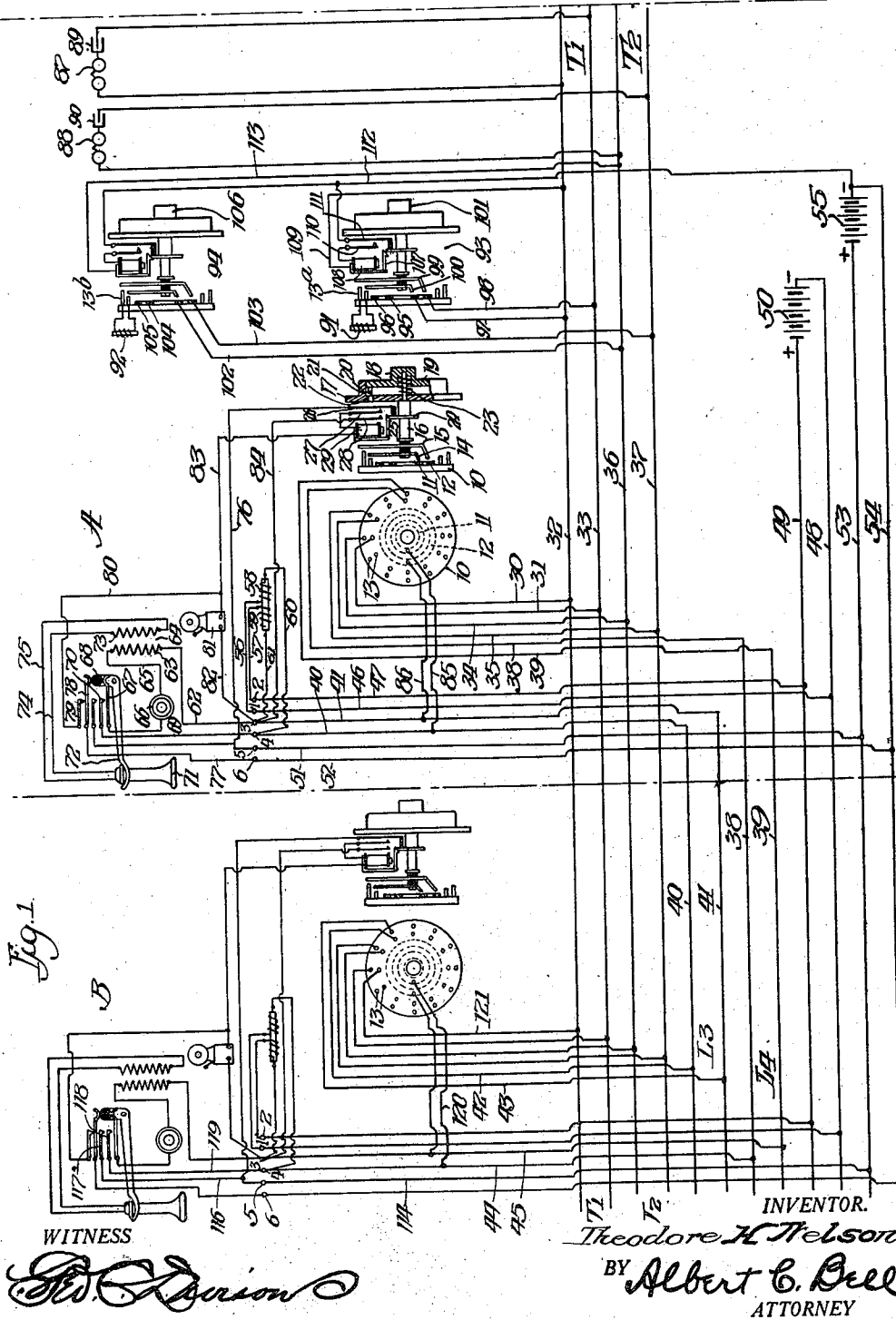


SWITCHING MECHANISM FOR INTERCOMMUNICATING TELEPHONE SYSTEMS.

Patented Jan. 7, 1919.

2 SHEETS—SHEET 1.

1,290,645.



T. H. NELSON.

SWITCHING MECHANISM FOR INTERCOMMUNICATING TELEPHONE SYSTEMS.

• APPLICATION FILED MAY 7, 1917.

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2 SHEETS—SHEET 2.

1,290,645.

Fig. 2.

