

No. 708,710.

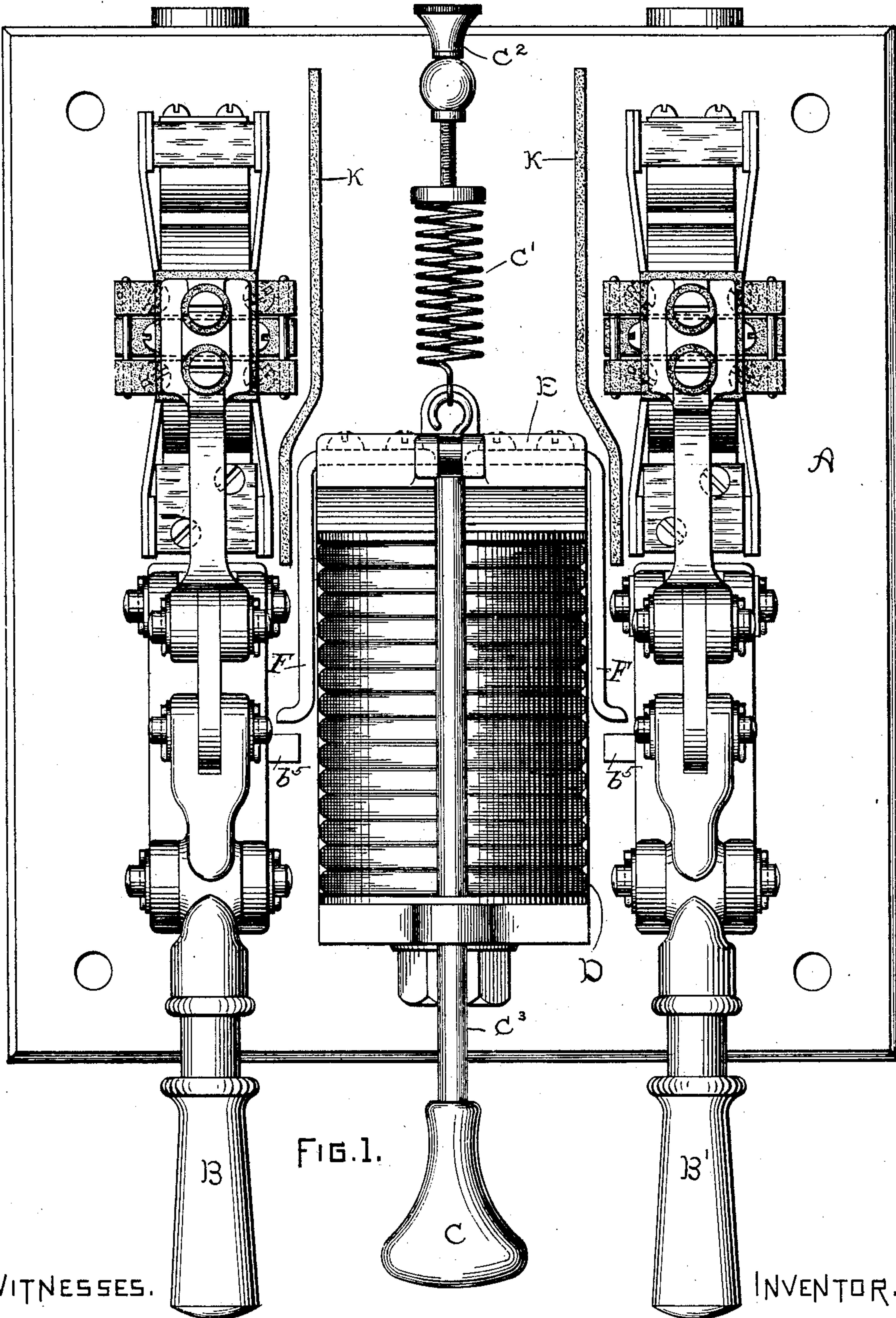
Patented Sept. 9, 1902.

E. M. HEWLETT.
CIRCUIT BREAKER.

(Application filed Sept. 29, 1898.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES.

