

No. 848,283.

PATENTED MAR. 26, 1907.

J. A. BIRSFIELD.  
SWITCHING DEVICE.  
APPLICATION FILED FEB. 13, 1905.

Fig. 1.

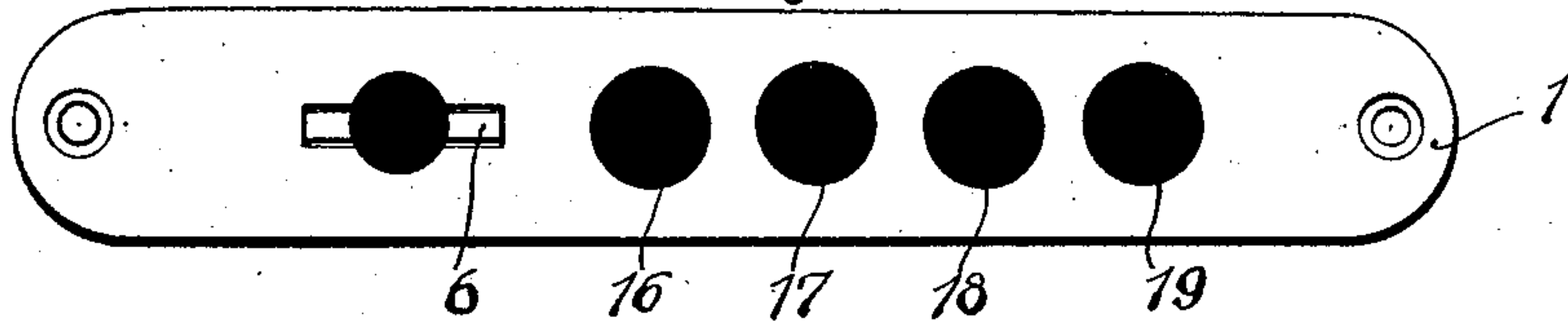


Fig. 2.

