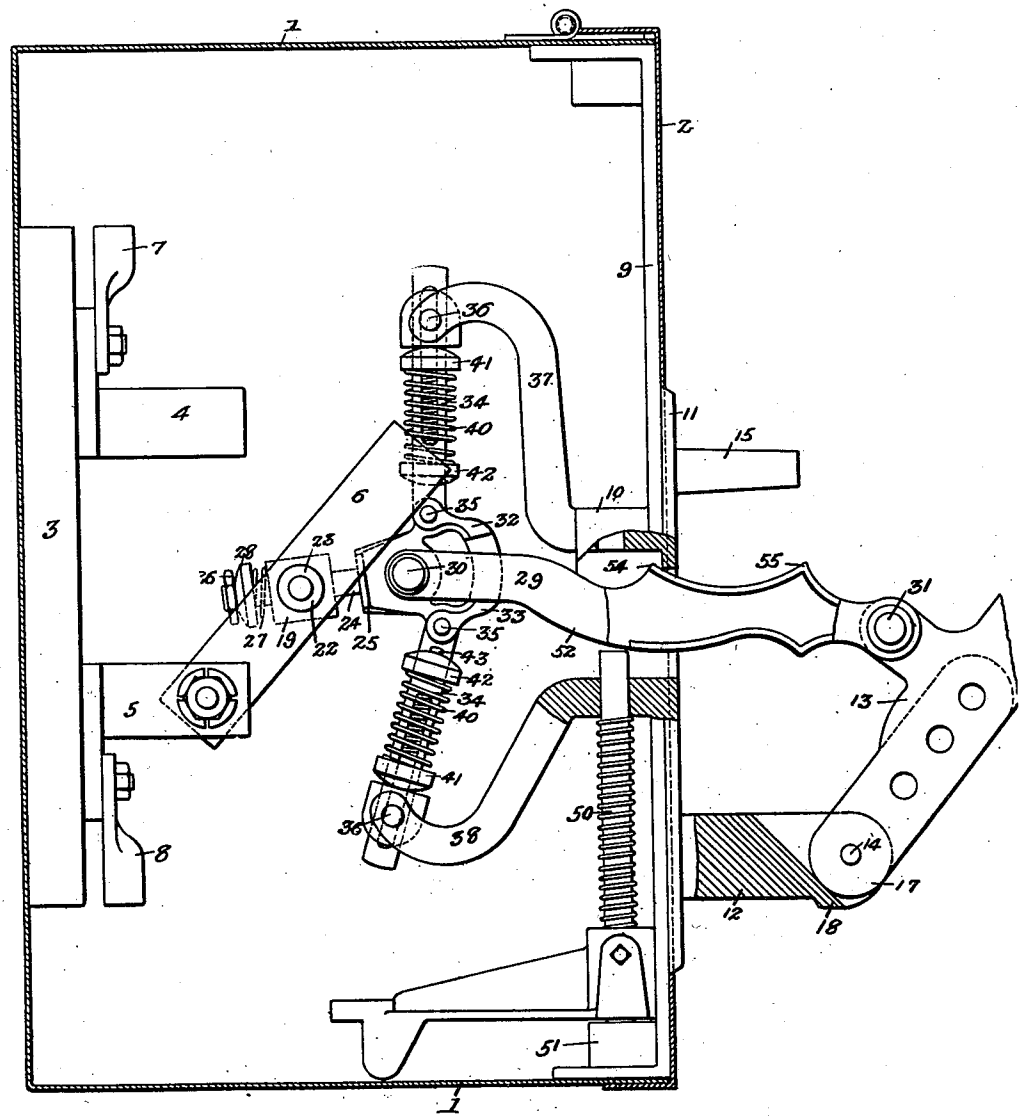
Sept. 11, 1923. 1,467,527

J. F. BURNS

QUICK BREAK SWITCH

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Fig. 2.



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Sept. 11, 1923. 1,467,527

J. F. BURNS

QUICK BREAK SWITCH

Filed Aug. 8, 1918 3 Sheets-Sheet 3

Fig. 3.

