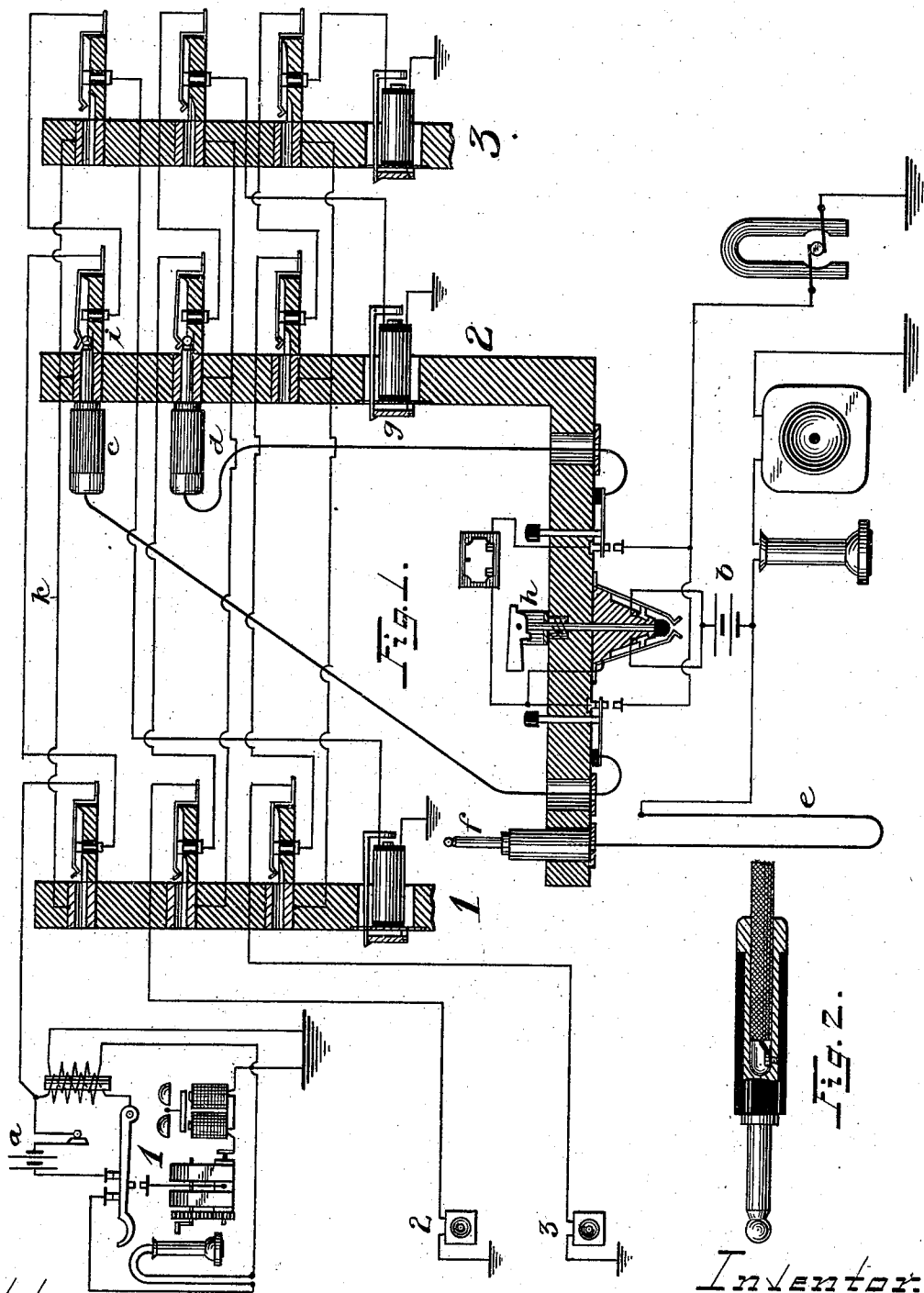


(No Model.)

C. E. SCRIBNER.
TELEPHONE EXCHANGE TESTING APPARATUS.

No. 504,250.

Patented Aug. 29, 1893.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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

TELEPHONE-EXCHANGE TESTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 504,250, dated August 29, 1893.

Application filed June 1, 1889. Renewed December 13, 1892. Serial No. 455,012. (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 Telephone-Exchange Testing Apparatus, (Case No. 207,) 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 apparatus and its object is to provide for testing at one board to determine whether a line wanted is in use at any other board while the same operator's telephone may be used when desired to listen out or to determine whether any pair of subscribers who have been connected have hung up their telephones.

My invention consists in the arrangement of the circuits of the subscriber's telephone outfit to include the subscriber's telephone battery in the circuit of the line when the telephone is off the hook while the same battery also serves to operate the transmitter and induction coil of the subscriber's set.

My invention further consists in the arrangement of the circuits of the switchboard key-table including the operator's telephone outfit whereby an operator may test at any of the test rings by means of her own test battery to determine whether any line is in use or test at any plug in the circuit of two connected subscribers independently of her test battery to determine whether the subscribers have hung their telephones upon the hook; the operator is thus enabled by listening at her telephone and manipulating the proper apparatus to determine whether a line is connected at another board and also whether two subscribers who have been connected have hung up their telephones.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a diagram showing three grounded telephone lines connected each with a different switch on each of three multiple switchboards and each through its individual annunciator to ground, a subscriber's outfit being shown in detail at one of the subscriber's

station and the operator's outfit at one of the switchboards. Fig. 2 is a sectional view of one of the connecting plugs.

The subscriber's outfit at station 1 consists of the usual telephone signal bell transmitter, the local battery *a*, however, being connected in derived circuit with the main line so that in addition to its ordinary work of furnishing current for the transmitter and primary of the induction coil it sends current at the same time over the main line whenever the telephone is removed from the switch as shown at said station 1.

