

(No Model.)

2 Sheets—Sheet 1.

J. F. McLAUGHLIN.
ELECTRIC RAILWAY.

No. 544,863.

Patented Aug. 20, 1895.

Fig. 1.

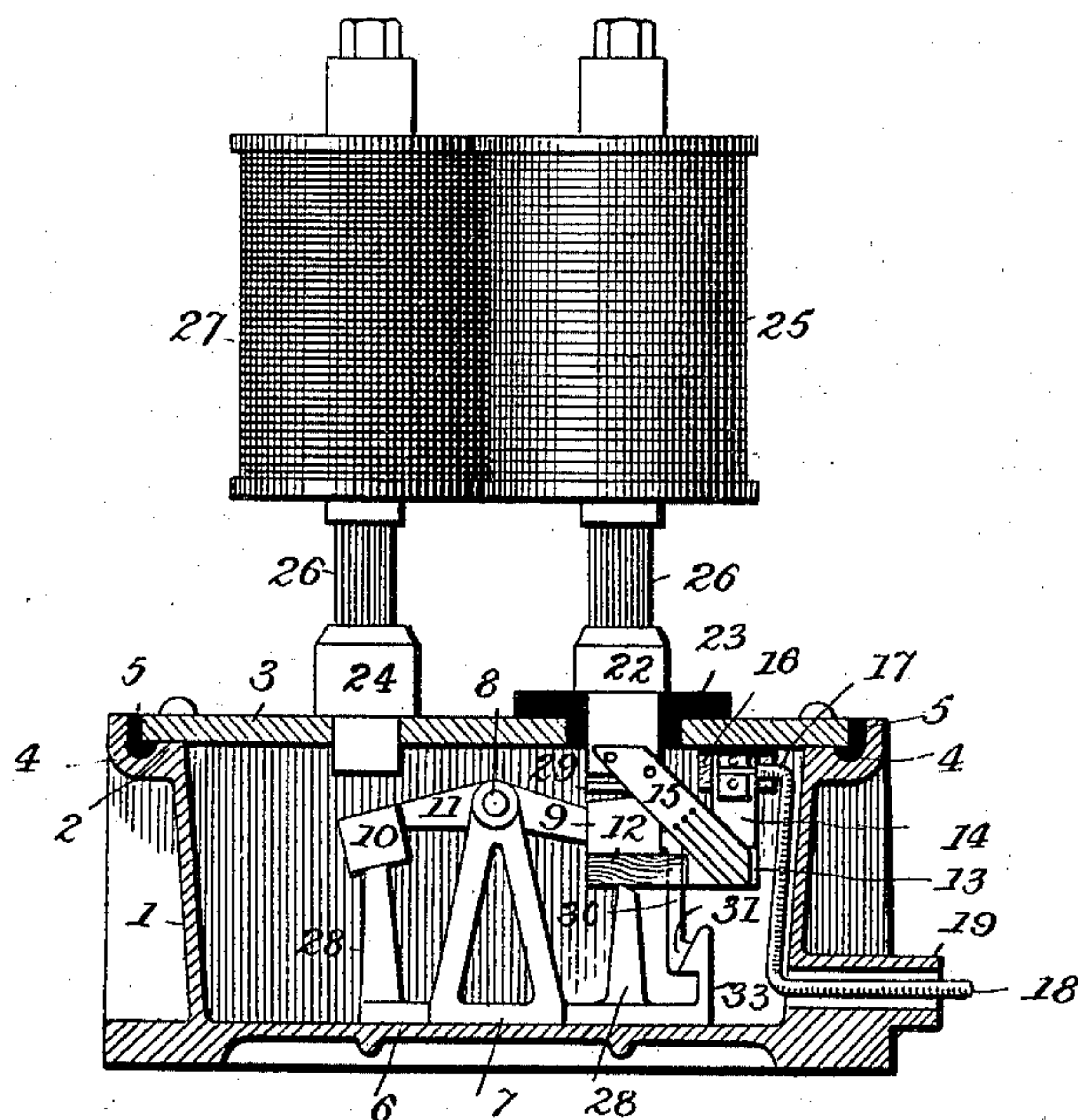


Fig. 2.

