(No Model.)

4 Sheets—Sheet 1.

I. ANDERSON.

TELEPHONE SWITCHBOARD.

No. 556,609

Patented Mar. 17, 1896.

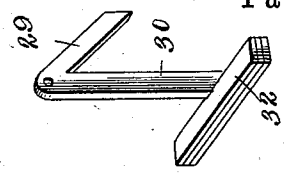

Fig. 6.

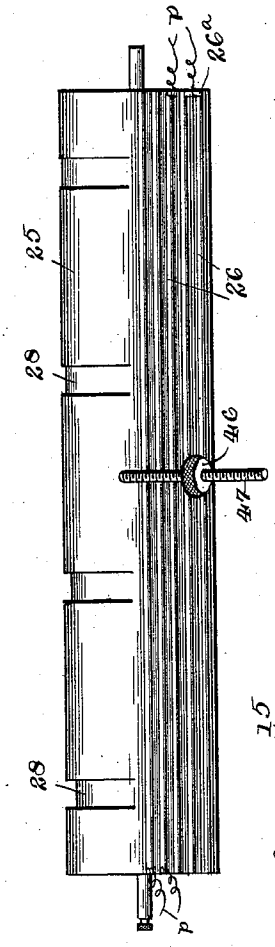

Fig. 5.

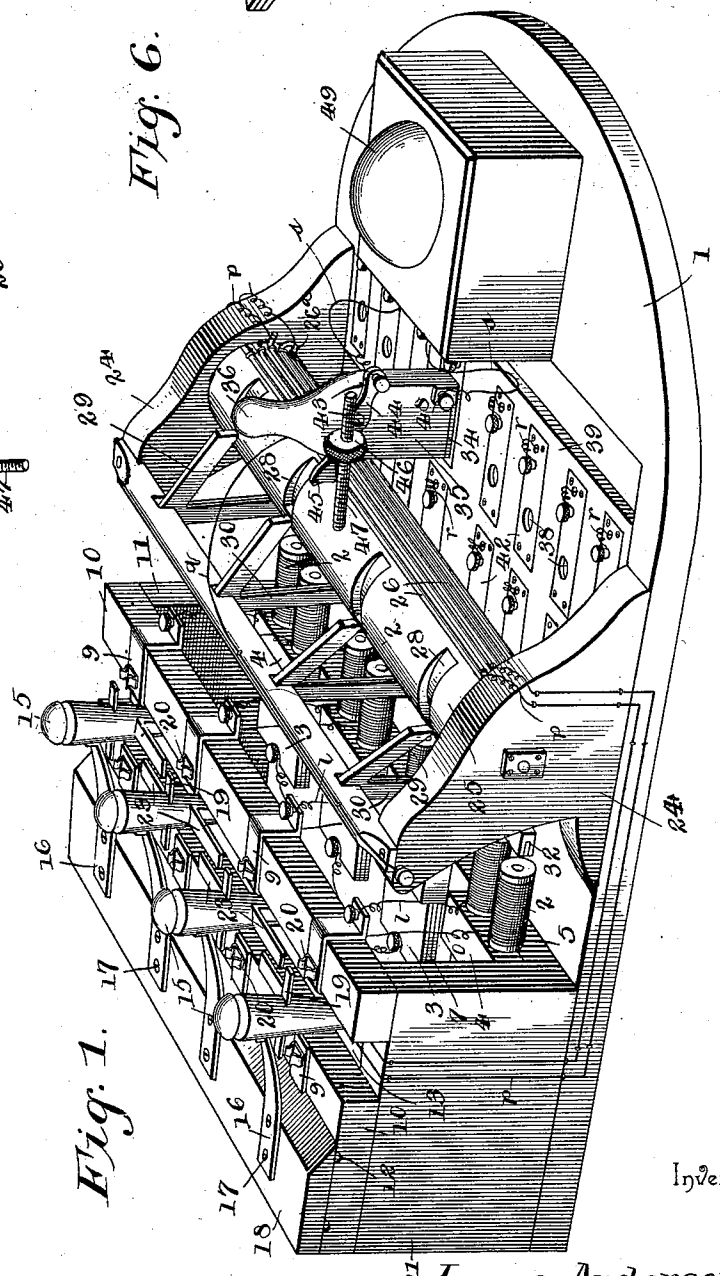

Fig. 1.

Witnesses

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(No Model.) 4 Sheets—Sheet 2.

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TELEPHONE SWITCHBOARD.

No. 556,609. Patented Mar. 17, 1896.

Fig. 2.

