

G. E. MUELLER.

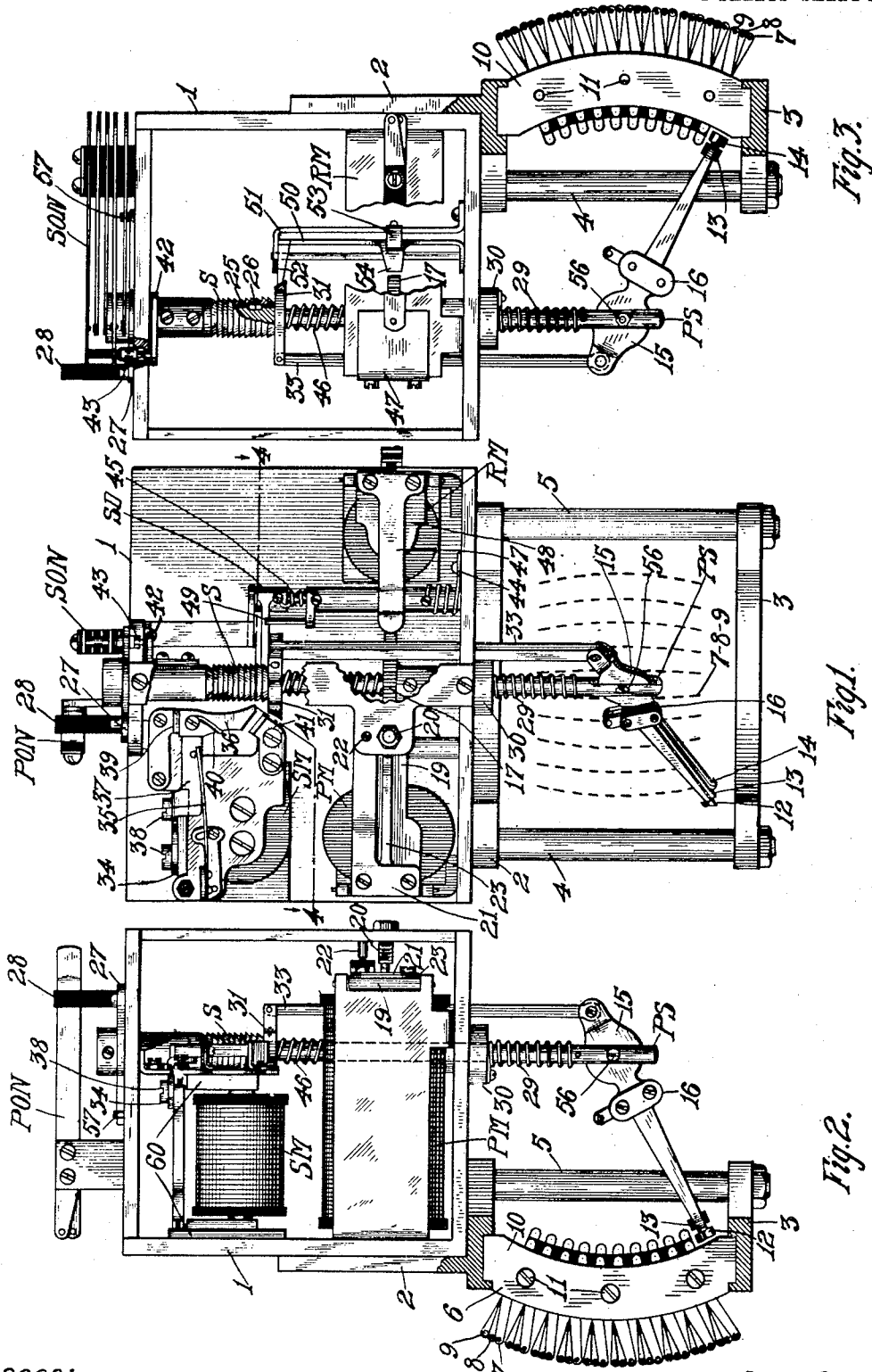
AUTOMATIC SWITCH FOR TELEPHONE SYSTEMS.

APPLICATION FILED JULY 27, 1910.

Patented July 29, 1913.

2 SHEETS—SHEET 1.

1,068,521.