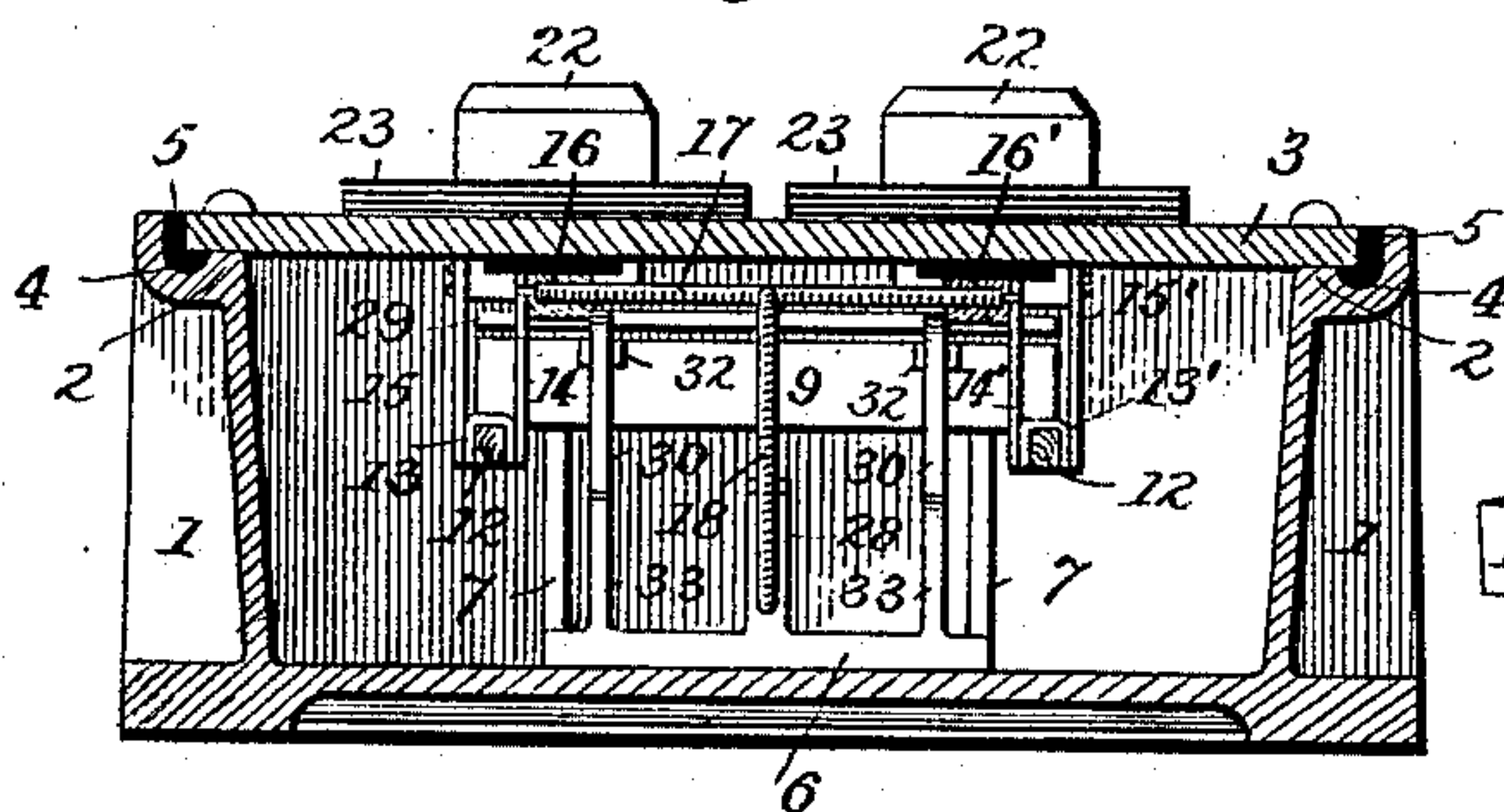


Fig. 3.

