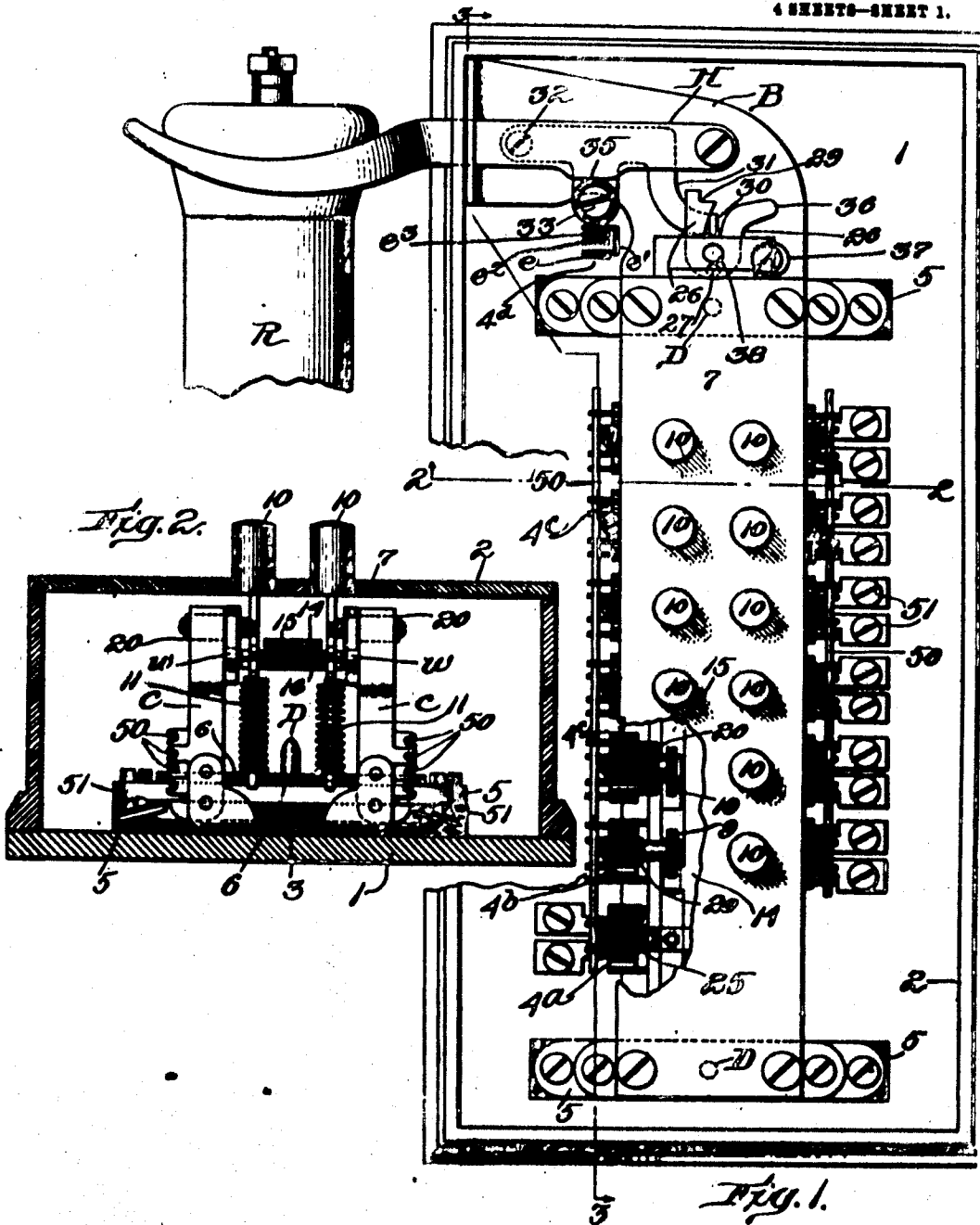


S. A. KOLTONSKI.
 TELEPHONE SWITCH APPARATUS.
 APPLICATION FILED AUG. 12, 1903.

947,840.

Patented Jan. 25, 1910.

4 SHEETS—SHEET 1.



Witnesses:
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Inventor:
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S. A. KOLTONSKI.
TELEPHONE SWITCH APPARATUS.
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4 SHEETS—SHEET 2

