W. S. BRALLEY.

SYSTEM OF DISTRIBUTION.

APPLICATION FILED MAY 11, 1906.

**916,988.**

Patented Apr. 6, 1909.

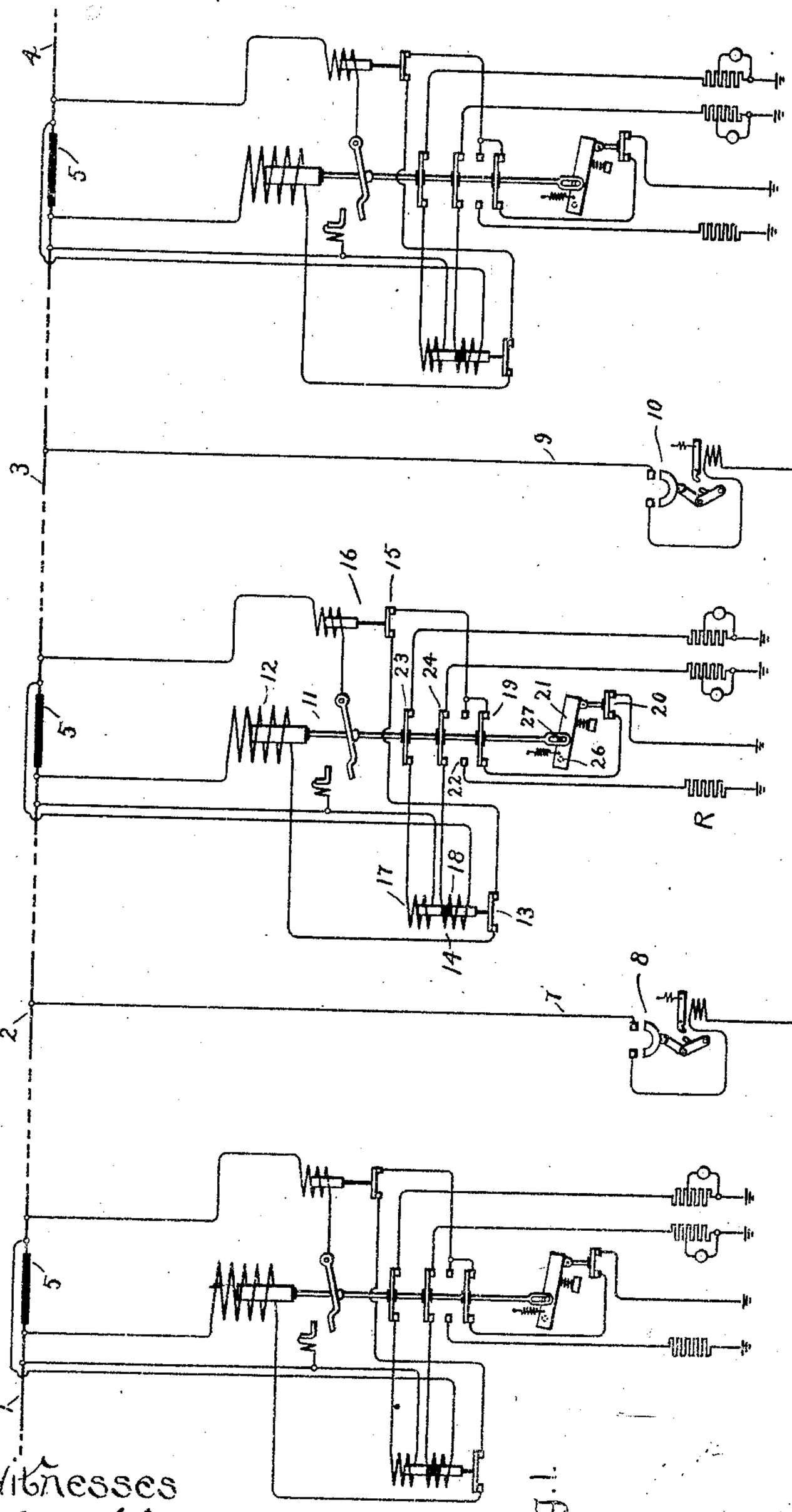


Fig. 1.