Witnesses:
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Inventor:
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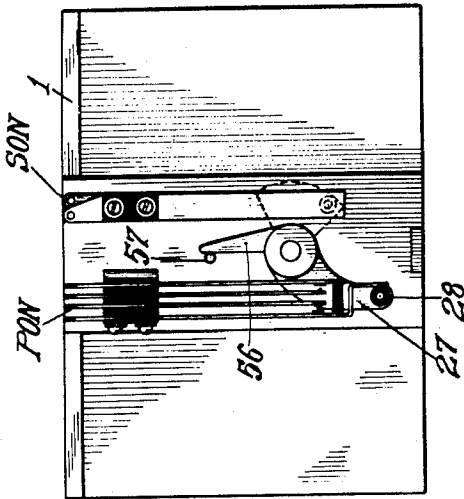


Fig. 5.

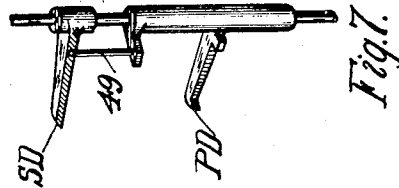


Fig. 7.

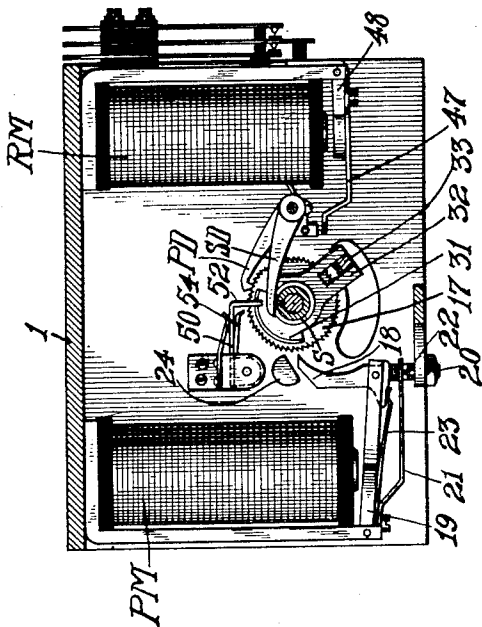


Fig. 4.

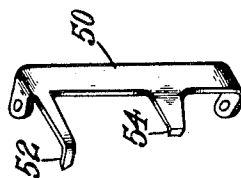


Fig. 6.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC SWITCH FOR TELEPHONE SYSTEMS.

1,068,521.

Specification of Letters Patent.

Patented July 29, 1913.

Application filed July 27, 1910. Serial No. 574,112.

To all whom it may concern:

Be it known that I, GEORGE E. MUELLER, a citizen of the United States of America, residing in La Grange, county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Switches for Telephone Systems, of which the following is a specification.

My invention relates to automatic switches for telephone systems in which a movable wiper is adapted to coöperate with a bank of contacts divided into groups and in which the said wiper is moved in a primary direction to select a group of contacts and thereafter in a secondary direction to select a contact in a group, the object being to provide such a switch which is simple in construction and most positive in its operation.

There are many features and advantages in the switch of my invention which will be better understood upon reference to the following description taken in connection with the accompanying drawings, and the scope of my invention will be particularly pointed out in the appended claims.

Referring now to the accompanying drawings in which like reference characters indicate like parts, Figure 1 is a front elevation of the switch of my invention, but with the bank contacts illustrated diagrammatically. Fig. 2 is a left side elevation of Fig. 1; Fig. 3 is a right side elevation of the structure shown in Fig. 1; Fig. 4 is a sectional view along the line 4—4 of Fig. 1; Fig. 5 is a plan view of Fig. 1, but showing only the primary and secondary off-normal springs; Fig. 6 is a perspective view of a controlling detent; Fig. 7 is a perspective view of the primary and secondary retaining detents.

Referring now in detail to the switch shown in Figs. 1 to 7, the frame 1 which serves as a mounting for the different magnets and coöperating mechanism is secured to the bank frame consisting of the upper mounting 2, the lower mounting 3, and the posts 4 and 5. Clamped between the upper and lower parts 2 and 3 are ten individual banks of contacts such as 6, and being radially disposed about the center of the primary shaft PS. Each bank 6 contains ten sets of contacts 7, 8 and 9, the said contacts being clamped between two plates 10 by means of the screws 11.

In the Figs. 2 and 3 I have shown a single bank 6 with the wipers and primary shaft moved off normal and opposite the said bank of contacts. In Fig. 1 the ten banks of contacts are diagrammatically represented by ten rows of broken lines, each dash representing three contacts such as 7, 8 and 9. The wipers in Fig. 1 are shown in their normal position.

