No. 829,630. PATENTED AUG. 28, 1906.

R. V. COLLINS.

SWITCH.

APPLICATION FILED JULY 13, 1903.

4 SHEETS—SHEET 1.

Fig. 1.

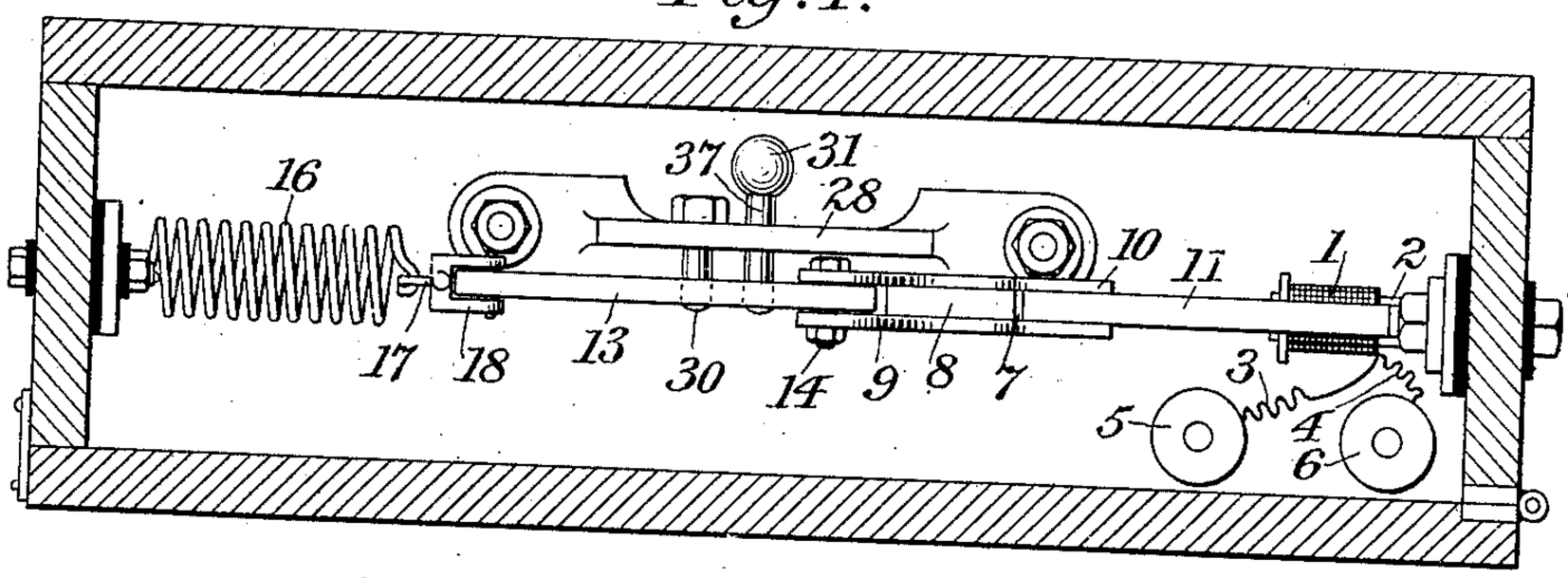
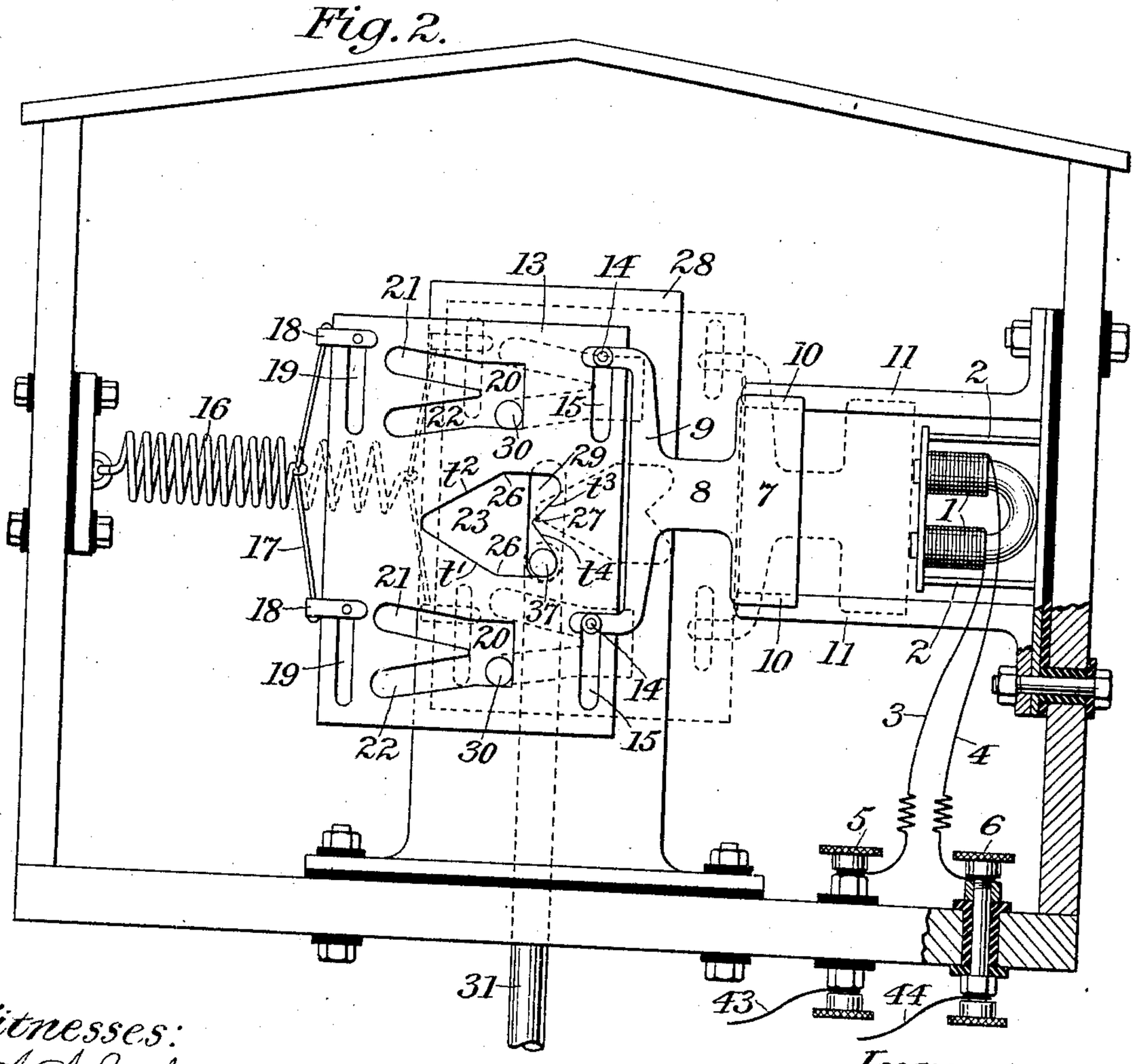


Fig. 2.



