A. H. DYSON.

SWITCH FOR AUTOMATIC TELEPHONE SYSTEMS.

APPLICATION FILED JULY 5, 1907.

975,608.

Patented Nov. 15, 1910

3 SHEETS—SHEET 1.

Fig. 3

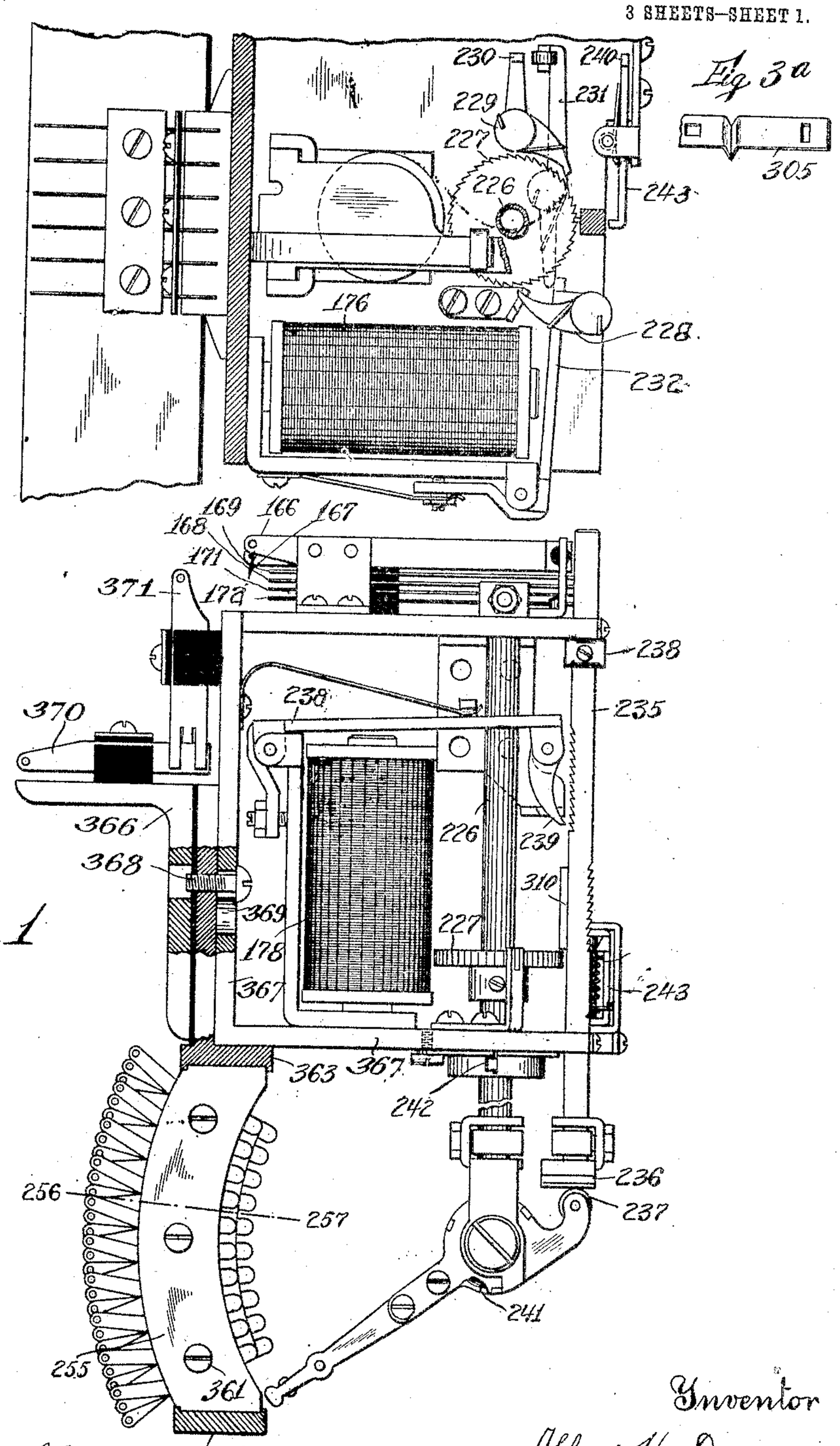

Fig. 3a

Fig. 1

Witnesses

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3 SHEETS—SHEET 2.

