

Dec. 13, 1938.

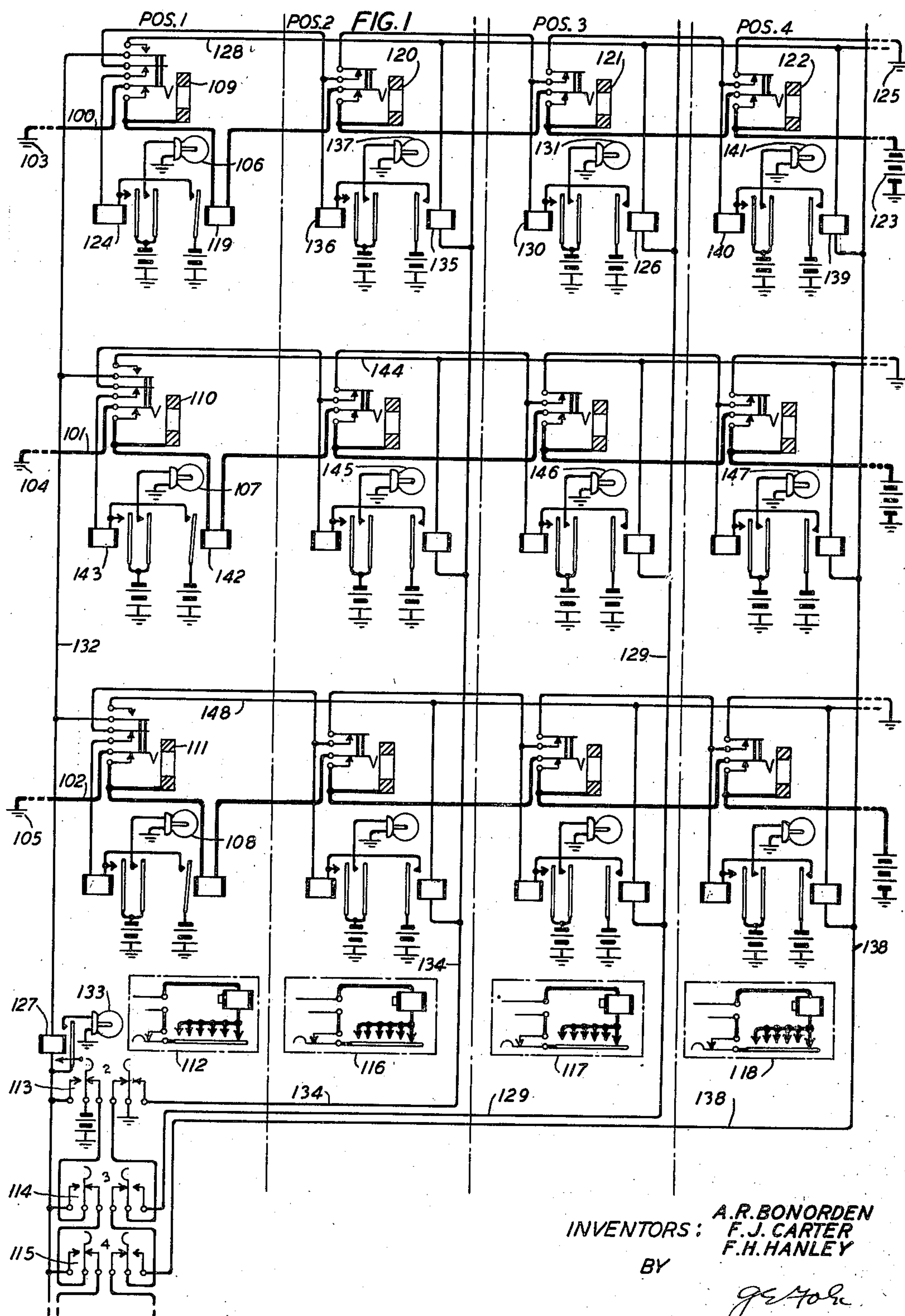
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2,139,798