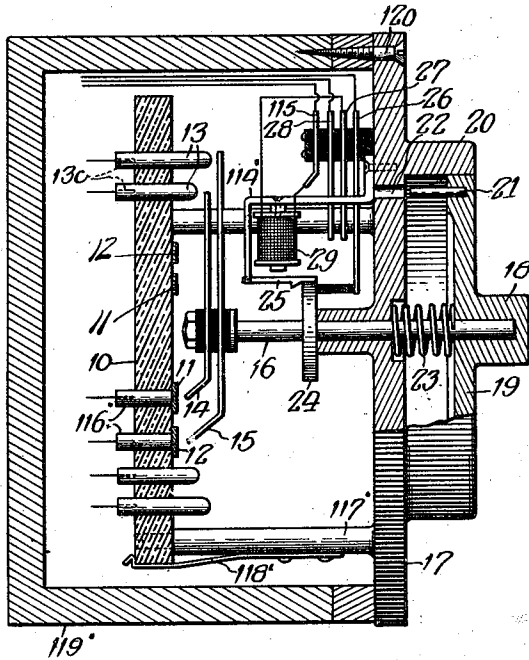
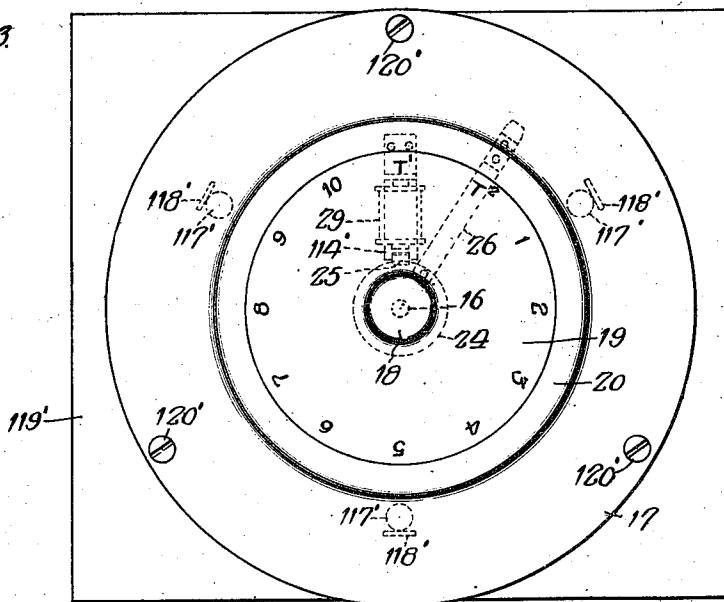


Fig. 3.



WITNESS

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SWITCHING MECHANISM FOR INTERCOMMUNICATING TELEPHONE SYSTEMS.

1,290,645.

Specification of Letters Patent.

Patented Jan. 7, 1919.

Application filed May 7, 1917. Serial No. 166,818.

To all whom it may concern:

Be it known that I, THEODORE H. NELSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and Improved Switching Mechanism for Intercommunicating Telephone Systems, of which the following is a specification.

My invention relates to an improved form of switching mechanism for connecting different ones of the telephones of an intercommunicating telephone system for conversation and consists essentially of a single moving part having two directions of motion, one for selecting the line to be connected to the talking line and the other for connecting the lines. The switching mechanism further serves as a signaling mechanism by imparting to the moving element further motion in one of its directions of motion, which further motion serves to send signaling current over the connected line for operating signaling devices at the called station. My improved switching mechanism is preferably provided with locking devices so that when the mechanism at one of the stations is operated to select and connect a desired line, the connection is maintained until the receiver at the calling station is placed upon the switch hook which closes a circuit including a releasing magnet which actuates the locking devices of the switching mechanism to release the connected line.

A further object of my invention is to provide an improved trunk holding mechanism by adapting and properly connecting a switching mechanism of the kind referred to so that when the single movable element of the switching mechanism is operated to connect the holding coil of the desired trunk the releasing magnet is in circuit through one side of the trunk with contacts of the hook switch of the called station, so that when the receiver at the called station is removed from the hook the releasing magnet is energized to permit the switching mechanism to move to a position disconnecting the holding coil from the trunk.

My invention will best be understood by reference to the accompanying drawings showing the preferred embodiment of my invention, in which—

Figure 1 is a diagrammatic view of an intercommunicating telephone system pro-

vided with switching mechanism in accordance with my invention,

Fig. 2 is an enlarged sectional view of the selective switching mechanism shown in Fig. 1, and

Fig. 3 is a front elevation of said switching mechanism.

