P. L. SIBOLE.

ELECTRIC SWITCH.

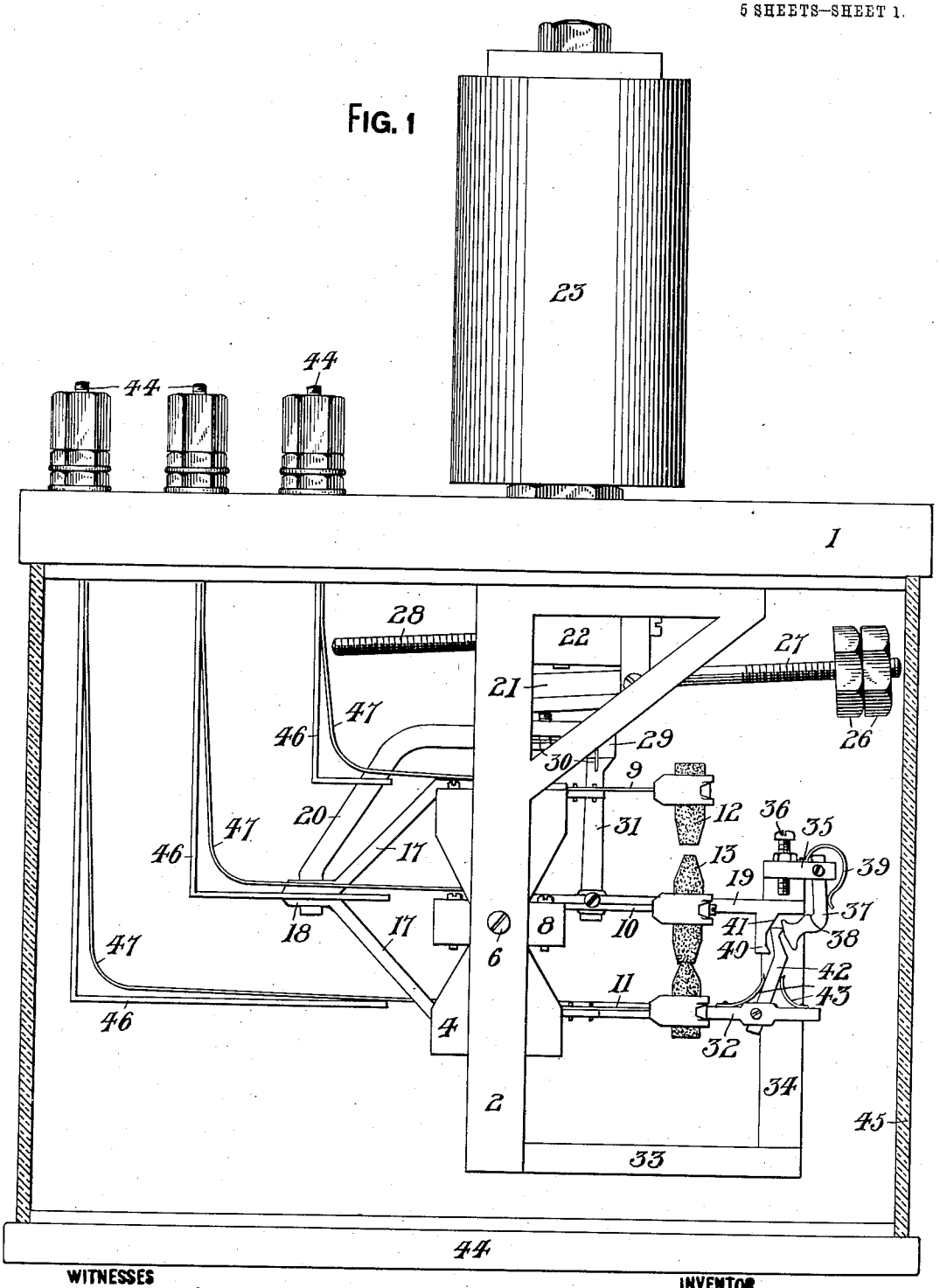
APPLICATION FILED DEC. 20, 1910.

1,013,569.

Patented Jan. 2, 1912.