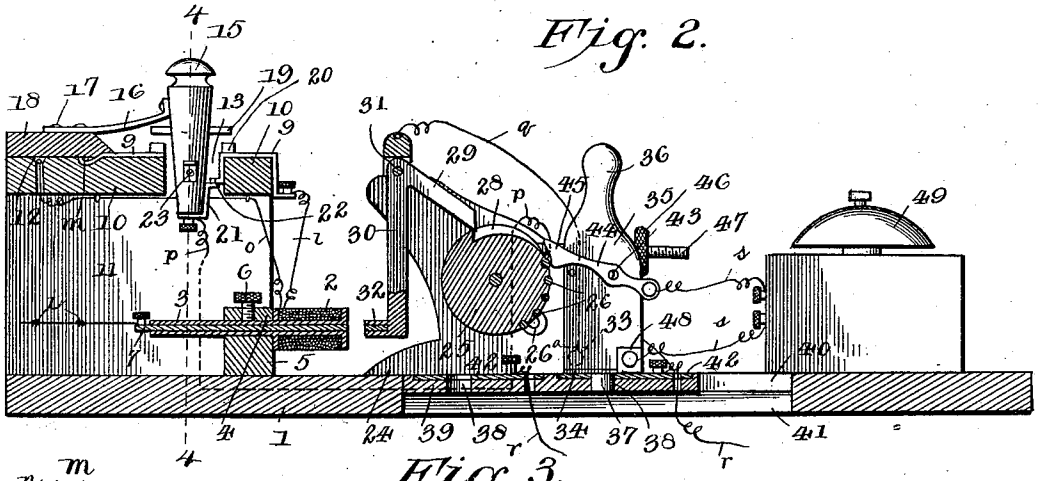
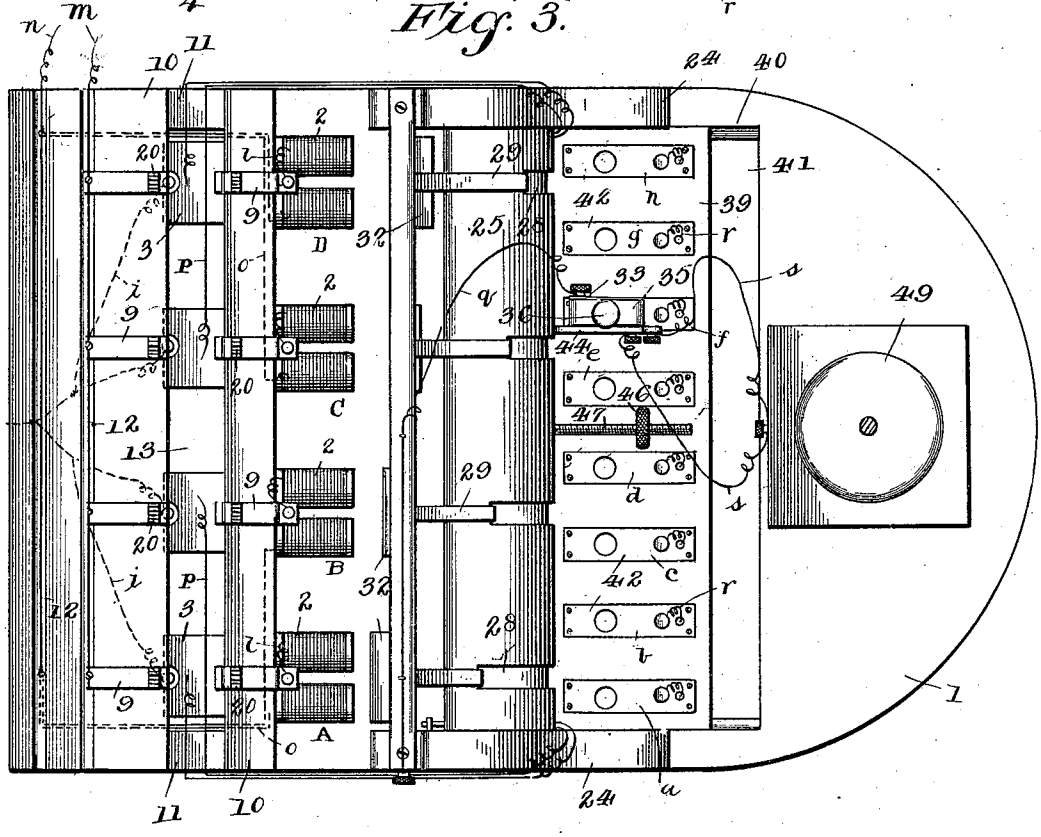


Fig. 3.



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(No Model.) 4 Sheets—Sheet 3.

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TELEPHONE SWITCHBOARD.

No. 556,609. Patented Mar. 17, 1896.