Similar numerals refer to similar parts throughout the several views.

As shown in Fig. 1, station A represents one of the stations of the intercommunicating telephone system and also the answering station for receiving incoming calls on trunks T^1 and T^2 . Station B represents another station of the intercommunicating system similar in all respects to station A with the exception that it is not provided with signaling mechanism and holding coils for the two trunk lines shown. In view of this it will be necessary to describe the circuit connection of but one of the stations, as for example the station A and to then point out the manner in which the stations A and B are connected to the line wires of the intercommunicating system.

The switching mechanism for selecting, connecting and ringing a desired line, is, as more clearly shown in Figs. 1 and 2, constructed as follows: An insulating base is provided with two concentric contact rings 11 and 12, around which in radial lines are mounted pairs of contacts 13. Contact springs 14 and 15 are rigidly mounted upon and insulated from each other and from a supporting rod 16 extending through the mounting plate 17 and rigidly carrying at its end an operating knob 18. The knob 18 has extending from its inner end a disk 19 fitting the bore of a flange 20 carried by the plate 17. The disk 19 also carries an aligning pin 21 for entering one of the holes in the plate 17 for which position the contact springs 14 and 15 are in alignment with and engage a corresponding pair of the contacts 13 when the knob 18 is pressed inwardly against the action of the spring surrounding the rod 16 between the plate 17 and the disk 19. The disk 19 is preferably provided with indicating characters of any desired kind so that by angular movement of the knob 18 any desired pair of the contacts 13 may be selected thus bringing the contact springs 14 and 15 in line with said pair of contacts. The rod 16 carries a disk

24 for engagement with a pivoted latch 25, the proportions of the parts being such that when the knob 18 is depressed sufficiently to bring the disk 24 and latch 25 into engagement with each other, the contact springs 14 and 15 make contact with the selected pair of contacts 13 and at their other end with the contact rings 11 and 12. The disk 24 is rigidly mounted on the rod 16 and has pressing against its front side the insulated end of a normally flexed contact spring 26, which, when the knob 18 is pressed inwardly, engages a second contact spring 27. For this position of the switching mechanism the disk 19 and the plate 17 are still separated somewhat and further motion of the knob 18 inwardly is possible, which further motion moves the contact spring 27 into engagement with a third contact spring 28 connected with the ringing circuit in a manner to be described. A releasing magnet 29 is mounted in a position to operate the latch 25 when energized, thus releasing the disk 24 and the rod 16 which permits the spring 23 to move the disk 19 outwardly, disconnecting the contact rings 11 and 12 from the selected pair of contacts 13.

As shown in Fig. 1, a first pair of contacts 13 is connected by wires 30 and 31 with the wires 32 and 33 respectively of the trunk T^1 . A second pair of the contacts 13 is connected by wires 34 and 35 with the wires 36 and 37 respectively of trunk T^2 . The third pair of contacts 13 is left disconnected since this position corresponds to station A, which is connected permanently to its own line as will be described. The fourth pair of contacts 13 is connected with wires 38 and 39, constituting the two conductors of line L^4 of the intercommunicating system. Wires 40 and 41 constituting the conductors of line L^3 of the intercommunicating system are connected with the terminals 4 and 3 respectively of the telephone set at station A and by wires 42 and 43 respectively with the third pair of contacts 13 of the switching mechanism at station B. Wires 38 and 39 of line L^4 are connected by wires 44 and 45 with the terminals 4 and 3 respectively of the telephone set at station B. While but two stations of the intercommunicating system are shown, it will be understood that there may be as many stations as desired and that the trunk lines T^1 and T^2 may extend to all of the stations and that a pair of line wires extends throughout the system for each one of the stations and that the switching mechanism at each station has its first pair of contacts 13 connected with the trunk T^1 , its second pair of contacts 13 connected with the trunk T^2 , its third pair of contacts 13 connected with line L^3 , its fourth pair of contacts 13 connected with the line L^4 , and so on with the exception that the pair of

contacts 13 corresponding with the station at which the switching mechanism is located is not provided with connecting wires extending to the corresponding line of the intercommunicating system, since each station is permanently connected through the terminals of its telephone set with the corresponding line and is therefore in condition to answer a call on the intercommunicating system without actuation of the selective switching mechanism.

