

No. 641,879.

Patented Jan. 23, 1900.

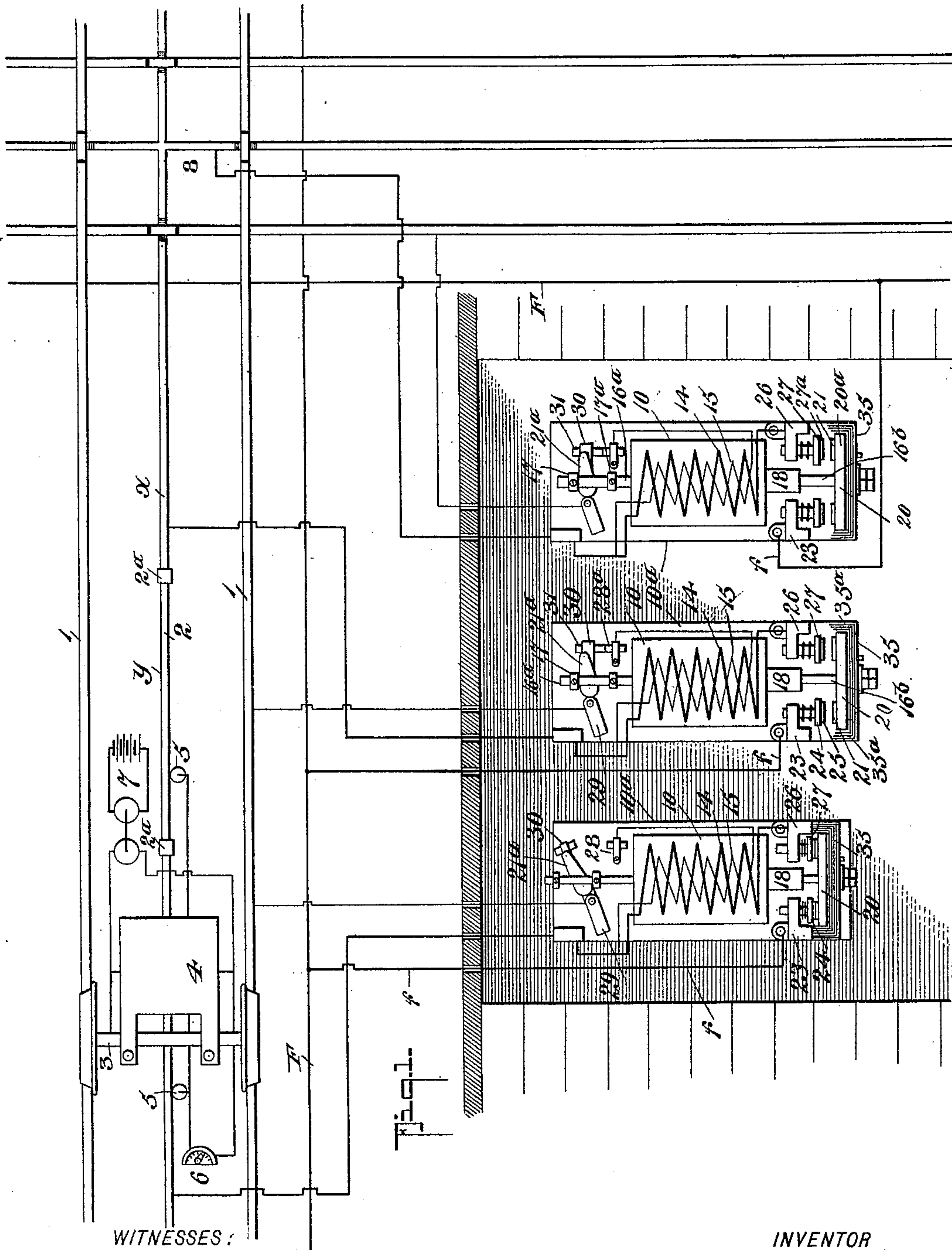
J. McL. MURPHY.

SURFACE CONTACT ELECTRIC RAILWAY SYSTEM.