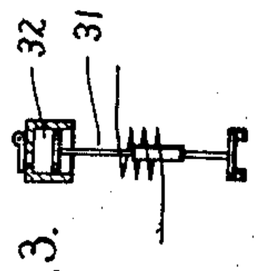


Fig. 3.

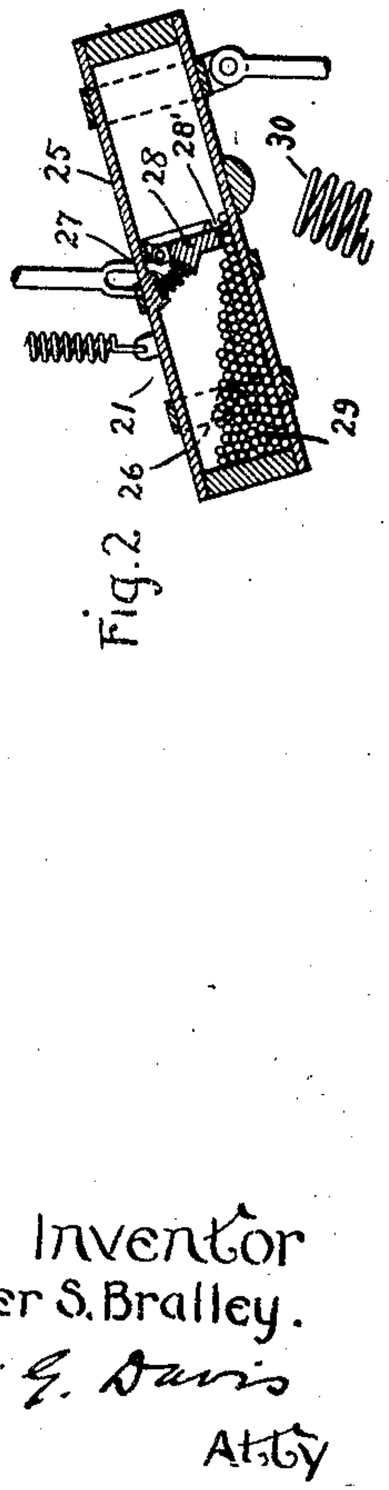


Fig. 2.

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# UNITED STATES PATENT OFFICE.

WALTER S. BRALLEY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## SYSTEM OF DISTRIBUTION.

No. 916,988. Specification of Letters Patent. Patented April 6, 1909.

Application filed May 11, 1906. Serial No. 316,269.

*To all whom it may concern:*

Be it known that I, WALTER S. BRALLEY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Systems of Distribution, of which the following is a specification.

The present invention has for its object to improve sectionalized distribution systems provided with automatic switches for connecting the sections together in order that all sections may be utilized in the most efficient manner.

A system of this character is disclosed in Patent No. 777,866, granted on December 20, 1904, on an application filed by John B. Taylor. In said patented system two contactors or circuit-breakers are used to control the connection between each pair of adjacent sections. The present invention makes it possible to dispense with one of these contactors, which is necessarily large and expensive, by the use of a relatively small and inexpensive relay for controlling the other contactor. It may happen in the system of said patent that there is sufficient drop in potential between the contactors and the point at which the short circuit upon the line occurs that the actuating coils of the contactors remain energized; or a high resistance arc may be formed so that in this case also the voltage across the terminals of the contactor coils is sufficient to maintain the contactors closed. The present invention contemplates means whereby the sections shall be positively disconnected from each other under the latter conditions as well as under the conditions provided for in said prior arrangement. This is accomplished by means of an overload relay which operates to cause the contactor or circuit breaker to open at some predetermined overload short of a dead short-circuit.