Referring again to station A, the terminals 1 and 2 of the telephone set are connected by wires 46 and 47 with the wires 48 and 49 extending from the negative and positive terminals respectively of the talking battery 50. The terminals 5 and 6 of the telephone set are connected by wires 51 and 52 with wires 53 and 54 connected respectively with the positive and negative terminals of the signaling battery 55. The terminals 1 and 2 are connected by wires 56 and 57 with the impedance coils 58 and 59, the other ends of which coils are connected by wires 60 and 61 with the terminals 4 and 3 respectively. The terminal 3 is connected by wire 62 with one end of the primary winding 63 of the induction coil 64, the other terminal of which winding is connected by wire 65 with one terminal of the transmitter 66 the other terminal of which is connected with the spring contact 67 of the hook switch 68. The terminal 4 is connected by wire 69 with the contact spring 70 of the hook switch which spring is engaged by the spring 67 when the receiver 71 is off the hook 72, for which condition a talking circuit is closed by the contacts 67 and 70 as follows: line wire 40, terminal 4, wire 69, spring 70, spring 67, transmitter 66, wire 65, primary winding 63, wire 62, terminal 3, wire 41, and thus to line. Talking current is supplied for this condition over the following circuit: battery 50, wire 49, wire 47, terminal 2, wire 57, coil 59, wire 61, terminal 3, wire 62, primary winding 63, wire 65, transmitter 66, spring 67, spring 70, wire 69, terminal 4, wire 60, coil 58, wire 56, terminal 1, wire 46, wire 48, back to battery 50. The secondary winding 73 of the induction coil 64 is connected by wires 74 and 75 with the terminals of the receiver 71, from which it will appear that the apparatus of the telephone set is placed in talking condition when the receiver 71 is removed from the switch hook 72.

The terminal 5 is connected by wire 76 with contact spring 26. The terminal 6 is connected by wire 77 with contact spring 78 of the hook switch 68. When the receiver 71 is on the hook 72 the contact spring 78 engages contact spring 79 connected by wire 80 with one terminal of the bell 81, the other terminal of which is connected by wire 82 with the terminal 3. The wire

80 is connected by wire 83 with one terminal of the electromagnet 29 of the switching mechanism, the other terminal of which is connected with contact spring 27, and the contact spring 28 is connected by wire 84 with the terminal 3, from which it appears that if the wire 53 of the signaling battery is connected with the terminal 3 of any station the bell 81 will be operated, the current taking the following course: terminal 3, wire 82, bell 81, wire 80, contact spring 79, contact spring 78, wire 77, terminal 6, wire 52, wire 54, battery 55, wire 53.

The wires 40 and 41 are connected by wires 85 and 86 with the contact rings 11 and 12 respectively of the switching mechanism. When therefore the contact springs 14 and 15 are rotated into alinement with one of the pairs of contacts 13, as for example the fourth pair, and the knob is depressed, lines L^3 and L^4 are connected since, as described, line L^4 is connected at station A with the fourth pair of contacts and line L^3 is permanently connected to the terminals 3 and 4. The telephone set at station B, having similar electrical connections to those described, it will be understood that when the receiver is off the hook at station B, the lines L^3 and L^4 are in talking condition, assuming that the switching mechanism at station A is in its connecting position above described. A similar result may, of course, be secured by means of the switching mechanism at station B by rotating the movable member of the switching mechanism to connect with the third pair of contacts, since the line L^4 is permanently connected to the terminals 3 and 4 and with the contact rings of its switching mechanism, and the third pair of contacts of said switching mechanism is connected with the line L^3 .

In calling the station B from the station A, the wire 53 of the signaling battery is connected with the terminal 3 at station B as follows: The knob 18 at station A being in the angular position to connect with the fourth pair of contacts 13, said knob is depressed to its full extent thus bringing the contact springs 27 and 28 into engagement with each other, for which condition a connection is established as follows: wire 53, wire 51, terminal 5, wire 76, contact spring 26, contact spring 27, contact spring 28, wire 84, terminal 3, wire 41, wire 86, ring 12, contact spring 15, contact 13, wire 39, wire 45, to terminal 3 at station B. From terminal 3 the course of the circuit is through the bell at station B back to the signaling battery in the same manner described above for the signaling circuit at station A. In a similar manner each of the stations may signal each of the other stations by operating its switching and signaling mechanism in the manner just described.