5 SHEETS—SHEET 1.

FIG. 1



WITNESSES

J. P. Appleman,

Elva Staniek

INVENTOR

P. L. Sibole

by F. N. Barber

attorney

P. L. SIBOLE.

ELECTRIC SWITCH.

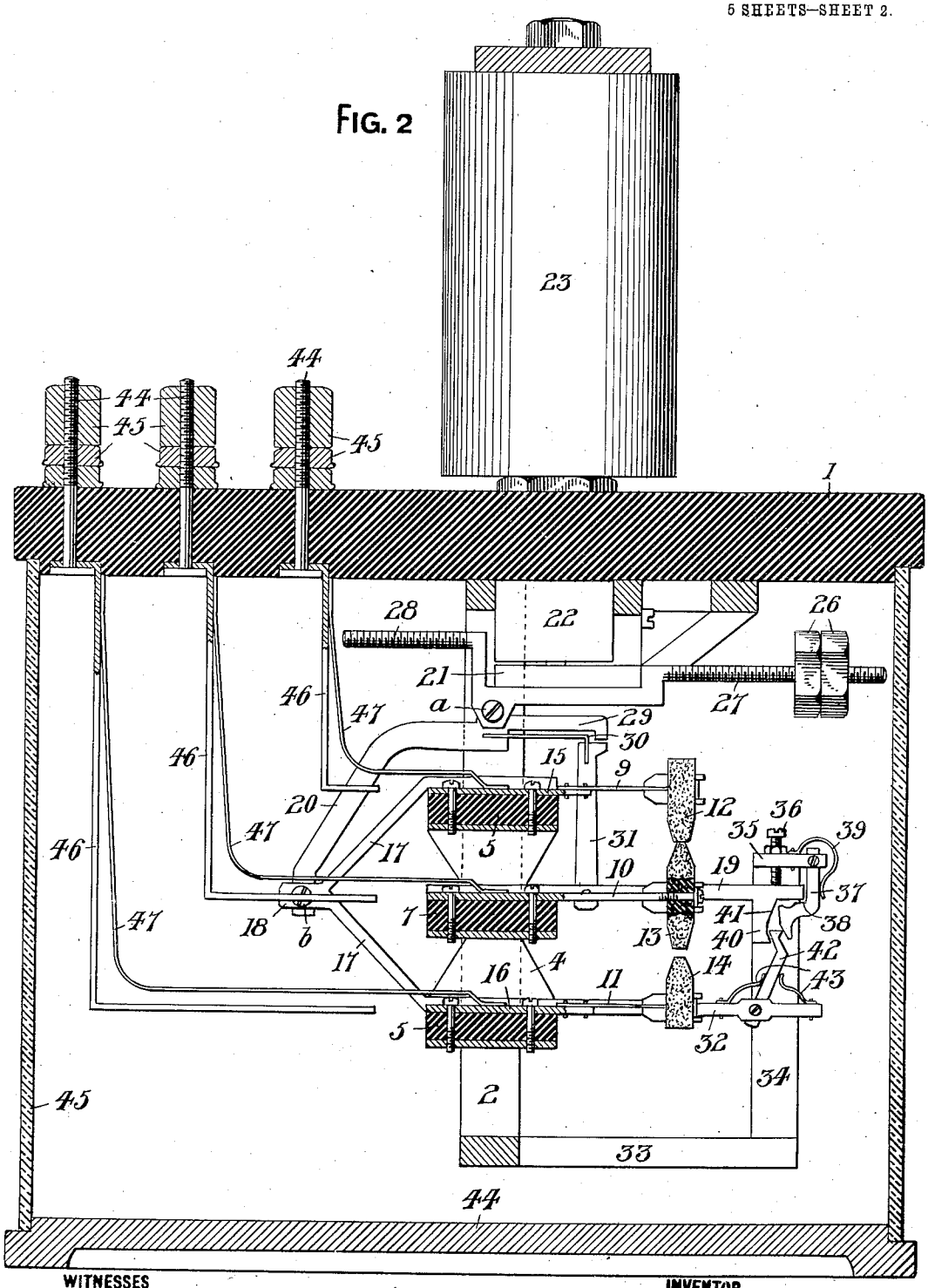
APPLICATION FILED DEC. 20, 1910.

