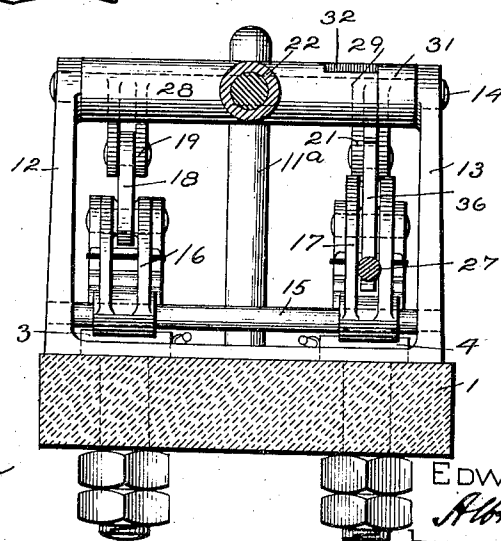
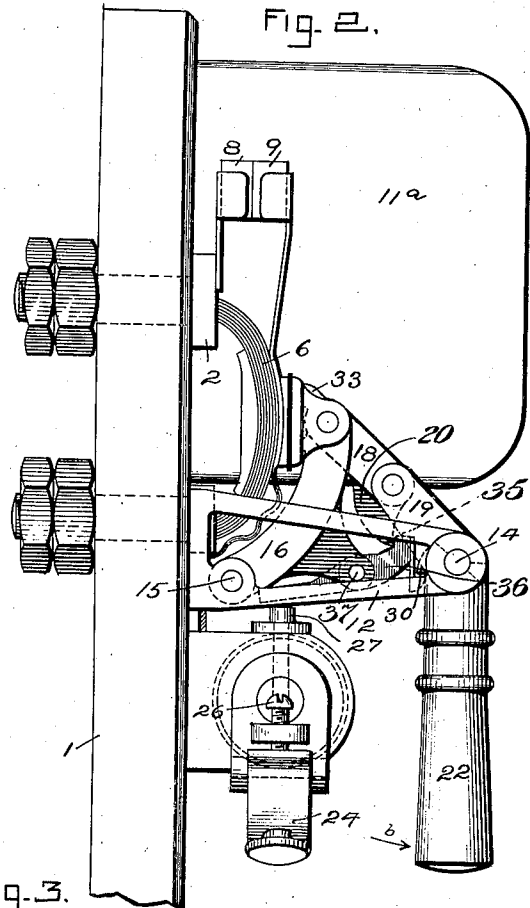
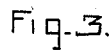


937,442.

3 SHEETS--SHEET 1.

Fig. 2.



INVENTOR.

EDWIN JOHNSON.

