

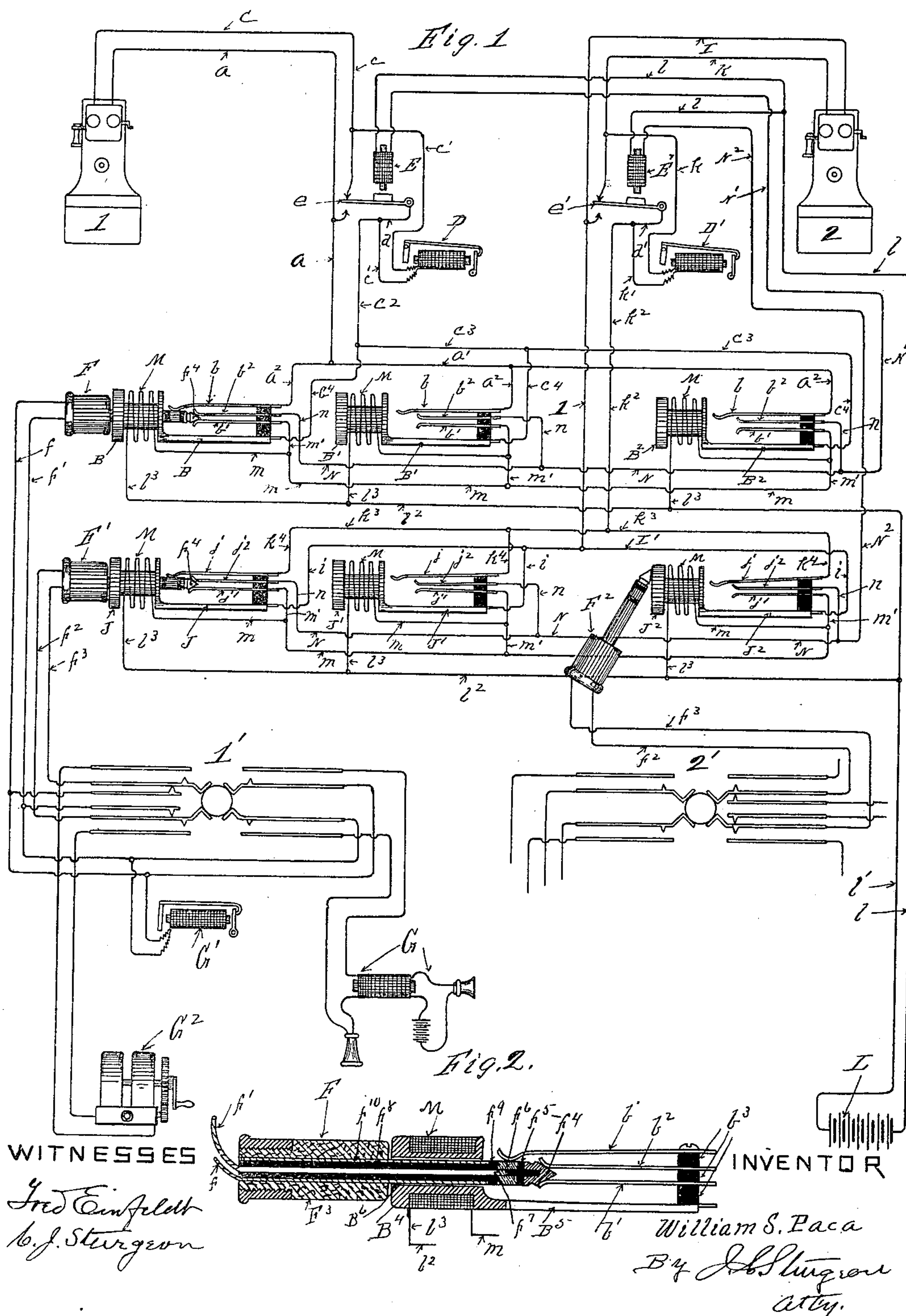
No. 663,510.

Patented Dec. 11, 1900.

W. S. PACA.
TELEPHONE SWITCHBOARD.

(Application filed Feb. 16, 1900.)

(No Model.)



UNITED STATES PATENT OFFICE.

WILLIAM S. PACA, OF ERIE, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO
PETER H. ADAMS, OF SAME PLACE.

TELEPHONE-SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 663,510, dated December 11, 1900.

Application filed February 16, 1900. Serial No. 5,462. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. PACA, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Telephone-Switchboards; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, forming a part of this specification.

