(No Model.)

M. G. KELLOGG.

MULTIPLE SWITCHBOARD.

No. 592,342. Patented Oct. 26, 1897.

Fig. 1ª

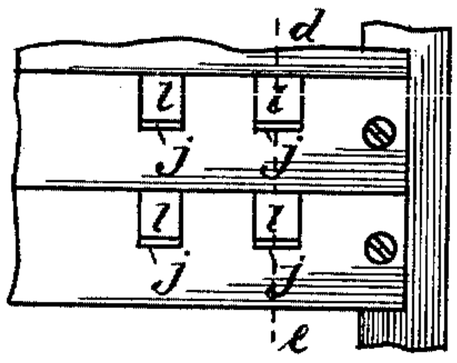


Fig. 1ᵇ

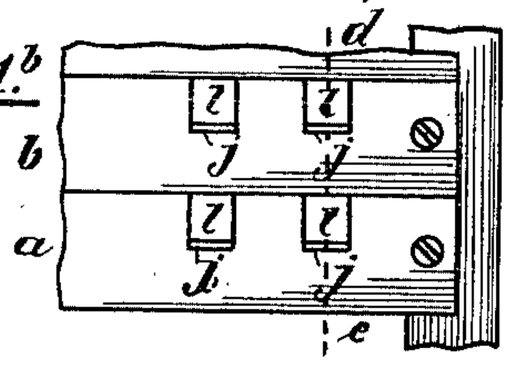


Fig. 2.