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2 Sheets—Sheet 2.

FIG. 2.

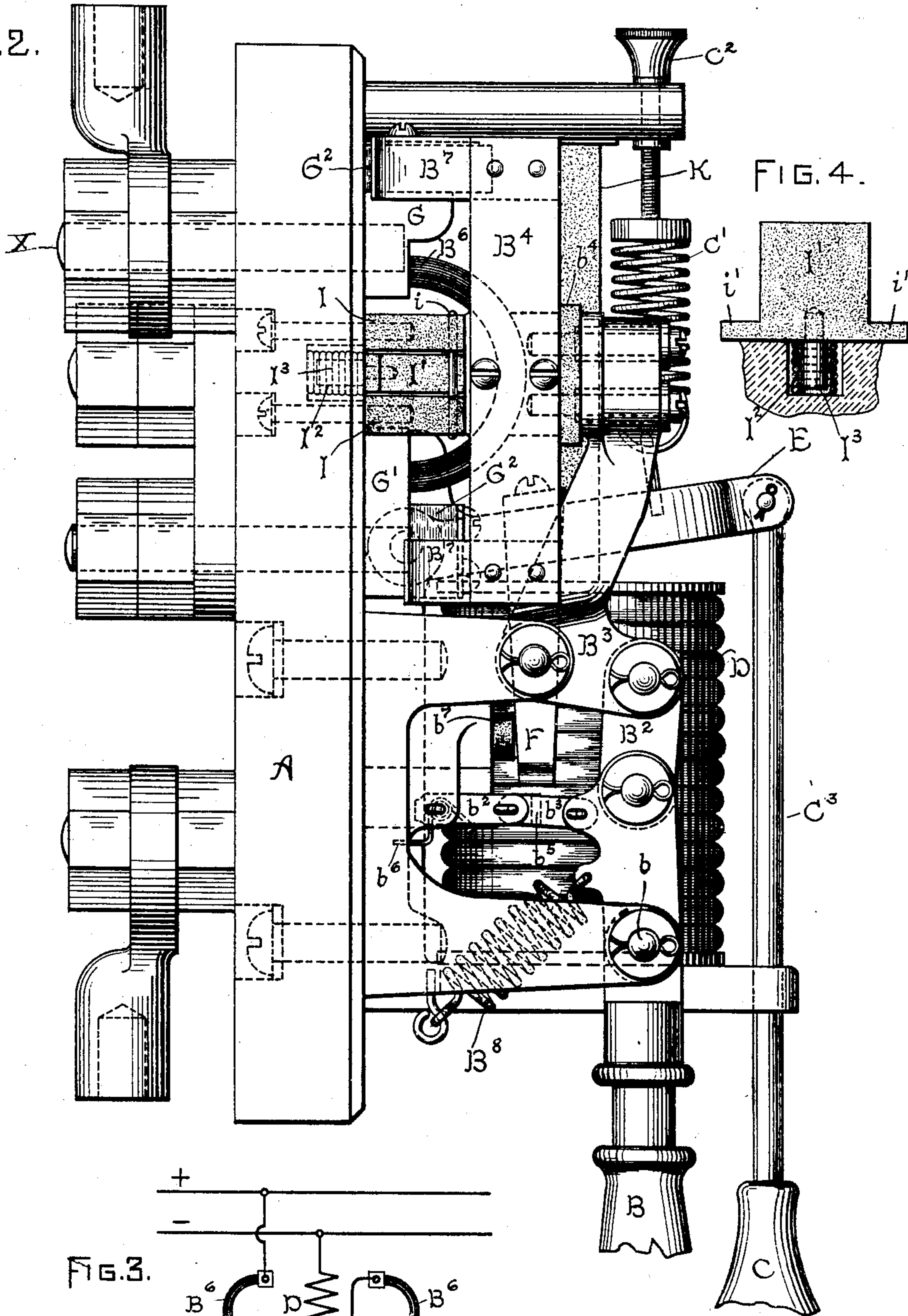
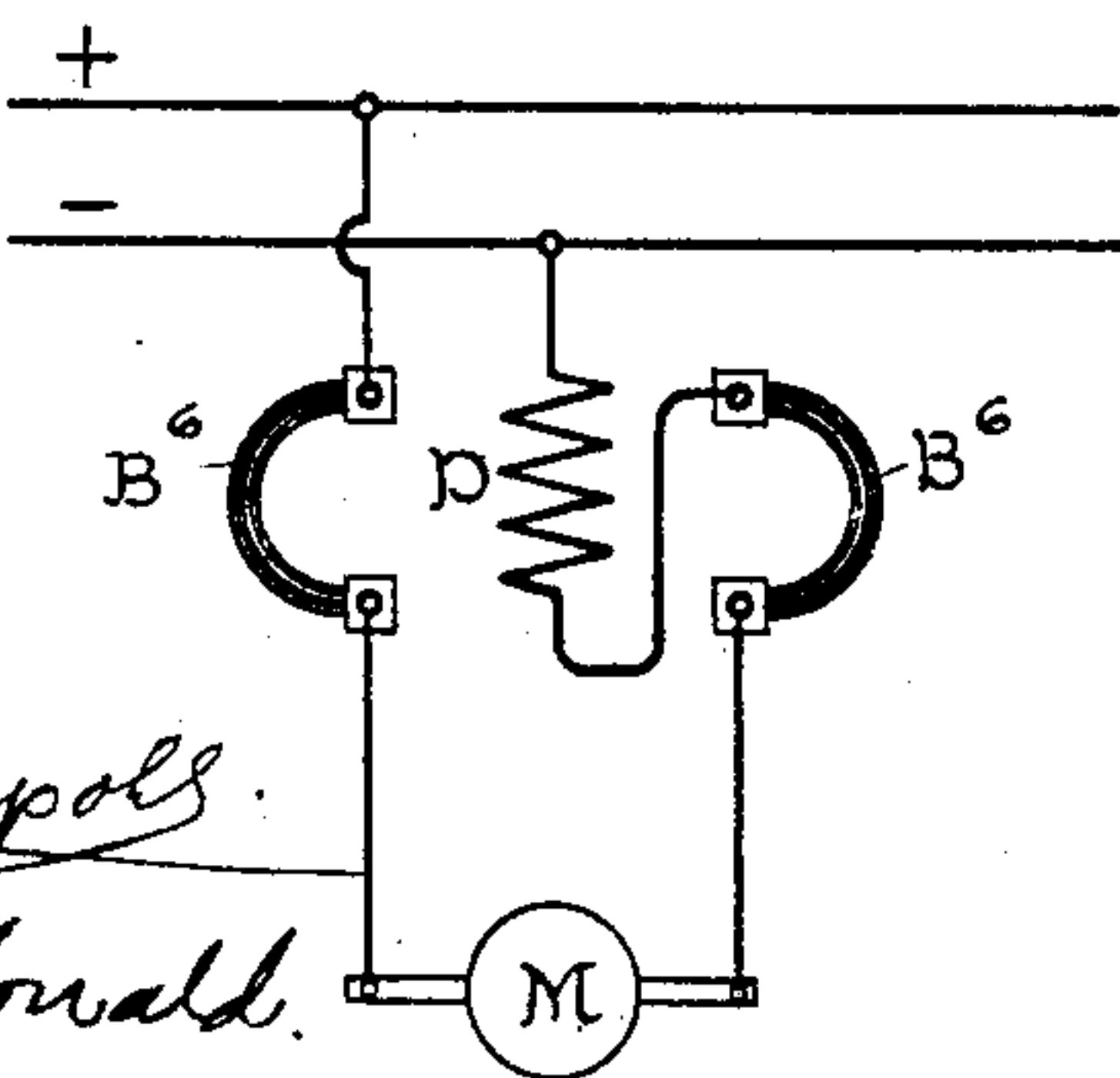


