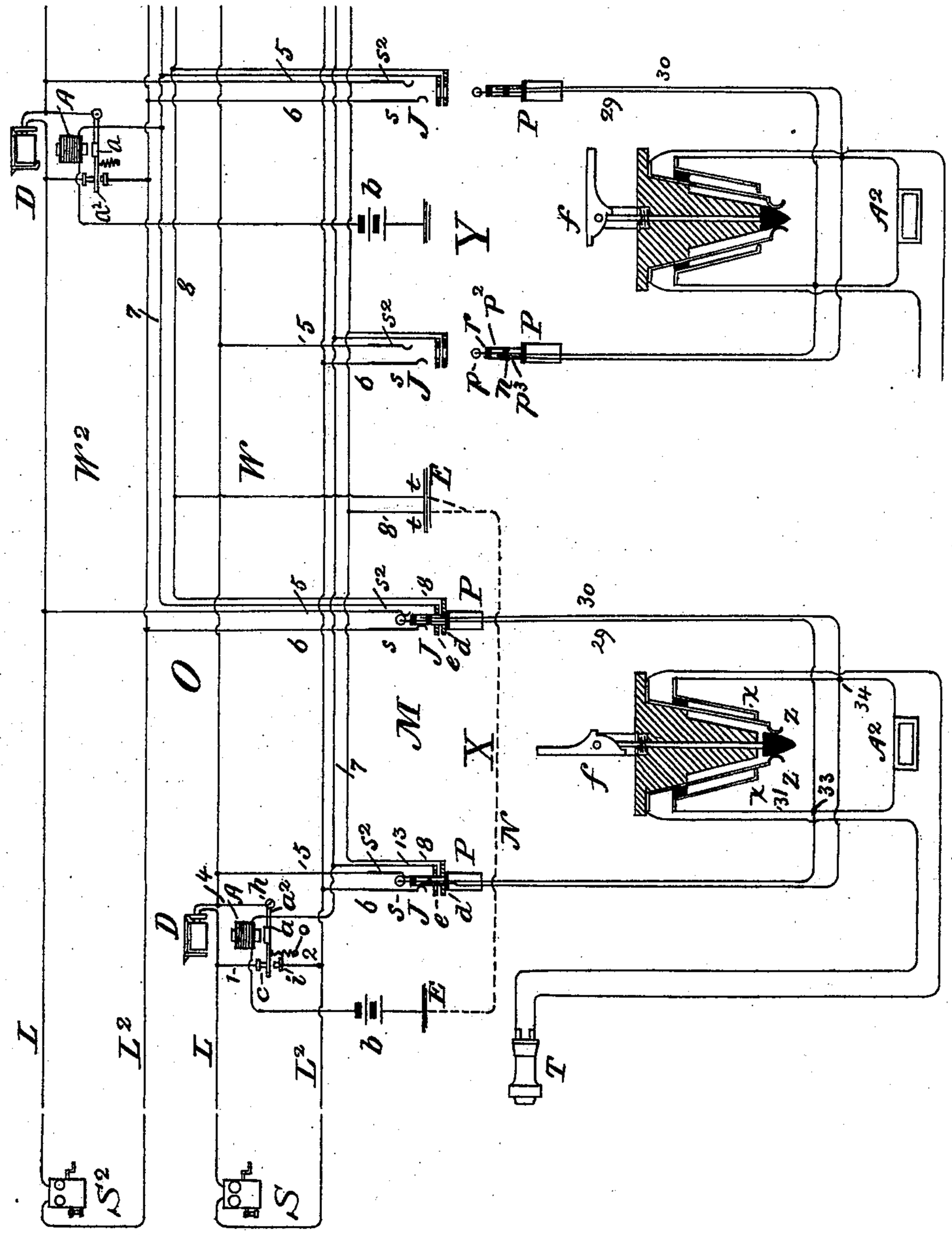
(No Model.)

G. TAINTOR.

ANNUNCIATOR CONNECTION FOR MULTIPLE SWITCHBOARDS.

No. 539,099. Patented May 14, 1895.



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ANNUNCIATOR CONNECTION FOR MULTIPLE SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 539,099, dated May 14, 1895.

Application filed April 11, 1892. Renewed March 13, 1893. Serial No. 465,729. (No model.)

To all whom it may concern:

Be it known that I, GILES TAINTOR, residing at Keene, in the county of Cheshire and State of New Hampshire, have invented certain Improvements in Annunciator Connections for Multiple Switchboards, of which the following is a specification.

