

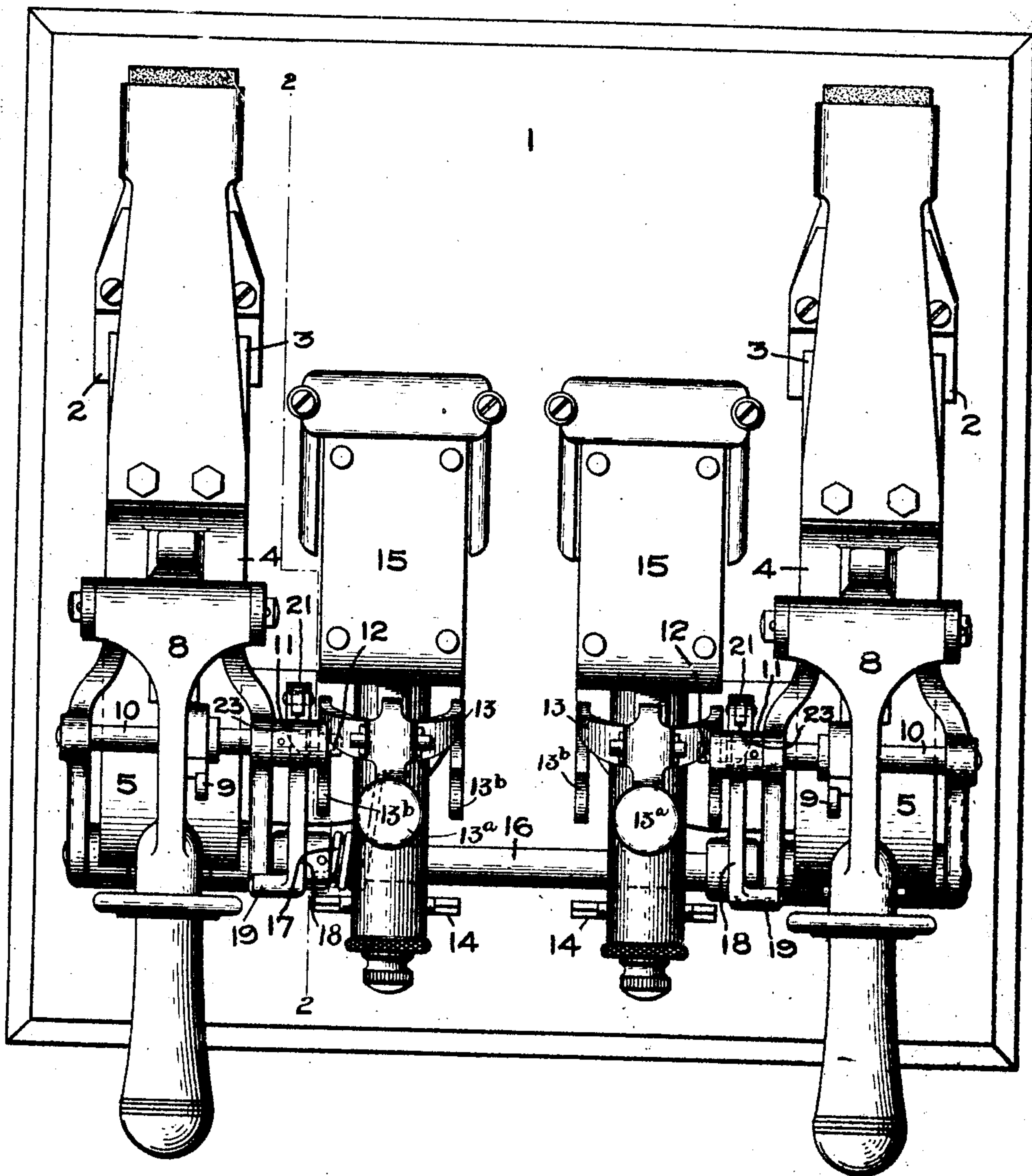
970,600.