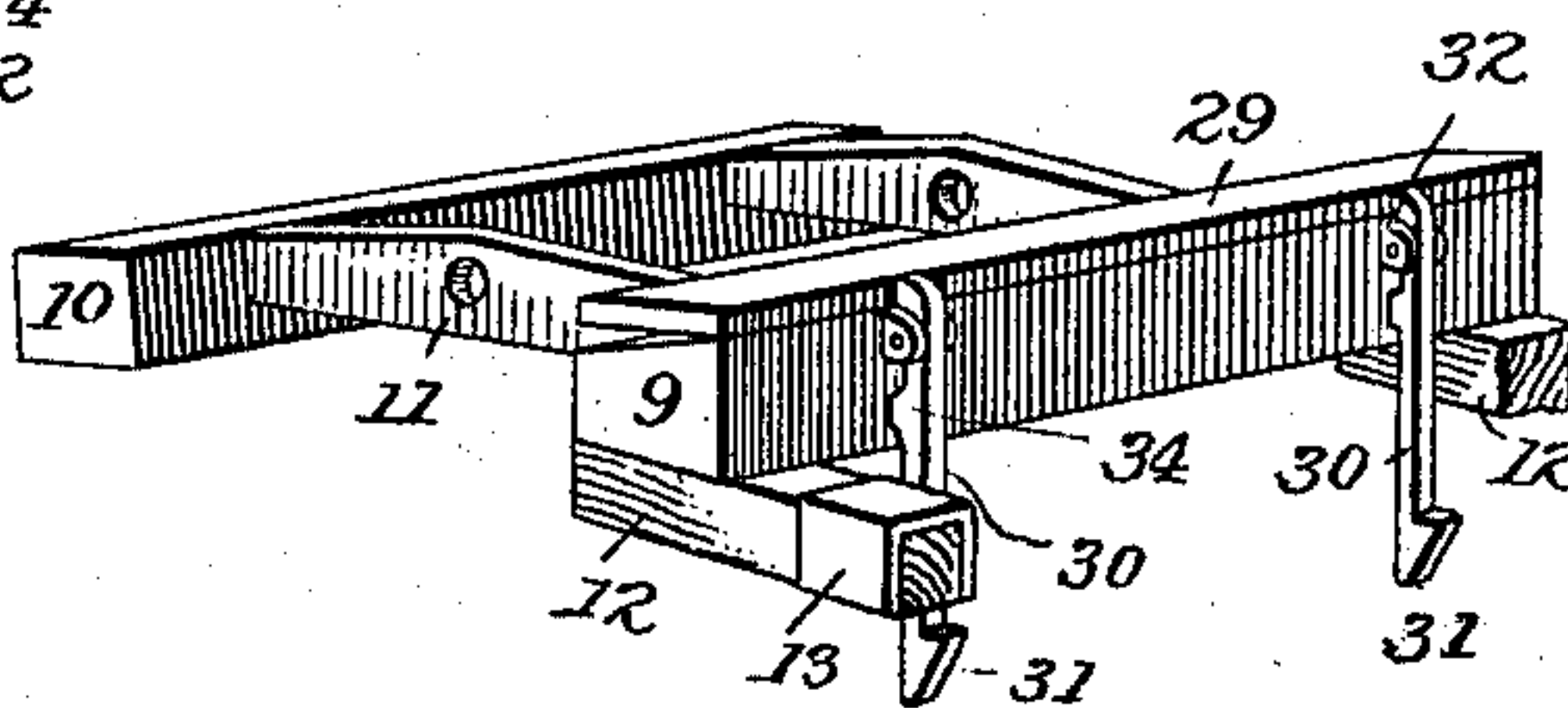
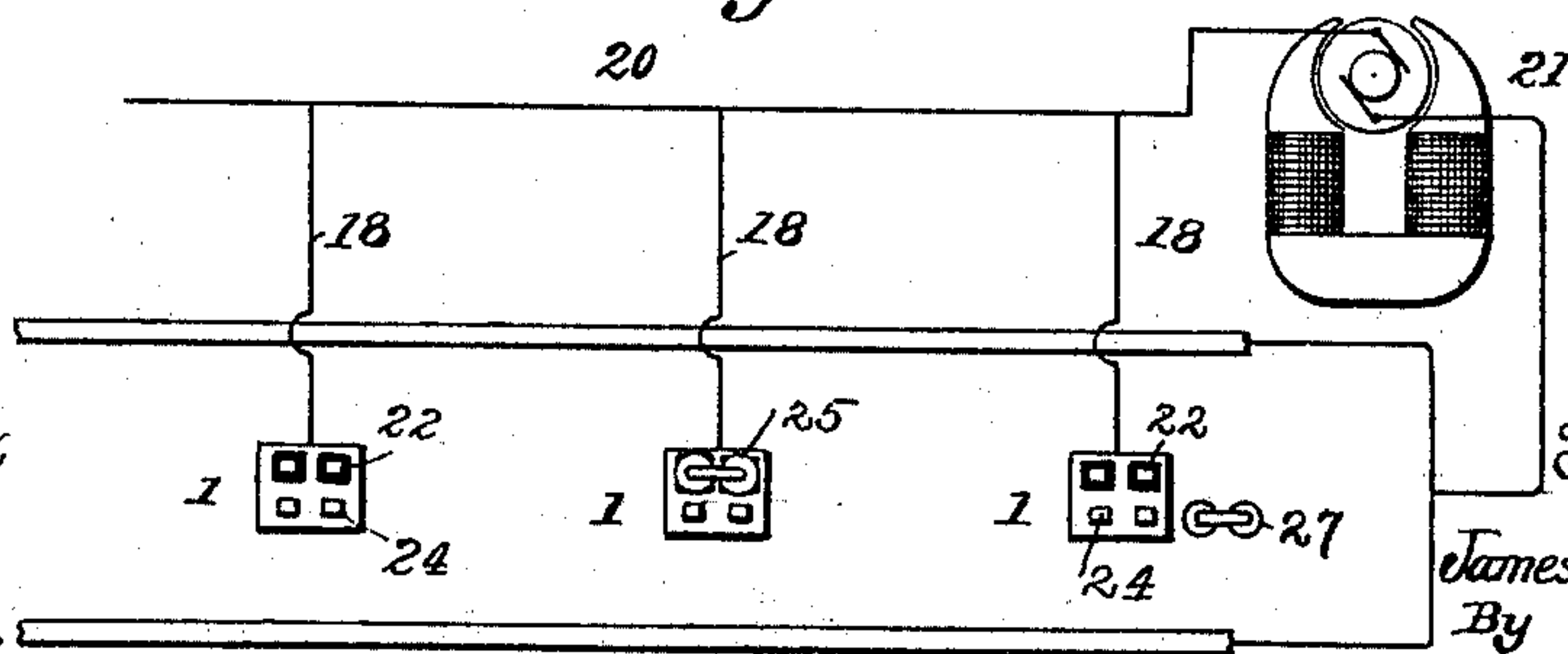


Fig. 6.