Multiple switchboards for telephone exchange central stations are of two general classes, namely: First, those of which the form shown in Letters Patent of the United States No. 305,021, granted September 9, 1884, to Charles E. Scribner, is a type, in which the main circuits pass to the several switchboard sections in successive loops and then to a suitable calling device. On each switchboard section of this class the loop terminals of the several circuits are each provided with a plug socket or other attachment, including separable spring contacts, whereby on the insertion of a plug connector the circuit may be broken, cutting off its normal route through the call instrument and connecting the outgoing end or ends with a new path or paths through a conductor or conductors (according to whether the circuit is earth completed or metallic) leading from the said plug to any other such circuit similarly arranged for the purpose of interconnection. Second, those of the type illustrated and described in Letters Patent of the United States No. 252,576, granted to Leroy B. Firman January 17, 1882, in which the main circuits pass to the several switchboard sections by independent normally discontinuous branches, which are represented on the said sections by terminals in the form of plug sockets or similar connections of a simple character in which separable spring contacts are not required, whereby any two such circuits may be united through any suitable conductor, such as a flexible conducting cord provided with a plug connector at both ends.

My present invention relates to multiple switchboards of the latter class. Switchboards of this class have heretofore not largely been used, for the reason that when the several main circuits connected therewith have been worked in connection with call annunciators (they being simply branched to the switch sections) no simple plan has presented itself whereby the insertion of a connecting plug for the purpose of making connection between two lines has been enabled also to effectuate the breaking of the original route of the circuit through the call receiving device, which, if unbroken, would ordinarily constitute a shunt or derived circuit to the through talking circuit, introducing several features decidedly objectionable in practice and materially interfering with the efficient operation of the circuits; such for example as dropping the annunciator of a line wanted at the answering switch section of said line in sending a call to the sub station connected therewith; a partial short circuiting of the voice currents through the call device or normal circuit route of both of two connected lines; and finally, the reception of a disconnecting signal not only by the disconnecting annunciator at the point where any two lines were connected, but also by the original call indicating devices of both lines concerned, and the consequent misunderstanding which such a multiplication of signals would involve. These difficulties have usually been avoided, where switchboards of this class have been employed, by adopting the expedient of the Firman patent, to which reference has been made, which is to dispense altogether with a call device included in the working circuits, thus enabling such circuits to remain normally open and to send the calls over a distinct circuit.

More recently it has been proposed to leave unbroken the normal circuit through the call annunciator, permitting the said circuit to remain as a derived circuit of the main line; and to prevent the display by the said annunciator of underived signals by employing for the regular signal receiving annunciators or call indicators electro magnets of relatively high resistance and self induction and for the disconnecting or "clearing-out" annunciator magnets of relatively low resistance, or by the adoption of other and similar expedients which I do not deem it necessary to mention. I consider it however as being preferable in many respects, to sever the normal connections of the circuit so that no more derivations shall exist between the direct and

return conductors thereof during the transmission of conversation than are absolutely necessary; and also to avoid the necessity of specially constructed annunciators.

The object then of my present invention is to dispense with the permanently closed annunciator derived circuit and thereby to avoid the necessity of special arrangements for the prevention of undesired signals; to provide a convenient means for opening the normal calling circuit by the act of answering a call or making a connection with another line; and to accomplish these results practically without introducing delicate contacts into the talking circuit. Some of these results are attained by the invention described by Patent No. 239,557, granted March 29, 1881, to John I. Sabin, for an electrical switchboard, my present invention being a modification and specific improvement thereof.

For the accomplishment of these results my invention comprises a main circuit; the call annunciator magnet connected directly in one side thereof instead of placing it in a branch between the two main conductors; a circuit changer which normally or when the line is at liberty maintains a short circuit between the said two main conductors but which has an alternative position when the circuit is busy in which the said main conductors are separated and the call annunciator short circuited or shunted, and means for automatically actuating the said circuit changer upon the insertion of the plug connector in any springjack or plug socket of the circuit.

It further consists in combining a call annunciator of ordinary construction placed directly in one side of conductor of the main circuit, with a normally open shunt circuit round its electro magnet; a normally closed low resistance branch uniting the two conductors of the circuit, a circuit changing conductor controlled by an electro magnet in a local circuit including a battery or other generator and arranged to close either the said shunt circuit, or the said low resistance branch according to its position, and in closing one of these to open the other; and a circuit closer of said local circuit so constructed and placed with respect to the switch board plug sockets of the main circuit, that it shall be operated by the insertion of a suitable plug connector in such socket.

It consists further in certain details of construction and arrangement more fully hereinafter described and set forth in the several clauses of claim.

The drawing which accompanies and forms a part of this specification is a diagram of the connections of a branch terminal multiple switchboard utilizing my invention.

For facility of illustration I have shown the connections of but two circuits, and but one plug and cord connector at each switch board section.