All the local batteries of the subscribers' stations are arranged to send current over the telephone lines thereof to the central office in the same direction. I have shown the zinc pole connected to line toward the central office.

As shown at board 2 the operator is provided with a telephone and transmitter and a battery *b* in a normally open circuit, this battery having its copper pole toward the connecting plugs *c d*. When, therefore, the test battery *b* is closed to any line having its local battery *a* closed to line the two batteries will be in a direction to reinforce one another and this is one object of having the local batteries *a* of all the stations connected in the same direction with reference to their lines respectively.

Between the test battery *b* and the telephone I have connected a flexible branch or cord *e* having a suitable terminal *f*; this branch being connected on the ground side of the battery *b* and hence when the said battery is open at the key *h* the telephone of the operator will not be in any wise affected by the test battery *b* when the terminal *f* is closed to ground or to a line as is done in the act of testing to determine the condition of a subscriber's line, that is, to determine whether two subscribers who were in connection have hung up their telephones.

As shown at board 2 the telephone lines of stations 1 and 2 are connected together by the plugs *c d*; these plugs are provided with metallic heel pieces so that when inserted so as to cover up the test piece of the spring jacks in which they are inserted the said test

pieces will be extended electrically so that a test may be made by making connection with the heels of the plugs. Thus suppose the lines of stations 1 and 2 have been connected for considerable time and the clearing out annunciator has not been thrown down and the operator wishes to find out whether the subscribers are through talking without interrupting any conversation that may be going on. This she does by means of the extra test plug *f*; this plug *f* being applied to the heel of plug *c* a click will be heard in the operator's telephone, this click being due to the closing of the circuit of battery *a* over the line of station 1 to the heel of plug *c* and thence through the plug *f* and cord *e* through the operator's telephone to ground. Now it is evident that if either telephone of two connected lines is off from the hook the battery current from the local battery of said station will find circuit to the test plug and thence through the telephone when the test is made at the heel of either of the two connecting plugs *c* *d*. Thus the operator by means of the test plug *f* may determine whether two connected subscribers have both hung up their telephones without cutting in to their circuit.

Either plug *c* *d* may be used in the first instance to test to determine whether a line is connected at any other board. Suppose the plugs *c* *d* resting in their sockets in the key-table and suppose a call sent in from station 2 throwing down annunciator *g* the operator at board 2 thereupon inserts one of the plugs *c* *d*, we will say plug *d*, in the spring jack switch of the line of station 2 upon board 2 as shown; the cam lever of switch *h* being thrown down the operator's telephone will be connected with station 2 and the operator may receive the order; suppose the order to be for line of station 1, the operator simply by touching the tip of plug *c* to the frame or test piece of the switch *i*, being the switch of the line of station 1, upon board 2 and listening at her telephone may determine whether the line called for is connected at any other of the boards; if the line is connected a cross will be established between the test circuit *k* and the line by the plug where the connection is made, in which case a circuit will be formed through the operator's telephone and battery *b* over the test circuit *k* and the line tested and the operator hearing the click caused in the telephone will know that the line is busy. The battery *b* is of sufficient strength in itself to cause the click in the telephone when its circuit is thus completed. If, however, the telephone of the line tested is removed from its hook battery *a* will be in the same circuit with battery *b* and the click heard in the telephone will therefore be louder. The experienced operator can therefore tell on making the test not only whether the line tested is connected at another board but also can tell by the character of the sound whether the

telephone line tested is being used in conversation, that is, whether the telephone of the line is removed from its hook. Of course it will be understood that if both telephones of two connected lines are removed from their hooks the two local batteries will be connected to send current in the same direction as battery *b*; the operator will not be able to tell whether one telephone or the other of two connected subscribers is removed from its switch; it may be one or the other, but generally will be both since both subscribers usually will hang up their telephones at the same time.

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

1. The combination with two or more lines upon two or more switch boards, each line being connected with a spring jack upon each board, of connecting plugs and cords connected with a listening key, the operator's telephone outfit, a testing battery connected intermediate of the listening key and the operator's telephone outfit, a test plug and cord connected with the operator's telephone outfit at a point between the test battery and telephone outfit, whereby a test may be made with the telephone outfit through the test battery or independent of it as may be desired.

2. In a telephone exchange system the combination with the multiple switch board system, of the subscriber's transmitter battery connected with the transmitter and in derived circuit with the subscriber's line and the operator's test battery connected in a direction to operate in conjunction with the subscriber's transmitter battery whereby the operator may determine whether a line is connected and by the same test determine whether the subscriber's telephone is removed from the hook.

3. In a multiple switch board system the operator's telephone outfit, branches through a test battery to the listening keys and to a special testing plug, subscribers' telephone outfits having their batteries in derived circuit through a transmitter set and to their respective individual lines, whereby an operator may with the same telephone outfit test to determine whether a line is connected at another board and whether the subscribers of connected lines have hung their telephones upon the hook, substantially as described.

4. The combination with a telephone line provided with a local battery closed to line in derived circuit when the telephone is removed from its hook, of spring jack connections for said line one upon each of the switch boards, a test circuit for said line connecting together the insulated frames or test pieces of said spring jack switches and a ground circuit containing a battery and telephone at each of the switch boards, said ground circuits being provided each with a terminal plug

adapted to be inserted in the spring jack
switch of the line, the battery in said circuit
at the central office, the local battery of the
line and the batteries in the said circuits at
5 the central office having their poles in the
same direction when connected to line, sub-
stantially as and for the purpose specified.

In witness whereof I hereunto subscribe my
name this 22d day of May, A. D. 1889.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
GEORGE P. BARTON.