(No Model.)

C. E. SCRIBNER.

TESTING APPARATUS FOR MULTIPLE SWITCHBOARD SYSTEMS.

No. 491,250. Patented Feb. 7, 1893.

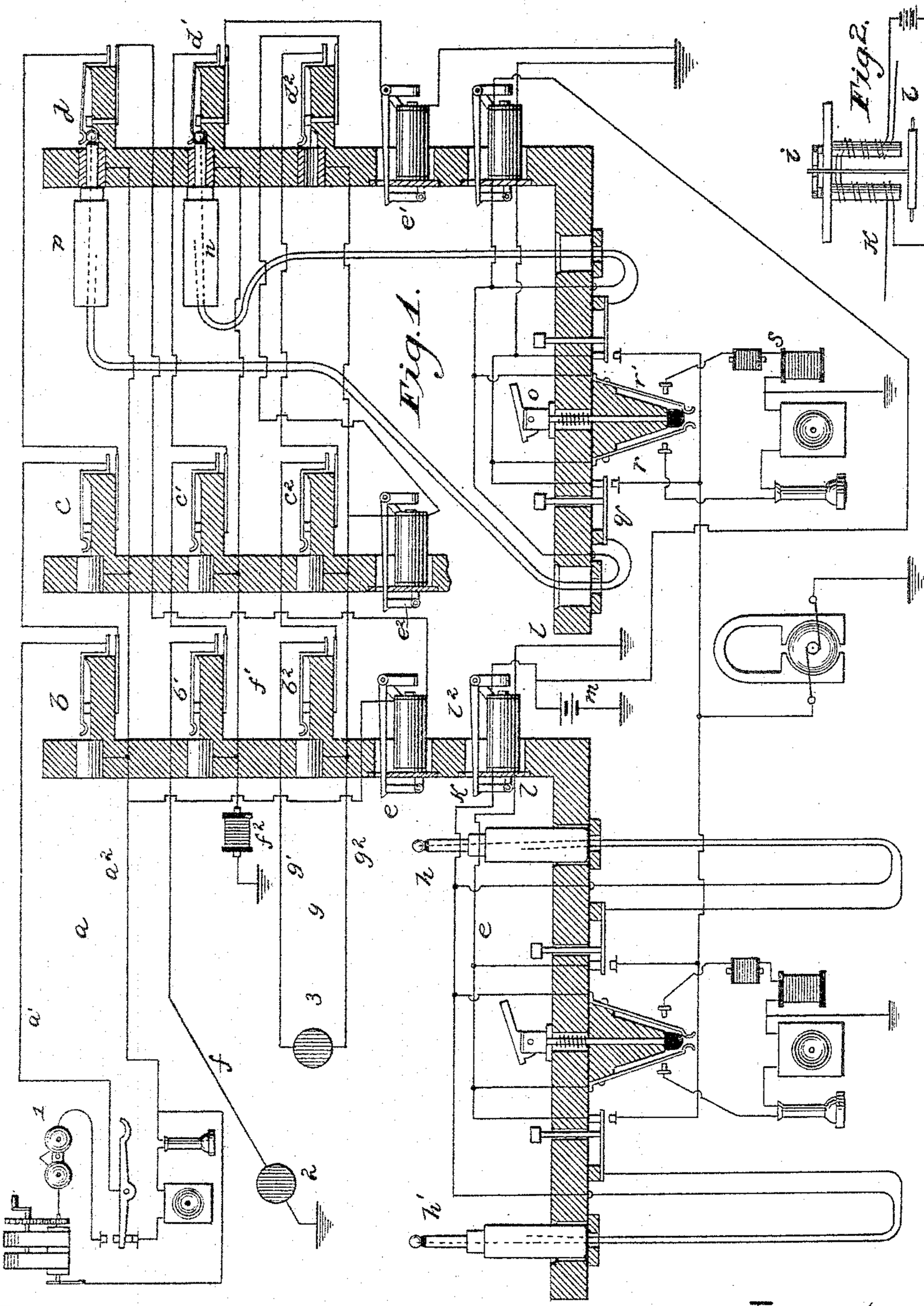

Fig. 1.