A primary shaft PS is journaled in the upper and lower extensions of the frame 1 and is adapted to be rotated to move the wipers 12, 13 and 14 to any desired contact bank 6. The wipers 12, 13 and 14 are mounted upon the plate 15, being insulated therefrom by the insulating washers 16. The plate 15 is pivoted in a slot of the primary shaft PS at 56 and is adapted to be rotated about said pivot to move the wipers 12, 13 and 14 to connect to a desired set of contacts 7, 8 and 9 in the selected bank 6. The primary ratchet 17 is fastened to the primary shaft PS by means of the screw as shown in Fig. 1. This primary ratchet 17 serves as a means to be engaged by the pawl 18 of the primary magnet PM to move the shaft PS. The said pawl 18 is pivoted to the armature 19 of the said magnet PM and is normally held out of engagement with the teeth of the ratchet 17, due to the said pawl 18 resting against the stop 20. The spring 21 is fastened to the armature 19 and has its free end engaging the spring adjusting screw 22. This spring 21 is adapted to retract the armature 19 after it has been attracted by the primary magnet PM. The spring 23 is also fastened to the armature 19 and rests against the pawl 18 so that when the armature 19 is attracted, the said spring 23 forces the pawl 18 into engagement with a tooth of the ratchet wheel 17. The stop 24 is so adjusted that when the armature 19 has been fully attracted it engages and moves the ratchet 17 one step, the said pawl 18 fitting between the bottom of its engaged tooth and the beveled part of the stop 24. This is to prevent any overrun of the primary shaft due to its momentum when rotated by the primary magnet.

The sleeve S is loose upon the shaft PS but has a key way 25 which slides along the key 26, the said key 26 being secured to the shaft PS. Thus, when the shaft PS is rotated the sleeve S is carried around with it,

but the said sleeve is free to be moved along the shaft PS. Secured to the upper end of the shaft PS is the arm 27 carrying the insulated stud 28. This insulated stud 28 normally rests against the primary off-normal springs PON and holds them in the position shown in Fig. 5. When the shaft PS is rotated, the said arm 27 is carried around with it and the stud 28 moves away from the said springs PON allowing them to move to their alternate position. The spring 29 has one end fastened to the boss 30, the other end being secured to the shaft PS. This spring 29 serves to restore the primary shaft PS when it has been moved off normal.

The cam plate 31 is rigidly secured to the sleeve S and has a slotted projection 32 having the link 33 pivoted thereto. The said link 33 passes through a hole in the lower part of frame 1 and has its lower end pivotally secured to the plate 15. The secondary magnet SM which is mounted on the frame 1 to the left of the sleeve S has an armature 34 pivotally mounted on the pole pieces 60 thereof. This armature 34 is held in its detracted position by the spring 35. The pawl 36 is mounted on the extension 37, the said extension 37 being fastened to the armature 34 by means of the screws 38. The pawl 36 is normally held out of engagement with the teeth of the sleeve S, due to its engagement with the stop 39. When the armature 34 is attracted the said pawl 36 is moved away from the stop 39 and is moved into engagement with the teeth of the sleeve S by the spring 40. The adjustable stop 41 is adapted to hold the pawl 36 against an engaged tooth of the sleeve S when the armature 34 is in its fully attracted position. Thus, the said sleeve and the wipers connected thereto by the link 33 are prevented from over-running, due to their momentum when moved forward by the operation of the secondary magnet SM. The plate 42 is fastened to the sleeve S and normally rests against the insulated stud 43 which holds the secondary off-normal springs SON in their normal position. When the sleeve S is moved downward, the plate 42 moves away from the stud 43, allowing said springs SON to move to their alternate position.

The primary detent PD engages the teeth of the ratchet wheel 17, being held against the said teeth by the spring 44. The said primary detent PD is adapted to hold the wipers against restoration by the spring 29 when the said wipers are moved to a contact bank 6.

The secondary detent SD is held against the teeth of the sleeve S by the spring 45. The said detent SD is adapted to prevent restoration of the wipers and sleeve S from their secondary movement by the spring 46

when they have been moved to a set of contacts 7, 8, 9 of a selected contact bank 6.

