

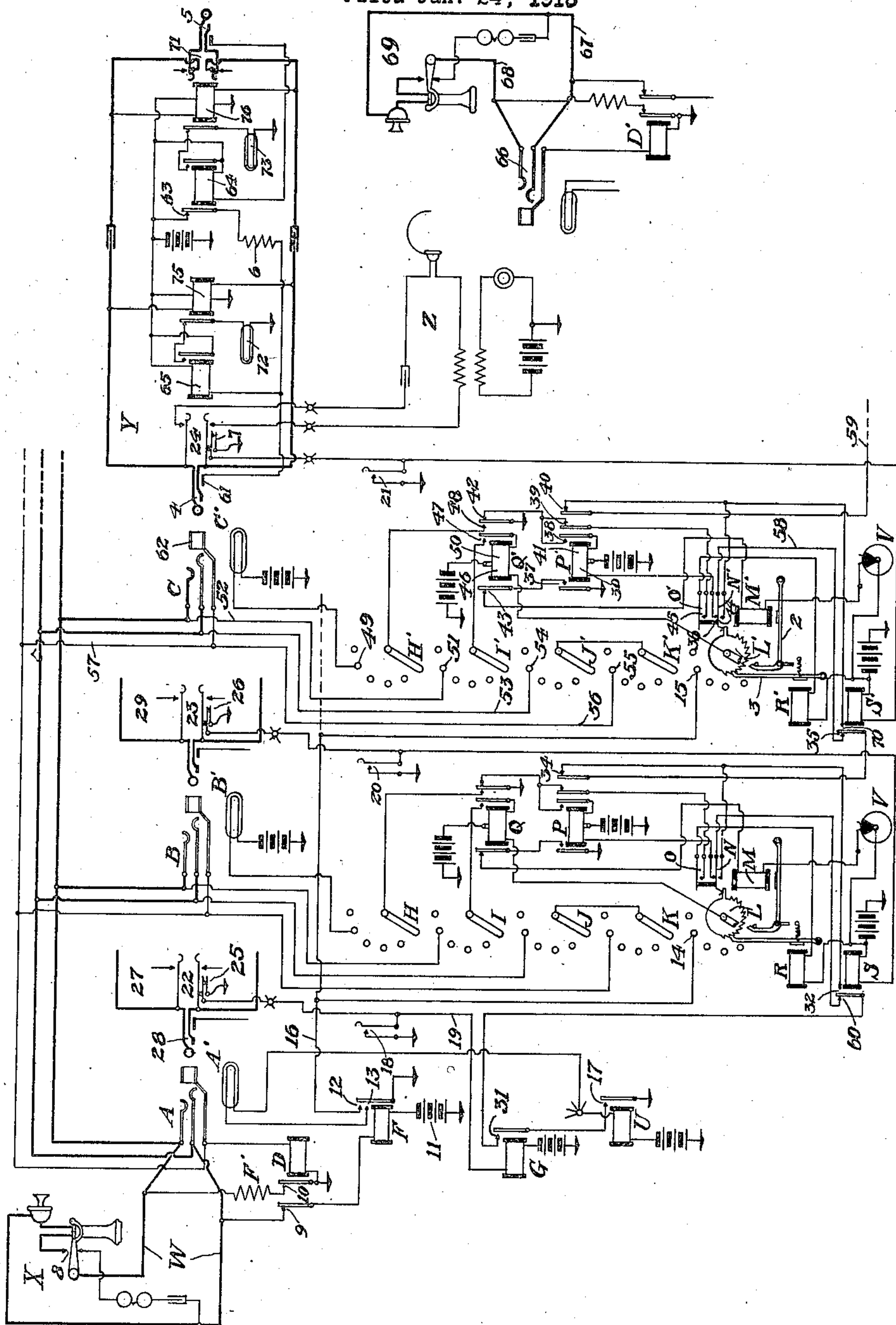
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J. A. TAGGART

TELEPHONE SIGNAL ALLOTING SYSTEM

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TELEPHONE-SIGNAL-ALLOTING SYSTEM.

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To all whom it may concern:

Be it known that I, JOHN A. TAGGART, a citizen of the United States; residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Telephone-Signal-Allothing Systems, of which the following is a full, clear, and concise description.

This invention relates to telephone switchboard signal systems, and more particularly such systems in which a telephone line terminates in multiple switchboard jacks.

It has been proposed to locate calling signals for the line, one for each multiple jack, a multiple jack and one of the said signals being located together; different sets of jacks and signals being located on the different sections of the switchboard. In carrying out this proposition in practice the signals of such circuits appear simultaneously before two or more operators, whenever the subscriber on the line initiates a call. In connection with such a system it has been furthermore proposed to designate one of the signals as a primary signal by the use of certain notations, such as the location of a particular signal, or a distinctly colored opal therefor, such a signal being answered in the conventional way. The auxiliary signals are answered only by the operator before whom they appear during a lull in the telephone traffic of the auxiliary positions. Very frequently two operators will answer the same call, even though barring features may be incorporated in the cord circuit so that but one operator will be connected with the calling line, this results in confusion and a serious delay in operating.