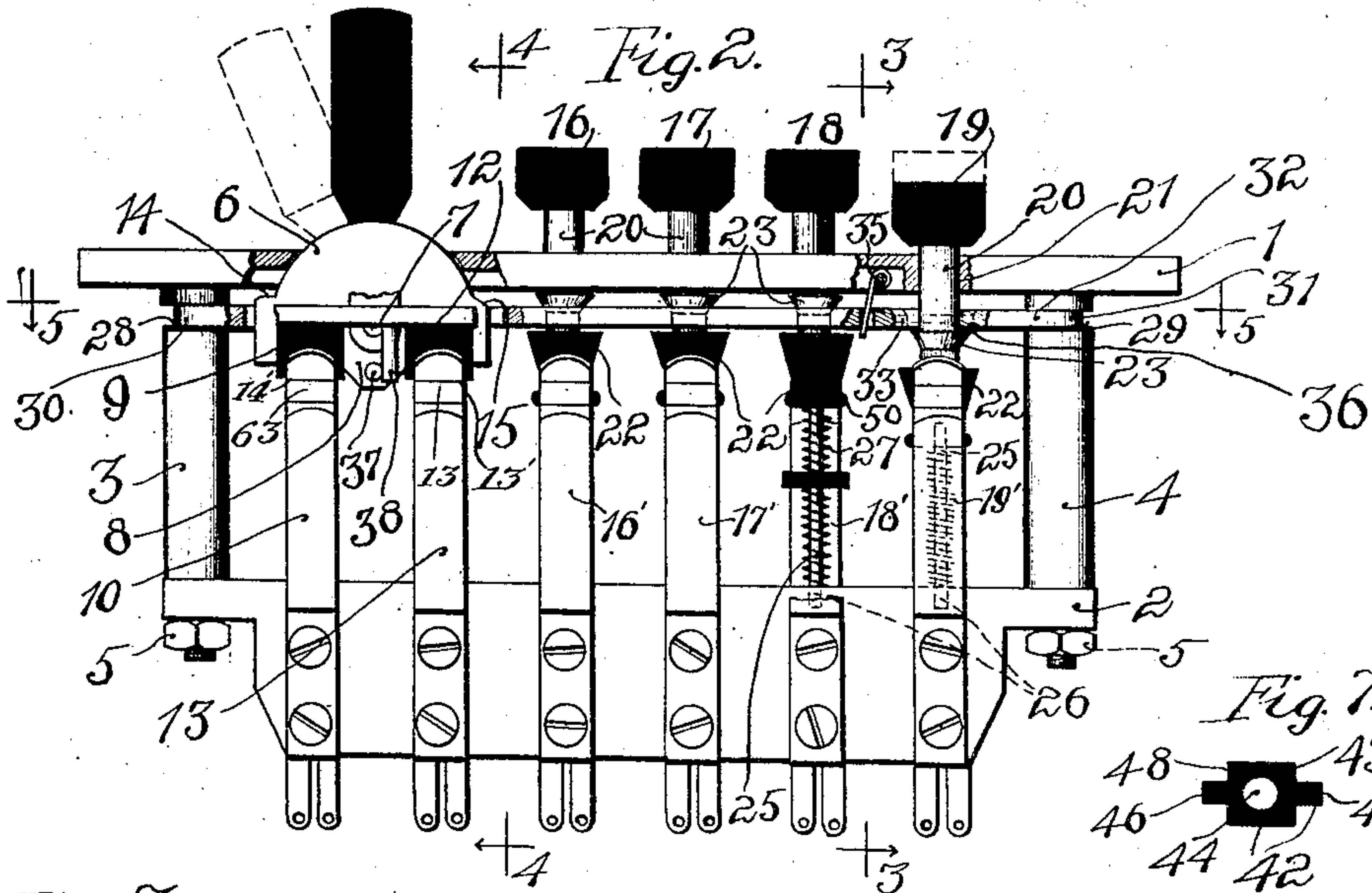


Fig. 7.

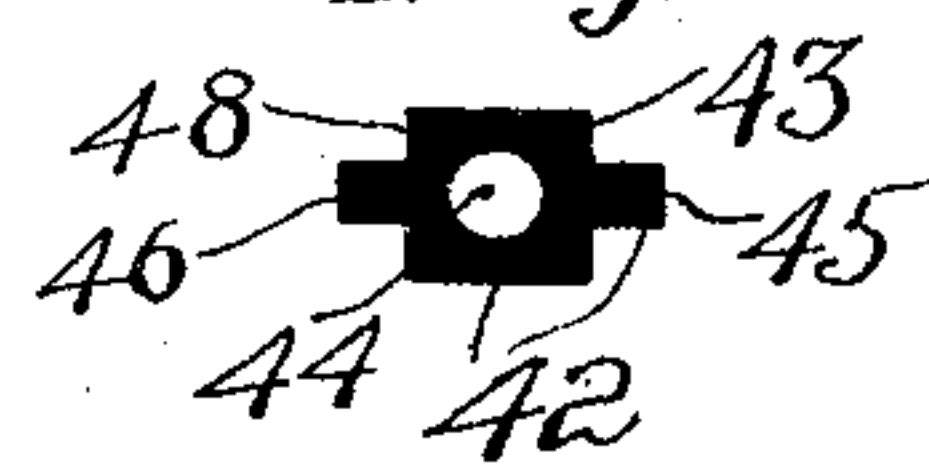


Fig. 3.