W. A. ATWOOD.  
CIRCUIT CONTROLLING MECHANISM.  
APPLICATION FILED DEC. 8, 1909.

Patented Sept. 20, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:  
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J. Ellis Elen

INVENTOR:  
WINFIELD A. ATWOOD.  
BY *Albert H. Davis*  
HIS ATTORNEY

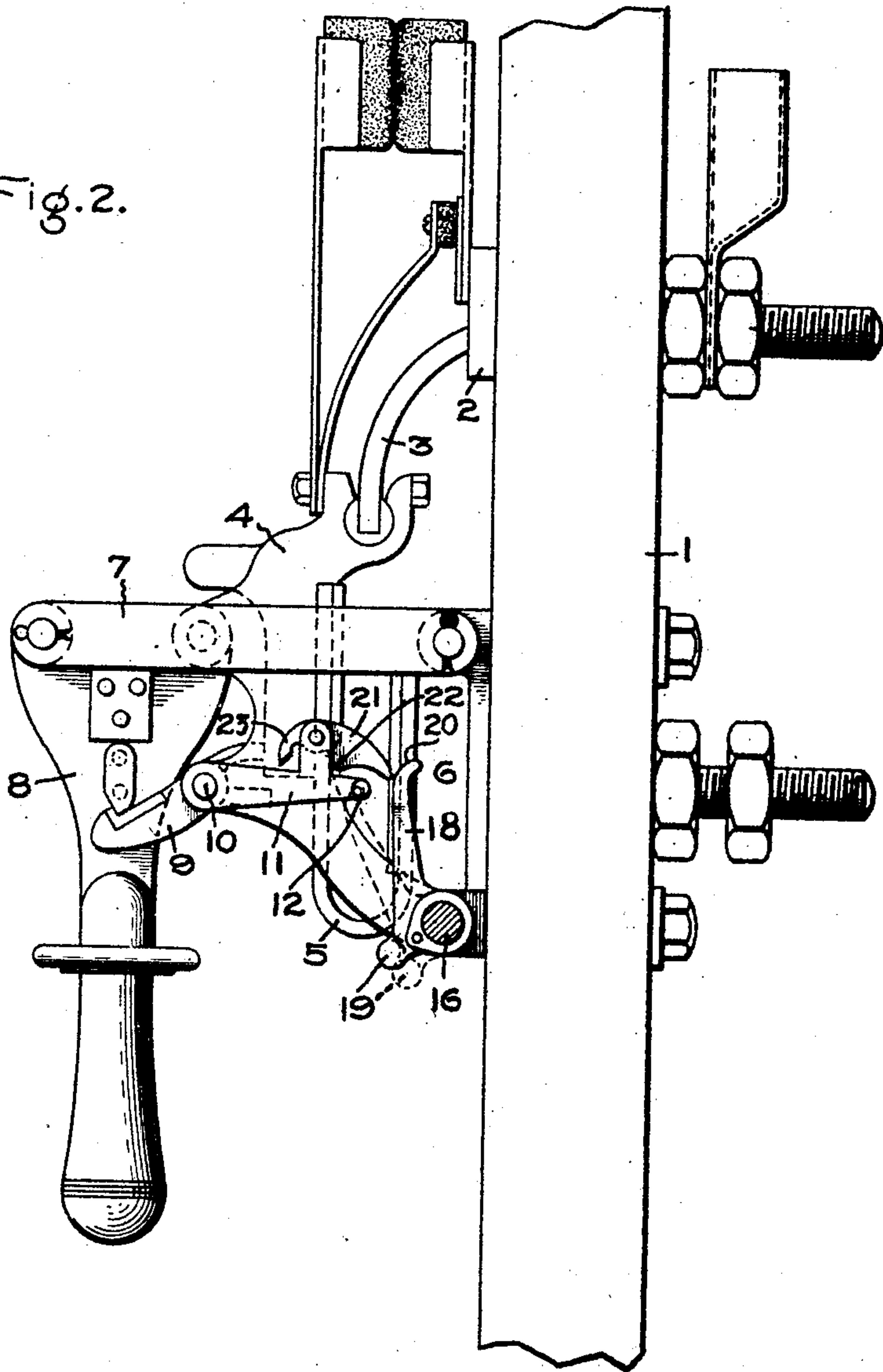
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3 SHEETS-SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

