

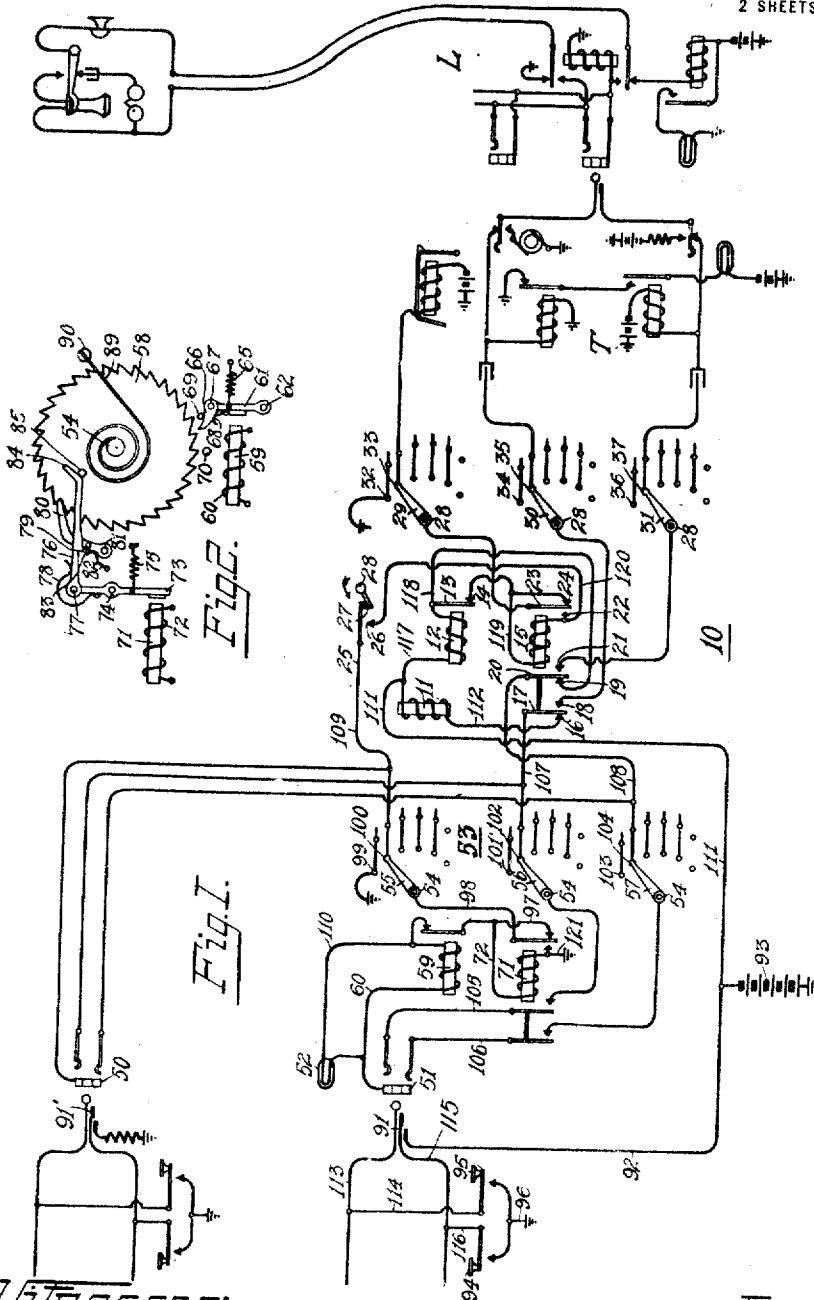
E. LAND.
TELEPHONE SYSTEM.

APPLICATION FILED FEB. 13, 1905. RENEWED OCT. 18, 1906.

1,146,177.

Patented July 13, 1915.

2 SHEETS—SHEET 1.



Witnesses:

G. E. Mueller

Wm. Berghahn

Inventor:

Edmund Land

By Curtis Blum
Attorney.

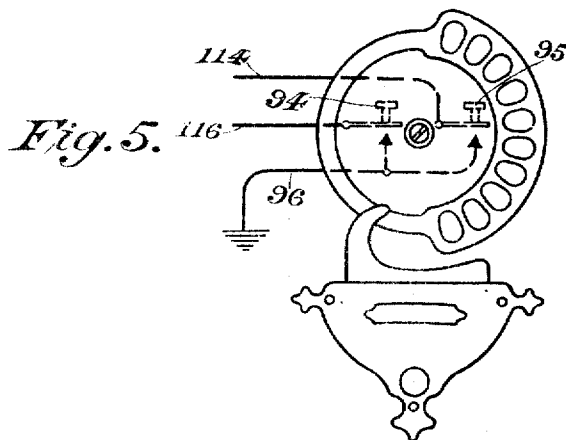
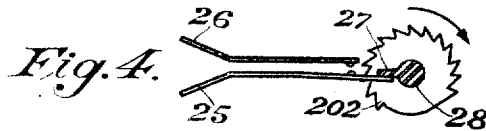
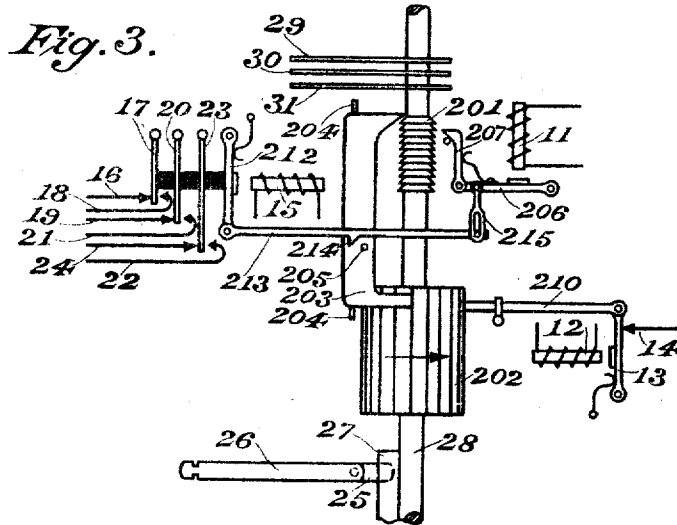
E. LAND.
TELEPHONE SYSTEM.

APPLICATION FILED FEB. 13, 1905. RENEWED OCT. 18, 1906.

1,146,177.

Patented July 13, 1915.

2 SHEETS—SHEET 2.



Witnesses:
Harold C. Prado.
David S. Hulfish

Edmund Land,
Inventor.
by Samuel A. McMeen
Attorney.

UNITED STATES PATENT OFFICE.

EDMUND LAND, OF GRAND RAPIDS, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO KELLOGG SWITCHBOARD & SUPPLY COMPANY, A CORPORATION OF ILLINOIS.

TELEPHONE SYSTEM.

1,146,177.

Specification of Letters Patent.

Patented July 13, 1915.

Application filed February 13, 1905, Serial No. 245,344. Renewed October 18, 1906. Serial No. 339,577.

To all whom it may concern:

Be it known that I, EDMUND LAND, a citizen of the Dominion of Canada, and a resident of Grand Rapids, county of Kent, and State of Michigan, have invented a new and useful Improvement in Telephone Systems, of which the following is a specification.

My invention pertains to telephone systems in which automatic devices are used for connecting telephone lines, or for performing certain functions in the connection of telephone lines, in addition to functions performed manually by telephone operators at the central office.

It is the scope of my invention to enable operators at a telephone switchboard to complete connections for telephone lines terminating in other central offices directly from the keyboard of the operator first receiving the call, and without the intervention or assistance of any operator in the said other central office, by means of automatic switches in the other central office, the switch being automatically controlled by the operator first receiving the call; and further, it is the object of my invention to provide the automatic switches with a new and improved circuit by means of which circuit, applied to automatic switches of well known type, many of the parts now existing in those automatic switches are rendered useless, their functions being performed fully by those parts used in my improved circuits, thus rendering possible a much simpler and much improved type of the automatic equipment used.

I accomplish the results first outlined, by the use of automatic selecting switches in connection with the trunks and controlling keys or devices in connection with the operator's switching equipment. I accomplish the further results by a novel circuit, fully shown in accompanying drawings.

In the drawings, Figure 1 shows the circuits; Fig. 2 shows mechanical operating details of the switch 53 of Fig. 1; Fig. 3 shows mechanical operating details of the switch 10 of Fig. 1; Fig. 4 is a section through the main shaft 28 of Fig. 3, showing detail of the off-normal switch; and Fig. 5 shows a modification of the circuits of Fig. 1 in which the well known Strowger calling dial with its associated contact-making

devices is substituted for the keys 94 55 and 95 of Fig. 1.

In Fig. 1, I have shown circuits adapted to be used in connection with automatic switches of the Strowger type as now commercially used, that switch being of the general type covered by United States Patent No. 638,249, dated December 5, 1899, Keith, *et al.*, assignors to the Strowger Automatic Telephone Exchange; the switch as disclosed in that patent has been modified as now used in the detail of its releasing mechanism, the operation of that detail now being as follows: A releasing electromagnet is provided which is energized upon the simultaneous energization of the vertical and rotary magnets or line relays; the releasing magnet has attached to its armature, a link adapted to engage a pin upon the pawl holding the part carrying the moving contact terminals; upon the energization of the releasing magnet, the armature advances the link and the link drops over the pin in the holding pawl, the pin in the holding pawl then projecting into or through a hole in the link, but as yet, the holding pawl has not been moved; upon the deenergization of the releasing magnet, a retractile spring returns the armature to its position of rest and thus withdraws the link and thus actuates the holding pawl to withdraw it from engagement with the part carrying the moving contact terminals, permitting that part to return to its normal position of rest; the link attached to the armature of the releasing magnet retains the pin upon the holding pawl and thus retains the holding pawl out of engagement with the part carrying the movable terminals until by the actuation of either the vertical or rotary magnet, the link is pushed from the pin and the holding pawl is thus permitted to return to its position in engagement with the part carrying the moving contact terminals, to retain that part in such position as may be determined by actuation of its driving pawls, both vertical and rotary. 100

I have invented circuits by which, when those circuits are applied to a modern Strowger automatic switch, only the vertical magnet, rotary magnet and releasing magnet are necessary, the releasing magnet being provided with armature contacts replacing, and therefore displacing also, the well 105

known side-switch of the Strowger mechanism.