The constantly appearing and disappearing auxiliary signals are very disconcerting to an operator who is wholly taken up with answering her primary calls. Furthermore an operator is under a mental strain when it becomes necessary for her to determine whether or not she is to answer a signal. Knowing that the signals are appearing before other operators each one feels that the responsibility rests with the other. These conditions may appear trivial but they are far reaching in their effect.

An object of my present invention is to provide a means for causing the auxiliary

signal to appear before the operator only when she is idle and ready to answer the call. When the signal once appears it becomes permanent and may be considered as a primary signal for no other auxiliary signals will appear until this one has been answered.

Other objects of my invention and the invention itself will be better understood by reference to the drawing accompanying this specification, in which at A, B and C, I show multiple jacks for a telephone line W having a substation located at X, and the usual line and cut-off relays at F and D. Associated with the multiple jacks are signals A', B' and C' for each of the multiple jacks.

It is to be understood that the multiple jack A and the associated lamp A' are located at one section of the switchboard, which may be a home position for the particular line whose signal system is being described; that is, the operator at the position wherein the jack A and the lamp A' are located is the position whereat the call will be answered, providing the operator stationed at this position is not at the time busy. If the operator at this position is busy, the signal lamp B' will be operated at another section of the switchboard providing the operator at the position whereat the signal B' is located is not busy. If the operator at this second position is busy, the apparatus is so arranged that the call will cause the operation of the signal C' at a third position.

It is obvious by the circuits and apparatus of my invention, the number of positions whereat a call may cause a signal to be made, may be increased indefinitely according to the needs of the system. The system of my invention provides means whereby the signal appears in only one position at a time, and having thus appeared in a given position will not be extinguished until the call is answered at this position, and other calls will be barred from this position until the said call is answered. This is for the purpose of preventing the confusion before related as occurring on existing switchboards. However, the system is so designed, that if desired, the signals at the home position, such as the signal A' will be lighted if all of the other posi-

tions are busy regardless of the busy or idle condition of the said home position. And if a plurality of such signals have been lighted, they may be extinguished and a corresponding signal lighted on one of the associated positions to indicate the call upon such an associated position becoming idle before the call has been answered at the home position.

I aim to produce a system where such a home position may so indicate stored calls, although it is obvious that by the mere elimination of the signal lamp A' for the lines of the home position and substituting therefore the switch mechanism, such as shown for each of the associated positions, that the uniformity of the signal operation will be had for all of the positions and the extinguishing quality of the so-called home position will be lost in identity of operation with the other positions.

Referring to the drawing, in each of the secondary positions there is located an automatic finder switch of any of the well-known types, having bank contacts and wiping fingers which engage these contacts, thereby establishing electrical connections with any of the contacts. Each of these switches has in the embodiment illustrated, five banks of contacts, one contact of each bank for a given switch position being associated with each of the lines capable of displaying a signal on the particular secondary position with which the said switch is associated.

Referring particularly to the switch mechanism of the second secondary position shown in the drawing which has a signal lamp C' for one of the lines and a multiple jack C for the line, at H', I', J', K' and L', I show finder wiping fingers for the switch mechanism, each of the said fingers being shown in the drawing in its normal or non-contact making position. And in an arc of the circle about the said fingers for each of the same, I show a bank of contacts, shown as five contacts in the drawing although more or less may be provided in a system of my invention, and for the line W, in each of the banks H', I', J', K' and L', the fourth contact of each bank is connected by circuit conductors to apparatus and circuit conductors, including the signal lamp C' for the line, of the line W. The finder wipers H', I', J', K' and L' are assumed to be mounted on a vertical shaft with a notched ratchet wheel L' and adapted to be moved when the said ratchet wheel is rotated one step at a time to cause the said wipers to make contact each with a contact in its bank, leading to circuit conductors and apparatus of a given telephone line, such as the line W for the fourth contact in each bank. A stepping motor-magnet M' is provided for the said ratchet

wheel adapted to move the lever arm 2 to step the said ratchet wheel one step for each energization of the motor-magnet. The retaining pawl 3, is normally adapted to hold the ratchet wheel in any operative position to which it may be stepped under the propelling action of the lever member 2. A release magnet R', for the switch by being so arranged, that it will when energized, withdraw the retaining pawl 3 from its engagement a notch of the ratchet wheel L' releases the said ratchet wheel from any advanced position, whereby the said ratchet wheel will be restored to normal position under the retracting power of a spring or equivalent mechanism well understood in the art, but not specifically shown in the drawing.

Two sets of contact springs N' and O' are so arranged that when the switch ratchet wheel is advanced from its normal position, that these sets of contact springs will immediately be operated to close and open contacts as will be later described for purposes to be indicated. The switch mechanism controls the extending and retiring of the signal C' by means of the operation of the switch mechanism with which they are related. The operation and function of these relays will be later specifically described. Like switch mechanism is illustrated in the drawing to control the signal C' of the line W, and other signal lamps for other lines not specifically shown but understood, but the operation of this switch being like the operation of the first switch for the controlling of the signal lamp C', that this operation will not be specifically described except as its operation may effect or be effected by the operation of the switch mechanism for the signal lamp C' and other signal lamps for other lines of the group.