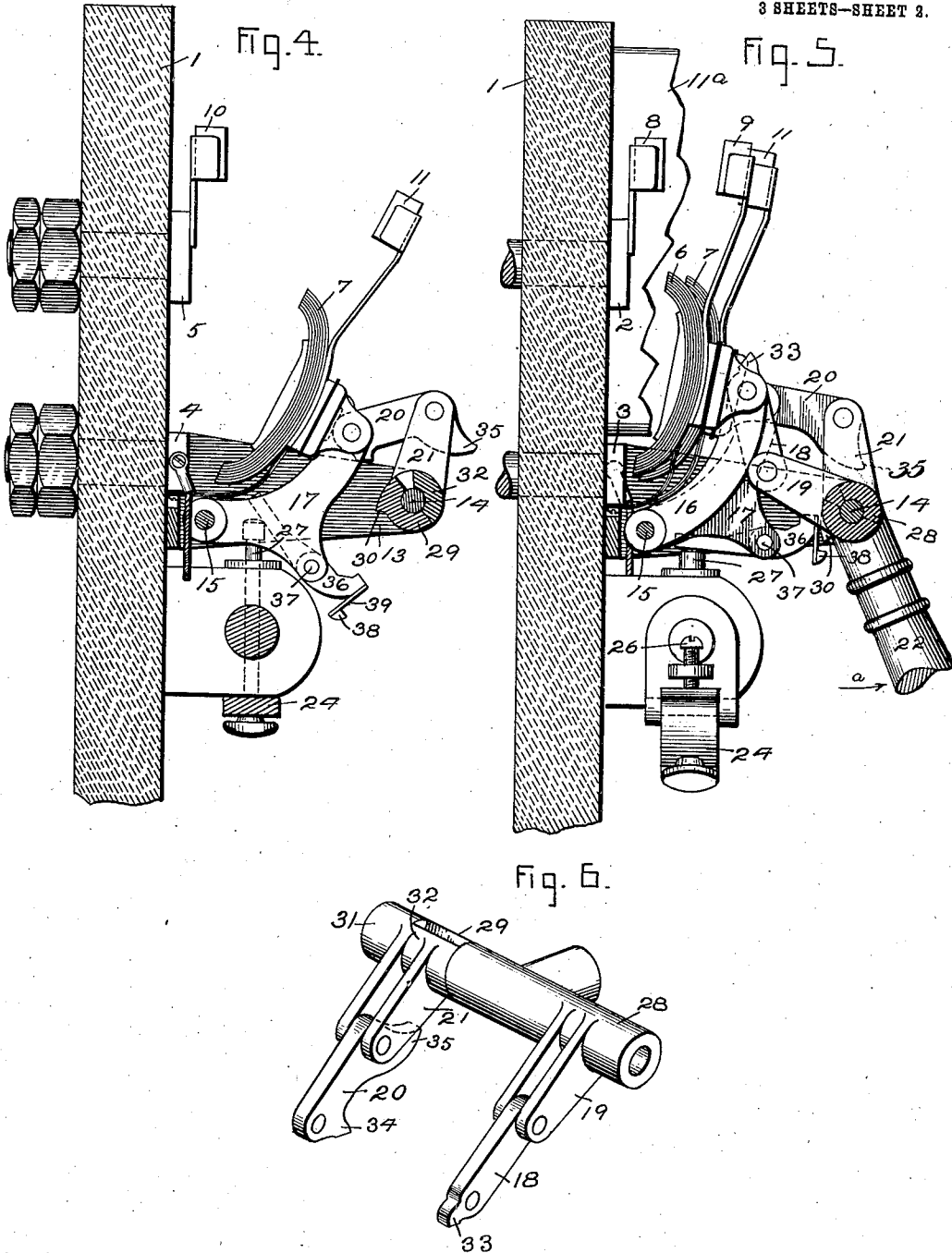
Albert G. Davis
Att_y.

E. JOHNSON.
CIRCUIT CONTROLLING DEVICE.
APPLICATION FILED APR. 13, 1908.

937,442.

Patented Oct. 19, 1909.

3 SHEETS—SHEET 2.



WITNESSES.
W. Ray Taylor.
Allen O'Connell

INVENTOR.
EDWIN JOHNSON
by *Albert G. Davis*
Atty.

E. JOHNSON.
CIRCUIT CONTROLLING DEVICE.
APPLICATION FILED APR. 13, 1906.

937,442.

Patented Oct. 19, 1909.

3 SHEETS—SHEET 3.

Fig. 7.

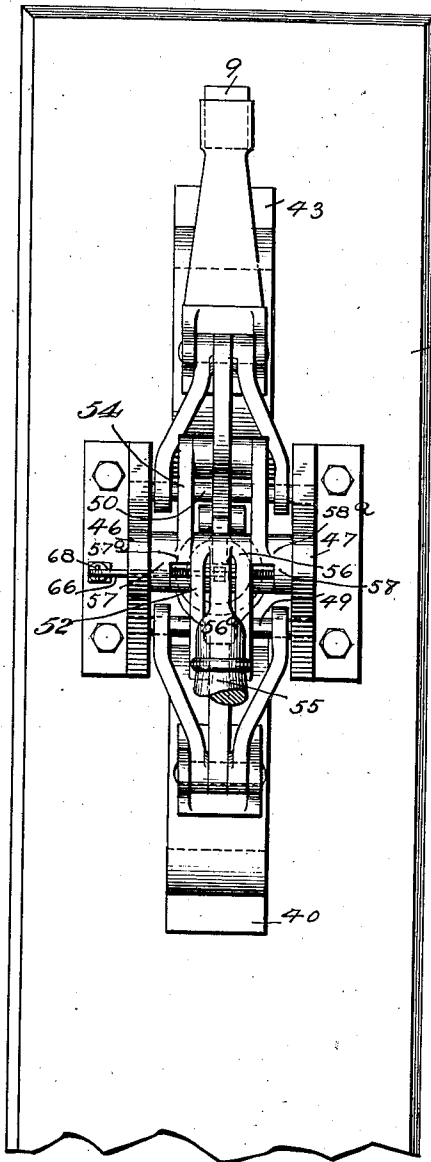


Fig. 8.