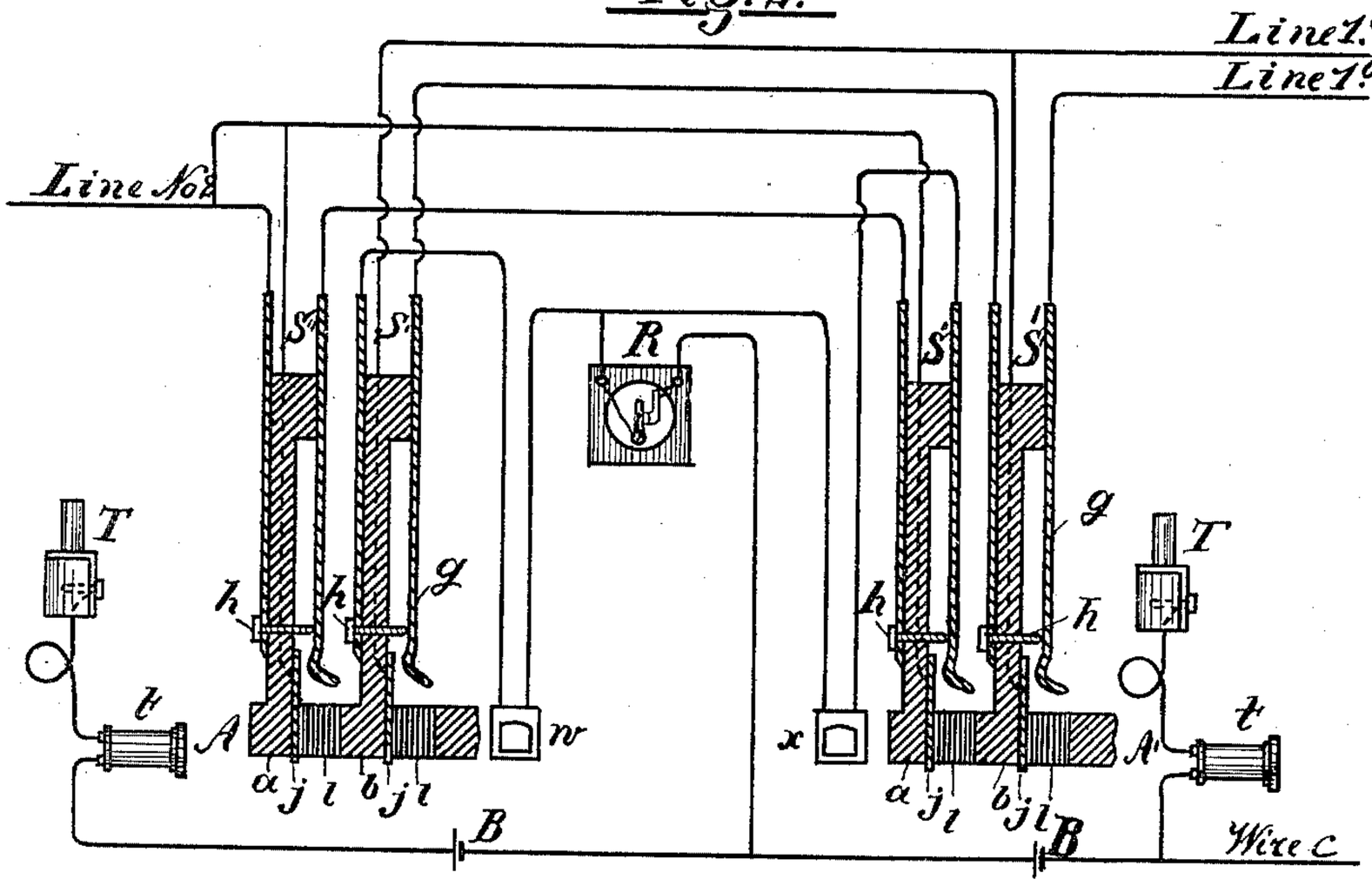


Fig. 3.

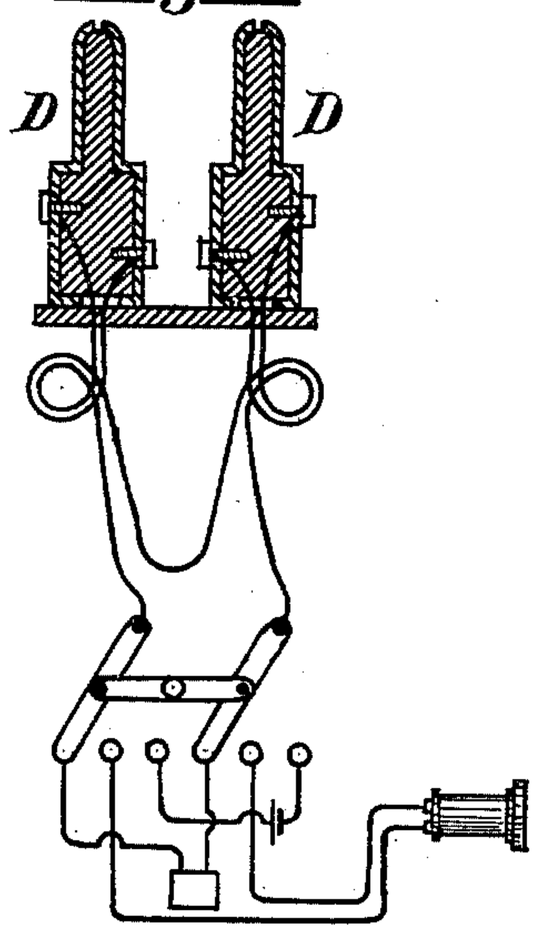
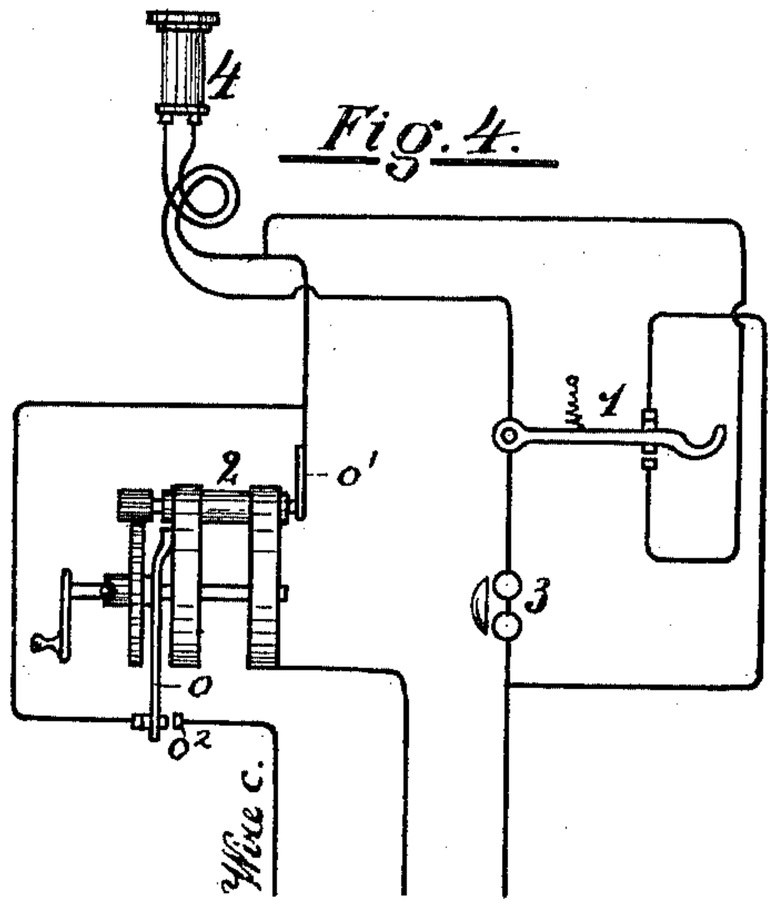


Fig. 4.