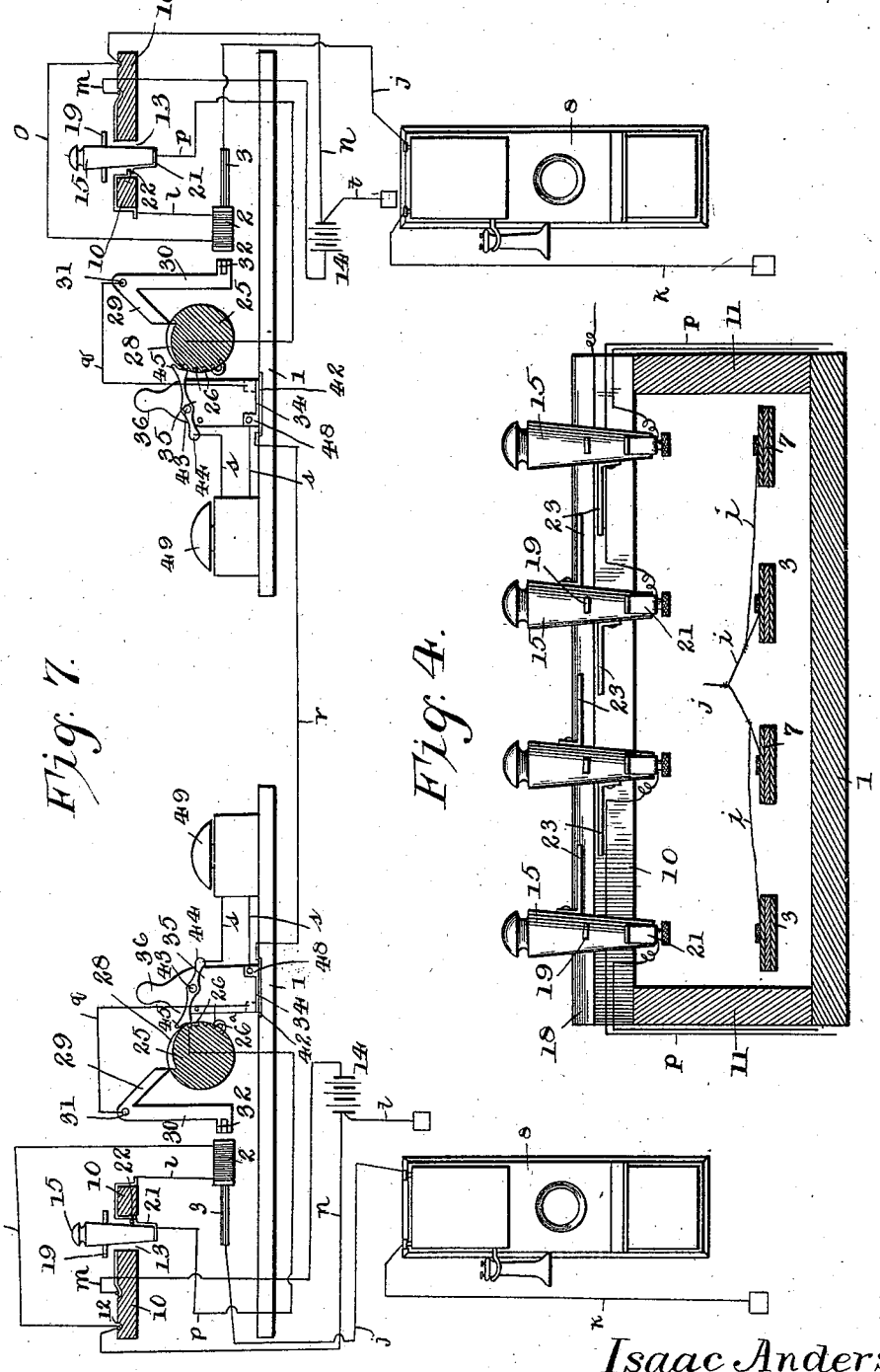

Fig. 7.

Fig. 4.

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TELEPHONE SWITCHBOARD.

No. 556,609. Patented Mar. 17, 1896.

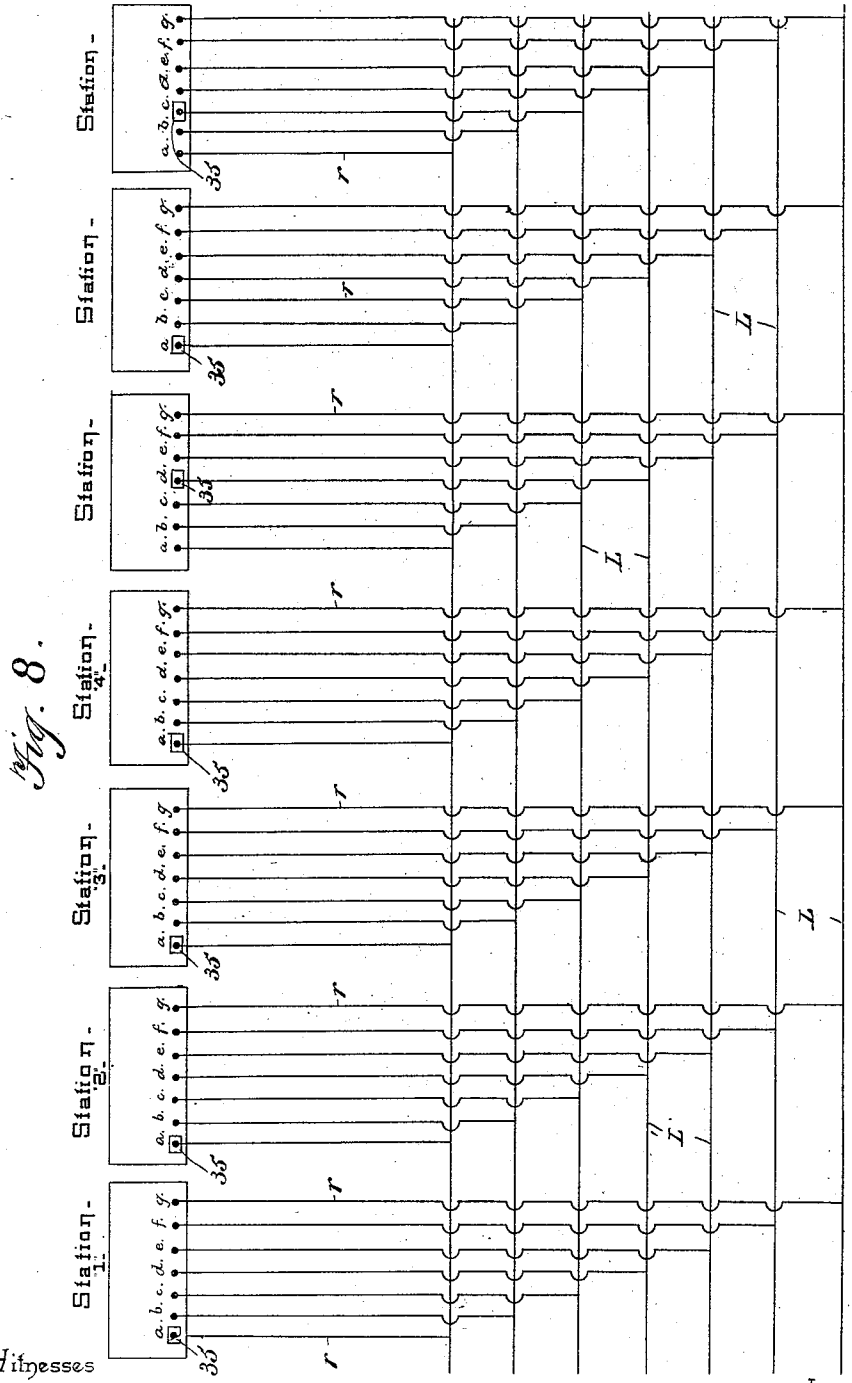

Fig. 8.