Fig. 2.

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TESTING APPARATUS FOR MULTIPLE-SWITCHBOARD SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 491,250, dated February 7, 1893.

Application filed September 9, 1890. Serial No. 364,442. (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 Testing Apparatus for Multiple-Switchboard Systems, (Case No. 192,) 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 telephone exchange systems in which multiple switch boards are employed.

The object of my invention is to simplify the apparatus whereby an operator at one board determines whether or not a line is busy at any other board.

Briefly then my invention relates to the busy test apparatus and consists in placing a battery in connection with that strand of the cord which connects with the sleeve thereof, a winding of the clearing out annunciator being preferably included to circuit with the said test battery. In this manner I avoid the use of a retardation coil and the loss of efficient current strength necessarily resulting from the use of such retardation coils. In other words the clearing out annunciator is made to perform its own function and in addition permits the test battery to be applied in a ground branch without destroying the balance as between the two sides of a metallic circuit.

My invention herein is an improvement upon the test systems described in prior pending applications Serial No. 288,140, filed October 15, 1888, and Serial No. 291,659, filed November 23, 1888. In each of said prior applications I have illustrated, described and claimed a test system in connection with retardation coils for preventing the current from the test battery from injuriously affecting the talking circuits.

In my invention herein such retardation coils are dispensed with and the test battery is so combined with the loop plugs and cords and the doubly wound clearing out annunciators that the current from the test battery cannot harmfully affect the talking circuits.

In the accompanying drawings—Figure 1 is a diagram illustrative of three telephone lines connected with three multiple switch boards together with the operators' outfits at two of the boards embodying my invention. Fig. 2 is a detailed view illustrative of the manner of winding the clearing out annunciators.

As shown in Fig. 1 station 1 is connected by metallic circuit a with the central office. Thus limb a' of this metallic circuit extends from telephone switch at said station 1 through the spring and contact of each of the switches b c d of the line on the different boards and thence through individual annunciator e to the return portion or limb a^2 of metallic circuit a. This limb a^2 is connected with the test pieces or rings of the switches b c d and extends back to station 1 as shown.

Station 2 is connected by ground wire f with switches b' c' d' and through individual annunciator e' and thence to ground. The test wire f' of line f is connected with the rings or test pieces of switches b' c' d' and through resistance f^2 to ground.

Station 3 is connected by metallic circuit g with switches b^2 c^2 d^2. The limb g' extends through the spring and contact of each of said switches and thence through individual annunciator e^2 and thence to the limb or return wire g^2 of said metallic circuit g. This limb g^2 is connected with the rings or test pieces of switches b^2 c^2 d^2 and extends to station 3 after the manner described with respect to the circuit of station 1.

It will be noted that a usual subscriber's outfit will be provided at station 2; the outfit at station 3 may be the same as illustrated at station 1.

I have shown the key board apparatus at the first and last of the switch-boards, and will briefly describe this outfit as shown at the first board. The loop plugs h and h' are of usual construction. The tips of these plugs are connected with one strand of the cords and the sleeves of the two plugs are