TELEGRAPH SWITCHBOARD SWITCHING SYSTEM

Filed Aug. 26, 1936

2 Sheets-Sheet 1



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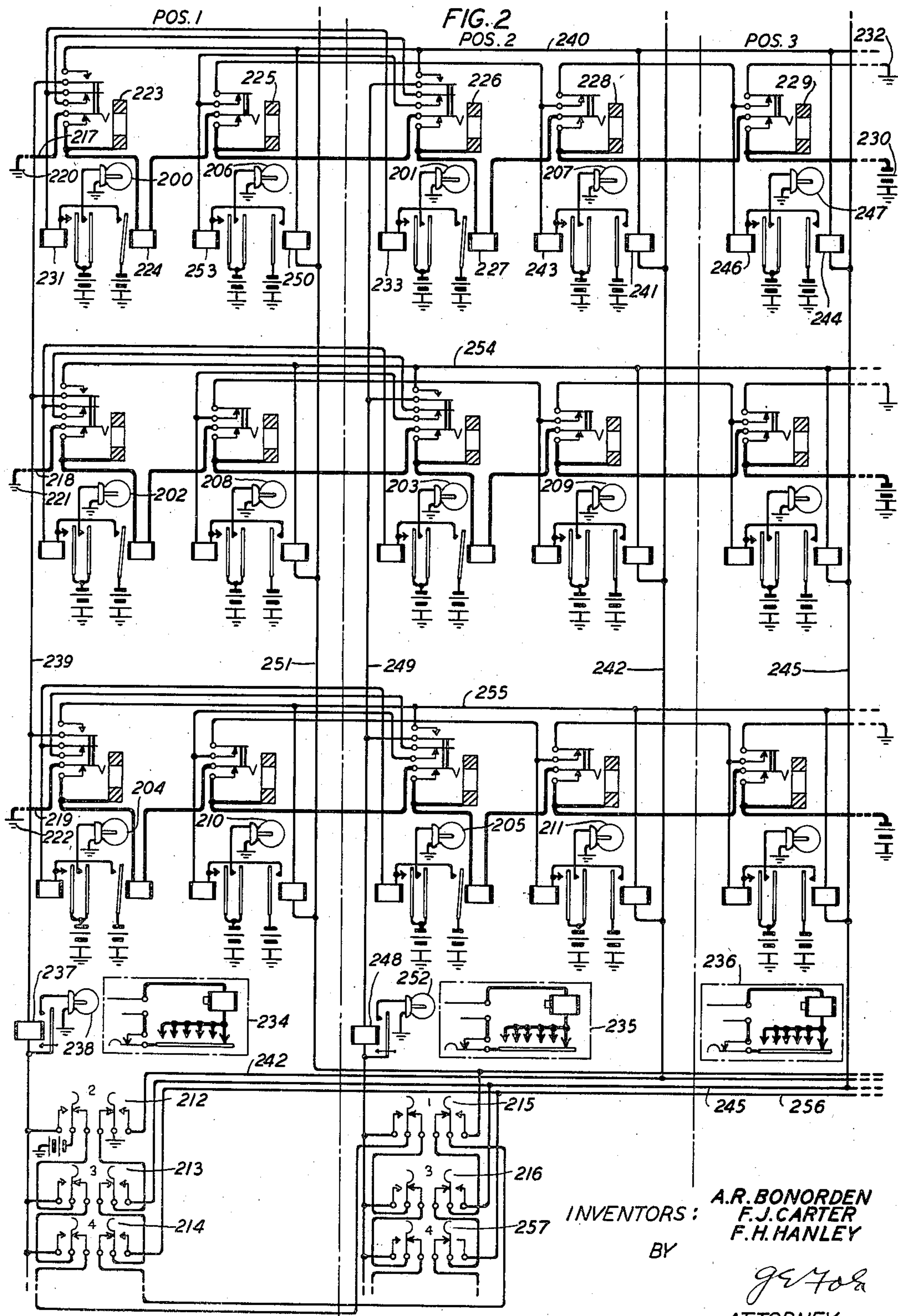
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2,139,798

TELEGRAPH SWITCHBOARD SWITCHING SYSTEM

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Application August 26, 1936, Serial No. 98,054

5 Claims. (Cl. 178—2)

This invention relates to telegraph systems and more particularly to supervising and maintaining private wire telegraph service over intercity telegraph trunk circuits between test board attendants located in different cities.

An object of the invention is to permit an attendant at a telegraph switchboard in one locality to be connected with any one of a plurality of attendants at a switchboard in a different locality.

