

(No Model.)

5 Sheets—Sheet 1.

M. H. SMITH.

SYSTEM FOR SUPPLYING ELECTRICITY TO RAILWAYS.

No. 500,256.

Patented June 27, 1893.

Fig. 2.

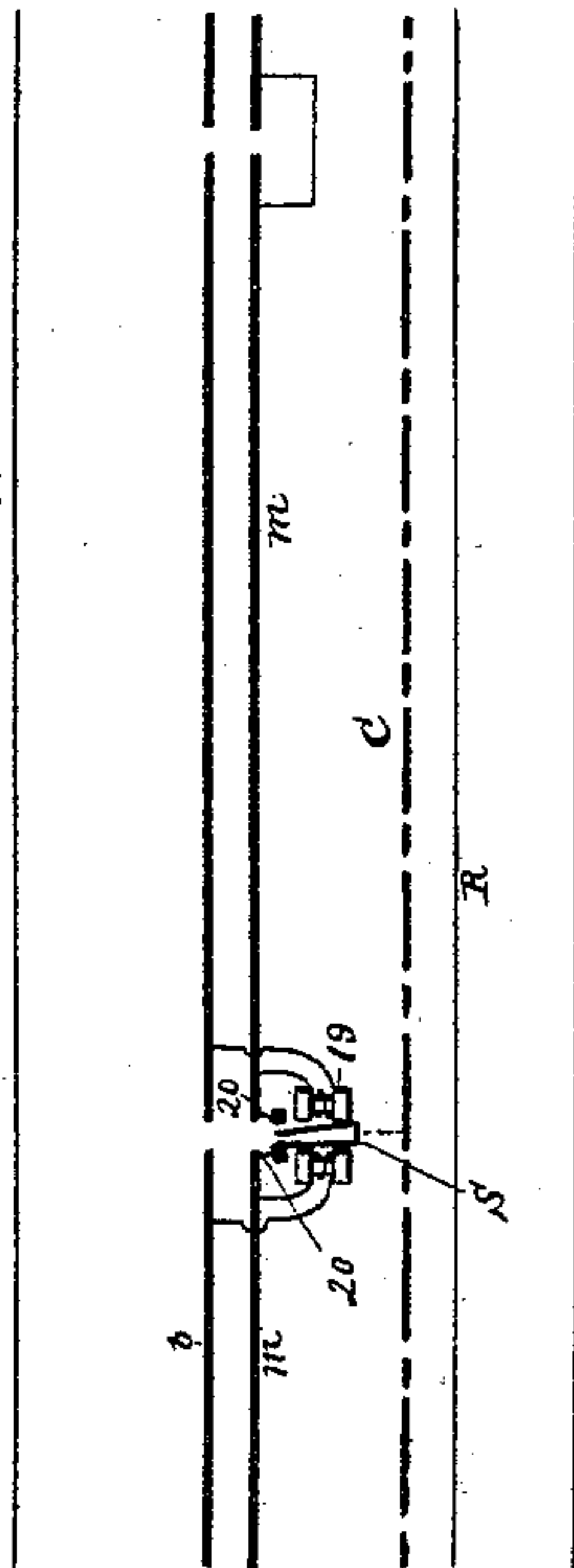


Fig. 1.

