

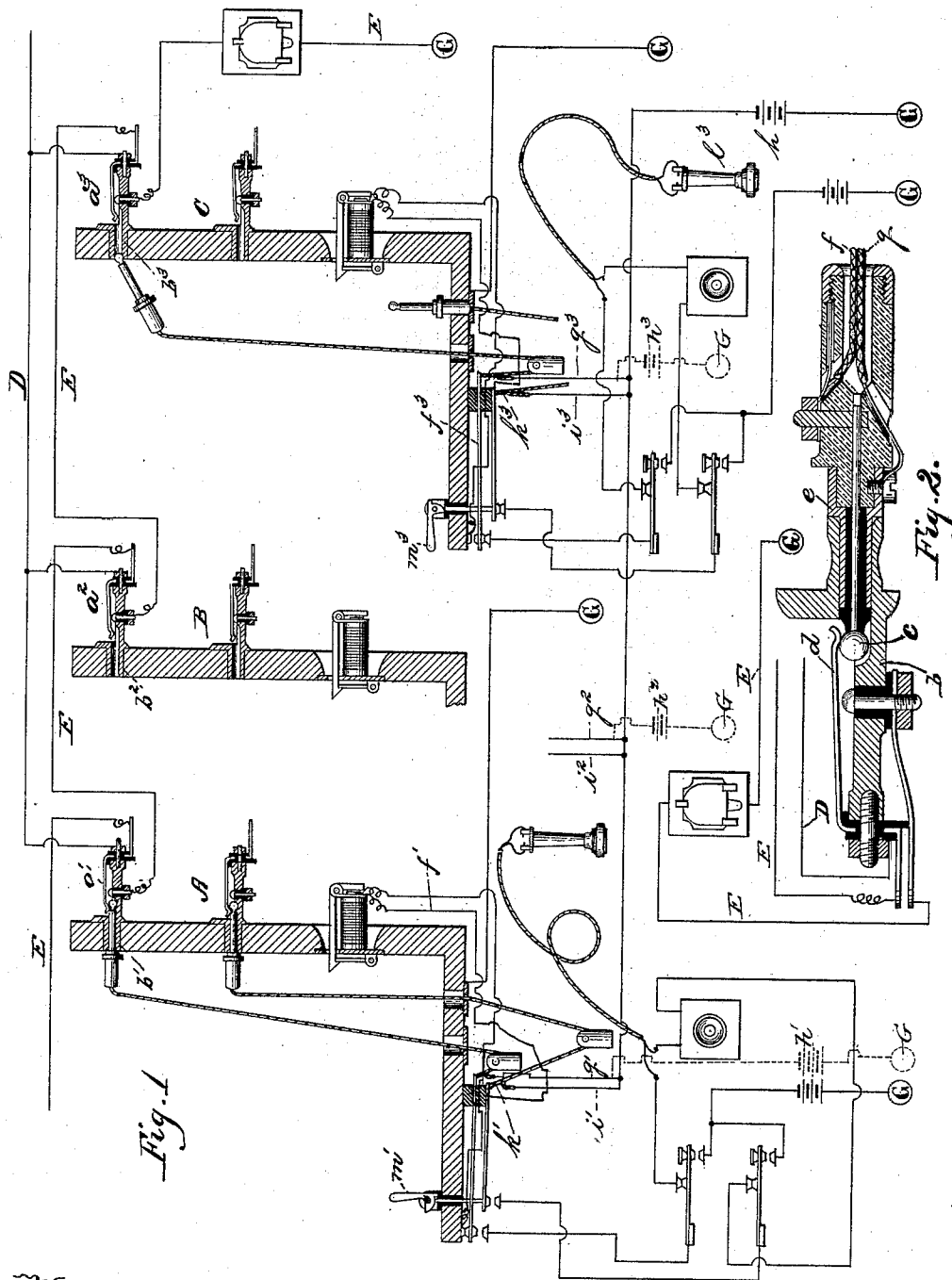
(No Model.)