It is essential in test board operation in a telegraph system for the attendant in two localities, having charge of a particular service at their respective switchboards, to obtain direct communication with each other and consequently it is desirable to have an arrangement which will facilitate certain direct communication or permit of an incoming call being rapidly transferred to an attendant responsible for a particular service. In both toll and telephone practice the transfer of calls received over certain trunks or lines is possible to a very limited extent, that is, the facilities at present permit the transfer to one, or at the most, two points in the office.

According to the present invention, the facilities permit each position in a line of test boards to become a potential transfer point and in the larger offices these facilities extend to arrangements for transferring a call to any one of two or more positions. In other words, an attendant at a multi-position switchboard may upon receiving an incoming call over an intercity telegraph communication trunk, transfer the incoming call signal to any particular one of a plurality of trunk lamps, each of which is located at a different position in the switchboard.

A more complete understanding of the invention may be obtained from the following description when read in connection with the accompanying drawings in which:

Figure 1 shows line circuit equipment of a multiposition switchboard or test board arranged according to this invention and provided with one primary answering position and a plurality of secondary answering positions.

Fig. 2 shows line circuit equipment of a multiposition switchboard or test board arranged according to this invention, with two primary answering positions and with provision for a plurality of secondary answering positions.

Referring to Fig. 1, at position 1 are terminated three inter-city telegraph communication trunks, 100, 101, and 102, which may extend from another switchboard at some distant city, at which switchboard they may connect with apparatus similar to that of Fig. 1 and terminate respectively, at grounds 103, 104 and 105. Actually, these trunks terminate at terminating telegraph repeaters in the same office, the line side of each repeater extends to a like repeater in

the distant city. However, for the purpose of reducing the disclosure of the invention to its simplest form the repeaters are omitted. Associated with the trunks are primary answering lamps 106, 107 and 108 and associated jacks 109, 110 and 111 located at primary position 1. To enable the attendant at position 1 to respond to a lighted answering lamp a teletypewriter or manual telegraph, cord circuit, represented by the abbreviated circuit schematic enclosed in the box 112 is provided. Secondary answering positions 2, 3 and 4 are also shown, to each of which positions the attendant at position 1 may selectively transfer an incoming call, when such transfer is required by the operation of key 113, 114 or 115, which effects the lighting of the secondary answering lamp at the called positions 2, 3 and 4, respectively. The attendants at the secondary positions are also provided with teletypewriter, or manual telegraph, cord circuits 116, 117 and 118.

A detailed description of the operation of the arrangement of Fig. 1 will now be given. Let it be assumed that an attendant at a distant city desires to communicate over trunk 100 with an attendant at one of the positions of the switchboard, the circuits of which are shown by Fig. 1. To initiate the call, the distant attendant will cause, in some suitable manner, ground 103 to be momentarily disconnected from trunk 100. This may be done by momentarily operating the break key of a teletypewriter circuit, after plugging into the line jack with a teletypewriter cord circuit, or some other suitable method of obtaining a momentary circuit opening may be used. Normally a circuit is closed from ground 103 over line conductor 100, through lowermost contacts of primary answering jack 109, through winding of primary line relay 119, lower contacts of secondary answering jacks 120, 121, 122 and of other similar jacks, not shown, the omission of which are indicated by broken lines, to the grounded battery 123. In response to this momentary opening the normally operated relay 119 releases, and closes a circuit from battery through the winding of relay 124, middle normally closed contacts of jack 109, upper normally closed contacts of jacks 120, 121, 122 and other jacks not shown, to ground 125. Relay 124 operates and locks to battery with its inner contacts, and with its outer contacts closes an obvious circuit through line lamp 106, which is lighted. When the circuit of trunk 100 is closed again after its momentary opening, relay 119 reoperates. In response to the lighted line lamp 106, the attendant of position 1 inserts the plug of teletypewriter cord circuit 112 into jack 109 operating the middle contact of jack 109 and opening the circuit through the winding of relay 124, which releases, extinguishing lamp 106. Plugging into jack 109