Fig. 2

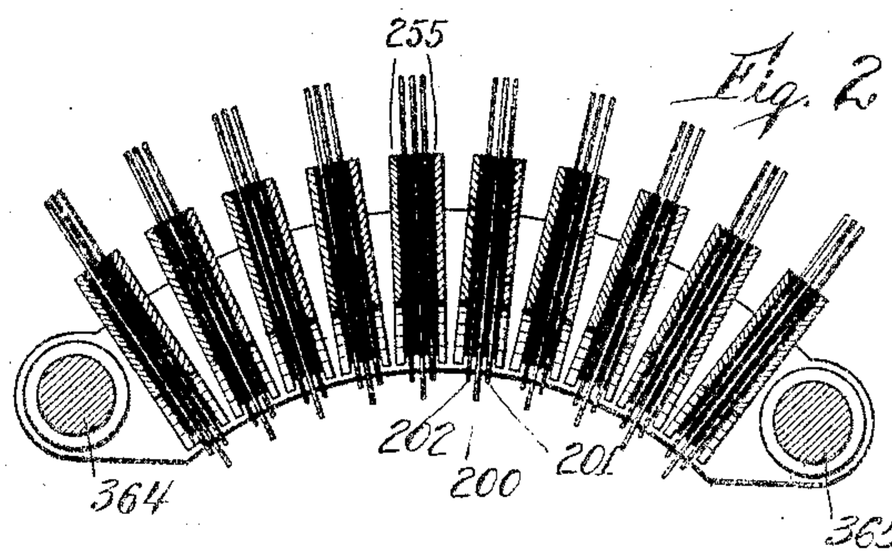


Fig. 3

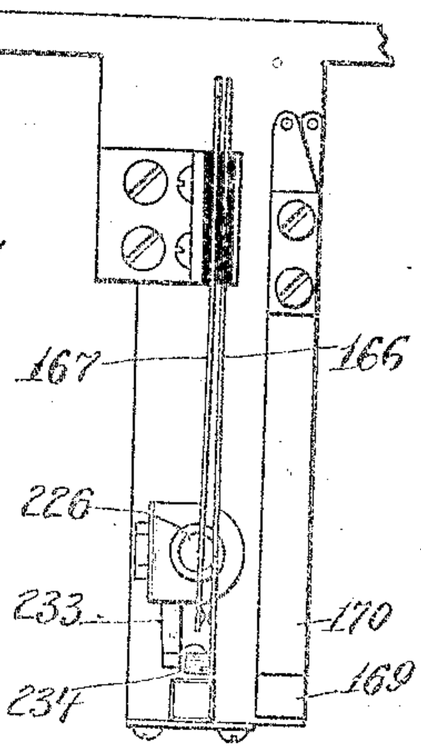


Fig. 4

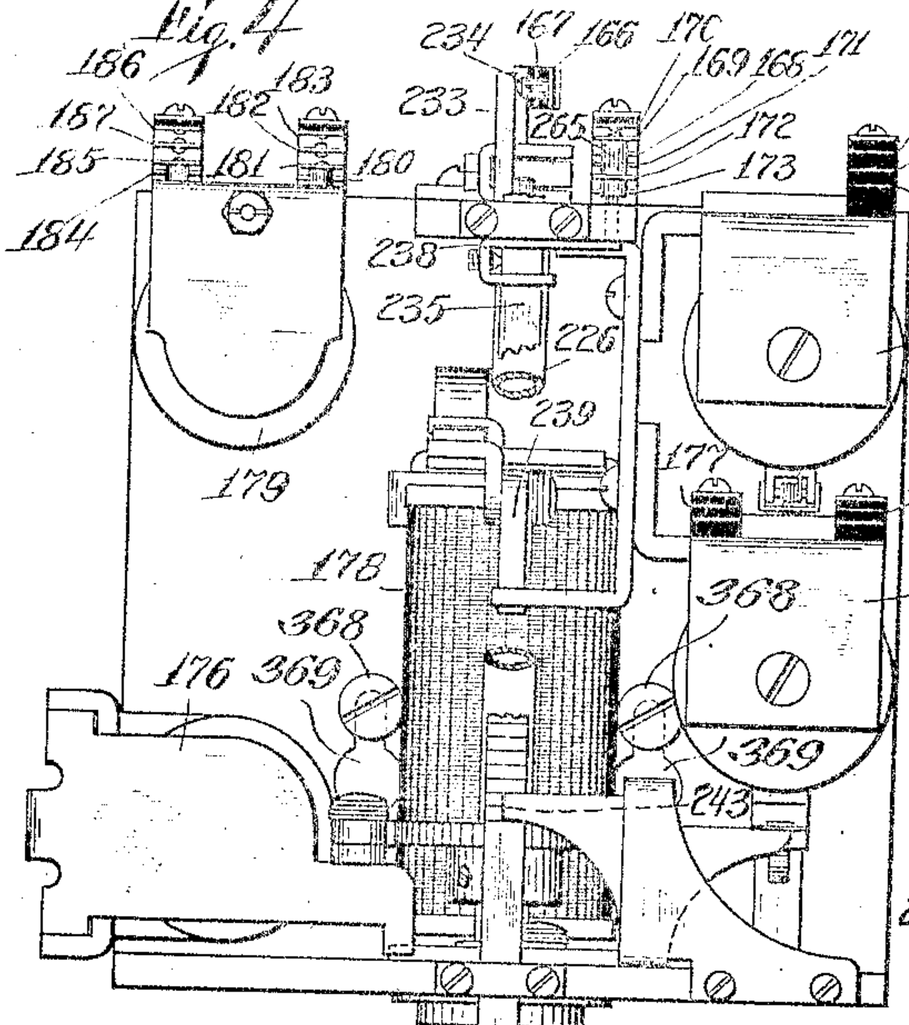


Fig. 5