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4 SHEETS—SHEET 2.

Fig. 3.

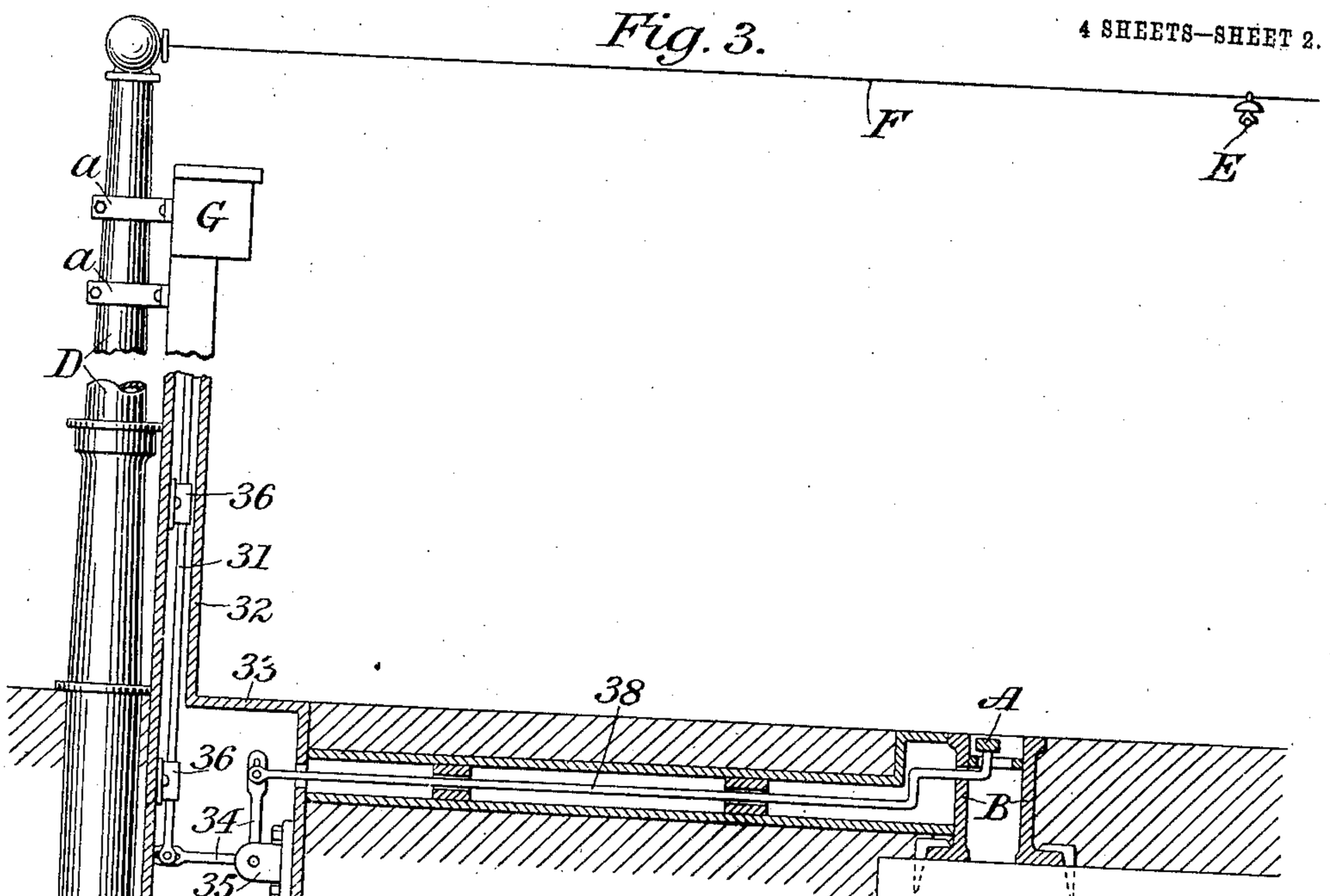
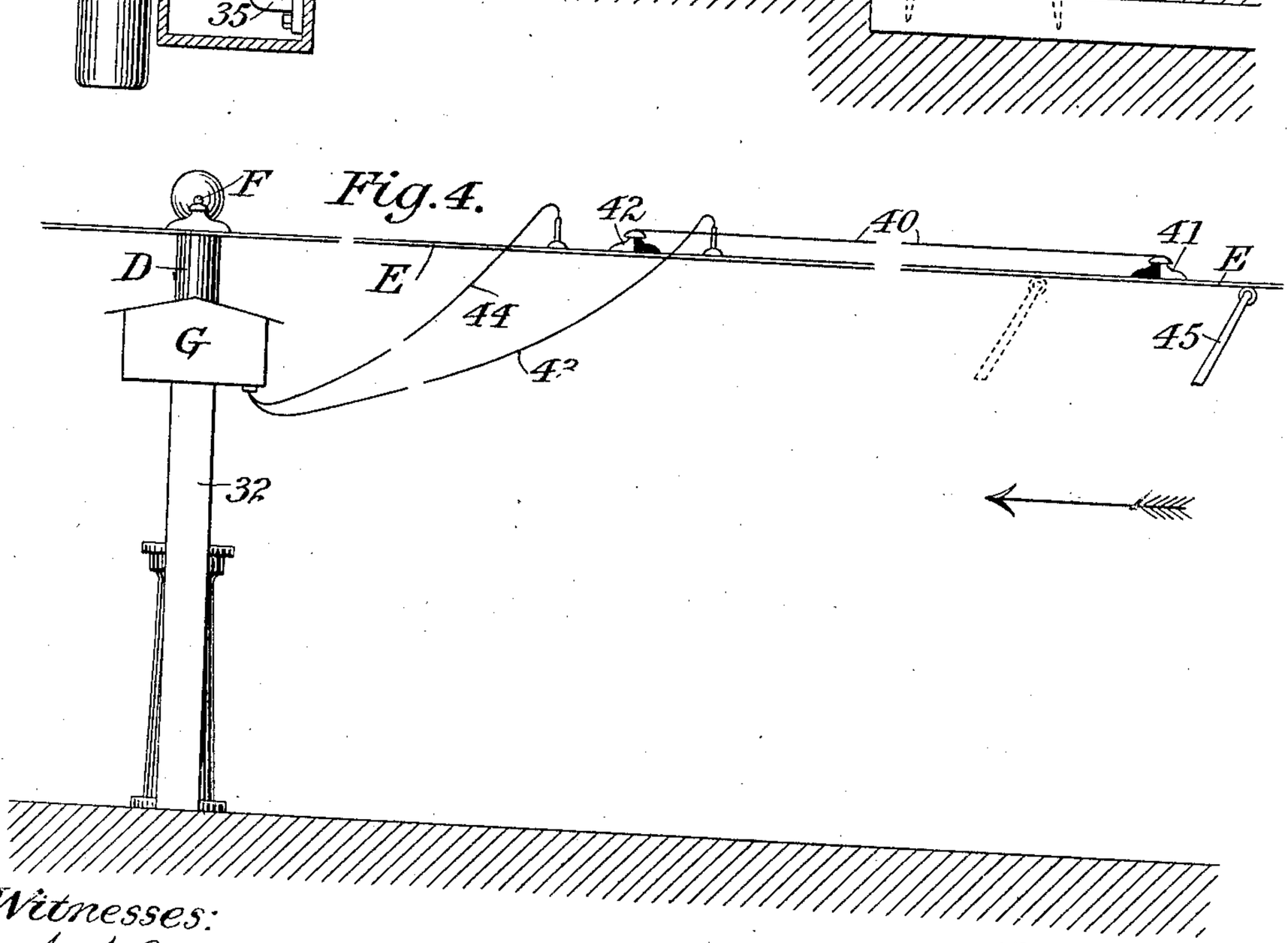