1,013,569.

Patented Jan. 2, 1912.

5 SHEETS—SHEET 2.

FIG. 2



WITNESSES

J. P. Appleman,

Elva Staniek.

INVENTOR

P. L. Sibole

by F. N. Barber

attorney

P. L. SIBOLE.

ELECTRIC SWITCH.

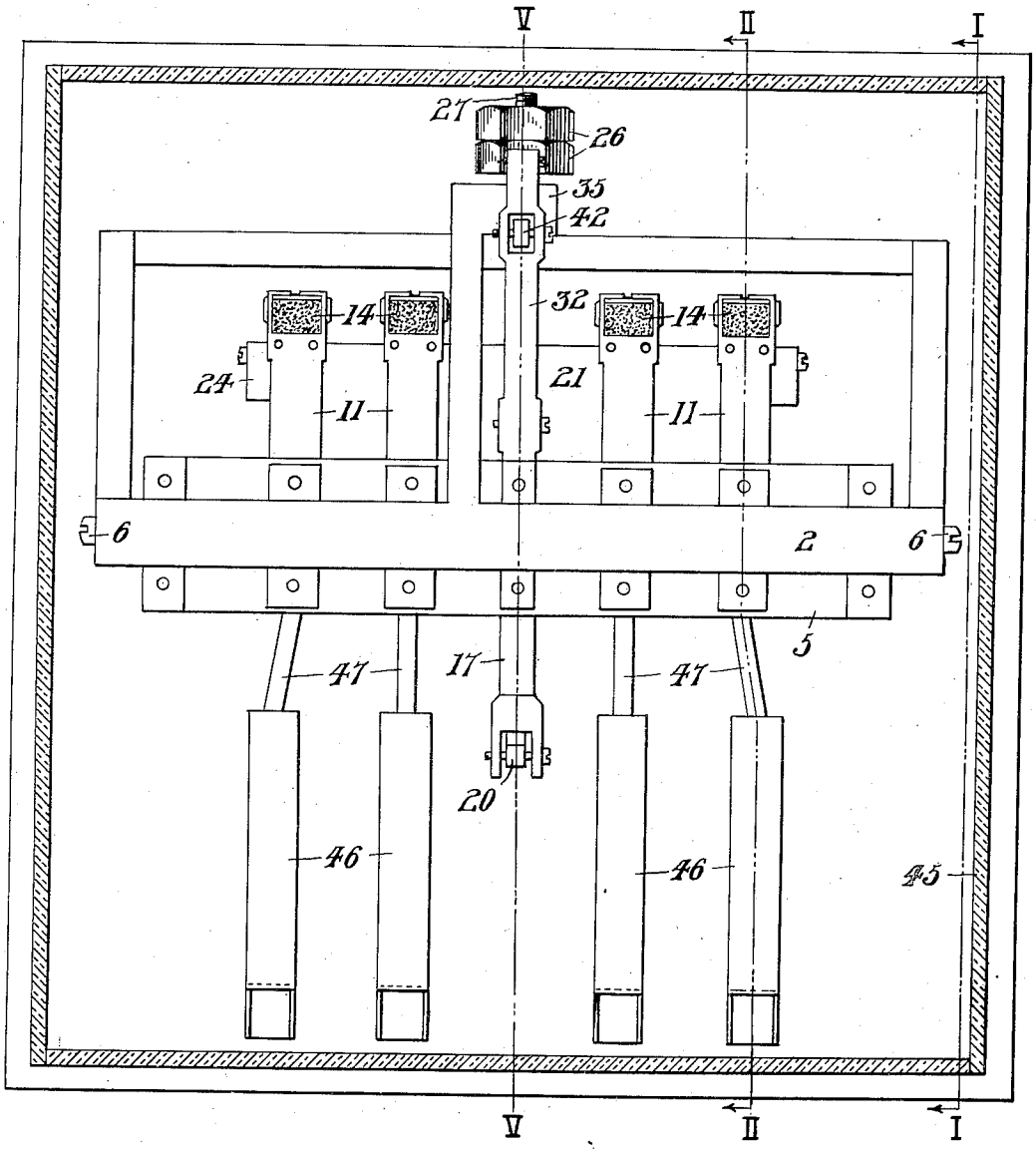
APPLICATION FILED DEC. 20, 1910.