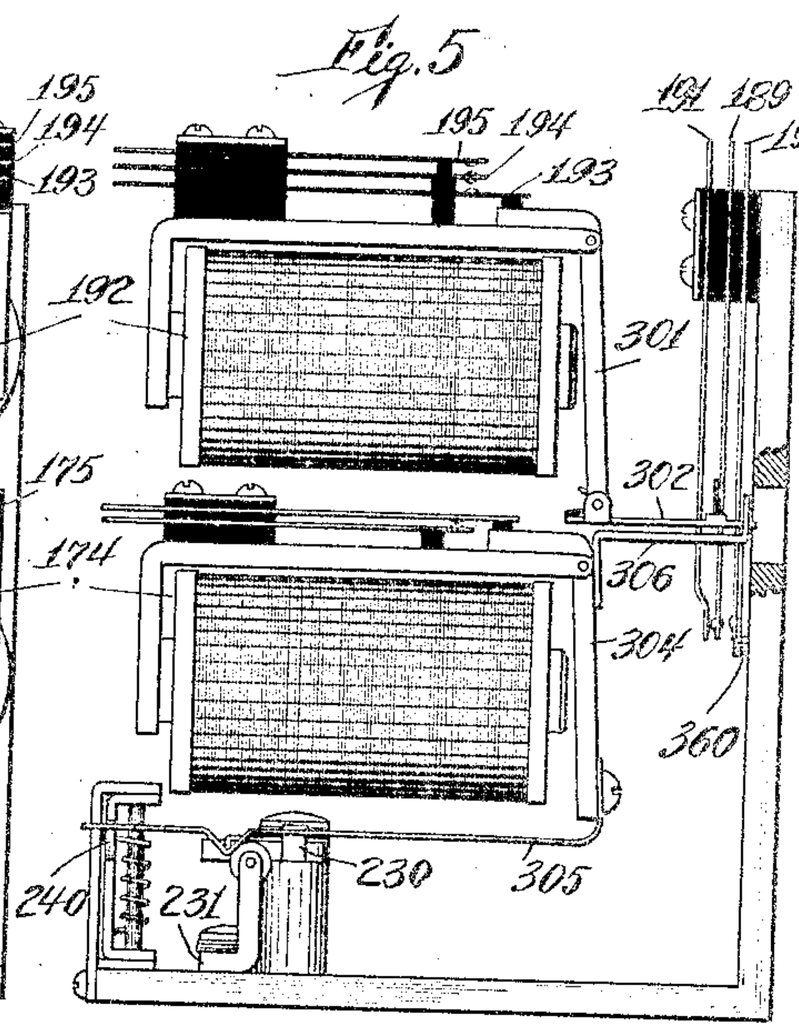
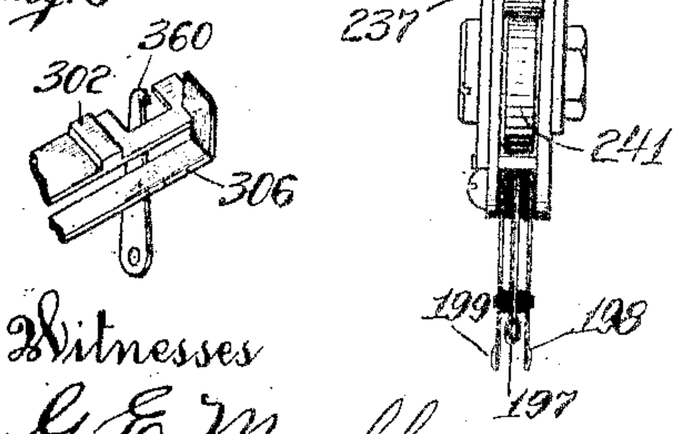


Fig. 6



Witnesses

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3 SHEETS—SHEET 3.