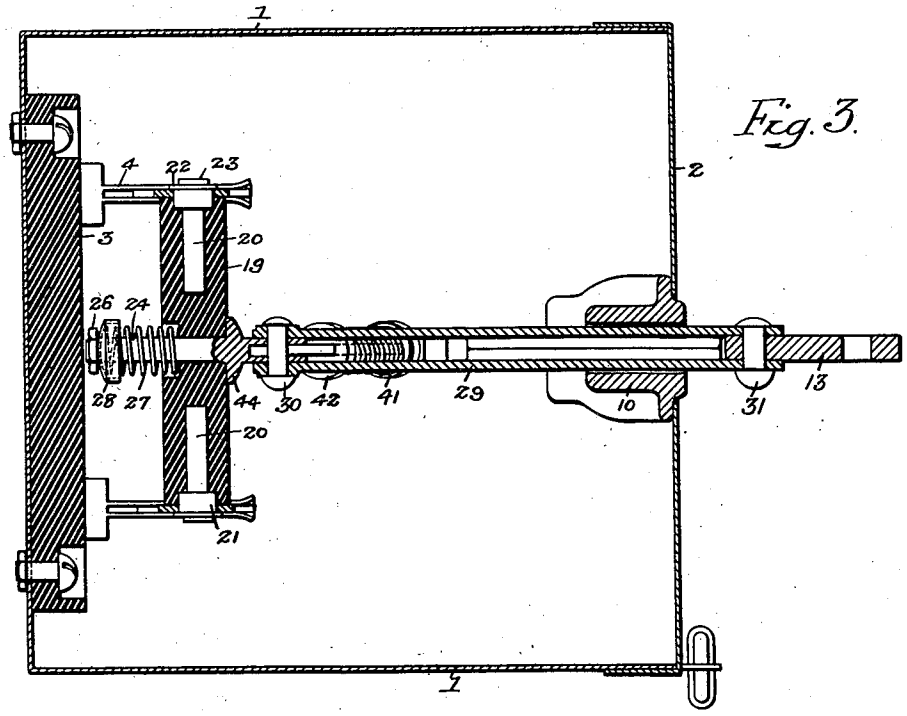


Fig. 4.

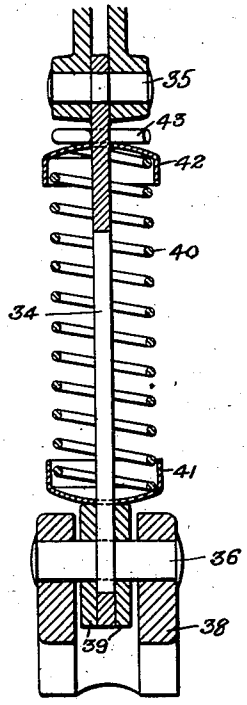
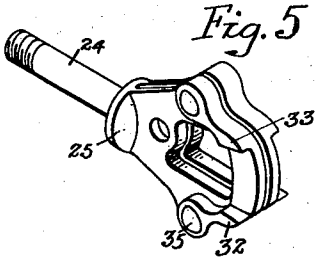


Fig. 5



Inventor.
James F. Burns
by his Attorneys
Howson & Howson

Patented Sept. 11, 1923. 1,467,527

UNITED STATES PATENT OFFICE.

JAMES F. BURNS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO V. V. FITTINGS COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

QUICK-BREAK SWITCH.

Application filed August 8, 1918. Serial No. 248,886.

To all whom it may concern:

Be it known that I, JAMES F. BURNS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented Quick-Break Switches, of which the following is a specification.

One object of this invention is to provide a novel device for insuring movement of a switch blade at a high speed after the operating member of such switch has been moved to a predetermined position, with a view to preventing or to a large extent reducing, the arcing ordinarily occurring.

It is further desired to provide an electric switch with a novel form of toggle mechanism for insuring the quick action of its blade and which shall be of such construction that it is not possible for its toggle arm pivots to remain in line or at their dead point even though the switch operating member be moved slowly; the arrangement of parts being such as to materially reduce the power necessary for the operation of said switch.

It is further desired to provide a switch operating mechanism whose parts shall be so formed and connected that when power is applied to the actuating element to open or close the switch, said parts shall be free to assume those positions in which there will be the least resistance to their movement.

Another object of my invention is to provide an enclosed switch with a novel form of link connecting its blade with its operating member whereby a closure of the opening through which said link passes in the enclosing casing shall be insured regardless of the position of the switch, said link being so formed that when the switch is equipped with a locking bolt, the latter cannot be moved through a part of its possible path of movement when the link is in some position corresponding to a closed or partially closed condition of the switch. With my invention the switch must be in its fully open position before the bolt can be operated to lock the link and prevent closure of the switch.