At Y, I show an operator's cord circuit adapted to interconnect telephone lines and to answer calls on the lines at the position where the said cord circuit is located, the cord circuit terminating at each end in switchboard plugs 4 and 5, the plug 4 being an answering plug and is adapted to co-operate with jacks of calling lines, such as the jack C for the line W to connect therewith. The cord circuit comprises suitable supervisory signals and suitable relays to control the same, as well as a resistance coil 6 and contacts 7 which effect the operation of the call allotting system, as will be later described. An operator's telephone set is shown at Z, comprising the usual transmitter and receiver and suitable connections and apparatus. In addition to the relays D and F which are individual to a calling line such as the line W associated with each group of such lines, are a pair of relays G and U which are common to the

group of lines for purposes to be described.

For a better understanding of my invention, I will now describe the operation of the system, describing the operation of apparatus and circuits involved in the displaying of a signal, such as the signal C' at the second associated operator's position whenever a call is made upon the line, such as signal B' for the line W whenever the substation shown at X is operated to initiate a call on the said line.

Assuming that the subscriber at X desires to make a call, the receiver will be lifted from the hookswitch closing the contacts 8 thereof completing a circuit over the line W, including the telephone instrument of the substation X, conductors of the said line and resistance F at the central office, contacts 9 and 10 of the cut-off relay D and a line relay F for the line, the said circuit also including the central office source of current indicated at 11. Current from the said source flowing over the said circuit will energize the said relay F, causing it to close contacts 12 and 13. The closing of the contacts 12 will connect the ground pole of the central office source of current to each of the contacts as 14 and 15 of the finder switches on each of the associated positions to arrest the movement of the said finder switches in the proper position as will be described, ground potential being applied to the said test contacts over a test wire 16. The contacts 13 being closed, will complete a circuit including the source of current, the signal lamp A' for the line W at the home position for the line, and for the relay U common to the group of lines in which the line W is located. Current from the said source will flow over the said circuit operating signal lamp A' to light the same, and will cause the relay U to close contacts 17. The closing of the contacts 17 will be impotent to produce any operative effect if the operator at the home position is idle, and the apparatus is available to answer calls. If the position is not available to answer calls, as by the operator leaving the switch-board, the key 18 will be operated throwing a ground on the conductor 19 to cause the operation of the position busy relay G for the home position. Equivalent "busy" relays for the associated positions are shown at S and S' with equivalent "busy" keys 20 and 21 for the several associated positions. The operation of any of the keys 18, 20 or 21 for the respective positions will operate the associated relay G, S or S' to denote the busy condition of the respective position and to suitably control the circuits to be described that the signal lamp for the calling line which resides on the position of the said operated busy keys may not be lighted. Ground may also be connected to the busy wire 19, to perform the same function in identically the

same way by the operation of any of the listening keys of a position, such as the listening key 22 for the home position, or of listening keys 23 or 24 for certain cord circuits of the associated positions. The operation of these keys produces a closure of busy contacts 25, 26 and 27 for the respective listening keys of the respective positions indicated in the drawing. Other listening keys for other cord circuits than those specifically shown in the drawing will have other busy contacts connected in multiple with the busy contacts of the cord circuits shown in the drawing.

Assuming for the present that the operator at the home position having a cord circuit 27 is not busy or the position rendered artificially busy by the operation of the key 18, the call will be indicated to the said operator by the operation of the signal lamp A', as has been described, and the call will be answered in the usual way by the insertion of the switchboard plug 28 into the jack A of the line operating the cut-off relay D in the usual way to release the line relay F for the line, and a call will be answered and extended to a called line in the usual way with usual cord circuit apparatus. However, assuming that a ground is placed on the busy wire 19, either by the operation of the artificially busy key 18 or by one of the listening keys 22 of the position, or by the closing of the line contacts to guard the position from the intrusion of call signals arranged in any suitable way, as by being mounted on a common relay for the cord circuits, etc., a call will be extended to the next idle position which in this description we will assume is the position wherein is located the signal lamp C' for the calling line W and a multiple switchboard jack C for the line, and wherein are located inter-connecting cord circuits, such as the cord circuit Y, and an operator's telephone set, such as indicated at Z. It is therefore assumed that in addition to the home position having the signal lamp A' being busy and a relay G suitably operated to denote that fact, that the first associated position having the signal lamp B' for the line W is also busy and the relay S is operated to denote the fact, the operation of the relay being accomplished by the closure of a circuit including the source of current by the operation of the contacts 26 of a listening key 23 for a cord circuit 29 located on the position. Under these conditions, the closure of the contacts 17 of the common relay U for the group of lines will complete a circuit for the winding 30 of the relay P' common to the group of lines and located on the position wherein appears the signal C' for the calling line W. This circuit is traced as follows:—from the ground pole of battery, now closed contacts 17 of the relay U, the now closed contacts

31 of the relay G, the now closed contacts 32 of the relay S, normal contacts 34 for the common relay P for the first associated position, the normal contacts 35 of the busy relay S' of the second associated position, the normal contacts 36 of the finder switch of the position, the winding 30 of the relay P' to the negative pole of battery. Current from the said source flowing over the circuit energizes the relay P' which will attract its armatures, closing contacts 37 and 38, and opening contacts 39 and 40 for purposes to be described.

