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H. LINTON.

SYSTEM OF ELECTRICAL DISTRIBUTION.

No. 597,855. Patented Jan. 25, 1898.

Fig. 1.

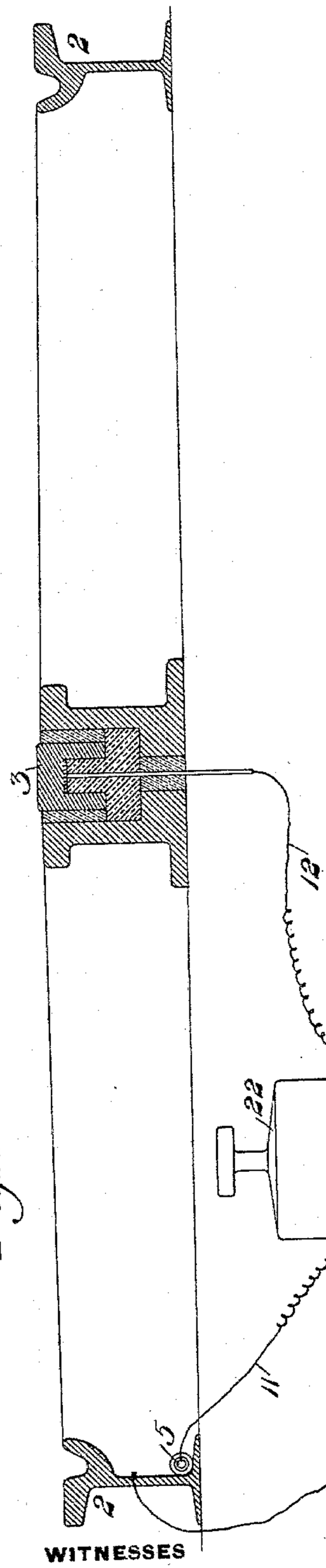
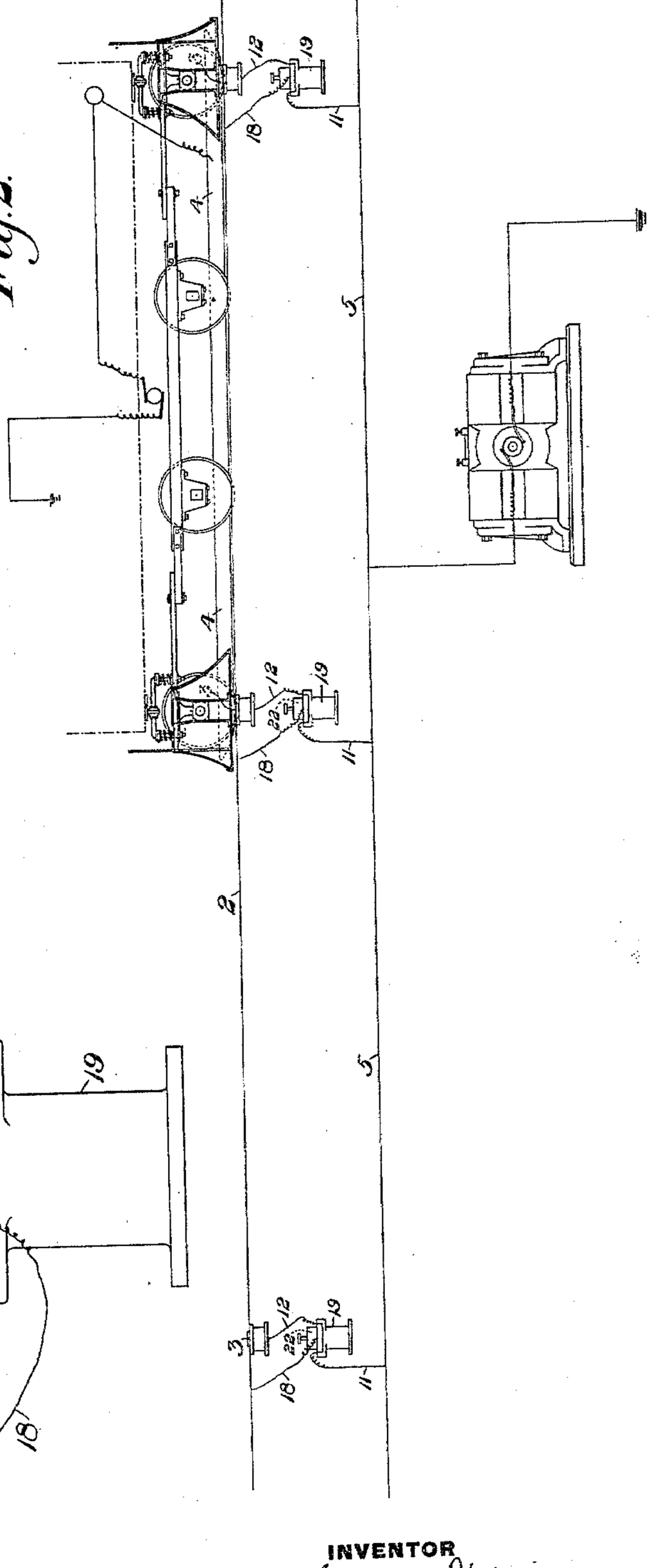


Fig. 2.



WITNESSES

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INVENTOR

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SYSTEM OF ELECTRICAL DISTRIBUTION.

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Fig. 4.