1,013,569.

Patented Jan. 2, 1912.

5 SHEETS—SHEET 3.

FIG. 3



WITNESSES

J. P. Appleman,

Elva Staniek

INVENTOR

P. L. Sibole

by F. N. Barber

attorney

P. L. SIBOLE.

ELECTRIC SWITCH.

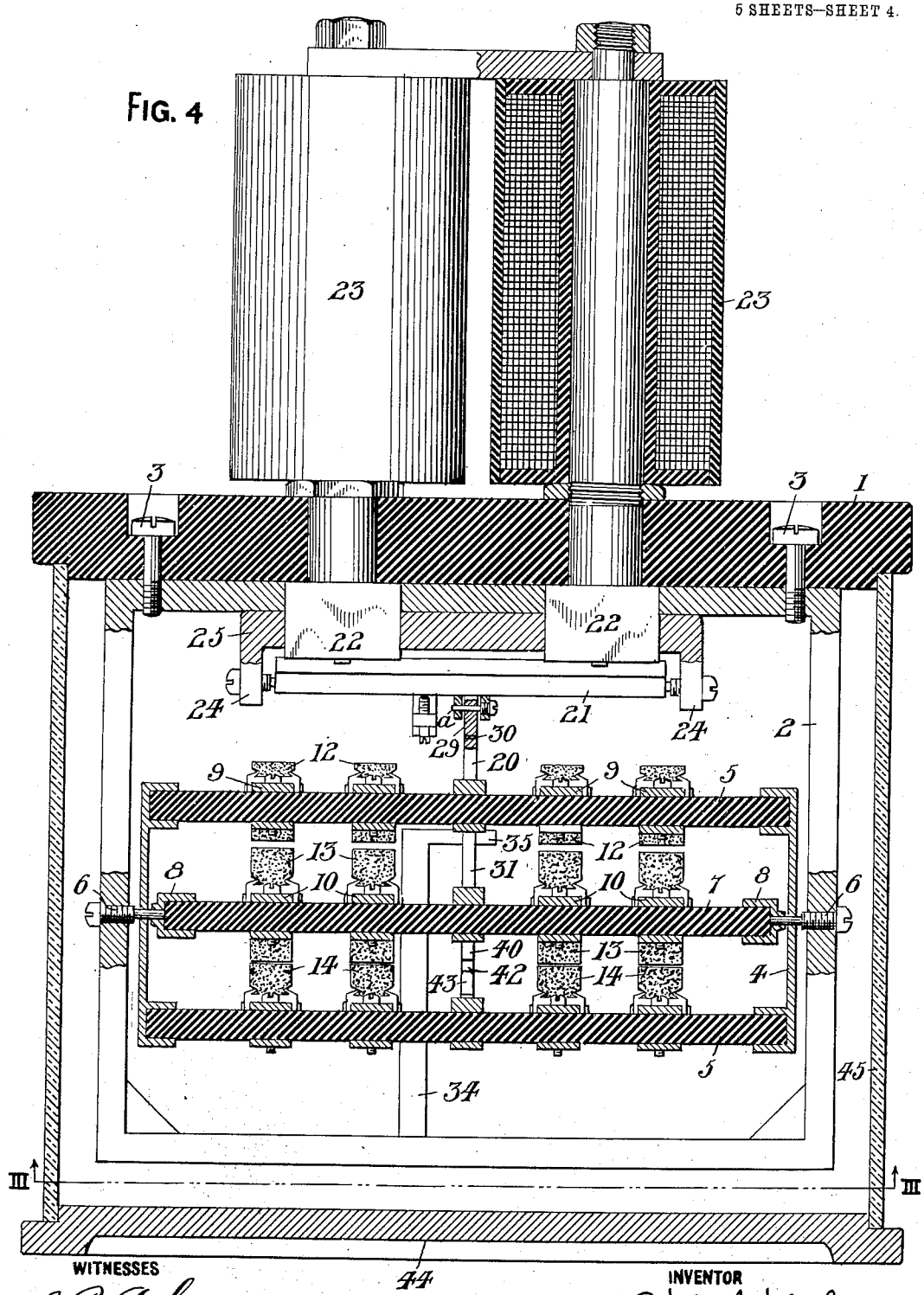
APPLICATION FILED DEC. 20, 1910.