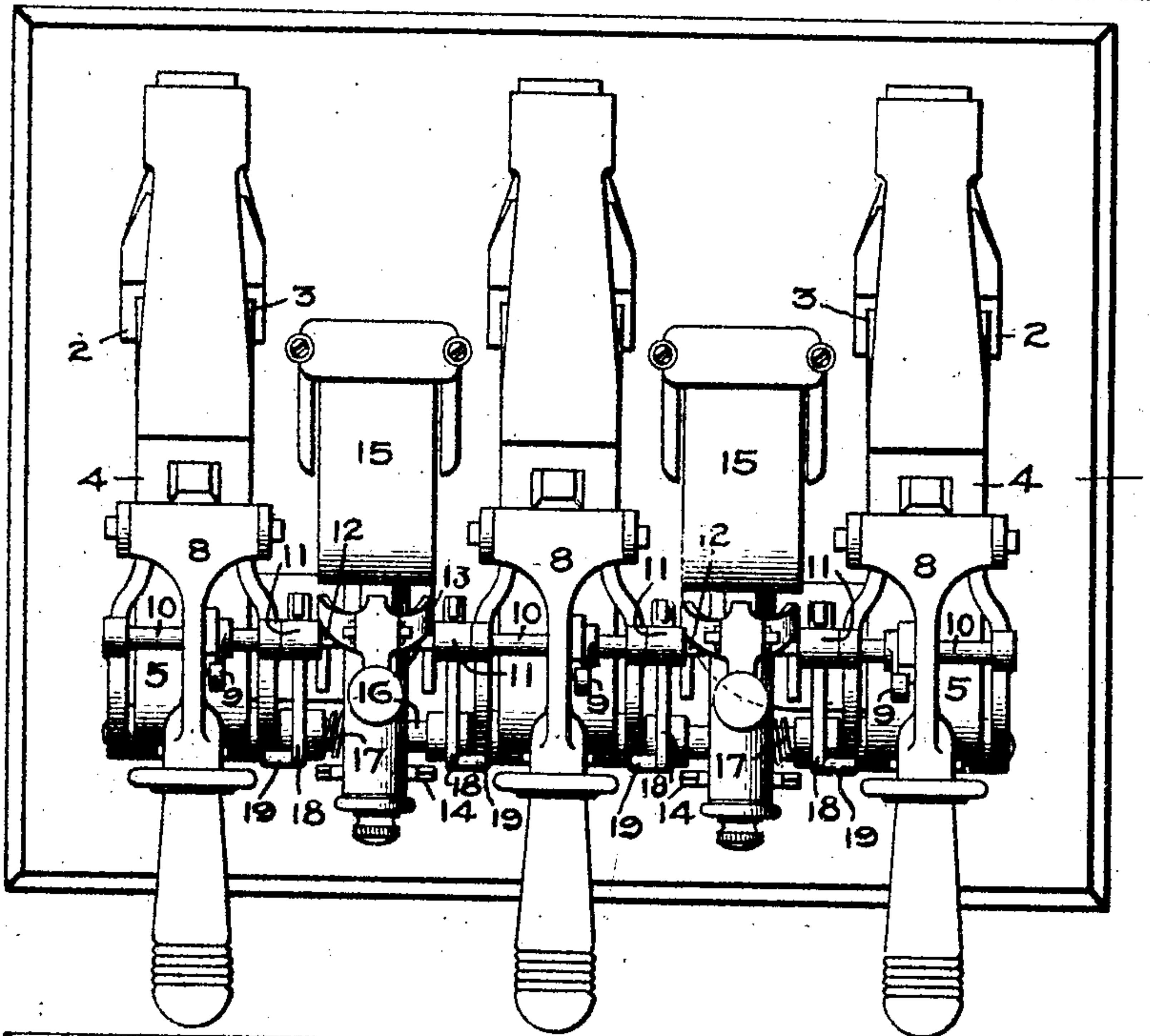