connected together by the other strand of the cords. The clearing out annunciator *i* is provided with two windings as shown in Fig. 2. Two branches *k l* from the different strands of the cords extend through the windings of this annunciator to ground. The branch *k* from the strand connecting the sleeves together is connected through the test battery *m*. The branch *l* from the strand connecting the tips of the plugs extends through the other winding of the clearing out annunciator directly to ground. The annunciator will therefore be operated either by current sent from the generator of the metallic circuit or by current sent from a grounded circuit as circuit *f*. The windings *k* and *l* are of such direction that when current is sent from a metallic circuit both coils will act together to energize and hence throw down the clearing out shutter. In case of current sent from a grounded line as line *f* coil *l* alone will be included in the circuit but this will be sufficient to operate the insulator. It will be noted that the battery *m* is always present at the strand of the cords connecting the sleeves thereof and hence when a plug is inserted in the switch of any line the test portion of that line will be in electrical condition to indicate the busy test at any other board. We will suppose subscriber at station 2 throws down his shutter *e'*. The operator will insert one plug of a pair as plug *n* in switch *d'* of said line *f* and throwing up cam lever of telephone switch *o* bring her telephone into connection with subscriber at station 2 and will receive the subscriber's order. Suppose the order be for connection with station 1. The operator will first test circuit *a* of station 1. This test consists of touching tip of plug *p* to test ring of switch *d* and listening at telephone. If no sound is heard the operator will know that the line tested is free. She will then insert plug *p* as shown completing the connection and will then signal subscriber 1 by calling key *q* the calling current finding circuit from the calling generator to the lower contact point of key *q*, thence to the strap thereof, thence to the tip of the plug *p*, to the line spring of jack *d*, through spring jacks *c* and *b* to substation 1, and through the signal bell and generator thereat; thence it returns over the line a^2 to the sleeve of plug *p*, thence through one winding of the clearing-out drop, to earth. Suppose, however, the telephone line had been busy when the test was made; that is, suppose plug *h* at the first board had been inserted in switch *b*. In such case the subscriber at the last board on touching tip of plug *p* to test ring of switch *d* would hear the busy click in her telephone due to current from test battery *m*. I will trace this supposed test circuit from battery *m*. Beginning at ground the circuit would extend through battery *m*, through winding *k* to strand of cord connecting with sleeve of plug *h*. Sleeve of plug *h* being connected with test piece of switch *b* the circuit of battery would be completed to limb a^2 of circuit *a* and thence also to test piece of switch *d* to which the tip of plug *p* is supposed to be applied. From the tip of plug *p* the circuit would be completed through the strand connecting with said tip as shown to spring *r* of the operator's switch *o* and thence the cam lever being up through the telephone and thence to ground. A dummy telephone set *s* is shown connected between the contact of spring *r'* and the ground branch of said operator's outfit for the purpose of balancing the two sides of the circuit. Thus if any line is busy when a test is made at another board battery current will be found present and will cause the characteristic click or sound in the telephone of the operator making the test.

It will be seen that each of the coils of the clearing out annunciator will be connected in a branch from a different side of the metallic circuit so that the proper balance between the two circuits will be preserved while either of two connected subscribers may by turning his generator operate the clearing out annunciator. Thus, supposing subscriber at station 1 to operate his generator, the current would find circuit over lines a' a^2, to the exchange, and thereat to the tip and sleeve strands, respectively, of plug *p*, and then through the respective windings of the clearing-out annunciator to earth.

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

1. The combination with the pair of loop plugs and cords of a branch from that strand of said cords connecting the sleeves thereof, said branch extending through a winding of the clearing out annunciator and a battery to ground.

2. The combination with the clearing out annunciator of two windings placed thereon, a pair of loop, plugs and cords connecting like parts thereof one of said windings being connected in a circuit branched from the strand of the cord connecting the sleeves and through a test battery to ground, the other winding being connected in a branch from the cord connecting the tips of the plugs and directly to ground and the switches connected with the subscribers' lines, whereby the lines may be connected together and a test provided without disturbing the electrical balance of the lines.

3. The combination with a clearing out annunciator, of a pair of loop plugs and their cords and branch connections from the different strands of said cords, each branch including a different winding of said annunciator and extending to ground, a battery being connected with that branch which extends

from the strand connecting together the sleeves of said plugs, substantially as and for the purpose specified.

4. The combination with a metallic circuit telephone line, of the generator of the subscriber included therein and the clearing out annunciator at the central office provided with two windings each connected in a ground branch from different sides of said metallic circuit, whereby the subscriber may operate said clearing out annunciator, substantially as and for the purpose specified.

In witness whereof I hereunto subscribe my name this 20th day of June, A. D. 1890.

CHARLES E. SCRIBNER.

Witnesses:
ELLA EDLER,
GEORGE P. BARTON.