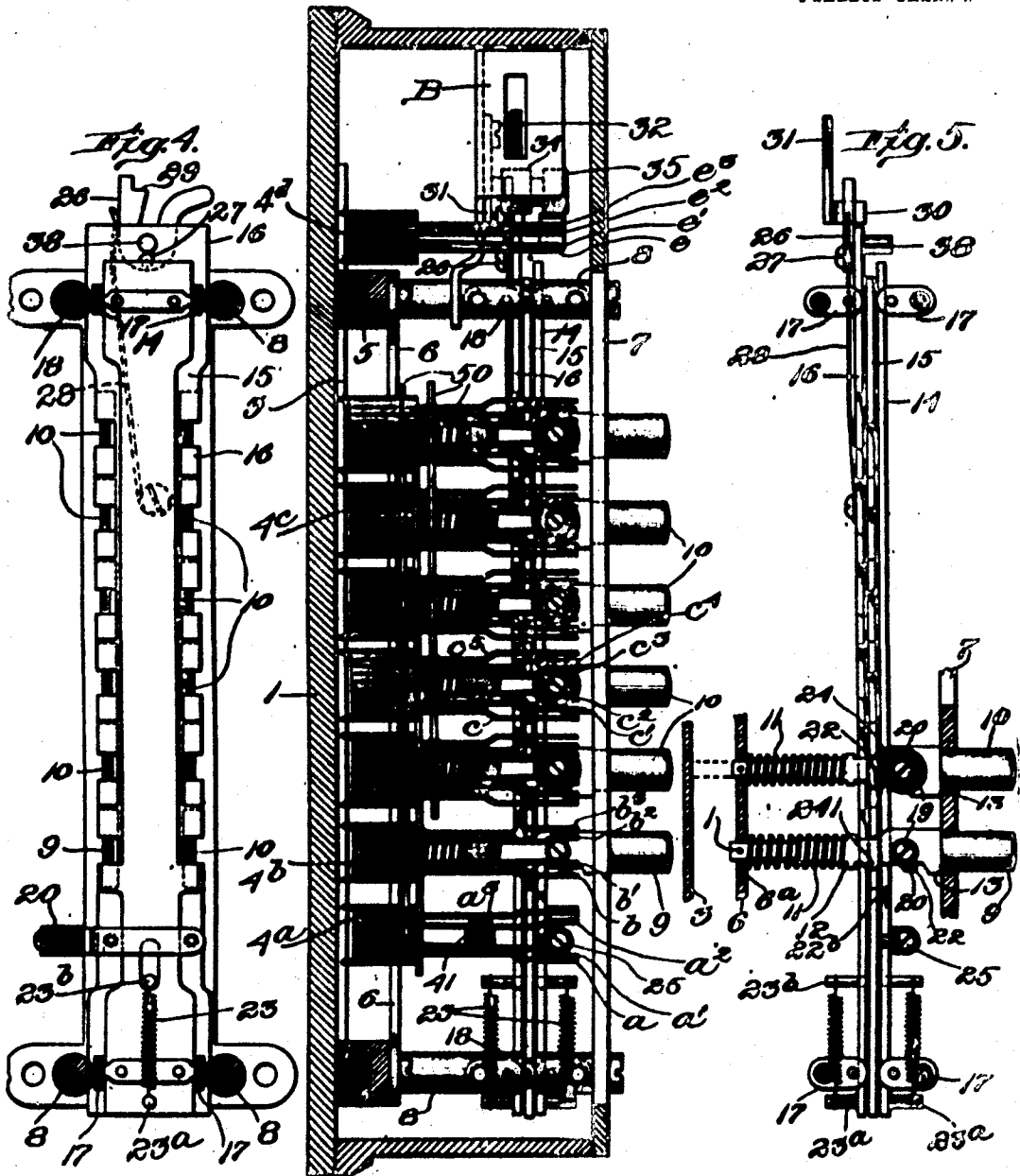


Fig. 3

Witnesses:
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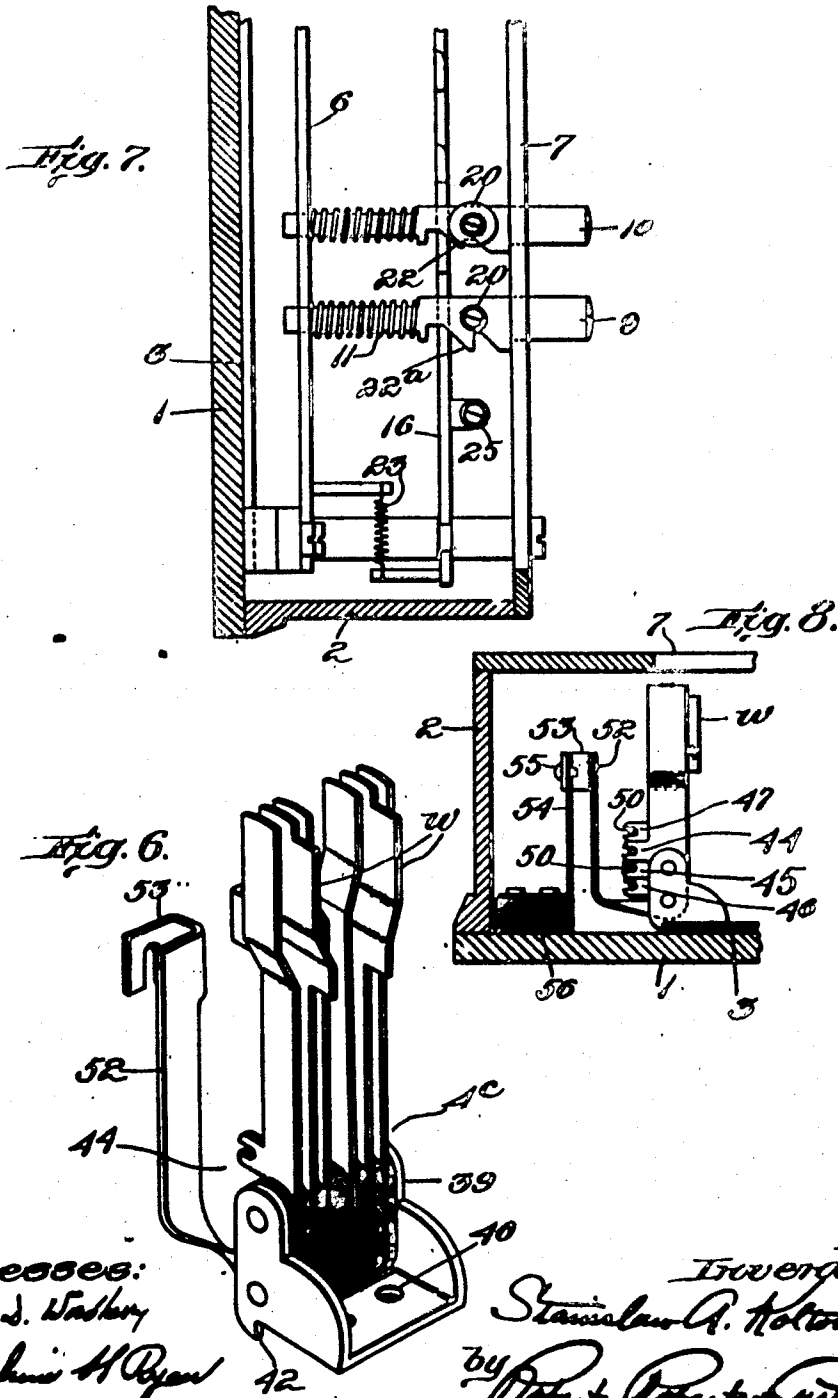
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S. A. KOLTONSKI.
TELEPHONE SWITCH APPARATUS.
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4 SHEETS—SHEET 3.