The closing of contacts 38 provides a locking circuit for the relay P', the locking circuit comprising the source of current, the winding 41 of the relay P', and normal contacts 42 of the relay Q'. The closure of the contacts 37 completes a circuit for the motor-stepping-magnet M', said circuit including the source of current stepping interrupter wheel V, the winding of the said motor-magnet M', normal contacts 43 of the relay Q' and the now closed contacts 37 of the relay P'. Current from the said source will flow over the said circuit intermittently thru the revolving stepping interrupter wheel V, and will step the wiping finders H', I', J', K' and L' from contact to contact in their respective banks until their motion is arrested, as will be described. Upon the first step of the said switch mechanism by the operation of the motor-magnet M', the switches N' and O' will be operated closing the contacts 44 and 45 and opening contacts 36. These opened contacts being in the circuit of the winding 30 of the relay P' which circuit has been described, the relay P' remains operated by virtue of the locking circuit which also has been described. The closure of the contacts 44 and 45 are for purposes later fulfilled which will be described.

The motor-magnet M' will continue stepping the wiping finders H', I', J', K' and L' from one set of contacts of a line to another set of contacts of another line, and so on until the wiping finger L' comes into contact with the test contact 15 of the calling line whereupon a circuit will be closed thru the said test contact and wiping finger, including the winding 46 of the test relay Q' to energize the said test relay, the circuit including the source of current, the said winding 46, the wiping finger L' and contact 15, test conductor 16, and now closed contacts 12 of the line F of the calling line W. Current from the said source will energize the relay Q' causing it to open contacts 42 and 43 and closing contacts 47 and 48. The opening of the contacts 43 will break the established circuit of the motor-magnet M' which has been described, causing it to cease its stepping action upon the finder switch. The closure of the contacts 48, completes a circuit for the signal lamp C' of the

second associated position, the said circuit including the source of current, the signal lamp switch contact 49, the wiping finger H', now making contact with the said contact 49, and the said contacts 48. Current from the said source will flow over the said circuit to energize the signal lamp C' to cause it to display a signal indicating a call on the line W to the operator having jurisdiction over the group of signal lamps containing the signal lamp C', and which operator will have a cord circuit, such as the cord circuit Y, by means of which connection can be made to the calling line to answer the call. The closure of the contacts 47 will complete a locking circuit for the relay Q', the said locking circuit including a winding 50 for the relay Q', the contacts 47, the now connected contact 51, a finger arm I', a circuit conductor 52 leading thru the tip conductor of the line circuit and from thence to the resistance F' and normal contacts 10 of the cut-off relay D to the ground pole of battery. Current from the said source of current will flow over this circuit to retain the relay Q' operative. A path for the current thru the said winding 50 will also be completed, including the said winding from the negative pole of battery thru the contacts 47 of the relay Q', the wiping finger I' and contacts 51 of the finder switch, the tip side of the telephone line, the contacts 8 of the substation instrument on the subscriber's line, W, the sleeve side of the said line, the circuit conductor 53 leading therefrom to a contact 54 and thru the finger arm J' now making connection with the said contact, a connected finger arm K', a now connected contact 55, circuit conductor 56 leading to the multiple jack test conductor 57, thru the winding of the cut-off relay D, to the ground pole of the source of current. Current from the said source will flow over the said circuit operating the cut-off relay D and retaining the relay Q' operative. The cut-off relay D being operated, and its contacts 9 and 10 thereby opened, the line relay F will be deenergized, opening its contacts 12 and 13 to extinguish the signal lamp A' at the home position to remove the ground from the test contacts of the line of the telephone switches at the different positions, and to deenergize the relay U in the circuit of the contacts 13. The release of the relay U will open the circuit leading thru contacts 31 of the relay G, contacts 32 of the relay S, contacts 34 of the relay P, contacts 35 of the relay S', and conductor 58 leading to the apparatus in the second associated position, and this call allotting system may be utilized by other calling lines for the operation of a calling signal on an idle position in the manner which is being described for the line W to its signal lamp C'.

The call allotting circuit, including contacts 17 of the relay U and contacts 31 of the

relay G, being now extended to the circuit conductor 59 leading to apparatus of the next associated position not shown in the drawing, but which is understood to be like that shown in the drawing for the associated position whose apparatus is therein illustrated, the circuit extending connections for the time being, being thru contacts 35 of the relay S', now closed contacts 44 of the switch N' and now closed normal contacts 40 of the relay P' to the said circuit conductor 59. By virtue of the extension to the call allotting circuit just described, calls immediately succeeding the call over the line W, will be extended to additional associated positions for the group of lines, unless in the interim a preceding position has become available for use, such as the first associated position, in which case, the calling line would have its signal displaced on the said position in a manner like that which has been described, or for the line W and its signal lamp C' on the second associated position. The initial circuit for such succeeding call being established thru normal contacts 60 of the busy relay S, which under the assumption that the position is at the time not busy, will be released. The rest of the operation will be understood.