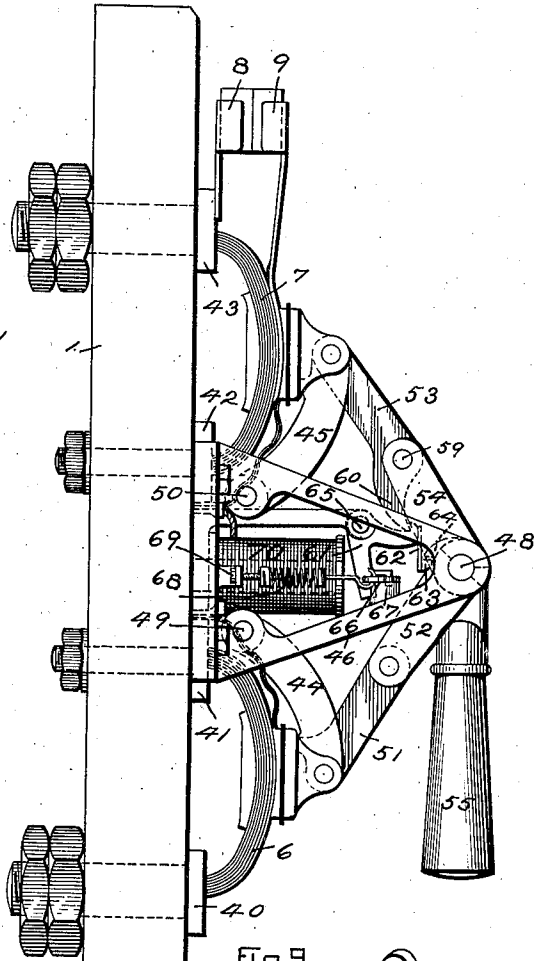


Fig. 9.

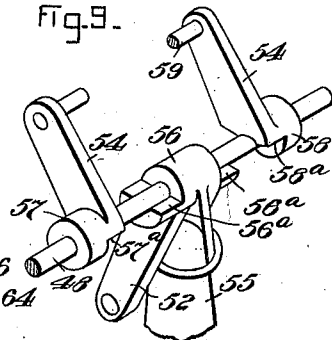
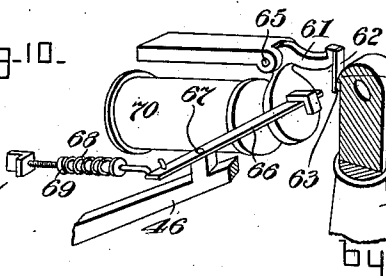


Fig. 10.



WITNESSES

W. Ray Taylor
Allen Oxford

INVENTOR

Edwin Johnson.

Albert G. Davis
Att'y.

UNITED STATES PATENT OFFICE.

EDWIN JOHNSON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CIRCUIT-CONTROLLING DEVICE.

937,442.

Specification of Letters Patent.

Patented Oct. 19, 1909.

Application filed April 13, 1906. Serial No. 311,408.

To all whom it may concern:

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

This invention relates to a device for controlling electric circuits in which a number of breaks in the circuit in series are closed, one after the other, and one of the devices for controlling said breaks is arranged to be opened automatically in case an overload exists upon the circuit. The means for controlling the breaks may be an automatic circuit-breaker and a switch connected in series upon the switch-board; when the attendant desires to close the circuit the circuit-breaker is first set and the switch is then closed. In case an overload exists upon the circuit the circuit-breaker will open automatically; thus the circuit and translating devices therein are protected from dangerous conditions, as the circuit is automatically broken notwithstanding the operator is holding the control handle of the circuit-breaker, and at the same time errors of manipulation are avoided.

This invention consists in providing a controlling device operating in the manner above described and requiring but little room upon the switch-board and arranged to be easily set by the operator by means of a single handle.

It also consists in providing means whereby an attempt to open the switch will result in tripping the circuit-breaker open, so that the circuit is always opened very quickly, thereby avoiding the formation of arcs by the slow opening of the switch.

The object of the present invention is to provide a compact arrangement for controlling the circuit, which may be operated by one handle; to set the circuit-breaking device by a movement of the operating handle in one direction and to close the switch by a movement of said handle in another direction; to prevent opening the circuit by means of the switch; and to improve the construction and operation of devices of this type generally.