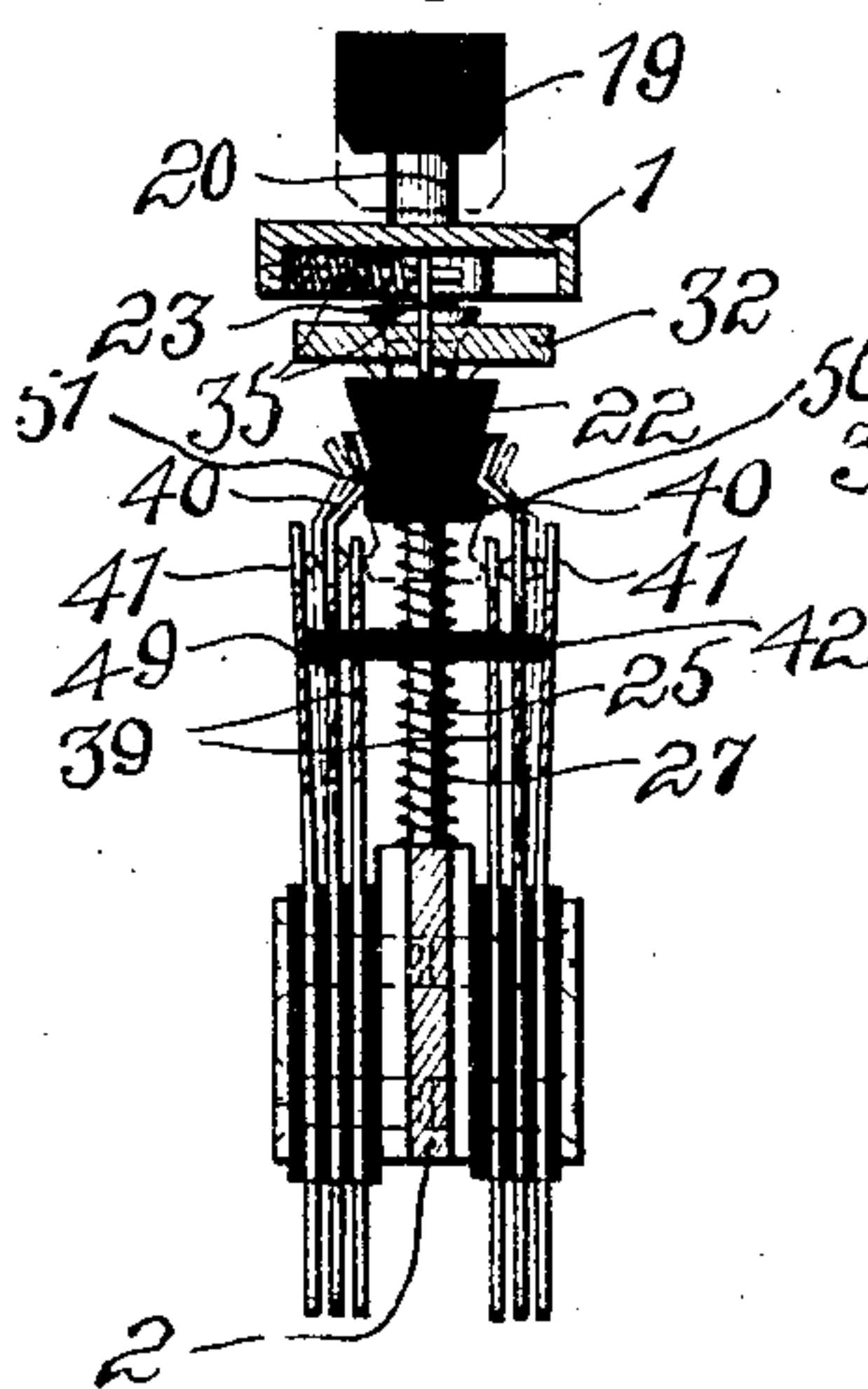


Fig. 4.

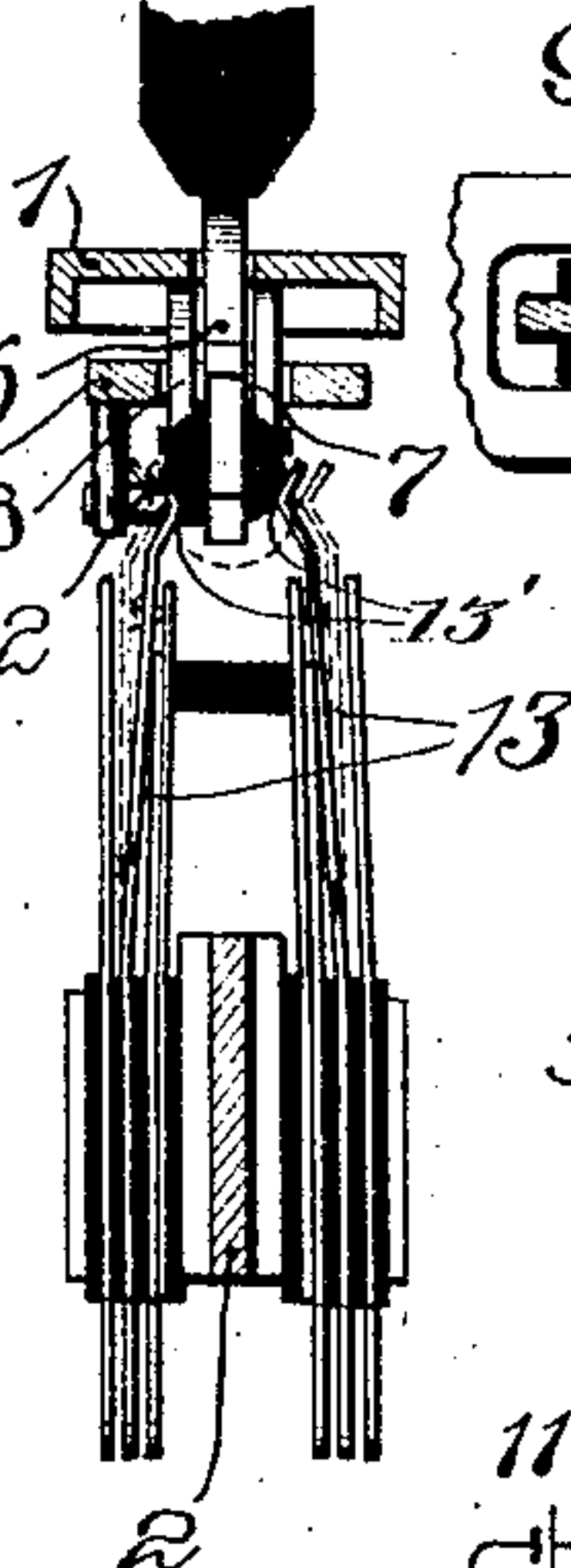


Fig. 5.