(Application filed Feb. 7, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

*Fred Go Dieterich*  
*E McCormic*

INVENTOR  
*John M. Murphy*

BY  
*Fred Go Dieterich & Co*  
ATTORNEYS

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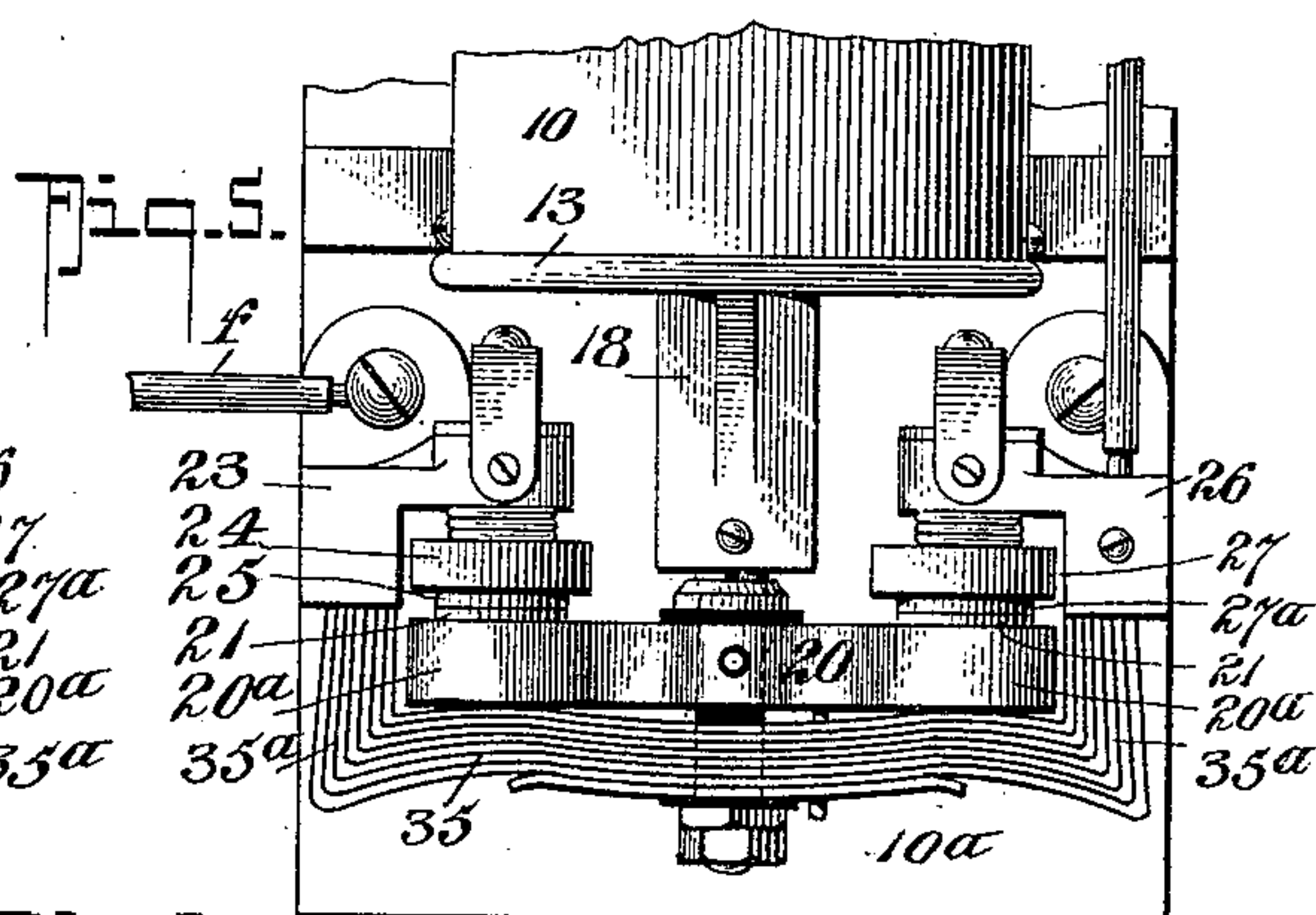
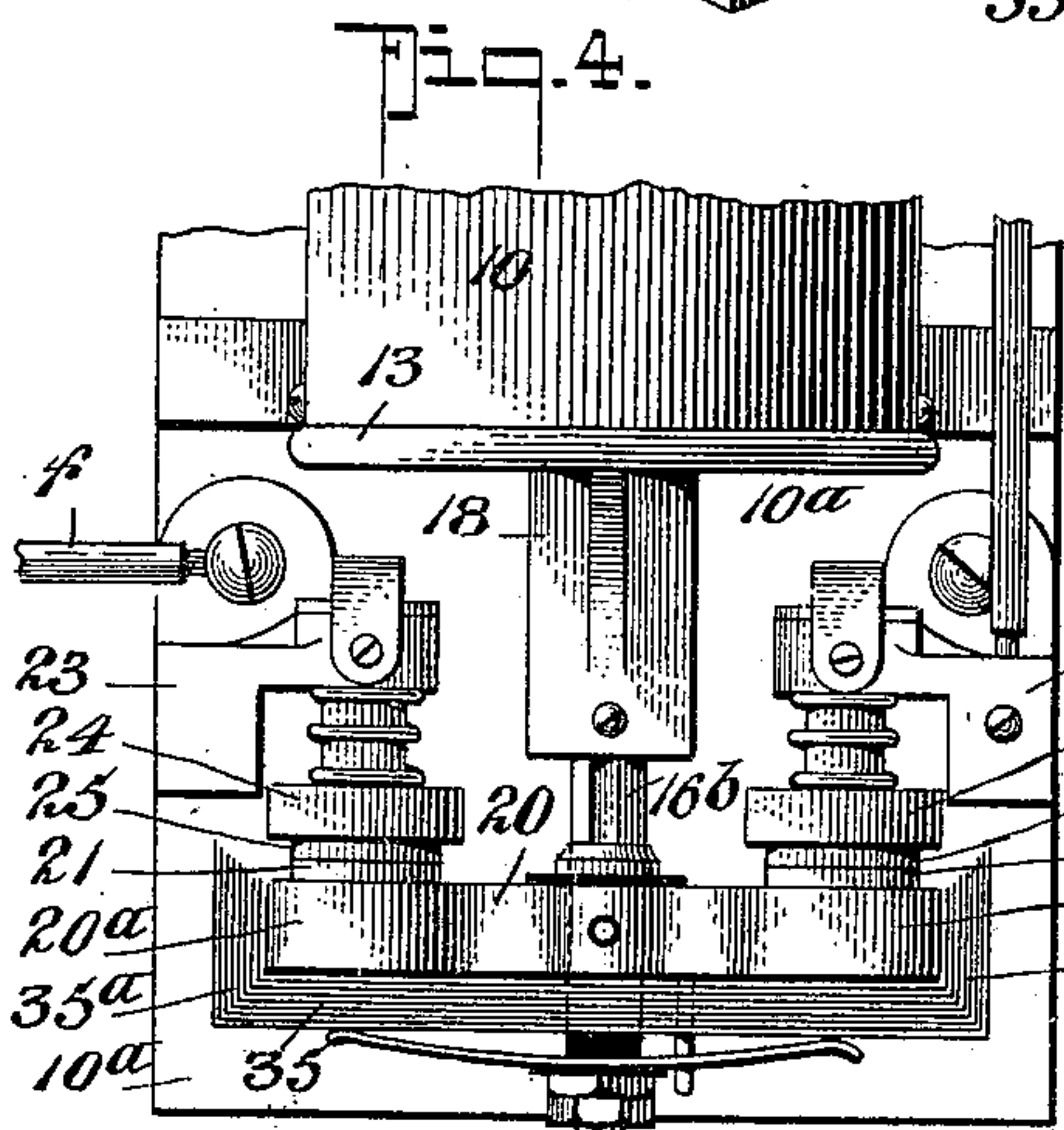
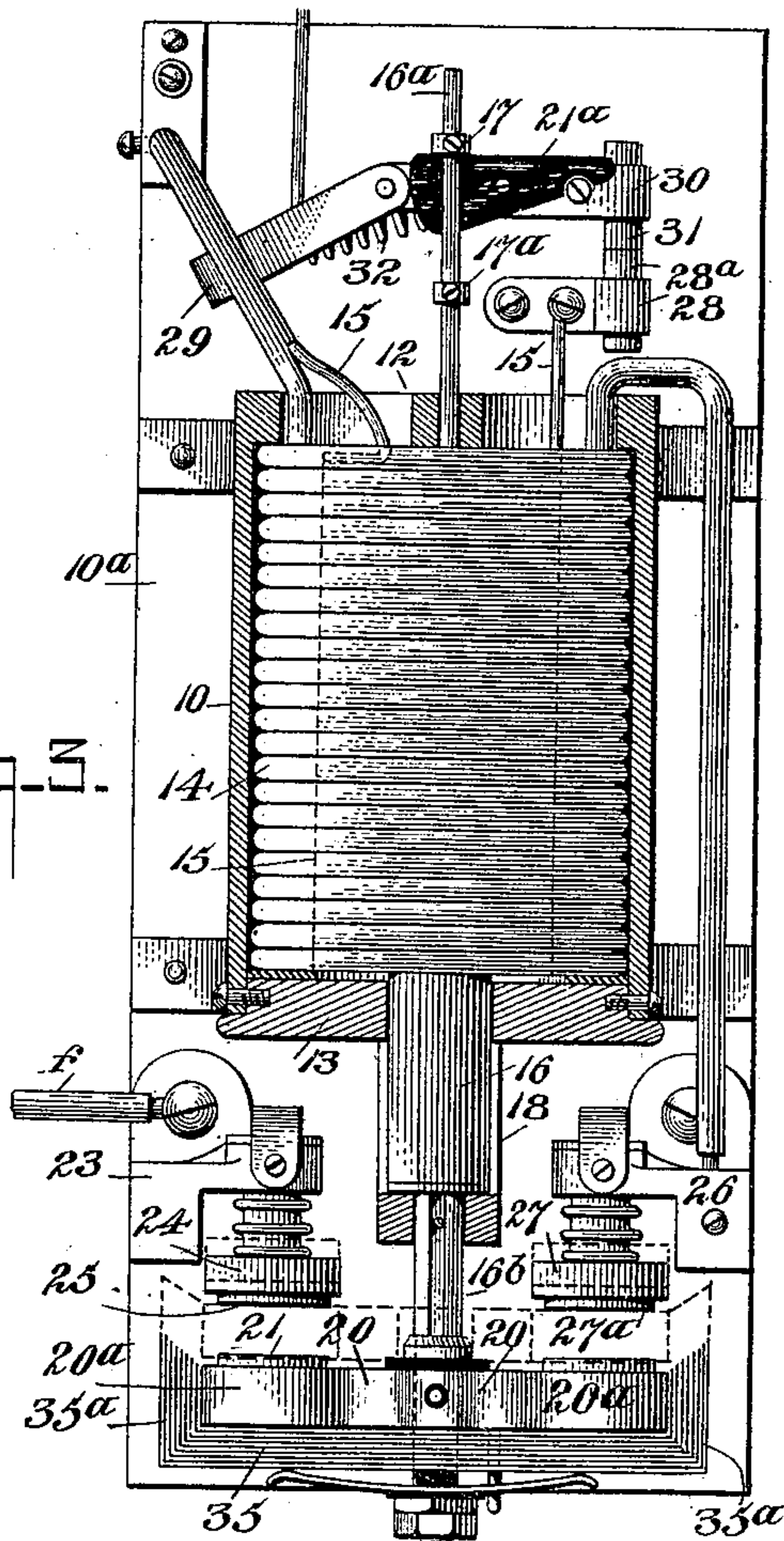