At the end of a conversation, assuming that the station A is the calling station, when the receiver 71 is placed upon the hook 72, current from the signaling battery 55 flows through the releasing magnet 29 over the following path: battery 55, wire 53, wire 51, terminal 5, wire 76, contact spring 26, contact spring 27, magnet 29, wire 83, wire 80, contact spring 79, contact spring 78, wire 77, terminal 6, wire 52, wire 54, back to battery 55. The releasing magnet being thus energized, withdraws the latch 25 from engagement with the disk 24 and the spring 23 moves the knob 18 and parts attached thereto outwardly thus removing contact springs 14 and 15 from engagement with the selected pair of contacts and separating the contact springs 26 and 27 from engagement with each other. Since the connections on the switching mechanism at the several stations are similar, the switching mechanism at any calling station is similarly released when the receiver at said station is placed upon its hook.

The trunks T^1 and T^2 are provided at the station A with signal bells 87 and 88 bridged across said trunks respectively through condensers 89 and 90, by which the operator at station A is advised of incoming calls on the trunks. The bells 87 and 88 are preferably of different sound so that the operator at station A may know by the sound on which trunk the incoming call is being made. There are also located at station A holding coils 91 and 92 for the trunks T^1 and T^2 respectively, the terminals of these coils being connected with contacts 13^a and 13^b of switching mechanisms 93 and 94 used by the operator at station A for holding the trunks T^1 and T^2 while the called station of the intercommunicating system is being signaled by the operator at the station A.

The switching mechanisms 93 and 94 may be of the same construction as the selective switching mechanisms above described, the differences being in the connection of the contacts and the operation of the switching mechanisms. The contact rings 95 and 96 of the holding switch 93 are connected by wires 97 and 98 respectively with the two sides of the trunk T^1 and the contact springs 99 and 100 of said switch connect the contacts 13^a with the rings 95 and 96 when the knob 101 is pressed inwardly, thus connecting the holding coil 91 in circuit through the wires 97 and 98 across the wires of the trunk T^1 . The wires 102 and 103 connected with the contact rings 104 and 105 of the holding switch 94 similarly serve to connect the holding coil 92 in circuit across the wires of the trunk T^2 when the knob 106 of the holding switch 94 is depressed. The knob 101 is held in its depressed position by a latch 107 in a manner similar to the holding of the selective switching mechanism in

its operated position and the release magnet 108 associated with the latch 107 has one of its terminals connected by wire 109 with the wire 32 of trunk T¹, the other terminal of said magnet being connected with the contact spring 110. A second contact spring 111 is provided, which is operated by the knob 101 when the latter is moved to its holding position and said spring 111 is connected to wire 112 and thus to negative terminal of battery 55. The release magnet of the holding switch 94 is similarly connected, the only difference being that one of its terminals is connected by wire 113 with the wire 36 of trunk T².

The operation of effecting a connection with a desired station of the intercommunicating system upon receiving a signal from one of the trunks is as follows: Assuming that the signal bell 87 is operated thus indicating that the incoming call is being made on trunk T¹, the operator at station A, knowing by the sound of the signal that the trunk T¹ must be connected with, rotates her knob 18 of the selective switching mechanism to position T¹ and presses the knob inwardly thus connecting her telephone set through the connection of the selective switching mechanism with the wires 30 and 31 which are permanently connected with the wires 32 and 33 of the trunk T¹ and at the same time removes the receiver 71 from the hook 72. Upon answering the call and learning that station B is wanted, the operator depresses the hook 72 and at the same time pushes the knob 101 inwardly. The depression of the hook 72 releases the knob 18, thereby disconnecting the trunk T¹ from the telephone set of station A and the depression of the knob 101 holds the trunk T¹ by the flow of current through the holding coil 91, in which position the knob 101 is held by the latch 107. The operator thereupon releases the hook 72, rotates the knob 18 to position four and pushes the knob inwardly to connect with line L⁴, the amount of inward motion of the knob 18 being such as to bring the contact springs 27 and 28 into engagement with each other thus sending signaling current from the battery 55 through the bell at station B in the manner above described. When the receiver at the station B is removed from its hook the operator at station A states that a call is being made for station B over trunk number one, and thereupon the party at station B rotates his selective switch to position T¹ and presses it inwardly to its connecting position. When he does this his telephone set is bridged across the wires 32 and 33 of the trunk T¹ in the manner above described and, since his switch hook is in its upper position, current flows through the release magnet 108 over the following path: battery 55, wire 53, wire 114, terminal 5, wire 116, contact spring 117, contact spring