Resuming the description of the incoming call from the line W displaying the signal C' on the second associated position, the apparatus will be retained in such a position that the switch fingers H', I', J', K' and L' will continue in contact with the contacts of the calling lines, 49, 51, 54, 55 and 15, until the operator answers the call by inserting a plug, such as the plug 4 for the cord circuit Y into the jack C of the calling line to interconnect the said cord circuit and the said line. When this occurs, the resistance coil 6 connected between the test contacts 61 of the plug 4 and the negative pole of the source of current is placed in multiple with the holding winding 50 of the relay Q' and its circuit, and the resistance is purposely made so low that it will operatively shunt out the winding 50 to deenergize the relay Q'. This accomplished, the relay Q' will be deenergized to a degree which will cause it to open its previously closed contacts 47 serially included in the holding circuit with the holding winding 50, and the relay Q' will be permanently retired. The retiring of this relay will now close the normally closed contacts 42, completing a circuit from the ground pole of the said source of current, thru the said contacts 42 to normal contacts 39 of the relay P', thru the now closed contacts 45 of the switch spring O', thru the winding of the release magnet R' to the negative pole of the said source of current. Current from the said source will flow over the said circuit to operate the release magnet R' which will attract the pawl-armature

magnet 3, withdrawing it from its switch retaining position, whereupon the switch will be restored to normal under the retracting force of gravity, or a suitable spring not shown in the drawing, but well known and understood in the art. The retiring of the switch will restore all of the wiping fingers H', I', J', K' and L' to their normal positions, as shown in the drawing, and the switch contacts N' and O' for the switch will be likewise restored to normal position as shown in the drawing, opening the circuit of the contacts 45 in the releasing magnet circuit just described, so that it will be deenergized. Current will now flow over the resistance coil 6 from the negative pole of the source of current, over the plug and jack switch contacts 61 and 62, over the test conductor 57 of the line circuit thru the winding of the cut-off relay D to the ground pole of the source of current to keep energized the cut-off relay D of the line circuit.

The operator having made connection with the line, will now answer the call by operating her listening key 24 to connect the telephone set Z to the talking strands of the cord circuit in the well-known manner, one of the said cord circuit talking strands being extended thru co-operating plug and jack switch springs with the line talking strands in the well-known manner illustrated in the drawing. The operator may now converse with the subscriber, learn the number of the called line and make connection therewith by inserting the called plug 5 into the jack of the called-for line to complete the connection.

Only portions of the called line circuit are shown in the drawing, such as the cut-off relay D, the switchboard jack 66, line conductors 67 and 68, and the substation instrument indicated at 69. The rest of the apparatus may be of the same type as is illustrated for the line W, or of other well-known types.

The operation of the listening key 24 will cause the closure of the busv contacts 7 which are a part of the said listening key to operate the busy relay S of the operator's position, the operator's position thereby being cut out of calls to be allotted, the said calls being extended past the operator's position, thru now closed contacts 70 of the relay S', the closed contacts extending the circuit of the call allotting wire to the conductor 59, thru normal contacts 40 of the relay P'. The circuit may be extended to the called line by inserting the plug 5 into the jack 66 and the ringing operation caused by the operation of a ringing key 71. The rest of the operation is not described, since it is well understood in the art, being in accordance with the usual practice, except the special feature of breaking the circuit including resistance coil 6 by

the opening of contact 63 on the operation of relay 64, which relay is responsive to the insertion of the called plug into the called line jack. The supervisory signal controlling relay 65 in the answering side of the cord circuit takes the place of the resistance coil 6 in the energizing circuit of the cut-off relay previously described preserving its operation, and the relay 65 itself being now operated will be operative to control the actuation and retiring of the supervisory signal 72 in the usual manner. The supervisory signal 73 being likewise controlled by the like relay 64, both signals being also controlled by the subscriber controlled relays 75 and 76 in the usual way. Upon the operator having answered the call of the line W by means of listening key 24 of the relay Y, the listening key 24 will be restored to its normal position opening the busy contact 7 thereof and releasing the busy relay S' for the position, so that the subsequent calling lines may have access to their signals located on the position and may control the actuation of the switch mechanism of the position to operate the said signals, and to perform the functions which have been described in connection with the calling line W.

It will be understood that many and numerous departures may be made from the embodiment illustrated without departing from the spirit of my invention, such as other call receiving circuits being provided on the several positions than such a cord circuit as is illustrated at Y, and other forms of switch finder mechanism may be substituted for those illustrated, such and other substitutions being well-known and understood in the art, but what I claim is my invention is defined in the following claims:—

1. In a telephone system, the combination with a plurality of telephone lines leading from substations to an exchange, a plurality of operators' call answering positions at the exchange, multiple jacks at the exchange at the different operators' positions for each of the lines, signals associated with each of the said jacks, a switch at each of the positions for displaying any of the said signals located thereat, operator controlled means at each of the positions to render the said switch inoperative to display a calling signal of a calling line, and means to cause a switch of a different operator's position to display the signal associated with the calling line at the said different operator's position.