FIG. 3.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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BY MESNE ASSIGNMENTS, TO H. WARD LEONARD, OF BRONX-
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CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 708,710, dated September 9, 1902.

Application filed September 29, 1898. Serial No. 692,160. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. HEWLETT, a citizen of the United States, residing at Schenectady, county of Schenectady, and State of New York, have invented certain new and useful Improvements in Circuit-Breakers, (Case No. 869,) of which the following is a specification.

My present invention relates to automatic circuit-breakers for electric machinery, and more particularly to those of the double-pole type. Its embodiment consists, in its essential features, of two independent switches which are operated, preferably simultaneously, by a tripping-coil. Each side of the circuit is provided with one of the switches, which may be of any convenient form, and the tripping-coil which operates the two may be in either side of the circuit or, if desired, may be divided and part of the coil put upon each side. This, however, is not the preferred form on account of the additional complication of circuits and increased cost of the apparatus. My apparatus thus serves both as a double or single pole switch or as an automatic circuit-breaker. It obviously possesses great advantages over the ordinary double-pole switch, in which the two blades are connected mechanically, so that they are opened simultaneously and closed in a similar manner. It often happens in closing the circuit after a circuit-breaker has blown that the short circuit or overload condition has not been removed. Under such circumstances the closing of the circuit by hand may produce serious accident either to the apparatus or to the operator, inasmuch as the handle, being the grasp of the operator, would retard the opening of the circuit so much as to cause arcing, and in the case of, for instance, a dead short circuit on a large machine might, perhaps, wreck the machine or even the station. Such accidents have in the past been caused in this manner. With the apparatus of my invention, however, such an accident would be impossible, because in its operation one side of the circuit is first completed by closing one of the switches, which in itself sets the circuit-breaker ready for operation. The operator then closes the

other switch, and if the short circuit or overload is still maintained the switch which was first closed is immediately thrown open and all damage prevented. Ordinarily the arrangement of apparatus will be such that the two sides of the circuit will be opened simultaneously. This is of course the best arrangement, as it not only "kills" all of the parts of the circuit at once, but provides a number of breaks in series, so that the interruption of large currents is facilitated.

In the construction of the device I have arranged the handle so that when the circuit opens the handle is thrown up and projects in a substantially horizontal position. This arrangement I prefer, because it enables me to put the circuit-breaker higher up on the switchboard and prevents the arc being close to the attendants. It also keeps the arc away from the instruments upon the switchboard. This is a convenient arrangement, because by the connecting mechanism between the contact and the handle the motion of the handle is at first quite easy, and as the contact is made it moves harder. Thus in reaching for the handle when only the fingers of the hand touch it it is nevertheless readily moved, and at the time when any strength must be exerted to close the contacts firmly it is in such a position that it may be grasped firmly by the whole hand. The particular combination by which this is effected I do not, however, claim in this case, but reserve it for another application.

Under the bridging-contact, which is now almost universally employed in circuit-breakers, I arrange a barrier of insulating material between the two stationary contacts spanned by the bridge, and I make a part of this barrier movable and force it outward by a spring, so that it follows the bridge when the circuit is broken by the opening of the switch. The adjustment of this spring is such that it assists in overcoming the friction of the sliding contacts which are in shunt to the bridge.

While I have illustrated in the accompanying drawings a suitable and convenient embodiment of my invention, the particular apparatus used is immaterial so long as the

main feature of the independent switches, (two or more,) with a trip arrangement designed to open them all as occasion demands, be employed.

5 The drawings annexed show, in Figure 1, a front elevation of the circuit-breaker ready to mount upon the switchboard; in Fig. 2, a side elevation of the parts shown in Fig. 1. Fig. 3 is a diagram of the circuits, and Fig. 10 4 is a detail.