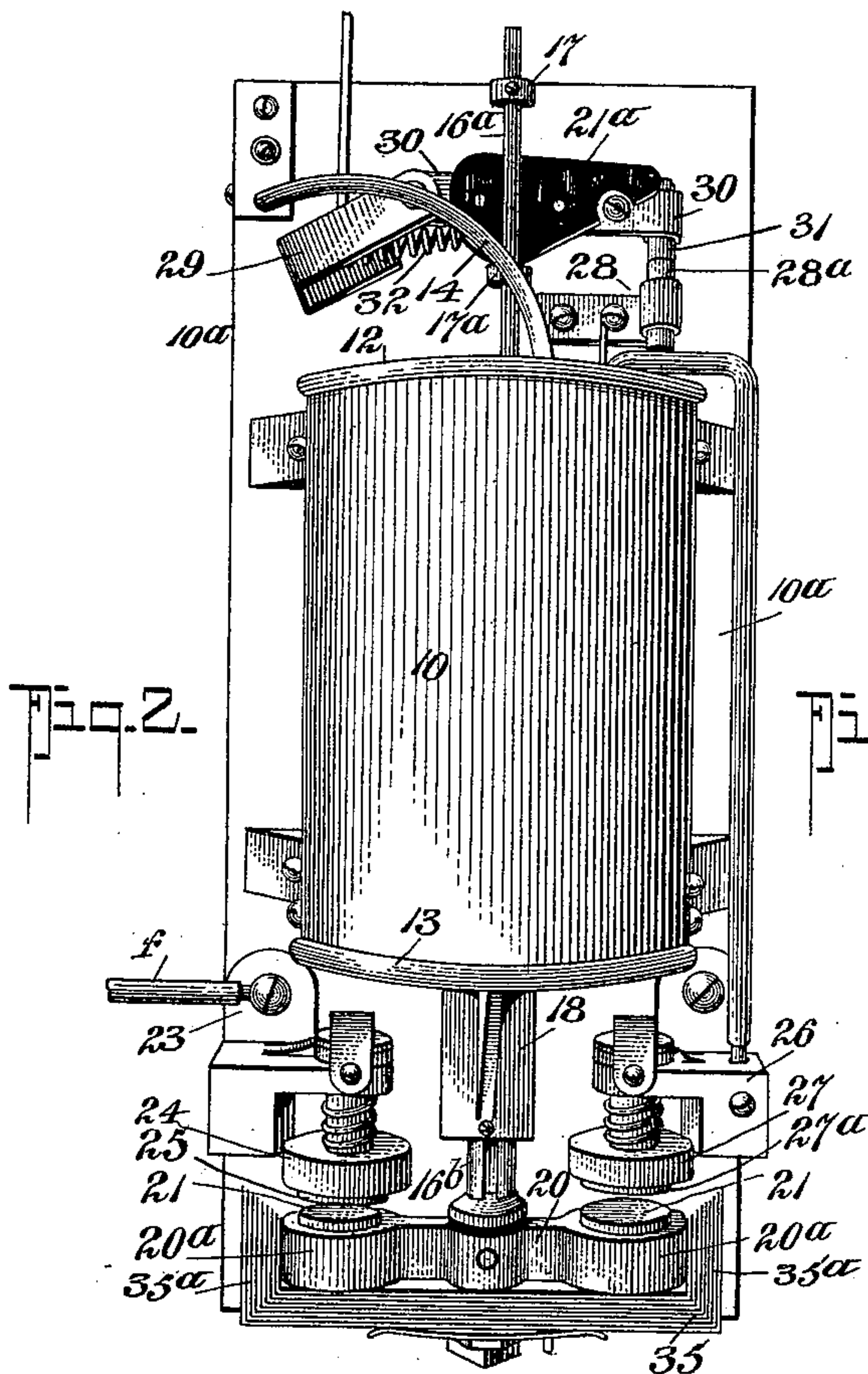
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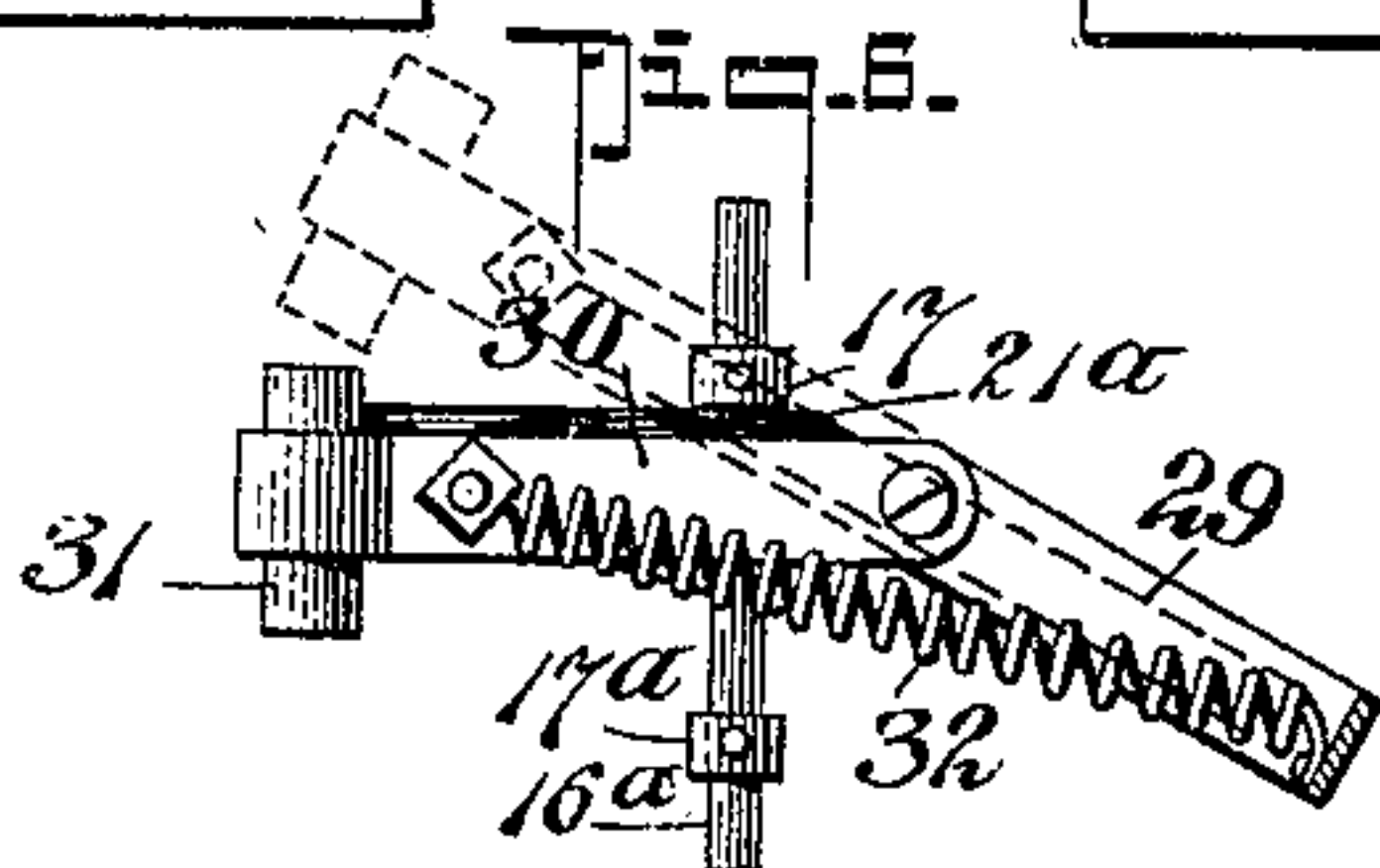
(No Model.)