I also desire to provide a switch with a novel form of connection between its operating member and its blade or blades whereby the quick disengagement of the latter from the fixed contact or contacts is insured;—the arrangement of parts being relatively simple, substantial, durable, and of such a nature as to be conveniently manufactured and assembled.

These objects and other advantageous ends I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figs. 1 and 2 are side elevations partly in section, illustrating a quick break switch constructed according to my invention, in its closed and in its open positions, respectively;

Fig. 3 is a horizontal section on the line 3—3, Fig. 1;

Fig. 4 is a longitudinal section of one of the toggle elements and its associated parts; and

Fig. 5 is a perspective view of the connecting member for the toggle elements, the operating link and the switch blades.

In the above drawings 1 represents a sheet metal box constituting an enclosing casing provided with a front door 2 hinged to swing from the top and having within it a base plate or slab 3 of insulating material such as slate, marble or the like, on which are fixed in the customary manner, two sets of switch terminals 4—4 and 5—5. To the terminals 5—5 are pivoted switch blades 6 and cable or conductor terminals 7; the switch terminals 5 being likewise designed for the attachment of conductor terminals 8.

Extending centrally between the top and bottom of the casing 1 at the front thereof is a relatively heavy, rigidly fixed vertical bar 9 having a thickened block-like central portion 10. This bar has on its front face a projecting boss 11 and the door 2 has a correspondingly formed elongated opening whose edges are designed to closely fit around it. At the bottom of the boss a post 12 projects horizontally and at its outer end is forked for the reception of a switch-operating member 13 pivoted to it by a pin 14. The member 13 is prevented from moving inwardly toward the bar 9 beyond a position substantially parallel therewith by a second post 15 at the top of the boss and said member at its upper end has a handle 16, similar in form to that of an ordinary single blade switch. For limiting the outward movement of the member 13, its lower end has an abutment 17 designed to strike a second abutment 18 provided by a suitably placed portion of the post 12. A bar 19 of insulating material such as vulcanized fibre,

extends between and is movably connected to the two blades 6 at or adjacent their middle portions, by pins 20 having heads 21 rotatably fitting correspondingly formed openings in said blades respectively. The latter are held to these pins by washers 22, outside of which the ends of the pins are spread or headed as indicted at 23.

The cross bar 19 has mounted in it an arm or link in the form of a stem 24 having an integral head 25 on its outer end and at its opposite end having a nut 26 between which and said bar is confined a coil spring 27. The latter extends into a recess in the bar and has a cap 28 confined between its outer end and the nut 26, being so designed that when the stem 24 is drawn outwardly through the bar 19, the edges of said cap will strike said bar before the convolutions of the spring are so far compressed as to strike each other.

The head 25 of the stem 24 is connected to the handle 13 by an elongated link 29 made of two similar flat pieces both pivotally held to said head by a pin 30 and to said handle by a second pin 31. The head 25 has two pairs of abutments 32 and 33 between which pass the two parts or branches of the link 29, and the space between these abutments is greater than the width of said link parts so that said head may turn to a limited extent relatively to the link 29 on the pivot pin 30.

The head 25 constitutes the central member of a spring toggle, having at each side a link 34 pivotally connected to it by a pin or rivet 35 and longitudinally slotted for the greater part of its length to receive a second pivot pin 36 mounted between the branches of the forked end of a fixed arm 38 projecting downwardly and to the rear within the casing 1 from the central enlargement 10 of the front bar 9. The second link 34 is similarly connected by its pin 36 to the forked end of a second arm 37 extending upwardly from the structure 10 but not projecting so far toward the rear of the casing as the arm 36. The links 34 are guided between the forks of their arms 37 and 38 respectively by pairs of parallel plates or washers 39 and each has mounted upon it a coil spring 40 confined between a cap 41 adjacent said plates and a second cap 42 engaged by a cottor pin 43 mounted in its link adjacent its point of connection to the head 25.