1,013,569.

Patented Jan. 2, 1912.

5 SHEETS—SHEET 4.

FIG. 4



WITNESSES

J. P. Appleman,

Elva Staniek.

INVENTOR

P. L. Sibole

by F. N. Barber

attorney

P. L. SIBOLE.

ELECTRIC SWITCH.

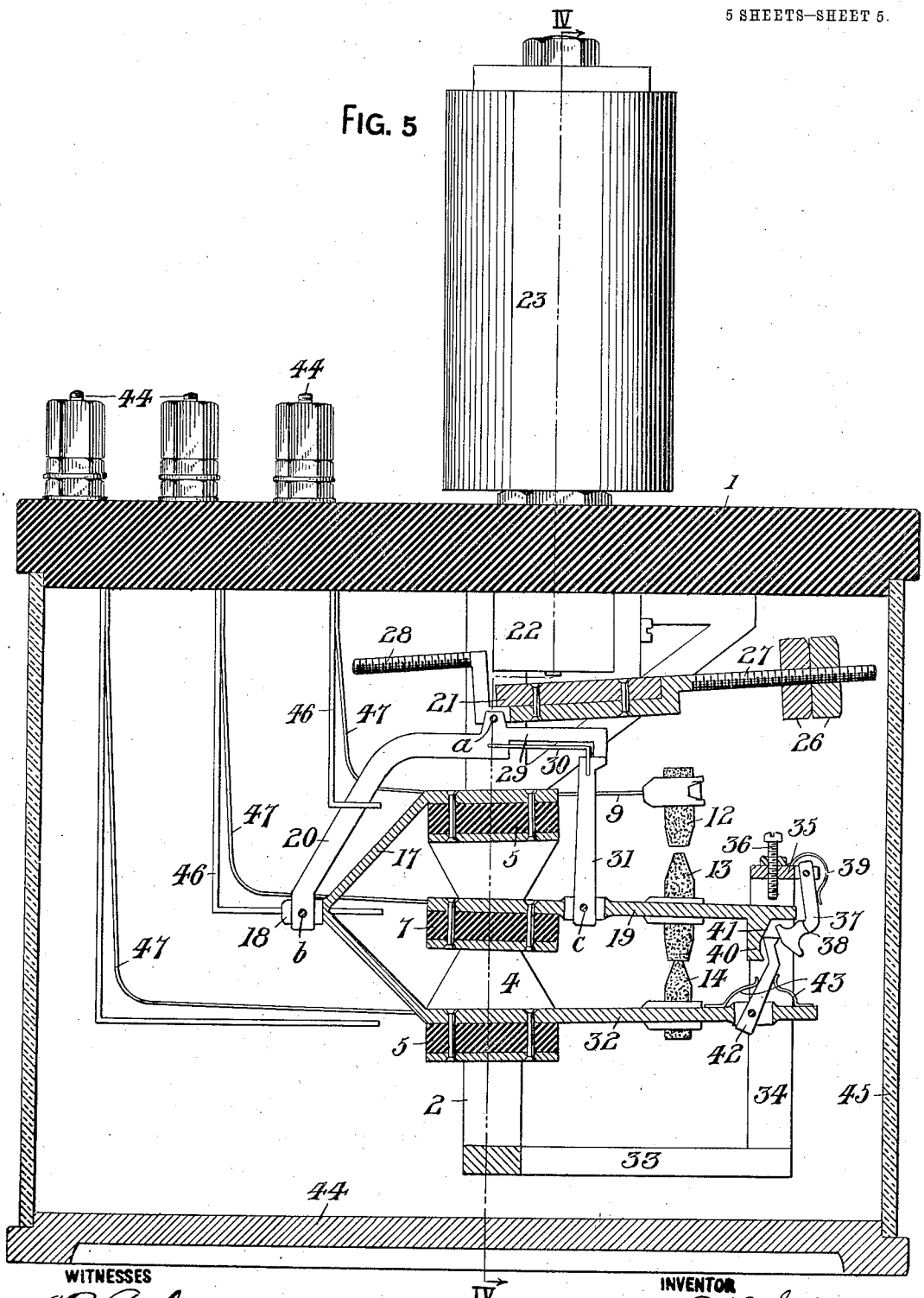
APPLICATION FILED DEC. 20, 1910.