Fig. 4.



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4 SHEETS—SHEET 3.

Fig. 5.

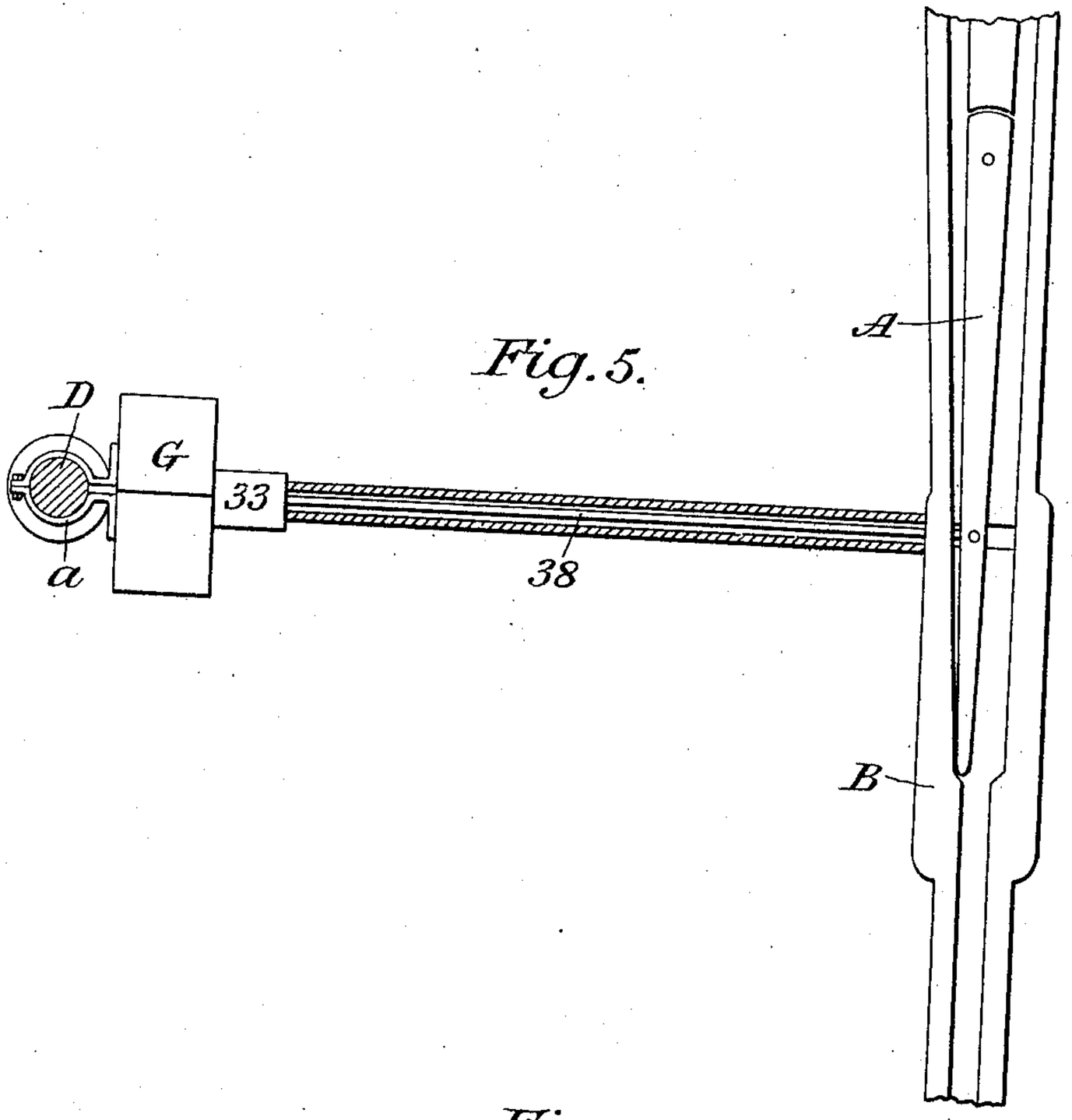
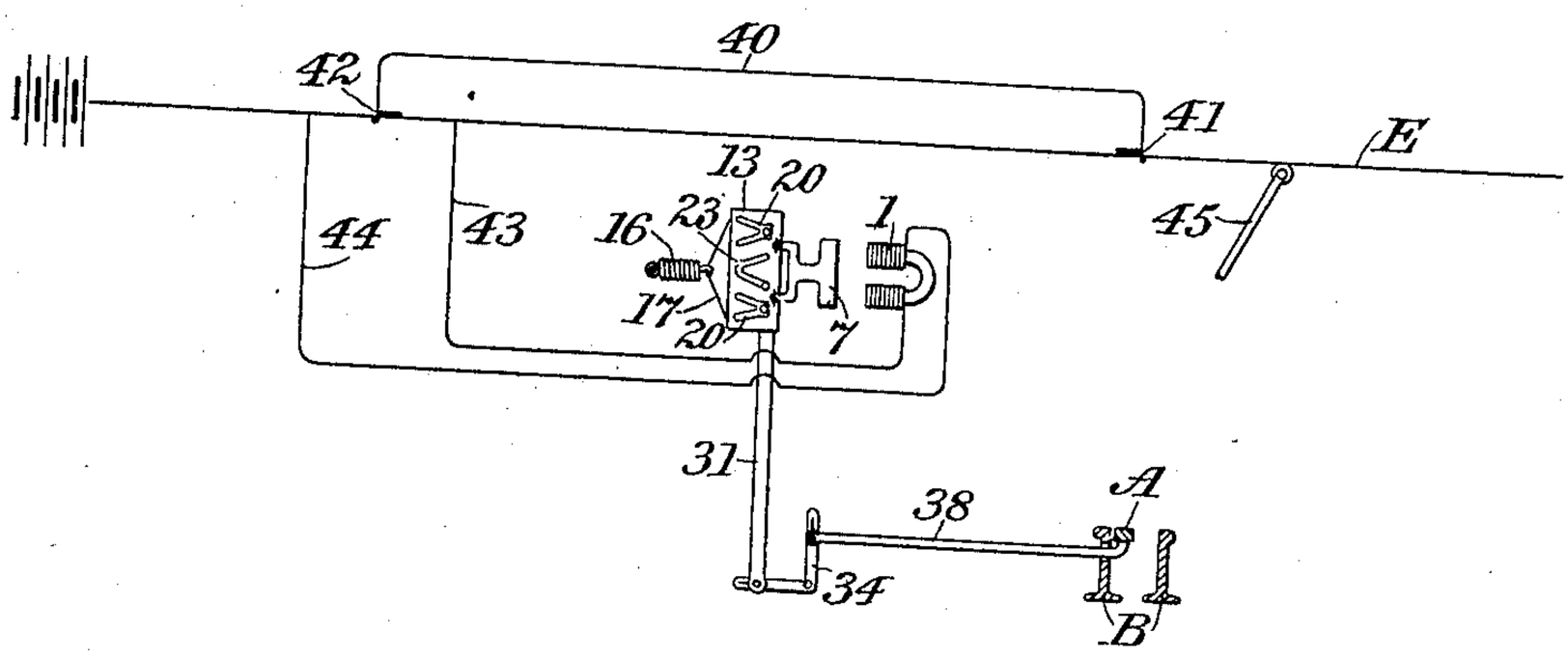