The parts are so proportioned that when the switch blades 6 are in their closed position between the clips of the fixed terminals 5, the handle or operating member 13 is perpendicular and in engagement with the post 15. At such time the springs 40 of the links 34, as well as the spring 27 on the stem 24, are practically uncompressed. When an outward force is exerted on the handle 16 of the operating member in order to open the switch, the first effect thereof is to cause a compression of the spring 27, owing to the longitudinal movement of the stem 24 through the cross bar 19, there being at the same time a compression of the toggle springs 40. At or just before the time when the cap 28 strikes the cross bar 19, the frictional hold of the switch clips 4 on the blades 6 is overcome so that they suddenly disengage said clips, whereupon the compressed spring 27 expands to move the cross bar with the blades away from the clips at an increased speed until said bar engages a flange 44 on the stem 24 immediately adjacent the head 25.

The switch blades 6 are thus caused to move away from the fixed contacts at the moment of disengaging the same, at a speed very considerably higher than that due to the outward movement of the operating lever 13 and the link 29, by the operator and as this outward movement is continued, the toggle elements 34 approach and pass the dead point at which they are substantially in line. Thereafter the springs 40 act to again increase the speed of the outward movement of the switch blades and their associated parts, until further movement is stopped by engagement of the abutment 17 on the operating member with its cooperating abutment 18 on the post 12.

It is to be noted that as the above movements occur, the head 25 with the cross bar 19 turns on the pins 20 as an axis and moves from a position in which the abutments 33 engage the branches of the link 29 to a second position in which the latter is engaged by the abutments 32;—there being thus a slight turning of said head on the pivot 30.

Even if the outward movement of the operating member is made as slow as possible, the above described arrangement of parts prevents the switch blades being held in a position immediately adjacent the terminal clips 4, for since a straight line between the pivot pins 35 passes to one side of the center line of the pin 30, the expansive force of the springs 40 is exerted in such manner that it is a practical impossibility to bring and hold the parts to a position in which said springs cannot act to turn the head with the cross bar 19 in one direction or the other and either to close the switch or move the blades to their extreme open position. Similarly, when it is attempted to close the switch, even though the operating member be slowly moved toward its inner position, the springs 40 are first compressed to a maximum extent when the four pins 36—35—35—36 all lie in the same straight line, but in view of the freedom of the head 25 and cross bar 19 to turn on the axis provided by the pins 20, the springs 40 do not permit the parts to remain in this position, but at once cause a quick movement of said

head from the position in which the abutments 32 engage the link 29. As a result the lines of action of the forces exerted by the springs 40 extend on the inner side of the straight line between the pivots 36, and the head with the cross bar and blades 6 are therefore forcibly moved to their innermost positions in which said blades engage the clips of the terminals 4.

While the above quick make and break mechanism may be utilized as described regardless of the shape of the link 29, I have illustrated the latter as designed for coaction with a locking bolt 50 mounted to move longitudinally in guideways provided by passages in a block 51 of the bar 9 and a second passage in the structure 10. Such a locking bolt may form part of and be operated by the apparatus shown and claimed in my application for U. S. Patent #198,968, filed October 29, 1917, and in order that it may not be possible to move it through a portion of its possible path of movement when the link 29 is not in its extreme outer position with the switch blades 6 fully opened, I give the under edge of said link the curved form indicated at 52, so that regardless of the swinging accompanying its longitudinal movement as the operating member 13 is moved, said edge at all times remains adjacent the end of the bolt. The central portion of the link 29 (Fig. 3) is preferably cut away or omitted so that when the operating member 13 is in its extreme angular position corresponding to the fully opened position of the switch blade 6, said bolt 50 is free to be moved into said link element, thus preventing inward movement thereof and closure of the switch until the bolt has been withdrawn.

It will further be noted that the upper edge of the link 29 is provided with two enlargements or projecting parts 54 and 55, while its lower edge likewise has a similar projection 56 so placed that when the operating member 13 is in the closed position shown in Fig. 1, the projections 55 and 56 completely close the opening in the block 10 and similarly, the projection 54 cooperates with the curved under edge of the link to likewise completely close said opening when the operating member 13 is in its fully open position.

From the above description it will be noted that the movement of the switch blades away from their coacting fixed contacts is accelerated just as they clear the latter and their movement is again further accelerated by the heavier springs of the toggle elements, after these latter have been brought to and past positions in which their pivots are approximately in line. As a result, even though the operating member be moved at a slow speed, the switch blades are moved at such a high velocity that destructive arcing is effectually prevented. Owing to the peculiar shape given the connecting link, the locking bolt is effectually prevented from movement until said link has been drawn outwardly to a position in which the switch blades are at their maximum distance from the fixed switch contacts, and this result is obtained in spite of the lateral swinging of said link incident upon the construction and mechanism employed. Moreover, owing to the provision of the two pivotally connected elements 25 and 29 between the operating element 13 and the switch blade or blades, the frictional resistance of the several parts is reduced as is also the power required for operation of the apparatus.