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CIRCUIT FOR MULTIPLE SWITCH BOARDS.

No. 415,765.

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CIRCUIT FOR MULTIPLE SWITCH-BOARDS.

SPECIFICATION forming part of Letters Patent No. 415,765, dated November 26, 1889.

Application filed June 1, 1885. Serial No. 167,226. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. CARTY, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented a certain new and useful Improvement in Circuits for Multiple Switch-Boards, 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 testing apparatus of multiple switch-boards for determining at one board whether the line of a subscriber called for is "busy" or connected at any other board. Many different automatic electric devices have been heretofore used for this purpose, among which I would refer to the apparatus described and claimed in United States Letters Patent granted Milo G. Kellogg November 18, 1884, No. 308,315, and United States Letters Patent granted Charles E. Scribner September 9, 1884, No. 305,021.

In my system the lines may be connected with the switch-boards and the insulated frames of the spring-jacks may be provided with test-circuits, as described in said Scribner patent. I, however, avoid making the cross between a line and its test-circuit when a plug is inserted in one of the spring-jacks of the line, as is required in Scribner's testing system, and in lieu thereof I provide a local circuit including a battery which is automatically closed to the test-circuit of any given line when a plug is inserted in a spring-jack of the line upon either of the boards.

My invention will be readily understood by reference to the accompanying drawings, in which—

Figure 1 is a diagram view illustrative of my system. Fig. 2 is a detailed sectional view of a spring-jack and its connections with a plug inserted therein.

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

As shown in Fig. 1, A, B, and C represent partial sectional views of three multiple switch-boards, the connections and test-circuit D of a single line E being shown. The spring-jacks

a' , a^2 , and a^3 of said line are distributed on the different boards and their insulated frames or test-pieces b' , b^2 , and b^3 are connected together by said test-circuit connection D. Thus each of a large number of lines may be connected with the switch-boards and each provided with its test-circuit. The plug I use is shown in detail in Fig. 2. The stem c of the plug, except the point, is insulated, so that when inserted there is no electrical connection between the said stem and the insulated frame or piece b . The stem of the plug, however, makes contact with the spring d of the switch, and lifting said spring from the ground contact-point thereby switches the line from said point to the stem of the plug, as shown in Fig. 2. I provide the metallic sleeve e about the shank of the plug, said sleeve being insulated from the stem, as shown. When the plug is inserted, this metallic sleeve comes in contact with the insulated piece b . Thus on the insertion of a plug in a spring-jack the circuit of the line is changed from the ground-connection to the stem of the plug, while at the same time the insulated piece b of the spring-jack is connected to the insulated metallic sleeve e of the plug.

A flexible conducting-cord provided with two strands or conductors f and g is provided with each plug, one strand f being connected with the stem c , and the other strand g being connected with the insulated sleeve e . The strand g is connected with a local circuit, in which is placed the battery h . The strands g' , g^2 , g^3 of the cords of Fig. 1 correspond to strand g of Fig. 2, and the strands f' and f^2 of Fig. 1 correspond to strand f of Fig. 2. Each cord of the different pairs is double, one strand being in each case connected with the sleeve of its plug and also with the local circuit. Thus strands i' , i^2 , i^3 are each connected with the local circuit and with the sleeves of their respective plugs. The strands k' and k^2 are connected with the stems of their respective plugs, and may be said to correspond to strand f of Fig. 2. It will thus be seen that when a plug is inserted there is no "cross" or connection between the line E and the test-circuit D of said line. On the other hand, the said test-circuit is connected with a local cir-

cuit including a battery when either plug of a pair of cords is inserted in a spring-jack of a line upon either of the boards.

