

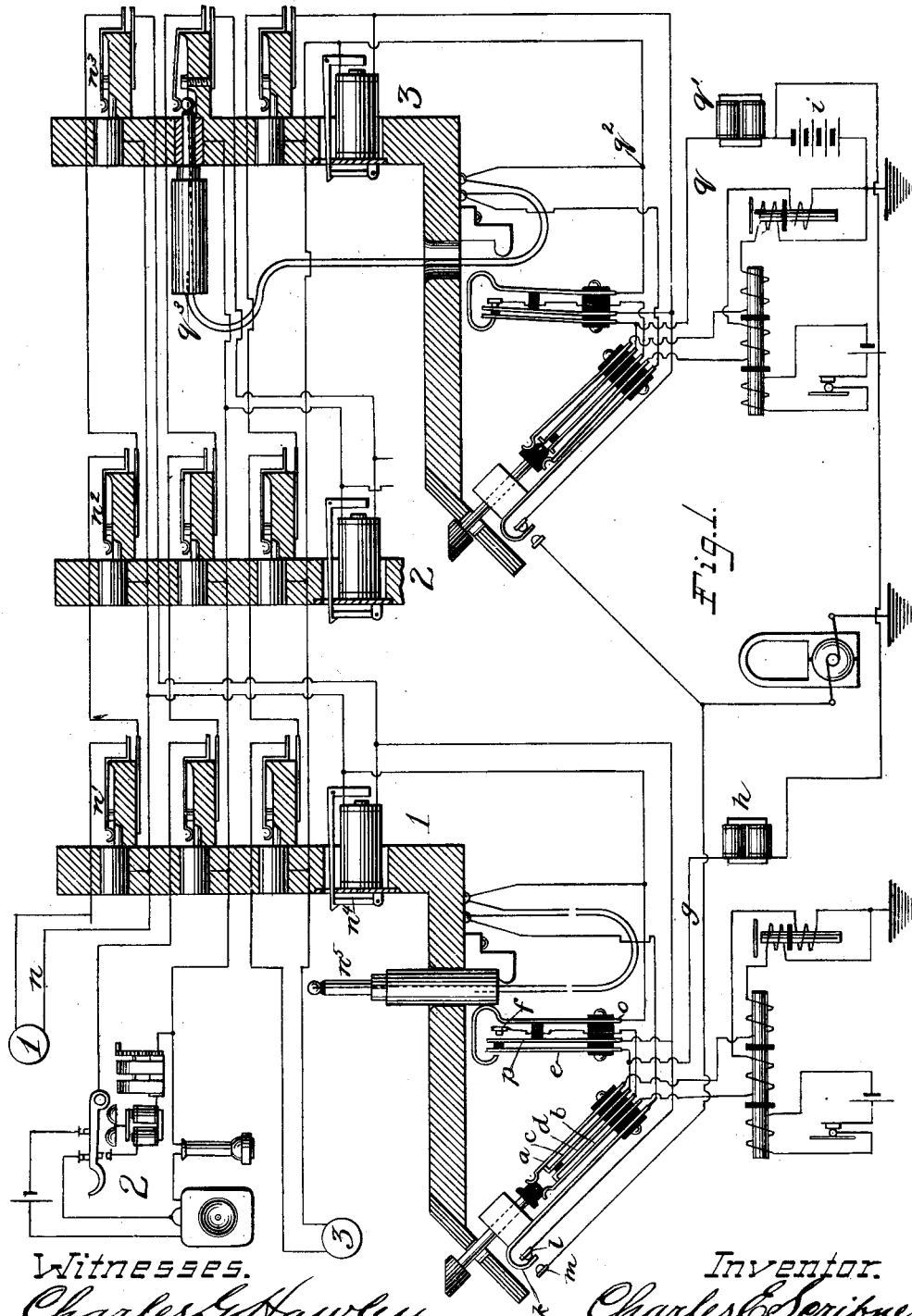
(No Model.)

2 Sheets—Sheet 1.

C. E. SCRIBNER.
TEST CIRCUIT FOR MULTIPLE SWITCHBOARDS.

No. 489,100.

Patented Jan. 3, 1893.



Witnesses.

Charles E. Hawley.
F. A. Boynton

Inventor.

Charles E. Scribner.
By George P. Barton
Attorney.

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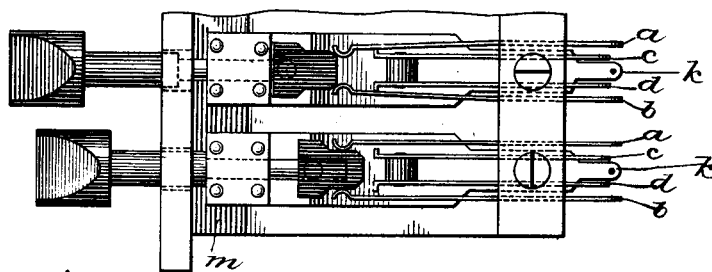


Fig. 2.