Fig. 6.



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4 SHEETS—SHEET 4.

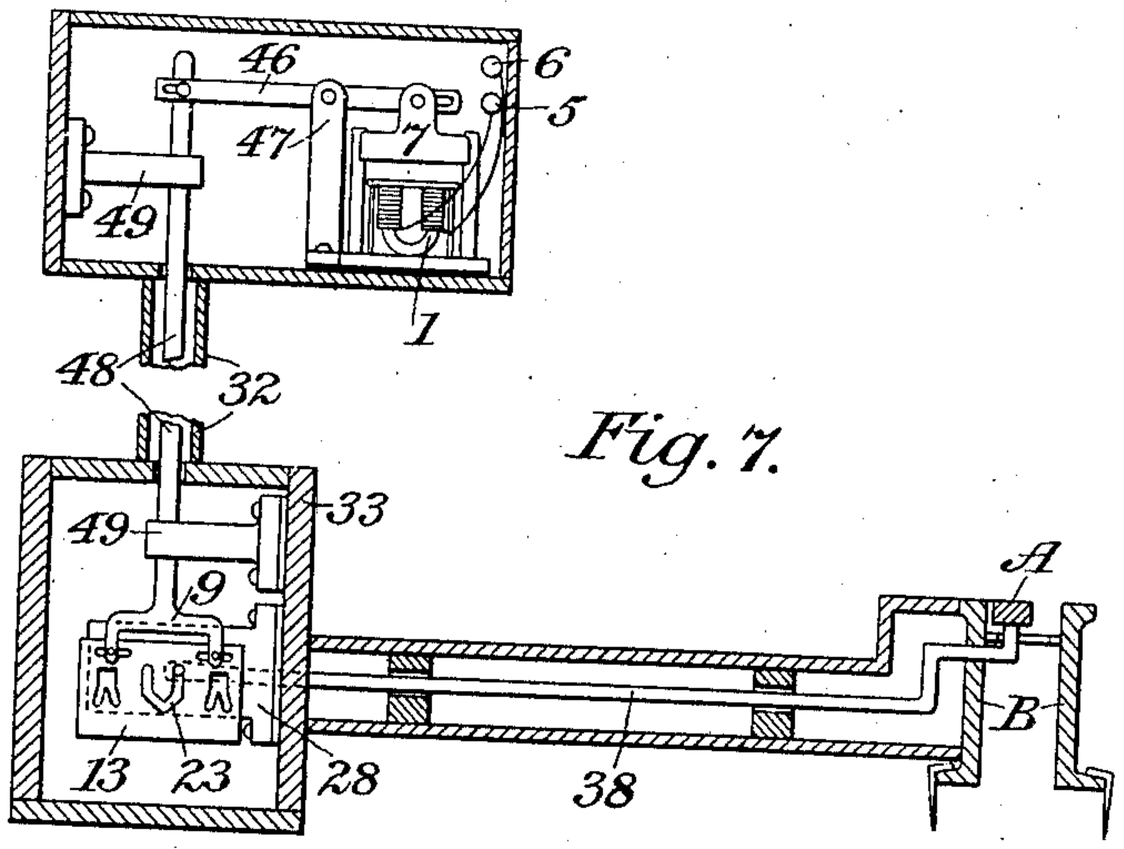


Fig. 7.

Fig. 8.