The invention will best be understood in connection with the accompanying drawings in which—

Figure 1 is a plan view of the device applied to a switch-board; Fig. 2 is an end view of the device shown in Fig. 1; Fig. 3 is a section of Fig. 1 on line 3, 3, looking in the direction of the arrows; Fig. 4 is a section on the line 4, 4, of Fig. 1; Fig. 5 is a section on the line 5, 5, of Fig. 1; Fig. 6 is a view of the power-multiplying means for operating the contacts; Fig. 7 is a plan view of a modified form of this device; Fig. 8 is an end view of Fig. 7; Fig. 9 is a view of part of Fig. 7; and Fig. 10 is a view of the tripping mechanism of Fig. 8.

The device is preferably arranged upon a switch-board 1 of slate or other insulating material such as is commonly used in the art. Fixed contacts 2, 3, 4 and 5 are firmly secured to the switch-board by means of nuts threaded upon the stems of said contacts. The contacts 2 and 3 are arranged one above the other and the contacts 5 and 4 are similarly arranged parallel to the contacts 2 and 3. A bridging contact 6, preferably made in the form of a laminated brush so as to be capable of yielding under pressure, engages the contacts 2 and 3, and a similar bridging contact 7 engages the fixed contacts 4 and 5. The fixed contacts 2 and 5 carry shunt contacts 8 and 10, while the bridging contacts 6 and 7 carry shunt contacts 9 and 11 co-operating with the shunt contacts 8 and 10. The shunt contacts, preferably made of carbon, are carried upon spring-blades and do not separate until the bridging contacts are out of engagement with the fixed contacts, so that the final arc is formed between the carbon surfaces of the shunt contacts. A barrier 11^a of insulating material is mounted between the two series of fixed contacts to prevent an arc forming from one set of fixed contacts to the other.

Brackets 12 and 13 are secured to the switch-board 1 and form the support of the operating parts of the device. The outer ends of these brackets carry a rod 14 which forms an abutment or support for the means for closing the switches and also holds the outer ends of the brackets in proper relation to each other. A rod 15, extending from one bracket to the other is firmly secured thereto and forms the pivot upon which the rock-arms 16 and 17 are mounted; these rock-arms carry the bridging contacts 6 and 7, which are pivoted to the upper ends thereof. The bridging contact 6 is brought into en-

gagement with the fixed contacts 2 and 3 by means of a power-multiplying device, preferably in the form of a toggle having links 18 and 19, while the bridging contact 7 is brought into engagement with the fixed contacts 4 and 5 by means of a similar power-multiplying device comprising a toggle having links 20 and 21. The ends of the links 19 and 21 of these toggles are supported upon the rod 14, while the other ends of these links are pivoted to the links 18 and 20, which in turn are pivoted to the rock-arms 16 and 17. An operating handle 22 is also mounted upon the rod 14 for the purpose of straightening the toggles and bringing the bridging contacts into engagement with the fixed contacts.

An overload coil 23, mounted upon the switch-board, has an armature 24, mounted upon a pivot 25, and adjusted by a set-screw 26. A trip pin 27 is loosely mounted in guides upon the end of the overload coil in position to be engaged by the armature 24. When the armature 24 is attracted by the overload coil the end strikes the trip pin 27 and moves it upward to trip the device and open the circuit. The current in the circuit to be controlled comes in through the fixed contact 2, passes through the bridging contact 6, to the fixed contact 3, thence through the overload coil, to the fixed contact 4, through the bridging contact 7, to the fixed contact 5, and back to the line.

A sleeve 28, to which the operating handle 22 is firmly attached, is loosely mounted upon the pin 14. This sleeve carries a projecting shoulder 29, as shown in Figs. 1 and 6, and also carries a lug 30, as shown in Figs. 2 and 4. A sleeve 31 is also loosely mounted upon the pin 14 and is provided with a shoulder 32 corresponding to the shoulder 29 of the sleeve 28. These sleeves are of such a length that endwise movement on the pin 14 is prevented by engagement of the ends of the sleeves with the brackets 12 and 13. The sleeve 28 carries the toggle links 19 which are rigidly secured to said sleeve, while the sleeve 31 carries the toggle links 21 firmly attached thereto. The shoulders 29 and 32 do not engage with each other when both bridging contacts are in engagement with the fixed contacts, but there is a certain amount of lost-motion between said shoulders, which form a lost-motion connection between the sleeves 28 and 31.