At 10 in Fig. 1 are shown the circuits of an automatic switch of the fundamental type of the Strowger, but modified for the use of my circuits, and having, therefore, many of the Strowger features omitted. In Fig. 3 are shown the mechanical operating details of this switch, with an additional detail in Fig. 4. In these figures, 11 is the vertical magnet, causing the vertical steps of the main shaft 28 through the action of its armature 206, pawl 207 and ratchet 201; 12 is the rotary magnet, causing the rotary steps of the shaft 28 through its armature 13, pawl 210 and ratchet 202; 14 is an electrical contact point connecting with the armature 13 of rotary magnet 12; 15 is the release magnet with its armature 212 and attached link 213, the link 213 having a hook 214 adapted to engage pin 205 on pawl 203, the pawl 203 being pivoted at 204 and being adapted to engage the shaft 28 by both vertical and horizontal ratchets. When the armature 212 is attracted, the link 213 is advanced, the hook 214 passes over the pin 205 and all parts remain thus during the continuance of energization of release magnet 15; upon the deenergization of the release magnet 15, the armature 212 is restored by its retractile spring, drawing with it the link 213, causing the hook 214 to engage and carry with it the pin 205, thus lifting the pawl 203 from engagement with the two ratchets of the shaft 28, and permitting the shaft 28 to return to its normal position of rest through the action of its springs and gravity. Link 215, attached to armature 206, will lift link 213 upon the first energization of vertical magnet 11 subsequent to disconnection, thus releasing pin 205 and pawl 203. Attached to the armature 212 of release magnet 15 are electrical contact-springs 17, 20, 23, adapted when at rest to make connection with contact points 16, 19, 24, respectively, and when the armature is in its attracted position to make connection with contact points 18, 21, 22, respectively. Part 25 is a contact-spring associated with a contact-spring 26, the pair constituting an off-normal switch, held open by rib 27 on the shaft 28 and adapted to be closed at the first rotary movement of the shaft 28. Parts 29, 30 and 31 are the moving contact terminals or wipers supported insulatively upon the shaft 28, and adapted to make contact with the fixed contact terminals, or waiting contacts, 32, 33, 34, 35, 36, 37, etc., to effect circuit conditions as described later.

In the use of my invention as herein shown, a jack 51 is located in the same central office with the switch 10, and associated with the jack 51 are the signal lamp 52 and the automatic selecting device 53. The selecting device 53 is an automatic switch hav-

ing only one movement of selection, namely, a rotary one, the essential mechanical parts of which are shown diagrammatically in Fig. 2. In some telephone exchanges the distribution of central offices and traffic might require that the switch 10 be in a central office distant from the jack 51, in which case the principles of my invention apply equally well, the trunks extending from the switch 10 reaching either various portions of that central office, or extending to still other central offices, or both.

In Fig. 2, 54 is a shaft bearing insulatingly three movable contact terminals, or wipers (Fig. 1, 55, 56, 57), and bearing rigidly ratchet 58. 59 is an electromagnet energized by winding conductor 60 and controlling armature 61, pivotally sustained at 62 under tension of spring 65, and carrying upon its free end driving pawl 66, pivoted at 67, pressed by spring 68 and held from ratchet 58 by fixed pin 69; when magnet 59 attracts armature 61, driving pawl 66 is propelled to engage ratchet 58 and to move said ratchet the distance of one tooth, further motion being prevented by fixed pin 70. Magnet 71, adapted to be energized by winding conductor 72, controls armature 73, pivotally sustained at 74, under tension of spring 75, and bearing link 76, pivoted at 77, pressed by spring 78 and with a downwardly projecting hook, 79. Holding pawl 80, pivotally sustained at 81 pressed by spring 82, engages ratchet 58 as shown, and bears projecting pin 83. Link 76 has a cam edge 84 extending over the face of ratchet 58, and ratchet 58 carries a pin 85 adapted to engage cam edge 84 and to lift link 76. Link 76 is shown in its lifted position. The electrical connections and contacts of the switch and armatures are not shown. The operation of the mechanical parts is as follows: Magnet 59 is energized and released repeatedly, thus propelling ratchet 58 and shaft 54, and moving pin 85 away from link 76; magnet 71 then is energized, hooking projection 79 over pin 83; upon the deenergization of relay 71 and release of its armature, holding pawl 80 is withdrawn from engagement with ratchet 58 which is returned to its position of rest by volute spring 89, attached to shaft 54 and fixed pin 90; at return of ratchet 58 to rest, pin 85 has engaged cam edge 84 to lift link 76 from pin 83, restoring holding pawl 80 to engagement with ratchet 58.

At 91 is shown the connecting plug of an operator's equipment, the remainder of the equipment being of any well known or desired type; to this plug are connected the conductor 92 from the body of the plug to the grounded battery 93, and the two manually operated keys 94 and 95; by the operation of the key 94, ground at 96 is connected to the ring conductor of the plug 91, and by

the operation of the key 95, ground is connected to the tip conductor of the plug 91.

The operation of the system thus shown is as follows: The telephone operator, having taken a call and having learned that the line called for is not terminated in the central office whose line terminals may be before her in multiple, or otherwise accessible, places the connecting plug 91 in the jack 51, or a similar jack similarly equipped; wipers 55, 56, 57 are in their position of rest in contact with points 99, 101, 103 respectively; current flows from battery 93 through elements 92, 60, 59, 97, 98, 55 to ground at 99; this energizes magnet 59, steps shaft 54 forward one step, advancing wipers 55, 56, 57 one step, so that wiper 55 now is in connection with waiting contact 100, and also magnet 59 breaks the circuit just described by its own armature contact and thus releases its own armature to complete the circuit as before, but now to ground through waiting contact 100, if that waiting contact be grounded, and so on, repeating until a waiting contact without ground is connected with by wiper 55; assume that the first waiting contact tested, 100, is without a ground, then upon the closure of the armature contact of relay 59, current must flow from battery 93 through elements 92, 60, 59, 72, 71 and 121 to ground; the winding of magnet 71 is of comparatively high resistance, while the winding of magnet 59 is of comparatively low resistance, so that in the circuit now completed, the magnet 71 is sufficiently energized by its large number of turns to attract its armatures, yet the magnet 59 by its small number of turns is insufficiently energized and does not attract its armature; armature contacts of relay 71 therefore, are actuated and conductors 105 and 106 are connected to wipers 56 and 57 and thence by waiting contacts 102 and 104 to trunk conductors 107 and 108, respectively; also conductor 98 is disconnected from conductor 97 and connected to ground, thus placing ground upon waiting contact 100 and upon trunk conductor 109. The lamp 52 is a signal lamp for the operator who has inserted plug 91 into jack 51, and its operation is as follows: Being in shunt by conductor 110 around the winding of magnet 59, the current flow through the lamp is proportional to the flow through the circuits already considered, in which magnet 59 has formed a part.

The filament of lamp 52 shall be so designed as to glow when magnet 59 is receiving such a current as will operate its armature; and not to glow when the current through magnet 59 is reduced to such an extent that the armature of said magnet is not operated; this requirement on the part of lamp 52 will cause lamp 52 to flash rapidly or to glow continuously or variably dur-

ing the vibrations of armature magnet 59, which will continue until wiper 55 has found a waiting contact without ground and magnet 71 is energized: at which time the reduction of current through magnet 59 will cause such a reduction of current through lamp 52 that the filament will not be heated to give an apparent signal. It is seen, thus, that when operator in charge of plug 91 inserts the plug in jack 51, the lamp will glow until the automatic mechanism 53 has made selection and has connected with the conductor of a local trunk, such as 107—108—109. Conductors 107—108 and 109 show a representative local trunk of a large number of similar local trunks, each of which trunks is connected to a modified Strowger switch as shown at 10, and each of which local trunks is terminated in branch multiples in many automatic devices, such as 53 connected to jacks such as 51. By the action of magnet 71 the conductor 98 has been grounded, and thus the waiting contact 100 has been grounded and ground has been placed upon all homologous contacts in other switches as 53, thus preventing connection with that trunk by any other such switch, since the presence of ground upon waiting contact 100 would prevent the energization of magnet 71, and thus would cause magnet 59 to step the shaft 54 past this local trunk, and so on, until an idle conductor was connected with by wiper 55. The complete equipment of such an office, therefore, consists of a plurality of local trunks such as 107—108 and 109, and a plurality of selecting devices such as 53, each of the selecting devices having accessible, a plurality of said local trunks, and being adapted when a plug is inserted into its jack, as 51, to automatically test consecutively the trunks, to connect the jack with the first idle one found, and to isolate it by placing upon its waiting contact, as 100, in other switches, a ground which prevents that local trunk from being taken by any of the other switches. The operator, thus, by selecting the group of conductors 107—108 and 109 has selected an idle modified Strowger switch, as 10, and has appropriated it to her own use for this connection. The selection of that switch is announced to her by the permanent darkening of lamp 52, and she then may proceed to manipulate the automatic switch 10.

A plurality of switches as 10 are located in the same central office, and from them extend trunks to other central offices; the arrangements of trunks being as follows: upon the first level of contacts shall terminate trunks for a given distant central office; upon the next level shall terminate trunks for another given central office, and so on, for the different levels. Each level represents a different distant central office or a

different division of such central office. In each level the trunks are similar and terminate upon similar equipments at the distant central offices, so that it is immaterial which of them be selected for service for a particular call, the selection merely depending on the necessity of taking a trunk not already in use.