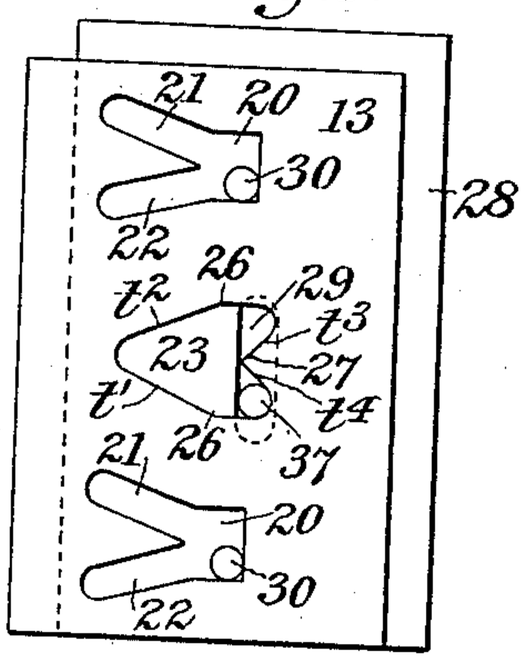


Fig. 9.

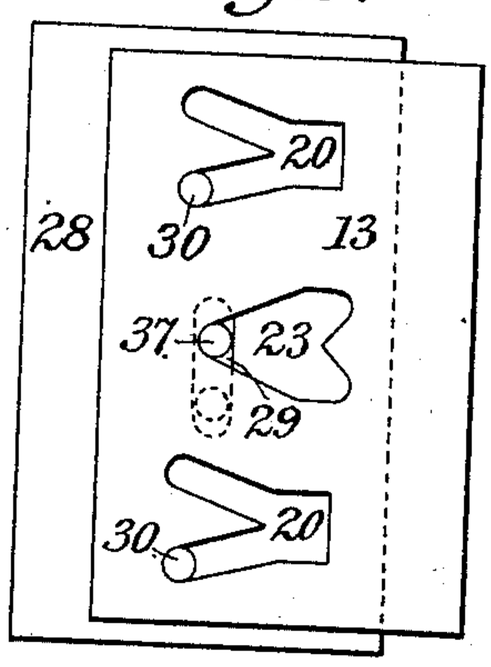


Fig. 11.

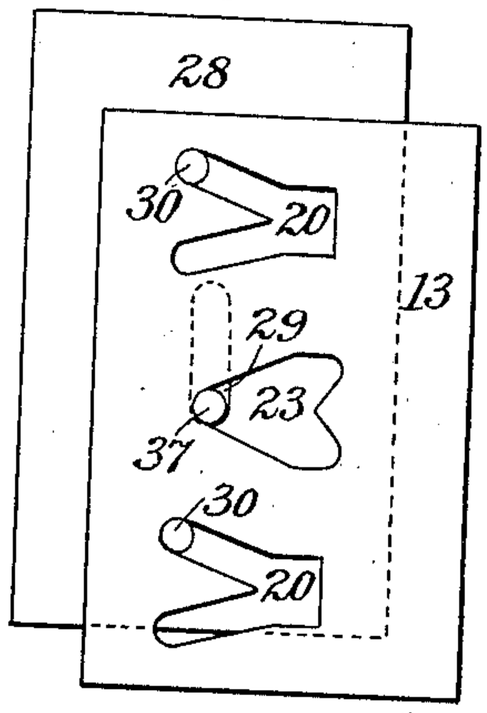
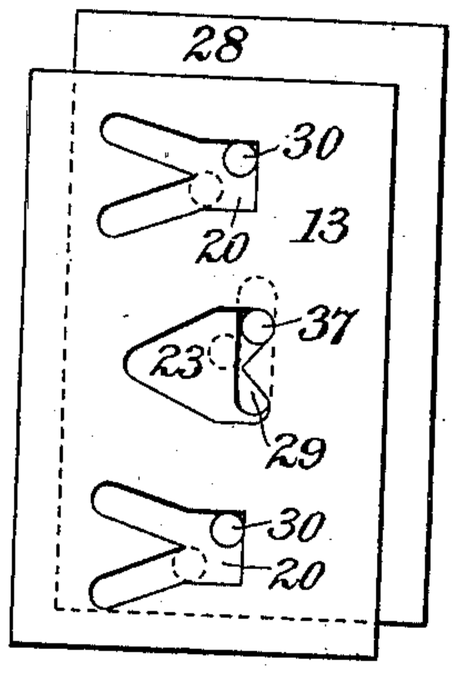


Fig. 10.



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UNITED STATES PATENT OFFICE.

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SWITCH.

No. 829,630. Specification of Letters Patent. Patented Aug. 28, 1906.

Application filed July 13, 1903. Serial No. 165,351.

To all whom it may concern:

Be it known that I, ROY V. COLLINS, a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Switches, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to railway-switches and to means for operating the same for the purpose of shunting a car or a train of cars, from one line to another or from the main line to a side track or turnout, and it has particular reference to the switches of electrically-operated railways and to means for moving the switches and setting them to a desired position by electric power taken from the main conductor and deflected to an electromagnet connected with the switch by the passing of the trolley-contact to an insulated section of the main conductor while the car is driven by the motor.

The object of the invention is to provide simple and direct-acting mechanism for transmitting the motion of the armature of the magnet to the switch and moving it in opposite directions alternately upon successive energizations of the magnet.

A further object of the invention is to provide an automatic switch-operating mechanism that will permit the switch to be moved and set from the car in the usual manner if it should be necessary to do so.

In the accompanying drawings, Figure 1 represents a top view of the mechanism by which the motion of the armature of the electromagnet is transmitted to the switch. Fig. 2 is a front elevation of the same, the casing being shown partly in section. Fig. 3 is a sectional side elevation of the connections between the mechanism that transmits the motion and the switch. Fig. 4 represents the electric connections between the magnet and the main conductor or wire. Fig. 5 is a plan view of the switch and the transverse rod by which the motion of a vertical rod, which is operated by the electric mechanism, is transmitted to the switch the casing for the transverse rod being in section. Fig. 6 is a diagrammatic representation of the mechanism, its connections with the switch, and the electric connections with the main conductor. Fig. 7 represents a modification of the arrangement by which the motion of the armature is transmitted to the switch. Figs. 8 to 11 are diagrammatic representations of a portion of the mechanism that transmits the motion of the electromagnet to the switch.

Referring to the drawings, A designates a switch pivoted to a switch-plate B, which connects with the track-rails in the usual manner.

D is one of the trolley-wire poles that are set alongside the track, this particular one being located near the switch, so that the box or case containing the switch-operating mechanism can be attached to it, thus making it unnecessary to provide a special support for the purpose.