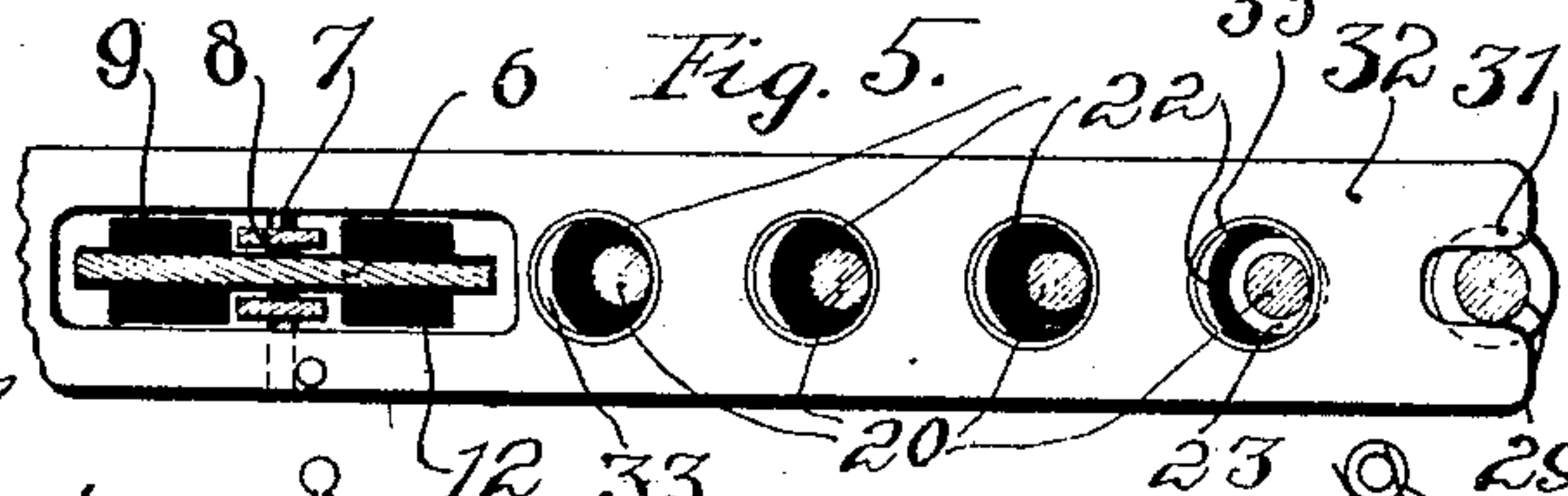
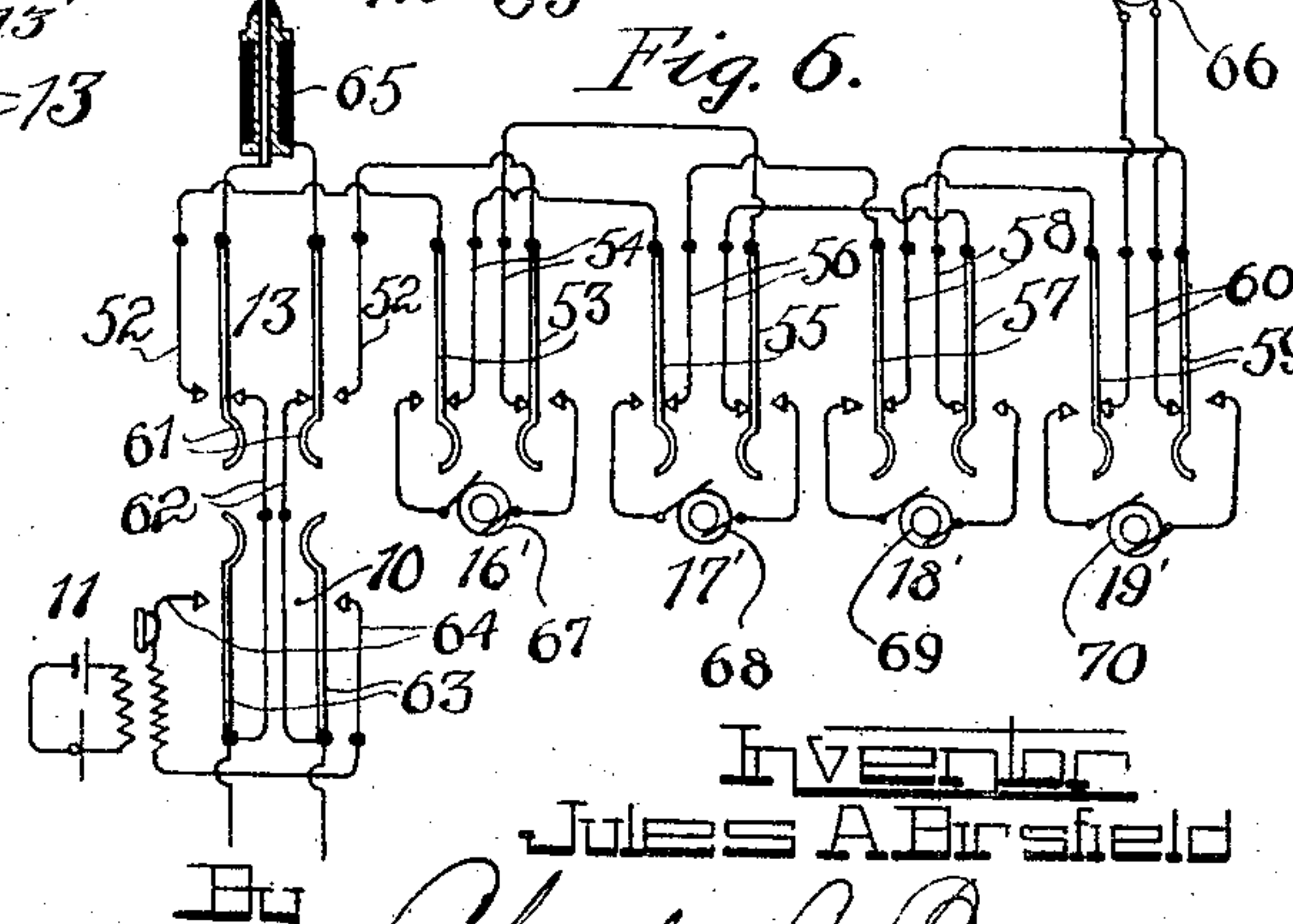


Fig. 6.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## SWITCHING DEVICE.