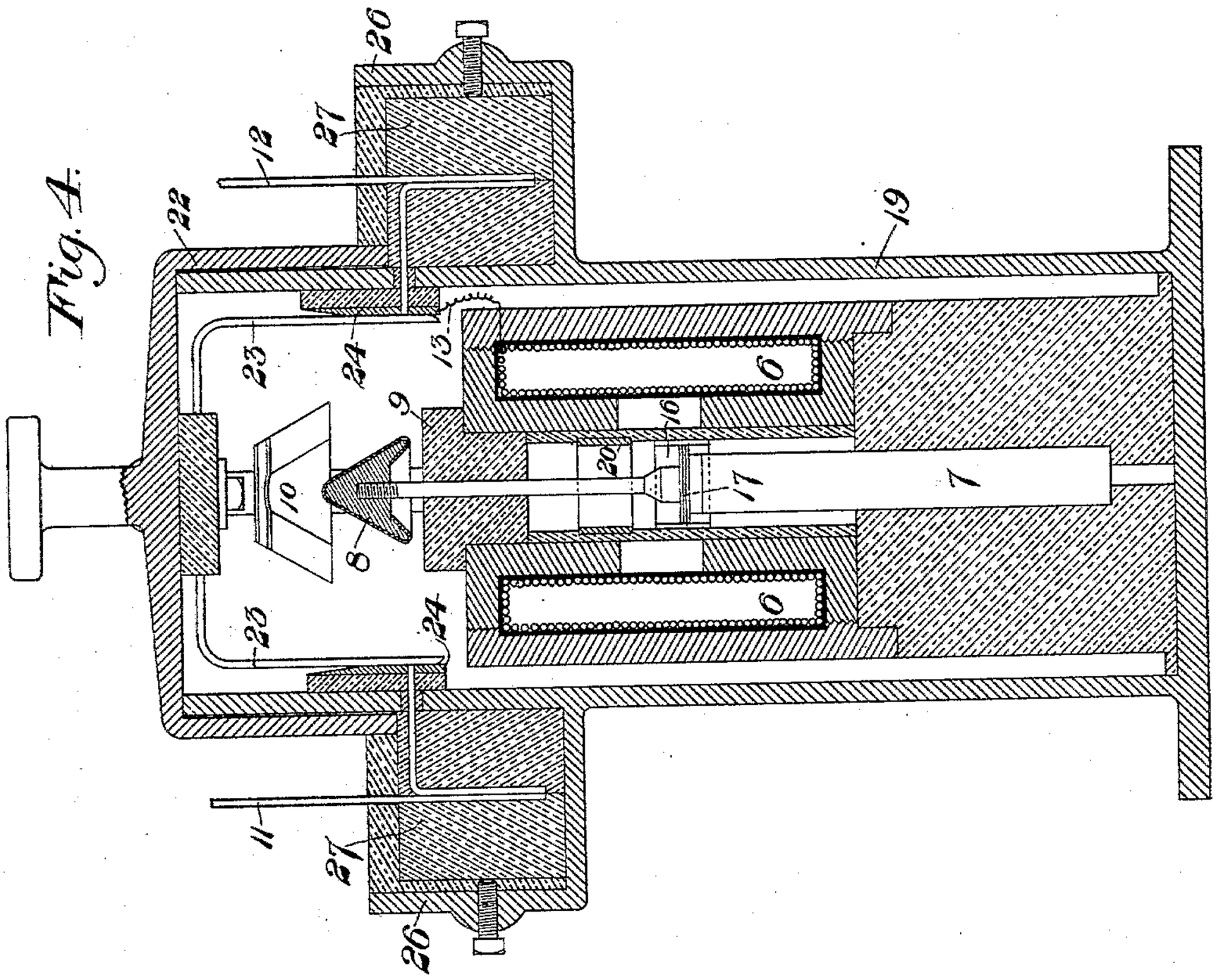
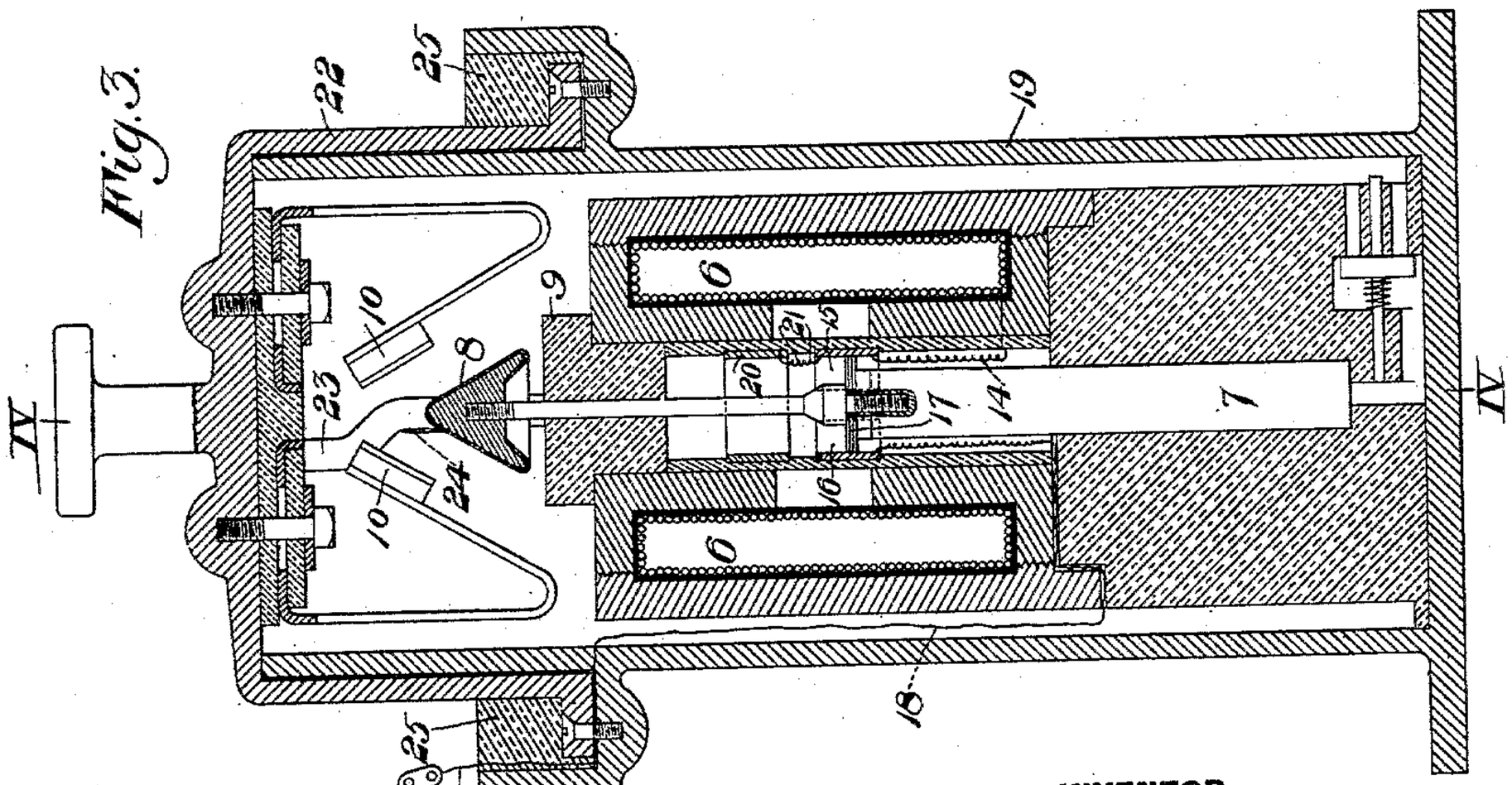


Fig. 3.