Witnesses
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UNITED STATES PATENT OFFICE.

ISAAC ANDERSON, OF SAGINAW, MICHIGAN, ASSIGNOR OF THREE-EIGHTHS TO JOHN DODDS, OF DAYTON, OHIO, AND ROBT. W. HUTCHINSEN, OF MARCELLUS, MICHIGAN.

TELEPHONE-SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 556,609, dated March 17, 1896.

Application filed July 8, 1895. Serial No. 555,255. (No model.)

To all whom it may concern:

Be it known that I, ISAAC ANDERSON, a citizen of the United States, residing at Saginaw, in the county of Saginaw and State of Michigan, have invented a new and useful Telephone-Switchboard, of which the following is a specification.

This invention relates to telephone-switchboards; and it has for its object to provide a new and useful switchboard of this character adapted for use in connection with each telephone of a system; in order to dispense with the complicated and otherwise objectionable "central-exchange" systems.

To this end the main and primary object of the present invention is to provide a telephone-switchboard which shall be comparatively simple in construction, while at the same time very efficient in operation to enable a person having a telephone to connect his telephone with any other telephone on the same system, and when thus connected to throw all the other telephones on the system out of the circuit, so that there will be no interruption to the communication through any two telephones of the system. In accomplishing these results the switchboard will be found especially adapted for use in small systems, such as in small towns and cities and in large private and public establishments.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a perspective view of a telephone-switchboard constructed in accordance with this invention. Fig. 2 is a vertical longitudinal sectional view thereof. Fig. 3 is a plan view of the switchboard. Fig. 4 is a transverse sectional view on the line 4 4 of Fig. 2. Fig. 5 is a plan view of the oscillating circuit-roller. Fig. 6 is a detail in perspective of one of the bell-crank swinging armatures. Fig. 7 is a diagrammatic view showing two opposite switchboards and the circuit-wire connections thereof. Fig. 8 is a diagrammatic view illustrating the arrangement of the main-line wires and the branch-wire connections therewith.

Referring to the accompanying drawings, 1 designates a base-board that is adapted to be arranged in any convenient position so that the switchboard can be easily manipulated in connection with the particular telephone with which it is employed. The said base-board has arranged thereover a transversely-aligned series of electromagnets 2, which may be successively lettered A, B, C, and D for convenience in describing the operation of the switchboard, and at this point it will be noted that the number of electromagnets 2 corresponds to the number of telephones that are assigned for use with each main line.

The electromagnets 2 are arranged in pairs and have extended from one end thereof the flat core-plates 3, that are slidably mounted in the guide-boxes 4, that are suitably secured on a transverse cleat 5, fastened on the outer side of the base-board 1, and the said guide-boxes 4 are adapted to receive therein the clamp-screws 6, that impinge against the extension core-plates 3, and provide means for holding the electromagnets properly adjusted with relation to the other parts of the switchboard, as will be readily understood. The main cores of the electromagnets and the extension core-plates 3 thereof inclose copper or other suitable conductor-plates 7, which provide for the free transmission of the speaking-current from end to end of the magnet-cores, including the extensions 3, while any two telephones of the system are connected together, and at one end the conductor-plates 7 of all of the magnets 2 have connected therewith by means of the branch wires *i* one of the telephone-circuit wires *j*. The telephone-circuit wire *j* is connected to one terminal of the telephone 8, which is used in connection with the switchboard, and the other terminal of the telephone is connected with the usual ground wire *k*.

The telephone 8 is of the ordinary construction, excepting that the usual call-bell is omitted, inasmuch as the call-bell for the system is arranged in connection with the switchboard, as will be more particularly referred to.

Each pair of electromagnets 2 has one terminal thereof connected by the magnet-wire

l to one of a pair of spaced contact-plates 9. There is a pair of the spaced contact-plates 9 for each pair of the magnets 2, and the contact-plates 9 of each pair are fastened on the parallel supporting-strips 10, the opposite ends of which strips are suitably secured on the short end boards 11, that are arranged at opposite side edges of the base-board 1 and project a distance thereabove in order to support the strips 10 properly in position above the row of electromagnets 2. The parallel supporting-strips 10 are spaced a sufficient distance apart to provide for the proper separation of the contact-plates 9 of each pair, and the contact-plates 9 directly opposite the plates which have the wire connections *l* therewith have connected therewith the battery-wire *m*, which may be conveniently arranged in one of a pair of parallel wire grooves 12, formed in the upper side of one of the supporting-strips 10, and the battery-wire *m* leads from its connection with the several plates 9 at one side of the space 13 between the two strips 10 to the carbon element of a suitably-arranged working battery 14. The zinc element of the working battery 14 has connected thereto one terminal of the other battery-wire *n*, which is also arranged in one of the grooves 12, separate from the wire *m*, and has a series of branch-wire connections *o* therewith, which branch-wire connections *o* lead to the terminals of the several electromagnets 2 opposite the terminals to which the magnet-wires *l* are connected.

Arranged to work in the space 13, between the parallel strips 10, is a series of push-buttons 15. There is a push-button for each pair of the spaced plates 9, and said push-buttons are preferably of a tapering or conical shape, so as to properly work in the space between the strips 10. The said push-buttons have attached to one side thereof one end of leaf-springs 16, the other ends of which are fastened, as at 17, on a cap board or plate 18, which is fitted on one of the strips 10 over the wire-grooves 12, so as to cover such wire-grooves and properly hold the wires in position therein.