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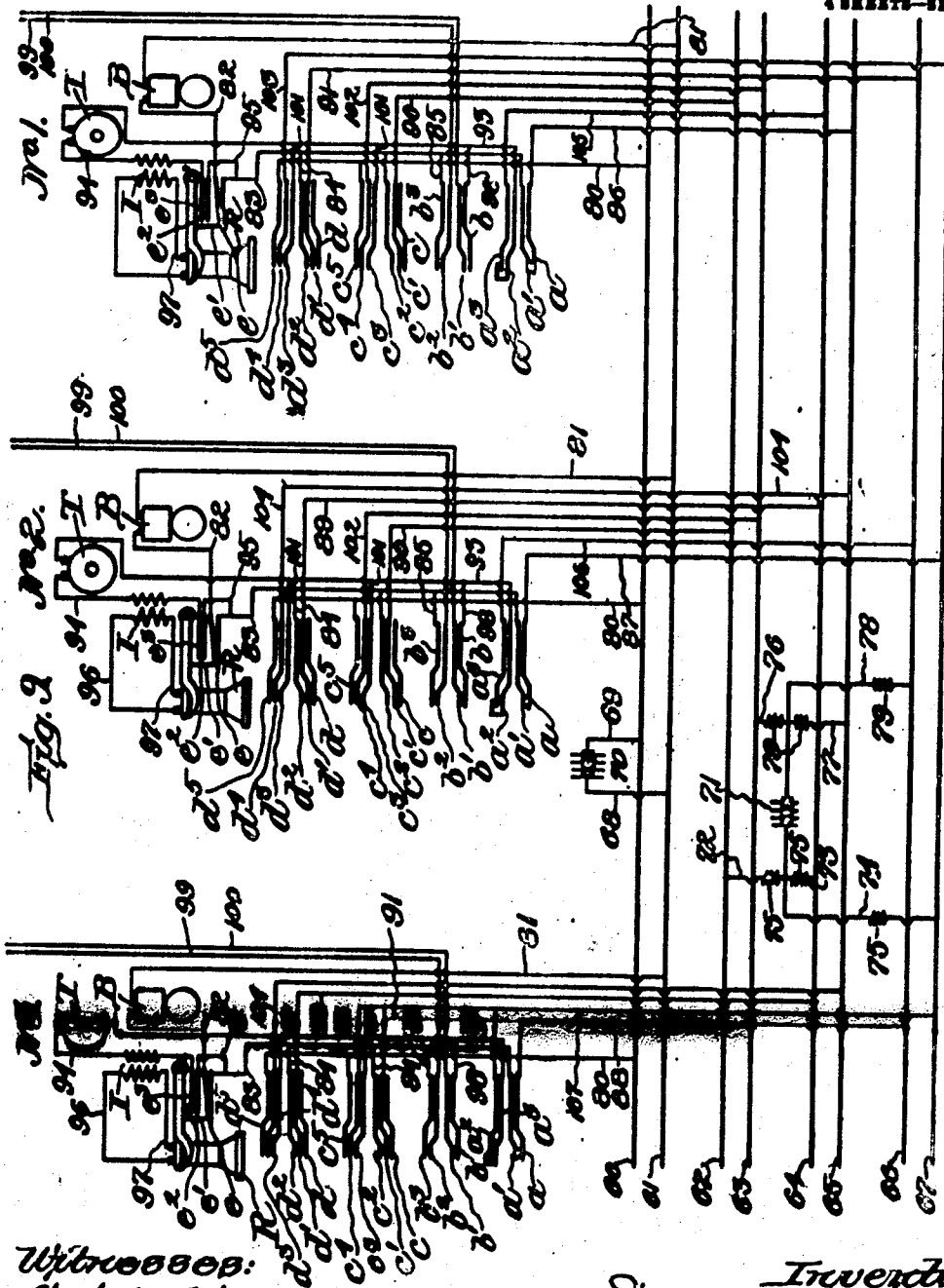
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TELEPHONE SWITCH APPARATUS.
 APPLICATION FILED AUG. 12, 1908.

947,340.

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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

STANISLAW A. KOLTONSKI, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO ELECTRO MECHANICAL WORKS, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

TELEPHONE SWITCH APPARATUS.

947,340.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Application filed August 12, 1906. Serial No. 446,133.

To all whom it may concern:

Be it known that I, STANISLAW A. KOLTONSKI, a subject of the Czar of Russia, and resident of Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Telephone Switch Apparatus, of which the following is a specification.

This invention relates to telephone switch apparatus for use in what is commonly known as a private branch exchange and is for certain improvements upon apparatus of the general character of that described in Letters Patent of the United States No. 846,479 issued to me March 12, 1907.

One of the objects of my invention is to provide means whereby the trunk line or central exchange circuit will be automatically held closed irrespective and independently of the operation of the switching devices controlling or operating the branch or intercommunicating circuits, thus overcoming the objection common to instruments of this type heretofore used, that unless the attendant at the central instrument of the branch exchange holds the trunk line circuit closed by manually depressing the plunger of the trunk line circuit and holding it depressed while connecting or calling one of the branch lines, the operation of the branch line switching mechanism releases the trunk line switching mechanism and breaks the trunk line circuit.

Another object of my invention is to provide a separable two-part frame for the switch apparatus, one of which parts carries the switching devices and the means for holding them in operative position, and the other of which part carries the circuit contacts and circuit connections, the cooperating parts upon the two sections being so arranged as to come into their proper relationship when the two sections are placed together.

A further object of my invention is to aggregate all of the contacts and circuit connections for each branch station circuit in separate groups each upon a single yoke or bracket which may be attached to or detached from the frame as a separate and complete unit.

A further object of my invention is to provide the rows or banks of circuit springs or contacts with lugs projecting outwardly therefrom at either side of the instrument so

that they are readily accessible for the attachment or detachment of the bus bars.

Other features of novelty and improvement will be hereinafter described and pointed out in the claims.

In the accompanying drawings which illustrate certain embodiments of my invention,—Figure 1 is a front elevation of an apparatus embodying the invention with the cover removed; Fig. 2 is a cross section on line 2—2 of Fig. 1 viewed from below; Fig. 3 is a side elevation, partly in section, on line 3—3 of Fig. 1; Fig. 4 is a plan view of the latch-plates for controlling the switch operating devices; Fig. 5 is a side elevation of the latch-plates showing two of the plungers in normal position; Fig. 6 is an enlarged perspective view of one of the unit groups of spring contact switches showing also a modified form of line connection devices; Fig. 7 is a side elevation of one of said unit groups showing said modified form of line connection completed; Fig. 8 is a detail showing in side view a single latch-plate which may be used in place of a plurality of latch-plates by employing a longer catch projection on the trunk line plunger than those on the plungers for the branch or intercommunicating circuits; and Fig. 9 represents diagrammatically the wiring or circuit connections between three stations provided with my improved switching instruments, which is a sufficient number for the purpose of illustration.

When in use the instrument as a whole is placed in a vertical position as shown in Fig. 1 with the receiver-hook lever at the top, and one such instrument or apparatus is provided at each station of the branch exchange.

The apparatus consists of a base 1 upon which the instrument is mounted. A cover or box 2 incloses and protects the instrument. The instrument proper contained therein consists of a base plate 3 to which a series of groups of circuit springs or contacts is secured in a row along each edge. One or more of these groups are to be employed for trunk lines or main exchange circuits and the others for the branch or intercommunicating circuits. As illustrated in the drawings, two of said groups 4 are employed for trunk line circuits and the others 4' for the branch circuits. There is also employed an additional unit or group

4^a which includes contacts and connections for what may be termed a non-interfering circuit by which all other stations are excluded from the signaling or "home station" or from cutting into a circuit connected with a trunk line. The base plate 3 is secured to cross bars 5 by which it is fastened to the base 1.