WITNESSES

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(No Model.) 6 Sheets—Sheet 3.

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Fig. 6.

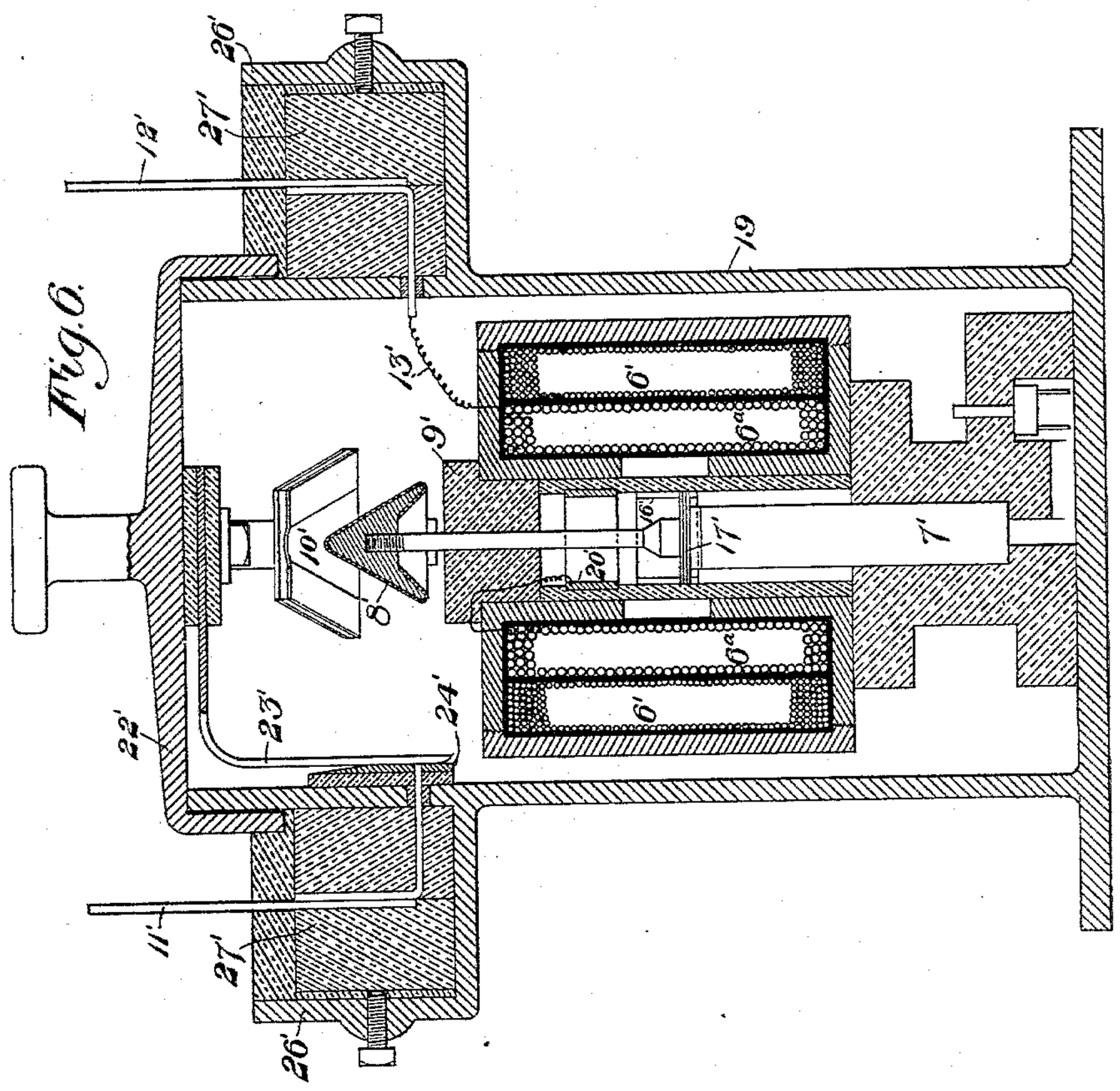

Fig. 5.