W and W^2 are two metallic telephone circuits extending from two terminal sub-stations S and S^2, respectively, to a central station O, where for the purpose of facilitating interconnection with one another and with other circuits entering the said central station, they are connected with a multiple switchboard M, branching to the several sections X, Y, &c., thereof, by normally discontinuous conductors 5 and 6, terminating respectively in contact springs s^2 and s, which are insulated from each other in any suitable way. These spring contacts are mounted within spring jacks or plug sockets J, adapted for the reception of plug connectors, by means of which any main circuit may be united at the central station with any other; and the said sockets are provided with suitable ring or bar contact pieces e d arranged in close proximity to but insulated from each other, one of these, d, being the terminal of an earth wire or connection 8; and the other, e, being the terminal of a branch conductor 13 leading from the main conductor 7 of a battery or other generator b which has its other pole grounded. An electro magnet A is included in the circuit of the said main conductor 7, at such a point that when a connection leading from an earth wire or from the grounded pole of said generator is brought into contact with any of the plug socket contact pieces e of a given line so as to close the circuit of said generator, the current will pass through the coils of the magnet A and will excite the same. The adjacent contact piece d constituting such a connection, it is evident that if the two contact pieces e and d are united electrically, the magnet A connected with e will be operated; and it is also evident that a wire indicated by the broken line N may, if desired, unite the earth pole of the generator b and the terminals t t of the wires 8; in which case the earth connections of both may be dispensed with.

At each switch board section are placed a number of pairs of plug connectors, which, with their flexible conductors 29 and 30 are adapted to unite any two lines as shown at X when placed in the sockets of such lines. Each plug P is a complex organization. It has a bulbous conducting tip p, which when the plug is placed in the socket makes contact with the contact spring s^2, and thereby is brought into connection with the conductor L of the main circuit. The two tips p of a pair of plugs P are united by a flexible conductor 29. The plug P also has a forward sleeve conducting surface p^2 insulated from the central conductor and tip by a non-conducting bushing r, and adapted upon the insertion of the plug in its socket to register with the contact spring s and thereby with the line conductor L^2; and the sleeve surfaces p^2 of each pair are united by a flexible conductor 30. The plug is likewise provided with a rear sleeve conducting surface p^3 insulated from the other plug conductors by the non-conducting bushing n, or in any suitable way; but which has no linear conductor leading from it. The

sole function of this conducting sleeve is to electrically unite the two rings or surfaces *e* and *d* of the plug socket when the plug is inserted therein; it being brought then into resting contact with both; as shown by the plugs of section X which are in place. When the plugs of a pair are inserted in the sockets of two circuits, as shown, it is evident that by reason of the contact made by the springs *s* and s^2 of the said lines upon the tip and front sleeve conductors of the plugs which are united as described, the said two circuits are formed into one compound circuit between the two substations S and S^2; and not only so, but that the local circuit of the generator *b* leading through the circuit changing magnets A of the lines concerned, which was normally open between the metal rings or bars *e* and *d* is now closed by the contact of the rear conducting plug sleeve p^3 with both.

With each cord conductor is associated a cam loop key *f* controlling the connection of the operator's telephone T, which by altering the position of the key can be connected with or disconnected from any particular pair of cord conductors. This is arranged by providing the conductors 9 and 10 of the telephone loop with terminal springs *z* in each loop key, these having their movable ends close to companion springs *x*, one of which branches by wire 31 from the point 33 on the link conductor 29, while the other branches by wire 32 from the point 34 from the link conductor 30; and by this arrangement the telephone is bridged between the two conductors of a circuit when the cam key is turned down. In the same way, a disconnecting annunciator A^2 is also bridged, albeit permanently between the cord conductors 29 and 30. The call or line annunciator D, which may be of any desired construction, that for example which is known as the standard "tubular drop" is not included in a bridge between the mains parallel to the connecting branches of its circuit, but as shown, is included directly in the circuit of one of the mains, say L.

The circuit controlling magnet A, which has been mentioned, is located in any convenient position and has an armature *a* and a lever a^2 therefor, hung by one end in pivots, or on an arbor *h* in the ordinary manner. This armature lever works between two limiting contact stops, viz., a back contact *i* united by wire 2 with the main conductor L^2; and a front contact *c* united by wire 1 with the main conductor L on one side of the electro magnet of the call annunciator. The lever a^2 is itself connected by the wire 4 with the main L on the other side of the annunciator magnet. The condition of the said magnet with respect to the main circuit, and also the arrangement of the said main circuit itself is thus determined by the position of the armature lever a^2, which is, in fact, a circuit changer. When the main circuit is not in use, the said circuit changing lever either by its own weight, or by its weight reinforced by a counter spring *o*, rests on its back contact *i*, in which event the two main conductors of the circuit L and L^2 are united by a closed low resistance branch including the wire 2, contact *i*, circuit changing lever a^2, and wire 4; but when the line is busy, the plug P having been inserted in any of its spring jacks or sockets J, and the local circuit of the generator *b* having thereby been closed through the electro magnet A, the circuit changer a^2 is attracted forward, leaves its back contact *i* and thereby breaks the normal low resistance branch, and making contact with the front stop *c* closes the normally open shunt circuit around the annunciator magnet D, thus cutting its resistance and retardation out of the talking circuit and also establishing a more perfect balance between the two sides of such circuit. Upon the withdrawal of the plug P from its socket the excitement of the magnet A ceases, its armature falls back, the shunt circuit is again opened and the short branch between the lines is again established; the normal condition of the apparatus and circuits being thus automatically restored.