2. In a telephone system, the combination with telephone lines leading from substations to a plurality of call answering switches at a main station, a call signal for each line associated with each of said switches, an operator controlled means at

each of said switches to prevent the display of the signal associated therewith, and means including a plurality of multi-contact progressively movable switches at the main station to permit the display of one of the signals of a calling line to the exclusion of the other signals of said calling telephone line.

3. In a telephone system, the combination with a plurality of operators' call answering positions, of a plurality of telephone lines leading from substations to switchboard jacks, one for each operator's position, of call signals at the said positions associated with the switchboard jack of each line terminating therein, a switch mechanism common to the operator's position and to a plurality of lines terminating thereat for selectively operating the signal of a calling line, and means associated with the said common switch mechanism to prevent the display of more than one lamp at a time at a given position.

4. In a telephone system, the combination with a plurality of telephone lines leading from substations to a main station, of a plurality of call answering operators' positions at the main station, a multiple jack for each line at each of the operators' positions of a group, a call signal for the line associated with each jack, and a line finder switch for each operator's position common to a plurality of lines terminating thereat, to operate the call signal of a calling line, and operator controlled means to disable the said finder switch.

5. In a telephone system, the combination with a plurality of telephone lines leading from substations to a main station, of a plurality of call answering operators' positions at the main station, a multiple jack for each line at each of the operators' positions of a group, a call signal for the line associated with each jack, a finder switch for each operator's position common to a plurality of lines terminating thereat to operate the call signal of a calling line, operator controlled means to disable the said finder switch, and call allotting means to control a group of the said finder switches to operate one of the said finder switches to the exclusion of the others of the group.

6. In a telephone system, the combination with a plurality of telephone lines leading from substations to a main station, of a plurality of call answering operators' positions at the main station, a multiple jack for each line at each of the operators' positions of a group, a call signal for the line associated with each jack, a finder switch for each operator's position common to a plurality of lines terminating thereat to operate the call signal of a calling line, operator controlled means to disable the said finder switch, call

allotting means to control a group of the said finder switches to operate one of the said finder switches to the exclusion of the others of the group, and signal operating retaining means to retain a signal displayed independent of the said call allotting means after the said call allotting means has displayed the said signal.

7. In a telephone system, the combination with a plurality of telephone lines leading from substations to a main station, of a plurality of call answering operators' positions at the main station, a multiple jack for each line at each of the operators' positions of a group, a call signal for the line associated with each jack, a finder switch for each operator's position common to a plurality of lines terminating thereat to operate the call signal of a calling line, operator controlled means to disable the said finder switch, call allotting means to control a group of the said finder switches to operate one of the said finder switches to the exclusion of the others of the group, signal operating retaining means to retain a signal displayed independent of the said call allotting means after the said call allotting means has displayed the said signal, a plurality of operators' link circuits at each of the said positions, an operator's listening key for each of the said link circuits, said disabling means being under the control of each of the said listening keys.

8. In a telephone system, the combination with a plurality of telephone lines leading from substations to an exchange, a plurality of operators' call answering positions at the exchange, multiple jacks at the different positions for each of the lines, signals associated with each of the said jacks, a finder switch at each of the positions having contacts controlling each of the said signals located at its position, common operator controlled means at each of the positions to render the said switch inoperative to display any of the said signals for calling lines, line apparatus for each of the lines, common call allotting apparatus for each of the lines, the said line apparatus and the said common apparatus co-operating to display a signal of a calling line in the first operator's position containing non-operated operator controlled means.

9. In a telephone system, the combination with a plurality of operators' call answering positions, of a plurality of telephone lines leading from substations to switchboard contacts at each operator's position, of call signals at each of the positions for each of the lines associated with the switchboard contacts of the lines, a line relay for each of the lines, a cut-off relay for the said line relay, a finder switch for each operator's position common to the lines to locate the circuit of the call signal of a calling line,

operator controlled means to disable the said finder switch, call allotting apparatus common to the lines to extend a call of a calling line to an operator's position having a non-disabled finder switch, means under the control of the line relay of a calling line to operate the said finder switch to close a circuit including the call signal of a line located at the operator's position of the operated finder switch, a circuit completed by the said finder switch for the said cut-off relay to operate the said cut-off relay, contacts for the said cut-off relay to dissociate the said line relay from the line circuit to restore the said line relay, and a retaining circuit for the said finder switch to cause the continued display of the said signal, and an operator controlled switch including contacts of the calling line jack at the operator's position, and an answering plug of an interconnecting link circuit for restoring the said switch to its normal position.

10. In a telephone system, the combination with a plurality of telephone lines leading from substations to a main station, of a plurality of call answering operators' positions at the main station, a multiple jack for each line at each of the said operators' positions, a call signal for each line associated with each jack, and a finder switch for each of the said operators' positions common to the said telephone lines, apparatus common to the group of signals to allot a finder switch of an idle operator's position for use in extending a call over a calling line to the said idle operator's position, and means to cause the said finder switch to locate the call signal circuit of the calling line to operate the said line signal.