I claim:

1. The combination of a fixed structure; two spring toggle elements pivoted thereto; an oscillatory intermediate element pivoted to both of said toggle elements; a switch including a reciprocable blade pivotally connected with said intermediate element; a longitudinally movable link and an operating member connected through said link to the intermediate element.

2. The combination of a switch including a pivoted blade; a member rotatably connected to said blade; a head connected to said member; a spring toggle connected to the head to accelerate movement of the blade on either side of a dead point; an operating member; a longitudinally movable link connecting the head with the operating member; and a spring operative between the head and the rotary member.

3. The combination of a switch including a blade; an operating member; a link and an oscillatory head pivotally connected between said member and the blade; abutments on the head for limiting its pivotal movement relatively to the link; with a spring toggle operative on the head for accelerating opening and closing of the blade.

4. The combination of a switch including two blades; a rotatable block connecting said blades; a head having a portion longitudinally movable through said block; a spring between the head and the block; a spring toggle connected to the head for accelerating movement of the blade toward and from its closed position; and an operating member connected to said head.

5. The combination of a switch including two blades; a rotatable block connecting said blades; a head having a portion longitudinally movable through said block; a spring between the head and the block; two spring actuated toggle links respectively connected to opposite sides of the head for accelerating movement of the blade toward and from its closed position; and an operating member connected to said head.

6. The combination of a switch including a blade; a block pivoted to said blade; a

member slidable through the block; a spring operative between the block and a portion of said member; an operating member pivotally connected to said slidable member; and two spring toggle elements operative on said first member to accelerate its movement on either side of a dead point.

7. The combination of a switch including a blade; a block pivoted to said blade; a member slidable through the block; a spring operative between the block and a portion of said member; an operating member pivotally connected to said slidable member; and two spring toggle elements operative on said first member to accelerate its movement on either side of a dead point, there being abutments on the slidable member to limit its movement relatively to the operating member.

8. The combination of a switch including a pivoted blade and a contact placed to be frictionally engaged thereby; a block pivotally connected to the blade; an operating member; a member connected to the operating member and slidable through the block; with a spring operative between the block and said slidable member for accelerating movement of the blade away from the contact after it has disengaged the same.

9. The combination of a switch including a plurality of blades and contacts mounted to coact therewith; a bar extending between said blades and having pivot pins rotatably engaging the same; an oscillatory member connected to said bar; two spring toggle elements operative on said member; and an operating member connected to the oscillatory member.

10. The combination of a switch; a bar connected to the movable element of said switch; and means for operating the switch including a stem extending through the bar; a spring mounted between a head fixed on the stem and said bar; with an abutment on the stem for limiting its movement under the action of the spring.

11. The combination of a switch; a bar connected to the movable element of said switch; and means for operating the switch including a stem slidable through the bar; a cap on said stem; and a spring confined between the cap and the bottom of a recess in the bar.

12. The combination of a switch; a bar connected to the movable element of said switch; and means for operating the switch including a stem slidable through the bar; a cap on said stem; and a spring confined between said cap and the bar, the cap being formed to engage the bar before the convolutions of the spring engage each other.

13. The combination of an operating element; a switch blade; a link connected to the operating element; a member pivotally connected with the blade and with the link; and a pair of spring actuated toggle links operative on said member.

14. The combination of an operating element; a switch blade; a plurality of links connecting said blade and said element, one of said links being longitudinally yieldable; stops on one of the links for limiting its angular movement relatively to the other; with a spring toggle operative on one of the links.

15. The combination of a switch including a pivoted blade; a head rotatably connected to said blade; an operating member; a link connecting said member and the head; with a device interposed between the head and the blade for accelerating movement of the latter.

16. The combination of a switch including a pivoted blade; a head rotatably connected to said blade; an operating member; a link connecting said member and the head; a device interposed between the head and the blade for accelerating movement of the latter; with a second movement-accelerating device operative on the head.

In witness whereof I affix my signature.

JAMES F. BURNS.