2 Sheets—Sheet 2.



WITNESSES:

*H. G. Dietrich*  
*E. McCormick*



INVENTOR  
*John M. Murphy*

BY  
*Frederick G. Dietrich & Co.*  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

JOHN MCLEOD MURPHY, OF TORRINGTON, CONNECTICUT, ASSIGNOR TO THE  
SAFETY THIRD RAIL ELECTRIC COMPANY, OF NEW YORK, N. Y.

## SURFACE-CONTACT ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 641,879, dated January 23, 1900.

Application filed February 7, 1899. Serial No. 704,841. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN MCLEOD MURPHY, of Torrington, in the county of Litchfield and State of Connecticut, have invented certain  
5 new and useful Improvements in Surface-Contact Electric-Railway Systems, of which the following is a specification.

This invention relates to improvements in that character of surface-contact systems referred to in my Patent No. 599,344, dated February 22, 1898, and in its more specific nature comprehends certain improved details of construction in the switch mechanism referred to in the said patent, all of which will hereinafter  
10 be fully described, and specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating my improved electric-railway system.  
20 Fig. 2 is a perspective view of my improved solenoid-switch forming a part thereof, said switch being shown open. Fig. 3 is a front elevation, parts being in section, of the same, the carbon or bridge-held contacts and  
25 the supplemental feed-brush contacts being shown in a position the instant the circuit through the switch is broken. Fig. 4 illustrates the initial position of the bridge-piece carrying the carbon contacts as it is sucked  
30 up to close the circuit. Fig. 5 is a detail view illustrating the complete contacting of the carbons and the brush members when the current is full on, and Fig. 6 is a detail view of the supplemental switch member herein-  
35 after referred to.