Witnesses,
J. F. Hinkel
J. T. Chapman.

Inventor,
James F. McLaughlin
By
Joseph H. Hinkel
Attorney.

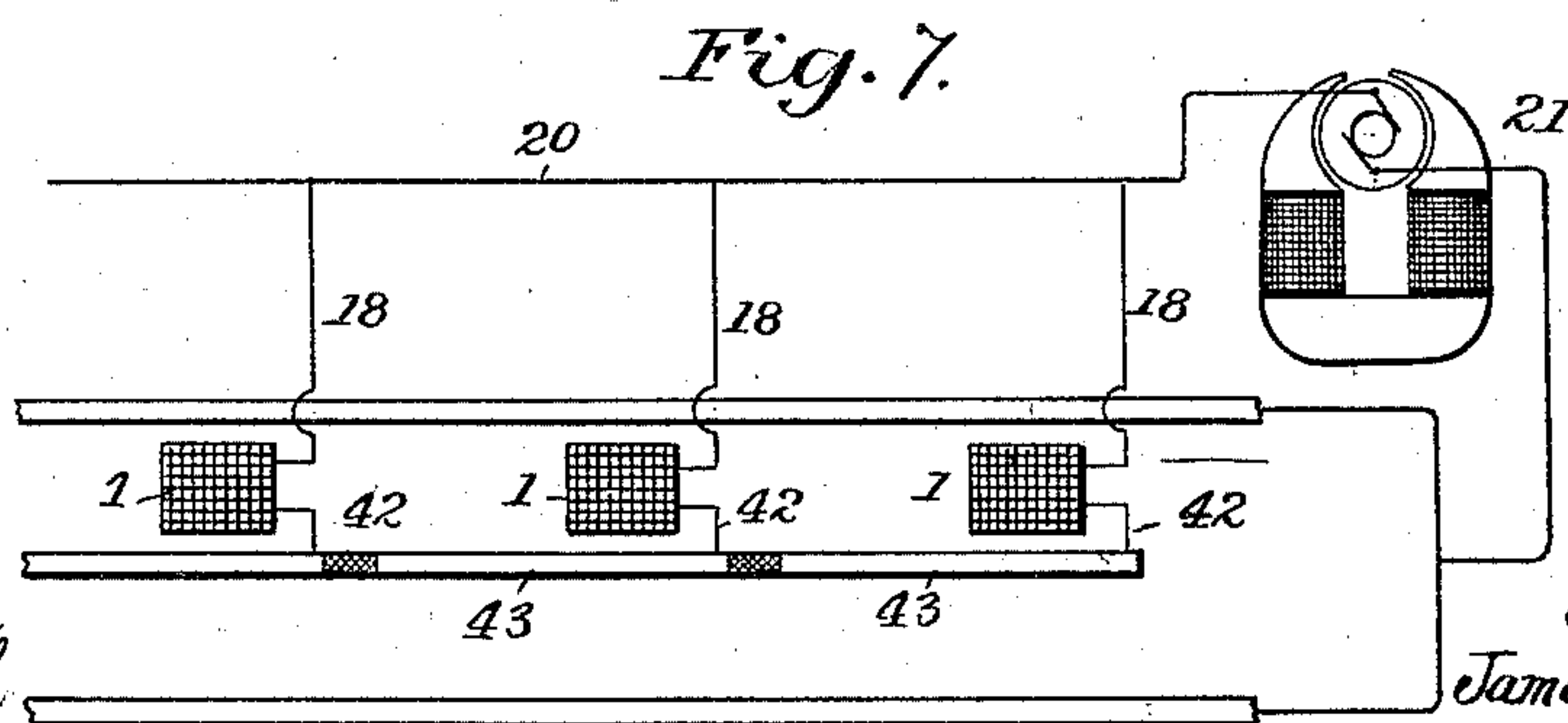
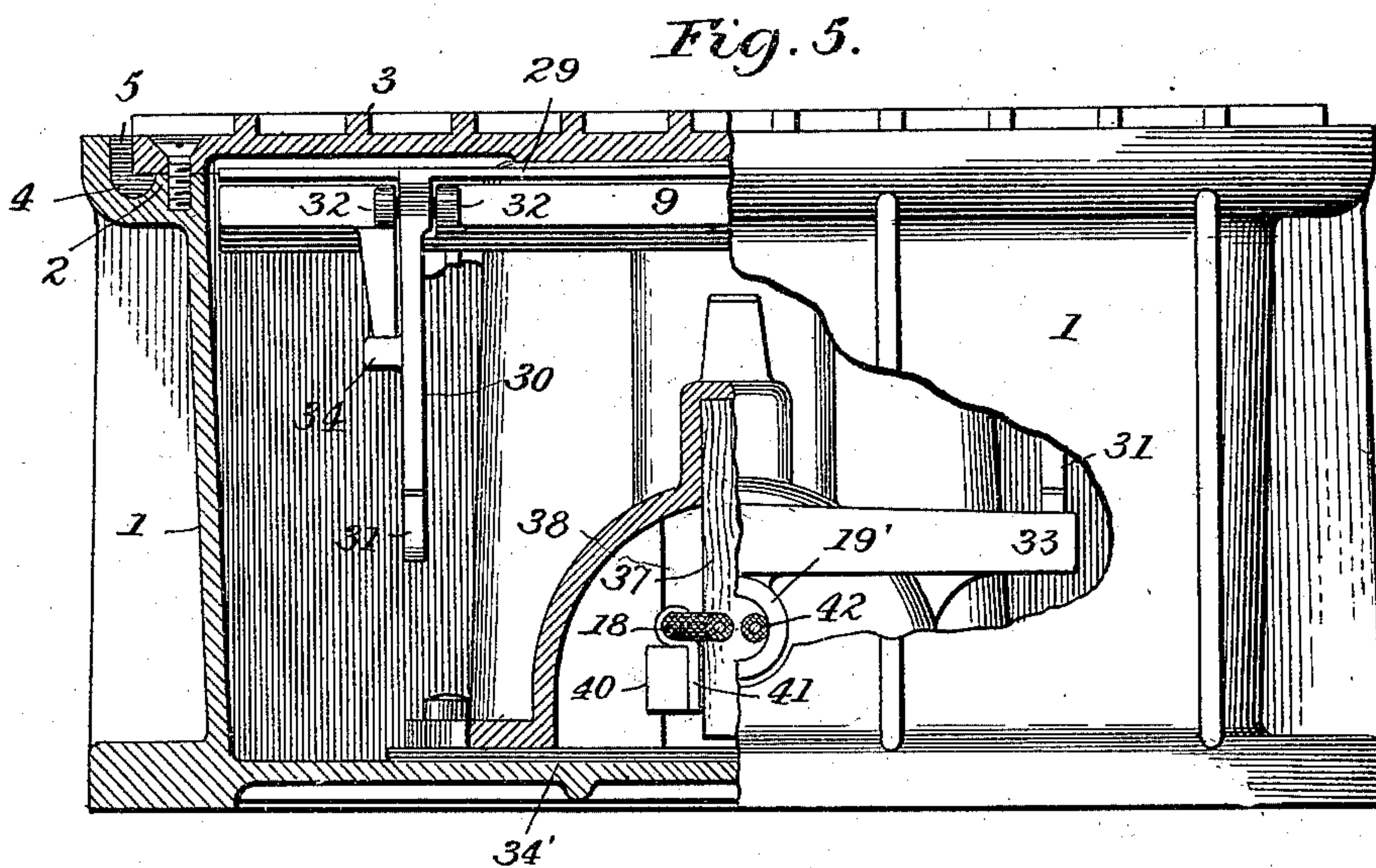
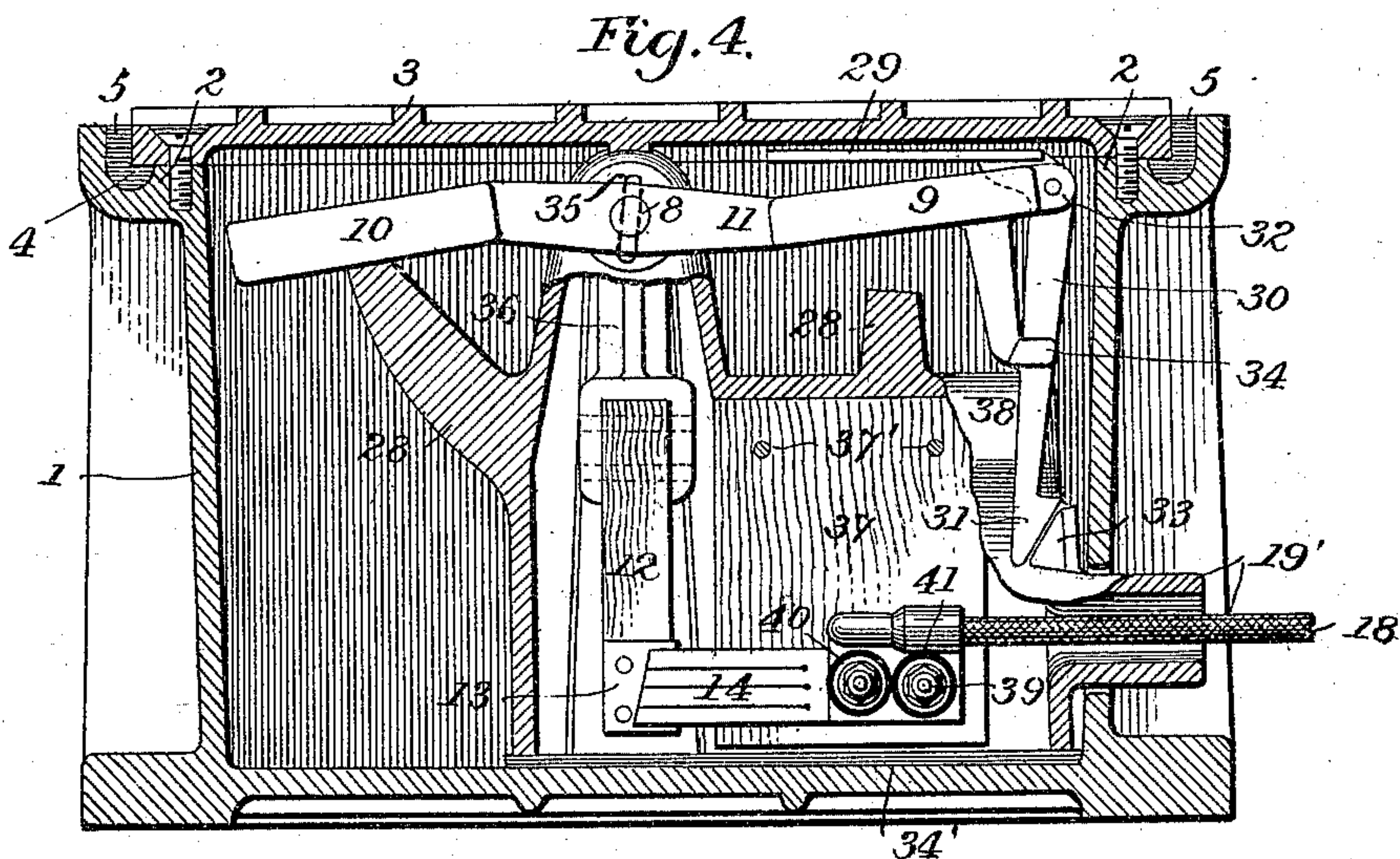
(No Model.)