118, wire 119, terminal 3, wire 44, wire 120 through the switching mechanism of the selective switch at station B to wire 121, wire 32, wire 109, magnet 108, contact spring 110, contact spring 111, wire 112, back to battery 55. This withdraws the latch 107 from its holding engagement and the knob 101 returns to its outer position thus separating the contact springs 110 and 111 and also interrupting the connection between the holding coil 91 and the wires 97 and 98 from which time the trunk is under the control of the telephone set at station B. From the above it will be observed that the position of the knob 101 is a visual indication to the operator at station A as to whether the party at station B has connected with the trunk. Upon giving the instructions referred to, to the party at station B, the operator at station A hangs up her receiver which results in her selective switch being released in the manner above described, and at the end of the conversation when the party at station B hangs up his receiver his selective switching mechanism is released and all of the mechanism of the system is thereby restored to its normal condition. The operation of the holding switch 94 is similar to that described for the holding switch 93, the only difference being that the releasing current flows over wire 36 of trunk T², and through wire 113 to the releasing magnet instead of over the path above traced for the releasing magnet 108 of the holding switch 93. It will be understood that a single holding switch may be employed if desired instead of the two holding switches shown for conditions where it is not necessary to hold more than one trunk at a time by connecting the holding coil to the rings 95 and 96 and by connecting the pairs of wires 97, 98 and 102, 103 to successive pairs of the contacts 13^a and selecting the trunk by rotation of the knob 101 in the manner described for the selective switching mechanism for connecting the stations of the intercommunicating system.

From the above it will appear that I have provided an improved switching mechanism which has a single moving element which may be moved in a first direction to select a station of an intercommunicating system and by a motion in a second direction may effect connection with the desired station and, furthermore, that by continued motion of the element in the second direction the called station may be signaled and that in addition my switching mechanism is provided with holding means for maintaining the connection with the desired station until the close of the conversation at which time the movable element or member is released by the placing of the receiver upon the hook at the corresponding station. It also appears that a switching mechanism constructed in the

same manner may be employed to hold a trunk line in connection with an intercommunicating system while a call is being extended to a desired station and until the called station answers, and that by the connection of the telephone set at the called station to the trunk the holding switch is released.

It will also appear from the above description of the switching mechanism that it is impossible to ring more than one station for any given selection effected by the selective switching mechanism at a calling station and that before a second selection can be effected the switching mechanism must be released by pressing down the switch hook at the calling station. That is to say, the selection of a desired line cannot be effected while the contacts of the switching mechanism are connected with each other and when a particular line has been selected by the switching mechanism the current can be sent from the switching mechanism only over that line. In this manner the accidental ringing of some other line than the desired line is prevented.

As shown in Figs. 2 and 3, the electromagnet 29 of the switching mechanism may be secured to the front plate 17 of the apparatus by a bracket 114', and the contact springs 26, 27 and 28 may also be mounted on the front plate sufficiently out of line with the bracket 114' to clear said bracket as indicated in Fig. 3. In practice it is desirable to mount with the said contact springs a terminal clip 115 for connection with one of the terminals of the electromagnet 29, so that the wiring of the electromagnet may be completed to the terminal clip 115 and the contact spring 27 as a part of the manufacture of the switching mechanism. In manufacturing the mechanism I also find it desirable to extend the contacts 13 through the insulating plate 10. The rear ends of the contacts are preferably drilled as indicated at 13' to facilitate soldering the connecting wires to said contacts. I also find it desirable to provide connecting studs 116' on the contact rings 11 and 12 which studs 116' extend through the plate 10 and are similarly drilled at their rear ends to receive the wires to be connected thereto. The plate 10 is supported from the front plate 17 by means of posts 117' extending rearwardly from the front plate and provided with portions of reduced diameter at their rear ends which enter holes formed therefor in the plate 10, which plate is preferably held in position upon said posts by spring catches 118' mounted upon said posts. The switching mechanism is preferably mounted upon a box or cabinet 119' by suitable screws 120' extending through the front plate 17, so that the switching mechanism and connecting wiring is contained in said cabinet or casing.

The construction of the switching mechanism facilitates the connecting of the wiring as follows: The plate 10 and parts carried thereby are preferably removed from the plate 17 by releasing the spring catches 118' for which condition the connection between the parts carried by the plate 10 may readily be effected with the proper wires and if desired this operation may be performed during a part of the installation of the system before it is desirable to have the more delicate portions of the switching mechanism installed. When the installation is nearly completed the front plate 17 and parts carried thereby may be put in place quickly since but three wires are to be connected to the terminals carried by the front plate, and the front plate is then easily and quickly secured to the plate 10 by means of the spring catches above referred to, after which the completely assembled switching mechanism is placed in the cabinet or casing and held in place as described. When it is desired to inspect the wiring of the switching mechanism it may be bodily removed from the cabinet or casing and the front plate 17 need not be removed from the plate 10 unless it is necessary to adjust the parts contained between the plates.