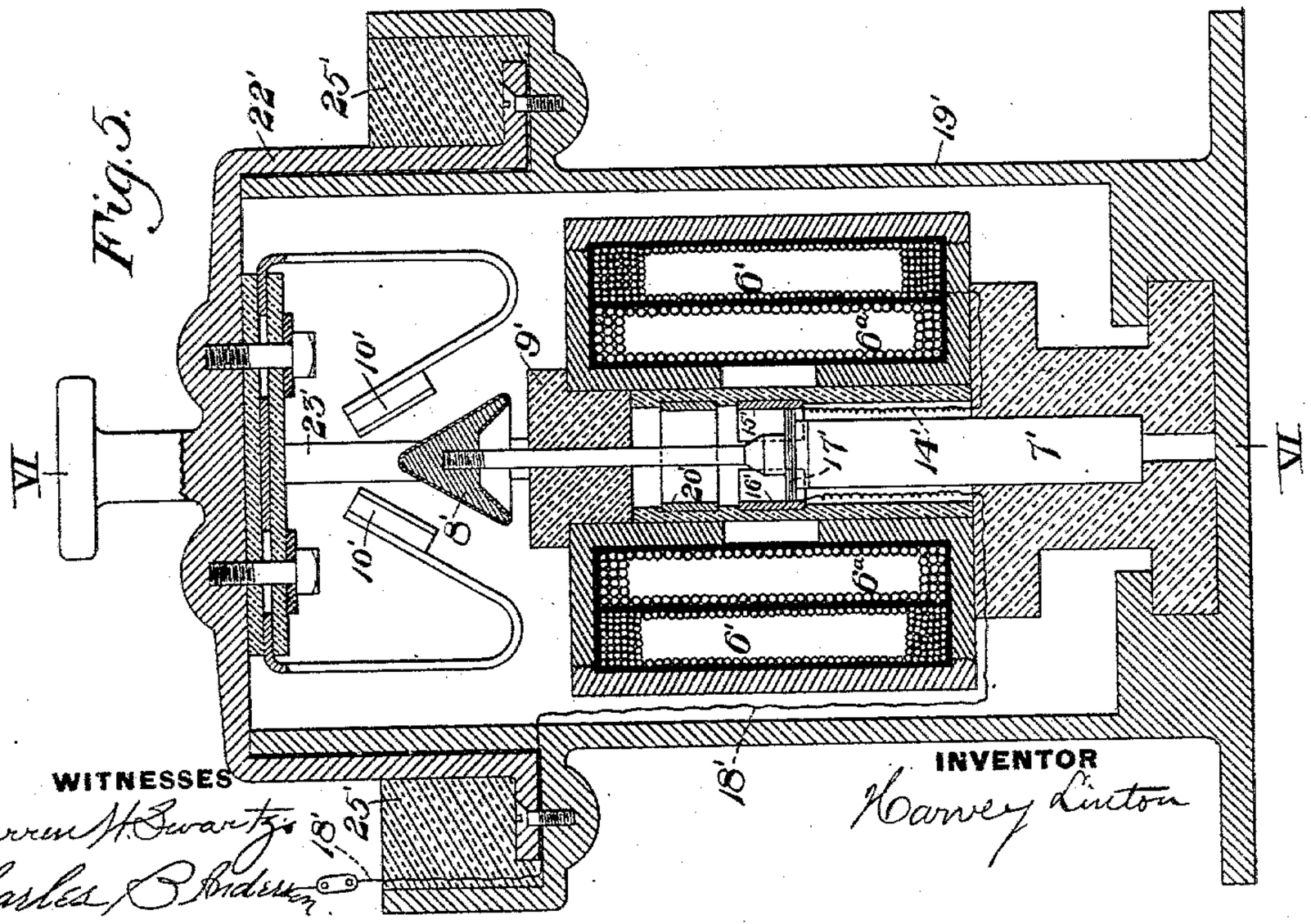

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Fig. 8.