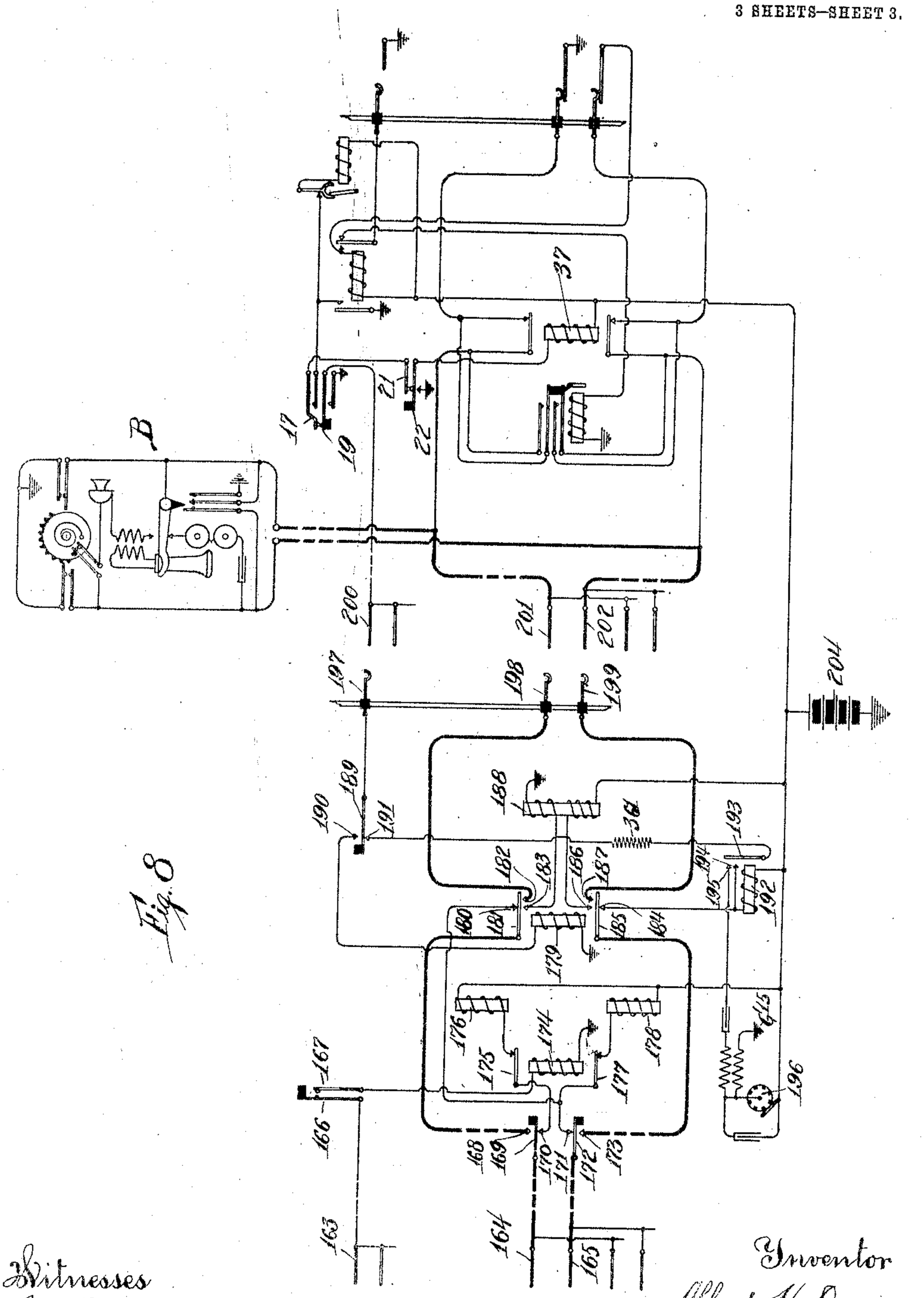

Fig. 8

Witnesses
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UNITED STATES PATENT OFFICE.

ALFRED H. DYSON, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO KELLOGG SWITCHBOARD & SUPPLY COMPANY, A CORPORATION OF ILLINOIS.

SWITCH FOR AUTOMATIC TELEPHONE SYSTEMS.

975,608. Specification of Letters Patent. **Patented Nov. 15, 1910.**

Original application filed October 31, 1905, Serial No. 285,321. Divided and this application filed July 5, 1907. Serial No. 382,244.

To all whom it may concern:

Be it known that I, ALFRED H. DYSON, residing in Chicago, county of Cook, and State of Illinois, have invented new and useful Improvements in Switches for Automatic Telephone Systems, of which the following is a specification, the present application being a division of my application, Serial No. 285,321, filed October 31, 1905, for improvements in telephony.

The object of my invention is to provide an improved form of selective switch for automatic telephone systems.

The switch of my invention is capable of use in varying environments, and I have elected to illustrate and describe the same as employed for the purpose of a "connector" although in general aspects it is also adapted for use as a first or second selector or for other purposes as will be well understood by those skilled in the art.

Referring to the accompaying drawing forming part of this application, I show in Figure 1, a side elevation of a switch of my invention; Fig. 2 is a sectional view of a contact bank of the said switch; Fig. 3 is a sectional view of the said switch showing the details of the primary magnet and its associated mechanism; Fig. 4 illustrates the said switch when viewed from the front; Fig. 5 shows the mechanism of the private relay and release magnet for said switch; Fig. 6 illustrates a detail of Fig. 5; Fig. 7 is a top view of a primary off-normal switch; Fig. 8 illustrates diagrammatically one circuit environment in connection with which the switch of my invention may be employed, the said circuit being a connector circuit for an automatic telephone system and shown in association with a called subscriber's substation and line circuit.

I shall first refer briefly to the circuit structure shown in Fig. 8 before proceeding to the description of the switch proper.

At 197, 198, 199 in the circuit diagram are indicated the traveling contact wipers of the switch in association with which are shown the multiple contacts 200, 201, 202, forming multiple terminals pertaining to an individual subscriber's line B. Although but one set is shown, the switch is provided with a total of one hundred switch sets of contacts 200, 201, 202, forming terminals of that many subscribers' lines, the said contact sets being arranged in ten groups before the switch wipers 197, 198, 199 according to the tens values of the lines in the one hundred to which they belong. The wipers are first adjusted step-by-step in a primary plane to select the group of contact sets wanted, each step moving them adjacent to a different group of contact sets, whereafter the wipers are adjusted in an intersecting plane, wiping over the contact sets of the group to select the contact set of the wanted line.

For adjusting the wipers to select the group, the primary magnet 176 is provided, while for adjusting them in the secondary direction, the secondary magnet 178 is provided. After the wipers are brought to connect to the contact set of a called line, the test relay 192 is brought into operative relation with a contact 200 pertaining to the called line and is then effective to place a busy signal device 196 in connection with a conductor of the connector, or to cause the completion of the talking circuit at the connector according as the called line is found busy or idle. For releasing the switch and restoring it to normal, a release magnet 174 is provided.

In adjusting the switch, current impulses from ground are first transmitted in any preferred manner over contact 164 (the switch being assumed at normal) which impulses pass through contact 169—170, contact 175, primary magnet 176, to the grounded battery 204, actuating the magnet 176 as many times as impulses are transmitted, each actuation thereof stepping the wipers 197, 198, 199 adjacent to a different contact group. With the first primary step of the wipers, primary off-normal contact 166—167 is closed. A secondary impulse follows the last impulse through magnet 176, which secondary impulse travels over contact 165, 172—171, 177, secondary magnet 178, passing through the battery 204 to ground and actuating the secondary magnet which advances the wipers 197, 198, 199 one step toward the first contact set of the selected group, it being understood that two steps in the secondary plane are required to bring them to en-

gage the first contact set. With this first secondary step of the wipers, secondary off-normal switch-arm 169 is brought to engage contact 168, disengaging contact 170, and arm 172 disengages contact 171, although it does not move sufficiently to engage contact 173, this being effected only on the second secondary step of the wipers.