2 Sheets—Sheet 2.

J. F. McLAUGHLIN.
ELECTRIC RAILWAY.

No. 544,863.

Patented Aug. 20, 1895.



Witnesses
J. F. Hinkel
J. F. Chapman

Inventor
James F. McLaughlin
By
Joseph Lyons
Attorney.

UNITED STATES PATENT OFFICE.

JAMES F. McLAUGHLIN, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 544,863, dated August 20, 1895.

Application filed May 3, 1895. Serial No. 548,015. (No model.)

To all whom it may concern:

Be it known that I, JAMES F. McLAUGHLIN, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

This invention has reference to improvements in electric railways in which underground switches for coupling a supply conductor to feeding conductors or contacts are operated by traveling electromagnets carried upon the motor-cars.

The main object of this invention is to provide an underground switch which will be positively locked when in the open position, and which will be unlocked and closed only when covered by a motor-car.

In the practical embodiment of the present invention it is found advantageous to employ balanced switch-levers, each having two armatures, each in the vertical plane of the path of one of two traveling electromagnets, one magnet acting on one set of armatures to close the switches and the other magnet acting on the other set of armatures to open the switches, the said magnets being placed at the front and rear, respectively, of the motor-car. Each switch-lever is provided with a gravity latch and a supplemental armature which is acted upon by the forward electromagnet to unlock the switch, after which the same magnet operates to close the switch. The other magnet acts directly to open the switch, which latter operation moves the latch into a position whereby it falls by gravity behind a catch and thereby locks the switch. All this will more clearly appear from the following detailed description, taken in connection with the accompanying drawings, in which—

Figure 1 is a cross-section of a switch-box constructed in accordance with the present invention with the traveling switch-operating magnets shown in elevation. Fig. 2 is a section of the switch-box at right angles to that shown in Fig. 1. Fig. 3 is a perspective view of the switch-lever. Fig. 4 is a cross-section of a switch-box constructed in accordance with the present invention and more particularly adapted to a road in which ex-

posed sectional feeding-conductors are used. Fig. 5 is a section, partly in elevation, at right angles to that shown in Fig. 4; and Figs. 6 and 7 are diagrams illustrating the circuit connections of an electric-railway system using switch-boxes constructed in accordance with the present invention.