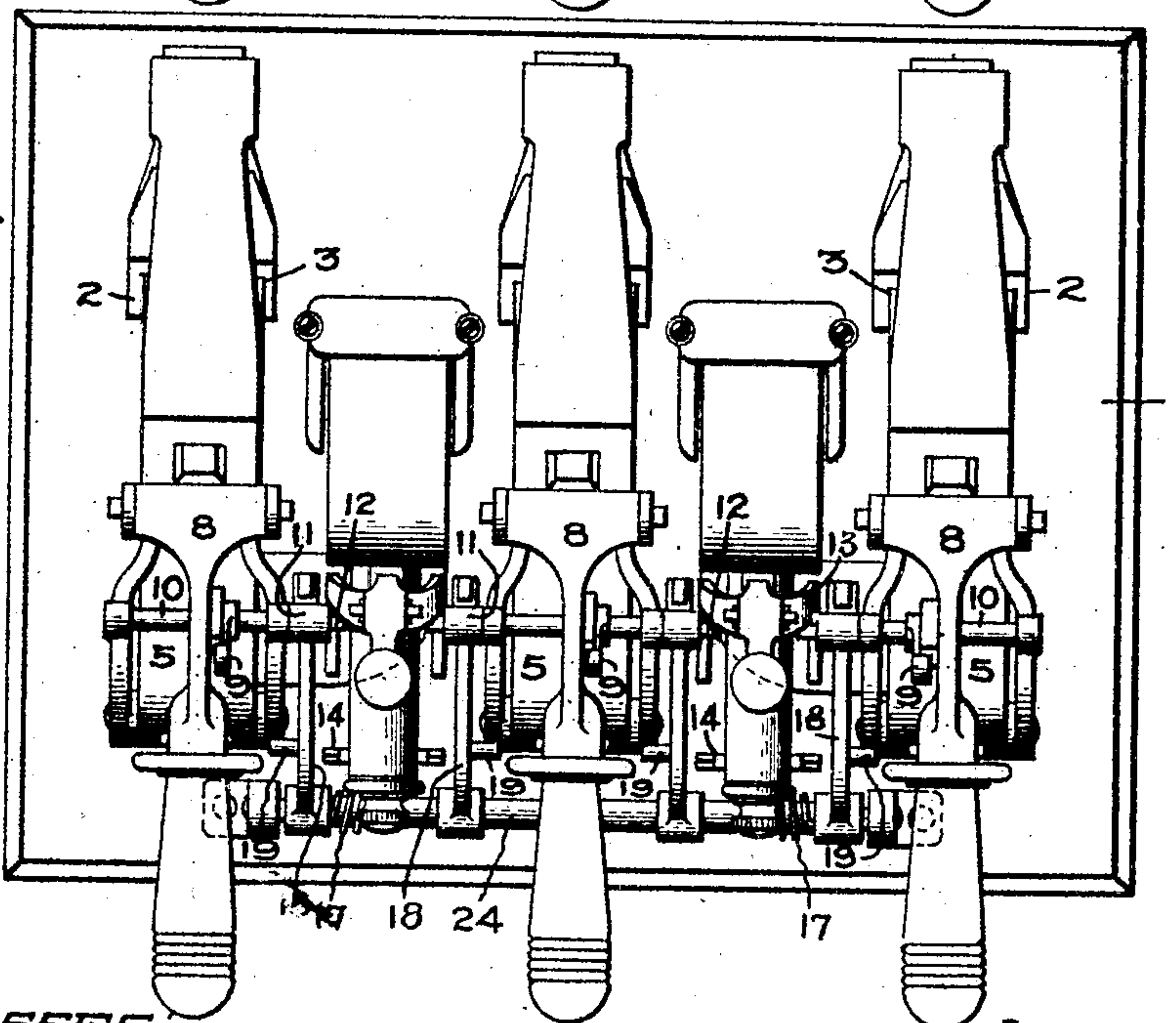