No. 848,283.

Specification of Letters Patent.

Patented March 26, 1907.

Application filed February 13, 1905. Serial No. 245,524.

*To all whom it may concern:*

Be it known that I, JULES A. BIRSFIELD, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Improvement in Switching Devices, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electrical switching apparatus, and particularly to operators' keys employed in telephony.

My invention may also be considered as an improvement over the switching device shown and described in the application of Alexander M. Haubrich, Serial No. 226,286, filed September 28, 1904. In that application the operator's ringing and listening key is combined in a compound unitary structure with party-line selective keys, actuation of any selective-key button causing release of any other selective buttons which may have been depressed. One of the features of that application is the provision of means for automatically causing restoration of selective button upon actuation of the operator's key to its listening position.

One of the objects of my invention is to provide additional means whereby actuation of the selective buttons will return the operator's listening-key to its normal position.

In switching devices of this kind there is apt to be considerable noise during operation thereof due to the recoil of the springs and actuating-plungers of levers, and particularly in the key shown in the application referred to a metallic part of the key-plunger is caused to strike against a metallic escutcheon-plate upon release of the key.

Another feature of my invention, therefore, is the provision of means for prevention of such noises, and this second feature is applicable in all keys employing springs actuated by plungers or levers.

My invention will be best understood when described with reference to the accompanying drawings, in which—

Figure 1 is a plan view of the device. Fig. 2 is an elevation view thereof. Fig. 3 is a sectional view thereof, taken on line 3 3 of Fig. 2, the upper part of the springs being shown in section. Fig. 4 is a sectional view

thereof, taken on line 4 4 of Fig. 2. Fig. 5 is a sectional view taken on line 5 5 of Fig. 2. Fig. 6 is a diagrammatic view showing the connection of the various switch-springs of the keys and the connection therewith of various signaling-current sources, and Fig. 7 shows separator-plate for adjusting the springs of switch mechanisms employed.

Like reference characters refer to like parts throughout the various figures.

The framework of the device consists of the combined supporting and escutcheon plate 1 and the lower supporting-bar 2, connected by pillars 3 and 4, which may have threaded engagement with the escutcheon plate, and which may be secured to the bar 2 by means of bolts 5 5. The operator's listening and ringing key comprises an actuating-plate 6, pivoted at 7 in downwardly-extending lugs 8, and carries a cylindrical actuating-button 9 for actuating switch-spring mechanism 10, having suitable connection with the cord-strands and with an operator's telephone set 11. The actuating-plate 6 also carries a cylindrical actuating-button 12 for operating ringing-switch mechanism 13, suitably connected with sources of ringing-current. The actuating-plate 6 has stops 14 and 15 for engaging against the lower face of the plate 1 as the operator's key is rotated. The adjustment of the stop 14 is such as to prevent sufficient rotation of the key to bring the center of the button 12 beyond the edge 13' of the actuating-springs 13, so that the key will be thrown back to its normal position by the springs upon release. Stop 15, however, is adjusted to allow sufficient rotation of the key to carry the button 9 within the edges 14' of the actuating-springs 63, whereby the key will be locked after actuation between the springs 63. A plurality of selective buttons 16, 17, 18, and 19 are mounted on the escutcheon-plate 1. Each button consists of a stem 20, passing through a corresponding opening 21 in the escutcheon-plate. Each button is also provided with a plunger or wedge 22 of insulating material, having a screw-threaded engagement with the lower end of the stem portion, and above the actuating-wedge is a cam-detent 23. The actuating-wedges are adapted upon depression of buttons to engage the corresponding switch



spring mechanisms 16', 17', 18', and 19', mounted upon the supporting-frame 2. The stems of the buttons are prolonged into spindles 25, which are adapted to pass into openings 26 in the supporting-bar 2, and helical springs 27 surround the spindles between the top of the bar 2 and the actuating-wedges, the tendency of the springs being to maintain the buttons in a normal upper position. The pillars directly below the escutcheon-plate are provided with grooves 28 and 29, respectively, and the bifurcated ends 30 and 31 of a latch-bar 32 are adapted to ride in these grooves. The latch-bar is provided with openings 33 large enough to allow ready passage therethrough of the cam-detents 23. A spring 35, secured to the escutcheon-plate 1, engages the latch-bar and tends to move the latch-bar toward the left of the device, as best shown in Fig. 2, and when in this position the right side edges of the openings 33 are disposed to the left of the detent edges 36 of the cam-detents 23. Thus upon depression of the selective buttons the detent-cams will move the latch-bar to the right and after the detent edge has passed downwardly below the latch-plate the spring 35 will return the latch-bar to its position to the left, the edge of the latch-bar opening below the depressed button, however, being disposed before the detent edge and the depressed button is locked in its depressed position. Upon depression of a second button the cam-detent of this button will engage the latch-bar and move it to the right sufficiently to allow escape of the first depressed button and the second button in turn will be locked in its depressed position after its cam-detent has passed below the latch-bar, and thus depression of one button will serve to release all the depressed buttons. The actuating-plate of the operator's key is provided with an extension 37, and the locking-bar is provided with an extension 38, projecting into the path of extension 37. Upon actuation of the operator's key to its listening position the extension 37 will engage the extension 38 to move the latch-bar to the right to allow the escape of all selective keys which may have been locked.