The next step on the part of the operator at plug 91 is to select the proper distant central office required to complete the call. This she does by the use of key 95. Upon closing key 95, current flows from battery 93 through elements 111—11—112—16—17—107—56—105—114—95 and to ground at 96, energizing vertical magnet 11, and stepping the mechanism of the modified Strowger switch up to the first level of waiting contacts in a manner well known in the art; the use of key 95 is repeated until the proper level is reached upon switch 10, then the key 94 is operated once. Upon the closure of key 94, current flows from battery 93 through elements 111—117—12—118—19—20—108—57—106—115—116 to the ground at 96; energizing rotary magnet 12. Wipers 29—30—31 are normally not in connection with any waiting contact. The energization of magnet 12 has broken the contact between parts 13 and 14 and has stepped shaft 28 forward one step, closing off-normal switch 25—26, and carrying wipers 29—30—31 into connection with waiting contacts at 32—34—36 respectively. Upon release of key 94, the circuit through magnet 12 is broken and armature 13 is released, whereupon a circuit is completed for current from battery 93, through elements 111—117—12—13—14—24—23—29 to waiting contact 32 and to ground if that contact be grounded, as it will be if the trunk associated with that contact be already in use. Assuming that such trunk is in use, the circuit to ground at waiting contact 32 will energize magnet 12 again, attracting armature 13 and stepping shaft 28 forward another step; this will advance wipers 29—30—31 into electrical connection with waiting contacts 33—35—37 respectively, and such vibration of armature 13 will continue until wiper 29 reaches a trunk not already in use and whose waiting contact, as 33, therefore is not grounded. Upon reaching an idle trunk, the circuit at wiper 29 is not grounded and path for current exists from battery 93 through elements 111—117—12—13—14—119—15—120—26—25—109—55 98 and to ground at 121, energizing magnet 15, but owing to the comparatively high resistance of magnet 15, and the comparatively low resistance of magnet 12, the magnet 12 is not energized to step the shaft 28 farther, nor to break its armature contact. The magnet 15, therefore, being energized attracts its armature and by the contact of parts 23 and 22, places ground

upon the waiting contact 33 by the following conductors: 29—23—22—120—25—109—55—121; thus, busy test is placed upon other waiting contacts in multiple with 33 to prevent other selective switches from connecting with the selected trunk. The energization of magnet 15 also operates to break contact parts 16 from 17 and 19 from 20, to make connections between elements 17—18 and 20—21, thus connecting the conductors of the selected trunk directly to the conductors of operator's connecting plug 91, and to her controlling keys 94—95, by the following conductors: 30—18—17—107—56—105—113—114, and 31—21—20—108—57—106—115—116; thus it is seen that the operator using the plug 91 is enabled to select the required distant central office by the manipulation of keys 95 and 94, and that the conductors leading from those keys are carried through to the distant central office so that by the further manipulation of those keys automatic switches either similar to the switch 10 or of the standard well known Strowger type, may be operated to select further trunks or to select the desired subscriber's line. Many minor details may be modified or added for convenience without departing from the spirit or scope of my invention, for instance: Keys 94 and 95 may be replaced by the well known Strowger calling device, or by any mechanism which automatically would give the proper number of ground impulses upon the conductor 114, and then one upon the conductor 116. Further, only one of the Strowger calling devices might be used by the operator, it being switched from plug to plug by a key provided for each of the operator's connecting plugs.

In lieu of the jacks as 51, and lamps as 52, with automatic selective equipments as 53, each trunk as 107—108—109 may terminate directly in a jack as 50, or in a plurality of such jacks connected in branch terminal multiple. In the former instance the operator would connect directly with switch 10 by taking the jack 50 with plug 91'; in the latter case, the operator would, in the usual well known manner, test such jacks as 50 as might be before her, and having found an idle one would plug into it, and thus be connected directly with the selected switch, as 10 connected with that jack.

The out-going trunk connected with the waiting contacts 33—35—37 may terminate in the distant central office in manually operated switching equipments, instead of in automatic switches. For the purpose of illustration a trunk circuit T is shown extending from contacts 33, 35, 37, being equipped with a well known form of supervision including tip and sleeve relays and a supervisory lamp. A line circuit L adapted for use with circuit T is also illustrated, being

of a well known character and further reference thereto is believed unnecessary. Any signal to indicate to the operator at the incoming end of trunk T may be employed, but I have shown a drop associated with the incoming end, it being adapted to indicate a call to the operator when connection is made with its associated trunk by a switch 10. Of course, it is to be understood that the application of my invention is not limited to any particular type of trunk, the one shown being merely for the purpose of illustration.

In each place where battery is shown in the circuit drawings accompanying this specification, a ground may be substituted, and where a ground is shown, a connection to a source of electric potential may be substituted, thus reversing the direction of the current flow, but not materially changing the system. Therefore, in view of the many possible modifications, I do not wish to limit myself to the specific details of apparatus designs, herein shown or described.

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

1. In a telephone system, the combination of an automatic switch, wipers and waiting contacts in said automatic switch, talking strands, an actuating magnet, means for operating said magnet over a talking strand, a releasing magnet, a source of electric energy, said magnets and said source of energy being in series and said actuating magnet being adapted to operate only when said releasing magnet is shunted, and a shunt for said releasing magnet including in its circuit a wiper and a waiting contact for said automatic switch, substantially as described.

2. In a telephone system, the combination of an automatic selective switch, a vertical magnet, a rotary magnet, switches by which the armature of said rotary magnet makes and breaks the circuit of the winding of said rotary magnet, and a release magnet adapted to be energized continuously throughout the duration of connection and adapted to restore all parts of said automatic selective switch to normal positions of rest upon its deenergization, substantially as described.

3. In a telephone system, the combination of an automatic selective switch, an actuating magnet, a releasing magnet, normally open off-normal contacts, means for closing said contacts, and a source of electric energy, said magnets said off-normal contacts, and said source of electric energy being in series and said actuating magnet being adapted to operate only when said releasing magnet is shunted, and a circuit adapted to shunt said releasing magnet, substantially as described.

4. In a telephone system, the combination of an automatic selecting switch, wiper-contacts and trunk-terminals in said automatic selecting switch, talking strands, an actuat-

ing magnet, means for operating said magnet over a talking strand, a releasing magnet, a source of electric energy, said magnets and said source of energy being in series and said actuating magnet being adapted to operate only when said releasing magnet is shunted, and a shunt for said releasing magnet adapted to be maintained while said wiper-contacts of the automatic selecting switch are testing busy trunk-terminals and adapted to be interrupted when said wiper-contacts engage trunk-terminals not already busy, substantially as described.

5. In a telephone system, the combination of a connecting plug, a jack adapted to be connected with by said plug, an automatic selective switch having one movement of selection associated with said jack and adapted to select and connect with an idle trunk when said plug is connected with said jack, a trunk terminating in said automatic switch and associated with another automatic selective switch in the same or other office having two movements of selection, groups of trunks terminating in said latter automatic switch and leading to other central offices, means in said latter automatic switch for selecting first a group of trunks and then an idle trunk of that group, two conductors in said trunk, keys associated with said connecting plug to control said latter selective switch over said two conductors, a third conductor in said trunk, circuits including said third conductor and controlling the release and restoration of said first selective switch, circuits by which said latter automatic switch is released by the restoration of said first selective switch, means by which said first selective switch is released by the disconnection of said plug from said jack, substantially as described.

6. In a telephone system, the combination of a connecting plug, a jack adapted to be connected with by said plug, an automatic selective switch having one movement of selection associated with said jack and adapted to select and connect with an idle trunk when said plug is connected with said jack, a trunk terminating in said automatic switch and associated with another automatic selective switch in the same or other office having two movements of selection, a group of trunks terminating in said latter automatic switch and leading to another central office, means in said latter automatic switch for selecting first said group of trunks and then an idle trunk of that group, two conductors in said first-mentioned trunk, keys associated with said connecting plug to control said latter selective switch over said two conductors, a third conductor in said trunk, circuits including said third conductor and controlling the release and restoration of said automatic switch, means by which said latter automatic switch is re-

leased by the restoration of said first selective switch and means by which said first selective switch is released by the disconnection of said plug from said jack, substantially as described.

7. In a telephone system the combination of a central office, a plug in said central office, switching devices adapted to connect with said plug, controlling keys associated with said plug, an automatic selective switch having two movements for selection and located in the same central office with said plug and switching devices, fixed waiting contacts in said selective switch, movable wiping contacts in said selective switch, other central offices, trunks terminating on said waiting contacts and extending to said other central offices, a local trunk terminating on said movable wiping contacts and extending to said switching devices adapted to connect with said plug, two conductors in said local trunk, circuits by which said controlling keys will be connected to said two conductors when said switching devices are connected to said plug, a third conductor in said local trunk extending from said automatic switch to said switching devices, circuits by which said third conductor is open at said switching devices when said local trunk is not connected with and by which said conductor is grounded at said switching devices when said trunk is connected with, a releasing magnet in said automatic switch, circuits by which said releasing magnet is connected between a grounded source of electric potential and said conductor after a trunk has been selected by said selective switch and with consequent energization of said releasing magnet, mechanical means by which the breaking of said circuits and consequent deenergization of said releasing magnet will restore all parts of said automatic switch to their normal positions of rest, substantially as described.

8. In a telephone system the combination of a connecting plug, a jack adapted to be connected with by said plug, selective switch having one movement of selection associated with said jack and adapted to select and connect with an idle local trunk when said plug is connected with said jack, a pair of wipers in said selective switch, a third wiper in said selective switch, an electromagnet in said selective switch, releasing means in said selective switch actuated consequent upon the deenergization of said electromagnet, armature contacts on said electromagnet adapted to connect two conductors of said jack with two of the said wipers while said electromagnet is energized, armature contacts on said electromagnet adapted to connect said third wiper directly with ground while said electromagnet is energized, a circuit adapted to main-

tain the energization of said electromagnet, and to be broken by the removal of said plug from said jack, a local trunk terminating in said selective switch and associated with an automatic selective switch in the same office having two movements of selection, groups of trunks terminating in said latter automatic switch and leading to other central offices, means in said latter automatic switch for selecting first a group of trunks and then an idle trunk of that group, two conductors in said local trunk, a third conductor of said local trunk, an electromagnet in said latter automatic switch, a pair of wipers in said latter automatic switch, a third wiper in said latter automatic switch, armature contacts on said electromagnet adapted to connect the said two conductors of said local trunk to said pair of wipers during the energization of said electromagnet, armature contacts on said electromagnet adapted to connect said third wiper to ground by a circuit extending through said third conductor of said local trunk during the energization of said electromagnet, and releasing and restoring means in said latter selective switch adapted to be actuated consequent upon the deenergization of said electromagnet, substantially as described.