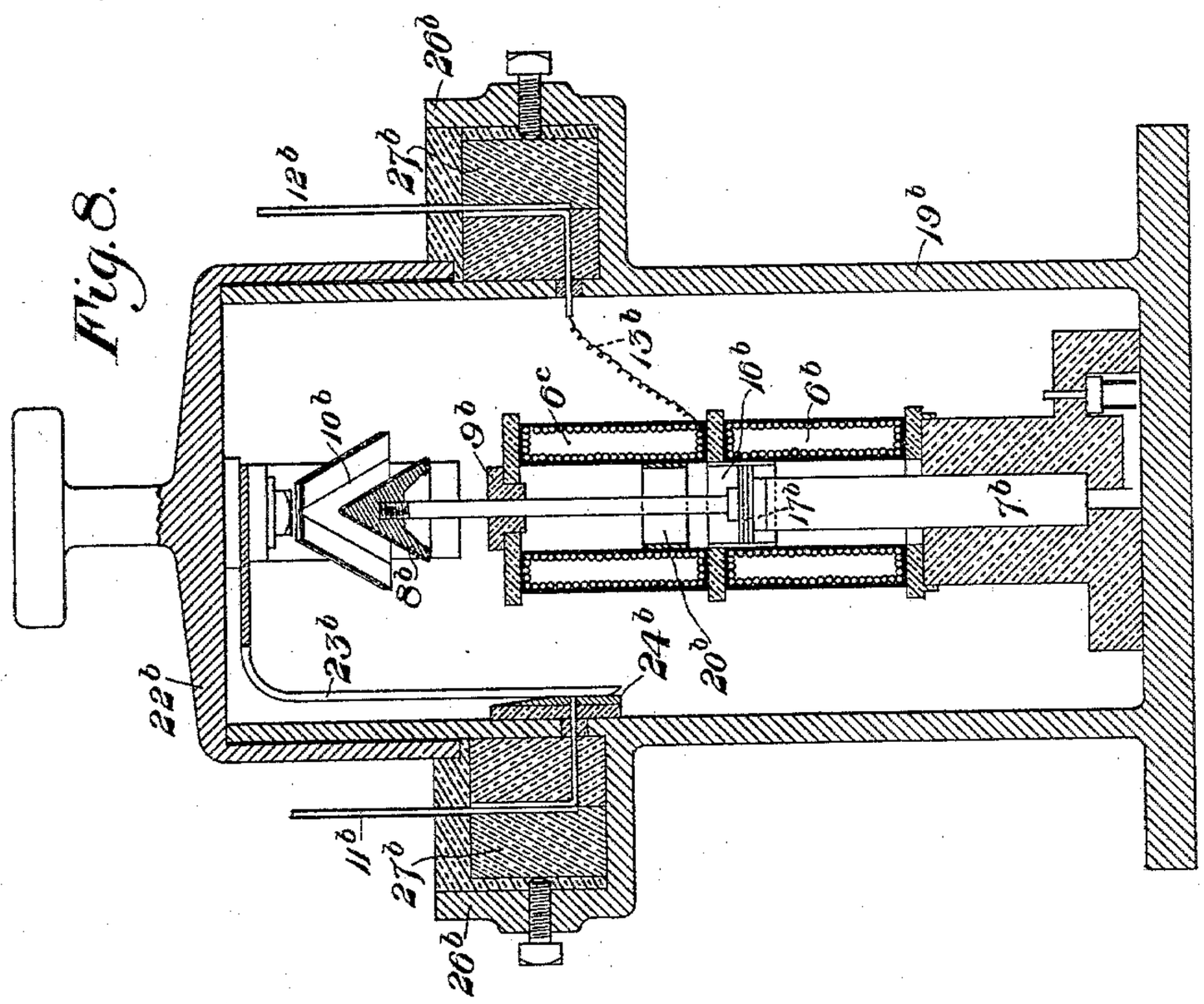
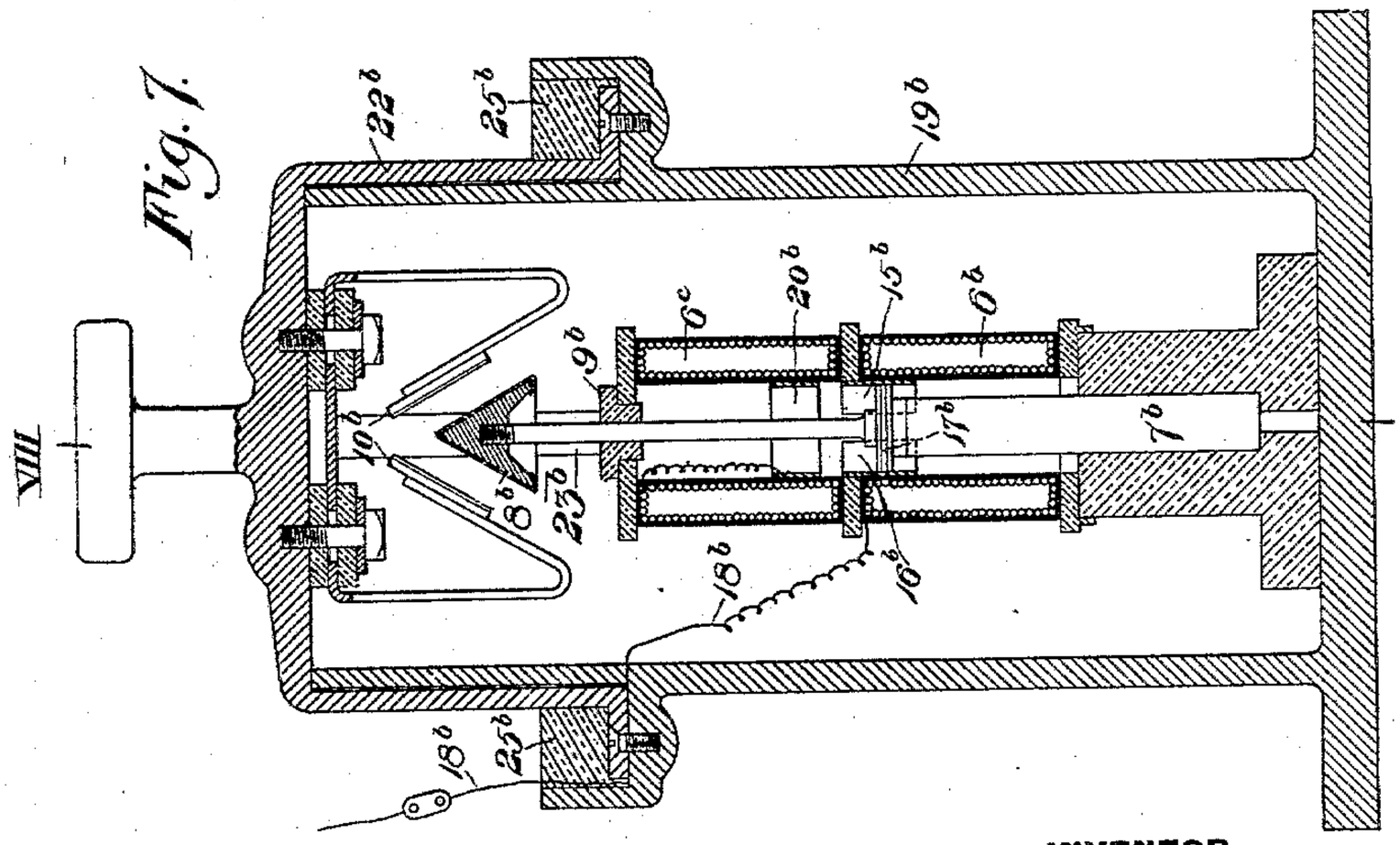