One of the features of my invention consists in the disposition of the parts in such a manner that if the operator's key is in a listening position the depression of any of the selective buttons will cause the restoration of the key to its normal position. This result is accomplished by adjusting the length of the openings 33 in the latch-bar 32, so that the depression of a button will cause engagement of the corresponding cam-detent with the left-hand edge of the corresponding opening 33 to cause a slight movement of the latch-plate toward the left from its right-hand position, into which it has been moved upon actuation of the listening-key. This

slight movement to the left is sufficient to trip the operator's key and to cause its restoration from the listening to a normal position. As the spring mechanism 10 upon actuation of the operator's key to the listening position is adjusted to lock the key in such position, this automatic restoration of the key would otherwise not result upon actuation of the selective keys; but owing to the adjustment of the cam-detents and the latch-plate openings, as above described, the listening-key is moved from locking engagement upon actuation of the selective buttons and is returned to its normal position.

In keys employing springs, such as shown, and plungers or levers for actuating them there is apt to be considerable noise upon release of the keys, owing to the recoil of the springs. In the key shown there is apt to be a great amount of noise, as upon release of the selective buttons the metallic cam-detents will strike against the metallic escutcheon-plate 1. In the application of Haubrich referred to the inner springs of the various switching mechanism of the selective keys are normally in contact at their ends with the actuating-wedges 22. This necessarily causes friction on the wedges which must be overcome by the helical restoring-springs 27, and these springs must therefore be heavier than would otherwise be necessary. If these springs are heavy, however, the buttons upon release will be returned with greater force to their normal position, thus increasing the noise of impact between the escutcheon-plate and the cam-detents. To obviate this, I shorten the actuating-wedges to clear them from the inner springs 39, and to maintain the inner springs in proper adjustment in relation to the actuating-springs 40 and outer springs 41 I employ separator-plates 42. (Shown in Fig. 7.) These separator-plates are of insulating material and consist of a body portion 43, having a central opening 44, and from which arms 45 and 46 extend laterally at opposite sides thereof. These plates are disposed in the various switch mechanisms, as shown in Figs. 2 and 3, the central opening 44 being large enough to pass freely about the spindle 25 and helical spring 27. The inner springs are provided with openings through which the extensions 45 and 46 may snugly pass, the inner springs resting against the shoulders 48 of the separator-plates, and these plates and inner springs serve mutually to hold each other in position. The actuation-springs 40 are provided with larger openings 49, through which the extensions 45 may freely pass, and the outer springs 40 rest against the ends of the extensions, the length of the extensions being such that normally the outer springs are disengaged from the actuating-springs which normally engage the inner springs. Upon actuating of the keys to depress the wedge 22 the actuation-



springs are disengaged from the inner springs  
 and move into engagement with the outer  
 springs. The inner springs are at all times  
 maintained out of contact with the wedges  
 5 by means of the separator-plates, and thus  
 upon release of the keys there will be no re-  
 tarding force exerted thereon, and conse-  
 quently the helical springs 27 may be very  
 much lighter. This of itself will materially  
 10 lessen the noise upon release of the buttons.  
 To entirely eliminate the noises upon restora-  
 tion, I provide means for preventing suffi-  
 cient motion of the actuation-buttons upon  
 release to allow the cam-detents to strike the  
 15 escutcheon-plate. I therefore provide the  
 lower end of the actuation-wedges with en-  
 largements to form collars 50, which engage  
 the lower side of the inwardly-bent ends 51 of  
 the actuating-springs, as best shown in Fig.  
 20 3. As the buttons are depressed the wedges  
 will actuate the springs to cause the desired  
 circuit changes, and upon release of the but-  
 tons the upward movement of the wedge is  
 25 arrested by the engagement of the collar with  
 the ends of the actuating-springs, and the  
 cam-detent is prevented from reaching and  
 striking the escutcheon-plate, and thus all  
 noise is eliminated.