The springs 16 normally hold the push-buttons 15 in elevated inoperative positions, and the said push-buttons have fitted thereto above the strips 10 the bridge-plates 19, which extend to both sides of the push-bottons so as to bridge the space 13 between the directly-opposite contact-plates 9, and are adapted to be forced down in contact with said plates 9, so as to close the circuit over the same, and also through the electromagnets directly below the plates. When the push-buttons 15 are depressed so as to carry the bridge-plates 19 onto the plates 9, the opposite ends of the said plates become engaged in the spring-clips 20, that are fitted on the ends of the plates 9 at the edge of the intermediate space 13 between the plates, and the said spring-clips 20 serve to hold the bridge-plates 19 locked in contact with the directly-opposite plates 9 until it is desired for the contact to be broken, at which time a slight pull with the fingers on the push-button will serve to disengage the bridge-plates 19 from the clips 20.

The push-buttons 15 have fitted to the inner ends thereof a flanged contact-plate 21, which is adapted to be normally held in contact with a contact-lip 22, formed at one end of the plates 9, to which the wires *l* are connected, so that there will be a normally-closed circuit through the said plates 9 and the flanged contact-plates 21 fitted to the inner ends of the push-buttons 15, and the said flanged contact-plates 21 have connected thereto one terminal of the circuit-wire *p*, which will be more particularly referred to. When one of the buttons 15 is depressed, it is necessary that the contact of the plate 21 of the next succeeding button be broken, and to effect this result the buttons 15 are provided at their sides with offstanding press-fingers 23, the press-finger at one side of one push-button overlapping the adjacent press-finger of the adjacent button. By means of this construction when one of the push-buttons 15 is depressed the next succeeding push-button will also be depressed sufficiently far so that the contact-pieces 19 and 21 of such next succeeding push-button will have no contact at all, and consequently short-circuiting through the contact-pieces of the next succeeding push-button is impossible when one of the push-buttons is in use.

At one side of the short end boards 11 the base-board 1 has fitted thereon at opposite side edges thereof the bearing-boards 24, in which are journaled the opposite extremities of an oscillating circuit-roller 25. The oscillating circuit-roller 25 has fitted to one side thereof a series of spaced contact cores or rods 26, which are grouped sufficiently close together to provide for the proper operation of the switchboard, while at the same time being placed sufficiently far apart to prevent any electrical connection between the cores. The said contact-cores 26 are arranged longitudinally of the roller and extend from end to end thereof, and the number of said cores correspond to the number of electromagnets on the switchboard, and consequently to the number of bush-buttons 15, but by reference to the drawings it will be observed that one of the cores or the lowermost core on the circuit-roller is looped at one end, as at 26, to provide two separate parallel core portions, the function of which will be more particularly referred to. Each of the contact-cores 26 has connected thereto one terminal of one of the circuit-wires *p*, the other terminals of which circuit-wires are connected to the flanged contact-plates 21 on the inner or lower ends of the push-buttons 15, and for convenience in understanding the construction it may be stated that the circuit-wire *p*, connected to the uppermost of the cores 26, is connected to the contact-plate 21 of the first push-button on the switchboard, or, in other words, the

push-button used in connection with the electromagnet A and the other succeeding lower contact-cores 26 are in circuit respectively with each succeeding push-button, as will be readily understood.

The oscillating circuit-closing roller 25 is provided in the upper side thereof with a series of inclined pawl-notches 28, which pawl-notches are arranged spirally and are severally disposed directly opposite or in alignment with the electromagnets 2. The spirally-arranged pawl-notches 28 are adapted to receive therein the pointed extremities of the pawl-arms 29 of the bell-crank swinging armatures 30, which are arranged to play at one side of the electromagnets. The swinging bell-crank armatures 30 are pivotally suspended from the metallic pivot-rod 31, fitted on the opposite bearing-boards 24 beyond the oscillating circuit-roller 25, and at their extremities opposite the pawl-arms 29 the said bell-crank armatures 30 are provided with the widened contact ends 32, that are adapted to be attracted against the adjacent core ends of the electromagnets.

By reason of the spiral arrangement of the pawl-notches 28 and the engagement of the pawl-arms 29 in such notches it will be noted, by reference to Fig. 3, that this construction provides for normally holding the armatures of the second, third and fourth sets of magnets too far away from such magnets to be attracted thereby, and it is therefore necessary in operating the switchboard to successively depress the push-buttons to bring the armatures operatively adjacent to their magnets, as will be hereinafter more particularly referred to.

The metallic pivot-rod 31, which supports the series of swinging bell-crank armatures 30, has connected thereto one terminal of a circuit-wire *q*, the other terminal of which wire is connected to the attaching-flange 33 at one side edge of the heel-plate 34, fitted to the lower side of a shifting-key 35. The shifting-key 35 is provided at its upper end with a finger-knob 36 and at its lower end with a stud 37, that is adapted to fit in the openings 38, formed in the slide-board 39. The slide-board 39 is supported for a sliding adjustment on the ways 40, formed at opposite side edges of the slide-opening 41, formed in the base-board 1, and the said slide-board 39 has fitted on the upper side thereof two or more longitudinal rows of contact-plates 42, which are perforated directly over the openings 38 in the board 39 to receive the stud 37 at the lower end of the shifting-key 35. For convenience in understanding the operation of the switchboard one row of the contact-plates 42 are additionally lettered *a*, *b*, *c*, *d*, *e*, *f*, *g*, and *h*, respectively, and each of these contact-plates has connected therewith one terminal of a main-line branch wire *r*, which main-line branch wire has electrical connection with every other switchboard and telephone in the system. It will be understood that the main-line branch wire connected with the plate *a*, for instance, is used entirely independent of the main-line branch wire connected with the plate *b* and the other succeeding plates in the same row, and when it is desired to connect with a telephone that is not assigned to any of the main-line wires having branch connections with the plates *a b c*, &c., the slide-board 39 is moved to a position so as to bring the other row of contact-plates at one side of the circuit-roller 25, whereby the shifting-key 35 can be used in connection with this other row of contact-plates to effect a connection with the particular telephone desired. While the slide-board 39 is illustrated as being provided with two independent rows of contact-plates for the main-line branch wires, it will be understood that this board may be made sufficiently large to have even three or four rows of the contact-plates, according to the number of telephones that are employed in the entire system.