The link 18 is provided with a stop 33 which engages with the support for the bridging contact 6 and thereby locks the toggle 18, 19, in an overset position when the bridging contact 6 is in engagement with the fixed contacts 2 and 3. The toggle link 20 is provided with a corresponding stop 34 which engages the support of the bridging contact 7 when the bridging contact is in engagement with the fixed contacts and

the toggle 20, 21, is nearly straight, to hold the toggle in a slightly underset position. The link 20 is also provided with a toe 35, engaged by a latch 36 mounted upon a pivot 37, carried by the rock-arm 17; the toggle 20, 21, is held extended, but will collapse as soon as the latch 36 releases the toe 35. On the end of the latch is mounted a lug 38 carried upon a spring-blade 39 in such position as to be engaged by the lug 30 upon the sleeve 28 when the latch is in position to lock the bridging contact 7 in engagement with the fixed contacts.

It is evident from the foregoing description that the bridging contact 7, the toggle 20, 21, the latch 36, and the overload coil 23 form an automatic circuit-breaker which will be tripped open in case of an overload upon the circuit, while the bridging contact 6 and the toggle 18, 19, form a switch which may be closed or opened by means of the operating handle 22.

A modified form of this device is disclosed in Figs. 7 and 8 in which fixed contacts 40, 41, 42 and 43 are mounted in a vertical line, one above the other and engaged by bridging contacts 6 and 7 similar in structure to the bridging contacts used in a similar device disclosed in Figs. 1 and 2. The bridging contact 7 is provided with shunt contacts 8 and 9. The bridging contact 6 is carried upon a rock-arm 44, and the bridging contact 7 upon a rock-arm 45. Brackets 46 and 47 are secured to the switch-board 1 and in the outer ends of these brackets is carried a rod 48. The brackets also carry rods 49 and 50, the rod 49 forming a pivot for the rock-arm 44, while the rod 50 forms a pivot in the rock-arm 45. The bridging contact 6 is moved into engagement with the fixed contacts by means of a power-multiplying device formed of toggle links 51 and 52, while the bridging contact 7 is controlled by a power-multiplying device formed of the toggle links 53 and 54. When these toggles are straightened, the bridging contacts are brought into firm engagement with the fixed contacts.

An operating handle 55 is firmly attached to a sleeve 56 loosely mounted upon the rod 48. This sleeve is provided with shoulders 56^a and carries a toggle link 52 and a lug 64. On each side of the sleeve 56, sleeves 57 and 58 are loosely mounted on the rod 48. These sleeves are provided with shoulders 57^a and 58^a which cooperate with the shoulders 56^a. Sleeves 57 and 58 carry the toggle links 54, the ends of which are held together and are connected to the link 53 by means of a pin 59 passing through the link 53 and engaging both toggle links 54. The link 53 is provided with a toe 60 which is engaged, when the toggle is nearly straightened out but is still underset, by a latch 61 mounted upon a pivot 65. The end

of this latch carries a spring-blade 62 upon which is mounted a lug 63, engaging and co-operating with the lug 64 on the sleeve 56.

The latch 61 is held in engaging position by a calibrating lever 66 mounted upon a pivot stud 67 carried by the bracket 46. One end of the calibrating lever engages the latch and the other end engages a calibrating spring 68, the tension of which may be varied by means of an adjusting screw 69. The latch 61 is in the form of a bell-crank lever, one arm of the lever forming a hook engaging the toe 60, while the other arm is the armature of an overload coil 70 mounted upon the switch-board 1. The overload coil 70 is included in series in the circuit and current entering through the fixed contacts 40 flows through the bridging contact 6, through the fixed contact 41, and thence through the overload coil 70 to the fixed contact 42, through the bridging contact 7 to the fixed contact 43 and back to the line.