E is the main or trolley wire, and F one of the cross-wires that extend across the track from post to post on opposite sides and which support the main or trolley wire.

The mechanism by which the switch is shifted to shunt the car from one track to another at a siding or at the junction of the tracks of two roads is inclosed in a box or case G, which is hung on a trolley-pole D by means of collars *a a*, placed on the pole to which it is fastened, or it may be otherwise supported a suitable distance from the track at one side, preferably immediately opposite the switch which the mechanism it contains is intended to operate.

Inside of the box there is an electromagnet 1, supported by a frame 2, fastened to one side of the box. The wires 3 4 of the magnet are connected with binding-posts 5 6 inside the box, and these in turn are connected with the trolley-wire E, as will be further and more fully described presently.

The numeral 7 designates the armature of the magnet, which has a shank 8 projecting from it that carries a yoke 9. The ends 10 10 of the armature are slotted to receive the guide-rods 11 11, that project inward from the sides to which they are fastened by screws, as shown. The end of the yoke 9 is bifurcated, and the guide-bars 11 11 pass through the bifurcations, while the extremities of the bifurcations embrace the right-hand edge of a plate 13 and are connected with the plate by pins 14 14, passed through elongated slots 15 15, formed in the adjacent part of the plate, the plate thus being permitted to move lengthwise to a limited extent. In this way the armature is held and

guided by means of the guide-bars, and the plate 13, being connected with the armature, receives motion from it when it is attracted to the magnet. The plate is returned by any suitable means, and in the construction shown by a spring 16, fastened to one side of the box and engaging a strap 17, connected with clevises 18 18, the pins of which are passed through elongated slots 19 19 in the bottom part of the plate. Formed in the plate are two Y-shaped slots 20 20 and a heart-shaped slot 23. The Y-shaped slots comprise recesses 21 and 22 and a portion 20 uniting the recesses, which is of a substantially rectangular shape, thus forming a square space or opening 24 instead of an angle, as would be the case were the outer sides or edges of the branches extended to the closed end in straight lines. The heart-shaped slot 23 is broader than slots 20 20, and the upper and lower edges are bent abruptly at 26 26, from which point they are continued to the ends of the slot in straight lines perpendicular to the side edges of the plate. Between the straight sides of the slot 23 is a short V-shaped tongue 27.

Behind or beneath the plate 13 is another immovable plate 28, supported in place by having one end fastened to one side of the box by means of screws or other suitable devices. This plate has an elongated slot formed in it, and at opposite points beyond the ends of the opening on a line parallel with the edges of the plate there are pins 30 30, projecting from the face of the plate 28, and which rest in each of the Y-shaped slots 20 20, respectively.

Back of the fixed plate 28 there is a vertical rod or link 31, that extends down through the bottom of the box and through a suitable casing 32 to a box or casing 33 underground, where it is pivoted to one arm of a bell-crank lever 34, fulcrumed to a casting 35, attached to the casing. The other end of the bell-crank lever is connected to the switch A by a rod or link 38. Suitable guides 36 are placed in the casing 32 for the rod. Inside the box near its upper end the rod carries a pin 37, that projects from it horizontally and is passed through the elongated opening 29 in the plate 28 and is entered into the slot 23. The rod 31 is thus made to form a link between the switch A and plate 13.

The plate 13 forms a connection between the armature of the electromagnet and the switch, and the function of this connection is to transmit the motion of the armature when it is attracted by the magnet to the switch first in one direction to move the switch from the position where, say, it leaves the track open to a passing car to the position where it shunts the car to another line or siding, and, upon the next actuation by the magnet, in the opposite direction, thus moving the switch back to its first position. The two movements of the plate are brought about by successive energizations of the electromagnet with intervals of demagnetization between, during which the plate is automatically returned to one of two normal positions.

The slots 20 20 and the pins 30 30, projecting into them from the fixed plate, are intended to give a longitudinal movement to the link-plate 13 when it is moved by the action of the electromagnet and armature in one direction and by the spring or equivalent means in the opposite direction, the slots moving against the pins and the pull of the armature combining to produce an oblique or diagonal motion of the plate, and these slots and pins are hereinafter referred to as the "guiding means" for the plate. These guiding means, combined with the peculiar pin-and-slot connection between rod 31 and plate 13, serve upon the successive movements of the plate to move rod 31 first in one direction and then in the other direction, as will be more fully explained presently.

The electric connections of the switch-moving mechanism with the main or trolley wire and the means by which they are caused to act will now be described.

At a point a greater or less distance from where a switch is located a bridge-wire 40 is laid over or alongside of the main or trolley wire E, and its ends are connected with breakers 41 42, that insulate the part E of the main wire between them, so that the current leaves the main wire and flowing through the bridge-wire returns to the main wire on the opposite side of the second breaker. Between the breakers and adjacent to the second one a wire 43 is connected with the upper side of the main wire, while the other end is attached to one of the binding-posts in the box. Another wire 44 has one end attached to the upper side of the main wire beyond the second breaker and the other end connected with the other binding-posts in the box. Hence the part of the main wire between the breakers being perfectly insulated the current cannot pass to the electromagnet until this part is brought into a circuit. This occurs when the traveling contact (indicated by the numeral 45) passes the breaker 41 and reaches the insulated part of the wire beyond the breaker, whereupon a circuit is made from the main wire beyond the breaker 42 through the wire 44 to the magnet, then through wire 43 to the part of the main wire between the breakers, and thence through the traveling contact to the motor and rail, as indicated by the arrows.

The operation of throwing the switch will now be described, and for this purpose the movements of the plate 13 will be discussed in detail, reference being had to Figs. 2, 8, 9, 10, and 11. It should first be observed that the plate 13 is loosely supported—that is, it

is mounted so as to have a limited freedom of movement in any direction and no point of said plate is fixed, as would be the case, for instance, were the plate designed to rotate. When the plate moves, accordingly, all of its points move in the same direction and through the same distance, the plate having, in other words, a motion of translation and no rotation. The means for translating the plate or giving to it the movement referred to comprises, with the prime mover, which has a double engagement with the plate, the slots in the plate heretofore referred to, the pins which work in the slots to guide and shift the plate, and the pin 37.