Describing first Figs. 1 and 2, A is the base, made of any suitable insulating material non-combustible in character. For this purpose 15 slate or porcelain may be used, as is customary. B B' are the handles of the two switches. These are counterparts, so that a description of one will answer for both. C is a tripping-handle, by which the switches may be opened mechanically. D is the series coil acting on 20 overload in the well-known way. To the handle C is affixed a rod C³, connected to the armature E of the series coil. C' is a spring, and C² an adjusting-screw, by means of which the capacity of the circuit-breaker may be 25 adjusted as required to open upon different amounts of current flow. The handle B is pivoted at b in a projection from the frame of the device, and a link B² connects it with a bell-crank lever B³. Connected to the outer 30 end of the bell-crank lever are conducting-bars B⁴, separated from the lever B³ by insulation b⁴. Upon each end of the conducting-bars is a spring-contact B⁷, making rubbing contact with carbon blocks G², which form 35 the shunt-terminals of the device. The bars B⁴ may or may not be flexible if the contacts B⁷ have sufficient flexibility; but preferably they are yielding. A bridge B⁶ is carried by the bell-crank B³ and is in electrical connection with the bars B⁴. This spans the main 40 terminals G G', whose contact-faces are in the same or approximately the same vertical plane, and is composed of a number of strips of copper, phosphor-bronze, or other good conducting material. It is of well-known form— 45 that is, the ends of the laminæ make a yielding and rubbing contact with the terminal blocks. A spring B⁸ is attached to the inner end of the handle B. To maintain the toggle 50 composed of the handle and the link B² in its illustrated position, (see Fig. 2,) another toggle composed of the links b² b³ is employed. As will be seen, when the circuit-breaker is set this toggle is cramped above a 55 line drawn between its ends. It is provided (see Fig. 1) with a lug b⁵, projecting from one of its members. Affixed to the armature E of the series coil is a yoke composed of the two bars F F, coöperating with the lugs b⁵ b⁵ 60 when the circuit-breaker is tripped. The spring b⁶ acts to throw the toggle positively to a position above the center. Under each of the bridges is a barrier composed of two sheets or blocks I I, of insulating material, 65 secured to the base of the apparatus. Between the two is another block I', which is thrust outward by the spring I², surrounding

the pin I³, whenever the switch is opened. The spring I² also aids the spring B⁸ in opening the switch. A detail of the construction is shown in Fig. 4, which shows the 70 piece I' in plan. As will be seen, it is provided with shoulders i' i', which engage with the pins i i. Suitable barriers K K, Fig. 1, of insulating material, separate the two sides 75 of the circuit. X, in Fig. 2, shows a bolt which serves at once for electrical connection from apparatus external to the switch with the massive contact-block G and to secure said contact-block G mechanically to the 80 switchboard or base A. The terminal blocks are tapped to receive the bolts, and such blocks are drawn forcibly against the switchboard or base by means of nuts on the rear of the base or switchboard. 85

The circuit of the apparatus is shown in Fig. 3, where M is the generator, motor, or other apparatus or circuit to be protected, the rest of the parts being easily recognizable.

The operation of the device as thus described is as follows: When the current increases to or above a maximum predetermined by the adjustment of the spring C', the armature E is attracted, the bars F strike the lugs b⁵ b⁵, and throw down the toggle b² b³. 95 The spring B⁸ then pulls the inner end of the handle down and the toggle formed of the handle and the link B² collapses, drawing with it the bell-crank B³. The bridge B⁶ is first withdrawn from the main terminals, thus 100 shunting the current through the carbon-terminals G² G² and the spring-terminals B⁷, this break occurring an instant after the bridge has left the main terminals. The insulating-piece I' follows the bridge in its removal until stopped by the pins i. A cushion 105 b⁷, of rubber or other elastic material, receives the short arm of the bell-crank lever B³.

As already briefly described in the statement of invention, it will be seen that the 110 handle B moves upward when the toggle b² b³ is thrown to the other side of the center by the bar F, the spring B⁸ readily overcoming the smaller spring b⁶, and thus the handle assumes a substantially horizontal position, 115 with the advantages already pointed out.

It is manifest that if one of the arms F should be of different length from the other the switch controlled by that arm would be tripped before or after the other one, and such 120 a variation would clearly be within my invention. It is, however, not desirable, as ordinarily it is better to make as many simultaneous breaks as possible when the circuit is to be opened at all. As will be seen, the 125 construction indicated herein provides four breaks in series in the circuit and is efficient, reliable, simple, and cheap.