In order that the arrangement of the different main-line branch wires *r* may be clearly understood, attention is directed at this point to diagrammatic Fig. 8 of the drawings. In this figure of the drawings a few of the branch wires *r* are illustrated in connection with a few of the switchboards, which are simply diagrammatically indicated.

By reference to Fig. 8 of the drawings it will be observed that every switchboard has the same number of branch wires *r*, and these branch wires are connected with the main-line wires L in the same way. These main-line wires L are practically the street-wires of the system, and there are as many of these main-line wires as there are branch wires for each switchboard of the system, so that each contact-plate 42 of each switchboard has an independent branch-wire connection with a particular main-line wire. For instance, the branch wires *r* leading from the "a" contact-plates 42 of every switchboard are connected with one of the main-line wires L, the branch wires *r* leading from the "b" contact-plates 42 of every switchboard with another of the main-line wires L, and so on, as may be clearly seen from the diagrammatic view. Now, while every switchboard has its branch wires connected with the main-line wires in the same way, it is to be understood that there are, say, four telephones and switchboards assigned for use in connection with one particular line-wire, and these telephones are assigned numbers, respectively 1, 2, 3 and 4, so that a subscriber will know when he is called up by the number of rings, as will be readily understood. By reason of this particular manner of assigning a specified number of switchboards to a particular main line it is necessary that the shifting-keys 35 of these switchboards are normally placed on the particular contact-plates having the branch-wire connections with the said main line, so that in order to call up any of the telephones on the line referred to any person in the system simply places his shifting-key on the contact-

plate having a branch connection with the said main wire and the connection is at once made, whereby any of the telephones referred to can be readily called up.

The shifting-key 35 of the switchboard is adapted to be fitted directly over any of the contact-plates 42, so as to place the heel-plate 34 in direct contact with such plate 42, so as to connect the switchboard with any particular main line and the branches of such main line, and the said shifting-key 35 has pivotally supported at one side thereof on the pivot 43 the gravity circuit-closing lever 44. The gravity circuit-closing lever 44 is provided at one end with a widened toe 45, which normally contacts with the contact-cores 26 on the circuit-roller 25, it of course being understood that the toe 45 only contacts with one of said cores at a time, and when the circuit-roller is in its normal position the toe 45 contacts with the first or uppermost of the cores 26. The circuit-roller is maintained normally in such a position to provide for the contact of the lever 44 with the uppermost core 26 by means of the adjustable counterbalance-weight 46, adjustably fitted on the offstanding weight-rod 47, secured at its inner end in the roller 25, as clearly illustrated in the drawings.

The end of the gravity circuit-closing lever 44, opposite the contact-toe 45, has connected thereto one of the bell-circuit wires *s*, the other of which bell-circuit wires is connected to the attaching-flange 48, formed at one edge of the heel-plate 34, opposite the flange 33 of said heel-plate. The bell-circuit wires *s* are connected to an ordinary electric call-bell 49, suitably fitted on the base-board 1 at one end thereof and at one side of the slide-opening 41, in which is fitted the slide-board 39.

When a switchboard is not in use the shifting-key 35 is always placed on the contact-plate 42, having a connection with the main line to which the particular switchboard is assigned, so that the telephone connected with this switchboard can be called up from any other telephone of the entire system. Bearing this in mind and the fact that the push-buttons 15 of two opposite switchboards are normally elevated with the contact-plates 21 thereof in direct contact with the plates 9 having the magnet-wire connections *l* therewith, the operation of two opposite switchboards will be readily understood from diagrammatic Fig. 7 of the drawings; and at this point attention is called to the fact that the term "opposite" refers to the telephone being called up, and is simply intended to designate one switchboard from the other in diagrammatic Fig. 7 of the drawings, so that the operation of the apparatus will be readily understood.

Assuming that the telephone to be called up is "No. 1" on the main line connected with the "a" contact-plates 42, it is simply necessary for the person manipulating the switchboard to shift his key 35 to the "a" contact-plate and to depress the push-button 15 for the electromagnet A. When this push-button is depressed, the bridge-plate 19 will be carried against the spaced contact-plates 9 directly therebelow and a circuit will at once be completed through the battery 14 and the electromagnet A over the wires *n*, *o*, *l*, and *m*, which will cause the said electromagnet to be energized and attract the adjacent bell-crank armature 30. The movement of the bell-crank armature against the core of the energized magnet closes the telephone-circuit through the armature and the core of the energized magnet, or, at least, through the conductor-plate 7 of such magnet. By reason of the fact that the spring-clips 20 hold the push-button in a depressed position the magnet A will be maintined energized, so that the attracted armature will remain in contact with the core of the magnet, and in this position it will be understood that the telephone-circuit will be completed through the wires *k j*, the pivot-rod 31, the wire *q*, the heel-plate 34 of the shifting-key 35, the contact-plate 42, and through the main-line branch wire *r* and main-line wire to the opposite switchboard. When the circuit is thus closed through the telephone of the person manipulating the switchboard, the ordinary battery of the telephone will be brought into play and the current of this battery will pass through the connections described to the opposite switchboard, and in entering the said opposite switchboard the current passes from the main-line branch wire *r* to the contact-plate 42, through the heel-plate 34, touching such contact-plate, thence through the bell 49, over the wires *s*, through the gravity circuit-closing lever 44, the first or uppermost of the contact-cores 26, through the wire *p* to the closed-contact connection 21 22, through the electromagnet A, thence through the wires *o*, *n*, and *t*, the latter wire being a ground connection with the zinc element of the working battery 14, and which provides for a grounding of the current which passes through the several connections of the switchboard for the telephone that is being called up.