The present invention in its various aspects will be more fully understood and other objects and advantages thereof will more fully appear from the following detailed description thereof taken in connection with the accompanying drawing, wherein:

Figure 1 indicates diagrammatically four sections of a distributing system, together with the apparatus for connecting them together; Fig. 2 shows in cross-section a time interval relay which may be used to prevent the circuit breakers from closing immediately after they have been opened; and Fig. 3 shows a modified form of overload relay.

Reference being had to the drawing, 1, 2, 3 and 4 represent successive sections of a sectionalized conductor; 5, 5, 5, are sections of insulation between the conductors 1, 2, 3 and 4; 6 is a main feeder, such as a bus-bar at a sub-station; 7 is a conductor, including a circuit-breaker 8, for connecting section 2 to the feeder 6; and 9 is a conductor including a circuit-breaker 10 for connecting the section 3 to the feeder. Sections 1 and 4 are similarly connected to the feeder. It is not necessary that the feeder 6 be continuous, since adjacent sections may be supplied from separate sources. Three similar sets of apparatus for connecting adjacent sections together are illustrated, and only one need therefore be described in detail. Referring to the devices for connecting section 2 to the section 3, 11 is a switch or circuit-breaker arranged to close a path about the piece of insulating material 5. The switch is provided with an actuating coil 12 connected at one end to section 2 and at its other end to ground through contacts 13 of a relay 14 and through contacts 15 of an overload relay 16. The relay 14 has two coils 17 and 18, so arranged that, when both coils are energized, they neutralize each other and the relay remains closed; but each coil is sufficiently powerful, when it alone is energized, to lift the relay. The coil 17 is connected between section 2 and ground, and the coil 18 is connected between section 3 and ground. Assuming that the parts are in the positions shown and circuit-breaker 8 at the sub-station is closed; current will flow into section 2, through the coil 17, and to ground; and, since there is no current in section 3, coil 18 will remain deënergized and the relay will lift. This operation of the relay 14 opens the circuit of the actuating coil of the circuit-breaker and prevents the circuit-breaker from closing. Thus the sections 2 and 3 remain isolated from each other. If now circuit-breaker 10 is closed, causing section 3 to be energized, current flows through the coil 18 of relay 14; and, since the two coils now neutralize each other, the relay will drop and current flows from section 2, through the actuating coil 12 of the circuit-breaker, through the contacts of relays 14 and 16, through contacts 19 associated with the cir-

cuit-breaker, through contacts 20 controlled by a time interval relay 21, to ground. The circuit-breaker thereupon closes and a maintaining circuit is established, through contacts 22 associated with the circuit-breaker, through resistance R, to ground, in shunt to the time interval relay. When section 3 is energized first, the relay coil 18 is supplied with current and maintains the relay raised until section 2 is energized and coil 17 receives current.

In case section 2 is grounded, the circuit-breaker opens, either of its own accord, or, if the conditions are such that a difference of potential is maintained across the actuating coil of the circuit-breaker, then by reason of the operation of the overload relay which, under the influence of a heavy flow of current from section 3, is actuated and opens the circuit of the circuit-breaker actuating coil at contacts 15. The overload relay may of course be set to operate at any desired load as conditions may require. Similarly, in case of a heavy overload on section 3 and a heavy flow of current through the circuit breaker, the overload relay operates to open-circuit the actuating coil of the circuit-breaker so that the circuit-breaker opens under this condition also.

The circuits including the coils 17 and 18 of the relay 14 may respectively pass through auxiliary contacts 23 and 24, connected to the circuit-breaker and so arranged that when the circuit-breaker is open they are closed and when the circuit-breaker is closed they are open. In this way the relay 14 is cut out during the time the circuit-breaker is closed and no current is wasted therein. It is of course evident that the contacts 19, 22, 23 and 24 are not essential to the successful operation of the apparatus; and they may be entirely omitted where it is not desired to stop the flow of current through the coil of the relay 14 when the circuit-breaker is closed or to have separate actuating and maintaining circuits for the circuit-breaker itself.