Similarly my invention is not confined to instruments of the double-pole type alone, for 130 some of its features are capable of application to a single-pole device or of extension to circuit-breakers with more poles than two, and this by the exercise of ordinary engineer-

ing skill. I do not illustrate or describe such arrangements, as they are quite obvious to those skilled in the art.

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

1. In an electric switch, the combination of a pair of fixed contacts, a bridging-contact and a barrier of insulating material between the fixed contacts and spanned by the bridge; the barrier consisting of fixed and movable portions, and means for causing the movable part to follow the bridge as the switch is opened.

2. In a switch, the combination of a spring for opening the switch, a toggle for closing it, and a second toggle holding the first one extended.

3. In a switch, the combination of fixed and movable contacts, a toggle connected to the movable contacts, and a second toggle for holding the first in its extended position.

4. In a switch, the combination of fixed and movable contacts, a toggle connected to the movable contacts, a second toggle for holding the first in its extended position, and a spring for cramping the second toggle positively out of line.

5. An automatic circuit-breaker provided with a switch, a toggle for closing the switch, a second toggle for holding the first one extended, and an armature and series coil for causing the second toggle to release the switch.

6. The combination of a plurality of electric switches each comprising terminal blocks, a laminated member for bridging said blocks, independent means for bringing the laminated member into engagement with the terminal blocks, and a single controlling device for automatically controlling the movement of said switches.

7. The combination of a plurality of electric switches each comprising separated terminal blocks, a laminated bridging member for engaging said blocks, a toggle for operating each laminated bridging member, independent means in each switch for operating said toggle, and a single controlling device for automatically controlling the movement of said switches.

8. The combination of a plurality of electric switches, each comprising separated terminal blocks, a laminated bridging member for engaging said terminal blocks, a pivoted arm supporting said laminated bridging member at approximately its middle, independent means in each switch for operating said pivoted arms, and a single controlling device for automatically controlling the movement of said switches.

9. The combination of a plurality of electric switches, each comprising separated terminal blocks, a pivoted laminated bridging member for engaging said terminal blocks, independent means in each switch for operating the pivoted laminated bridging member, and a single controlling device for auto-

matically controlling the movement of said switches.

10. The combination of a plurality of electric switches, each comprising separated terminal blocks, a pivoted laminated bridging member for engaging said blocks, a toggle for operating said pivoted laminated member, and independent means in each switch for operating the toggle, and a single controlling device for automatically controlling the movement of said switches.

11. The combination of a plurality of electric switches juxtaposed, and in series in the same electric circuit, each switch comprising separated terminal blocks, a laminated bridging member for engaging said terminal blocks to close the circuit, independent means in each switch for operating said bridging member, and a single electric responsive device for automatically controlling the movement of said switches.

12. The combination of a plurality of electric switches capable of independent manual movement into normal position, each switch comprising separated terminal blocks, a laminated bridging member for engaging said blocks, means for locking said bridging member in engagement with said terminal blocks, and a single electroresponsive device for automatically unlocking all the switches.

13. The combination of a plurality of electric switches designed to be moved independently into normal position, each switch comprising separated terminal blocks, a pivoted laminated bridging member for engaging said terminal blocks, independent locking devices for holding said switches in their normal position, and a single electroresponsive device for automatically releasing said switches.

14. The combination of a plurality of electric switches capable of independent movement into normal position, each switch comprising separated terminal blocks, one vertically above the other, a laminated bridging member for engaging said blocks, independent means in each switch for operating said bridging member, and a single controlling device for automatically controlling the movement of said switches.

15. The combination of a plurality of electric switches capable of independent movement into normal position, each switch comprising separated terminal blocks whose contact-faces are in approximately the same plane, a laminated bridging member for engaging said terminal blocks, independent means in each switch for operating said bridging member, and a single controlling device for automatically controlling the movement of said switches.