In Fig. 6 I have diagrammatically shown  
 30 the electrical connection between the vari-  
 ous switching mechanisms of the key. The  
 outer springs 52 of the ringing-switch mech-  
 anism 13 may be permanently connected  
 with the actuating-springs 53 of the select-  
 35 ive switch mechanism 16'. The inner springs  
 54 of the switching mechanism 16' are nor-  
 mally in contact with the actuating-springs  
 53 thereof and may be permanently con-  
 nected with the actuating-springs 55 of the  
 40 switching mechanism 17'. The inner springs  
 56 of the switch mechanism 17' are normally  
 in contact with the actuating-spring 55  
 thereof and may be permanently connected  
 45 with the actuating-spring 57 of the switch  
 mechanism 18', whose inner springs 58, nor-  
 mally in connection with the actuating-  
 springs thereof, may be permanently con-  
 nected with the actuating-springs 59 of the  
 50 switch mechanism 19', whose inner springs  
 60 are normally in contact with the actuat-  
 ing-spring 59. The outer springs 52 of the  
 ringing-switch mechanism 13 are normally  
 disengaged from the actuating-springs 61  
 thereof, which actuating-springs are nor-  
 55 mally in engagement with the inner springs  
 62 of the switch mechanism 13, and these in-  
 ner springs permanently connect with the  
 actuating-springs 63 of the listening-switch  
 mechanism 10, the outer springs 64 of which  
 60 are normally disconnected from the actu-  
 ating-springs and may be connected with the  
 operator's apparatus 11. The actuating-  
 springs 61 of the ringing mechanism 13 are  
 connected with a calling-plug 65, and inner  
 65 springs 60 of the switch mechanism 19' may

be connected with a source 66 of an alternat-  
 ing ringing-current. The outer springs of the  
 switch mechanism 16', 17', 18', and 19' are  
 normally disconnected from their respective  
 actuating-springs and may respectively con- 70  
 nect with sources 67, 68, 69, and 70 of ring-  
 ing-current, each of different character. It  
 will thus be seen that the selective switch  
 mechanisms are normally entirely discon-  
 nected from the cord-circuit and can only be 75  
 connected therewith upon actuation of the  
 operator's key to the ringing position to con-  
 nect the switch-springs 61 with the springs  
 52, and upon such connection the depression  
 of any one of the selective keys will connect 80  
 with a calling-plug the corresponding select-  
 ive ringing-current independently of the  
 other sources of current. As the various  
 springs of the switching mechanisms may be  
 permanently connected together, very few 85  
 connections are necessary upon installation  
 of the key in the operator's switchboard, it  
 being necessary only to connect thereto the  
 cord-circuit and the various sources of ring-  
 ing-current. 90

I do not wish to be limited to the exact ar-  
 rangement and construction herein shown  
 and described, as changes may readily be  
 made without departing from the spirit of  
 the invention. The noise-preventive means 95  
 such as I have described are equally appli-  
 cable to other keys besides the keys herein  
 shown.

I claim as new, however, and desire to se-  
 cure by Letters Patent—

1. In a telephonic switching device, the  
 combination with an operator's key, of a plu-  
 rality of selective keys, switch mechanism  
 for each selective key, independent switch  
 mechanism for said operator's key, said inde- 105  
 pendent switch mechanism forming means  
 for locking said operator's key upon actua-  
 tion thereof, and means upon actuation of  
 one of said selective keys for automatically  
 causing the restoration of said operator's key. 110

2. In a telephonic switching device, the  
 combination with an operator's key, of a plu-  
 rality of selective keys combined with said  
 operator's key in a unitary structure, switch  
 mechanism for said selective keys, independ- 115  
 ent switch mechanism for said operator's  
 key, said independent switch mechanism  
 forming means for locking said operator's  
 key upon actuation thereof, and means asso-  
 ciated with said selective keys for automat- 120  
 ically causing the restoration of said opera-  
 tor's key upon the actuation of one of said  
 selective keys.

3. In a telephonic switching device, the  
 combination with an operator's key, of a plu- 125  
 rality of selective keys combined in a unitary  
 structure, means for locking any one of said  
 keys upon actuation thereof, independent  
 means for locking said operator's key upon  
 actuation thereof, means upon actuation of 130



said operator's key for automatically causing restoration of actuated selective keys, and means upon actuation of selective keys for automatically causing restoration of the operator's key.

4. In a telephonic switching device, the combination with an operator's ringing and listening key, of selective keys associated with said operator's key in a unitary structure, means for locking said selective keys upon actuation thereof, independent means for locking said operator's key when actuated to its listening position, means upon actuation of said operator's key to its listening position for automatically causing restoration of selective keys, and means upon actuation of selective keys for automatically restoring the operator's key from its listening position to its normal position.

5. In a telephonic switching device, the combination with an operator's key, of a plurality of selective keys combined with said operator's key in a unitary structure, means for locking any one of said selective keys upon actuation thereof, independent means for locking said operator's key upon actuation thereof, and means upon actuation of any one of said keys for causing the restoration of the actuated key.

6. In a telephonic switching device, in combination with an operator's key, of a plurality of selective keys combined therewith in a unitary structure, switch mechanism for each key adapted for actuation thereby, the switching mechanism of the operator's key causing said key to be locked, means upon actuation of any one of said selective keys for locking said key in its actuated position, means upon actuation of any other selective key for causing restoration of the actuated key, and means upon actuation of any selective key for automatically causing the restoration of said operator's key.