1,013,569.

Patented Jan. 2, 1912.

5 SHEETS—SHEET 5.

FIG. 5



WITNESSES

J. C. Fleeman,

Elva Staniek.

INVENTOR

P. L. Sibole

by F. N. Barber

attorney

UNITED STATES PATENT OFFICE.

PERCY L. SIBOLE, OF SWISSVALE, PENNSYLVANIA.

ELECTRIC SWITCH.

1,013,569. Specification of Letters Patent. Patented Jan. 2, 1912.

Application filed December 20, 1910. Serial No. 598,409.

To all whom it may concern:

Be it known that I, PERCY L. SIBOLE, a citizen of the United States, residing at Swissvale, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Electric Switches, of which the following is a specification.

My invention relates to electric switches, particularly of the general type shown in Letters Patent No. 977,140 granted to me November 29, 1910.

The principal objects of my invention are to simplify and improve the details of the mechanism shown in my said patent whereby the results desired may be secured more economically.

Referring to the accompanying drawings, Figure 1 is an elevation showing one form of my invention with the upper contacts open and the lower closed, the sides of the casing being in vertical section, on the line I—I, Fig. 3. Fig. 2 is a vertical section showing the positions of the contacts reversed from those of Fig. 1, the section being on the line II—II, Fig. 3. Fig. 3 is a section on the line III—III, Fig. 4. Fig. 4 is a section on the line IV—IV, Fig. 5. Fig. 5 is a section on the line V—V, Fig. 3.

On the drawings 1 represents a horizontal terminal board or support composed of suitable insulating material, to one face of which I secure the open vertical rectangular frame 2 by means of the screws 3, passed through the support 1 and into the upper horizontal side of the frame 2.

5, 5 are two horizontal parallel switch-arm bars composed of insulating material, having their ends rigidly connected to the ends of two spaced parallel metal bars or arms 4, pivotally supported on the pivot-screws 6 in the sides of the frame 2. The arms 4 lie close to the sides of the frame 2 and are parallel therewith. Between the switch-arm bars 5 and parallel therewith I arrange a third switch-arm bar 7 composed of insulating material and provided with end-caps 8, into which the ends of the pivot-screws 6 extend. By this construction the two bars 5 and the bar 7 may have independent pivotal or oscillatory movements.

To the upper face of the upper bar 5, the middle bar 7, and the lower bar 5, I secure a number of preferably horizontal parallel switch-arms 9, 10, and 11, respectively, carrying at their outer ends the respective contacts 12, 13, and 14. The arms 9 and 11 are preferably resilient and the arms 10 preferably stiff. The arms 9, 10, and 11 are arranged in vertical groups so that each arm 10 stands between an arm 9 and an arm 11, but it will be clear that some of the advantages of my invention may be secured with the presence of only one of the switch-arm bars 5 and its connected switch-arms and contacts. With the arrangement shown the middle contacts 13 may contact with the upper contacts 12 or the lower contacts 14. The arms 9 and 11 are shown connected to metal plates 15 and 16 secured by bolts to the bars 5.

The switch-arm bars 5 are provided with the arms 17 which converge to form the single arm 18 at that side of the pivot 6 opposite to the contacts 12, 13, and 14. The switch-arm bar 7 is provided with the stiff arm 19 which projects on the opposite side of the pivot 6 from the arm 18. To the arm 18 is pivotally connected one end of the lever 20, having an intermediate part pivoted to the armature 21 arranged within the influence of the poles 22 of the electromagnets 23 mounted on the top of the support 1. The armature 21 has its ends pivoted to the ears 24 of the plate 25 on the under side of the top horizontal member of the frame 2.

26, 26 are weights to counterweight the armature and connected parts and are shown on the screw-threaded arm 27.