To adjust the switch wipers over the contact sets of the selected group, a suitable number of current impulses are next transmitted from ground over contact 164 which impulses pass by way of the now closed contact 169—168 through contact 181—180, contact 177, secondary magnet 178 to battery 204, each impulse causing an actuation of magnet 178, and each actuation driving the wipers 197, 198, 199 to engage a successive set of line contacts, the last impulse bringing them to engage the contact 200, 201, 202 of the wanted line. After the last of these impulses is transmitted, a secondary impulse is caused to flow from ground over contact 165, the now closed contact 172—173, contact 185—184, test relay 192 to battery 204, energizing the said relay which attracts its armature 193 to engage contacts 194 and 195. If the called line be idle, its multiple contact 200 will be connected to battery 204 through its cut-off relay 37 as shown in Fig. 8. Relay 192 being also now connected to the active side of said battery, and to wiper 197 engaging contact 200 of the wanted line, via contact 194—193 and 191—189, on the cessation of the impulse energizing relay 192, the said relay is deënergized, its deënergization shifting contact 189 to disengage contact 191 and to engage contact 190 whereby circuit is completed from ground through relay 179, contact 190—189, contacts 197—200, 19—17, 21—22, cut-off relay 37 of called line to ground through battery 204, operating the said relays, whereon 179 completes normal open contacts of the talking conductors of the connector by armatures 181 and 185 and bridges the central battery 204 across the called subscriber's line through inductive resistance 188.

It will be readily seen that if another connector were already connected with a multiple of contact 200 of the called line, relay 192 when operated by the last secondary impulse would have found ground upon the multiple contact engaged by wiper 197 of the connector, Fig. 8, (the said ground being traced through relay 179 of the other connector) and the relay 192 would have held its armature attracted whereby the busy machine 196 would have been maintained connected with the lower talking conductor of the connector of Fig. 8, indicated by the heavy line, through contact 195—193—194 and contact 184—185. To release the switch, an impulse of current is sent from battery over contact 163, shifted contact 166—167, release magnet 174 to ground which magnet will attract its armatures. When the impulse ceases, the armatures are retracted and the switch is restored to normal. The impulses described as transmitted over the contacts 163—164—165, may be transmitted in any preferred manner and for the purpose of the description of my present invention, they may be transmitted by any form of manually controlled switch.

Referring now to Fig. 1, I there show a side elevation of the connector switch, including one section 255 of a contact bank. In Fig. 2, is shown a sectional view of a bank on line 256—257 of Fig. 1. The terminal contacts of the bank are disposed as if projecting through the inner surface of a hollow sphere, as will be apparent from an inspection of Fig. 2 and section 255, shown in Fig. 1. Referring to the said Fig. 1, the wipers or contact arms of the switch may be rotated from left to right by means of shaft 226 to which ratchet 227 is attached, the said ratchet being rotatable by primary magnet 176, the details of this being shown in Fig. 3. Thus, the wipers may be rotated to positions in front of, and into engagement with, different sections of contacts similar to that shown at 255. A second shaft 235 is provided, adapted to be moved downward by the operation of secondary magnet 178, as indicated in Fig. 1. Upon the extremity of this shaft is a piece 236 which, as the shaft moves downward, presses downward the extremity of the wipers engaged by it. The ends of the wipers are so spaced with respect to the bank, that the first movement toward the bank only approaches them to it, without causing their engagement with bank contacts. The wipers being pivotally associated with shaft 226, successive downward movements of shaft 235, after the first, bring the wipers into engagement with successive sets of contacts of a selected section. There being the proper number of teeth on ratchet 227 and the proper number of ratchet teeth in shaft 235, the contact ends of the wipers may be brought to engage any of one hundred sets of contacts in a bank. Referring to Fig. 4, it will be noted that piece 236, upon the end of shaft 235, is broad in order that primary movements may not bring end 237 of the wipers beyond the extremity of the piece.

Referring now to Fig. 3, the primary movements of the wipers are controlled as follows: Primary magnet 176 is provided with armature 232 to which is attached pawl 228. When the said magnet is energized, its armature draws the said pawl forward, the latter engaging a tooth of ratchet 227 and rotating the ratchet of the primary shaft one step from left to right. Detent 229 is provided, associated with ratchet 227, and holds the ratchet in whatever position

it may be rotated. Detent 229 is normally held out of engagement with the ratchet, the first movement of armature 232 coöperating with lever 231 to release the said detent, as will be hereinafter described. The ordinary circuit changes, directly effected by the armatures of connector switch electromagnets, will be obvious in the illustration and will not be described.