The release magnet RM which is mounted to the right of the detents PD and SD, when energized, is adapted by means of the extension 47 mounted on the armature 48, to move the detent PD out of engagement with the ratchet wheel 17 and the pin 49 engaging the detent SD moves it out of engagement with the sleeve S. The control detent 50 is pivotally mounted between the frame 1 and the bracket 51. The extension 52 of the said detent 50 is held against the cam 31 by the spring 53, and due to the arcuate shape of cam 31, detent 50 is held in its normal position while sleeve S and cam 31 are rotating, and not until sleeve S is moved downwardly does finger 52 move inwardly allowing rotation of detent 50, whereby 54 engages a tooth of ratchet 17. The detent 50 is to prevent the wipers 12, 13, 14, from rubbing against the sides of the contacts in the selected contact bank in restoring, when the detents PD and SD have been withdrawn from engagement with their respective ratchets by the energization of the release magnet RM, as without detent 50, it will be noted that if holding pawls PD and SD are withdrawn after the switch is operated there would be nothing to prevent spring 29 from acting upon shaft PS while spring 31 is effecting the restoration of the wipers from their secondary movement.

Operation: Having now fully described the detail construction of the switch of Figs. 1 to 7, it is believed that said switch will be more fully understood by description of its operation, which is as follows: Assuming that the contact bank 6 is the fifth contact bank of the switch and that it is desired to connect to the fourth set of contacts 7, 8, 9, of the bank 6, the primary magnet PM is first energized and de-energized five times. This causes the pawl 18 to engage a tooth of the primary ratchet wheel 17 five times, thereby rotating the shaft PS and moving the wipers 12, 13, 14 to a point opposite the fifth group of contacts which we have assumed is bank 6. In rotating the shaft PS, it is moved against the tension of the spring 29, but the primary detent PD holds the wipers in their selected position, due to its engagement with the teeth of the said ratchet wheel 17. Upon the first step of the shaft PS, off-normal, the insulated stud 28 moves out of engagement with the primary off-normal springs PON, allowing them to move to their alternate position. The sleeve S, which is slidably keyed to the shaft PS, is rotated therewith, the plate 42 also being carried along with the sleeve S. Having now moved the wipers 12, 13 and 14 to the desired group of contacts, the secondary magnet SM is energized and de-energized

four times. This operation of the secondary magnet SM imparts a rectilinear movement to the sleeve S as previously explained, moving it along the shaft PS and due to the link connection 33, the wipers 12, 13 and 14 are rotated about the pivot 56 along the selected group of contacts until they are in engagement with the fourth set of contacts 7, 8, 9. Upon the first off-normal movement of the sleeve S, the plate 42 moves away from the insulated stud 43 allowing the secondary off-normal springs SON to move to their alternate position. Also upon the first off-normal movement of the sleeve S, the extension 54 moves into engagement with a tooth of the ratchet wheel 17 due to the cam plate 31 moving downward away from the extension 52, which allows detent 50 to swing inward on its shaft, whereby said extension 54 engages a tooth in ratchet 17. The wipers 12, 13 and 14 having been moved to engagement with the desired set of contacts, the next step is to release the switch to restore the parts to normal. To accomplish this, the release magnet RM is energized attracting its armature 48 which moves the arm 47 against the detent PD, moving it out of engagement with the ratchet wheel 17. The pin 49 which is fast to the detent PD then engages and moves the secondary detent SD away from its engaged tooth of the sleeve S. The detents having been withdrawn from engagement with their respective ratchets, the wipers 12, 13, 14, are restored from their secondary movement, due to the spring 46 pressing against the lower end of the sleeve S and moving it back along the shaft PS until said sleeves rests against the upper part of the frame 1. The plate 42 being secured to the sleeve S restores the secondary off-normal springs SON to normal. After the primary and secondary detents have been moved out of engagement with their respective ratchets, the extension 54 of the detent 50, engaging a tooth of the ratchet wheel 17, prevents the spring 29 from acting upon shaft PS and pressing the wipers 13, 14 against the sides of the contacts causing undue friction while the said wipers are being restored from their secondary movement. Upon the return of the sleeve S to normal, the cam plate 31 again engages the extension 52 thereby moving the detent 50 with its extension 54 out of engagement with the ratchet wheel 17. The extension 54 having been moved away from the ratchet wheel 17, the spring 29 rotates the shaft PS, restoring the wipers 12, 13, 14, from their primary movement. The arm 56 by its engagement with the pin 57 serves to stop the shaft PS in its restoration to normal. The arm 27 having been moved back to its normal position, the insulated stud 28 again engages the primary off-normal springs

PON restoring them to normal and the switch and its associated mechanism is now restored and in a normal condition.

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

1. An automatic switch comprising a rotatable shaft, a plurality of rows of contacts, a movable wiper pivoted to said shaft, means for rotating said shaft to move said wiper to a row, and means carried by said shaft and linked to said wipers, adapted to receive rectilinear motion whereby said wiper is rotated on its pivot along a row of contacts.