Fig. 7.



WITNESSES

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SYSTEM OF ELECTRICAL DISTRIBUTION.

No. 597,855. Patented Jan. 25, 1898.

Fig. 9.

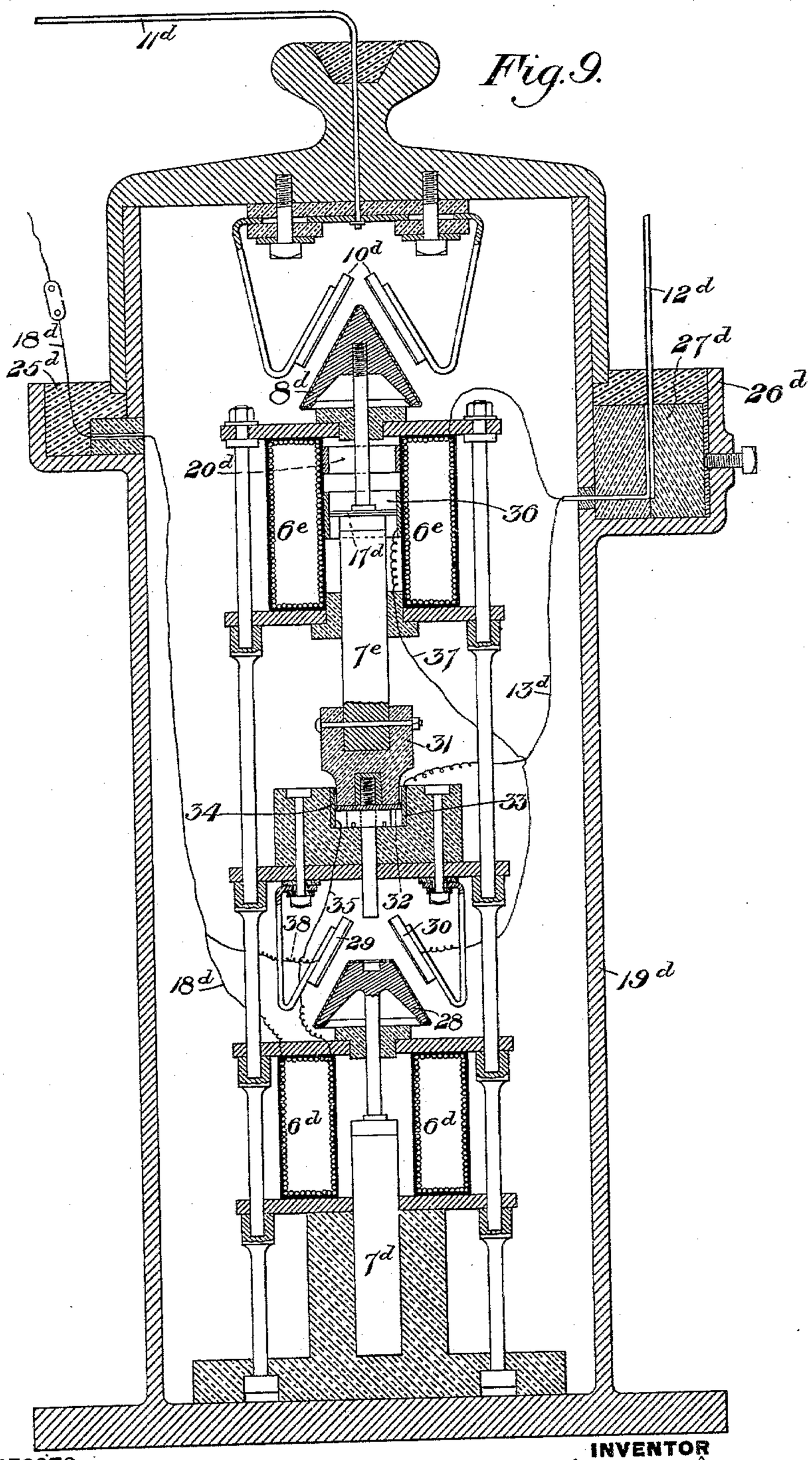

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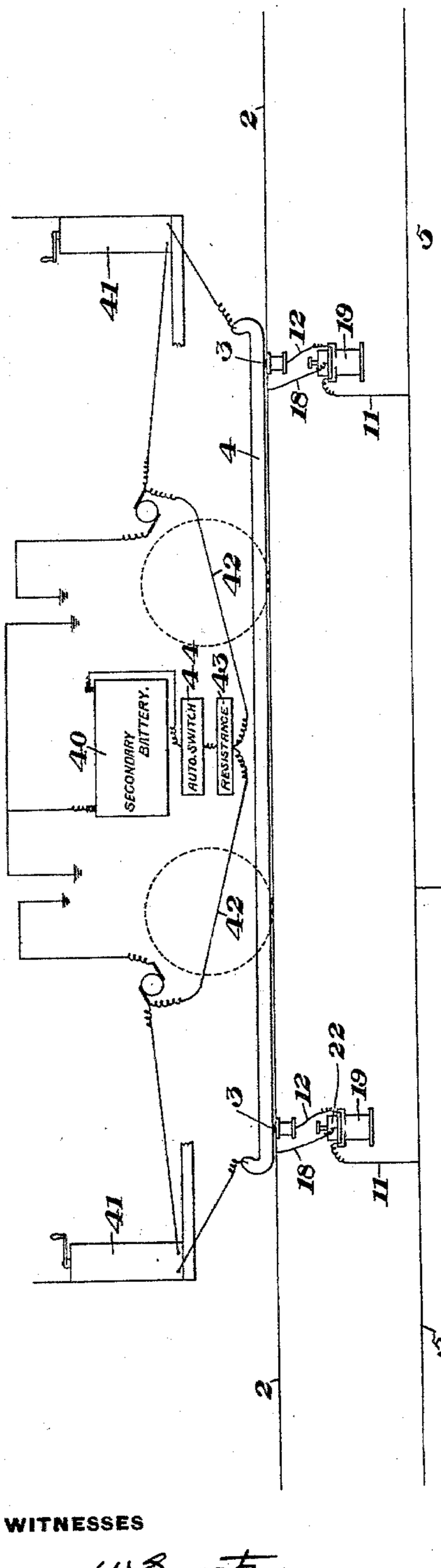
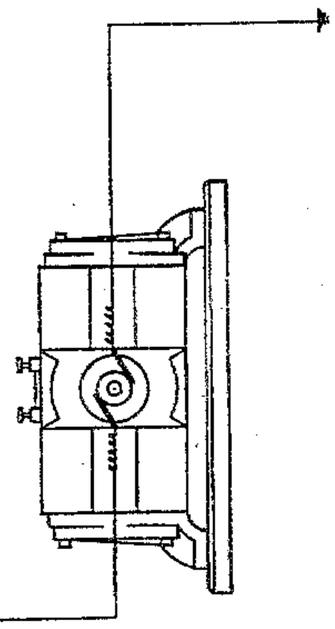
Fig. 10.





WITNESSES

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H. M. Corbin

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by Cox. Bakewell & Sons
his attys:

UNITED STATES PATENT OFFICE.

HARVEY LINTON, OF ALTOONA, PENNSYLVANIA, ASSIGNOR OF SEVEN-SIXTEENTHS TO THOS. H. BOWMAN, OF McKEESPORT, PENNSYLVANIA.

SYSTEM OF ELECTRICAL DISTRIBUTION.

SPECIFICATION forming part of Letters Patent No. 597,855, dated January 25, 1898.

Application filed May 7, 1894. Serial No. 510,276. (No model.)

To all whom it may concern:

Be it known that I, HARVEY LINTON, of Altoona, in the county of Blair and State of Pennsylvania, have invented a new and useful Improvement in Systems of Electrical Distribution, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a cross-sectional view of my improved apparatus. Fig. 2 is a diagram view showing the system in side elevation in connection with the truck of a railway-car. Fig. 3 is a vertical cross-section of the electric magnetic switch device forming part of the apparatus. Fig. 4 is a vertical section on the line IV IV of Fig. 3. Figs. 5 and 6 are similar sectional views of a modified construction, Fig. 6 being a section on the line VI VI of Fig. 5. Figs. 7 and 8 are similar sectional views showing another modification, Fig. 8 being a section on the line VIII VIII of Fig. 7. Fig. 9 is a vertical section of a third modification, and Fig. 10 is a diagrammatic view showing the storage battery and its connections.

Like symbols of reference indicate like parts in each view.

My invention relates to a system of distributing an electric current from a main generator or generators to traveling motors by means of sectional or interrupted contact points or rails set on the line of travel of the motor, together with automatic mechanism by means of which the circuit from the generator through the several contact points or rails is established as the car arrives thereat and is interrupted as the car passes, so that the contact points or rails, except those in immediate proximity to the cars, are kept at the same electrical potential as the earth and all danger to life and liability to loss of current by leakage incident to the use of constantly-charged surface conductors is avoided.