16. The combination of a plurality of electric switches, capable of independent movement into normal position, each switch comprising separated terminal blocks, one vertically above the other, and whose contact-surfaces are in approximately the same vertical plane a laminated bridging member for

engaging said terminals, independent means in each switch for operating the laminated member, and a single electroresponsive device for automatically controlling or effecting the simultaneous movement of said switches.

17. The combination of a plurality of switches, independently movable into normal position, each switch comprising separated terminal blocks, a laminated bridging member for engaging said terminal blocks, a stationary shunt-contact located upon and above the upper terminal block, a movable shunt-contact cooperating with said fixed shunt-contact, locking devices for holding said switches in their normal positions and a single electroresponsive device for automatically and simultaneously releasing said switches.

18. The combination of a plurality of electric switches independently movable into normal position, each switch comprising separated terminal blocks, a laminated bridging member normally engaging with said terminal blocks, locking means for holding said bridge in engagement with said terminal blocks and a single electroresponsive device for automatically and simultaneously releasing the bridging devices of the switches from the control of their locking devices.

19. The combination of a plurality of electric switches independently movable into normal position and juxtaposed upon a common base, each switch comprising separated terminal blocks, one vertically above the other, a laminated bridging member cooperating with said terminal blocks, independent means in each switch for operating the laminated member, and a single electroresponsive device located between a pair of said switches for automatically and simultaneously releasing all the switches.

20. The combination of a plurality of electric switches independently movable into normal position, each switch comprising separated contact terminals, a laminated bridging member for engaging said contact terminals, independent means in each switch for operating the laminated member, a single electroresponsive device for automatically and simultaneously releasing said switches, and barriers of insulating material located between the independent switches.

21. An electric switch comprising separated contact-blocks one vertically above the other, and whose engaging faces are in approximately the same vertical plane, a laminated bridging member engaging with the ends of the laminae upon said contact-blocks, means for bringing said bridging member into engagement with said blocks, means for locking said bridging member in engagement with said blocks and electroresponsive means for controlling the switch.

22. In an electric switch the combination of separated contact-blocks one vertically above the other and whose contact-surfaces are in approximately the same vertical plane, a stationary shunt-contact, a movable laminated

bridging member for engagement with said contact-blocks, a vertically-extending member, a movable shunt-contact carried thereby, means for maintaining said bridging member in engagement with said contact-blocks, and electroresponsive means for controlling the switch.

23. In an electric switch the combination of separated contact-blocks one vertically above the other, and whose engaging faces are in approximately the same vertical plane, a shunt-contact in electrical communication with the upper contact-block and located above the engaging surface thereof, a laminated bridging member, for engaging with the ends of its laminae with the engaging surfaces of said contact-blocks, a vertically-extending pivoted member, a movable shunt-contact carried at the upper end thereof, means for restraining the laminated bridging member in normal position, and electroresponsive means for controlling the switch.

24. In an electric switch the combination of separated contact-blocks one vertically above the other, and whose engaging faces are in approximately the same vertical plane, a shunt-contact in electrical communication with the upper contact-block and located above the engaging surface thereof, a laminated bridging member, for engaging at the ends of its laminae with the engaging surfaces of said contact-blocks, a vertically-extending pivoted member, a movable shunt-contact carried at the upper end thereof, and means for restraining the laminated bridging member in normal position.

25. In an electric switch, the combination of separated contact-blocks one vertically above the other, and whose engaging faces are in approximately the same vertical plane, a shunt-contact in electrical communication with the upper contact-block and located above the engaging surface thereof, a pivoted laminated bridging member for engaging at the ends of its laminae with the engaging surfaces of said contact-blocks, a vertically-extending pivoted member a movable shunt carried at the upper end thereof, and means for restraining the laminated bridging member in normal position.

26. In an electric switch the combination of separated terminal blocks, one vertically above the other and having their engaging faces in approximately the same vertical plane, a horizontally spring-pressed member located between such terminal blocks, a laminated bridging member for engaging with said terminal blocks and in its normal position compressing said spring-pressed member, means for restraining said laminated member in its normal position, and means for releasing the switch.