also opens its lowermost contacts and effects the series insertion into trunk 100 of the teletypewriter cord circuit 112. The attendant of position 1 is now in telegraphic communication with the distant attendant who initiated the call and is requested to transfer the call to some secondary position, position 3, for instance, and in order to effect this transfer operates momentarily transfer key 114, assigned for transfers to position 3. Transfer key 14 is held operated until lamp 133 lights as hereinafter described, causing thereby the operation of secondary line relay 126 in a circuit traced from battery through the left inner contacts of key 113, left outer contacts of key 114, winding of relay 127, over vertical conductor 132, through uppermost operated contacts of jack 109, over conductor 128, through winding of relay 126, over conductor 129, through right operated outer contacts of key 114, to ground on the right inner contacts of key 113. Relay 126 in operating closes a circuit from battery through the winding of relay 130, upper contacts of jacks 121, 122 and jacks, not shown, of succeeding positions to ground 125. Relay 130 operates and locks to battery with its inner contacts and with its outer contacts closes an obvious circuit to ground through secondary line lamp 131, which lights. Simultaneously with relay 126, relay 127 operates, and lights pilot lamp 133 through an obvious circuit, thereby indicating to the attendant of position 1 that the circuit through the winding of relay 126 has been satisfactorily closed, that now transfer key 114 may be released and plug of cord circuit 112 removed from jack 109, releasing thereby relay 127 and extinguishing lamp 133. The attendant of position 3 now inserts into secondary answering jack 121, the plug of positional teletypewriter cord circuit 117, thereby releasing relay 130, by opening its circuit through the upper contacts of jack 121, before traced. Plugging in with cord circuit 117, effects the insertion of the cord circuit conductors in series with the line and the attendant of position 3 can now communicate telegraphically with the originating distant attendant. When the plugs of cord circuits 112 and 117 are withdrawn from jacks 109 and 121 there is no momentary opening of the transmission circuit, since the jacks are arranged so that the normal connection between the tip and sleeve conductors is established before either the tip or sleeve conductors are disconnected from the corresponding conductors of the withdrawing plug.

If the attendant at position 1 should be informed that a connection with position 2 is desired, then transfer key 113 would be operated, thereby connecting battery with its left contacts through the winding of relay 127 to conductor 132, and with its right contacts ground to conductor 134. Secondary line relay 135 accordingly operates over conductor 128, through the uppermost contacts of jack 109, and in turn operates relay 136, through the upper normal closed contacts of jacks 120, 121, 122 and succeeding jacks to ground 125. Relay 136 locks to battery through its inner contacts, and through its outer contacts lights lamp 137 at position 2. If the attendant at position 1 should be requested to transfer the call to position 4, then transfer key 115 should be operated, which would extend battery through the left back contacts of key 113, the left inner contacts of key 114 and left outer contacts of key 115 and the winding of relay 127 to conductor 132. The ground normally connected to the right inner contacts of key 113

would be extended to conductor 138, through the right inner contacts of key 114 and right outer contacts of key 115. The apparatus at position 4, associated with trunk 100, would now function in the manner before described for the other positions—relay 139 operating, and in turn operating relay 140, which locks up and in turn lights lamp 141. In a similar manner, incoming calls over trunk 100 would be transferred to additional positions, not shown, by means of additional transfer keys, similar to keys 113, 114, 115 which may be connected in the same manner as keys 113, 114, 115 are connected.

In the herein before given description, the operation of the invention for calls incoming over trunk 100 has been discussed. The invention functions in a similar manner for the other trunks. Assume that the distant attendant calls over trunk 101, causing thereby the momentary release of relay 142, the locking up of relay 143, and the lighting of line lamp 107. When the attendant of position 1 plugs into jack 110, releasing relay 143 and extinguishing lamp 107, conductor 132 is connected by the uppermost contacts of jack 110 to conductor 144. When one of the transfer keys, 113, 114 or 115, is operated battery is connected to conductor 132 through the winding of relay 127, and ground to conductors 134, 129, or 138, respectively, causing thereby the lighting of the secondary line lamp, 145, 146 or 147, respectively. The invention functions in a similar manner for a call incoming over trunk 102. In general, it will be noted that the particular position to which an incoming call is to be transferred, is identified by the connection of ground to the corresponding positional conductors, namely, 134, 129, 138 by the associated keys, 113, 114, 115, respectively, and that the calling trunk is identified by the connection of conductor 132 to conductors 128, 144, 148 by the uppermost contacts of associated jacks 109, 110, 111, respectively.