When the ordinary telephone-current passes through the connections of the switchboard for the telephone being called up, in the manner just described, the electromagnet of this switchboard will be energized so as to attract the adjacent armature against the core, and thereby close the speaking-circuit through the said armature and core, and when the electromagnet of the opposite switchboard has thus attracted the armature a speaking-circuit will be established between the opposite telephones through the following connections: *k*, *j*, 30, *q*, *r*, main-line wire *r*, *q*, 30, *j*, and *k*. When communication has ceased the person whose switchboard was manipulated to secure the connection releases the depressed push-button from its fastenings so that the several parts of the switchboard will assume their proper relative positions.

When the push-button for the first electromagnet A is depressed the magnet A will be energized so as to attract its armature, as already described, and this movement of the armature through the medium of the pawl-arm 29, working in the first notch of the roller 25, will cause such roller to partially rotate, so as to carry the first or uppermost of the cores 26 out of contact with the toe 45 of the lever 44, which will then drop into contact with the second core 26, and in this position of the roller it will be impossible for any other telephone to call up the telephone which is in use, and it will of course be understood that the circuit-roller 25 of the switchboard for the telephone being called up will be partially rotated in the same manner to secure the same result. Now, assuming the telephone to be called up is No. 3 on a particular main line, the operator will first adjust his key 35 to the proper plate 42 and depress the push-button for the magnet A, which will cause one ring of the bells of the switchboards normally in circuit with the main-line wire to be used. Then the push-button for the magnets B and C will be successively depressed, so that when the push-button for the magnet C is depressed the bell on the switchboards referred to will have rung three times, so that the person having the No. 3 telephone on the line brought into use will know that his telephone is being called up. In this successive depression of the push-buttons it will be noted that the armature for the magnet A will move the roller 25 to a position which brings the armature for the magnet B operatively adjacent thereto, and the movement of the armature for the magnet B will move the roller to a position which brings the armature for the magnet C to an operative position, so that when this latter magnet is energized its armature will be attracted and will move the circuit-roller 25 to a position which brings the lowermost or double core 26 against the toe 45 of the lever 44, thereby cutting off communication from any other telephone except No. 3 on the main line, having connection with the plate 42, on which the shifting-key 35 rests. However, in this successive depression of the push-button it will also be understood that the magnets of the opposite switchboard will be successively energized, so that the circuit-roller 25 of this opposite switchboard will be partially rotated successively by the first three armatures of the switchboard, so that the roller will be brought to a position corresponding to the position of the roller on the switchboard being manipulated to cut off all communication with other telephones.

The function of looping or doubling the lowermost or double core 26 on the roller 25 will be found in connection with the depression of the fourth or last push-button on the switchboard for the magnet B. When the magnet C is energized, the roller 25 is rotated to a position which brings the upper branch of the looped or doubled core 26 against the toe 45 of the lever 44, and when the magnet D or the last magnet on the switchboard is energized the roller will move this upper branch of the core out of contact with the toe of the circuit-closing lever, which will then drop in contact with the lower branch of the looped or double core and allow the proper circuit connections to be made with the switchboard for the last or "No. 4" telephone on a main line, it being understood that if it were not for the lower branch cf the looped or double core the toe 45 of the lever 44 would drop onto the body of the roller and break the circuit connections when the last push-button was manipulated.

From the foregoing it is thought that the construction, operation and many advantages of the herein-described telephone-switchboard will be readily apparent to those skilled in the art without further description, and it will be understood that changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a telephone-switchboard, an electromagnet, the core of which is included in the circuit of a telephone, the working battery in circuit with the magnet to energize the same, a circuit-roller having a contact-core in circuit with the working battery, a movable armature for the magnet having a pawl connection with the roller to partially rotate the same, a suitably-supported circuit-closing lever normally resting against the core of the circuit-roller, and the main-line branch wire having a circuit connection with the armature and also with said circuit-closing lever, substantially as set forth.

2. In a telephone-switchboard, an electromagnet, the core of which is included in the circuit of a telephone, a working battery in circuit with the magnet, the zinc element of said battery having a ground connection, a circuit-closing device included in the line of the circuit connections for the battery, a circuit-closing roller having a contact-core circuited with the circuit-closing device, a movable armature for the magnet having a pawl connection with the roller to partially rotate the same, a suitably-supported circuit-closing lever normally resting against the core of the circuit-roller, and a main-line branch wire having a circuit connection with the armature and also with the circuit-closing roller, substantially as set forth.

3. In a telephone-switchboard, an electromagnet, the core of which is included in the circuit of a telephone, a working battery circuited with the magnet, the zinc element of said battery having a ground connection, a circuit-closing device included in the line of the circuit connections for the battery, a cir-

cuit-closing roller having a contact-core in circuit with the circuit-closing device, a movable armature for the magnet having a pawl connection with the roller to partially rotate the same, a suitably-supported circuit-closing lever normally resting against the core of the roller, a call-bell having a circuit connection with said lever, and the main-line branch wire having a circuit connection with the call-bell and also with the armature, substantially as set forth.