Readily separable from the base plate 3 and the parts carried thereby is a frame 10 which consists of an inner plate 6 and an outer plate 7 connected by posts 8. Two rows of plungers of which 9, 9, are employed to operate the trunk line circuits, and 10, 10, to operate the branch circuits, are mounted to play through holes in said plates the inner ends of the plungers being flattened to play through holes 6^a of corresponding shape in the plate 6. Springs 11 surround the plungers between plate 6 and shoulders 12 provided on each plunger normally holding the plungers in elevated position with their shoulders 13 abutting against plate 7. Between the two rows of plungers are three spring-controlled latch-plates 14, 15 and 16. The ends of the middle latch-plate 15 are guided in grooves 18 in the posts 8. The plates 14 and 16 are supported as hereinafter described. The plate 14 serves as a latch for holding the trunk line plungers 9 in their depressed position, and the plate 16 as a latch to hold the branch line plungers 10 in their depressed position to close the talking circuits. For this purpose lugs or projections are provided upon said plates adapted to cooperate with catches on said plungers as will be hereinafter more particularly described. To provide free action thereof the plates 14 and 16 are hung at their ends upon a pair of links 17, each link pivoted at one end to the latch plate and at the other end to the frame of the machine. Between the plates 14 and 16 lies the plate 15 which is operated by the depression of any plunger to cut out or open the home circuit of the calling station.

Each plunger or switching device is provided with a member consisting of a roll 20 of non-conducting material mounted on a stud 19. The outer ends of the rolls 20 upon the branch line plungers 10, are of smaller diameter than the inner ends for the purpose hereinafter described. When the two sections of the frame, that containing the plungers and latch-plates, and that containing the groups of contact springs, are placed together in their proper position, the smaller portions of the rolls 20 pass between the upper ends of the spring contacts of the talking circuit, and the larger portions of the rolls enter between the spring contacts of the line circuits, but in this position which is their normal position none of the circuits controlled by said

spring contacts are closed. The closing of said switches is accomplished by the depression of said plungers as hereinafter described.

The part of the frame comprising the inner plate 6 and outer plate 7 and connecting posts 8 carrying the plungers, latch-plates, receiver-hook lever and their associated parts, is constructed so as to be readily attached to or detached from the plate 3 which carries the contact units; and to facilitate and insure the accurate alinement of the two parts of the frame so as to bring the coacting members into their proper relation, two or more dowel pins D are employed secured to cross bars 5, which pins pass through properly located holes in plate 6. Should it be desired to remove the plate 7 for any purpose, this may be accomplished by removing the screws at the tops of the posts 8 which hold said plate, in which case the plungers may be held in their position by the inner plate 6, by depressing each and passing a pin or stop through the perforation I in the lower end of each plunger.

When a trunk line plunger 9 is depressed its roll 20 will spread the spring contact members 7^a and 8^a causing them to make contact respectively with 7 and 8^a thus closing the trunk line circuit. To hold the plunger 9 depressed it is provided on its lower side with a beveled tooth 22 which engages a projection 22^a on latch plate 14. In order to call one of the intercommunicating stations and to connect it with the trunk line, the attendant then depresses one of the plungers 10 appropriate to the desired station. The depression of the plunger 10 causes the roll 20 at its smaller diameter to spread the springs c^a and c^b causing them to make contact respectively with the talking circuit springs c^a and c^b, while they are in their operative position. By depressing the plunger 10 to its full extent, the roll 20 at its larger diameter will bear upon the inwardly projecting wings w of the contact springs c^a and c^b spreading said springs outwardly against springs c and c^a respectively, thus closing the signaling circuit of the station being called. By relieving pressure on plunger 10, plunger 10 returns sufficiently to again open the signaling circuit and close the talking circuit, the catch or tooth 22 which engages latch-plate 14 holding the talking circuit closed. The branch or intercommunicating circuit thus closed will remain closed until another plunger 10 is depressed, whereupon the tooth 22 of such plunger will move the latch-plate 14 and unlatch the previously depressed plunger 10 allowing it to return to normal position under the influence of spring 11. The trunk line plunger will remain in depressed position until another trunk line plunger is depressed so as to move the latch-plate 14 to

release it, or until the telephone receiver hook releases it as hereinafter set forth.

On the side of each plunger shank opposite to the tooth 22 is a bevel cam surface 24 which bears against a projection on plate 15 when the plunger is depressed moving the plate 15 upward and thereby moving upward a small insulating roll secured to plate 15 by stud 25. This roll projects between contact springs a' and a'' of the group 4^a. The upward movement of the roll breaks the contact between the circuit springs a and a' and between a'' and a' and thus opens the home circuit and prevents all other stations from cutting into that station. This so-called home circuit is kept open by said cam surface so long as any one of the plungers is held in depressed position and is closed again only when all of the plungers are returned to normal position.

From the foregoing it will be seen that the latch-plate holding the trunk line plunger or plungers 9 is independent of and not affected by the operation of any of the other switching devices but will hold the trunk line closed notwithstanding the depression of the plungers controlling the branch circuits.

Springs 23 under tension are connected at one end with a post 23^a secured to each of the outer latch-plates, and at the other end to the post 23^b secured to the middle latch-plate 15 and extending through slots in the two outer latch-plates. These springs normally tend to urge the plates respectively toward their operative position.

In order to restore all of the switching devices to normal position after a call, I provide means whereby the depression of the receiver-hook lever by hanging the receiver thereon releases all the plungers both of the trunk line and of the branch lines which are then in depressed position. This restores all of the circuits to normal condition. This means consists of a dog 26 pivoted at 27 upon the latch-plate 16 and held in operative position by a spring 28 (see Fig. 5). One arm of this dog is provided with a notch 29 against which a lateral extension 30 of a supplemental lever 31 bears. The supplemental lever 31 is pivoted to the bracket B at 32 and carries a stud 33 projecting beneath the receiver-hook lever H. The stud 33 carries thereon a roll 34 against which the receiver-hook lever H bears and also carries a bearing roll of insulating material 35 which serves as a bearing to act upon the contacts of group 4^a to open and close the telephone circuit when the receiver is hung up or taken down. The dog 26 is also provided with a curved arm 36 which extends over an adjustable eccentric stop 37 secured to bracket B in such position that when the dog 26 is depressed by the action of the supplemental

lever 31, which is moved by the downward swing of the telephone receiver-hook lever H, the arm 36 will be brought into contact with the eccentric stop 37 and will cause the dog 26 to tilt upon its pivot 27 until the lateral projection 30 of the lever 31 is disengaged from the notch 29 allowing the dog and the sliding latch-plates controlled thereby to return to normal position, the projection 30 passing between the arms 26 and 36 of the dog. By turning the eccentric 37 upon its supporting screw the time when the dog may be released from engagement with the projection 30 can be varied and regulated. When the plate 16 is depressed by the operation of the dog as above described, it releases the plungers controlling the intercommunicating circuits. The pin 38 then will engage the plate 14 depressing the same thereby releasing the trunk plungers; thus all of the plungers held by the latch-plates become released. The plate 15 which is held in elevated position by the cam surfaces 24, will be simultaneously released with the release of the plungers and all the circuits will be restored to normal condition.