Referring now to Fig. 4, attached to the rotary shaft is an arm 233 which, when the shaft is in its normal position, presses against buffer 234 and holds spring 166 out of engagement with spring 167. A top view of these parts is shown in Fig. 7. The first rotary movement of shaft 226 is in a direction to move arm 233 away from buffer 234 so that spring 166 engages spring 167. When the primary shaft is released and returned to normal, the arm again engages the buffer and restores the springs to their normal positions. Assuming the rotary shaft has been stepped a sufficient number of times to bring the wipers of the switch opposite a desired section of contacts, their movement along the section to select the desired contacts will be described, having reference to Fig. 1. Secondary magnet 178 is provided with armature 238, with which is associated pawl 239. With each movement of the armature, said pawl engages a tooth on vertical shaft 235 and moves the shaft downward a step. Below the ratchet engaged by pawl 239 is a second ratchet, whose teeth detent 243 is adapted to engage. Detent 243 is normally out of engagement with its ratchet. The first movement of armature 232, acting upon lever 231 (Fig. 3), operates by lifting spring 305 (Fig. 5) to free detent 240 to release the detent 243 and cause it to engage the ratchet. The said detent engages, with each thrust of pawl 239, successive teeth of its appropriate ratchet and holds shaft 235 in whatever downward position it may have been carried by a thrust of pawl 239. Attached to shaft 235 is arm 238, which, when the shaft is in its normal position, holds stud 265 in the position shown in Fig. 4, whereby contacts 169—170 and 171—172 are maintained closed and contacts 169—168 and 172—173 are maintained open. With the first downward movement of shaft 235, arm 238 is carried down so that stud 265, which extends through the frame of the switch, is carried downward by the tension of springs 169 and 172 and opens contacts 170—169 and 171—172, closing contacts 169—168 and on the second downward movement closes contacts 172—173. When shaft 235 is released after the switch has been operated and returns to normal, arm 238 again engages stud 265, and the springs associated with it are returned to normal. Private relay 192 (see Fig. 5) is provided with armature 301. with which is associated arm 302, provided with a lug toward its extremity. When magnet 192 is energized, its armature draws arm 302 to the left so that the lug thereon engages a buffer of insulating material, shown associated with spring 189. When the magnet is deënergized, its armature retracts arm 302, which carries with it spring 189, opening contact 189—191 and closing contact 189—190. Release magnet 174, also shown in Fig. 5, is provided with armature 304, associated with which are arms 305 and 306. When the magnet is energized, the latter of these arms, which is interlocked with arm 302, retracts the latter out of engagement with spring 189, whose tension again closes contact 189—191. Detail of this is shown in Fig. 6. A dog 360 is provided, its normal relation to arm 302 being such that when the arm is attracted, its solid right extremity is brought over dog 360. If, under this condition, that is while private relay 192 is energized, release magnet 174 is energized, arm 306, depressing arm 302, causes dog 360 to engage the extremity of said arm. When the switch has reached normal under these circumstances, although magnet 192 has been energized and deënergized, circuit changing spring 189 remains in its normal position, dog 360 holding arm 302 depressed until its lug passes to the right of the buffer on spring 189. This combination prevents movement of spring 189 when the switch is released after connecting with a line already in use. When armature 304 is attracted, arm 305 moves to the left and engages lugs 230 and 240 on detents 229 and 243 by means of orifices provided in the arm. In Fig. 3ª is shown a top view of the operating end of arm 305. In the portion of Fig. 3 adjacent thereto is shown the operating relations of lugs 240 and 230 to detents 243 and 229. When the armature 304 is retracted, it draws the said detents out of engagement with the primary and secondary shaft ratchets respectively. Associated with arm 305 is lever 231, provided with a roller as shown in Fig. 3. This lever, it will be remembered, is actuated upon the first movement of armature 232 of the primary magnet. Detents 230 and 240 are held by arm 305 in their retracted positions after the connector switch is returned to normal. The actuation of lever 231 causes the roller, shown in Figs. 3 and 5, at its extremity, to engage the bent portion of arm 305 which is thus raised, the arm disengaging lugs 230 and 240. The springs, shown in association with detents 229 and 243, then move them to engage their respective ratchets.

Referring to Fig. 1, when the detents are simultaneously withdrawn from the ratchets of the two shaft ratchets as described, spring 241, against the tension of which shaft 235 is operated, raises the shaft upward until it resumes the position shown, in which the

contact ends of the wipers are free of the lower edge of the bank. Attached to shaft 235 is a projecting tooth 310 which, with the first downward movement of said shaft, engages any adjacent tooth of ratchet 227, the two shafts being thus interlocked. When shaft 235 reaches normal, tooth 310 disengages ratchet 227, and shaft 226 is free to be rotated, by the influence of spring 242. to its normal position.

As indicated in Figs. 1 and 2, each section or group of contacts may be built or assembled separately, the two exterior plates 255 holding the contacts, separated by suitable strips of insulating material, between them, the said plates being fastened together by the screws 361. After being assembled, the sections are placed between the suitably grooved plates 362, 363, which are then drawn together by means of the posts 365 in the well known manner, holding the assembled structure rigid. By this arrangement the different sections of contacts may be removed and replaced without unwiring an entire switch bank.