In the drawings, 2 2, Figs. 1 and 2, represent the rails of an electric railway, and 3 3 are separated exposed contact plates, rails, or rollers set at intervals along the line of the track. They are preferably constituted by plates or rollers. When rails are used, they should be set, for safety's sake, in an underground slotted conduit. Each railway-car is provided with a contact brush or bar 4 of sufficient length to span the gap between each two adjacent contacts, so that it shall always be in contact with at least one of them.

5 is the main conducter, which leads from the electric generator and is suitably insulated and laid underground, or it may be laid at or above the surface of the ground, along the rails, or otherwise arranged. At or near each of the contacts 3 is a connection between it and the main conductor, with automatic mechanism for establishing and interrupting the circuit, constructed as follows:

As shown in Figs. 1, 2, 3, and 4, the switching device which I use in my improved system comprises a solenoid-magnet 6, having a vertically-movable core or armature 7, carrying upon its upper end a contact 8, the stem of which may move in a suitably-insulated guide-piece 9. When the armature is in its highest position, this contact is adapted to make contact with and to connect the terminals of opposite contact-springs 10, one of which is electrically connected to a conductor 11, which leads from the main conductor 5. The other contact-spring 10 is connected to a branch conductor 12, which leads to the adjacent surface contact-plate 3. The magnet-coil 6 is also connected with the branch conductor 12 by a wire 13, which is attached to one end of the magnet-coil. The other end of the magnet-coil is connected by a wire 14 to one of two separated sections of a ring 15 16, which are set within the hollow of the magnet and are adapted to be engaged by a contact disk or brush 17, (preferably made up of laminated platinum disks,) fixed to the armature 7, the position of the parts being such that the contact-disk is in engagement with the sections 15 and 16 when the armature is in its lower position and that when in such position said disk bridges the space between these separated contacts and, through the wire 14 and contacts 15 and 16, makes electrical connection between the magnet-coil and a wire 18, which leads from the contact 16 to the track-rail or other return-conductor of the circuit.

The magnet and its armature and the contact parts above named are supported and in-

closed in a suitable case 19, from which the current-carrying parts are completely insulated. This case may be provided with a cap 22, which carries the contact-springs 10 and spring-arms 23, which are electrically connected therewith and are adapted, when the cap is put in place, to engage and to make electrical connection with plates 24, constituting the terminals of the conductors 11 and 12, respectively. The lower end of the cap 22 preferably fits into a paraffin-filled cup 25, by which moisture is excluded from the case, and for the purpose of insulation the conductors 11 12 are preferably extended into chambers or recesses 26, containing porcelain holders 27 and also covered by paraffin or other suitable insulating material.

The operation is as follows: The parts being in the position shown in Fig. 3, when the traveling contact of the car reaches the exposed contact 3 adjacent to the switching device illustrated in said figure a part of the current from the preceding contact 3 of the series passes through a conductor 12, wire 13, magnet-coil 6, wire 14, the switch constituted by the contacts 15, 17, and 16, wire 18, and the rail 2 or other return-circuit. This energizes the magnet, raises its armature, so as to bring the parts of the switch constituted by the contacts 8 and 10 into contact with each other, and simultaneously raises the disk 17 out of contact with the parts 15 and 16 and into contact with an upper ring 20, which is connected with the contact 15 by a wire 21. This motion of the armature therefore cuts off the current through the wire 18 and the return-conductor and establishes a shunt-circuit from the contacts 10 8, ring 20, wire 21, contact 15, wire 14, through the magnet of the exposed contact 3, thereby keeping the magnet energized, so that the armature shall be held in elevated position, and at the same time the contact of the parts 8 and 10 establishes a direct electric circuit from the conductor 11 to the conductor 12 and through the exposed contact 3 to the traveling contact of the car and the motor on the car. When the traveling contact of the motor engages the next-exposed contact 3 of the series, it operates its mechanism in the manner above described, and as it passes each contact it breaks the circuit therethrough, so that the armature of the adjacent switching device drops and the parts are restored to the position shown in Fig. 3.

It will be noticed that in the operation of the device the contact of the parts 15, 16, and 17 is but momentary and that as soon as the parts 8 10 come into contact the circuit through the wire 18 to the return-conductor is interrupted. The passage of the current to ground therefore does not involve any appreciable waste of energy, for ordinarily the magnet is in circuit only with the conductors 11 and 12 and contact 3 and the current which passes therethrough goes to the motor and is not lost. Each apparatus pertaining to the several contact-plates is independent of the others and is separately actuated, and hence the cars may run in either direction with equal facility.

If the car should stop with its contact brush or plate in engagement with one of the contacts 3 and the current be interrupted in any way, so as to cause the armature to drop and to break the circuit through the magnet, the circuit could not be restored without means additional to those which I have described. For this purpose I provide each car with an independent generator or source of electrical energy, such as an ordinary battery or a storage battery charged by the current used to drive the motor and adapted to be put in circuit with the traveling contact of the car by means of a suitable switch. On the happening of the event above stated the motorman puts the battery in circuit with the traveling contact, whereupon the current therefrom passes through the conductors 12 and 13, energizes the magnet, and by the operation above described causes the armature to rise and to establish a circuit from the main conductor 5 through the magnet to the exposed contact 3. Thus in Fig. 10 I show the car as provided with a secondary or storage battery 40, connected through a rheostat 41 and magnetic switch 19 with the electric main 5. This storage battery when the car is in motion is charged through the connection 42, resistance 43, and automatic switch 44 to the ground. When the charge in the battery reaches a certain limit, it is cut out of circuit by the switch 44, thus protecting the battery.