9. In a telephone system the combination of a central office, a plug in said central office, switching devices adapted to connect with said plug, controlling keys associated with said plug, an automatic selective switch having two movements for selection and located in the same or another central office, fixed waiting contacts in said selective switch, movable wiping contacts in said selective switch, trunks terminating on said waiting contacts, a trunk terminating on said wiping contacts and extending to said switching devices adapted to connect with said plug, two conductors in said trunk, a third conductor in said trunk extending from said automatic switch to said switching devices, circuits by which said third conductor is open at said switching devices when said trunk is not connected with and by which said third conductor is grounded at said switching devices when said trunk is connected with, a releasing magnet in said automatic switch, circuits by which said releasing magnet is connected between a grounded source of electric potential and said third conductor after a trunk has been selected by said selective switch and with consequent energization of said releasing magnet, and mechanical means which will restore all parts of said automatic switch consequent upon the deenergization of said releasing magnet, substantially as described.

10. In a telephone system, the combination of a central office, a plug in said central office, switching devices adapted to con-

nect with said plug, controlling keys associated with said plug, an automatic selective switch having two movements for selection and located in the same or other central office, fixed waiting contacts in said selective switch, movable wiping contacts in said selective switch, trunks extending from said waiting contacts to other switching devices in the same or other central offices, a trunk terminating on said wiping contacts and on said switching devices adapted to connect with said plug, two conductors in said trunk, a third conductor in said trunk, a releasing magnet in said automatic switch, a circuit including the winding of said releasing magnet and said third conductor by which said releasing magnet is energized after a trunk has been selected by said selective switch, and mechanical means for restoring said automatic switch consequent upon the deenergization of said releasing magnet, substantially as described.

11. In a telephone system the combination of a connecting plug, a jack adapted to be connected with by said plug, selective switch having one movement of selection associated with said jack and adapted to select and connect with an idle trunk when said plug is connected with said jack, a pair of wipers in said selective switch, a third wiper in said selective switch, an electromagnet in said selective switch, releasing means in said selective switch actuated consequent upon the deenergization of said electromagnet, armature contacts on said electromagnet adapted to connect two conductors of said jack with two of the said wipers while said electromagnet is energized, armature contacts on said electromagnet adapted to connect said third wiper directly with ground while said electromagnet is energized, a circuit adapted to maintain the energization of said electromagnet, and to be broken by the removal of said plug from said plug from said jack, a trunk terminating in said selective switch and associated with an automatic selective switch in the same or other central offices having two movements of selection, groups of trunks terminating in said latter automatic switch and leading to other switching devices, means in said latter automatic switch for selecting first a group of trunks and then an idle trunk of that group, two conductors in said trunk, a third conductor in said trunk, an electromagnet in said latter automatic switch, a pair of wipers in said latter automatic switch, a third wiper in said latter automatic switch, armature contacts on said electromagnet adapted to connect the said two conductors of said trunk to said pair of wipers during the energization of said electromagnet, armature contacts on said electromagnet adapted to connect said third wiper to ground by a circuit through said

third conductor of said trunk during the energization of said electromagnet, and releasing and restoring means in said latter selective switch adapted to be actuated consequent upon the deenergization of said electromagnet, substantially as described.

12. In a telephone exchange system, interconnecting mechanism comprising a conductor, means under the control of the operator for establishing connection therewith, a plurality of trunks, automatic switch mechanism responsive to the establishment of said connection to automatically establish connection between said conductor and an idle one of said trunks, additional automatic switch mechanism associated with the distant end of the selected trunk for extending the circuit of said trunk, and means for releasing all of said automatic switch mechanisms by breaking the connection with said conductor.

13. In a telephone system, an automatic switch, a conductor extending to said switch, a plurality of trunks extending from said switch, a manual terminal for said conductor, a plug for establishing connection with said terminal, operator's means associated with said plug for directing the advance of said switch to desired positions, means for subsequently causing said switch to automatically test said trunks and connect with an idle one, a release circuit for said switch extending directly through contacts of the plug and manual terminal, and means for restoring said switch to normal by interrupting said circuit upon withdrawing said plug from said terminal.

14. In a telephone system, an interconnecting conductor, a manual terminal and an automatic terminal at one end of said conductor, means associated with the other end of said conductor for extending the circuit of said conductor, manual means for connecting to said manual terminal, automatic switching means for connecting to said automatic terminal, and means responsive to said manual connection to indicate busy at the automatic terminal.

15. In a telephone system, an interconnecting conductor, a manual terminal and an automatic terminal at one end of said conductor, an automatic switch associated with the other end of said conductor, manual means for connecting to said manual terminal, automatic switching means for connecting to said automatic terminal, and means responsive to said manual connection to indicate busy at the automatic terminal.

16. In a telephone system, an interconnecting conductor, a manual terminal and an automatic terminal at one end of said conductor, an automatic switch associated with the other end of said conductor, manual means for connecting to said manual terminal and causing the operation of

said automatic switch, automatic switching means for connecting to said automatic terminal, means whereby said automatic switch may be controlled through said automatic terminal, and means responsive to said manual connection to indicate busy at the automatic terminal.

17. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contact busy, a magnet and coöperating means for advancing said active contact, relay-contacts, means for closing an initial energizing circuit for said magnet through certain of said relay-contacts to cause said active contact to advance a definite distance, means for closing a second energizing circuit for said magnet through other of said relay-contacts to continue the movement of said active contact, and means for actuating said relay-contacts to interrupt both of said magnet circuits.

18. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a magnet and coöperating means for advancing said active contact, relay-contacts, means for closing an initial energizing circuit for said magnet through certain of said relay-contacts to cause said active contact to advance a definite distance, means for closing a second energizing circuit for said magnet through other of said relay-contacts to continue the movement of said active contact, and means for actuating said relay-contacts upon the engagement of said active contact with an idle passive contact to interrupt both of said magnet circuits.

19. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a magnet and co-operating means for advancing said active contact, a control relay, means for closing an initial energizing circuit for said magnet through contacts of said relay to cause said active contact to advance a definite distance, means for closing a second energizing circuit for said magnet also through contacts of said relay to continue the movement of said active contact, and means for operating said relay upon the engagement of said active contact with an idle passive contact to interrupt both of said magnet circuits.

20. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a magnet and coöperating means for advancing said active contact, a control relay, means for closing

an energizing circuit for said magnet through contacts of said relay to cause the advance of said active contact over said passive contacts, means for maintaining an energizing circuit for said magnet through other contacts of said relay until said active contact engages an idle passive contact, and means responsive to such engagement to operate said relay to cause the deenergization of said magnet.

21. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and coöperating means for advancing said active contacts, a control relay having contacts under its sole control, means controlled over a single one of said talking strands to close an energizing circuit for said magnet through said contacts of said relay to cause the advance of said active contacts over said passive contacts, and means for operating said relay upon the advance of said active contacts to a position having idle passive contacts to cause the interruption of said magnet circuit.

22. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and coöperating means for advancing said active contacts, a control relay having contacts under its sole control, means controlled over a single one of said talking strands to close an energizing circuit for said magnet through said contacts of said relay to cause the advance of said active contacts over said passive contacts, means for operating said relay upon the advance of said active contacts to a position having idle passive contacts to cause the interruption of said magnet circuit, and means controlled by said relay to control the continuity of said talking strands.

23. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and coöperating means for advancing said active contacts, a control relay having contacts under its sole control, means controlled over a single one of said talking strands to close an energizing circuit for said magnet through said contacts of said relay to cause the advance of said active contacts over said passive contacts, means for maintaining an energizing circuit for said magnet through contacts of said relay until said active contacts are advanced to a position

having idle passive contacts, and means responsive to such advance to operate said relay to cause the deenergization of said magnet.

24. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and coöperating means for advancing said active contacts, a control relay having contacts under its sole control, means controlled over a single one of said talking strands to close an energizing circuit for said magnet through said contacts of said relay to cause the advance of said active contacts over said passive contacts, means for maintaining an energizing circuit for said magnet through contacts of said relay until said active contacts are advanced to a position having idle passive contacts, means responsive to such advance to operate said relay to cause the deenergization of said magnet, and means controlled by said relay to control the continuity of said talking strands.

25. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and coöperating means for advancing said active contacts, a control relay having contacts under its sole control, talking strands including said contacts of said relay, means controlled over a talking strand to close an energizing circuit for said magnet through contacts of said relay to cause the advance of said active contacts over said passive contacts, and means for operating said relay upon the advance of said active contacts to a position having idle passive contacts.

26. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and coöperating means for advancing said active contacts, a control relay having contacts under its sole control, talking strands including said contacts of said relay, means controlled over a talking strand to close an energizing circuit for said magnet through contacts of said relay to cause the advance of said active contacts over passive contacts, means for maintaining an energizing circuit for said magnet through contacts of said relay until said active contacts are advanced to a position having idle passive contacts, and means responsive to the advance of the active contacts to an idle position to cause the operation of said relay.

27. In a telephone system, an automatic switch comprising passive contacts and co-

operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of said first-mentioned passive contacts busy, a magnet and coöperating means for advancing said active contact, means controlled over a talking circuit to close an energizing circuit for said magnet, relay-contacts, a relay having sole control of said relay-contacts, means operative upon an advance of said active contact to close a maintaining circuit for said magnet through certain of said relay-contacts, a busy connection for said active contact including certain of said relay-contacts, and means including said relay responsive to the advance of said active contact to an idle position to actuate said relay-contacts to prevent the further advance of the switch and to render the passive contacts multiply connected to the engaged passive contact busy.

28. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of the first-mentioned passive contacts busy, a magnet and coöperating means for advancing said active contact, means controlled over a talking strand to close an energizing circuit for said magnet, a control relay having contacts under its sole control, means operative upon an advance of said active contacts to close a maintaining circuit for said magnet through said contacts of said relay, a busy connection for said active contact including contacts of said relay, and means responsive to the advance of said active contact to an idle position to operate said relay to prevent the further advance of the switch and to render the passive contacts multiply connected to the engaged passive contact busy.

29. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of the first-mentioned passive contacts busy, a magnet and coöperating means for advancing said active contacts, means controlled over a talking strand to close an energizing circuit for said magnet, a control relay having contacts under its sole control, means operative upon an advance of said active contacts to maintain a circuit for said magnet through said contacts of said relay, a busy connection for one of said active contacts extending

through contacts of said relay, talking strands including contacts of said relay, and means for operating said relay as soon as said active contacts reach an idle position
 5 to stop the further advance of the switch and to render the corresponding passive contacts of other switches busy and the talking strands continuous.

30. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of the first-mentioned passive contacts busy, a magnet and coöperating means for advancing said active contact, means controlled over a talking strand to
 20 close an energizing circuit for said magnet, a control relay, means operative upon an advance of said active contact to maintain a circuit for said magnet through normally closed contacts of said relay, a busy connection for said active contact extending through normally open contacts of said relay, and means for energizing said relay, whereby the further advance of the switch is prevented and the passive contacts multiply connected to the engaged passive contact are rendered busy.

31. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of the first-mentioned passive contacts busy, a magnet and coöperating means for advancing said active contacts, means controlled over a talking strand to close an energizing circuit for said magnet, a control relay, means operative upon
 45 an advance of said active contacts to close a maintaining circuit for said magnet through normally closed contacts of said relay, a busy connection for one of said active contacts extending through normally open contacts of said relay, talking strands including normally open contacts of said relay, and means for energizing said relay as soon as said active contacts reach an idle position to prevent the further advance of the switch and to render the corresponding passive contacts of other switches busy and the talking strands continuous.

32. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of the first-mentioned pas-

sive contacts busy, a magnet and coöperating means for advancing said active contact, means controlled over a talking strand to close an energizing circuit for said magnet, a control relay having contacts under its sole control, means operative upon an advance of said active contact to maintain a circuit for said magnet through said contacts of said relay a busy connection for said active contact controlled by said relay, and means responsive to the advance of said active contact to an idle position to operate said relay to prevent the further advance of the switch and to render the passive contacts multiply connected to the engaged passive contact busy.

33. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of the first-mentioned passive contacts busy, a magnet and coöperating means for advancing said active contacts, means controlled over a talking strand to close an energizing circuit for said magnet, relay-contacts, a relay having sole control of said relay-contacts, means operative upon an advance of said active contacts to maintain a circuit for said magnet through certain of said relay-contacts, a busy connection for one of said active contacts including certain of said relay-contacts, means responsive to the advance of said active contacts to an idle position to operate said relay-contacts to prevent the further advance of the switch and to render busy the passive contacts multiply connected to the engaged passive contact, and means controlled by said relay-contacts to control the continuity of said talking strands.

34. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of the first-mentioned passive contacts busy, a magnet and coöperating means for advancing said active contacts, means controlled over a talking strand to close an energizing circuit for said magnet, a control relay having contacts under its sole control, means operative upon an advance of said active contacts to maintain a circuit for said magnet through said contacts of said relay, a busy connection for one of said active contacts controlled by said relay, means responsive to the advance of said active contacts to an idle position to operate said relay to prevent the further advance of the switch and to render busy

the passive contacts multiply connected to the engaged passive contacts, and means controlled by said relay to control the continuity of said talking strands.

5 35. In a telephone system, an automatic switch comprising passive contacts and co-
operating active contacts, talking strands
extending to certain of said active contacts,
10 other switch passive contacts multiply con-
nected to said passive contacts, means asso-
ciated with said other passive contacts for
rendering certain of the first-mentioned pas-
sive contacts busy, a magnet and coöperat-
15 ing means for advancing said active contact,
means controlled over a talking strand to
close an energizing circuit for said magnet,
a control relay, means operative upon an
advance of said active contact to maintain a
20 circuit for said magnet through normally
closed contacts of said relay, a busy connec-
tion for said active contact controlled
through normally open contacts of said re-
lay, and means responsive to the advance
25 of said active contact to an idle position to
energize said relay to prevent the further
advance of the switch and to render busy
the passive contacts multiply connected to
the engaged passive contact.

36. In a telephone system, an automatic
30 switch comprising passive contacts and co-
operating active contacts, talking strands
extending to certain of said active contacts.
other switch passive contacts multiply con-
nected to said passive contacts, means asso-
35 ciated with said other passive contacts for
rendering certain of the first-mentioned
passive contacts busy, a magnet and coöper-
ating means for advancing said active
contacts, means controlled over a talking
40 strand to close an energizing circuit for
said magnet, a control relay, means opera-
tive upon an advance of said active con-
tacts to maintain a circuit for said magnet
through normally closed contacts of said
45 relay, a busy connection for one of said
active contacts controlled through normally
open contacts of said relay, means respon-
sive to the advance of said active contacts
to an idle position to energize said relay to
50 prevent the further advance of the switch
and to render busy the passive contacts mul-
tiply connected to the engaged passive con-
tacts, and means controlled by said relay
55 to control the continuity of said talking
strands.

37. In a telephone system, an automatic
switch comprising passive contacts and a
coöperating active contact, means outside of
said switch for rendering certain of said
60 passive contacts busy, electrically controlled
means for advancing said active contact, a
control relay, means for initially advancing
said active contact by closing a circuit for
said advancing means excluding windings
65 of said relay, means responsive to the initial

advance of said active contact to close a
control circuit for said advancing means
through an energizing winding of said re-
lay, and means for preventing the opera-
tion of said relay as long as said active con-
70 tact engages busy passive contacts.

38. In a telephone system, an automatic
switch comprising passive contacts and a
coöperating active contact, means outside
of said switch for rendering certain of said
75 passive contacts busy, electrically controlled
means for advancing said active contact, a
control relay, means for initially advancing
said active contact by closing a circuit for
said advancing means excluding windings
80 of said relay, means responsive to the initial
advance of said active contact to close a
control circuit for said advancing means
through an energizing winding of said re-
lay, and means for short-circuiting said
85 winding of said relay as long as said active
contact engages busy passive contacts.

39. In a telephone system, an automatic
switch comprising passive contacts and a
coöperating active contact, means outside of
said switch for rendering certain of said
90 passive contacts busy, a magnet and co-
operating means for advancing said active
contact, a control relay, means for initially
advancing said active contact by closing a
95 circuit for said magnet, means responsive
to the initial advance of said active contact
to close a circuit through said magnet and
said relay, and means for preventing the op-
eration of said relay as long as said active
100 contact engages busy passive contacts.

40. In a telephone system, an automatic
switch comprising passive contacts and a
coöperating active contact, means outside of
said switch for rendering certain of said
105 passive contacts busy, a magnet and co-
operating means for advancing said active
contact, a control relay, means for initially
advancing said active contact by closing a
circuit for said magnet, means responsive
110 to the initial advance of said active contact
to close a circuit through said magnet and
relay, and means for short-circuiting said
relay through said active contact as long as
said active contact engages busy passive
115 contacts.

41. In a telephone system, an automatic
switch comprising passive contacts and co-
operative active contacts, means outside of
said switch for rendering certain of said
120 passive contacts busy, electrically controlled
means for advancing said active contact, a
control relay, talking strands including nor-
mally open contacts of said relay, means for
initially advancing said active contacts by
125 closing a circuit for said advancing means
excluding windings of said relay, means re-
sponsive to the initial advance of said active
contact to close a control circuit for said ad-
vancing means through an energizing wind-

130

ing of said relay, and means for preventing the energization of said relay as long as said active contacts engage busy passive contacts, whereby as soon as an idle passive contact is engaged said relay is energized and said talking strands rendered continuous.

42. In a telephone system, an automatic switch comprising passive contacts and co-operative active contacts, means outside of said switch for rendering certain of said passive contacts busy, electrically controlled means for advancing said active contact, a control relay, talking strands including normally open contacts of said relay, means for initially advancing said active contacts by closing a circuit for said advancing means excluding windings of said relay, means responsive to the initial advance of said active contact to close a control circuit for said advancing means through an energizing winding of said relay, and means for short-circuiting said relay through one of said active contacts as long as it engages busy passive contacts, whereby as soon as an idle passive contact is engaged said relay is energized and said talking strands rendered continuous.

43. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and co-operating means for advancing said active contact, a control relay, talking strands including normally open contacts of said relay, means for causing the initial advance of said active contacts by closing a circuit through said magnet and excluding windings of said relay, means responsive to the initial advance of said active contact to close a circuit through said magnet and said relay, and means for preventing the energization of said relay as long as said active contacts engage busy passive contacts, whereby as soon as an idle passive contact is engaged said relay is energized and said talking strands rendered continuous.

44. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and co-operating means for advancing said active contact, a control relay, talking strands including normally open contacts of said relay, means for causing the initial advance of said active contacts by closing a circuit through said magnet and excluding windings of said relay, means responsive to the initial advance of said active contact to close a circuit through said magnet and said relay, and means for short-circuiting said relay through one of said active contacts as

long as it engages busy passive contacts, whereby as soon as an idle passive contact is engaged, said relay is energized and said talking strands rendered continuous.

45. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a magnet and co-operating means for advancing said active contact, a control relay, an off-normal switch for closing a circuit for said relay upon the initial advance of said active contact, and means for preventing the energization of said relay while said active contact engages busy passive contacts.

46. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a magnet and co-operating means for advancing said active contact, a control relay, an off-normal switch for closing a circuit for said relay upon the initial advance of said active contact, and means for short-circuiting said relay through said active contact while said active contact engages busy passive contacts.

47. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said contacts busy, means for advancing said active contact, a control relay, an off-normal switch closing a circuit for said relay upon the initial advance of said active contact, and means for preventing the energization of said relay while said active contact engages busy passive contacts.

48. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said contacts busy, means for advancing said active contact, a control relay, an off-normal switch closing a circuit for said relay upon the initial advance of said active contact, and means for short-circuiting said relay through said active contact while said active contact engages busy passive contacts.

49. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, means outside of said switch for rendering certain of said passive contacts busy, means for advancing said active contact, a control relay, talking strands including normally open contacts of said relay, an off-normal switch for closing a circuit for said relay upon the initial advance of said active contact, and means for preventing the energization of said relay as long as said active contacts engage busy passive contacts, whereby as soon as

idle passive contacts are engaged, said relay is energized and said talking strands rendered continuous.

50. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, means outside of said switch for rendering certain of said passive contacts busy, means for advancing said active contact, a control relay, talking strands including normally open contacts of said relay, an off-normal switch for closing a circuit for said relay, upon the initial advance of said active contact, and means for short-circuiting said relay through one of said active contacts as long as it engages busy passive contacts, whereby as soon as idle passive contacts are engaged, said relay is energized and said talking strands rendered continuous.

51. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and co-operating means for advancing said active contacts, a control relay, talking strands including normally open contacts of said relay, an off-normal switch for closing a circuit for said relay upon the initial advance of said active contact, and means for preventing the energization of said relay while said active contacts engage busy passive contacts, whereby as soon as idle passive contacts are engaged said relay is energized and said talking strands rendered continuous.

52. In a telephone system, an automatic switch comprising passive contacts and co-operating active contacts, means outside of said switch for rendering certain of said passive contacts busy, a magnet and co-operating means for advancing said active contacts, a control relay, talking strands including normally open contacts of said relay, an off-normal switch for closing a circuit for said relay upon the initial advance of said active contact, and means for short-circuiting said relay through one of said active contacts as long as busy passive contacts are engaged, whereby as soon as idle passive contacts are engaged said relay is energized and said talking strands rendered continuous.

53. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a control relay having contacts under its sole control, talking strands including said contacts of said relay, means for causing an initial advance of said active contact by closing a circuit over a single one of said talking strands, means for continuing the advance movement of said

active contact to an idle passive contact, and then stopping it in engagement therewith, and means whereby said relay maintains said talking strands open while said active contact engages busy passive contacts.

54. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a control relay, talking strands including normally open contacts of said relay, means for causing an initial advance of said active contact by closing a circuit over a talking strand, means for continuing the advance movement of said active contact to an idle passive contact and then stopping it in engagement therewith, and means for energizing said relay as soon as said active contact engages an idle passive contact.

55. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a control relay having contacts under its sole control, talking strands including said contacts of said relay, means for causing an initial advance of said active contact by closing a circuit over a single one of said talking strands, means for continuing the advance movement of said active contact to an idle passive contact and then stopping it in engagement therewith, and means whereby said relay maintains said talking strands open while said active contact engages busy passive contacts and closed as soon as said active contact engages an idle passive contact.

56. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of the first-mentioned passive contacts busy, means for advancing said active contact, a control relay, a busy connection controlled by said relay, off-normal contacts included in said connection, means for operating said contacts during the selecting operation of the switch, and means for operating said relay to apply said connection to a selected idle passive contact and its multiples as soon as such idle contact is selected by said active contact.

57. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, other switch passive contacts multiply connected to said passive contacts, means associated with said other passive contacts for rendering certain of said first-mentioned passive contacts busy, means for advancing said active contact, a control relay, a busy connection in-

cluding normally open contacts of said relay, normally open off-normal contacts, means for closing said off normal contacts during the selecting operation of the switch, 5 and means for energizing said relay to apply said connection to an idle passive contact and its multiples as soon as such idle contact is engaged by said active contact.

58. In a telephone system, an automatic 10 switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated 15 with said other passive contacts for rendering certain of the first-mentioned passive contacts busy, means controlled over a talking strand for initially advancing said active contact, means for continuing its advance 20 until an idle passive contact is encountered and then stopping it in engagement therewith, a control relay having contacts under its sole control, a busy connection controlled by said contacts, and means 25 for operating said relay to apply said connection to a selected idle passive contact and its multiples as soon as such idle contact is selected by said active contact.

59. In a telephone system, an automatic 30 switch comprising passive contacts and co-operating active contacts, talking strands extending to certain of said active contacts, other switch passive contacts multiply connected to said passive contacts, means associated 35 with said other passive contacts for rendering certain of the first-mentioned passive contacts busy, means controlled over a talking strand for initially advancing said active contact, means for continuing its advance 40 until an idle passive contact is encountered and then stopping it in engagement therewith, a control relay, a busy connection including normally open contacts of said relay, and means for energizing said 45 relay to apply said connection to an idle passive contact and its multiples as soon as such idle contact is engaged by said active contact.

60. In a telephone system, an automatic 50 switch comprising passive contacts, and a coöperating active contact, other switch passive contacts multiply connected to said passive contacts, means associated with said 55 other passive contacts for rendering certain of the first-mentioned passive contacts busy, a control relay having contacts under its sole control, a busy connection controlled by said relay contacts, talking strands having their continuity controlled by said relay, 60 means controlled over a single one of said talking strands for initially advancing said active contact, means for continuing its advance into engagement with an idle passive contact, means whereby said control relay 65 maintains said talking strands open while

said active contact engages busy passive contacts, and means whereby said relay closes said talking strands and applies said busy connection to a selected idle passive contact as soon as said idle contact is engaged by 70 said active contact.

61. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, other switch passive contacts multiply connected to said passive contacts, means associated with said 75 other passive contacts for rendering certain of the first-mentioned passive contacts busy, a control relay having contacts under its sole control, a busy connection including 80 contacts of said relay contacts, talking strands including contacts of said relay, means controlled over a talking strand for initially advancing said active contact, means for continuing its advance into en- 85 gagement with an idle passive contact, means whereby said control relay maintains said talking strands open while said active contact engages busy passive contacts, and means whereby said relay closes said talking 90 strands and applies said busy connection to a selected idle passive contact as soon as said idle contact is engaged by said active contact.

62. In a telephone system, an automatic 95 switch comprising passive contacts and a co-operating active contact, other switch passive contacts multiply connected to said passive contacts, means associated with said 100 other passive contacts for rendering certain of said first-mentioned passive contacts busy, a control relay, a busy connection including normally open contacts of said relay, talking 105 contacts including normally open contacts of said relay, means controlled over a talking strand for initially advancing said active contact, means for continuing its advance into engagement with an idle passive 110 contact, means for energizing said control relay to close said talking strands and to apply the busy connection to the engaged passive contact only upon the engagement of said active contact with an idle passive contact.

63. In a telephone system, an automatic 115 switch comprising passive contacts arranged in groups and a coöperating active contact, a primary magnet and associated mechanism for advancing said active contact to positions corresponding to said groups, a 120 secondary magnet and associated mechanism for advancing said active contact over passive contacts in said groups, means outside of said switch for rendering certain of said passive contacts busy, means for energizing 125 said primary magnet to produce the primary movement of said active contact, a control relay having contacts under its sole control, means for closing a controlling circuit for said secondary magnet through said 130

contacts of said relay to produce the secondary movement of said active contact, and means for operating said relay so that, upon the engagement of said active contact with an idle passive contact, said secondary magnet circuit is interrupted.

64. In a telephone system, an automatic switch comprising passive contacts arranged in groups and a cooperating active contact, a primary magnet and associated mechanism for advancing said active contact to positions corresponding to said groups, a secondary magnet and associated mechanism for advancing said active contact over passive contacts in said groups, means outside of said switch for rendering certain of said passive contacts busy, a control relay, means for closing a circuit for said primary magnet through normally closed contacts of said relay, means for closing a circuit for said secondary magnet also through normally closed contacts of said relay, and means for energizing said relay upon the engagement of said active contact with an idle passive contact.

65. In a telephone system, an automatic switch comprising passive contacts arranged in groups and a cooperating active contact, a primary magnet and associated mechanism for advancing said active contact to positions corresponding to said groups, a secondary magnet and associated mechanism for advancing said active contact over passive contacts in said groups, means outside of said switch for rendering certain of said passive contacts busy, a control relay, means for closing a circuit for said primary magnet through normally closed contacts of said relay, means for closing a circuit for said secondary magnet also through normally closed contacts of said relay, talking strands including normally open contacts of said relay, and means for energizing said relay upon the engagement of said active contact with an idle passive contact.

66. In a telephone system, an automatic switch comprising passive contacts arranged in groups and a cooperating active contact, a primary magnet and associated mechanism for advancing said active contact to positions corresponding to said groups, a secondary magnet and associated mechanism for advancing said active contact over passive contacts in said groups, means outside of said switch for rendering certain of said passive contacts busy, talking strands, a relay having contacts under its sole control for controlling said primary and secondary magnets and talking strands, and means for operating said relay upon the engagement of said active contact with an idle passive contact.

67. In a telephone system, an automatic switch comprising passive contacts arranged in groups and a cooperating active contact,

a primary magnet and associated mechanism for advancing said active contact to positions corresponding to said groups, a secondary magnet and associated mechanism for advancing said active contact over said passive contacts in said groups, means outside of said switch for rendering certain of said passive contacts busy, talking strands, a busy connection for said active contact, a relay having contacts under its sole control for controlling said primary and secondary magnets and said talking strands and busy connection, and means for operating said relay upon the engagement of said active contact with an idle passive contact.

68. In a telephone system, an automatic switch comprising passive contacts arranged in groups and a cooperating active contact, a primary magnet and associated mechanism for advancing said active contact to positions corresponding to said groups, a secondary magnet and associated mechanism for advancing said active contact over passive contacts in said groups, means outside of said switch for rendering certain of said passive contacts busy, talking strands, a relay having contacts under its sole control for controlling said secondary magnet and talking strands, and means for operating said relay upon the engagement of said active contact with an idle passive contact.