The essential feature of this invention therefore consists in certain improved constructions particularly relating to the switch mechanism, whereby to further increase the  
40 efficacy of the same and reduce the arcing and leakage incident thereto to a minimum, it also comprising a compound set of contacts, one of carbon and the other metallic, so arranged that when the current is full on said carbon  
45 contacts will be protected and when the current is broken the metallic contacts will be separated before the carbon contacts are apart, and thereby avoid all danger of fusing the metallic contacts by arcing.

50 Another feature of this invention lies in the improved construction of the "breaker" in

the high-resistance winding or lead of the switch, whereby to render the operation thereof the more positive and make the accidental separation of the same by reason of  
55 jarring action on the switch impossible, and thereby avoid unnecessary leakage or arcing at its contact.

In the accompanying drawings, 1 1 indicate the track-rails, and 2 the short or sectional  
60 conductor-rail, which preferably is located between the main track-rails 1 1 and 2<sup>a</sup>, the insulating-blocks supporting the conductor-rail section.

3 indicates one of the car-trucks, 4 the motor, 5 the straddle-trolleys, 6 the controller, and 7 the storage batteries, all of which may be arranged in the manner referred to and illustrated in my patent aforesaid; but in the present arrangement of my system a motor-  
65 dynamo is used, the construction of which forms an essential feature of my copending application, (Serial No. 687,726, filed August 4, 1898,) which acts as a transformer for alternately charging the storage batteries and for  
70 supplying a current of high voltage for operating the switches and the car-lights.

In the practical arrangement of my improved system the switches are usually disposed in nests within vaults, as indicated in  
80 Fig. 1, in which three switches are shown, two connected with the contact-rail sections *x y* and the third for operating the crossover 8, which may be of any well-known construction.  
85

My present form of switch mechanism generally embodies the same arrangement of parts disclosed in my patent above referred to; but to render its construction and operation the more clearly understood I shall describe the same in detail.  
90

10 indicates the solenoid or suction magnet, mounted on a suitable base 10<sup>a</sup>, and said magnet comprises an outer casing and upper and lower head-pieces 12 13, respectively.  
95

14 indicates the low-resistance or outer winding, which encircles the inner or high-resistance winding 15, which in turn surrounds the armature-core or plunger 16, the upper end of which terminates in a reduced shank  
100 16<sup>a</sup>, which has separated adjustable contacts 17 17<sup>a</sup>, the purpose of which will presently



appear. The lower end of the plunger has a reduced pendent shank 16<sup>b</sup>, which slides in a bracket-piece 18, which forms a guide for the plunger and a stop to limit the drop of the same, as will be clearly understood by referring to Fig. 3. The lower end of the plunger carries a metallic bridge-piece 20, (insulated from the plunger,) the opposite ends of which have each a socket 20<sup>a</sup> to receive the carbon contact-blocks 21 21.

F indicates the feeder-wire, and *f* the laterals which join it with the switches. Each of the laterals *f* connect with a post 23 of the switch, which forms a bracket for a yielding member 24, normally pressed downwardly, which carries a carbon block 25.

26 indicates a similar bracket on the opposite edge of the switch-base, in which plays a yielding member 27, carrying a carbon-block contact 27<sup>a</sup>.

The carbon blocks 21, 25, and 27<sup>a</sup> oppose each other. The outer or low-resistance winding couples with the bracket 26 and connects with the conductor or third rail, while the inner or high-resistance winding couples with the low-resistance lead from the conductor-rail and joins with the terminal 28, having a carbon contact 28<sup>a</sup>.

29 indicates a bracket-piece secured to the base 10<sup>a</sup>, to which is pivotally connected a switch-arm 30, which arm carries an insulated plate 21<sup>a</sup>, projected between the adjustable contact members on the plunger, and at its outer end said switch-arm carries a carbon contact-piece 31.

32 indicates a spring which is joined to the bracket 29 and to the arm 30 in such manner that when the said arm is swung up to the position indicated in dotted lines in Fig. 6 it will maintain it in such position and when the arm is swung down to close contact with the opposing member 28<sup>a</sup> it will hold the said contacts 28<sup>a</sup> 31 together against any jarring of the switch.

35 indicates what I term a "supplemental" contact, or "circuit-closer," the main purpose of which is to relieve the carbon blocks 21 to 25 and 27<sup>a</sup> from the full current charge after the switch has been closed. The said contact 35 comprises a series or a laminated pack of copper spring-plates having a central spring clamping engagement with the bridge-piece, but insulated from the plunger.