28 is another threaded arm lying on the opposite side of the fulcrum of the armature from the arm 27 and adapted to receive weights, if required. The poles 22 are shown as acting on the armature between its fulcrum and its connection to the lever 20.

The lever 20 has its intermediate portion connected to the armature 21 and one end to the arm 18, while its remaining end has the stop 29 and the spring or yielding portion 30 with its outer end connected to the upper end of the link 31 which is pivoted to the arm 19 between the contacts 13 and the bar 7.

The lower switch-arm bar 5 is provided with a stiff arm 32 which is parallel with the arm 19. The frame 2 has the horizontal frame 33, from which a vertical standard 34 rises. From the top of the standard 34 extends the horizontal bar 35, which carries

the set screw 36 located so as to be engaged by the upper side of the arm 19. To the bar 36 is pivotally suspended the stop or dog 37 having a shoulder 38 adapted to be seated beneath the end of the arm 19 when the latter engages the stop-screw 36 and prevents the downward movement of the arm 19. The spring 39 tends to urge the stop 37 toward the arm 19 so that, as soon as the arm 19 is raised above the shoulder 38, the stop will lock the arm 19. The stop 37 is, below the shoulder 38, bent toward the vertical pendent lug 40 on the arm 19 and has a rounded cam-like end inclining upwardly and inwardly toward the said lug 40 which has a cam portion 41 inclined upwardly toward the stop 37 so that between the said cam portion 41 and the end of the stop 37 there exists an upwardly tapering path. The arm 32 has pivoted thereto the up-standing wedging member 42 which has its upper end lying in the said upwardly tapering path, or so as to enter the same on the upward movement of the arm 32 and push the stop or dog 37 out of locking engagement with the arm 19, as shown on Figs. 1 and 5. The stop 37 is shown in its other position in Fig. 2. The springs 43 yieldingly support the member 42. The stop 29 is adapted to engage the top of the link 31 when the armature is in its idle or lowered position as shown on Figs. 1 and 5.

I provide the terminal screws 44 with the terminal clamping nuts 45, the heads of the bolts being at the under side of the board 1 and clamping between them and the board 1 the ends of the strips 46, to which are secured the terminal strips 47, electrically connected to the switch-arms 9, 10, and 11.

Upon the energization of the magnets 23, the armature 21 swings up from the position shown on Figs. 1 and 5 to that shown on Fig. 2, causing the lever 20 to be lifted. One arm of the lever 20 lifts the arms 17 and rocks the switch-arm bars 5, causing the contacts 12 and 14 and the arm 32 to move downwardly. The remaining arm of the lever 20, which contains the light spring 30, causes the switch-arm 10 and the arm 19 to rise. As the moving parts are nearly balanced, very little power is required to cause the contacts 13 and 14 to separate, and the contacts 12 and 13 merely to engage each other. The spring 30 is as light and flexible as is possible and yet make it lift the arms 10 and 19 and connected parts until the arm 19 engages with the set-screw 36. Just as the arm 19 engages the set-screw 36, the contacts 12 and 13 merely engage each other, and the stop or dog 37 locks the arm 19 against downward movement, as hereinbefore explained, the unlocking member 42 now being at its lower position as shown in Fig. 2. The movement of the contacts 12 and 13 so as merely to close the air gaps between them is accomplished by a very slight movement of the actuating element, the armature 21, at its connection *a* with the lever 20. With the proportions as shown on the drawings, wherein the pivots 6 and the connection *a* are midway between the contacts and the connection *b* of the lever 20 with the arm 18, and wherein the connection *c* of the link 31 with the arm 19 is midway between the pivots 6 and the contacts, the parts being constructed so that the connections *a*, *b*, and *c* rise equal distances until the arm 19 engages the stop or set screw 36, the contact 12 travels the same distance as the connection *a* and the contact 13 travels twice as far; that is, the upward movement of the actuating element closes an air gap three times as large between the contacts 12 and 13. But after the contacts 12 and 13 merely touch, the upward pull of the armature increases the pressure between these contacts. The contact 13 is locked by the arm 19 and the set-screw or stop 36 against further upward movement, and by the dog or stop 37 against downward movement. The spring 30 permits the conections *a* and *b* to rise so that any movement of the lever 20 caused by the up-movement of the connection *a* causes the flexible arm 9 to be curved or bent by the resistance which the contact 12 meets by engagement with the now immovable contact 13. If the stop 37 or its equivalent were not used, the contact 13 would be pushed down by the contact 12, owing to the stronger leverage which the arms 17 have as compared with that urging the arm 19 upwardly. The lock 37 prevents a loss of motion transmitted by the actuating element and saves energy for pressing the contact 12 upon the contact 13. Supposing the contacts 12 and 13 merely to touch without pressure and the arm 19 to be locked by the stops 36 and 37 and then the energy of the actuating element to be applied, the full energy or force of the actuating element will be transmitted to the contact 12, less the slight losses due to the up-pull on the spring and to thrusts on the pivots. With the apparatus which I have constructed, I have demonstrated that nearly $\frac{15}{16}$ of the energy of the actuating element is transmitted to the contacts after the same have been placed in contact. The spring yields very easily permitting the lever 20 to act substantially as a link to rock the switch-arm bars 5 and their connected parts.