For supporting in place the selector mechanism described, an angle-iron strip 366, forming part of the usual rack, is provided. The upper bank plate 363 has an upwardly extending arm, parallel with the vertical portion of the iron 366, insulating material being inserted between the two. These parts are rigidly fastened together so that the bank as a whole is supported in fixed position by the angle-iron. The magnets, switch-shafts and other moving parts of the selector are carried by the main switch frame 367. In mounting the apparatus, the bank may be first fastened in place upon the strip 366. The screws 368 may then be inserted part way in plate 363. The switch frame 367 is provided with two orifices 369, larger below so as to pass over the heads of the screws 369, while the upper portions of the orifices are narrowed to fit snugly the shanks of said screws. The bank having been mounted, the switch frame 367 may be brought so that the orifices pass over the heads of the screws 368. The frame is then allowed to drop down to the position shown in Figs. 1 and 4, and the screws being then tightened, the entire apparatus is held rigidly in proper relation. Should trouble arise in the parts supported by frame 367, the screws 368 may be loosened, the frame 367 and its parts removed, and a new frame substituted in a few seconds. To facilitate such exchange, the circuits leading to the apparatus of frame 367 are carried through jack contacts 370, 371, of which the contacts 370 are carried upon mounting strip 366 and contacts 371 by frame 367.

It is apparent that various adaptations of the switch of my invention may be made to meet the requirements of varying circuit organization, and the invention is not confined to the specific structure shown.

I claim:

1. In an electrical switching mechanism, passive contacts arranged in rows, movable arms having contact ends adapted to engage said contacts, an electromagnet and apparatus controlled thereby for rotating said contact ends to select a row, and an electromagnet and apparatus controlled thereby for rotating said contact ends in an intersecting plane to select a contact of a row.

2. In an electrical switching mechanism, passive contacts arranged in rows, movable arms having contact ends adapted to engage said contacts, a primary shaft and a magnet therefor for rotating said ends in one plane to select a row, and a secondary shaft and a magnet therefor for rotating said ends in a selected intersecting plane to select a contact of a row.

3. In an electrical switching mechanism, passive contacts arranged in rows, movable arms having contact ends adapted to engage said contacts, a primary shaft and a magnet therefor for rotating said ends in one plane to select a row, a secondary shaft and a magnet therefor for rotating said ends in a selected intersecting plane to select a contact of a row, and an off-normal switch actuated on the first movement of the primary shaft and a second off-normal switch actuated on the first movement of the secondary shaft.

4. In an electrical switching mechanism, the combination with passive contacts arranged in groups of switching mechanism for connecting with said contacts, a moving member carrying contacts to select a group of contacts, a second moving member carrying said contacts to select contacts of a group, an off-normal switch actuated by said first member and a second off-normal switch actuated by said second member.

5. In an electrical switching mechanism, movable contact arms, apparatus for causing said arms to move in a plane, a shaft for moving said arms in an intersecting plane, and a broad lug associated with said shaft in operative relation with said arms in whatever position they may be moved in said first plane.

6. An automatic switch for electrical exchanges including a traveling switch contact, a first actuating member for adjusting said contact primarily, a second actuating member for adjusting said contact secondarily, and a mechanical interlock for said two members effective when said second member is actuated.

7. An automatic switch for electrical exchanges including a traveling contact member and stationary contacts in groups, a ratchet for adjusting said member to select a group, an additional ratchet for adjusting said member to thereafter select a contact of

a group, and a device controlled by said second ratchet holding stationary said first ratchet after initial actuation of said second ratchet.

8. In an automatic switch for electrical exchanges, the combination with two independently adjustable switch shafts, of a pawl mechanically actuated by one of said shafts on its initial operation to lock the other shaft, and contact devices controlled by said shafts.

9. In an automatic switch for electrical exchanges, the combination with a rotary switch-shaft, of an independently adjustable longitudinally movable shaft, mechanism actuated on the first step of one of said shafts to lock the other, and contact devices controlled by said shafts.

10. In an automatic switch for electrical exchanges, the combination with a pair of independently adjustable switch shafts, of a ratchet member fastened to one shaft, a pawl member adapted to engage said ratchet, said member being controlled by the actuation of the other shaft, and contact devices adjusted by said shafts coöperatively.

11. In an automatic switch for electrical exchanges, the combination with a primary switch adjusting ratchet and a secondary switch adjusting ratchet, of a movable member actuated responsive to the operation of said secondary ratchet to engage said primary ratchet, and adjustable contact devices controlled by said ratchets jointly.

12. In an automatic switch for electrical exchanges, the combination with a rotary ratchet, of a longitudinally adjustable switch-shaft and a pawl member rigid upon said shaft and adapted to be moved thereby to engage said ratchet.

13. In an automatic switch for electrical exchanges, the combination with adjustable contact devices, of a primary ratchet member, a secondary ratchet member, means for independently adjusting said members, and a mechanical device rigidly associated with said secondary ratchet and moving therewith adapted to engage said primary ratchet.

14. In an automatic switch for electrical exchanges, the combination with switch wipers, of a pair of independently adjustable switch shafts jointly controlling said wipers, a contact adapted to have its connection altered on initial actuation of the first shaft, and a second contact adapted to have its connection altered on initial actuation of the second shaft.

15. In an automatic switch for electrical exchanges, the combination with switch wipers, of a pair of independently adjustable switch shafts jointly controlling said wipers, a contact adapted to have its connection altered on initial actuation of the first shaft, a second contact adapted to have its connection altered on initial actuation of the second shaft, and mechanism for restoring the shafts, said mechanism serving to also restore said contacts in an order inverse to that of their operation.

16. In an automatic switch for electrical exchanges, the combination with a primary shaft and an independently adjustable secondary shaft, of a primary off-normal contact actuated by the primary shaft, and a secondary off-normal contact actuated by the secondary shaft.