Referring to the drawings, and more particularly to Figs. 1, 2, and 3, there is shown a rectangular switch-box 1, the side walls of which flare slightly from the bottom upward and terminate in a ledge 2, on which rests, and to which is secured by screws or otherwise, the cover 3. Exterior to the ledge there is formed a channel 4, the outer wall of which is a continuation of the sides of the box and rises to the level of the top surface of the cover, thereby forming a receptacle for waterproof cement 5, which serves to seal the joint between the cover and the box. Secured to the bottom of the box and within the latter is a base-plate 6, from opposite sides of which rise standards 7, receiving at their upper ends a pivot bolt or rod 8, on which the switch-lever is mounted. This switch-lever, which is best shown in Fig. 3, is composed of two iron bars 9 10, joined near their ends by cross-pieces 11, centrally perforated for the passage of the pivot-bolt 8. The bar 9 carries near each end an insulating-block 12, fast on its under face and projecting laterally therefrom. Each insulating-block has near its outer end a U-shaped metal strip or jack 13, adapted to enter between and bridge the projecting ends of two metal brushes 14 15 and 14' 15', respectively. The brushes 14 and 14' are secured to insulating-blocks 16 16', fast on the under face of the cover 3, and these two brushes are connected in multiple arc by a conductor 17 to a branch conductor 18, entering through a neck 19, formed in one side of the switch-box, the said branch conductor coming from a supply-conductor 20, (see Fig. 6,) fed by a generator 21, located at the central station. The other two brushes 15 15' are fast on the lower ends of two iron contact-blocks 22 and these blocks are mounted on, but insulated from, the cover 3, each block having its lower end projecting into the interior of the box close to the bar 9. The insulating material 23, interposed between these blocks and the box-cover, is indicated by appropriate

shading. It will be seen that the switch-lever operates two switches in multiple, thus preventing or greatly reducing the sparking when the circuit is ruptured. There are two other iron blocks 24 24 on the box-cover and these blocks also project through the cover with their lower ends close to the bar 10. The two blocks 22 are in line with each other and in the vertical plane of the line of travel of an electromagnet 25, preferably of the horse-shoe type and having its pole-pieces provided with iron-wire brushes 26, which, as the magnet passes over the switch-box, make contact with the exposed faces of the contact-blocks 22, by which these contact-blocks constitute temporarily-extended pole-pieces of the magnet, thus causing the attractive force of the magnet to be exerted under the most favorable conditions—that is, the pole-pieces of the magnets are brought into close relation to the bar 9, which thus becomes an armature for this magnet. The action of the magnet 25, which is placed at or near the front of the motor-car or car-truck, is to draw the armature 9 toward the contact-blocks 22 until the jacks 13 have closed the circuit between the brushes 14 15 and 14' 15'. The switch-lever is held in the closed position by the friction between the spring-brushes and the jacks. The two iron blocks 24 are also in line with each other and in the vertical plane of the line of travel of another electromagnet 27, similar to the magnet 25, and also having its pole-pieces provided with iron-wire brushes 26. This magnet 27 is placed at or near the rear end of the motor-car or car-truck and when over the blocks 24 these latter become temporarily-extended pole-pieces thereof and attract the bar or armature 10. Since the switch-lever is pivoted centrally, the lifting of the armature 10 by the magnet 27 will depress the armature 9, thus moving the jacks from between and out of contact with the brushes, thereby breaking the circuit between the blocks 22 and the source of current-supply. The limit of movement of the switch-lever in either direction around the pivot is determined by two stops 28 28, one in the path of the armature 9 and the other in the path of the armature 10, the said stops rising from the base-plate 6.

Current for feeding the motors on the car and for energizing the traveling magnets is collected in any suitable manner from the contact-blocks 22; but as such collector forms no part of the present invention and may be of any well-known type, if sufficiently extended to bridge two contact-boxes, it is not illustrated in the drawings.

A switch constructed as described will operate under the action of the traveling magnets to close the circuit when the car reaches the switch-box and to open the circuit as the car leaves it. In order that the switch-levers may be moved in either direction with the requisite speed and with the exertion of the minimum amount of power, they are balanced

on their pivots as accurately as is practicable. Such a balanced switch-lever is easily moved about its pivot by shocks and jars caused by the ordinary surface travel. To obviate the danger arising from the accidental closure of the circuit, in which case the exposed contacts would become charged, each switch is provided with a lock that will act automatically to hold the switch in the open position when not covered by a car, and which will be operated to unlock the switch by the forward magnet of a motor-car when it reaches the switch-box. This lock consists essentially of a gravity latch mounted on the switch-lever and capable of being lifted by magnetic attraction from a motor-car, and of a fixed catch in the switch-box in the path of the latch. The latch is composed of an iron plate 29, having near each end an arm 30, projecting at right angles therefrom and terminating in a beveled and shouldered head or hook 31. This plate 29, which performs the function of a supplemental armature, covers the upper face of the armature 9, and is pivoted to the said armature by means of pins passed through the arms 30, and through ears 32, formed on the outer side of the armature 9. The two arms 30 extend downward past the armature, and in the path of the shouldered heads 31 are similarly-shaped catches 33 erected on the base-plate 6. The latch has a limited movement about its pivot, the extent of movement in one direction being determined by lugs 34 on the arms 30, which lugs engage the side of the armature 9, and in the other direction by the catches 33, the upper face of the armature 9 being slightly inclined or beveled to give the supplemental armature 29 sufficient range of movement toward it. The supplemental armature 29 over-balances the arms 30, so that its tendency is to throw the lower ends of the arms outward. When the switch is in the closed position, the beveled edges of the heads or hooks 31 of the arms 30 and the beveled edges of the catches 33 are in engagement, and when the switch is moved toward the open position the heads 31 ride downward past the beveled faces of the catches until the shoulders on the heads 31 pass the shoulders of the catches. The supplemental armature 29 then immediately forces the heads 31 under the shoulders on the catches, where they are held by gravity, thus effectually locking the switch-lever against any force tending to move it toward the closed position, except a force which will lift the supplemental armature 29, thus moving it on its pivot and drawing the heads 31 from under the catches 33.

