

No. 721,742.

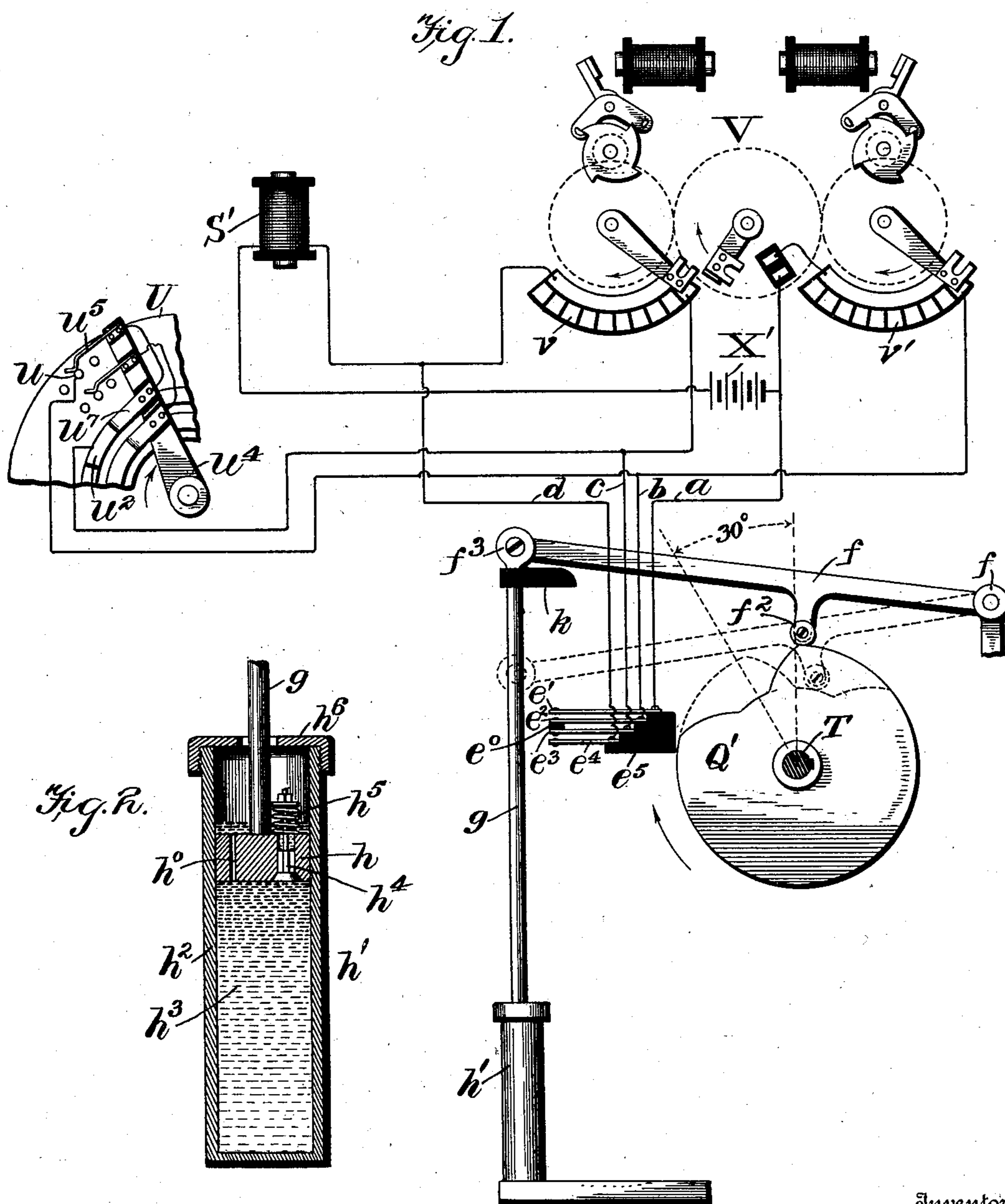
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TROUBLE TEST FOR AUTOMATIC TELEPHONE SYSTEMS.

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NO MODEL.



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UNITED STATES PATENT OFFICE.

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TROUBLE-TEST FOR AUTOMATIC TELEPHONE SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 721,742, dated March 3, 1903.

Application filed February 15, 1902. Serial No. 94,243. (No model.)