The operation of the device is as follows:—
 When the circuit is open the parts are in the position shown in Fig. 5. It will be noted in Fig. 5 that the toggle 20, 21, of the circuit-breaker bears such a relation to the toggle 18, 19, of the switch that it is necessary to move these toggles in opposite directions in order to straighten them. The shoulder 32 of the sleeve 31, which carries one of the links of the toggle for operating the circuit-breaker, is in engagement with the shoulder 29 of the sleeve 28 to which the operating handle 22 is connected. In order to close the circuit, the handle is moved in the direction of the arrow *a* in Fig. 5. As a result of the engagement of shoulder 29 with the shoulder 32 the sleeve 31 is rotated on the pin 14 and the toggle 20, 21, straightens, bringing the bridging contact 7 into engagement with the fixed contacts 4 and 5. When the toggle is nearly straightened, but is still underset, the shoulder 34 engages the support of the bridging contact 7, thereby preventing the toggle being overset, and at the same time the latch 36 engages the toe 35, locking the circuit-breaker closed. During this movement the bridging contact 6 has been swung farther away from the fixed contacts owing to the fact that as the toggle 20, 21, closes, the toggle 18, 19, opens. The direction of movement of the handle is now reversed, but this reversal does not affect the toggle 20, 21, as the lost-motion connection between the sleeves 28 and 31 permits the shoulder 29 to move away from the shoulder 32. As the handle is moved in the opposite direction from that shown by the arrow *a* in Fig. 5, the toggle 18, 19 is straightened, bringing the bridging contact 6 into operative engagement with the fixed contacts 2 and 3. The stop 33 engages the supporting means of the bridging contact 6 when the toggle 18,

19 is slightly overset, thereby locking the switch closed. Owing to the elasticity of the laminated bridging contact 6, a good contact is secured when the switch is locked, although the pressure upon the bridging contact is decreased after the toggle passes the center. If there should be an overload upon the circuit when the circuit is finally closed by means of the bridging contact 6, the overload coil 23 would be energized, bringing the trip pin 27 into engagement with the end of the latch 36 and moving this latch out of engagement with the toe 35 so as to permit the toggle 20, 21, to collapse, thereby opening the circuit-breaker.

If it be desired to open the circuit by hand, the handle 22 is moved in the direction of the arrow *b* in Fig. 2, and as the toggle 18, 19, is slightly overset when the bridging contact 6 is in operative position, the handle 22 moves a short distance before the bridging contact 6 begins to separate from the fixed contacts. The first portion of the movement of the operating handle 22 to open the circuit results in straightening the toggle from its overset position and thereby bringing the bridging contact 6 into firmer engagement with the fixed contacts. This movement is permitted, however, by the elasticity of the bridging contact 6 which yields slightly when the toggle is straightened and has sufficient elasticity to maintain good contact with the fixed contacts even when the toggle 18, 19, is over the center to the extent permitted by the stop 33. When the switch was closed, however, by means of the operating handle 22, the circuit-breaker had already been closed and the latch 36 was in the position shown in Fig. 2. At the conclusion of the movement of the operating handle, to close the switch, the lug 30 on the sleeve 28 passed over the lug 38 without moving the latch 36 owing to the elasticity of the spring-blade 39. When the operating handle 22 is first moved in the direction of the arrow in Fig. 5, the lug 30 engages with the lug 38 and the slight movement of the operating handle necessary to straighten out the toggle 18, 19, preparatory to moving the bridging contact 6 out of engagement, is sufficient to move the latch 36 away from the toe 35, thereby tripping the circuit-breaker open. As a result of this arrangement, it is impossible to open the circuit by means of the bridging contact 6. Any attempt to do so will result in tripping the circuit-breaker open and this is advantageous as the circuit-breaker opens very quickly and with a minimum of arcing.

The operation of the form of device disclosed in Figs. 7 and 8 is substantially the same as that of the form shown in Figs. 1 and 2. The operating handle 55 is moved in one direction with the shoulders 56^a in engagement with the shoulders 57^a and 58^a.

This movement straightens the toggle 53, 54, and sets the circuit-breaker. The movement of the operating handle 55 in the opposite direction straightens the toggle 51, 52, and closes the circuit between the fixed contacts 40 and 41. If an overload exists upon the circuit, the overload coil 70 attracts the latch 61 and trips the circuit-breaker open. If an attempt is made to open the circuit by means of the handle 55, the lug 54 engages with the lug 53, moves the latch 61 out of engagement with the toe 60 and trips the circuit-breaker open.

While I have shown one form of device embodying my invention, it is evident that many changes and modifications may be made therein which are within the scope of my invention; and I therefore do not limit the annexed claims to the specific device illustrated and described, but desire to cover all modifications and substitutions which come 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 two circuit controlling devices, a manually controlled operating member and connections between said member and each of said devices for operating said devices, of means whereby the preliminary operation of said operating member to open one of said devices causes the other device to open.