11. In a telephone system, the combination with a plurality of telephone lines leading from substations to an exchange, signals for each of the said lines at the said exchange located in different operators' positions, operators' link circuits for the said positions, multiple jacks for each of the lines at each of the said operator's positions, listening keys for each of the said link circuits, apparatus responsive to the line apparatus of a calling line to display the signal of a calling line in an operator's position having no operated listening key, the said signal displaying means being common to the lines and individual to the positions, retaining means for the said displaying means, a circuit for a cut-off relay of a calling line, including apparatus of an operated signal displaying means to operate the said cut-off relay, and a circuit including plug and jack switch contacts operated in association of an operator's link circuit with a calling line to dissociate said signal displaying apparatus from the signal of a calling line, and to restore the said signal displaying means to normal.

5 said signals, a line relay, and interconnecting means to associate contacts of the said line relay with apparatus of an idle finder switch, whereby the said finder switch under the control of the said line relay oper-
10 ates a signal of the line.

15 for each of the said signals and controlling the same, means under the control of the said line relay to operate the said finder switch to display one of the said signals, and retaining means under the control of an
20 operator for the said finder switch to retain in operation an operated line signal.

30 retaining means under the control of an operator for the said switch mechanism to retain in operation an operated line signal, a cut-off relay for the said line relay, and means including contacts of an operated switch
35 mechanism to operate the said cut-off relay, whereby the line relay will be restored to normal condition.

45 display one of the said signals, retaining means under the control of an operator for the said finder switch to retain inoperative an operated line signal, and operator controlled means for each of the said finder switches
50 to make the said finder switches inoperative to operate the said line signal.

60 at an operator's call answering position,
finder switch mechanism for each operator's
position, means to cause the said finder switch
mechanism to operate to connect with circuit
conductors individual to a calling line and
65 to operate the signal lamp of the said call-

retaining means independent of the said common apparatus to hold the said finder switch in signal operated position, and means under the control of calling substation apparatus on the calling line to release the said finder switch mechanism.

each of the lines and a plurality of multiple jacks for each of the lines, each of the said signals being associated with one of the said jacks, each signal and each jack being located at an operator's call answering position, finder switch mechanism for each operator's position, means to cause the said finder switch mechanism to operate to connect with circuit conductors individual to a calling line and to operate the signal lamp of the said calling line, a line relay for the line, circuit apparatus common to the lines to select an idle finder switch to operate the said signal, retaining means independent of the said common apparatus to hold the said finder switch in signal operated position, and means under the joint control of calling substation apparatus and an operator controlled connection switch to make connection with a jack of the calling line to restore the said finder switch to normal position.

jacks for each of the lines, each of the said
signals being associated with one of the said
jacks, each signal and each jack being lo-
cated at an operator's call answering posi-
tion, finder switch mechanism for each oper-
ator's position, means to cause the said
finder switch mechanism to operate to con-
nect with circuit conductors individual to a
calling line and to operate the signal lamp
of the said calling line, a line relay for the
line, circuit apparatus common to the lines
to select an idle finder switch to operate the
said signal, retaining means independent of
the said common apparatus to hold the said
finder switch in signal operated position,
and means under the control of an operator
in making connection with the calling line to
restore the said finder switch.

tion with a plurality of telephone lines extending by their limbs from substations to an exchange, of a plurality of signals for each of the lines and a plurality of multiple jacks for each of the lines, each of the said signals being associated with one of the said jacks, each signal and each jack being

located at an operator's call answering position, finder switch mechanism for each operator's position, means to cause the said finder switch mechanism to operate to connect with circuit conductors individual to a calling line and to operate the signal lamp of the said calling line, a line relay for the line, circuit apparatus common to the lines to select an idle finder switch to operate the said signal, retaining means independent of the said common apparatus to hold the said finder switch in signal operated position, a plurality of operators' link circuits at each position, listening keys for the said link circuits, an answering terminal plug for each of the said link circuits, the said terminal plugs being adapted to connect to terminal jacks of calling lines, and listening key operative means to remove the said finder switch from the path of incoming calls when the said listening key is operated.

20. In a telephone system, the combination with a plurality of telephone lines extending by their limbs from substations to an exchange, of a plurality of signals for each of the lines and a plurality of multiple jacks for each of the lines, each of the said signals being associated with one of the said jacks, each signal and each jack being located at an operator's call answering position, finder switch mechanism for each operator's position, means to cause the said finder switch mechanism to operate to connect with circuit conductors individual to a calling line and to operate the signal lamp of the said calling line, a line relay for the line, circuit apparatus common to the lines to select an idle finder switch to operate the said signal, retaining means independent of the said common apparatus to hold the said finder switch in signal operated position, listening keys for the said link circuits, and an answering terminal plug for each of the said link circuits, the said terminal plugs being adapted to connect the terminal jacks of calling lines, the operation of the said plug and jack switch restoring the said finder switch to normal position.