4. In a telephone-switchboard, the combination of the base-board, an electromagnet supported on the board, the core of which magnet is included in the circuit of the telephone, a working battery in circuit with the magnet, a circuit-closing device included in the line of the circuit connections for the battery, a circuit-closing roller mounted on the base-board and having a pawl-notch, and a contact-core circuited with the circuit-closing device, a movable armature for the magnet having a pawl-arm adapted to engage the pawl-notch of the roller, a series of contact-plates arranged on the base-board and having main-line branch wire connections therewith, a shifting-key adapted to be fitted on any of the contact-plates and having a metallic heel-plate, a gravity circuit-closing lever mounted on the shifting-key and normally contacting with the contact-core of the roller, and a circuit connection between the heel-plate of the key and the armature, and also between the heel-plate and said circuit-closing lever, substantially as set forth.

5. In a telephone switchboard, the combination of a base-board, an electromagnet supported on the base-board the core of which is included in the speaking-circuit of a telephone, a pair of spaced contact-plates arranged above the magnet, a spring-supported push-button arranged to work between the contact-plates and provided with a bridge-plate adapted to contact with said contact-plates, a working battery, circuit connections between the working battery, said contact-plates, and the battery, the main-line branch wire, and automatically-controlled circuit-closing connections between the main-line branch wire and the core of the magnet, substantially as set forth.

6. In a telephone-switchboard, the combination of a base-board, a series of electromagnets supported on the base-board, the cores of which magnets are included in the circuit of a telephone, a pair of spaced contact-plates arranged above each magnet and provided at their adjacent ends with spring-clips, spring-supported push-buttons arranged to work between the contact-plates and provided with bridge-plates adapted to engage in said spring-clips, a working battery, circuit connections between the battery, said contact-plates and the magnet, the main-line branch wire, and automatically-controlled circuit-closing connections between the main-line branch wire and the cores of the magnets, substantially as set forth.

7. In a telephone-switchboard, the combination of a base-board, a series of electromagnets supported on the base-board, the cores of which magnets are included in the circuit of the telephone, a pair of spaced contact-plates arranged above each magnet and provided at their adjacent ends with spring-clips, one of said contact-plates being additionally provided with a contact-lip, spring-supported push-buttons arranged to work between the contact-plates and provided with bridge-plates to contact with the former, and with flanged contact-plates adapted to normally contact with said contact-lips, a working battery, circuit connections between the battery, contact-plates, and the magnets, a circuit-closing roller having a series of contact-cores respectively circuited with the flanged contact-plates of the several successive push-buttons, movable armatures for the magnets having pawl connections with the roller to partially rotate the same, the main-line branch wire, a suitably-supported circuit-closing lever normally resting against the uppermost core of the circuit-roller, and circuit connections between the main-line branch wire and the armatures, and the circuit-closing lever, substantially as set forth.

8. In a telephone-switchboard, the combination of a base-board having a series of guide-boxes, a series of electromagnets having flat core extensions adjustably fitted in the guide-boxes and included in the circuit of a telephone, a pair of spaced contact-plates arranged above each magnet and provided at their adjacent ends with spring-clips, spring-supported push-buttons arranged to work between the contact-plates and provided with bridge-plates adapted to engage in the spring-clips and with offstanding press-fingers which overlap one another, a working battery, circuit connections between the battery, the contact-plates, and the magnets, the main-line branch wire, and automatically-controlled circuit-closing connections between the main-line branch wire and the cores of the magnets, substantially as set forth.

9. In a telephone-switchboard, the base-board, a series of electromagnets supported on the base-board, the cores of said magnets being included in the circuit of a telephone, a working battery in circuit with the magnets, a circuit-closing device included in the line of the circuit connections for the battery, a weighted oscillating circuit-roller provided with a series of spirally-arranged pawl-notches, and a series of longitudinal contact-cores corresponding in number to the number of magnets, and the lower of which cores is looped or doubled, circuit connections respectively between each core and said circuit-closing device, a series of pivotally-suspended bell-crank armatures arranged adjacent to each magnet and having pawl-arms adapted

to engage in the pawl-notches of the roller, a suitably-supported circuit-closing lever normally resting against the uppermost core of the circuit-roller, the main-line branch wire, and circuit connections between the main-line branch wire, the armatures and the circuit-closing lever, substantially as set forth.

10. In a telephone-switchboard, the combination of the base-board, a series of suitably-energized electromagnets, the cores of which are included in the circuit of a telephone, a weighted circuit-roller having a series of contact-cores respectively in circuit with the several successive magnets, the swinging armatures having a pawl connection with said roller, a series of contact-plates separated from each other and having openings therein and main-line branch-wire connections therewith, an adjustable shifting-key provided at its lower end with a stud to engage the openings of said contact-plate and with a heel-plate to contact with the same, a gravity circuit-closing lever pivoted at one side of the key and provided at one end with a toe to contact with the cores of the roller, the call-bell having a circuit connection with said lever and the heel-plate of the key, and a circuit connection between said heel-plate and the swinging armatures, substantially as set forth.

11. In a telephone-switchboard, the base-board, a series of suitably-energized electromagnets, the cores of which are included in the circuit of a telephone, a weighted circuit-roller provided with a series of contact-cores having suitable circuit connections with the several successive magnets, the swinging armatures having pawl connections with the roller, a slide-board adjustably fitted in the base-board below the roller and provided with separate longitudinal rows of contact-plates separated from each other and having openings therein and main-line branch-wire connections therewith, an adjustable shifting-key provided at its lower end with a heel-plate to contact with said contact-plates, a gravity circuit-closing lever pivoted at one side of the key and adapted to contact with the cores of the roller, the call-bell having a circuit connection with the lever and the heel-plate of the key, and a circuit connection between the heel-plate and the swinging armatures, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ISAAC ANDERSON.

Witnesses:

JOHN H. SIGGERS,

W. B. HUDSON.