My invention relates to improvements in testing apparatus for telephone-exchanges. In the multiple switchboards of telephone-exchanges the subscribers' lines are in closed connection with each section of the series forming the switchboard, the annunciators of the several lines being usually distributed in subdivisions at the different sections of the multiple switchboard, so that each operator has before her one section which embodies the drops of those lines the calls of which are assigned to her. By this arrangement each operator in response to a drop-call coming from any one of the lines in her charge may ascertain what line it is with which connection is desired, and because in this construction all of the subscribers' lines have terminals at each section of the multiple series the operator is able ordinarily by plugging in to establish a circuit at once with the terminal of the particular line called for; but as frequently happens such line may be then in use through some other section of the series unknown to her, so that if she plugs in she would interrupt a closed connection then in use. To avoid this difficulty, means whereby the operator may ascertain whether the desired line is in use without disturbing or interrupting its use is desirable. Heretofore this has been accomplished in various ways, in which the several terminals of each subscriber's line on the various sections of the series have been connected together by a normally open supplementary circuit which is so arranged that when a line is in use the branch terminals of such line on all of the sections of the series are in circuit in the

supplemental circuit of the test-battery of the telephone outfit, so that if an operator applies a switch-plug to one of the jacks forming the terminals of a line so in use an electrical impulse is conveyed through her telephone, which causes a click therein. This type of busy test is constructed in many ways and is known as the "click-signal" busy test, the construction of the mechanism and circuits of which are well understood by those skilled in telephony.

This invention has for its object the dispensing of the mechanism ordinarily used to operate the click-signal busy test, and consists, substantially, in improvements in multiple-switchboard mechanism whereby the jacks forming the terminals of the several lines on each section of the series are provided with coils connected with a local circuit, which circuit also connects with certain parts of each jack in such a manner that when any subscriber's line is in use the jacks forming the terminals of such line on all of the sections of the series are magnetized, so that any other operator desiring to find out whether such line is in use simply touches the jack connected with such line on her section with the point of a switch-plug, which if the line is in use adheres to the magnetized jack so touched, and thereby indicates to her that the desired line is in use; but if the line is not in use the jack is not magnetized, and therefore the plug does not adhere thereto, thus clearly indicating to her that the line is not in use. This construction also enables me to connect up the local test-circuit entirely independent of the subscribers' or operators' circuits of the telephone system, thus dispensing with the impedance-coils and ground connections and conductors ordinarily necessary in busy-test mechanisms as ordinarily constructed. These and other features of my invention are hereinafter fully described and explained, and illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic view of a portion of the apparatus of two sections of a multiple switchboard, illustrating my invention. Fig. 2 is an enlarged sectional view of one of the jacks and switch-plugs forming part of this invention.

In Fig. 1 the numerals 1 and 2 designate two subscribers' telephone apparatus, and the numerals 1' and 2' designate portions of the operator's apparatus at two sections of a multiple switchboard, and the drawing further illustrates telephones Nos. 1 and 2 connected up and in use while the operator of station 2' is testing to find out whether the line leading to telephone No. 2 is in use.

Referring, further, to the drawings, the line a from telephone No. 1 extends to and connects with line a' , which is connected by means of branch lines a^2 with the tongues b of the jacks B , B' , B^2 , while the line c from telephone No. 1 extends to and is connected by means of a line c' through a drop-magnet D and by one branch d with the armature e of any ordinary relay E in the usual manner, and thence by line c^2 to the line c^3 , and from thence by branch lines c^4 to the frames of the jacks B , B' , and B^2 , and from these jacks when the switch-plug F is inserted through the lines $f f'$, leading to the operator's switch mechanism 1' and to the operator's telephone set G and the ring-off drop G' and the magnet G^2 , all of which are of the usual and ordinary construction.

From telephone No. 2 the line I extends to and connects with the line I' , and thence by means of branch lines i to the frames of the jacks J , J' , J^2 , while the line K extends to and is connected by means of a line k , through a drop-magnet D' and by one branch k' , with the armature e' of an ordinary relay E' in the usual manner, and thence by line k^2 to line k^3 , and thence by branch lines k^4 to the tongues j of the jacks J , J' , J^2 , and from these jacks, when the switch-plug F' is inserted, through the lines $f^2 f^3$, leading to the operator's switch mechanism 1' in the usual manner.