Fig. 4.



WITNESSES.

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## UNITED STATES PATENT OFFICE.

WINFIELD A. ATWOOD, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## CIRCUIT-CONTROLLING MECHANISM.

970,600.

Specification of Letters Patent. Patented Sept. 20, 1910.

Application filed December 8, 1909. Serial No. 531,337.

*To all whom it may concern:*

Be it known that I, WINFIELD A. ATWOOD, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Circuit-Controlling Mechanism, of which the following is a specification.

My invention relates to devices for controlling electric circuits, especially devices comprising circuit breakers or switches which may be tripped open, and more particularly to devices in which a plurality of switches or circuit-breakers are mounted side by side and are interlocked so that the opening of one will cause all the others to open.

It is often desirable in systems of distribution to have a number of switches or circuit-breakers mounted side by side and so arranged that all will open simultaneously while any switch or circuit-breaker may be closed independently of the others, and the object of my invention is to provide a circuit controlling device in which a plurality of switches or circuit-breakers are interlocked so that the opening of any one will open all of the others; in which any of the switches or circuit-breakers may be closed independently of the others as easily as though the interlock did not exist; in which the interlocking or tripping member may be returned to normal position without actuating the latches of any of the switches or circuit-breakers which are in the closed position; and in which the energy for actuating the latches of interlocked automatic circuit-breakers is derived from the movable member of the first circuit-breaker which opens, so that the overload coil of each circuit-breaker need be only large enough to operate the latch of one circuit-breaker, because ample energy for tripping a large number of circuit breakers may be derived from the opening movement of the movable contact of any one of the circuit-breakers.

My invention will best be understood in connection with the accompanying drawings which show one of the various forms in which the invention may be embodied and in which—

Figure 1 is a front elevation of two automatic circuit-breakers interlocked in accordance with my invention; Fig. 2 is a section of Fig. 1 along the line 2—2, showing the

relation of the interlocking mechanism to the latch of the circuit-breaker; Fig. 3 is a front elevation of three circuit-breakers interlocked by means of two interlocking members; and Fig. 4 is a front elevation of three circuit-breakers interlocked by means of a single rock shaft or interlocking member.

While my invention may be applied to various forms of switches and circuit-breakers, I have, for purposes of illustration, shown my invention embodied in a circuit-controlling device in which two circuit-breakers of well known form are mounted side by side upon a suitable insulating base 1 as shown in Fig. 1. Each circuit-breaker comprises, as best shown in Fig. 2, a fixed contact or terminal 2 with which coöperates a movable brush or contact 3 mounted upon a movable arm or member 4 which is pivoted to the base 1 and is electrically connected through a flexible connection 5 to the other terminal 6. The circuit-breaker is operated by an actuating mechanism comprising a toggle link 7 pivoted at one end to the base 1 and at the other end to an operating handle 8, which in turn is pivoted to the movable arm 4, the pivots of the toggle link and of operating handle being properly related to form a toggle which is slightly underset when the circuit-breaker is closed.

In the particular form of device shown in the drawings, the circuit-breaker is automatic and is normally held closed by means of a latch comprising a hook 9 which engages a suitable lug or projection on the operating handle 8 and is pivotally mounted on the movable arm 4 by means of a shaft 10 which is journaled on the movable arm and is rocked to a sufficient extent to release the circuit-breaker and permit it to open by means of a latch-arm 11 secured to one end of the shaft 10 and provided with a pin 12 projecting at right angles from the latch arm. The latch above described is actuated automatically through the pin 12 which is of sufficient length to coöperate with a pivoted arm 13 so related to the pin 12 that when the arm is lifted by the cross pin 14, which extends through and moves with the core of an overload coil 15, the latch arm 11 is moved and thereby the hook 9 is carried out of engagement with the lug on the operating handle 8, whereupon the circuit-breaker opens. Each pivoted arm 13 is provided with a manual tripping button 13<sup>a</sup> for trip-



ping the circuit breaker by hand and is also provided with tripping lugs 13<sup>b</sup> symmetrically disposed on each side of the axis of the trip coil 15 in a position to be engaged by the two ends of the cross pin 14, so that the core of the trip coil does not bind against the side of the tube in which it slides when the pin 14 engages the lugs 13<sup>b</sup> to lift the pivoted arm 13. The overload coil 15 can be calibrated in any suitable way to actuate the latch and open the circuit-breaker on any predetermined amount of overload.