To all whom it may concern:

Be it known that I, FRANK NORRIS REEVES, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Trouble-Tests for Automatic Telephone Systems, (Case B;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to improvements in automatic means for indicating the occurrence of electrical or other trouble in the operation of automatic telephone systems, and has for its primary object the prevention of delay or interruptions in such systems by the immediate notification of the switchboard-attendant of the presence of such trouble either in the exchange or on the line.

The present invention is especially applicable to those automatic systems in which all the switching operations at central are controlled or operated by a single power device, but is designed with especial reference to the system shown and described in United States Letters Patent to Ernest A. Faller, No. 686,892, granted November 19, 1901.

In the system shown in the above-mentioned patent each successful switch is accompanied by or depends upon one complete revolution of a so-called "master-shaft." When the system is in order, each revolution of this master-shaft is completed in a predetermined length of time and no longer. This revolution of the said shaft, however, is not continuous, but its motion is interrupted once and resumed again. The whole cycle, though, occupies a predetermined period, as above stated. Should any trouble occur to prevent a complete switch from being effected or should anything happen to prevent this master-shaft from making its revolution in the prescribed time, including its failure to start again after its usual momentary stop, the delay will cause the operation of a signal which will notify the attendant of the occurrence of trouble.

To this end my said invention comprises

the combination and arrangement of parts hereinafter more fully described, and pointed out in the claims.

Referring to the accompanying drawings, Figure 1 represents, partly in diagram, the apparatus comprising my invention, together with parts of the Faller system with which it is adapted to cooperate; and Fig. 2 is an enlarged central vertical section of the dash-pot.

Similar letters refer to similar parts throughout both views.

Referring to Fig. 1, U represents the rotating contact-maker, S' the restarting-magnet, V the selector, X' the selector-battery, connected in circuit with the said rotating contact-maker, magnet, and selector, T the master-shaft, and Q' the cam for locking out the clearing-out carriage, all substantially as shown and described in said Patent No. 686,892, the same letters of reference being used to indicate these parts as are employed to indicate similar parts in the said patent.

My invention consists in this instance in tapping the selector-wires by four wires *a b c d* and connecting these to the four contact-springs *e'*, *e*², *e*³, and *e*⁴, constituting an emergency contact device, the said springs being mounted upon a rigid insulating-support *e*⁵ and providing means which in the case of trouble will bring said contacts into proper engagement, and thereby complete the circuit through the coils of the restarting-magnet S' and sound a call in the central station. This operating means comprises among other parts a lever *f* of the second order, pivoted, as at *f'*, and provided with a roller *f*², which rests upon the periphery of the cam Q'. Pivoted, as at *f*³, to the power end of the lever *f* is a depending rod *g*, which is secured at its lower end to the piston *h* of a dash-pot *h'*. This dash-pot consists, preferably, of a cylindrical casing *h*², containing the piston *h* and a suitable quantity of oil or other liquid *h*³. This piston is provided with a capillary opening *h*⁰ and a valve *h*⁴, the latter opening down against a spring *h*⁵, surrounding the valve-stem. By this arrangement the motion of the piston downward is retarded, owing to the restricted character of the opening *h*⁰, while

its upward movement may be much more rapid, as the valve h^4 will then open and greatly reduce the resistance of the oil, as the opening through the valve is much larger than the capillary opening h^0 . The top of the dash-pot is preferably closed by a screw-threaded cap h^6 . A trigger k , preferably of insulating material, is mounted fast on the rod g and is so located that when the piston of the dash-pot is allowed to descend to a predetermined extent said trigger will engage the contact-spring e' and complete the trouble-circuit, as hereinafter described.

It will be seen from the Patent No. 686,892 that for each cycle of operations to perform a complete switch the master-shaft is started and stopped twice. By the first portion of its revolution the calling-shuttle is dropped—that is to say, the line-terminals of the calling subscriber are placed in the first preparatory or selective position before actually connecting them to the loop-circuit. The second part of the revolution of said master-shaft causes the dropping of the called-subscriber's shuttle and the completion of the switch, including the actuating of the ringer mechanism. Assuming that the full-line position of the cam Q' and lever f is the position of rest, the operation is as follows:

When a call is sent in to the exchange, the master-shaft T rotates through an arc of about thirty degrees, then stops momentarily and starts up again, as stated, and rotates continuously through the remaining three hundred and thirty degrees, then stops until the next call is sent in. It will be seen, therefore, from Fig. 1 that immediately after the cam Q' starts to rotate the lever f will commence to descend; but owing to the resistance offered by the dash-pot this descent is necessarily very slow. If the system is in good working order, the pause of the cam Q' at the end of the first thirty degrees will not be of sufficient duration to allow the lever f to descend to any appreciable extent, the notch in the cam passing the roller before the trigger k can descend far enough to engage the emergency contact. If, however, owing to any one of many causes the said cam does not rotate through about the first sixty degrees in the prescribed time or if it fails completely to start after making its first stop—that is, stop in the position shown in dotted lines, Fig. 1—this will give the lever f time to descend and to such an extent that the trigger k will engage the spring e' of the emergency-contact device, bring it in contact with spring e^2 , and also send the spring e^3 into engagement with spring e^4 , the spring e^2 and e^3 being permanently separated by the insulation e^0 . When this takes place and as soon as the rotating contact-maker arrives at the position shown in the drawings, a circuit is completed, which may be traced as follows:

From plus pole of battery X' , coil of restarting-magnet S' , wire d , contact-springs e^4 and e^3 , wire c , segment u^2 of rotary contact-maker,

brush u^7 , brush u^5 , pin u , wire b , contact-spring e^2 , spring e' , wire a , then back to battery X' . The circuit being thus completed through the restarting-magnet S' , the said magnet will act as though a proper call had been sent in—that is, it will restart the master-shaft and cause the power device to go through its usual cycle. When the cam Q' resumes its rotation, it will lift the lever f and return it to its initial position. Very little resistance, however, will be offered to its motion, since the valve of the dash-pot opens and allows the oil to flow freely through its piston. It will thus be seen that while in the operation of the system this trouble-test device will always attempt to establish the said emergency contact it can only do so if actual trouble of some character either on the line or in the exchange or at the subscriber's instrument occurs, as otherwise the master-shaft will perform a revolution before the trouble-test has had time to establish its circuit.

The completion of the above circuit has exactly the same effect as sending in a call for instrument 00—that is to say, instead of the call-signal being sent to a subscriber it is sent to instrument No. 00 in the exchange, which notifies the attendant that something is wrong. The selector-circuit 00 is used for this purpose for the reason that such a circuit is never used for a subscriber. This call is designated "No. 00" for the reason that the selector-wires tapped are those connected to pin No. 0 and segment No. 0 of rotating contact-maker. Further description of the selector is not necessary, since it does not coöperate in any way with my invention and is shown simply to indicate which of its circuits are tapped in applying my invention to the Faller system. The operation of all the system for making the call No. 00 is just the same as for making any other call, except in the case of the call No. 00 the part usually performed by the selector is performed by the emergency-contact device. After the emergency call is sounded the apparatus will clear out and continue repeating the call until answered.

Having thus described a form of my invention, I do not wish to confine myself to the specific arrangement shown, since this may be modified in many ways without departing from the spirit of my invention; but

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

1. In a trouble-test for automatic telephone systems, the combination with switching mechanism adapted to perform a fixed cycle of operations in establishing each complete switch, of automatic means at the central exchange for positively indicating the failure of said mechanism to complete said cycle.

2. In a trouble-test for automatic telephone systems, the combination with switching mechanism adapted to perform a fixed cycle of operations for each complete switch in a prescribed time, of automatic means at the central exchange for positively indicating the

failure of said mechanism to complete said cycle in said prescribed time.

3. In a trouble-test for automatic telephone systems, the combination with switching mechanism adapted to perform a fixed cycle of operations for a complete switch in a prescribed time, of automatic means for sending a positive call into the central exchange upon the failure of said mechanism to complete said cycle.

4. In a trouble-test for automatic telephone systems, the combination with switching mechanism including a single power device for effecting a plurality of switches, an emergency contact, a time device operated by said power device and operating said emergency contact, and indicating means controlled by said emergency contact for indicating the failure of said power device to complete a switch.

5. In a trouble-test for automatic telephone systems, the combination with switching mechanism adapted to perform a fixed cycle

of operations in establishing each complete switch, calling apparatus, an emergency contact for initiating the operation of said apparatus, and means for operating said emergency contact, said means including a time device adjusted with relation to the time of the said cycle.

6. In a trouble-test for automatic telephone systems, the combination with switching mechanism including a single power device for effecting a plurality of switches, a cam-operated lever actuated by the said power device, a time device comprising a dash-pot connected to said lever, a call-circuit, an emergency contact controlling said circuit, and means actuated by the said lever and time device for operating the emergency contact.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK NORRIS REEVES.

Witnesses:

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