7. In a telephonic switching device, the combination with an operator's key, of a plurality of actuating-buttons associated therewith, switching mechanism for each actuating-button, a locking-bar common to said actuating-buttons, a cam-detent on each button, the depression of a button causing engagement of said locking-bar with the detent of said button to lock said button in its depressed position, means independent of said locking-bar adapted upon actuation of the operator's key for locking said key in its actuated position, and means upon the depression of any of said buttons for causing actuation of said locking-bar to restore said operator's key to its normal position.

8. In a telephonic switching device, the combination with an operator's key, of a plurality of actuating-buttons associated therewith, switching mechanism for each actuating-button and for said operator's key, said operator's key being locked into position by

its switching mechanism upon actuation of the key, a common locking-bar for the actuating-buttons, depression of any actuating-buttons causing said button to be locked in its actuated position by said actuating-bar, connecting means between said operator's key and said locking-bar actuation of said operator's key causing said locking-bar to release the actuated buttons, and actuation of any button after actuation of the operator's key causing said locking-bar to be actuated to return said operator's key to its normal position.

9. In a telephonic switching device, the combination with an operator's key, of a plurality of selective keys associated therewith in a unitary structure, switching mechanism for each selective key and for said operator's key, the switch mechanism for said operator's key serving to lock said key upon actuation thereof, a common locking-bar for said selective keys, a cam-detent for each key adapted to pass through a corresponding opening in said locking-bar upon depression of the key, means tending to normally hold said locking-bar to one side of the structure, actuation of any selective key causing the corresponding cam-detent to pass through the corresponding opening in the lock-bar whereupon the lock-bar engages the cam-detent to lock the depressed key, a connection between said operator's key and said locking-bar actuation of said operator's key causing movement of said locking-bar to allow the escape of the cam-detent through the corresponding opening in the bar, and actuation of any selective key after actuation of the operator's key causing said selective key to be locked in its depressed position by said locking-bar and to move said bar to release the operator's key.

10. In a telephonic switching apparatus, the combination with an operator's key, of a plurality of selective keys combined therewith in a unitary structure, switching mechanism for each key adapted to be actuated thereby, the switch mechanism for said operator's key causing said key to be locked upon actuation thereof, a locking-bar associated with said operator's key and with said selective keys, an extension from said operator's key, a lug extending from said locking-bar, a cam-detent for each selective key, an opening in the locking-bar for each cam-detent, depression of a selective key causing said locking-bar to engage the cam-detent and prevent restoration of the actuated key, actuation of the operator's key causing movement of said locking-bar to release the actuated selective key and actuation of the selective key after actuation of the operator's key causing the corresponding cam-detent to move the locking-bar to restore the operator's key to its normal position.

11. In a telephonic switching apparatus,



the combination with a plurality of switch-spring groups comprising actuating-springs and inner and outer contact-springs, of a plunger for engaging said actuating-springs, and a separator-plate for normally retaining said outer and inner springs in proper adjustment independently of the plunger.

12 In a telephonic switching device, the combination with an operator's key, of a plurality of selective keys, switch-contacts for said selective keys, means for locking said operator's key upon actuation thereof, means upon actuation of one of said selective keys for automatically causing the restoration of said operator's key, a plunger connected with each selective key for engaging with said switch-contacts, and means for limiting the upward motion of said plunger to a fixed distance.

13 In a telephonic switching device, the combination with an operator's key, of a plurality of selective keys, switch means for said operator's key, said switch means forming means for locking said operator's key upon actuation thereof, switch-contacts for each selective key, a plunger connected with each selective key for engagement with said switch-contacts, means upon actuation of one of said selective keys for automatically causing the restoration of said operator's key, and a collar upon said plunger for engaging said switch-contacts for limiting its upward motion to a fixed distance when said selective keys are restored.

14 In telephonic switching apparatus, the combination with an actuating-button of a stem, a wedge-shaped plunger secured to said stem, switching mechanism disposed below said plunger, actuating-springs for said switching mechanism engaging said plunger, inner contact-springs normally engaged by

said actuating-springs, outer springs adapted to be engaged by said actuated springs upon depression of the plunger, and a separator-plate for adjusting the positions of said springs independently of the plunger, the inner springs resting against shoulders of said separator-plate, and the outer springs resting against the ends of extensions from said separator-plate.

15 In telephonic switching apparatus, the combination with an actuating-button, of a stem extending therefrom, a wedge-shaped plunger secured to said stem, switching mechanism disposed below said plunger, actuating-springs for said switching mechanism engaging said plunger, inner contact-springs for said switch mechanism normally in engagement with said actuating-springs, outer contact-springs for said switch mechanism normally disengaged from said actuating-springs, depression of said plunger causing said actuating-springs to become disengaged from said inner springs and to be engaged with the outer springs, a spring surrounding said stem below said plunger for returning said plunger to its normal position upon depression thereof, a separator-plate of insulating material having a central opening for receiving said spring, the inner springs resting against the shoulders of said separator-plate and the outer contact-springs resting against the end of extensions from said separator-plate, said inner springs being thereby entirely disconnected from said plunger.

In witness whereof I hereunto subscribe my name this 9th day of February, A. D. 1905.

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Witnesses:

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