69. In a telephone system, an automatic switch comprising passive contacts arranged in groups and a cooperating active contact, a primary magnet and associated mechanism for advancing said active contact to positions corresponding to said groups, a secondary magnet and associated mechanism for advancing said active contact over passive contacts in said groups, means outside of said switch for rendering certain of said passive contacts busy, talking strands, a busy connection for said active contact, a relay having contacts under its sole control for controlling said secondary magnet and said talking strands and busy connection, and means for operating said relay upon the engagement of said active contact with an idle passive contact.

70. In a telephone system, an automatic switch comprising passive contacts arranged in groups and a cooperating active contact, a primary magnet and associated mechanism for advancing said active contact to positions corresponding to said groups, a secondary magnet and associated mechanism for advancing said active contact over passive contacts in said groups, means outside of said switch for rendering certain of said passive contacts busy, talking strands, a relay having contacts under its sole control for controlling said primary magnet and talking strands, and means for operating said relay upon the engagement of said active contact with an idle passive contact.

71. In a telescope system, an automatic switch comprising passive contacts arranged in groups and a cooperating active contact, a primary magnet and associated mechanism for advancing said active contact to positions corresponding to said groups, a secondary magnet and associated mechanism for advancing said active contact over passive contacts in said groups, means outside of said switch for rendering certain of said passive contacts busy, talking strands, a busy connection for said active contact, a relay having contacts under its sole control for controlling said primary magnet and said talking strands and busy connection, and means for operating said relay upon the engagement of said active contact with an idle passive contact.

72. In a telephone system, an automatic switch comprising passive contacts and cooperating active contacts, talking strands extending to certain of said contacts, means controlled over one of said strands to advance said active contact over said passive contacts to a desired position, a control electromagnet, means for energizing said magnet as soon as said active contact reaches said desired position, means for deenergizing said magnet, and means for restoring said active contact to normal upon the deenergization of said magnet.

73. In a telephone system, an automatic switch comprising passive contacts and cooperating active contacts, talking strands extending to certain of said active contacts, means outside of said switch for rendering certain of said passive contacts busy, means controlled over a talking strand to advance said active contact over said passive contacts until an idle passive contact is encountered, a control electromagnet, means for energizing said magnet as soon as said active contact reaches an idle passive contact, means for deenergizing said magnet, and means for restoring said active contact to normal upon the deenergization of said magnet.

74. In a telephone system, an automatic switch comprising passive contacts and cooperating active contacts, talking strands extending to certain of said active contacts, means controlled over a talking strand to advance said active contact over said passive contacts to a desired position, a control relay having normally open contacts including said talking strands, means for energizing said relay upon the movement of said active contact to said desired position, means for deenergizing said relay, and means for restoring said active contact to normal upon the deenergization of said relay.

75. In a telephone system, an automatic switch comprising passive contacts and cooperating active contacts, talking strands

extending to certain of said active contacts, means outside of said switch for rendering certain of said passive contacts busy, means controlled over a talking strand to advance said active contact over said passive contacts until an idle passive contact is encountered, a control relay having normally open contacts including said talking strands, means for energizing said relay upon the engagement of said active contact with an idle passive contact, means for deenergizing said relay, and means for restoring said active contact to normal upon the deenergization of said relay.

76. In a telephone system, an automatic switch comprising passive contacts and cooperating active contacts, talking strands extending to certain of said active contacts, means controlled over a talking strand to advance said active contact over said passive contacts to a desired position, a control relay, a busy connection to said active contact including contacts of said relay, means for energizing said relay to apply said busy connection, means for deenergizing said relay, and means for restoring said active contact to normal upon the deenergization of said relay.

77. In a telephone system, an automatic switch comprising passive contacts and cooperating active contacts, talking strands extending to certain of said active contacts, means outside of said switch for rendering certain of said passive contacts busy, means controlled over a talking strand to advance said active contact over said passive contacts until an idle passive contact is encountered, a control relay, a busy connection to said active contact including contacts of said relay, means for energizing said relay upon the engagement of said active contact with an idle passive contact, means for deenergizing said relay, and means for restoring said active contact to normal upon the deenergization of said relay.

78. In a telephone system, a plurality of operatively related automatic switches, means for successively actuating two of said switches for extending a circuit through them, an electromagnet associated with one of said actuated switches, means operated upon the deenergization of said electromagnet to cause the release of the associated switch, means associated with the other actuated switch for energizing said electromagnet responsive to the establishment of the circuit through said switches, and means for deenergizing said electromagnet.

79. In a telephone system, a plurality of operatively related automatic switches, means for successively actuating two of said switches for extending a circuit through them, an electromagnet associated with one of said actuated switches, means operated

upon the deenergization of said electromagnet to cause the release of the associated switch, and means associated with the other actuated switch for energizing said electromagnet responsive to the establishment of the circuit through said switches and deenergizing said magnet when it is desired to interrupt said circuit.

80. In a telephone system, a plurality of operatively related automatic switches, means for successively actuating two of said switches for extending a circuit through them, an electromagnet associated with one of said actuated switches, a relay associated with the other, means operated upon the release of said electromagnet for causing the release of the associated switch, a circuit for said electromagnet controlled by said relay, and means for operating said relay to close said circuit responsive to the establishment of the first-mentioned circuit through said switches and to interrupt said electromagnet circuit when it is desired to interrupt said switch circuit.

81. In a telephone system, two automatic switches, associated conductors, means for operating said switches to unite said conductors into a continuous circuit, an electromagnet associated with each switch, means for energizing said magnets upon the said operation of said switches, means for deenergizing one of said magnets in response to the deenergization of the other, means for deenergizing the latter, and means for releasing said switches individually in response to the deenergization of said magnets.

82. In a telephone system, two automatic switches, associated conductors, means for operating said switches to unite said conductors into a continuous circuit, an electromagnet associated with each switch, means for completing an energizing circuit for one of said magnets upon the said operation of the corresponding switch, means for completing an energizing circuit for the second magnet through contacts of said first magnet upon the said operation of the second switch, means for deenergizing said first magnet to thereby deenergize said second magnet, and means for releasing said switches individually in response to the deenergization of said magnets.

83. A telephone system including a pair of connected telephone lines, a plurality of directly operable selective switches having contacts included in the talking circuit, electromagnets for said switches respectively for restoring purposes, means for holding said magnets energized while connection exists, and apparatus for deenergizing said magnets when disconnection is desired to restore the respective switches to normal.

84. A telephone system including a pair of connected telephone lines, a plurality of selective switches having contacts included in the talking circuit, an additional contact for one of said switches not included in the talking circuit serving to protect said circuit against intrusion, an electromagnet for another of said switches held energized during conversation over a circuit including said additional contact, and mechanism for deenergizing said last-mentioned electromagnet when disconnection is desired to restore said other switch to normal.

85. In a telephone system, an automatic switch having active and passive contacts, means for advancing said active contact, other similar cooperating active and passive switch contacts, means for closing a release circuit for said switch through said other active and passive contacts responsive to the completion of the advance movement of said switch, and means for restoring said active contact to normal by interrupting said release circuit.

86. In a telephone system, an automatic switch having active and passive contacts, means for advancing said active contact, other similar cooperating active and passive switch contacts, means for closing a release circuit for said switch including said other active and passive contacts upon the completion of the advance movement of said switch, and means for restoring said active contact to normal by separating said other active and passive contacts.

87. In a telephone system, an automatic switch having active and passive contacts, a magnet for advancing said active contact, a release magnet, an associated plug and jack, means for closing a release circuit for said switch serially through said release magnet and said plug and jack, and means for restoring said active contact to normal by withdrawing said plug from said jack.

88. In a telephone system, an automatic switch having active and passive contacts, means for advancing said active contact, another passive contact, a terminal for establishing connection with said other passive contact, means for closing a release circuit for said switch through said other passive contact and said terminal responsive to the completion of the advance movement of said switch, and means for restoring said active contact to normal by interrupting said release circuit.

89. In a telephone system, an automatic switch having active and passive contacts, means for advancing said active contact, another passive contact, a terminal for establishing connection with said other passive contact, means for closing a release circuit for said switch through said other passive contact and said terminal upon the

completion of the advance movement of said switch, and means for restoring said active contact to normal by interrupting said release circuit at said terminal and other passive contact.

5 90. In a telephone system, an automatic trunk selector switch having active and passive contacts, means for advancing said active contact, a second trunk selector switch
10 having a like passive contact, a wiper terminal for establishing connection with said other passive contact, means for closing a release circuit through said terminal and second passive contact responsive to their
15 connection, a relay for controlling said release circuit, and means for restoring said active contact and wiper terminal to normal upon the interruption of said release circuit.

20 91. In a telephone system, an automatic switch having active and passive contacts, means for advancing said active contact, another switch having similar cooperating active and passive contacts, means for closing
25 a release circuit for said former switch through active and passive contacts of said latter switch, a relay associated with said latter switch for controlling said release circuit, means for actuating said relay to
30 interrupt said release circuit, and means for restoring the active contact of the former switch to normal upon the interruption of said release circuit.

35 92. In a telephone system, an automatic switch having active and passive contacts, means for advancing said active contact, another switch having similar cooperating active and passive contacts, means for closing
40 a release circuit for said former switch through active and passive contacts of said latter switch, another passive contact, means for closing a release circuit for said latter switch through said other passive contact,
45 means for interrupting said latter release circuit, means responsive to such interruption to interrupt said former release circuit, and means for restoring the active contact of each switch to normal upon the interruption of its release circuit.

50 93. In a telephone system, an automatic trunk selector switch having active and passive contacts, means for advancing said active contact, a release circuit for said switch normally open at two points of control, off normal contacts operated by the advance of said active contact to close said circuit at one control point, a second trunk selector switch having a contact and co-operating wiper included in the circuit at
55 the second control point, and means for subsequently exercising a control from the other control point so as to cause the restoration of said active contact to normal.

60 94. In a telephone system, an automatic trunk selector switch having active and pas-

sive contacts, means for advancing said active contact, another automatic trunk selector switch passive contact, a wiper terminal for establishing connection with said other passive contact, a release circuit for
70 said switch normally open at said other passive contact and at another point, off normal contacts operated by the advance of said active contact to close said circuit at said other point, and means for causing the restoration of said active contact to normal in response to a control occasioned by said terminal and associated passive contact.