In accordance with my invention, two circuit-breakers constructed as above described are mounted side by side on the base 1 and are interlocked by means of any suitable actuating or interlocking member common to the latches of the two circuit-breakers, and comprising a rigid member, such as a rock shaft 16, preferably made of wood or other suitable insulating material, and yieldingly biased to a normal position by a resilient device, such as a spring 17. The rock-shaft carries at each end circuit-breaker tripping members 18 independent of the overload coils and each so related to the movable arm 4 of the circuit-breaker by any suitable connection, such as a lug 19 projecting into the path of movement of the arm 4, that as the circuit-breaker opens the lug 19 is engaged by the movable arm 4 and the rock shaft 16 together with the tripping members 18 is forcibly rotated by energy derived from the opening movement of the circuit-breaker. Each tripping member 18 is also provided with a cam surface 20, which, as shown in Fig. 2, coöperates with one end of a pawl 21 pivotally mounted on the latch arm 11 and provided with a shoulder 22 to prevent the pawl from rotating in a clockwise direction from the position shown in Fig. 2, while a stop 23 on the pawl prevents excessive rotation of the pawl in a counter-clockwise direction. The tripping members 18 and the rock-shaft 16 constitute an interlock or actuating member which has no effect upon the latches of the circuit-breakers when in either the normal position shown in full lines in the drawings or in the extreme position shown in dotted lines in Fig. 2, but which actuates the latches when passing through an intermediate tripping position and thereby trips the circuit-breakers. When the actuating member is in either the normal or the extreme position any of the circuit-breakers can be closed as though the interlock did not exist, but if the interlock is in the extreme position and the circuit-breakers are closed one after the other, they will remain closed until the last one is closed, whereupon the interlock returns through the intermediate tripping position to the normal position and would trip out the closed circuit-breakers as it passed through tripping position, unless

some suitable means is provided to permit the latches to hold the circuit-breakers closed while the interlock is returning through the tripping position. In the specific embodiment shown, this result is obtained by a suitable ratchet connection between the actuating member and the latches, the pawl 21 forming a ratchet connection between the interlock and the latch so that when the tripping member 18 moves in a counter-clockwise direction from the normal position shown in Fig. 2 through the tripping position into the extreme position shown in dotted lines, the pawl 21 is held by the shoulder 22 and engages with and forms a rigid extension or projection on the latch arm 11 which is actuated by the cam surface 20 as the tripping member passes through tripping position, and therefore the tripping member through the pawl 21 moves the latch and trips the breaker. As the interlock moves in the reverse direction on its return from extreme position to normal position, no effect is produced upon the latch as the interlock passes through tripping position because the tripping member 18 lifts the pawl 21 without moving the latch arm 11.

The operation of the device is as follows: When the circuit is closed the parts are in the position shown in the drawings and if an excessive current flows through the overload coil of either circuit-breaker the cross pin 14 is lifted and actuates the latch through the pivoted arm 13 and thereby the circuit-breaker through which the excessive current is flowing is opened automatically. As the movable arm 4 swings out, it engages the lug 19 of the tripping member 18 and if, for purposes of illustration, it be assumed that the right hand circuit-breaker in Fig. 1 is opening automatically and that Fig. 2 represents the left hand circuit-breaker, a comparatively short movement of the movable arm 4 will bring it into engagement with the right hand lug 19, whereupon further movement of the movable arm 4 causes rotation of the rock-shaft 16. As the rock-shaft begins to rotate the upper end of the tripping member 18 shown in Fig. 2 begins to move to the left and in so doing encounters the end of the pawl 21. The shoulder 22 will not permit the pawl 21 to rotate in a clockwise direction in response to the pressure exerted by the tripping member 18, hence the end of the pawl begins to ride up on the cam surface 20 and as the pawl is lifted it carries with it the latch arm 11, thereby producing sufficient movement of the latch to trip the left hand circuit breaker. After the circuit breakers are open, either one may be closed as though the interlock were not present, but for the purposes of illustration let it be assumed that the left hand circuit-breaker is closed first,