The features hereinbefore described, except the arrangement of the local-battery circuit and the construction of the switch-plug, both of which will be hereinafter described, are those in ordinary use in multiple-switchboard mechanisms. The arrangement of the local battery L and the lines $l l'$ therefrom, connected with the jacks on each section of the switchboard, is as follows: One line, l , leading therefrom, extends from the battery L to and connects with the coils of the relays E and E' , while the other line, l' , leads to branch lines $l^2 l^2$, and thence by branch lines l^3 leading therefrom to one end of the coils M on the jacks B , B' , B^2 and J , J' , J^2 , the other ends of said coils connecting by lines m and branch lines m' with the springs b' and j' of the jacks B , &c., and J , &c. To the tongues b^2 and j^2 of the jacks B , &c., and J , &c., are connected lines N by means of branches n , which lines extend by means of lines N' and N^2 to and connect with the sides of the coils of the relays E and E' opposite to the connections formed by the lines l therewith. Now if a switch-plug F or F' be inserted in one of the jacks B , &c., or J , &c., so that the point f^4 of such plug contacts with the ends of the tongues b' , b^2 or j' , j^2 , a circuit

is formed from L by line l' through lines l^2 around coils M on the jacks, and thence by lines m and branches m' to jack-tongues b' or j' , thence by point or plug f^4 to tongue b^2 or j^2 , and thence by lines N and lines N' or N^2 to coil of relays E or E' , and thence by lines l to battery L , which circuit operates through the coils M on the jacks to magnetize all of the jacks forming terminals for the line connected with the jack in which the plug is inserted. Now if the operator of section 2' touches the end of one of the jacks of the line so plugged in upon with the point of her switch-plug, as illustrated by plug F^2 at jack J^2 , it will be found to be magnetized and the point of the plug F^2 will adhere thereto, showing clearly that the line connected with the jack J^2 is in use. If not in use, however, the jack will not be magnetized, and she therefore knows that the line connected therewith is not in use.

The jack and switch-plug therefor forming part of this invention are constructed (see Fig. 2) of a soft-iron spool B^4 , having an arm B^5 on one end thereof, to which are secured tongues b , b' , and b^2 . These tongues are secured to the rear end of the arm B^5 , so as to be insulated therefrom and from each other by insulating material b^3 . The spool B^4 is wound with a coil M of fine wire, so that when a current passes therethrough by the terminals l^3 and m the iron spool B^4 becomes highly magnetized. The switch-plug F used with this jack is provided with a soft-iron point f^4 , which is insulated from the remainder of the plug and adapted to form a connection between the ends of the jack-tongues b' , b^2 . Back of them are insulating material f^5 and a metallic section f^6 , adapted to engage the end of the jack-tongue b , the stem f^7 of this metallic section extending back, so as to connect with the wire f' , and surrounding this stem f^7 there is a layer of insulating material f^8 , ending in a collar of insulating material f^9 , and surrounding the insulating material f^8 is a metal shell f^{10} , adapted to contact with the walls of the opening B^6 in the jack and to the rear end of which a conducting-wire f is attached. The rear end of the plug F is also provided with a handle F^3 , of suitable material, for the convenient handling thereof by the operator. The operation of this jack and plug, together with the apparatus hereinbefore described, is believed to be so obvious that further description thereof is deemed unnecessary.

I have thus shown and described a convenient mechanism and arrangement of circuits for utilizing my invention; but I am aware that modifications, both in the construction of portions of the mechanism as well as in the arrangement of the circuits, can readily be made without departing from the spirit of my invention. Therefore I do not limit myself to the exact form and arrangement of mechanism hereinbefore described, as

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a jack for telephone-switchboards, the combination of a spool of magnetic metal, an arm extending backward therefrom, three insulated contact-tongues on said arm, one of which forms part of one side of the line-circuit, while the jack-frame forms the other, and the other two forming connections for a normally open local-battery circuit, a coil surrounding said spool and connected with said tongues in said normally open local-battery circuit, which contacts are adapted to be closed by means of a switch-plug, both as to the line-circuit, and the local-battery circuit, substantially as and for the purpose set forth.

2. In a jack and switch-plug for telephone-switchboards, the combination of a spool of magnetic metal, having an arm on the rear end thereof, contact-tongues secured to said arm and insulated therefrom and from each

other, a coil around said spool and connected up in open circuit with a local test-battery, with a switch-plug having an insulated tip of magnetic metal adapted to connect two of the tongues on said jack, so as to close the circuit between the coil surrounding the jack and the local test-battery, a contact on said plug adapted to connect with a third tongue on said jack, and another contact insulated from the first-named contact, adapted to contact with the opening in said spool and close the main-line circuit, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM S. PACA.

Witnesses:

FRED EINFELDT,
H. J. CURTZE.