Referring now to the other arrangement of the invention, Fig. 2 is similar to Fig. 1 except for the additional feature of providing two primary answering positions, positions 1 and 2, at each of which is also provided secondary answering equipment. The primary answering lamps, 200 and 201, 202 and 203 or 204 and 205 associated respectively with trunks 217, 218 and 219 at both of these positions are lighted simultaneously on incoming calls. As soon as a call has been answered, at either position, both associated answering lamps are extinguished. The primary positions 1 and 2 are also provided with secondary answering lamps 206, 208, and 210 and 207, 209 and 211, respectively. The primary positions have sets of transfer keys, 212, 213, and 214 and 215, 216, and 217, respectively, with which an incoming call can be transferred from one primary position to the other, and from either primary position to the secondary position 3. Keys 214 and 217 may be used to transfer calls to a position 4 not shown, and illustrate how keys may be added to provide for additional secondary positions. A more complete understanding of this arrangement may be obtained from the following detailed description.

Let it be assumed now that an attendant at a distant office desires to communicate with the attendant of position 2, over the inter-city communication trunk 217. To initiate the call the distant attendant causes the momentary removal of ground 220, thereby opening the normally closed circuit which is traced from ground

220, over trunk 217, through normally closed low-
 ermost contacts of jack 223, winding of line re-
 lay 224, lower contacts of jack 225, lowermost
 contacts of jack 226, winding of line relay 227,
 5 lower contacts of jacks 228, 229 and jacks at
 higher numbered positions, not shown, to bat-
 tery 230. Relays 224 and 227 release simultane-
 ously. Relay 224 in releasing closes a circuit from
 battery through the winding of relay 231, middle
 10 normally closed contacts of jacks 223 and 226,
 and upper normally closed contacts of jacks 225,
 228, 229 and similar jacks, not shown, of higher
 numbered positions to ground 232. Relay 231
 operates and locks to battery through its inner
 15 contacts, and with its outer contacts lights line
 lamp 200 through an obvious circuit. Relay 227
 in releasing closes a circuit from battery through
 the winding of relay 233, middle normally closed
 contacts of jack 223, thence over the circuit be-
 20 fore traced for relay 231 to ground 232. Relay
 233 operates and locks to battery with its inner
 contacts and with its outer contacts closes an ob-
 vious circuit through lamp 201, which lights.

The attendants at positions 1 and 2, observing
 25 the lighted lamps 200 and 201, endeavor to an-
 swer the call and plug in, respectively, with tele-
 typewriter cord circuits 234 and 235. Let it be
 assumed that the attendant at position 1 plugs
 into jack 223, before the attendant at position 2
 30 plugs into jack 226. As soon as the normally
 closed middle contacts of jack 223 open, the cir-
 cuit before traced for relays 231 and 233 is opened.
 These relays release and extinguish lamps 200 and
 201. The attendant at position 2, observing that
 35 lamp 201 is now extinguished knows that the call
 has already been answered at position 1 and does
 not plug into jack 226. The attendant at posi-
 tion 1 is now in communication with the distant
 attendant at the originating end of trunk 217,
 40 who requests telegraphically that the call be
 transferred to position 2. This the attendant
 at position 1 now proceeds to do by operating the
 transfer key 212. A circuit is closed from battery
 through the outer left contacts of key 212, through
 45 the winding of relay 237, over conductor 239,
 through uppermost operated contacts of jack
 223, over conductor 240, through winding of relay
 241, over conductor 242, to ground on the outer
 right contacts of key 212. Relays 237 and 241
 50 operate in this circuit. Relay 237 in operating
 lights pilot lamp 238 indicating to the attendant
 at position 1 that the transfer apparatus has op-
 erated and that key 212 may now be released. Re-
 lay 241 in operating operates relay 243 in a circuit
 55 through its contacts from battery through the
 winding of relay 243, upper closed contacts of
 jacks 228, 229 and jacks of other positions, not
 shown, to ground 232. Relay 243 locks through
 its inner contacts to battery, and with its outer
 60 contacts closes an obvious circuit through lamp
 207 which lights. The attendant at position 2
 now responds with teletypewriter cord circuit 235
 by plugging into secondary answering jack 228.
 This opens the circuit of relay 243 before traced,
 65 which releases, extinguishing lamp 207. The at-
 attendant at position 2 is now in telegraphic com-
 munication with the distant attendant, since the
 conductors of cord circuit 235 are now in series
 with the line.