While I have shown my invention in the particular embodiment described, it will be understood that I do not limit myself to the exact construction and circuit arrangements shown as I may employ equivalents thereof known to the art at the time of the filing of this application without departing from the scope of the appended claims.

What I claim is:

1. In a selective switch for an intercommunicating telephone system, the combination of radially arranged pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades for connecting the rings and contacts, a rotatable push-rod supporting said switch blades whereby rotating said push-rod selects a desired pair of contacts and depressing said push-rod connects the selected pair of contacts with the contact rings, a spring tending to hold said push-rod in its outer position, a latch for holding said push-rod in its depressed position, an electromagnet for releasing said latch, spring contacts in the circuit of said electromagnet and operated by said push-rod when depressed to close said circuit at said spring contacts, the releasing of said push-rod permitting the separation of said spring contacts, and a ringing spring contact for closing a ringing circuit when said push-rod is depressed beyond its line connecting position.

2. In a selective switch for an intercommunicating telephone system, the combina-

tion of radially arranged pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades for connecting the rings and contacts, a rotatable push-rod supporting said switch blades whereby rotating said push-rod selects a desired pair of contacts and depressing said push-rod connects the selected pair of contacts with the contact rings, a spring tending to hold said push-rod in its outer position, a latch for holding said push-rod in its depressed position, an electromagnet for releasing said latch, and spring contacts in the circuit of said electromagnet and operated by said push-rod when depressed to close said circuit at said spring contacts, the releasing of said push-rod permitting the separation of said spring contacts.

3. In a selective switch for an intercommunicating telephone system, the combination of radially arranged pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades for connecting the rings and contacts, a rotatable push-rod supporting said switch blades whereby rotating said push-rod selects a desired pair of contacts and depressing said push-rod connects the selected pair of contacts with the contact rings, a spring tending to hold said push-rod in its outer position, a latch for holding said push-rod in its depressed position, and an electromagnet for releasing said latch.

4. In a selective switch for an intercommunicating telephone system, the combination of radially arranged pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades for connecting the rings and contacts, a rotatable push-rod supporting said switch blades whereby rotating said push-rod selects a desired pair of contacts and depressing said push-rod connects the selected pair of contacts with the contact rings, a spring tending to hold said push-rod in its outer position, a latch for holding said push-rod in its depressed position, and devices for moving said latch to its releasing position.

5. In a selective switch for an intercommunicating telephone system, the combination of radially arranged pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades for connecting the rings and contacts, and a rotatable push-rod supporting said switch blades whereby rotating said push-rod selects a desired pair of contacts and depressing said

push-rod connects the selected pair of contacts with the contact rings.

6. In a selective switch for an intercommunicating telephone system, the combination of radially arranged pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades for connecting the rings and contacts, a rotatable push-rod supporting said switch blades whereby rotating said push-rod selects a desired pair of contacts and depressing said push-rod connects the selected pair of contacts with the contact rings, and a ringing spring contact for closing a ringing circuit when said push-rod is depressed beyond its line connecting position.

7. In a switch for an intercommunicating telephone system, the combination of contacts, a single operating and switching device having two directions of motion, motion of said device in one direction selecting desired ones of said contacts and motion in the other direction connecting said selected contacts, a latch for holding said device in its operated position, an electromagnet for moving said latch to its releasing position, and ringing contacts, continued motion of said device in said other direction closing said ringing contacts.

8. In a switch for an intercommunicating telephone system, the combination of switch contacts, a switch blade for closing said contacts, a push-rod carrying said switch blade, a latch for holding said push-rod in its operated position, an electromagnet for moving said latch to its releasing position, spring contacts in circuit with said electromagnet and closed by depression of said push-rod, and a spring tending to move said push-rod to its disconnecting position, whereby when said electromagnet is energized its circuit is opened at said spring contacts.

9. In a selective switch for an intercommunicating telephone system, the combination of radially arranged pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades, a rotatable push-rod supporting said switch blades whereby rotating said push-rod selects a desired pair of contacts and depressing said push-rod connects the selected pair of contacts with the contact rings, a spring tending to hold said push-rod in its outer position, a latch for holding said push-rod in its depressed position, an electromagnet for releasing said latch, spring contacts in the circuit of said electromagnet and operated by said push-rod when depressed to close said circuit at said spring contacts, the releasing of said push-rod permitting the

separation of said spring contacts, a ringing spring contact for closing a ringing circuit when said push-rod is depressed beyond its line connecting position, and devices for preventing rotation of said push-rod in its operated position.