Instead of employing a separate latch-plate 14 for holding the trunk line plungers in their depressed position, the trunk line and the branch line plungers may be all held by a single plate and at the same time provision made so that the operation of the branch plungers will not release the trunk line plungers. This is accomplished by the construction shown in Fig. 7 wherein the catch tooth 22^a of the trunk line plunger 9 is made longer than the tooth 22 of the branch plunger 10, in which case after plunger 9 has been depressed so that its tooth 22^a is engaged by latch plate 16, the depression of any of the plungers 10 for the branch circuits will not release the tooth 22^a because of its greater length. The latch plate may be made to operate properly by regulating the strength of the spring 23 and the springs 11 which respectively are urging the latch-plate and the plungers to their normal positions.

In Fig. 6 there is illustrated a group or unit of contact springs assembled and held as a single unit complete in itself in a yoke or bracket 39 which may be readily attached to or detached from the plate 3 for the purpose of repair or renewal by screws through holes 40 without disturbing other parts of the apparatus with the exception of unsoldering the bus bar connections presently to be described. In order to prevent accidental contact between any two of the springs of the several groups, stepped stops 41 made of insulating material may be inserted between the springs and for the purpose of accurately locating each bracket 39 with reference to the edge of plate 3, pro-

jections 42 are formed upon the bottom of each bracket to engage the edge of plate 3. The contact springs are properly insulated from each other as usual.

- 5 Projecting outwardly from each spring of the talking and ringing circuits is a lug to which the bus-bar is secured. These lugs are arranged in series. One series of lugs 44 upon the corresponding contacts of the several groups are preferably arranged in the same vertical plane. Another series of lugs 45 are upon their corresponding contacts of the several groups and are arranged in another plane. Another series of lugs 46 on still other corresponding contacts are in another plane, and a fourth series of lugs 47 are arranged upon still other corresponding contacts in a fourth plane. The bus bars 50 may then be soldered or otherwise secured to the several series of lugs and run in a straight line without interfering one with another. In order that all the lugs and bus bar connections may be readily accessible for inspection and repair by simply removing the cover from the apparatus, it will be observed that all of said lugs project outwardly from the spring contacts at either side of the apparatus. Heretofore it has been the practice to arrange bus bars in various other locations more or less covered and obscured by portions of the apparatus so that they have been accessible for repair only by removing or dismantling certain parts of the apparatus.
- 55 Line terminals 51 (see Fig. 2) are provided for the several contacts. In Figs. 6 and 8 I have shown a modified form of line terminal wherein an extension 52 from the contact springs projects outward from the base in front of the contacts and terminates in a U-shaped piece 53. A metal strip 54 secured within said U-shaped piece 53 by a screw 55 is fastened to the insulating strip 56 upon the base 1, to the lower end of which strips 54 the line wires are connected. By loosening the screws 55 when any one of the unit groups 4^a, 4^b etc. is removed, this U-shaped piece 53 will be removed with it. This construction affords a form of line connection which need not be disconnected from the terminals should it be necessary to remove the entire mechanism and circuit springs from the housing or box.
- 55 The wiring of the private branch telephone system having three stations provided with the improved switch apparatus, is shown diagrammatically in Fig. 9. The three branch stations, Nos. 1, 2 and 3, are connected by two bell circuit wires 60 and 61, and six telephone circuit wires 62 to 67 inclusive. The wires 62, 64 and 67 are connected with one of the poles of the telephone battery 71 by wires 72, 73 and 74, respectively, each of said wires including the usual 65 impedance coil 75, while wires 63, 65 and 66

are connected, respectively, with the other pole of battery 71 by wires 76, 77 and 78, respectively, each of the last mentioned wires including also an impedance coil 79. The wires 60 and 61 are connected by wires 68 70 and 69, respectively, with the opposite poles of a bell battery 70. At each station all of the contacts c^2 , d^2 etc. are connected by a single conductor or wire 80 with the wire 60 leading to one pole of bell battery 70, while 75 the wire 61 that leads to the opposite pole of battery 70 is connected with one terminal of a bell B at each station by a wire 81. The other terminal of each bell B is connected by a wire 82 with the contact c' of its station. 80 The contact c at each station with which c' is normally in engagement, is connected by a wire 83 with the contact a' of the home switch of its station, and each wire 83 is connected by wires 84 with the contacts c^2 , d^2 85 etc. of its station and by a wire 85 with the contact b^2 of the trunk switch of its station. At station No. 1 the contact a with which contact a' is normally in engagement, is connected by a wire 86 with wire 65; at station 90 No. 2 the contact a is connected by a wire 87 with wire 67; and at station No. 3 said contact a is connected by a wire 88 with wire 63. It will now be seen that the bell circuit for each station includes wire 81, bell B, wire 82, 95 contacts c and c' , wire 83, contacts a and a' , and wires 86, 87 and 88. At stations Nos. 2 and 3 the switch d , d' etc. is the branch switch for calling and controlling communication with station No. 1, and the contacts d' 100 of both of these branch switches are connected each by a wire 89 with the wire 64 to which the wire 103 connects contact a^2 of station No. 1. At stations Nos. 1 and 2 the contacts c , c' etc. is the branch switch for 105 calling and controlling communication with station No. 3, and the contacts c' of these two switches are connected each by a wire 90 with the wire 62 with which the wire 107 of station No. 3 connects. At station No. 1 the 110 contacts d , d' etc. and at No. 3 the contacts c , c' etc. are respectively switches for calling and controlling communication with station No. 2. The contacts c' and d' of these two switches are connected each by a wire 91 115 with the wire 66, with which the wire 106 of station No. 2 connects. Assuming now that the operator at station No. 2 or No. 3 desires to ring the bell of station No. 1, then he pushes in, to the limit of its movement, the 120 push button 10 of branch switch d , d' etc. of his station, and as long as he holds this push button in its extreme inner position a circuit is complete through bell B of station No. 1, which is traced as follows: from battery 125 70 through wires 68 and 61; wire 81 of station No. 1, bell B; wire 82; contacts c and c' ; wire 83; contacts a' and a of the home switch of station No. 1; wires 86 and 65, wire 104 of station No. 2 or No. 3 as the 130