Although two local batteries *b* and two earth returns together with two sets of local and branch conductors 7 and 8 are shown herein, it will be evident to those skilled in the art that a single battery, a single pair of main conductors for the circuit thereof, and a single earth terminal would practically be an equivalent construction.

I claim as my invention—

1. In a multiple switch board apparatus, the combination substantially as hereinbefore described, of a main circuit represented on two or more switch board sections by plug socket connections; connecting conductors having plug terminals for uniting the sockets of the said circuit with those of another circuit; a call annunciator connected directly in one of the two conductors of said main circuit; a circuit changer normally uniting the said two conductors to maintain a closed signaling circuit for said annunciator having an alternative position in which the said main conductors are separated, and the annunciator shunted; and means for automatically actuating the said circuit changer and for causing the same to change its position by the insertion or withdrawal of the plug connector in or from any one of the said sockets.

2. The combination of a double conductor main circuit plug and socket connectors therefor; a call annunciator of ordinary construction placed directly in one side or conductor thereof; a normally open or discontinuous shunt circuit round the electro magnet of said annunciator; a normally closed low resistance branch uniting the two conductors of the main circuit; a circuit changing conductor controlled by an electro magnet in a local circuit including a generator, arranged to close the said shunt circuit or the said low resistance branch according to its position, and

in closing one to open the other; and a circuit closer for said local circuit so constructed and placed with respect to the plug sockets of said main circuit that it shall be operated by the insertion and withdrawal of the plug in and from the said socket; whereby the movements of the circuit changing conductor are made automatic in both directions, substantially as described.

3. In a metallic circuit multiple switch board, a main circuit having connecting branches extending to plug sockets at the several switch board sections; connecting plugs united in pairs by suitable link conductors and adapted to be inserted in the said sockets; a local circuit including an electrical generator for each main, having branch terminals normally disconnected in each plug socket of said main; a contact piece mounted on the connecting plug arranged to unite the said terminals and thereby close said local circuit; an electro magnet included in said local circuit; a call annunciator connected directly in one of the main conductors of the main circuit; a circuit changing lever mounted on the armature of the said electro magnet and controlled thereby; a branch conductor of low resistance extending between the two conductors of the main circuit and normally closed to unite said conductors through said lever and a normally open shunt circuit round said annunciator, adapted to be automatically closed through the said lever upon the insertion of a plug connector in its socket and opened on the withdrawal of the same, substantially as described.

4. The combination with a telephone circuit, of an annunciator included in series in said circuit, a normally open short circuit about said annunciator, and means for closing said short circuit by the act of making connection with the line, substantially as described.

5. The combination with a telephone circuit, of a normally closed cross-connection between the sides thereof at the central station, an annunciator included in series in one side of said circuit and located between said cross connection and the sub-station, a normally open short circuit about said annunciator, and means for opening said cross-connection and closing said short circuit by the act of making connection with the line, substantially as described.

6. The combination with the two sides of a telephone line extending from the subscriber's station to the central station, of switches at the several sections of a multiple switch board, each of said switches comprising a pair of normally disconnected contact terminals connected respectively with the two sides of the line, an annunciator connected in series in one side of said line and located between the subscriber's station and the point of connection of the last switch with the side of the line containing the annunciator, an electro-magnetic device included with a source of electricity in a local circuit adapted to be closed by the operation of connecting with the line, and mechanism in connection with said electro-magnetic device for removing said annunciator from its position in series in the circuit when said electro-magnetic device is energized, substantially as described.

7. The combination with the two sides of a telephone line extending from the subscriber's station to the central station, of switches at the several sections of a multiple switch board, each of said switches comprising a pair of normally disconnected contact terminals connected respectively with the two sides of the line, an annunciator connected in series in one side of said line and located between the subscriber's station and the point of connection of the last switch with the side of the line containing the annunciator, and means for removing said annunciator from its position in series in the circuit by the act of making connection with the line, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 4th day of April, 1892.

GILES TAINTOR.

Witnesses:
GEO. WILLIS PIERCE,
JOSEPH A. GATELY.