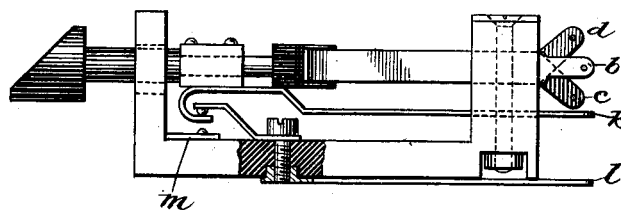


Fig. 3.

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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN
ELECTRIC COMPANY, OF SAME PLACE.

TEST-CIRCUIT FOR MULTIPLE SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 489,100, dated January 3, 1893.

Application filed March 1, 1890. Serial No. 342,278. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Test-Circuits for Multiple Switchboards, (Case No. 223,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to metallic circuit multiple switch board systems and its object is to provide simple and efficient apparatus for testing at the different boards to determine whether a line wanted or called for is in use at any other of the boards; this apparatus being arranged in connection with the operator's outfits in a novel, convenient and simple manner.

My invention consists, speaking generally, in providing a retardation coil in a ground branch connected with a test battery for each of the telephone lines, in combination with a cord switch and listening and calling key and the operator's telephone and switching devices so arranged that the operator on raising the plug in response to a subscriber's call brings her telephone into circuit and throws on the branch containing the retardation coil and battery to make the line immediately test busy. The listening and calling key is so arranged that on forcing in the plunger or knob thereof the telephone may be disconnected without opening the test branch containing the retardation coil.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a diagram illustrative of three telephone lines connected each with three different switch boards in the ordinary manner, together with my testing apparatus illustrated somewhat in detail at the first and last boards. Fig. 2 is a plan view of two of a strip of listening and calling keys. Fig. 3 is a side elevation showing one of the keys.

Like parts are indicated by similar letters and numerals of reference throughout the different figures.

The springs *a b* of the listening and calling key may be connected with the telephone.

The contacts *c d* may be connected respectively with connections *e f* of the cord switch as shown in Fig. 1 and the branch *g* through the retardation coil *h* and the test battery to ground is connected between the contact piece *c* of the listening key and the contact *e* of the cord switch. The spring *k* of the listening and calling key should be connected with the strand of the cord leading to the tip of its plug, the contact *l* being connected back to the limb of the circuit leading through the contact points and springs of the spring jack switches. The contact *m* is connected with the branch containing the generator at the central office. The stem of the plunger of the listening and calling key passes through a block or guide mounted on the spring *k*. When the plunger is thrust between the springs *a* and *b* these springs are separated from their normal contacts *c d*; when the plunger is withdrawn these contact springs *a b* close upon their normal contacts *c d* again. Now when the knob of the plunger is depressed the circuit is opened between the spring *k* and its contact *l* and closed upon the generator contact *m*; thus the generator is thrown upon the strand leading to the tip of the plug.

A usual subscriber's outfit is shown at station 2. I have not deemed it necessary to illustrate the subscribers' outfits at stations 1 and 3.

The line *n* of station 1 extends in two limbs or branches in the usual way through switches *n'* *n''* *n'''* of the different boards, the individual annunciator *n'* being bridged into the circuit in a well known way. That limb of the circuit *n* which passes through the springs and contacts of the spring jacks extends to contact *l*, spring *k* and thence to the strand of the cord leading to the tip of the plug *n'*; the other limb of this telephone line *n* is connected permanently as shown to the strand connecting with the sleeve of plug *n''*. Now, as before stated, the telephone of the operator is connected on different sides with the springs *a b* of the listening key and thence through the medium of contacts *c d* to contacts *e f* of the cord switch. Now it will be observed that the portion of the line extending to the sleeve of the plug is connected by a branch with

spring *o* of the cord switch, while the other branch or limb of the circuit, that is to say, the limb connecting with the tip of the plug is connected by a branch to the contact *p* of the cord switch. Now when the plug *n*³ is lifted from its socket the spring *o* closes on contact *e* and the spring *p* upon contact *f* and hence if the plunger of the listening key be not inserted between springs *a* and *b* the telephone will be looped into the circuit of the line when the plug *n*³ is thus lifted; and moreover, since the branch *g* is connected with the spring *e* this branch *g* will be closed to the portion of the line connecting with the sleeve of plug *n*³, that is to say, the portion of the line which is connected with the test pieces of switches *n'* *n*² *n*³; thus the test battery *i* will be connected with the test pieces of the switches *n'* *n*² *n*³ through the retardation coil *h* whenever the plug of the line is lifted from its socket in the cord switch.

The manipulation of a connecting plug in making a test is the same as has been heretofore usual. The call having been received the operator lifts the plug of this line and thus brings her telephone into circuit and having learned the number of the line wanted touches the plug to the test piece of this line. Now if the line thus tested is busy, that is, if its plug has been lifted from its socket, or if a plug has been inserted in any spring jack switch thereof battery current will be present and it will find circuit through one or the other of the strands of the cord through a winding of the telephone to ground.