In Figs. 5 and 6 I show a modification of the device in which, instead of having a single magnet-coil 6, I employ two magnet-coils 6′ and 6ª, which are made concentric and have a common case and a common armature-core 7′. The operation of this device will be clearly understood from the foregoing description, for I have marked the corresponding parts by the same reference-numerals, distinguishing them by the prime (′) mark. The magnet-coil 6′ is connected at one end by a wire 13′ with a conductor 12′ and at the other end is connected by a wire 18′ with the rail. The coil 6ª is made of coarser wire sufficient to carry the entire current required for the motor on the car and is connected at one end with the conductor 12′ and at the other end with the contact-ring 20′. The contact-pieces 10′ are not separated, as in Figs. 3 and 4, but are electrically connected with each other and with the branch conductor 11′. On the first engagement of the traveling contact of the car with the surface contact 3′ the current travels through the conductor 12′, magnet-coil 6′, wire 14′, contacts 15′ 17′ 16′, and conductor 18′ to the rail 2, thereby energizing the magnet-coil 6′, causing the armature to rise and to bring the parts 8′ and 10′ into contact. This establishes a current from the main conductor 5, branch 11′, contacts 10′, 8′, 17′, and 20′, and magnet-coil 6ª to the conduc-

tor 12′, and thence to the exposed contact-plate and to the motor, this current energizing the magnet 6^a and keeping the armature elevated until the traveling contact on the car has passed the exposed contact 3, whereupon the circuit is broken and the armature drops, bringing the parts into the position shown in Figs. 5 and 6.

The modification shown in Figs. 7 and 8 is similar to that of Figs. 5 and 6, and I have designated the corresponding parts by similar reference-numerals, distinguishing them by the exponent letter "b." The difference is that instead of arranging the two magnet-coils 6^b and 6^c concentric with each other I set one above the other in the same axial line, and, the operation being the same as in the above case, the description thereof need not be repeated here.

In Fig. 9 I show a modified construction of the apparatus in which parts corresponding to the parts of the former figures are indicated with the same reference-numerals, distinguished by the exponent letter "d." In this modification I employ two electromagnets 6^d and 6^e, the coil of the magnet 6^2 being of sufficiently coarse wire to carry the entire current which passes through the device. The magnet 6^e has a core or armature 7^e, carrying a contact-piece 8^d, adapted to make contact with contact-plates 10^d, whose construction is similar to that of the contacts 10^b of Figs. 7 and 8. The magnet 6^d has an armature or core 7^d, carrying a contact-piece 28, adapted to make contact with and to connect electrically-separated contacts 29 and 30. The lower end of the armature 7^e has an insulated shoe 31, carrying a contact-disk 32, which fits within and makes sliding electrical contact with separated sections of a ring 33 34. The section 33 is connected by the wire 13^d and a branch conductor 12^d, and the section 34 is connected by a wire 35 to one end of the coil 6^d, the other end of which is connected to a wire 18^d, leading to the wire or other return-conductor. One end of the coil of the magnet 6^e is connected directly to the conductor 12^d, and the other end is connected to a contact-ring 20^d. The armature 7^e carries a contact-disk 17^d, adapted to make contact with a contact-ring 36 when the armature is in its lowest position and to make contact with the ring 20^d when it is in its highest position. The ring 36 is connected to the coil of the magnet 6^e and by a wire 37 is connected to the contact 30, the opposite contact 29 being connected by the wire 38 with the wire 18^d. The operation of this form of my improvement is as follows: When the traveling contact on the car reaches the exposed contact 3, the current passes through the conductor 12^d, wire 13^d, contacts 33 34 32, wire 35, magnet-coil 6^d, and wire 18^d to the return-conductor, thus energizing the magnet 6^d, raising its armature, and bringing the parts 28, 29, and 30 into contact. Thereupon a circuit is established and a current is caused to flow through the conductor 12^d, magnet-coil 6^e, contacts 36 and 17^d, wire 37, contacts 30 28 29, and wire 38 to the return-conductor, thus energizing the magnet 6^e and causing its armature to rise and to bring the parts 8^d and 10^d into contact. This rise of the armature separates the contacts 32 33 34 and the contacts 36 and 17^d and disrupts the shunt-circuit last described, thereby cutting off the connection between the conductor 12^d and the return-wire 18^d. The contact of the parts 8^d and 10^d causes the current to pass directly from the conductor 11^d, by way of the contacts 8^d, 17^d, and 20^d, through the magnet-coil 6^e, to the conductor 12^d and exposed contact 3, and by its passage through the coil keeping the magnet energized and the armature raised. When the traveling contact on the car passes the exposed contact 3, the disruption of the current causes the armature 7^e to drop and restores the parts to the position shown in the drawings.

The different forms of mechanism above described may be set in boxes or cells underground in proximity to the contacts 3, or the boxes containing the same may be arranged opposite the track at suitable places above the surface of the ground, as may be most convenient in the case.

Other modifications of my invention involving the substantial principles thereof will be suggested to those skilled in the art by the foregoing description.

In all forms of the invention an essential feature is that the device operates by first momentarily sending the current to ground, which energizes the mechanism and establishes the main circuit from the main conductor to the contact-plate, a part or the whole of said main circuit passing through the magnet, by which the necessary electric contacts are maintained. Another common principle of these different modifications which I show is that the entire current by which the electrical contacts are maintained passes from the main conductor to the contact-plates and that none of it (except the current used initially in momentarily energizing the apparatus) is wasted by passing to the ground.

The apparatus is simple, reliable, and not apt to get out of order and affords a means for rendering safe and economical the distribution of the current to the cars by means of surface conductors.

I claim—

1. A system of electric distribution comprising a series of separated contacts independent of the track-rails and arranged to be engaged by a traveling contact on the car, a main conductor having a branch conductor leading to each contact, a wire leading from the branch to the ground, and a magnet arranged to automatically make and interrupt the circuit through the contact to ground, and thereafter connect the main conductor to the contact; substantially as described.

2. A system of distribution for electric railways comprising a series of separated con-

tacts independent of the track-rails and connected to a main conductor by separate branch conductors, a traveling contact arranged to engage the separated contacts, means interposed in each branch conductor for sending a current to ground, and automatic means for first cutting out said current and thereafter connecting the main conductor to the contact while the traveling contact is engaged therewith; substantially as described.

3. A system of distribution comprising a series of separated contacts connected to a main conductor by separate branch conductors, a traveling contact arranged to engage the separated contacts, a wire leading from each branch to ground, and a magnet in each branch, said magnet having a core arranged to be moved by the momentary current to ground, to first cut out the ground-current by this motion, and thereafter connect the main conductor to the contact; substantially as described.

In testimony whereof I have hereunto set my hand.

HARVEY LINTON.

Witnesses:

W. B. CORWIN,

H. M. CORWIN.