27. In an electric switch the combination of separated contact-blocks one vertically above the other, and having their engaging faces in approximately the same vertical plane, a stationary shunt-contact in electrical communi-

5 cation with the upper contact-block and lo-
 10 cated above the engaging face thereof, a lami-
 nated bridging member for engaging said ter-
 minal blocks, a spring-pressed member lo-
 cated between said terminal blocks and exert-
 ing pressure against said laminated member
 in its normal position, a vertically-extending
 pivoted member, a movable shunt-contact
 carried at the upper end thereof, and means
 for restraining the laminated bridging mem-
 ber in normal position.

28. In an electric switch the combination of
 separated contact-blocks one vertically above
 the other, and having their engaging faces in
 approximately the same vertical plane, a sta-
 tionary shunt-contact in electrical communi-
 cation with the upper contact-block and lo-
 cated above the engaging face thereof, a lami-
 nated bridging member for engaging said ter-
 minal blocks pivoted on an axis parallel with
 the base, a spring-pressed member located
 between said terminal blocks, and exerting
 pressure against said laminated member in its
 normal position, a vertically-extending piv-
 oted member, a movable shunt-contact car-
 ried at the upper end thereof and means for
 restraining the laminated bridging member
 in normal position.

29. In an electric switch the combination of
 separated contact-blocks one vertically above
 the other, and having their engaging faces in
 approximately the same vertical plane, a sta-
 tionary shunt-contact in electrical communi-
 cation with the upper contact-block and lo-
 cated above the engaging face thereof, a lami-
 nated bridging member for engaging said ter-
 minal block, spring means located between
 said terminal blocks and exerting pressure
 against said laminated member in its normal
 position, a vertically-extending pivoted mem-
 ber, a movable shunt-contact carried at the
 upper end thereof, and means for restraining
 the laminated bridging member in normal po-
 sition.

30. In an electric switch the combination of
 separated contact-blocks one vertically above
 the other, and having their engaging faces in
 approximately the same vertical plane, a sta-
 tionary shunt-contact in electrical communi-
 cation with the upper contact-block and lo-
 cated above the engaging face thereof, a lami-

nated bridging member for engaging said ter-
 minal blocks pivoted on an axis parallel with
 the base, and spring means located between
 said terminal blocks and exerting pressure
 against said laminated member in its normal
 position, a vertically-extending pivoted mem-
 ber, a movable shunt-contact carried at the
 upper end thereof, and means for restraining
 the laminated bridging member in normal
 position.

31. In an electric switch the combination of
 a base of insulating material, separated con-
 tact-blocks secured thereto by means of bolts
 extending through said base and serving also
 as an electrical connection to said blocks, one
 of said blocks located vertically above the
 other, said blocks having their engaging sur-
 faces in approximately the same vertical
 plane, a laminated bridging member for en-
 gaging with said contact-blocks, resilient
 means located between said blocks and ex-
 erting pressure against said bridging mem-
 ber in its normal position, means for forcing
 said bridging member into engagement with
 the contact-blocks and means for restraining
 said bridging member in its normal position.

32. In an electric switch the combination of
 separated contact-blocks, one vertically above
 the other and having their contact-faces ap-
 proximately in the same vertical plane, a lami-
 nated bridging member for engaging said con-
 tact-blocks, a lever pivoted on an axis paral-
 lel with the base and carrying at its upper
 end said laminated contact member, a toggle
 controlling said pivoted lever, and means for
 locking the toggle in its extended position.

33. In an electric switch the combination of
 separated contact-blocks, one vertically above
 the other, a laminated bridging member for
 engaging said contact-blocks, a lever pivoted
 on an axis parallel with the base and carry-
 ing at its upper end said laminated contact
 member, a toggle controlling said pivoted le-
 ver, and a second toggle for locking said tog-
 gle in its extended position.

In witness whereof I have hereunto set my
 hand this 27th day of September, 1898.

EDWARD M. HEWLETT.

Witnesses:

B. B. HULL,
 M. H. EMERSON.