17. In automatic switching mechanism for electrical exchanges, the combination with contacts arranged in groups, of a first shaft controlling selecting mechanism to cause selection of a particular contact group, a second shaft controlling selecting mechanism to cause selection of a particular contact of a selected group, an off-normal contact shifted on initial actuation of the first shaft, and a second off-normal contact shifted on initial actuation of the second shaft.

18. In automatic switching mechanism for electrical exchanges, the combination with contacts arranged in groups, of a first shaft controlling selecting mechanism to cause selection of a particular contact group, a second shaft controlling selecting mechanism to cause selection of a particular contact of a selected group, an off-normal contact shifted on initial actuation of the first shaft, a second off-normal contact shifted on initial actuation of the second shaft, and means for restoring said shafts to normal, said second shaft serving on reaching a normal point to restore the second off-normal contact, and said first shaft serving on reaching a normal point to restore the first off-normal contact.

19. An automatic switch for electrical exchanges including a plurality of groups of electrical contacts, each group constituting a mechanically self-contained and separately removable unit, adjustable contact devices and means for moving said devices step by step, each step serving to cause them to select a different one of said units.

20. An automatic switch for electrical exchanges including a plurality of groups of electrical contacts, each group constituting a mechanically self-contained and separately removable unit, adjustable contact devices, means for moving said devices step by step, each step serving to cause them to select a different one of said units, and means common to said units for holding them in fixed positions.

21. In an automatic switch for electrical exchanges, a contact bank comprising a plurality of terminal contacts arranged in sets, each set including a pair of talking contacts and a test or private contact, an assembling of said sets into groups, each group consti-

tuting a mechanically self-contained unit, and holding means for the units to maintain them in fixed position in the bank.

22. In an automatic switch for electrical exchanges, a contact bank comprising a plurality of like groups of contact sets, each set having a pair of contacts belonging to a particular circuit, a plurality of said sets forming one group and each group constituting a mechanically separately removable and replaceable unit in said bank.

23. In an automatic switch for electrical exchanges, a contact bank comprising a plurality of separately removable and replaceable contact units, each unit comprising a group of contacts, and means for adjusting said switch step by step, each step serving to select a different group.

24. In an automatic switch for electrical exchanges, the combination with an actuating ratchet, of a retaining pawl for holding said ratchet against back motion, a release member normally holding said pawl disengaged from said ratchet, an electromagnet for controlling said ratchet, a cam surface for said member, and a roller cam controlled by said magnet adapted to engage said surface and actuate said device to free said pawl.

25. In an automatic switch for electrical exchanges, the combination with movable contacts, of a switch shaft pivotally secured to said contacts and operative to adjust them in one plane, a second independently adjustable switch shaft for adjusting said contacts in an intersecting plane, mechanism for said contacts in mechanical contact with said second shaft, and means whereby the actuation of said first shaft modifies said mechanical contact.

26. In an automatic switch for electrical exchanges, the combination with movable contacts, of a pair of independently adjustable actuating members for moving said contacts, said contacts being pivotally connected with one of said members and mechanically connected with the other, and means whereby the actuation of one of said members alters but does not destroy the connection of said contacts to the other member.

27. In an automatic switch for electrical exchanges, the combination with a switch bank having contacts and wiper members adapted for adjustment to engage said contacts, of a rotarily adjustable primary switch shaft, a longitudinally adjustable secondary switch shaft, said wiper members being in mechanical contact with both said shafts, and means whereby the actuation of said primary shaft changes relatively the contact relation between said wipers and said secondary shaft.

28. In an automatic switch for electrical exchanges, the combination with a switch bank, of wiper members having contact ends adapted to be rotarily adjusted relatively to said bank, a rotary shaft for adjusting said members in one plane, and a longitudinally moving shaft for rotating said contact ends in an intersecting plane.

29. A selector for automatic exchanges including a contact bank and a switch frame supporting moving parts, means for rigidly supporting said bank in place independently of said frame, said frame being removably attached to said bank.

30. A selector for automatic exchanges including a switch bank, a switch frame carrying movable parts and removably supported by said bank, whereby said frame may be detached while leaving said bank in fixed position.

31. A selector for automatic exchanges comprising two mechanically self-contained units, one being the switch bank, and the other comprising the moving parts of the selectors, a mounting frame rigidly attached to the bank unit, and means for removably securing said other unit, whereby another like one may be substituted in its place, while leaving said bank in place.

32. The combination with an automatic selector having a bank unit, and a selector frame carrying moving parts detachably connected with and supported by said unit, of a rack support to which said bank unit is attached independently of said frame, with insulation between said rack and said unit.

33. In an automatic switch for electrical exchanges, the combination with movable contacts, of a switch shaft rotatable to adjust said contacts in one plane, a second switch shaft slidable to adjust said contacts in an intersecting plane, mechanism for said contacts in mechanical contact with said second shaft, and means whereby the actuation of said first shaft modifies said mechanical contact.

34. In an automatic switch for electrical exchanges, the combination with movable contacts, of a pair of independently adjustable actuating members one rotating and the other sliding to adjust said contacts, said contacts being mechanically connected with both said members, and means whereby the actuation of one of said members alters but does not destroy the connection of said contacts to the other member.

In witness whereof, I hereunto subscribed my name this 3rd day of July, 1907.

ALFRED H. DYSON.

Witnesses:
F. W. DUNBAR,
G. E. MUELLER.