case may be; contacts d^1 and d^2 ; and thence through wires 80, 60 and 69, back to battery 70. It will now be plain how the operator at any one of the stations by operating the proper push button 10 may ring the bell B of any one of the other stations. As has already been explained, the contact d^1 is in engagement with the contact d^2 only so long as a push button 10 is held in its innermost position, and therefore as soon as the operator at the calling station removes the pressure from such push button the bell B at the called station ceases to ring. At each station the contact a^2 of the home switch is connected by a wire 93 with one of the terminals of a transmitter T, the other terminal of which is connected through a wire 94 with the contact c^1 , said wire 94 including the primary of an induction coil I. The contact e^2 with which contact c^2 cooperates is connected by a wire 95 with the wire 83. The secondary of the coil I is connected by wires 96 and 97 with the receiver R. The contact b of the trunk switch is connected by a wire 98 with the wire 93, while the two middle contacts b^1 and b^2 are connected with the trunk line wires 99 and 100 leading to central.

It will now be clear that when the trunk switch button of any station is pushed in and the receiver R removed from its hook, a trunk line leading to central is closed, which is traced at the branch station as follows: from wire 99 through contacts b^2 and b^1 ; wires 85, 83 and 95 contacts c^2 and c^1 ; wire 94 including the primary of induction coil I; transmitter T; wires 93 and 98; and contacts b and b^1 to wire 100. Since the latch-plate 14 for the trunk switch is entirely independent of the branch switch buttons 10, any one or more of the latter may be depressed after the trunk switch button has been depressed, and those branch switch buttons will be caught and held in their inner positions by the latch plate 16; but if the branch switch buttons have been depressed previously to the operation of the trunk switch button, then when the trunk switch button is depressed the cam 241 of the latter will operate the plate 16 so as to return those branch switch buttons, automatically to normal position, leaving only the trunk line connected with the station.

At each branch station the wire 93 is connected by wires 101 with the contacts c^2 , d^1 etc. of the respective branch switches of the station. At station No. 1 the contact d^1 which cooperates with the contact d^2 of that switch and at station No. 3 contact c^1 are each connected by a wire 103 with wire 67. At stations Nos. 1 and 2 the contacts c^1 which cooperate with contacts c^2 of those switches are connected by a wire 102 with the wire 68. At stations Nos. 2 and 3 the contacts d^1 which cooperate with the contact

d^2 of those switches are connected by wires 104 with the wire 65. At station No. 1 the wire 64 is connected by a wire 105 with the contact a^1 of the home switch of said station; at station No. 2 the contact a^1 of the home switch of that station is connected by a wire 106 with the wire 66, and at station No. 3 the contact a^1 of the home switch of that station is connected by a wire 107 with the wire 62. As explained above, the contacts a and a^1 of the home switch of each branch station are normally closed as are also the contacts a^2 and a^3 of said switch. Also it has heretofore been made clear that the change in the condition of the circuits and switches at the called station is produced only by the removal of the receiver R from its hook in responding to the call which opens switch c , c^1 , and closes switch e^1 , e^2 . Therefore, if station No. 1 is the called station its part of the primary talking circuit is from wire 65 through wire 86; contacts a , a^1 ; wires 83 and 95; contacts e^2 , e^1 ; wire 94; transmitter T; wire 93; contacts a^2 , a^3 , and wire 105 to wire 64. That part of the primary talking circuit at the calling station is established by pushing in the button 10 corresponding to the called station, which operation serves to establish said circuit from either wire 62, 64 or 66, according to which push button 10 is operated through the transmitter of the calling station to wire 63, 65 or 67. Thus, if station No. 2 is calling station No. 1, push button at switch d^2 , d^3 is depressed and caught by plate 16, so that that part of the primary talking circuit at station No. 2 is from wire 65 with which wire 86 of station No. 1 connects, through wire 104; contacts d^1 and d^2 of that switch; wire 93; (contacts a^2 and a^3 of the home switch being opened at the calling station through the depression of the push button in calling station No. 1); transmitter T; contacts c^1 , c^2 ; wires 95 and 83 (contacts a and a^1 of the home switch being opened at the calling station through the depression of the push button in calling station No. 1), contacts d^2 and d^1 of that switch and wire 89 to wire 64 with which wire 105 of station No. 1 connects.

I claim:

1. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch or intercommunicating circuits, comprising a separate switching device for each circuit in the system, and movable retaining means adapted automatically to hold the trunk line or central exchange circuit closed independently of the operation of the switching devices controlling the branch circuits.

2. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange

circuit, and the others are branch or intercommunicating circuits, comprising a separate switching device for each circuit in the system, means whereby the operation of any of the switching devices controlling the branch circuits opens any branch circuit previously closed by the operation of any of the other branch circuit switching devices, and movable retaining means adapted automatically to hold the trunk line or central exchange circuit closed independently of the operation of the switching devices controlling the branch circuits.

3. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch or intercommunicating circuits, comprising a series of switching plungers, one for each circuit, a spring for each plunger normally urging the same toward its elevated or inoperative position, and movable retaining means adapted automatically to engage and hold depressed the plunger or plungers controlling the trunk line circuit irrespective of the operation of the switching plungers of the branch circuits.

4. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch or intercommunicating circuits, comprising a series of switching plungers, one for each circuit, a spring for each plunger normally urging the same toward its elevated or inoperative position, means whereby the depression of any of the branch circuit plungers will release other branch circuit plungers previously depressed, and movable retaining means adapted automatically to engage and hold depressed the plunger or plungers controlling the trunk line circuit or circuits irrespective of the operation of the plungers of the branch circuits.

5. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch or intercommunicating circuits, comprising a separate switching device for each circuit in the system, and means to hold the trunk line or central exchange circuit closed, irrespective of the operation of the switches controlling the branch circuits, a lever for supporting the receiver, and means controlled by said lever for operating all of the closed switches to restore all of the circuits to normal condition.

6. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch or intercommunicating circuits, comprising a series of switching plungers, one for each circuit, and means to hold depressed the plunger or

plungers controlling the trunk line switch or switches irrespective of the operation of the switching plungers of the branch circuits, a lever for supporting the receiver, and means controlled by said lever for releasing all of the depressed switching plungers to restore all of the circuits to normal condition.

7. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch or intercommunicating circuits, comprising a series of switching plungers, one for each circuit, automatically operated means to hold depressed the plungers of the branch circuits, and an automatically operated latch to engage and hold depressed the trunk line plunger or plungers, irrespective of the operation of the means employed to hold depressed the plungers of the branch circuits.

8. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch or intercommunicating circuits, comprising a series of switching plungers, one for each circuit, a latch-plate adapted to engage and hold depressed the plungers of the branch circuit, and an independent latch-plate adapted to engage and hold depressed the trunk line plunger or plungers irrespective of the operation of the first mentioned latch-plate.

9. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch or intercommunicating circuits, comprising a series of switching plungers, one for each circuit, a latch-plate adapted to engage and hold depressed the plungers of the branch circuits and an independent latch-plate adapted to engage and hold depressed the trunk line plunger or plungers irrespective of the operation of the first mentioned latch-plate, and a third latch-plate controlled by the movement of which plate opens a circuit to exclude all other circuits from the one connected with the home station.

10. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch exchange or intercommunicating circuits, comprising a series of switching plungers, one for each circuit, a latch adapted to engage and hold depressed the plungers of the branch circuits, means whereby the depression of any one of said branch circuit plungers releases any other depressed branch circuit plunger, an independent latch adapted to engage and hold depressed the trunk line plunger or plungers irrespective of the operation of the branch circuit plungers, and a third latch

controlled by the operation of any plunger in the series, the movement of which opens a circuit to exclude all other circuits from the home station.

11. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch exchange or intercommunicating circuits, comprising a series of switching plungers, one for each circuit, a latch adapted to engage and hold depressed the plungers of the branch circuits, means whereby the depression of any one of said branch circuit plungers releases any other depressed branch circuit plunger, an independent latch adapted to engage and hold depressed the trunk line plunger or plungers irrespective of the operation of the branch circuit plungers, and a third latch controlled by the operation of any plunger in the series, the movement of which opens a circuit to exclude all other circuits from the home station, and means to operate all of said latches together to release all of said plungers and restore all of said switches to normal condition.

12. A telephone switch apparatus for controlling a plurality of circuits, of which one or more is a trunk line or central exchange circuit, and the others are branch exchange or intercommunicating circuits, comprising a series of switching plungers, one for each circuit, a latch-plate adapted to engage and hold depressed the several plungers of the branch circuits, and means whereby the depression of any one of said branch circuit plungers releases any other depressed branch circuit plunger, an independent latch-plate adapted to engage and hold depressed the trunk line plunger or plungers irrespective of the operation of the branch circuit plungers, a third latch-plate controlled by the operation of any plunger of the series, the movement of which opens a circuit to exclude all other circuits from the home station, a lever for supporting the telephone receiver, and means controlled by said lever for operating all of said latch-plates to release all of said plungers, and restore all of said switches to normal condition.

13. In a telephone switch apparatus provided with a series of switching devices held in operative position by one or more latch-plates, the combination with the telephone receiver-hook lever, of a supplemental lever pivoted to the apparatus and operated by the receiver-hook lever, a spring controlled dog pivoted to one of the latch-plates, and means upon the supplemental lever to engage the dog and move it together with the latch-plates to release all of the switching devices held by said latch-plates, when the receiver-hook lever is depressed.

14. In a telephone switch apparatus provided with a plurality of circuits and a series

of switching devices therefor held in operative position by a plurality of spring actuated latch-plates, the combination with the telephone receiver-hook lever, of a supplemental lever pivoted to the apparatus and operated by the receiver-hook lever, a spring controlled dog pivoted to one of the latch-plates, means upon the supplemental lever to engage the dog and move it together with the latch-plate to which it is pivoted to open the circuits controlled thereby, means on such latch-plate simultaneously to operate the other latch-plates to restore the circuits controlled thereby to their normal position, and means to release said dog from said supplemental lever to permit all of the latch-plates to return to their normal position after said switches have been restored to normal position.

15. In a telephone switch apparatus for controlling a plurality of circuits and provided with a series of switching devices which are held in operative position by one or more spring actuated latch-plates, a receiver-hook lever, a dog pivoted to one of said latch-plates, means operated by the receiver-hook lever to engage and depress the dog and its latch-plate, and a fixed stop adapted to engage and actuate the pivoted dog to release it from the operation of the receiver-hook lever to permit said latch-plates to return to normal position.

16. In a telephone switch apparatus for controlling a plurality of circuits and provided with a series of switching devices which are held in operative position by one or more spring actuated latch-plates, a receiver-hook lever, a dog pivoted to one of said latch-plates, means operated by the receiver-hook lever to engage and depress the dog and its latch-plate, and a stop adapted to engage and actuate the pivoted dog to release it from the operation of the receiver-hook lever, said stop comprising an adjustable eccentric whereby the time of such release may be varied.

17. A telephone switch apparatus for controlling a plurality of circuits, comprising a readily separable two-part frame, one of which parts carries the switching devices, springs normally holding the same in operative position, and means to hold them in operative position and to release them therefrom, and the other of which parts carries groups of cooperating circuit springs, together with bus bars connecting the same, and means to guide the two parts of the frame when placed together so as to bring the switching devices into proper cooperative relationship or alinement with their respective circuit springs, the first mentioned part being so constructed that the relative positions of the devices carried thereby are not disturbed when the two parts of the frame are separated.

18. A telephone switch apparatus for controlling a plurality of circuits, comprising a readily separable two part frame, one of which parts consists of an inner plate and an outer plate provided with guides for the switching plungers, said plates spaced apart and rigidly connected together by posts, plungers in said guides carrying devices to operate circuit springs and movable latch-plates located between said inner and outer plates of the frame for holding depressed said plungers, and the other of which parts consists of a base plate having secured thereon a bank of groups of circuit springs and means separably to fasten said two parts together with the members carried thereby in cooperative relationship.

19. A telephone switch apparatus for controlling a plurality of circuits, comprising a readily separable two-part frame, one of which frame-parts carries the switching devices, the springs normally holding the switching devices in inoperative position, said springs retained between and abutting against said switching devices and said frame-part, and the means to hold said switching devices in operative position and to release them therefrom, said frame-part and said devices carried thereby being wholly self contained whereby said devices will not be dismembered or disturbed when the two parts of the frame are separated, and the other of which frame-parts carries groups of cooperating circuit contacts together with bus bars connecting the same, said two parts and said devices respectively carried thereby, each being complete in itself and so constructed that each part and the devices carried thereby are not dismembered or disturbed when the two parts are separated.