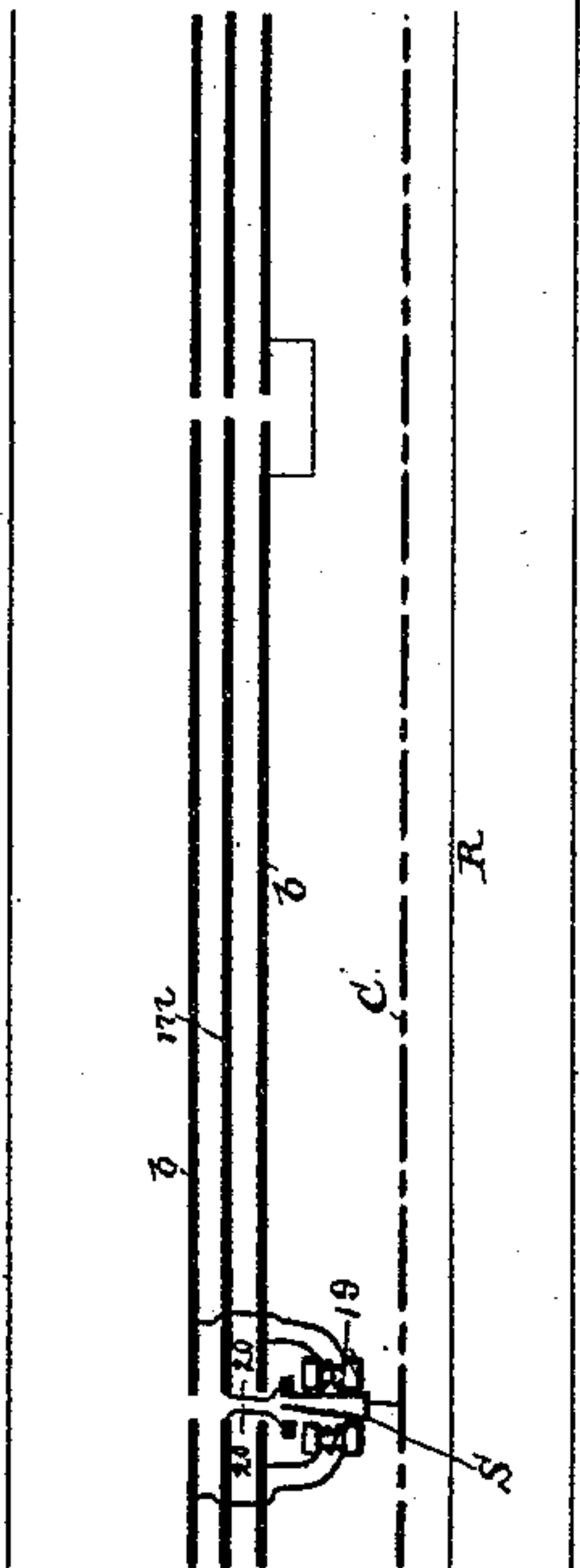


Fig. 3.

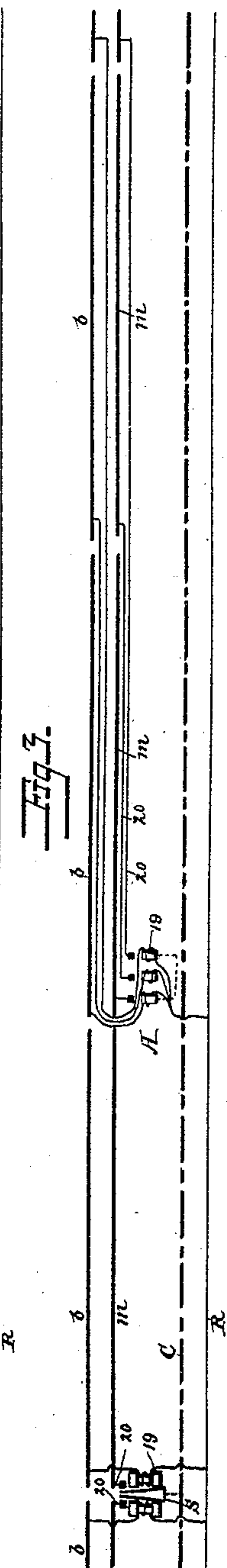


Fig. 4.