The ends of the plates 35 are bent up, as at 35<sup>a</sup>, to such extent relatively to the carbon contacts as to engage with the brackets 23 to 26 immediately after the carbon blocks have connected and to break away from the said brackets on the breaking of the circuit before the carbon contacts separate. By thus providing and arranging the supplemental metallic contacts it is obvious the same will reinforce the carbon blocks in conducting capacity; but as the said carbon blocks break last any arc that may occur comes upon them, is thus diverted from the metallic contacts,

and all danger of fusing the laminated plates is thereby avoided.

It will be noticed by referring more particularly to Figs. 4 and 5 that the impact ends of the members 35 have a stepped arrangement, the outer plate having its member 35<sup>a</sup> the longest, while the others successively decrease in length toward the inner one. The purpose of this construction is twofold. First, it provides for a gradual application of the contact of the metallic plates and the brackets or posts 26 to 29, and, secondly, the resistance or back pressure is against each plate independent of the others, thereby relieving the innermost ones of such plates from a too great back-tension strain, which would occur if the ends of the members 35<sup>a</sup> were of the same horizontal plane. The laminated plates also serve another and advantageous purpose in that they assist by reason of their spring tension, under which they are held when drawn up the current, in throwing the bridge-piece down in case of any slight leakage which might serve to slightly increase the minimum current necessary to hold the switch up and which under some conditions may cause the switch to stick against its gravity drop.

In operation at the initial starting of the car current from the local energy on the car is shunted through the trolley into the inner winding of the switch, which creates current enough to lift the plunger and bridge-piece and close the switch, the movement of the plunger and its adjustable contacts at the upper end being so governed as to break the local or inner-winding circuit immediately after the main or feeder line circuit is caused to flow through the switch, which then passes through the conductor-rail and the trolley to the controller and used as desired.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a surface-contact railway system, a solenoid-switch having independent inner and outer windings of different resistance, the high-resistance coil being grounded and having a lead connected with the low-resistance coil; a circuit-breaker in the said lead governed by the shifting of the plunger; a plunger carrying a duplex set of contacts, said contacts being set in different planes whereby one set of which makes after and breaks before the other set of contacts correspondingly acts, for the purposes specified.

2. An automatic circuit making and breaking mechanism of the character described, comprising a high-resistance coil having a ground-return and connected with one of the sectional conductor-rails; a switch in said high-resistance coil; a low-resistance coil connected with the feeder-wire and with the conductor-rail section; a pair of contacting members in said low-resistance coil normally held open, said members each consisting of a fixedly-held portion and a portion having a lim-



ited free movement projected in a plane in advance of the fixedly-held portions of the said contacting members; a plunger-rod governed by the energizing of the high or low resistance coils, said plunger including a pair of contacting members, said plunger-contacting members being held in different planes, whereby one set will engage the forwardly-projecting contacting members of the low-resistance coil before the other set engage the fixedly-held portion of the said low-resistance contacting members, said plunger having means for breaking the switch in the high-resistance winding immediately after the first active contact members engage.

3. In a solenoid-switch of the character described; the combination with the fixedly-held contacting portions, the yielding carbon-block-holding contacts and the circuit-wires; of the plunger-armature carrying a bridge-piece having carbon blocks to engage the yielding contacts and carrying metallic contacts consisting of a laminated pack of spring copper plates, the ends of which are bent up to engage the fixedly-held or bracketed contacts after the carbon contacts are closed,

said ends having their impacting portions arranged to engage the brackets successively from the outermost one toward the innermost one, for the purposes specified.

4. In an electromagnetic switch mechanism of the character described; the combination with the lead connecting the inner and outer windings and the armature-plunger; of a circuit-breaker in the aforesaid lead, consisting of a fixedly-held contact; a bracket connected with the inner terminal of the lead; a hinged member carrying a contact to engage the fixedly-held contact, said hinged member being arranged in the path of the plunger and adapted to be swung in opposite directions by the opposite movements of said plunger, and a spring device for holding the said swinging member in either its open or closed position until positively engaged by the plunger in its opposite movements, all being arranged substantially as shown and for the purposes described.

JOHN McLEOD MURPHY.

Witnesses:

LOUIS STECKLER,  
SAMUEL SEINFEL.