Starting with the plate in the position which it is seen to occupy in Fig. 2 and in the diagram of Fig. 8 the plate is drawn to the right, Fig. 2, by the actuating member 9, under the influence of armature 7, which is controlled by the magnet 1. Since the rod or link 31 can have no lateral movement, but only a vertical movement, and since the pins 30, traveling in recesses 22, prevent the plate from moving freely up or down, the pin 37 will travel upon the lower limb t' of slot 23 and the rod 31 will be raised and the switch-tongue shifted to the right. (See Fig. 3.) Accordingly it will be seen that the lower limb t' of slot 23 serves as a track upon which the pin 37 may travel to shift the rod 31, and consequently the switch.

When the plate has reached the limit of its movement to the right, the parts are in the position indicated in the diagram of Fig. 9. It will be observed that during the motion of the plate to the right just described said plate was moved upward slightly by the travel of pins 30 in the inclined recesses 22. The plate now being released by the magnet 1 the spring 16 pulls it toward the left, and on account of the recesses 22, in which the pins 30 work, it will be swerved downwardly just enough to cause the end of projection 27 to strike beneath the pin 37. The latter being prevented from moving upward, and therefore being relatively fixed on account of the position of the switch against the rail, the plate upon its further return movement will be shifted by the engagement of pin 37 by the limb t^3 of slot 23. Fig. 10 illustrates in dotted lines the position of the parts just as the point of projection 27 strikes below the pin 37, while the full lines show the position of the parts when the plate finally comes to rest and as these parts are just previous to the next actuation of the plate by the prime mover or actuating member 9. When this next actuation of the plate occurs, Fig. 11, the pin 37 will travel upon the upper limb t^2 of the slot 23, the pins 30 in the recesses 21, and the rod 31 will be moved down. When the plate is released by the magnet and is drawn back by spring 16, the point of the projection 27 will be carried above the pin 37 (which in the position now under consideration is at the limit of the downward movement) and the pin 37 will engage the limb t^4 of slot 23 and will cause upon the further return movement of the plate the shifting of said plate upwardly until the plate finally comes to rest again in the position shown in Figs. 2 and 8. It will accordingly be seen that the limbs t' and t^2 of slot 23 form a cam-track having two oppositely-inclined portions upon which the pin 37 may travel to cause the shifting of the rod or link 31, and consequently the alternating backward and forward movement of the switch, and also that the limbs t^3 and t^4 of said slot form a second track which has two oppositely-inclined portions and which the pin 37 in a relatively fixed condition engages to cause a shifting of the plate. Furthermore, it will be seen that the slots 20, with the two recesses 22 and 21 and the pins 30, serve to guide the plate after each actuation of the prime mover to bring the plate-shifting or cam track and the pin 37 into the proper relation. Accordingly, for the sake of clearness, the slots 20, with the recesses 22 and 21 and the pins 30, will be referred to as "guiding means" for the plate, while the track t^3 and t^4, coöperating with the pin 37, will be referred to as the "plate-shifting means."

It will be obvious that one of the slots 20, having the two recesses 22 and 21, would be sufficient to perform the functions assigned to both of these slots; but it is preferable to employ two, one at each end of the plate, inasmuch as the plate is more evenly balanced and less liable to get out of order. It will also be obvious that the slot 23, as well as the slots 20; may be variously arranged upon the plate without affecting in any way the proper performance of the functions of the plate. Furthermore, it will be understood that the slots in the plate may be replaced by tracks formed upon the plate in case it should be so desired. Many other changes may also be made in the specific construction of the plate without departing from the invention.

A modification of the invention is represented by Fig. 7. In this the armature 7 is connected with a lever 46, fulcrumed to the side of the box at 47. The lever is connected with the vertical bar 48, which is held in guides 49 49 and slides freely up and down when the armature is attracted to and released by the magnet. The lower end of the bar 48 carries the yoke 9, which connects with the plate 13, which in this construction is located in the case 33 in line with the horizontal bar 38, that extends transversely through a box or casing underground to the switch-plate B and connects with the switch A from underneath, as shown. The fixed plate 28, that carries the pins 30 30, is attached to the side of the casing, and the pins

enter the slots 20 20 in the same manner as heretofore described; but the movable pin 37 is on the end of the transverse bar 38, and thus a bell-crank-lever connection is not required, and the action of the slot 23 on the bar 38 is direct. The weight of the bar 48 and the plate 13 is relied upon to return the plate to its normal position, and thus the spring 16 is dispensed with.

By connecting the armature with a lever the necessary motion of the plate 13 for shifting the switch is obtained with a very small motion of the armature. As the distance the magnet will attract the armature is limited it may not be possible to move the plate 13 the required distance when connected directly with the armature, and to give it a greater movement the armature may be connected with a lever and the lever connected with the plate 13, whereby the length of the movement of the end of the lever that connects with the plate will determine the movement of the plate. This construction may be applied to the armature and plate shown in Figs. 1 and 2 as well as the arrangement shown by Fig. 7. In this modification as the plate 13 is parallel to the rod 38 the box G will be hung on the post, so as to face up or down the track instead of facing the track, as in the construction previously described.

If the switch is in the right position for the car—that is, if it is in the position shown in Fig. 3, so that the car will leave the line it is on and enter another line and no shifting of the switch is desired—when the car arrives at the first breaker the current is shut off and the car allowed to pass the two breakers and enter the other line by its own momentum.

The breaker and bridge-wire are located some distance—say seventy-five feet, more or less—from the switch in the direction the car approaches the switch, as indicated by Fig. 4, so that the shifting of the switch can be effected before the car arrives at the switch, and, furthermore, when the switch is not to be changed the shutting off of the power can be done at a distance from the switch and the car pass the switch with the power on.

The invention is not limited to an electric circuit taken from the main wire for operating the switch, as it may be taken from the rail or from any outside source, if desired.

The slots that engage the pins and move the plate when the armature is attracted by the magnet may be differently shaped to perform their functions. Those that engage the fixed pins 30 30 may have their limbs perpendicular to the side edge of the plate, while the slot that engages the movable pin 37 may remain substantially V-shaped, or the latter may be substantially rectangular with the tongue projecting into the same to divide the slot into two parts on one side for the movement of the pin up and down and the slots 20 20 may be formed substantially V-shaped. In the first-mentioned arrangement of these slots the plate would not be moved obliquely, but in a straight line, and the slot 23 would be shaped so as to produce the up-and-down movement of the pin and the bar to shift the switch. Furthermore, the electromagnet and the plate may be placed underground alongside of the switch-plate and connected directly with the switch by means of a rod.