bringing the parts into the position shown in full lines in Fig. 2, except that the tripping member 18 is in the position shown in dotted lines, because the right hand circuit-breaker is still open. As the operator closes the right hand circuit-breaker, the spring 17 rotates the rock-shaft in a clockwise direction and carries the tripping member 18 of the left hand circuit-breaker from the position shown in dotted lines to the position shown in full lines. This movement has no effect upon the latch and does not trip the circuit-breaker because the pawl 21 is free to lift to a limited extent and to turn about its pivot as the end of the tripping member 18 engages the under surface of the pawl. The interlock therefore returns from extreme position to normal position without producing any effect upon the latch and during the entire return of the tripping member 18 the latch is as free to move into latching position or to remain in latching position as though the interlock were not present, since the yielding of the pawl 21 prevents the tripping member 18 from interfering in any way with the normal operation of the latch.

Any number of circuit-breakers may be so interlocked in accordance with my invention that the opening of any one circuit-breaker will trip all the others while any circuit-breaker may be closed as though the interlock did not exist. The result is accomplished by interlocking each circuit-breaker to the adjacent circuit-breaker by means of an interlock constructed substantially as shown in Fig. 1. An example of this construction is illustrated in Fig. 3, which shows three interlocked circuit-breakers mounted on a panel side by side, with each outside circuit-breaker interlocked with the middle circuit-breaker. The construction and mode of operation of the circuit-breakers and interlocks are the same as in Figs. 1 and 2 except that the rock-shaft 10 of the middle circuit-breaker is extended to carry a latch arm 11 at each end, so that the opening of either outside circuit-breaker will actuate the latch of the middle circuit-breaker, while the opening of the middle circuit-breaker will actuate the latches of both the outside circuit-breakers.

A plurality of circuit-breakers mounted side by side may also be interlocked in accordance with my invention by the mechanism shown in Fig. 4, in which an interlocking member common to all the circuit-breakers is formed by a rock shaft 24 provided with a sufficient number of tripping members 18 to cooperate with all the interlocked circuit-breakers. The construction and mode of operation of the tripping members 18 and the parts with which these members cooperate is the same as in the device shown in Figs. 1 and 2 of the drawings,

and since all of the tripping members are mounted upon a common rigid member, such as the rock shaft 24, the opening of one circuit-breaker trips all the other circuit-breakers simultaneously.

My invention may be embodied in many other forms than that shown and described and I therefore do not desire to restrict myself to the precise arrangement disclosed, but aim in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,

1. The combination with a switch biased to open and comprising operating mechanism for closing said switch and restraining means for holding said switch closed, of an actuating member movable from normal position into tripping position to actuate said restraining means to trip said switch and on into extreme position to release said restraining means and thereby leave said restraining means free to operate when the switch is closed, and means whereby said actuating member returns through tripping position to normal position.

2. The combination with a switch biased to open and comprising operating mechanism for closing said switch and a latch for holding said switch closed, of a latch actuating member movable in opposite directions through tripping position, and connections between said latch and said member whereby said latch is actuated to release said switch and is then left free to return to latching position as said member moves through tripping position in one direction and is unaffected as said member moves through tripping position in the other direction.

3. The combination with a switch biased to open and comprising operating mechanism for closing said switch and a latch for holding said switch closed, of a latch actuating member movable in opposite directions through tripping position, and a ratchet connection between said member and said latch rigid during movement of said member in one direction through tripping position and yielding during the return movement of said member.

4. The combination with a switch biased to open and comprising operating mechanism for closing said switch and a latch for holding said switch closed, of a latch actuating member mounted to move in opposite directions through tripping position, and a pawl mounted on said latch to form a rigid projection in engagement with said member during its movement through tripping position in one direction and a yielding projection during the return of said member through tripping position.



5. The combination with a switch biased to open and comprising operating mechanism for closing said switch and a latch for holding said switch closed, of a latch actuating member provided with a cam surface and movable in opposite directions through tripping position, and a pawl pivoted to said latch to lock in position to engage said cam surface during the movement of said member through tripping position in one direction and to yield during the return movement of said member through tripping position.