2. The combination with two circuit controlling devices connected in series, of a force multiplying operating mechanism for each of said devices, an abutment held in definite relation to said devices to resist the thrust exerted by said mechanism, and an operating handle having a rigid connection with one of said mechanisms and a lost motion connection with the other mechanism.

3. The combination with a switch and a circuit breaker automatically opened when conditions on the circuit are abnormal, of an actuating toggle for said switch, an actuating toggle for said circuit breaker, an abutment for resisting the strain due to the straightening of said toggles, and an operating handle for straightening said toggles having a rigid connection with one toggle and a lost motion connection with the other toggle.

4. The combination with a switch and a circuit breaker, of a stationary abutment, a switch actuating toggle and a circuit breaker actuating toggle, each having one end connected to said abutment, and an operating handle having a rigid connection with said switch actuating toggle and a lost motion connection with said circuit breaker actuating toggle.

5. The combination with two circuit controlling devices connected in series, of a stationary abutment mounted adjacent said de-

vices, an actuating toggle between each of said devices and said abutment and an operating handle for said toggles having a rigid connection with one toggle and a lost motion connection with the other toggle whereby said toggles may be straightened in succession.

6. The combination with two circuit controlling devices connected in series, of an abutment, an actuating toggle between each of said devices and said abutment and a pivoted operating handle having a lost motion connection with the toggle of the first device whereby said toggle is straightened and the first device is closed when said handle is rocked in one direction, said handle having a rigid connection with the other toggle whereby the second device is closed as said handle rocks in the other direction and leaves said first device free to open.

7. The combination with a circuit breaker arranged to open the circuit upon the occurrence of abnormal conditions and a switch connected in series with said circuit breaker, of an actuating toggle for the switch, an actuating toggle for said circuit breaker, an abutment for resisting the thrust due to the straightening of the said toggles, and an operating handle pivoted on said abutment and having a rigid connection with one toggle and a lost motion connection with the other toggle.

8. The combination with a switch and a circuit breaker mounted side by side, of a switch actuating toggle, a circuit breaker actuating toggle, a stationary rod for supporting the outer ends of said toggles and resisting the thrust due to the straightening of said toggles, and an operating handle pivotally mounted on said rod, said handle having a rigid connection with one of said toggles and a lost motion connection with the other toggle.

9. In a circuit-controlling device, the combination of a switch and a circuit-breaker mounted side by side and connected in series, an operating handle, a power-multiplying connection between said handle and said switch, a sleeve loosely mounted near said circuit-breaker, a power-multiplying connection between said sleeve and said circuit-breaker, and a lost-motion connection between said handle and said sleeve, whereby a movement of the handle in one direction closes the circuit-breaker and leaves the switch open, and a movement in the other direction leaves the circuit-breaker closed and closes the switch.

10. A circuit having a plurality of breaks in series therein, an automatic switch for closing one of said breaks which opens quickly when tripped, a switch for closing another break, operating means for said switch, and connections whereby a movement of said operating means to open the switch

trips open the automatic switch before the switch is opened.

11. A plurality of circuit-controlling devices in series, tripping means for causing one of said devices to open quickly, operating means for the other devices, and means controlled by said operating means for actuating said tripping means before the circuit is opened by said operating means.

12. In a circuit controlling device, the combination with a switch and a circuit-breaker connected in series in a circuit, of means operated by the opening movement of the switch to trip the circuit-breaker.

13. In a circuit controlling device, the combination with a switch and a circuit-breaker connected in series in a circuit and having a common operating handle, of connections between the operating handle and the circuit-breaker to trip the circuit-breaker when the handle is moved to open the switch.

14. In a circuit controlling device, the combination with a switch and a circuit-

breaker connected in series in a circuit and having a common operating handle, of a latch for the circuit-breaker and a catch operative upon movement of the handle to open the switch for connecting the handle to said latch.

15. In a circuit controlling device, the combination with a switch and a circuit-breaker connected in series in a circuit and having a common operating handle, of a latch for the circuit-breaker, and cooperating lugs on the latch and the handle, one of said lugs being yieldingly mounted, whereby the lugs engage to trip the circuit-breaker when the handle is moved to open the switch and slip by each other when the handle is moved to close the switch.

In witness whereof, I have hereunto set my hand this 12th day of April, 1906.

EDWIN JOHNSON.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.