10. In a switch for an intercommunicating telephone system, the combination of switch contacts, a switch blade for closing said contacts, a push-rod carrying said switch blade, a latch for holding said push-rod in its operated position, an electromagnet for moving said latch to its releasing position, spring contacts in circuit with said electromagnet and closed by depression of said push-rod, a spring tending to move said push-rod to its disconnecting position, whereby when said electro-magnet is energized its circuit is opened at said spring contacts, and devices for preventing rotation of said push-rod in its operated position.

11. In a switch for an intercommunicating telephone system, the combination of a front plate, operating mechanism carried by said front plate, posts projecting rearwardly from said front plate, a rear plate having openings for receiving said posts, catches for holding said rear plate in place on said posts, and contacts carried by said rear plate, said catches and posts constituting the only mechanical connection between said plates.

12. In a switch for an intercommunicating telephone system, the combination of a front plate, operating mechanism carried by said front plate, posts projecting rearwardly from said front plate, a rear plate having openings for receiving said posts, catches for holding said rear plate in place on said posts, contacts carried by said rear plate, a switch blade connected with said operating mechanism, a latch for holding said operating mechanism in actuated position, an electromagnet for releasing said switch, and devices mounting said latch and electromagnet on said front plate.

13. In a switch for an intercommunicating telephone system, the combination of a front plate, operating mechanism carried by said front plate, posts projecting rearwardly from said front plate, a rear plate having openings for receiving said posts, catches for holding said rear plate in place on said posts, contacts carried by said rear plate, a switch blade connected with said operating mechanism, a latch for holding said operating mechanism in actuated position, an electromagnet for releasing said switch, devices mounting said latch and electromagnet on said front plate, and switch springs mounted on the front plate and actuated by said operating mechanism for controlling the circuit of said electromagnet.

14. In a switch for an intercommunicating

telephone system, the combination of a front plate, operating mechanism carried by said front plate, posts projecting rearwardly from said front plate, a rear plate having openings for receiving said posts, catches for holding said rear plate in place on said posts, contacts carried by said rear plate, and switching mechanism for engaging said contacts, said switching mechanism being wholly supported by said front plate and having no mechanical connection with said back plate.

15. In a selective switch for an intercommunicating telephone system, the combination of radially arranged pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades for connecting the rings and contacts, ringing contacts, a rotatable push-rod for supporting said switch blades and operating said ringing contacts whereby rotating said push-rod selects a desired pair of contacts and depressing said push-rod connects the selected pair of contacts with the contact rings and closes said ringing contacts, a spring tending to hold said push-rod in its outer position, and a latch for holding said push-rod depressed.

16. In a selective switch for an intercommunicating telephone system, the combination of radially arranged pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades for connecting the rings and contacts, ringing contacts, a rotatable push-rod for supporting said switch blades and operating said ringing contacts whereby rotating said push-rod selects a desired pair of contacts and depressing said push-rod connects the selected pair of contacts with the contact rings and closes said ringing contacts, a spring tending to hold said push-rod in its outer position, a latch for holding said push-rod depressed, and an electromagnet for releasing said latch.

17. In a selective switch for an intercommunicating telephone system, the combination of pairs of contacts for connection with the lines of the system, a pair of concentric contact rings for connection with the telephone set associated with the selective switch, switch blades for connecting the rings and contacts, ringing contacts, and a rotatable push-rod for supporting said switch blades and operating said ringing contacts whereby rotating said push-rod selects a desired pair of contacts and depressing said push-rod connects the selected pair of contacts with the contact rings and actuates said ringing contacts.

18. In a switch for an intercommunicating telephone system, the combination of a first

set of contacts, a second set of contacts, and
a single operating and switching device hav-
ing two directions of motion, motion of said
device in one direction selecting desired ones
5 of said first set of contacts, and motion in
the other direction connecting said selected
contacts and actuating said second set of

contacts for any selecting position of said
device, a latch for holding said device in
position to connect the selected contacts, and 10
an electromagnet for releasing said latch.

In witness whereof, I hereunto subscribe
my name this 28th day of April, A. D. 1917.

THEODORE H. NELSON.