6. The combination with a plurality of switches biased to open and each comprising a latch for holding it closed, of an interlocking member mounted to move between a normal and an extreme position and having an intermediate tripping position in which said member actuates all said latches and thereby opens all said switches, means for moving said member through tripping position into extreme position, and means cooperating with said member to permit said latches to remain in latching position during the return of said member from extreme position to normal position.

7. The combination with a plurality of switches biased to open and each comprising a latch for holding it closed, of an interlocking member mounted to move between a normal and an extreme position and having an intermediate tripping position in which said member actuates all said latches and thereby opens all said switches, means whereby any of said switches in opening moves said member through tripping position into extreme position, and means cooperating with said member to permit said latches to remain in latching position during the return of said member from extreme position to normal position.

8. The combination with a plurality of switches biased to open and each comprising a latch for holding it closed, of an interlocking member mounted to move between a normal and an extreme position and having an intermediate tripping position in which said member actuates all said latches and thereby opens all said switches, means whereby any of said switches in opening moves said member through tripping position into extreme position, and connections between each latch and said member whereby said latches are unaffected by the return of said member through tripping position to normal position.

9. The combination with a plurality of switches biased to open and each comprising a latch for holding it closed, of an interlocking member mounted to move between a normal and an extreme position and having an intermediate tripping position in which said member actuates all said latches and thereby opens all said switches, means

whereby any of said switches in opening moves said member through tripping position into extreme position, and ratchet connections between said latches and said member whereby said latches are actuated as said member moves through tripping position into extreme position and remain in latching position as said member returns through tripping position to normal position.

10. The combination with a plurality of switches biased to open and each comprising a latch for holding it closed, of an interlocking member mounted to move between a normal and an extreme position and having an intermediate tripping position in which said member actuates all said latches and thereby opens all said switches, means whereby any of said switches in opening moves said member from normal to extreme position, and pawls cooperating with said member to cause said member to actuate said latches during the movement of said member through tripping position into extreme position and to leave said latches unaffected by the return of said member to normal position.

11. The combination with a plurality of switches biased to open and each comprising a latch for holding it closed, of a rocking interlocking member mounted to move into tripping position to engage with all of said latches to actuate them, a pawl mounted on each latch to project into the path of said member during its movement in one direction and to move out of the path of said member during its movement in the other direction, and a lug on said member projecting into the path of movement of each switch, whereby the opening of any switch actuates said member to trip all the others and the switches may be reset independently of each other.

12. The combination with a plurality of switches biased to open and each comprising a latch for holding it closed, of a rocking interlocking member having a cam surface in operative relation to each latch and mounted to move into tripping position to engage with all of said latches to actuate them, a pawl mounted on each latch to project into the path of said member and thereby be actuated by said cam surface during its movement in one direction and to move out of the path of said member during its movement in the other direction and a lug on said member projecting into the path of movement of each switch whereby the opening of any switch actuates said member to trip all the others and the switches may be reset independently of each other.

13. The combination with a plurality of switches biased to open and mounted side by side, each comprising a pivoted latch for holding it closed, of an interlocking member



biased to normal position and mounted to  
rock about an axis parallel to the pivots of  
said latches and having a cam surface in  
operative relation to each latch, a lug on  
5 said member projecting into the path of  
movement of each switch, and a pawl  
mounted on each latch to form a projection  
which is rigid and engages said cam surface  
as said member is moved by the opening of  
10 any of said switches and which yields as said  
member returns to normal position.

14. The combination with a plurality of  
automatic circuit-breakers each comprising  
a latch for holding it closed and an electro-  
15 responsive device for actuating said latch,  
of an independent latch actuating member  
coöperating with all said latches and mov-

able from normal position through tripping  
position into extreme position, connections  
whereby any of said circuit-breakers in 20  
opening moves said member from normal  
position to extreme position, and means  
whereby all said latches are actuated as said  
member passes through tripping position  
to extreme position and are unaffected by 25  
the return of said member from extreme  
position to normal position.

In witness whereof, I have hereunto set  
my hand this 7th day of December, 1909.

WINFIELD A. ATWOOD.

Witnesses:

BENJAMIN B. HULL,  
HELEN ORFORD.