I claim as my invention—

1. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch and engaging the plate, and means for translating the plate to shift its position with respect to the link.

2. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch and engaging the plate, and means for translating the plate obliquely after each actuation thereof by the actuating member to shift its position with respect to the link.

3. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch and engaging the plate, and means to translate the plate alternately first toward one side and then toward the other side to shift its position with respect to the link.

4. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch and engaging the plate, an inclined track on the plate adapted to engage a relatively fixed part to shift the position of the plate with respect to the link.

5. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch and engaging the plate, a track with two oppositely-inclined portions on the plate adapted to engage a relatively fixed part to shift the position of the plate with respect to the link.

6. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch and engaging the plate, a track with two oppositely-inclined portions on the plate adapted to engage a relatively fixed part to shift the position of the plate with respect to the link, and means for causing each portion of

the track to be engaged alternately by the fixed part after each successive actuation of the plate by the actuating member.

7. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, a pin-and-slot connection between the link and the plate, and means for translating the plate obliquely after each actuation thereof by the actuating member to shift the position of the slot with respect to the pin.

8. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, a pin-and-slot connection between the link and the plate, and means to translate the plate alternately first toward one side and then toward the other side to shift the position of the slot with respect to the pin.

9. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by the actuating member, a switch, a link operatively connected with the switch and engaging the plate, an inclined track on the plate adapted to engage a relatively fixed part to shift the plate with respect to the link, and means for guiding the plate to bring said track and fixed part into the proper relation.

10. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by the actuating member, a switch, a link operatively connected with the switch engaging the plate, an inclined track on the plate adapted to engage a relatively fixed pin on the link to shift the plate with respect to the link, and means for guiding the plate to bring said track and pin into the proper relation.

11. In a railway-switch, the combination of an actuating member, a plate having a slot therein engaged by the actuating member, a switch, a link operatively connected with the switch and engaging the plate, a pin on said link and working in the slot, whereby the plate may be shifted with respect to the link, and means for guiding the plate to bring the slot and pin into the proper relation.

12. In a railway-switch, the combination of an actuating member, a plate having a heart-shaped slot and a Y-shaped slot therein, a fixed pin in the Y-shaped slot, a switch, a link operatively connected with the switch, a pin upon the link and resting within the heart-shaped slot whereby the plate may be shifted with respect to the link and whereby the link may be shifted with respect to the plate.

13. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, a cam-track upon the plate and adapted to engage the link, and means for translating the plate to change the position of the track with respect to the link.

14. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, a cam-track with two oppositely-inclined portions upon the plate and adapted to engage the link, and means for translating the plate to change the position of the track with respect to the link.

15. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, a cam-track with two oppositely-inclined portions upon the plate, a pin upon the link and adapted to engage the track, and means for translating the plate to change the position of the track with respect to the pin.

16. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, a cam-track upon the plate adapted to engage the link, a second track upon the plate adapted to engage a relatively fixed part for shifting the plate to change the position of the cam-track with respect to the link, and means for guiding the plate to bring the second track and fixed part into the proper relation.

17. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, a cam-track with two oppositely-inclined portions upon the plate adapted to engage the link, a second track upon the plate adapted to engage a relatively fixed part for shifting the plate to change the position of the cam-track with respect to the link, and means for guiding the plate to bring the second track and fixed part into the proper relation.

18. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, a cam-track with two oppositely-inclined portions upon the plate, a pin upon the link adapted to engage the track, a second track upon the plate adapted to engage the pin for shifting the plate to change the position of the cam-track with respect to the pin, and means for guiding the plate to bring the second track and pin into the proper relation.

19. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, said plate having a slot with two tracks each track having two oppositely-inclined portions, and a pin on the link adapted to engage one of the portions of one of the tracks when

the plate is actuated by the actuating member whereby the link is moved in one direction, and then to engage one of the portions of the other track whereby the plate is shifted to bring the other portion of the first track into engagement with said pin, so that upon the next actuation of the plate the link will be moved in the opposite direction and the plate will be shifted to its first position.

20. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, said plate having a slot with two tracks each track having two oppositely-inclined portions, a pin on the link and adapted to engage one of the portions of one of the tracks when the plate is actuated by the actuating member whereby the link is moved in one direction, and then to engage one of the portions of the other track whereby the plate is shifted to bring the other portion of the first track into engagement with said pin, so that upon the next actuation of the plate the link will be moved in the opposite direction and the plate will be shifted to its first position, and means for guiding the plate-shifting track and the pin into the proper relation.

21. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch and engaging the plate, means to shift the plate to change its position with respect to the link, said plate having a guide-slot with two recesses, and a fixed pin in said slot.

22. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch and engaging the plate, means to shift the plate obliquely after each actuation thereof by the actuating member to change its position with respect to the link, said plate having a guide-slot with two recesses, and a fixed pin in said slot.

23. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch and engaging the plate, a track with two oppositely-inclined portions on the plate adapted to engage a relatively fixed part to shift the position of the plate with respect to the link, said plate having a guide-slot with two recesses, and a fixed pin in said slot for guiding the plate to cause each portion of the track to be engaged alternately by the fixed part after each actuation of the plate.

24. In a railway-switch, the combination of an actuating member, a freely-supported plate engaged by said member, a switch, a link operatively connected with the switch, said plate having a cam-slot with two tracks each track having two oppositely-inclined portions, a pin on the link adapted to engage one of the portions of one of the tracks when the plate is actuated by the actuating member whereby the link is moved in one direction and then to engage one of the portions of the other track whereby the plate is shifted to bring the other portion of the first track into engagement with said pin so that upon the next actuation of the plate the link will be moved in the opposite direction and the plate will be shifted to its first position, said plate also having a slot with two recesses, and a fixed pin in said slot for guiding the plate to cause each portion of the plate-shifting track to be engaged alternately by the first-named pin after each actuation by the actuating member.

25. The combination of a bar having two opposite motions, an electromagnet, an armature therefor and an element moved by said armature on its forward stroke, said bar and element having engaging surfaces whereby the movement of the element will cause the bar to move, a cam-surface and a projection operating against the same, one of which is carried by said element, the projection being adapted to engage with said cam-surface when the armature makes its back stroke to shift the relative positions of said element, and bar, for the purpose set forth.

This specification signed and witnessed this 9th day of July, A. D. 1903.

ROY V. COLLINS.

In presence of—

JOHN M. SCOBLE,

LUCIUS E. VARNEY.