70 If the distant attendant should request that
 the call be transferred to the attendant of some
 secondary answering position, say position 3, then
 transfer key 213 at position 1 will be operated
 and a circuit will be closed from battery through
 75 the inner left contacts of key 212, outer left con-

tacts of key 213, winding of relay 237, over con-
 ductor 239, uppermost operated contacts of jack
 223, over conductor 240, through winding of relay
 244, over conductor 245, through outer right op-
 erated contacts of key 213, and inner right con-
 5 tacts of key 212 to ground. Relay 244 operates in
 this circuit and closes a circuit from battery
 through the winding of relay 246, upper normally
 closed contacts of jack 229 and similar contacts
 of jacks in other positions, not shown, to ground
 10 232. Relay 246 operates and locks with its inner
 contacts to battery, and closes with its outer con-
 tacts an obvious circuit to ground through lamp
 247, which is lighted.

In response to the lighted lamp the attendant
 15 of position 3 plugs into jack 229 with the associ-
 ated positional teletypewriter cord circuit 236,
 which opens the circuit through the winding of
 relay 246, which releases, extinguishing lamp 247.
 The attendant of position 3 is now in communica-
 20 tion with the distant attendant by means of cord
 circuit 236, the conductors of which were con-
 nected serially with the line when the plug of the
 cord was inserted into jack 229.

Let it be assumed that an incoming call over
 25 trunk 217 is answered at position 2, the at-
 attendant plugging into primary answering jack
 226, in response to the lighted line lamp 201, and
 that it is requested that the call be transferred
 to position 1. Key 215 is accordingly operated
 30 and closes a circuit from battery through the
 inner left contacts of keys 212, 213, 214, outer
 left contacts of key 215 and the winding of relay
 248 to conductor 249, thence through the upper-
 most contacts of jack 226 to conductor 240,
 35 through the winding of relay 250 to conductor
 251 and ground on the outer right operated con-
 tacts of key 215, which ground is extended
 through the inner right contacts of keys 212, 213
 and 214. As soon as this circuit is closed by the
 40 operation of key 215, relays 248 and 250 operate.
 Relay 248 in operating, closes an obvious circuit
 through lamp 252, which lights as an indication
 that the transfer to position 1 has been satisfac-
 torily effected. Relay 250 in operating closes a
 45 circuit from battery through the winding of relay
 253 and upper contacts of jacks 225, 228, 229
 and other jacks, not shown, to ground 232. Relay
 253 operates and locks to battery through its in-
 ner contacts and with its outer contacts closes
 50 an obvious circuit through lamp 206, which is
 lighted. The attendant at position 1, observing
 the lighted lamp 206, plugs into jack 225 which
 opens with its upper contacts the operating path
 of relay 253, which releases extinguishing lamp
 55 206. The attendant of position 1 can now com-
 municate over trunk 217 with the distant at-
 attendant. For a transfer of the call from position
 2 to position 3, key 216 is operated and the in-
 vention then functions as in the case of the call
 60 transferred from position 1 to position 3, relay 246
 and lamp 247 being lighted at position 3.

It should be pointed out that the effectiveness
 of the means provided for transferring calls is
 much increased by the method of wiring the
 65 transfer keys, so that the contacts of keys 212,
 213, 214, 215, 216 and 217 are all wired in series
 with battery and ground connected to the back
 contacts of key 212. With this arrangement if
 both attendants, at positions 1 and 2, respectively,
 70 should endeavor to transfer a call at the same
 time, the transfer would be effected by the at-
 attendant at position 1, since the operation of any
 transfer key at position 1, disconnects battery
 and ground from the keys of position 2. Under
 75

this condition, that is, while a transfer key of position 1 is operated, relay 248 cannot operate, and consequently lamp 252 does not light, thereby indicating to the attendant of position 2 that a transfer is being handled at position 1. Also to assure sufficient time for relays in series with relay 237 or 248 being properly operated relays 237 and 248 are made slow operating.