When the magnets 23 are deënergized, gravity restores the parts to the position shown on Figs. 1 and 5. The dropping of the lever 20 lifts the contacts 12 and 14 and the arm 32. The member 42 traveling up with the arm 32 wedges the stop 37 away from the arm 19, permitting the same and the contact 13 to descend. The parts stop shortly after the contacts 13 and 14 engage with each other, the stop-arm 29 then bear-

ing on the top of the link 31 to prevent the contact 13 from rising under the upward lift of the contact 14.

44 is the bottom of the casing and 45 the sides thereof, held in any desired manner between the terminal board 1 and the bottom 44.

I have described the operation under certain assumed proportions of parts, provided these come within the scope of the appended claims.

I claim—

1. The combination of two movable switch elements adapted to mutually engage, an actuating element, connections between the switch elements and the actuating element to move the switch elements toward each other, one of the said connections being yielding, and means arranged to prevent the movement of one of the switch elements while the switch elements are engaged.

2. The combination of two movable switch elements adapted to mutually engage, an actuating element, connections between the switch elements and the actuating element to move the switch elements toward each other, one of the said connections being yielding, a stop so arranged that on the actuation of the actuating element a part of the movement of one of said switch elements toward the other may be arrested, a releasable stop to prevent backward movement of said arrested switch element, and means for releasing the said arrested switch element upon the movement of the switch elements toward their normal positions.

3. In the combination of two switch elements, operating means for moving the said switch elements toward and from each other, and means for preventing movement of one of the said switch elements in either direction after engagement of the said switch elements, and means for returning the switch elements to their open position on the release and reverse movement of said operating means.

4. The combination of three movable switch elements, one being between the other two and arranged to engage either of the same, an actuating element, connections between the switch elements and the actuating element arranged to move either of the said two switch elements and the intermediate switch element toward each other and into mutual engagement, and the other one of the said two switch elements away from the said intermediate switch element, one of the said connections being yielding, and stop devices arranged to prevent movement of the intermediate switch element while engaged with one of the other switch elements.

5. The combination of three movable switch elements, one being between the other two and arranged to engage either of the same, an actuating element, connections between the switch elements and the actuating element arranged to move either of the said two switch elements and the intermediate switch element toward each other and into mutual engagement, and the other one of the said two switch elements away from the said intermediate switch element, one of the said connections being yielding, and a stop arranged to prevent the yielding connection from yielding except in one direction.

6. The combination of a frame, three switch-arm bars, two being connected together and pivoted to the sides of the frame, the third bar being between the other two and supported on the pivots that support the said two bars.

7. The combination of a frame, three parallel switch-arms pivotally connected to the sides of the frame, an operating arm connected to the outer switch-arms, a link connected to the intermediate switch-arm so as to move it oppositely to the direction which the said operating arm moves the other two switch-arms, and a lever connected to said operating arm and to said link, and means for actuating the lever.

Signed at Pittsburgh, Pa., this 15th day of December, A. D. 1910.

PERCY L. SIBOLE.

Witnesses:
SUZANNE S. BEATTY,
ELVA STANICK.