20. A telephone switch apparatus for controlling a plurality of circuits, comprising a readily separable two-part frame, one of which parts consists of an inner plate and an outer plate provided with guides for the switching plungers, said plates connected together by posts, plungers in said guides carrying contact spring operating members, and longitudinally movable latch-plates holding depressed said plungers, and the other of which parts consists of a base plate having secured thereon a bank or group of circuit contacts, and means to guide the two parts of the frame when placed together so as to bring the switching devices into cooperative relationship with their respective circuit contacts.

21. In a telephone switch apparatus for controlling a plurality of circuits and provided with a series of switching plungers, a frame comprising an outer guide plate for said plungers and a parallel inner plate having apertures to guide the inner ends of said plungers, the inner ends of said plungers

adapted to pass through said apertures, each plunger provided with a shoulder and held by a spring with the shoulder abutting against said outer guide plate, said outer guide plate being removable, and the inner ends of said plungers being so constructed below the inner guide plate as to be capable of passing therethrough, and being provided with means to receive and hold a separable stop to prevent the plungers from being forced out of their inner guiding apertures when the outer guide plate is removed.

22. In a telephone switch apparatus for controlling a plurality of circuits, in combination, a base having thereon a series of groups of spring contacts, each group assembled and held in a separate bracket adapted to be readily attached to and detached from said base as a single unit, and a separable frame carrying a plurality of switching devices cooperating each with its appropriate group of circuit contacts, said brackets having projections adapted to engage with said base to insure the accurate positioning of said contacts in relation to said switching devices.

23. In a telephone switch apparatus for controlling a plurality of circuits, in combination, two parallel rows of groups of spring circuit contacts, plungers to operate said circuit contacts, the talking and ringing springs of said circuit contacts being provided with lugs, the lugs on the springs of each row being on the outer side of the row and projecting away from the other row, whereby bus-bars connected to said lugs will be situated entirely outside of the rows of springs.

24. In a telephone switch apparatus for controlling a plurality of circuits, in combination, two parallel rows of groups of spring circuit contacts, plungers to operate said circuit contacts, the talking and ringing springs of said circuit contacts being provided with lugs, the lugs on the springs of each row being on the outer side of the row and projecting away from the other row, and the series of lugs on the corresponding contacts of each group being in alignment and in the same plane, and each of such series of lugs being in a different plane from any other series, whereby the bus-bars when connected to their respective series of lugs will be situated entirely outside of the rows of springs and in separate tiers.

25. A telephone switch apparatus of the character described comprising in combination a frame, a plurality of circuit springs and switching plungers, and a spring actuated plate for holding the plungers depressed, said plate being supported to swing in a small arc in the frame by links pivoted at one end to the frame and at the other end to the plate whereby sliding friction is avoided.

26. A telephone switch apparatus of the character described comprising in combination, a frame, a plurality of circuit springs and switching plungers one or more of which controls the trunk line, and the rest of which control the branch lines, a spring actuated latch-plate for holding the trunk line plunger or plungers depressed, and a spring actuated latch-plate for holding the branch line plungers depressed, each of said plates being hung at its ends by links pivoted to said frame and to said plate.

27. In a telephone switch apparatus of the character described, the combination with the plunger and latch-plate carrying a frame, of a laterally extending arm secured to said frame at the end thereof, comprising the plate B having the upturned end B' provided with a slot therethrough, a supplemental lever 31 pivoted to said plate close to said upturned end B', and a telephone receiver-hook lever pivoted to said plate B opposite to the pivot of lever 31 and extending through said slotted end B', means intermediate the supplemental lever and latch plates to release the latter, and means intermediate the supplemental lever and the receiver-hook lever whereby the depression of the latter operate the former.

28. In a telephone switch apparatus of the character described, a group of circuit springs consisting of a pair of inner springs for the talking circuit, a pair of outer springs for the signaling circuit, and a pair of intermediate springs for the line circuit, all of said springs being normally electrically disconnected from one another, and each of said line circuit springs having an extension or wing offset from the line of the other springs, in combination with a switching plunger carrying a stud extending laterally therefrom, one portion of the stud adapted to enter between the talking circuit springs and force them outwardly against the line circuit springs during the first part of the downward movement of the plunger, and another portion of said stud adapted to enter between the extensions or wings on the line circuit springs and force them out of contact with the talking circuit springs and into contact with the signaling circuit springs during a further downward movement of the plunger.

29. A telephone switch apparatus for controlling a plurality of circuits, comprising in combination a series of switching plungers, means to engage and hold depressed said plungers, a telephone circuit controlled by

each of said plungers, a longitudinally movable plate yieldingly held in inoperative position and provided with a cam-engaging surface, each of said plungers provided with a cam to shift said plate lengthwise, and means whereby the movement of said plate by the cam of any one of said plungers opens a circuit to exclude from the home station all the telephone circuits controlled by the other plungers.

30. In a telephone switch apparatus of the character described, a group of circuit springs consisting of a pair of inner springs for the talking circuit, a pair of outer springs for the signaling circuit, and a pair of intermediate springs for the line circuit, all of said springs being normally electrically disconnected from one another, and each of said line circuit springs having an extension or wing offset from the line of the other springs, in combination with a switching plunger carrying a stud consisting of two portions of different diameters extending laterally therefrom, the portion of the stud of the smaller diameter adapted to enter between the talking circuit springs and force them outwardly against the line circuit springs during the first part of the downward movement of the plunger, and the other portion of said stud of the larger diameter adapted to enter between the extensions or wings on the line circuit springs and force them out of contact with the talking circuit springs and into contact with the signaling circuit springs during a further downward movement of the plunger.

31. A telephone switch apparatus for controlling a plurality of circuits, comprising in combination a series of switching plungers, means to engage and hold depressed said plungers, a telephone circuit controlled by each of said plungers, a movable plate yieldingly held in inoperative position and provided with cam-engaging surfaces, said plungers provided with cams to engage said cam-engaging surfaces and move said plate, and means whereby the movement of said plate by the cam of any one of said plungers opens a circuit to exclude from the home station all the telephone circuits controlled by the other plungers.

Signed by me at Boston, Massachusetts, this 5th day of August, 1908.

STANISLAW A. KOLTONSKI.

Witnesses:

CHARLES D. WOODBERRY,
ROBERT CUSHMAN.