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UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF SAME PLACE.

MULTIPLE SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 592,342, dated October 26, 1897.

Application filed December 21, 1889. Serial No. 334,520. (No model.)

To all whom it may concern:

Be it known that I, MILO G. KELLOGG, of Chicago, in the county of Cook and State of Illinois, temporarily residing at Stuttgart, in the Empire of Germany, have invented certain new and useful Improvements in Multiple Switchboards for Telephone-Exchanges, of which the following is a clear, full, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telephone-exchange systems in which the lines are single-circuit lines or metallic-circuit lines, or in which the two lines are combined in one exchange; and it consists in a system of switching, calling, and testing with such lines which I shall describe and claim.

I place as many boards in the central office as are found necessary or desirable in order to properly answer the calls and make the necessary connections and disconnections. On each board is a spring-jack or similar switch for each line. Each switch has a contact-spring which normally bears on an insulated contact-point and has a contact-piece insulated from the rest (except by the circuit connections) and is adapted to receive a loop-switch plug and, when a plug is inserted, to disconnect the spring from the contact-point and connect the two contact-pieces of the plug with the spring and with said switch contact-piece, respectively.

The lines of the exchange, whether single or metallic circuit lines, pass successively through the pairs of contact-points of their switches on the several boards. The lines then unite into a common wire in which is a rheotome. When the lines are switched for conversation, they are disconnected from this common wire. Test receiving instruments at each board are connected to the other side of the rheotome and are adapted to be brought for testing into connection with the several lines whether the lines are switched or not. The test receiving instruments and the rheotome and its common wire are disconnected from the ground at the central office.

In the accompanying drawings, illustrating my invention, Figures 1^a and 1^b represent sections of two multiple switchboards of the exchange to which the same lines are connected. Fig. 2 shows a diagram of the boards with the line connections and apparatus necessary to illustrate my invention. Fig. 3 shows an operator's cord system to be used with the boards. Fig. 4 shows a subscriber's-station apparatus.

In the drawings like parts and apparatus are indicated by the same letters and figures of reference.

In Fig. 2, A is a sectional view of the switchboard shown in Fig. 1^a, and A′ is a sectional view of the switchboard shown in Fig. 1^b, each as indicated by the line *d e*.

In Fig. 2, *g g* represent the springs of the switches, *h h* the contact-points on which the springs normally bear, and *j j* the insulated contact-pieces of the switches. *l l* are the switch-holes. *a b* are the rubber strips on which the contact-pieces are mounted, as shown, and through the fronts of which are the holes *l l*.

The insulated contact-pieces *j j* of the switches are so placed that a test-plug or similar device may readily be applied to them. When a switch-plug (shown in Fig. 3) is inserted into a switch-hole *l*, it separates the pieces *g h* of the switch, and one of the contact-pieces of the plug is in contact with the piece *j* and the other piece is in contact with the spring *g*.

The switches for the single-circuit lines are marked S″ and those for the metallic-circuit lines are marked S′.

R is a rheotome or mechanical circuit-breaker containing a clockwork-movement actuated by a spring. It contains an oscillating bar fixed to the verge-shaft and standing at right angles to it. A pair of contact-points is connected with the bar or with the shaft in such a way that their contact is alternately made and broken with the oscillations. The pair of contact-points are properly insulated and are connected into the circuit, as indicated for the rheotome.

Instead of the rheotome shown any form of mechanical or electrical rheotome or any ap-

paratus which changes the electrical condition of the line, so that the change will be indicated on the test receiving instruments, may be connected into the circuit, as indicated for the rheotome.

w and *x* are calling-annunciators, one for each of the lines shown. Two lines are shown in Fig. 2, one a metallic-circuit line, the two sides or branches of which are marked line No. 1^a and line No. 1^b, respectively, and one a single-circuit line (to be grounded at its outer end) marked line No. 2.

The circuit of the single-circuit line is as follows: from the subscriber's ground through his station apparatus, through the line and the pairs of contact-points *g h* successively of its switches on the several boards, going in each case to the point *h* first, thence through its line-annunciator to the common wire of the lines in which is the rheotome. All the contact-pieces *j j* of a single-circuit line are connected together and to their line between its switches and the subscriber's station.