When the electromagnet 25 reaches a switch-box, it attracts the supplemental armature 29, thereby moving the hooked ends 31 of the arms 30 from under the catches 33, thus releasing the switch-lever. The armature 9 being unlocked is then immediately drawn upward by the magnet, and the jacks

13 close the circuit to the contact-blocks. The switch-lever is held in the closed position by the friction of the members of the switch, as before explained, and this position is maintained until the magnet 27 acts upon the armature 10 and opens the switch in the manner before described. As the switch-lever is moved toward the open position, the movable member of the latch descends toward the catches until the heads 31 ultimately engage under the said catches, and thereby lock the switch-lever against any force tending to close the switch until the lever is again unlocked by the passage thereover of the magnet 25 on a motor-car.

The switch-box and switch shown in Figs. 4 and 5 are similar in principle to those shown in Figs. 1, 2, and 3, but differ therefrom in several particulars. The cover of the switch-box shown in Figs. 4 and 5 is flush with or projects slightly above the surface of the road-bed and is ribbed to form a foothold for horses. The contact-blocks 22 and the blocks 24 are omitted and the armatures of the switch-lever and of the latch are acted upon by the electromagnets without the intervention of supplemental pole-pieces and through the cover of the switch-box. The standards 7 and stops 28, as well as the catches 33, are all cast in one piece and fastened to the bottom of the switch-box by screws or otherwise with an intervening cushion-plate 34', the whole structure being so formed as to constitute a chamber inclosing the switch and forming a support for the switch-lever. The pivot bolt or rod 8 is made fast to the cross-pieces 11 of the switch-lever by pins 35 at points exterior to the switch-containing chamber, and secured centrally to this rod, which passes through suitable bearings formed in the end walls of the said chamber, is a downwardly-projecting arm 36, having its lower end bifurcated to receive the insulating-block 12, having at its lower end a jack 13. This jack is moved to and fro by the armature-lever through an arc described about the axis of the rod 8, and in the path of this jack are metal brushes 14 15, (of which only one is shown,) fast upon opposite sides of an insulating-block 37, housed in and fixed by pins 37' to the contracted upper end of a lateral extension 38 of the switch-containing chamber. Both brushes are secured to the block 37 by bolts 39, insulated from the brushes by interposed bushings 40. These bolts also serve to secure to the brushes in electrical contact therewith plates 41 constituting the terminals, of one the branch conductor 18 and the other of another conductor 42 leading to a section 43 of an exposed feeding-conductor in the road-bed, (see Fig. 7,) from which current is collected in the usual manner and fed to the motors on the car, the return to the generator being through the rails, as usual. The conductors 18 and 42 enter the switch-box through a neck 19', formed on the extension 38 of the switch-containing chamber and ex-

tending through a perforation in one of the sides of the box 1.

Having now fully described my invention, I claim and desire to secure by Letters Patent—

1. In an electric railway, the combination with a main or supply conductor and feeding conductors or contacts, of switches for coupling the main and feeding conductors, each switch being provided with a rocking switch lever, extending transversely to the line of travel and having an armature on each side of its pivot and two traveling electro-magnets, one acting on one armature and the other on the other armature of the switch levers, substantially as described.

2. In an electric railway, the combination with a main or supply conductor and feeding conductors or contacts, of switches for coupling the main and feeding conductors, each switch being provided with a balanced switch lever extending transversely to the line of travel and having an armature on each side of its pivot, and two traveling electro-magnets, one acting on one armature and the other on the other armature of the switch levers, substantially as described.

3. In an electric railway, the combination with a main or supply conductor and feeding conductors or contacts, of switches for coupling the supply and feeding conductors, each switch being provided with a rocking switch lever and a gravity latch for locking the switch in the open position and traveling electro-magnets operating the switch to close and open the circuit and also operating the latch to unlock the switch, substantially as described.

4. In an electric railway, the combination with a main or supply conductor and feeding conductors or contacts, of switches for coupling the supply and feeding conductors, each switch being provided with a latch for locking it in the open position and traveling electro-magnets unlocking and operating the switch, substantially as described.

5. In an electric railway, the combination with a main or supply conductor and feeding conductors or contacts, of switches for coupling the supply and feeding conductors, each switch being provided with a switch lever having an armature on each side of its pivot and a lock composed of a latch carried by the switch lever with a supplemental armature covering one of the armatures of the switch lever and fixed catches in the path of the latch, and traveling electro-magnets operating the latch and switch lever by magnetic attraction, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES F. McLAUGHLIN.

Witnesses:

ROBERT J. BARR,
CHAS. E. ELLIS.