The description for Fig. 2 hereinbefore given referred to calls incoming over trunk 217. In like manner calls may be received over trunks 218 and 219, which also terminate at primary positions 1 and 2 and are arranged for transfer in the same manner as trunk 217. In general, when a trunk is to be transferred from an answering position to another position and a positional transfer key is operated, the calling trunk is identified by the connection of battery on conductor 239 or 249, to conductors 240, 254 or 255 by the uppermost contacts of the associated answering jacks and the position to which the transfer is to be made is identified by ground on conductors 251, 242, 245 or 256 connected thereto by the transfer key.

The invention has been described on the basis of calls incoming from a distant point. It will be understood, however, that the arrangement disclosed will function also for outgoing calls. The attendant at any position, primary or secondary, of Fig. 1 or Fig. 2 can originate a call by inserting the plug of a teletypewriter cord circuit into the jack at that position and then operating momentarily the break key of the teletypewriter circuit at the position whereat the call originates thereby causing terminating telegraph repeaters at each end, not shown but actually used, as stated hereinbefore, to operate and apparatus at the distant end to function and operate a line signal. This apparatus may be the same, or equivalent to that of Fig. 1 or Fig. 2, the line circuit being completed to the distant grounds, 103, 104, 105, 220, 221, 222 through the winding of line relays, similar to those of Fig. 1 and Fig. 2.

What is claimed is:

1. In a manually operated switching system, a switchboard divided into a plurality of sections, a plurality of two-way circuits for incoming and outgoing messages terminating at said switchboard and multiplied to each of the sections thereof, a primary signal lamp and a plurality of secondary signal lamps associated with each of said circuits and respectively located at said sections of said switchboard, and selecting means at each of said sections for transferring a signal displayed on the primary signal lamp at one section to a secondary signal lamp at any one of the other of said sections as desired, and a receiver at each of said sections whereby an incoming message may be received at any desired section.

2. In a manually operated switching system, a switchboard divided into a plurality of sections, a plurality of normally closed circuits terminating in said switchboard, a normally operated relay in each of said circuits and located at one of said sections, a plurality of spring jacks in each of said circuits, each of said plurality of spring jacks having an appearance in one of said sections, a signal lamp appearing in each of said sections and associated with one of said spring

jacks, means at a distant point in each of said circuits for opening said circuits and effective to cause the release of said normally operated relay, a second relay at each of said sections associated with each of said jacks and responsive to the operation of said first-mentioned relay, a locking circuit for said second-mentioned relay, an operating circuit for each of said signal lamps arranged to light its associated signal lamp simultaneously with the energization of its associated locking circuit, a cord circuit including a receiver at each of said sections for connecting said receiver to the line circuit corresponding to the lighted signal lamp, a keyset at each of said sections comprising a key for transferring the lighted signal at one section to a signal lamp at any one of the other of said sections.

3. In a manually operated switching system, a switchboard divided into a plurality of primary answering positions and into a plurality of secondary answering positions, a plurality of trunks for two-way messages terminating in said switchboard at each of said primary and each of said secondary answering positions, primary trunk signals individual to each trunk appearing at each of said primary positions, secondary trunk signals individual to each trunk appearing at each of said primary positions and also at each of said secondary positions, and means at each of said primary positions for transferring any primary trunk signal to any other of said primary positions or to any one of said secondary positions.

4. In a manually operated switching system, a switchboard divided into a plurality of primary answering positions and into a plurality of secondary answering positions, a plurality of trunks for two-way messages terminating in said switchboard at each of said primary and said secondary answering positions, primary trunk signals individual to each trunk appearing at each of said primary positions, secondary trunk signals individual to each trunk appearing at each of said primary positions and also at each of said secondary positions a positional transfer signal at each of said primary positions, transferring means associated with each primary position for transferring a trunk signal to any other primary position or to any one of the secondary positions, and means for actuating said transfer signal in response to the functioning of said transferring means.

5. In a manually operated switching system, a switchboard divided into a plurality of primary answering positions and into a plurality of secondary answering positions, a plurality of trunks for two-way messages terminating in said switchboard at each of said primary and each of said secondary answering positions, primary trunk signals individual to each trunk appearing at each of said primary positions, and also at each of said secondary positions, transferring means associated with each primary position for transferring a trunk signal to any other primary position or secondary position, and means for preventing the simultaneous use of said transferring means at more than one primary position thereby preventing circuit interference.

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