2. In an automatic switch the combination with a plurality of rows of contacts, of a shaft, a sleeve loose upon said shaft, a movable wiper, a link connection from said wiper to said sleeve, means for actuating said shaft to move said wiper to a row, and means for moving said sleeve upon said shaft to move said wiper along a row.

3. In an automatic switch the combination with a plurality of rows of contacts, of a movable wiper adapted to be moved to a row and thereafter along a row of contacts, a shaft and a sleeve loose upon said shaft separately connected to the wiper, said shaft and sleeve being independently adapted to be moved for controlling the respective movements of said wiper, and restoring springs for shaft and sleeve, carried by said shaft.

4. In an automatic switch the combination with a plurality of rows of contacts, of a movable wiper adapted to cooperate with said contacts, a rotatable shaft for moving said wipers to a row of contacts, a sleeve loose upon said shaft and adapted to be moved along the shaft and to be rotated by said shaft when said wiper is moved to a row, a link connection from said sleeve to said wiper for moving said wiper along a row when said sleeve is moved along said shaft.

5. In an automatic switch the combination with a plurality of rows of contacts, of a movable wiper, a rotatable shaft, a sleeve carried by said shaft and adapted to be moved along said shaft, means for pivotally securing said wiper to said shaft, a link connection from said sleeve to said wiper, means for rotating said shaft to move said wiper to a row of contacts, and means for moving said sleeve along said shaft whereby said wiper moves along a row of contacts.

6. In an automatic switch the combination with a plurality of rows of contacts, a shaft, a wiper pivoted to said shaft, means for operating said wiper in a primary direction to a row of contacts, means for operating said wiper in a secondary direction to a contact in a row, primary off-normal springs, secondary off-normal springs and means carried by said shaft for actuating

said primary and secondary off-normal springs.

7. In an automatic switch the combination with a plurality of rows of contacts, a rotatable shaft, a wiper pivoted to said shaft, a sleeve loose upon said shaft and linked to said wipers, means for rotating said shaft for operating said wiper in a primary direction to a row, means for moving said sleeve upon said shaft to rotate said wiper in a secondary direction to a contact in a row, retaining detents for holding said wiper in its actuated position, means for withdrawing said detents to allow said wiper to restore from both movements and means actuated by the restoration of said wiper from its secondary movement for controlling the restoration from its primary movement.

8. An automatic switch comprising a plurality of arcuate radially disposed rows of contacts, a rotatable shaft, a movable wiper pivoted to said shaft, electro-magnetically actuated ratchet mechanism for rotating said shaft to move said wiper to a row, a relatively longitudinally movable member supported by said shaft and linked to said wipers, and means for imparting a longitudinal motion to said member along said shaft whereby said wiper is rotated along a row of contacts.

9. An automatic switch comprising a plurality of arcuate radially disposed rows of contacts, a rotatable shaft, a movable wiper pivoted to said shaft, a ratchet member supported by said shaft and longitudinally movable thereon, a link connection from said member to said wipers, means for rotating said shaft to move said wiper to a row and means for acting upon said ratchet member to rotate said wiper on its pivot along a row of contacts.

10. An automatic switch comprising a plu-

rality of arcuate radially disposed rows of contacts, a shaft, a ratchet member longitudinally movable upon said shaft and linked to said wipers; ratchet mechanism for rotating said shaft to move said wiper in a primary direction to a row, means for acting upon said ratchet member for moving said wiper in a secondary direction along a row, a pair of retaining detents for said mechanism and member for holding said wiper in its actuated position, means for withdrawing said detents to allow said wiper to restore from both movements, and means for locking said wiper to prevent restoration from its primary movement until the restoration thereof from its secondary movement.

11. An automatic switch comprising arcuate radially disposed rows of contacts, a rotatable shaft, a movable wiper pivotally supported by said shaft, means for first rotating said shaft to move said wiper to a row, and means carried by said shaft and linked to said wipers, adapted to thereafter receive rectilinear motion whereby said wiper is rotated on its pivot along the selected row.

12. An automatic switch comprising arcuate radially disposed rows of contacts, a rotatable shaft, a movable wiper pivotally supported by said shaft, means for first rotating said shaft to move said wiper to a row, a rectilinearly movable member carried by said shaft and linked to said wiper, and means for imparting rectilinear motion to said member whereby said wiper is rotated on its pivot along the selected row.

Signed by me at Chicago, county of Cook, and State of Illinois, in the presence of two witnesses.

GEORGE E. MUELLER.

Witnesses:

WM. BERGHAIN,

MARJORIE E. GRIER.