In case the line tested be a calling line its terminal plug will be removed from its socket and the circuit of the test current may be traced as follows:—From earth at the battery *i* through the retardation coil *h* for example, to the spring *e* of the cord switch of the line tested, thence to the spring *o* thereof, thence by conductor to the test rings of its line, thence through the tip of the testing plug to the spring *k* of the listening key connected with that plug, thence to the contact *l* thereof, through the spring *p* of its cord switch, thence to the contact *f* thereof, thence to the contact *d* of its listening key, thence to the spring *b* thereof, thence through the operator's transmitter induction coil, one-half of the telephone coil, to earth, returning to battery *i*; and a click will be produced in the telephone. If, however, the line tested be an answering line the test current will find circuit from the battery *i* through the retardation coil to the spring *o* of the calling line with which the line tested is already in connection, thence to the sleeve of the terminal plug of the calling line which is inserted in a jack of the answering line, and thus to the series of test rings of the answering line, and through the tip of the test plug to earth as before, producing a click in the telephone of the operator testing. If the line tested be found free the operator immediately inserts the connecting plug of a calling line into the

switch of the line thus tested and the sleeve of the plug coming against the frame of the switch makes the called line thus test busy, that is to say, when a plug is lifted the test battery is connected with the sleeve thereof and when this plug is inserted in the switch of another line this sleeve comes against the frame or test piece of the switch, thus throwing battery on to this test piece, and hence battery will be present at all the test pieces of the switches of the two connected lines.

At board 3 I have shown the line of station 3 connected in metallic circuit with the line of station 2. Now, as before stated, the branch *g* from battery *i* through retardation coil *q'* will be connected at *q*² with the strand leading to the sleeve of plug *q*³; hence the test made at a test piece of any spring jack switch of either of said connected lines of stations 2, and 3, upon any other of the boards as boards 1 and 2 would show the presence of battery and hence would indicate that the lines were engaged.

It will be observed that the test branch containing the retardation coil when connected to one side of a metallic circuit will not throw the circuit out of balance as would be the case if the retardation coil were omitted; moreover, in case there should be a leak or escape of current on the side of the circuit opposite the branch to ground containing the retardation coil the retardation coil, while permitting the test battery current to flow over the branch, will prevent any disturbance which might otherwise take place on account of the escape of voice currents to ground.

In a pending application, Case No. 225, Serial No. 339,597, filed February 7, 1890, for multiple switch board apparatus, I have described and claimed certain of the more broad or general features of the system shown in this application, and therefore I limit myself herein to the specific combinations claimed.

Having thus described my invention I claim as new and desire to secure by Letters Patent:—

1. A telephone line connected in metallic circuit with two or more switch boards, one limb of the circuit being connected to the tip of the terminal plug thereof and the other limb to the sleeve of said plug, a telephone branched from the different sides thereof in one direction through the springs *b d* to a contact *f* of the cord switch and in the other direction to springs *a c* and thence to a spring *e* of the cord switch and a branch *g* connecting from ground through a battery and retardation coil to spring *e*, whereby on lifting the terminal plug from the socket of a cord switch the telephone is brought into circuit and the branch *g* connected therewith to make the line test busy while on separating springs *a b* from their normal contacts the telephone is disconnected while the branch *g* is left in the connection with the line, substantially as and for the purpose specified.

2. A telephone line extending from a sub-

station to a central station having its two sides connected to the two contact pieces respectively of the terminal plug at the central station, in combination with a cord switch having two contact springs connected to the two sides of the line circuit respectively, and two contact points adapted to engage with said springs respectively when the plug is removed from its socket, a telephone set included in a circuit having its terminals connected to the two contact points of said cord switch, and a ground test battery connected to one of said contact points, whereby the telephone set is connected in a bridge between the two sides of line and a test battery is connected in a branch to one side of the line when the terminal plug thereof is removed from its socket, substantially as described.

3. In a telephone switch board system the combination of a telephone line extending to the different switch boards and to a cord switch and to a listening key, two contacts of the cord switch being connected respectively with the two limbs of the metallic circuit, two contacts of the listening key being connected respectively with the two other contacts of the cord switch and a branch connection including a retardation coil and test battery, the said branch connection being connected with one limb of the metallic circuit at a point intermediate of the connection between one

contact of the cord switch and one contact of the listening key, substantially as and for the purpose specified.

4. A telephone line circuit extending from a substation to a central station and having two sides of its line connected to the two contact-pieces respectively of the terminal plug, in combination with a cord switch adapted to be actuated by the removal of said terminal plug from its socket, having two contact-pieces connected to the two sides of line respectively, and two contact-points adapted to engage with said contact-pieces respectively, a listening key having two contact pieces connected to the contact-points of said cord switch and two contact-springs constituting the terminals of a telephone set, and a grounded test battery connected to one of the conductors joining a contact-point of the cord switch with a contact-point of the listening key, whereby the telephone may be connected to or disconnected from the line circuit at the listening key, and both telephone and test battery may be connected to the line circuit at the cord switch, substantially as described.

In witness whereof I hereunto subscribe my name this 11th day of February, A. D. 1890.

CHARLES E. SCRIBNER.

Witnesses:

GEORGE P. BARTON,
ELLA EDLER.