The time interval relay 21 may be used to advantage, although it is not an essential feature. This relay is adapted to retard the completion of the actuating circuit for the circuit-breaker after the circuit-breaker has been opened, in order to prevent the circuit-breaker from immediately closing again. A convenient form of time interval relay consists of a tube 25 pivoted at 26 and loosely connected at 27 by a slot and pin connection to the movable member of the circuit-breaker. At the free end of the tube is carried the movable member of the switch 20. Within the tube and intermediate the ends thereof, is a hinged check-valve 28 having a small opening 28′ therein. A quantity of shot 29 is contained in the tube, and normally, when the circuit-breaker is closed, rolls past the check-valve into the end at which the pivot is located. When the circuit-breaker opens, the tube swings about its pivot until it rests upon a spring 30; the switch 20 still being open. The shot begins to roll through the opening 28 into the free end of the tube and the spring 30 is gradually compressed until the switch 20 is closed. It is possible to so proportion the parts that any desired time may elapse after the opening of the circuit-breaker before the switch 20 closes and completes the actuating circuit.

In Fig. 3 I have shown a modified form of overload relay wherein the movable member 31 is connected to a dash-pot 32. This dash-pot permits the relay to open quickly but retards its closing movement. This arrangement has the same effect as the time interval relay 21, and, by using an overload relay having a dash pot attachment, a separate time interval relay becomes unnecessary.

While I have described my invention in detail and have illustrated a construction embodying various features which may at times be used to advantage, I do not desire to be limited to the particular arrangement shown or to an arrangement embodying the various auxiliary features, except as particularly pointed out in the appended claims.

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

1. In an electrical system of distribution, sections independently connected to a source, automatic switch mechanism including an electromagnet actuating means constructed and arranged to connect said sections to each other when said sections are energized, and an overload relay having its winding arranged in series with the switch of said switch mechanism and auxiliary contacts in series with said electromagnetic actuating means for opening the energizing circuit of the electromagnetic actuating means upon an overload.

2. In an electrical system of distribution, sections independently connected to a source, means including an electromagnetically-actuated circuit-breaker for connecting said sections together when said sections are energized, and an overload relay having its winding in series with the contacts of said circuit-breaker and having auxiliary contacts controlling the circuit of the circuit-breaker actuating means.

3. In an electrical system of distribution, sections independently connected to a source, automatic electromagnetically-actuated switch mechanism constructed and arranged to connect said sections to each other when said sections are energized, an overload relay having its winding in series with the contacts of said switch-mechanism and having auxiliary contacts in series with the actuating means of said switch mechanism to open its energizing circuit to disconnect said sections from each other upon a predeter-

mined overload, and means for preventing said switch mechanism from again connecting said sections together for a predetermined interval of time after it has operated to disconnect the sections from each other.

4. In an electrical system of distribution, sections independently connected to a source, an electromagnetically actuated circuit-breaker arranged to connect said sections together, a relay controlling the circuit including the actuating coil of said circuit breaker, actuating coils on the relay connected to the sections wound to neutralize each other's effects on the relay when the sections are energized and contacts on the relay completing the circuit of the actuating coil of the circuit breaker when the sections are energized.

5. In an electrical system of distribution, sections independently connected to a source, an electromagnetically-actuated circuit-breaker arranged to connect said sections together and having its actuating coil connected to one of the sections, a relay controlling contacts in the circuit which includes the actuating coil of the circuit-breaker, a pair of coils on said relay arranged to oppose each other, a connection between one of said relay coils and one of the sections, and a connection between the other relay coil and the other section.

In witness whereof I have hereunto set my hand this 10th day of May, 1906.

WALTER S. BRALLEY.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.