I will now describe the operation of my system. The plug inserted in a switch a' of board A makes connection between the test-circuit D and the battery h included in the local circuit. All pieces b of the switches of line E are thus connected to test-battery h . If, therefore, a test made at any board indicates that test-piece b of any given switch is connected to battery, this will be notice that the line of said switch is in use at some other board. At board C, I have shown the tip of one of a pair of plugs touching the test-piece b^3 of the switch a^3 . The switchman listening at telephone l^3 can readily determine that the battery h is in the circuit, and this will be notice that the line is in use. If the test-circuit D should be open when the plug is tapped upon the piece b^3 , the operator will hear no sound in telephone l^3 , and hence will know that the line is free. By raising cam-lever m^3 of board C to position of cam-lever m' of board A telephone l^3 will be disconnected from the circuit of the strands $f^3 k^3$.

The strand k^3 , it will be understood, is connected with the tip and metallic heel of the plug, which is shown resting in the socket at board C. This metallic heel rests upon a metallic plate which is provided with a ground-connection. Ordinarily, however, it will be found most convenient to use the plug of the pair which is provided with the grounded heel-support in making the test, the other plug of the pair having been first inserted in the switch of the calling subscriber. I have shown a single battery h provided with connections to the different pairs of cords at the different boards.

It is evident that it is immaterial whether a single battery is thus used or whether a separate battery is provided at each of the boards. I have simply found it more convenient to use a single battery. The essential feature of my invention in this regard is that the strand of each pair of cords which connects with the sleeves of the terminal plugs thereof shall be connected with a source of electricity, this source of electricity being placed in a grounded line, or in such manner that when two lines are connected together the test-pieces b of each of the switches of the two lines shall be connected with such source of electricity, so as to make the electrical condition of the said test-pieces such that the busy-test will be indicated at all the boards on forming connection with a test-piece of the line.

In order that the use of a separate source of electricity may be more readily understood, I have indicated by dotted lines a separate battery at each of the boards A B C. Thus at board A, I have indicated the battery h' , at board B the battery h^2 , and at board C the battery h^3 . It is obvious, as before stated, however, that it is more simple to

use a single battery h instead of the separate batteries h' , h^2 , and h^3 , as shown.

I claim—

1. In a telephone-exchange, the combination, with telephone-lines, each extending to two or more switch-boards, of test-circuits, one test-circuit for each line, each test-circuit extending to all the boards and being permanently insulated from its telephone-line, a source of electricity included in a grounded branch connected with the strand of each of the pairs of cords, which strand connects the sleeves of the terminal plugs thereof at each board, and switching apparatus for connecting the test-circuit of any line automatically with the local-battery circuit when connection is made with said telephone-line at either board.

2. In a telephone-exchange system, two or more switch-boards, to which the same telephone-lines are connected, test-circuits for each telephone-line permanently insulated from their telephone-lines, respectively, pairs of double-stranded cords provided with terminal plugs at the different boards, the strand connecting the sleeves of each of the pairs being connected with a source of electricity included in a grounded circuit, switching apparatus, and the operator's telephone, whereby the operator at one board may determine whether a line called for is busy.

3. The combination, with the telephone-lines and test-circuits, of spring-jack switches a , one spring-jack on each board for each line and its test-circuit, the conducting-cords provided with two insulated strands, the plugs provided each with an insulated stem c and a sleeve e , to which the different strands of the cords are respectively connected, the strand connecting the sleeves of the terminal plugs of a pair being connected with a source of electricity, whereby on making connection with any line the electrical condition of the test-circuit will be changed, and testing apparatus at the different boards adapted to determine the electrical condition of any line, substantially as and for the purposes specified.

4. The combination, with the spring-jack switches upon the multiple switch-boards of a telephone-exchange, each spring-jack being provided with an insulated portion or test-piece, to which the test-circuits D are connected, of double-pointed plugs and double-stranded conducting-cords at the different boards, the battery-circuits, and operator's telephone-outfit, whereby any two telephone-lines may be connected together upon either of the boards and a test made to determine whether any given line is busy.

In witness whereof I hereunto subscribe my name this 16th day of May, A. D. 1885.

JOHN J. CARTY.

Witnesses:

GEO. WILLIS PIERCE,
GEORGE PRESTON BARTON.