95. In a telephone system, an automatic trunk selector switch having active and passive contacts, means for advancing said active contact, a release circuit for said switch having its continuity controllable at two points, a second automatic trunk selector switch, off normal contacts operated by the
85 advance of the first switch to exercise control of said release circuit at one of said points, and means associated with said second switch for exercising control of said release circuit at the other control point. 90

96. In a telephone system, an automatic trunk selector switch having active and passive contacts, means for advancing said active contact, a release circuit for said switch having its continuity controllable at two
95 points, off normal contacts operated by the advance of said switch to exercise control of said release circuit at one of said points, means including an automatic trunk selector for exercising the control at the second
100 point, and means for causing the restoration of the active contact to normal by the interruption of said release circuit.

97. In a telephone system, an automatic trunk selector switch having active and passive contacts, means for advancing said active contact, an electromagnet and mechanism for restoring said active contact to normal, an energizing circuit for said electromagnet controlled at two points, means
105 operated by the advance of said active contact to close said circuit at one point, means including a second trunk selector switch for closing said circuit at the other point, and talking strands controlled by contacts
115 of said electromagnet.

98. A telephone system comprising a plurality of central offices, and means for inter-connecting said offices by conversational circuits including selector switches located in
120 one of said offices and passive contacts arranged in groups severally assigned for connection to different distant central offices, trunks extending from said several groups to said several central offices, and manually
125 operated switching equipments in which said trunks terminate at said distant central offices for extending said trunks to telephone lines.

99. A telephone system comprising a plu- 130

rality of central offices, and means for inter-connecting said offices by conversational circuits including selector switches each having levels of passive contacts severally assigned for connection each to a different distant central office, trunks leading from said levels to said distant central offices, and manual switching equipments in which said trunks terminate at said distant central offices for extending said trunks to telephone lines.

100. A telephone system comprising telephone lines, operators' positions, operator's means for transmitting directive current impulses, and means for connecting said lines for conversation through a plurality of said positions including automatic switch mechanism responsive to current impulses from one included position for selecting another.

101. A telephone system comprising telephone lines, a plurality of operators' positions provided with terminals for said lines, an automatic switch associated with one of said positions, control circuits extending from said position to said switch, operator's means for transmitting directive current impulses over said control circuits, a plurality of trunk lines extending from said switch to other operators' positions, and means responsive to directive current impulses over said control circuits for actuating said switch to pick out a definite other operator's position and establish connection with it over a connecting trunk line.

102. A telephone system comprising a central office operator's control station, an automatic selecting switch individual to that station, a plurality of selectable conductors leading from said switch, other automatic switches associated with the distant ends of said conductors, operator controlled means outside of said individual switch for placing said other automatic switches severally in service, means controlled from said station first to actuate said individual switch to pick out an idle other automatic switch and then to operate the latter, and means to release both switches by a single act of the party at said control station.

103. A telephone system comprising a central office operator's control station, an automatic selecting switch individual to that station, a plurality of selectable conductors extending from said switch, other automatic switches associated with the distant ends of said conductors, operator controlled means outside of said individual switch for placing said other automatic switches severally in service, a circuit controlled at the control station and associated means for operating said individual switch to pick out an idle other automatic switch, means for directly operating the latter from said control station, and means for releasing both switches by a single act of the party at the control station.

104. A telephone system comprising a central office operator's control station, an automatic selecting switch individual to that station, a plurality of selectable conductors extending from said switch, other automatic switches associated with the distant ends of said conductors, operator controlled means outside of said individual switch for placing said other automatic switches severally in service, a circuit controlled at the control station and associated means for operating said individual switch to pick out an idle other automatic switch, means for directly operating the latter from said control station, and means for releasing both switches upon the return of said control circuitly breaking said control circuit at the control station.

105. A telephone system comprising a control station, a control circuit extending therefrom, an automatic selecting switch individual to that circuit, a plurality of selectable conductors extending from that switch, other automatic switches associated with the distant ends of said conductors, means outside of said individual switch for placing said other automatic switches severally in service, means for closing said control circuit at the control station, means responsive to such closure to cause said individual switch to pick out an idle other automatic switch, means for directly operating the latter from said control station, and means for releasing both switches by simply breaking said control circuit at the control station.

106. A telephone system comprising a central office operator's control station, a control circuit extending therefrom, an automatic selecting switch individual to that circuit, other automatic switches adapted to be selected by said individual switch, operator controlled means outside of said individual switch for placing said other automatic switches severally in service, means for causing said individual switch to pick out an idle other automatic switch in response to a control exercised over said control circuit, talking strands brought into connection by such operation, means for directly operating the selected other automatic switch over one of said talking strands, and means for releasing both switches by restoring the control circuit to its normal condition at the control station.

107. A telephone system comprising a control station, a control circuit extending therefrom, an automatic selecting switch individual to that circuit, other automatic switches adapted to be selected by said individual switch, means outside of said individual switch for placing said other automatic switches severally in service, means for closing said control circuit at the control station, means responsive to such clo-

sure to cause said individual switch to pick out an idle other automatic switch, talking strands brought into connection by such operation, means for directively operating the selected other automatic switch over one of said talking strands, and means for releasing both switches by simply breaking said control circuit at the control station.

108. A telephone system including an operator's plug and cord-circuit, an associated jack, an automatic selecting switch individual to said jack, other automatic switches subject to selection by said individual switch, means outside of said individual switch for rendering said other automatic switches individually busy, means responsive to the connection of said plug and jack to cause said individual switch to select an idle other automatic switch, means under operator's control for directively operating said latter switch, and means for releasing both switches by the disconnection of said plug and jack.

109. A telephone system including an operator's plug and cord-circuit, an associated jack, an automatic selecting switch individual to said jack, other automatic switches subject to selection by said individual switch, means outside of said individual switch for rendering said other automatic switches busy, means responsive to the connection of said plug and jack to cause said individual switch to select an idle other automatic switch, talking strands connected by such operation, means under operator's control for directively operating said latter switch over one of said talking strands, and means for releasing both switches in response to the disconnections of said plug and jack.

110. A telephone system comprising telephone lines, an interconnecting conductor, a passive manual terminal and a passive automatic terminal at the answering end of said conductor, an automatic switch associated with the opposite end of said conductor, manual means employed in connecting calling lines to said manual terminal, automatic switching means employed in connecting calling lines to said automatic terminal, and means for indicating busy at one answering end terminal when connection is made at the other answering end terminal.

111. A telephone system comprising telephone lines, an interconnecting conductor, a passive manual terminal and a passive automatic terminal at the answering end of said conductor, means associated with the opposite end of said conductor for extending the circuit of said conductor to called lines, manual means employed in connecting calling lines to said manual terminal, automatic switching means employed in connecting calling lines to said automatic terminal, and means for indicating busy at one answering

end terminal when connection is made at the other answering end terminal.

112. A telephone system comprising telephone lines, an interconnecting conductor, a passive manual terminal and a passive automatic terminal at the answering end of said conductor, an automatic switch associated with the opposite end of said conductor, manual means employed in connecting calling lines to said manual terminal and causing the operation of said automatic switch, automatic switching means employed in connecting calling lines to said automatic terminal, means whereby said automatic switch may be controlled through said automatic terminal and means for indicating busy at one answering end terminal when connection is made at the other answering end terminal.

113. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a control relay having contacts under its sole control, talking strands including said contacts of said relay, means responsive to the closing of a circuit over a talking strand to advance said active contact to an idle passive contact and then stop it in engagement therewith, and means whereby said relay maintains said talking contacts open while said active contact engages busy passive contacts and is energized to close said strands upon the engagement of said active contact with an idle passive contact.

114. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a control relay, talking strands including normally open contacts of said relay, means responsive to the closing of a circuit over a talking strand to advance said active contact to an idle passive contact and then stop it in engagement therewith, and means for energizing said relay as soon as said active contact engages an idle passive contact.

115. In a telephone system, an automatic switch comprising passive contacts and a co-operating active contact, means outside of said switch for rendering certain of said passive contacts busy, a control relay having contacts under its sole control, talking strands including said contacts of said relay, means responsive to the closing of a circuit over a talking strand to advance said active contact to an idle passive contact and then stop it in engagement therewith, and means whereby said relay maintains said talking strands open while said active contact engages busy passive contacts and is energized to close said strands as soon as said active contact engages an idle passive contact.

116. A telephone system comprising telephone lines, an interconnecting trunk, a manual terminal and an automatic terminal at one end of said trunk, an automatic switch
5 operatively associated with the other end of said trunk, a second manual terminal for engaging said first manual terminal to connect said lines and trunk, automatic switching means for engaging said automatic terminal to connect said lines and trunk, and
10 means for indicating busy at one terminal at the said first end of the trunk when connection is made with the other terminal thereat.
117. A telephone system comprising telephone lines, an interconnecting trunk, a manual terminal and an automatic terminal
15 at one end of said trunk, means associated

with the opposite end of said trunk for connecting said trunk and certain of said lines, 20
a second manual terminal for engaging said first manual terminal to connect certain of said lines and said trunk, automatic switching means for engaging said automatic terminal to connect certain of said lines and 25
said trunk, and means for indicating busy at one terminal at the said first end of the trunk when connection is made with the other terminal thereat.

Signed by me at Grand Rapids, county 30
of Kent, and State of Michigan in the presence of two witnesses.

EDMUND LAND.

Witnesses:

ANNA HUIZEN,
E. R. PEARSE.

It is hereby certified that in Letters Patent No. 1,146,177, granted July 13, 1915, upon the application of Edmund Land, of Grand Rapids, Michigan, for an improvement in "Telephone Systems," errors appear in the printed specification requiring correction as follows: Page 19, line 82, claim 104, strike out the syllable and words "ply breaking said control circuit" and insert the syllable and words *cuit to its normal condition*; same page, lines 100-101, claim 105, for the word "central" read *control*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of November, A. D., 1915.

[SEAL.]

J. T. NEWTON,

Acting Commissioner of Patents.