21. In a telephone system, the combination with a plurality of telephone lines extending from substations to an exchange, of a plurality of call answering positions for the said lines, multiple jacks for the lines for each of the said positions, signals for the lines associated with each of the multiple jacks, finder switches individual to each of the positions and common to the lines, contacts on the said switches for each of the lines, a contact finger capable of being moved over the said contacts, circuit conductors and a source of current for including one of the said fingers in circuit with signal lamps of the lines, a line relay for each of the lines, means responsive to

the operation of a line relay of a calling line to operate the finder switch mechanism of an idle operator's position to operate the signal lamp of the line at the said position, and means under the control of calling substation apparatus of the line for restoring the said finder switch to normal position, the said means being independent of the said line relay.

22. In a telephone system, the combination with a plurality of telephone lines extending from substations to an exchange, of a plurality of call answering positions for the said lines, multiple jacks for the lines for each of the said positions, signals for the lines associated with each of the multiple jacks, finder switches individual to each of the positions and common to the lines, contacts on the said switches for each of the lines, a contact finger capable of being moved over the said contacts, circuit conductors and a source of current for including one of the said fingers in circuit with signal lamps of the lines, a line relay for each of the lines, and means responsive to the operation of a line relay of a calling line to operate the finder switch mechanism of an idle operator's position to operate the signal lamp of the line at the said position.

23. In a telephone system, the combination with a plurality of telephone lines extending from substations to an exchange, of a plurality of call answering positions for the said lines, multiple jacks for the lines for each of the said positions, signals for the lines associated with each of the multiple jacks, finder switches individual to each of the positions and common to the lines, contacts on the said switches for each of the lines, a contact finger capable of being moved over the said contacts, circuit conductors and a source of current for including one of the said fingers in circuit with signal lamps of the lines, a line relay for each of the lines, means responsive to the operation of a line relay of a calling line to operate the finder switch mechanism of an idle operator's position to operate the signal lamp of the line at the said position, means under the control of calling substation apparatus of the line for restoring the said finder switch to normal position, the said means being independent of the said line relay, and a circuit conductor and contacts of the said finder switch for restoring the said switch under the said control.

24. In a telephone system, the combination with a plurality of telephone lines extending from substations to an exchange, of a plurality of call answering positions for the said lines, multiple jacks for the lines for each of the said positions, signals for the lines associated with each of the multiple jacks, finder switches individual to each of

the positions and common to the lines, contacts on the said switches for each of the lines, a contact finger capable of being moved over the said contacts, circuit conductors and a source of current for including one of the said fingers in circuit with signal lamps of the lines, a line relay for each of the lines, means responsive to the operation of a line relay of a calling line to operate the finder switch mechanism of an idle operator's position to operate the signal lamp of the line at the said position, switch position retaining means for each of the said switches, and means to dissociate controlling contacts for the said switches from the said switches upon the operation of the said retaining means.

25. In a telephone system, the combination with a plurality of telephone lines extending from substations to an exchange, of a plurality of call answering positions for the said lines, multiple jacks for the lines for each of the said positions, signals for the lines associated with each of the multiple jacks, finder switches individual to each of the positions and common to the lines, contacts on the said switches for each of the lines, a contact finger capable of being moved over the said contacts, circuit conductors and a source of current for including one of the said fingers in circuit with signal lamps of the lines, a line relay for each of the lines, means responsive to the operation of a line relay of a calling line to operate the finder switch mechanism of an idle operator's position to operate the signal lamp of the line at the said position, switch position retaining means for each of the said switches, means to dissociate controlling contacts for the said switches from the said switches upon the operation of the said retaining means, means to prevent the operation of an associated finder switch until the said operated finder switch is locked by the said retaining means, and means responsive to the operation of the said retaining means to condition another finder switch

of the group for operation to display a calling signal of a subsequent calling line.

26. In a telephone system, telephone lines leading from substations to a plurality of call answering switches at a main station, a call signal for each line associated with each of said switches, operator controlled means at each of said switches to prevent the display of the signal associated therewith, and means including progressively movable hunting switches to locate a calling line and to permit the display of one of the signals of said line to the exclusion of the other signals of the same line.

27. In a telephone system, a main station having operators' positions, a plurality of telephone lines terminating in said operators' positions, signals at said operators' positions for indicating that said telephone lines are calling, automatic means for allotting operators' positions for use, progressively movable automatic switches for disabling certain of said signals except those at an allotted operator's position, and operator's mechanism for controlling said switch.

28. In a telephone exchange provided with a plurality of operators' positions, telephone lines terminating in answering switches at each operator's position, a call indicating device associated with each answering switch at each operator's position, a relay individual to each line, a progressively movable automatic switch at each operator's position for locating the calling line and operating the call signal of any line on the initiation of a call over the same, a motor magnet for operating each switch, means for allotting a switch for use and a circuit for the magnet of an allotted switch, means controlled at the contacts of the relay associated with the calling line for governing said circuit, and operator controlled means for actuating said allotting device.

In witness whereof, I hereunto subscribe my name this 23rd day of January, A. D. 1918.

JOHN A. TAGGART.