The circuit of a metallic-circuit line is as follows: One side or branch of the line—say line No. 1^a, as shown—is connected with all the contact-pieces *j j* of its switches on the boards. The other branch of the line—say line No. 1^b—passes successively through the pairs of contact-points *g h* of its switches on the several boards, going in each case to the spring first. It then passes through the line-annunciator and thence to the common wire in which is the rheotome.

t t are test receiving instruments, one at each board. These test receiving instruments are preferably magneto-telephones, as shown, as they are peculiarly sensitive to variation of current on the line, and thus well adapted to coöperate with rheotomes even though the rheotomes are shunted by complete circuits. It is obvious, however, that any other kind of a test receiving instrument that will indicate variations in the strength of a test-current will properly coöperate with this system.

T T are test-plugs, one for each instrument, each connected by a flexible cord to one side of its instrument and adapted to be brought for testing into connection with any contact-piece *j* at its board. The other side of each test receiving instrument is connected to said common wire of the lines in which is the rheotome. The connection of the test receiving instruments to said common wire must be on the other side of the rheotome from that to which the lines are normally connected.

B B are test-batteries. There should be a test-battery in the circuit between the place where the lines are united with said common wire and any test-plug. The battery may be placed in the common wire between the place where the lines unite with it and the place where the test-instrument circuits branch off from the common wire. In that case only one battery would be required for the exchange.

The common wire in which is the rheotome is marked wire *c*, and it extends, insulated from the lines, to each subscriber's station, and is connected to each station apparatus, as will hereinafter be described.

In the operator's cord system shown in Fig. 3 D D are two loop-plugs, the two contact-points of which are connected by double flexible cords to their loop-switch, clearing-out annunciator, and the operator's telephone and calling-generator, substantially as shown. One of the contact-pieces of each of the loop-switch plugs is connected by a flexible conductor to a lever of the looping-in switch, and the two other contact-pieces of the plugs are connected together by means of a flexible cord-circuit. One pair of the plug-bolts are connected together through a clearing-out annunciator. Another pair are connected together through the operator's telephone, and the third pair are connected together through the calling generator or battery. Only one pair of plugs with their cords and apparatus is shown, but other pairs may be added in a way which will be apparent to those skilled in the art. This apparatus is not more specifically described, as its nature is quite immaterial as long as it properly performs the functions of connecting the lines. The essential feature is that when a line is switched for use the rheotome shall be cut off from the line.

In the subscriber's-station apparatus shown in Fig. 4, 1 is the telephone-switch. 2 is the calling-generator. 3 is the signal-receiving bell, and 4 is the subscriber's telephone. These parts may be the usual forms of apparatus and are connected as shown, or in other ways, so as to produce the required results. The generator, however, is modified and is as shown.

The modification consists, essentially, in the number and arrangement of the contact-points of the automatic device. The automatic device shown is a modification of a form very generally used. In consists in a V-shaped attachment to the hub of the driving-wheel, a pin in the shaft, which engages in this V-shaped arrangement, and a spring which presses against the wheel and brings the pin normally in the center of the V arrangement. The contact-points and circuits are substantially as shown. One side or branch of the line connects with the frame of the generator, as does also one end of the armature-coil and the spring *o* of the automatic device. The other side or branch of the line connects to the insulated spring *o'*, which bears on an insulated piece on the armature-shaft to which the other end of the armature-coil is connected. The contact-

line is ready to be connected to. In the case of metallic-circuit lines the circuit is through the line by way of the subscriber's station. Should, however, the line be switched at any board, this circuit is open, and the instrument will not sound or respond. When the instrument on a test being made does not respond, the operator knows, therefore, that the line is switched for use, and she will not then connect it with another line.

The test receiving instruments and the battery should be such that when closed to the circuits with the rheotome the instrument will respond to the vibrations of the rheotome. The parts should, however, be so related to the line-annunciators that on a test of a line being made it will not operate the annunciators. For this purpose the annunciators may be such as will be operated only when one der named, test-contacts at two or more boards, line conductors, normally closed pairs of contacts at said boards, open while the line is switched for use, a common ungrounded return-conductor, and test outfits in parallel, one at each board adapted to be applied to the test-contacts at their boards for testing; in combination with a call-circuit including said common return-conductor, one of said line conductors, and said normally closed pairs of contacts, including also an annunciator and call-generator.

In witness whereof I hereunto subscribe my name this 29th day of November, 1889.

MILO G. KELLOGG.

Witnesses:
EMIL ABENHEIM,
MARGARETHA RIEHL.