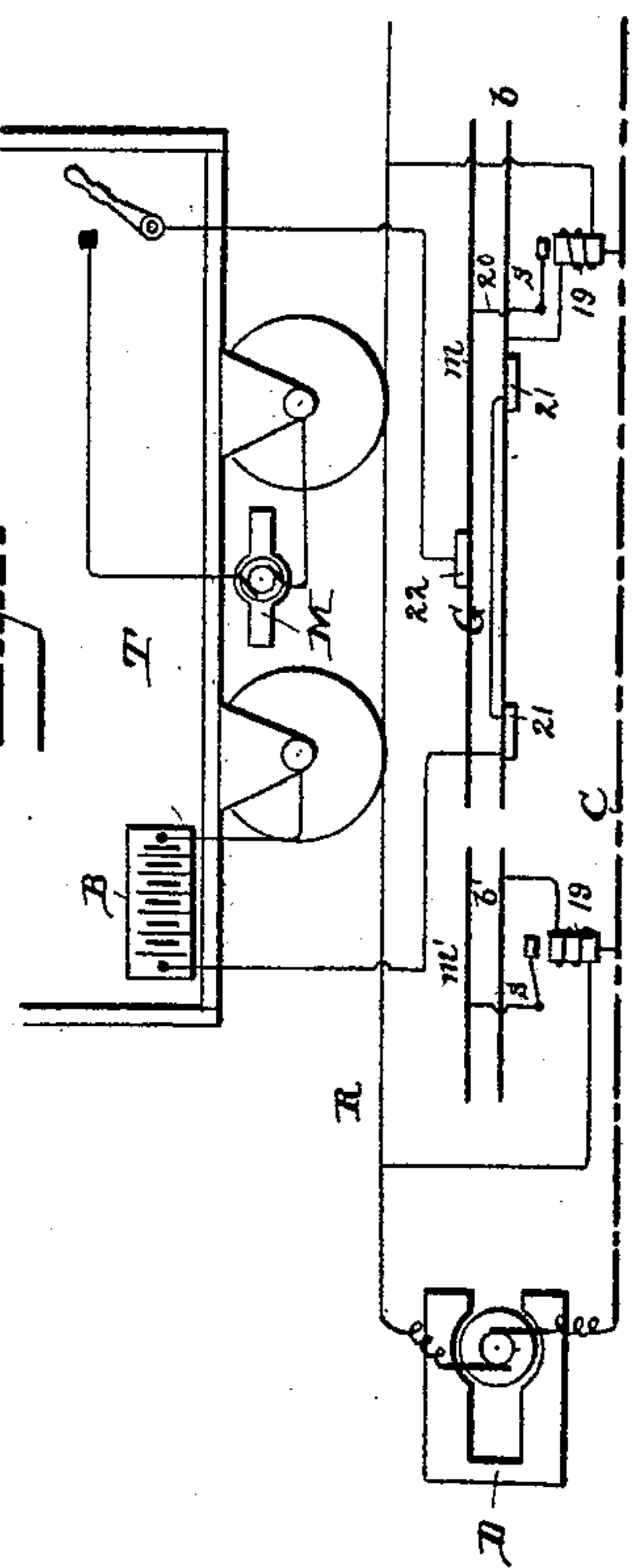


Fig. 5.

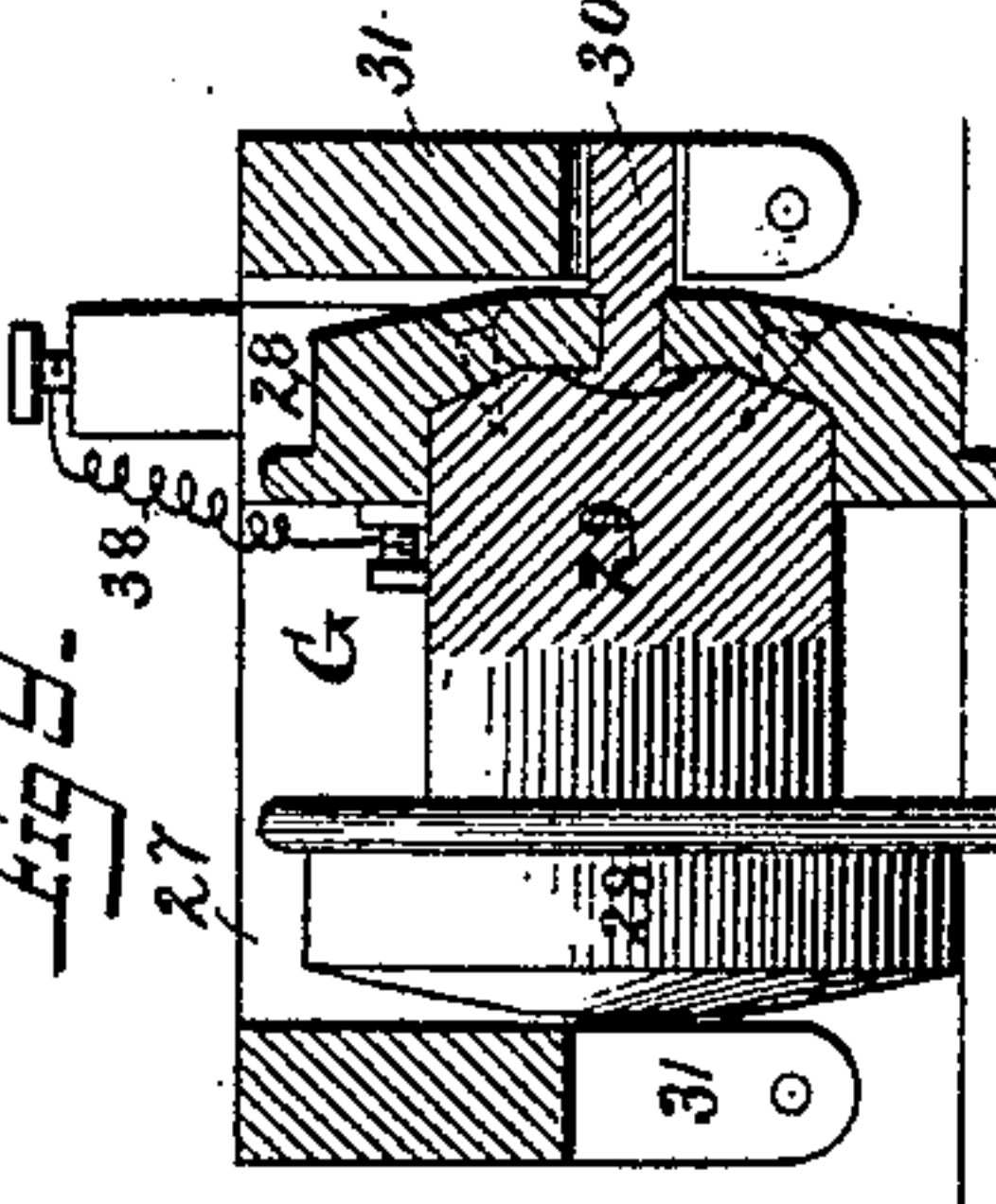


Fig. 6.

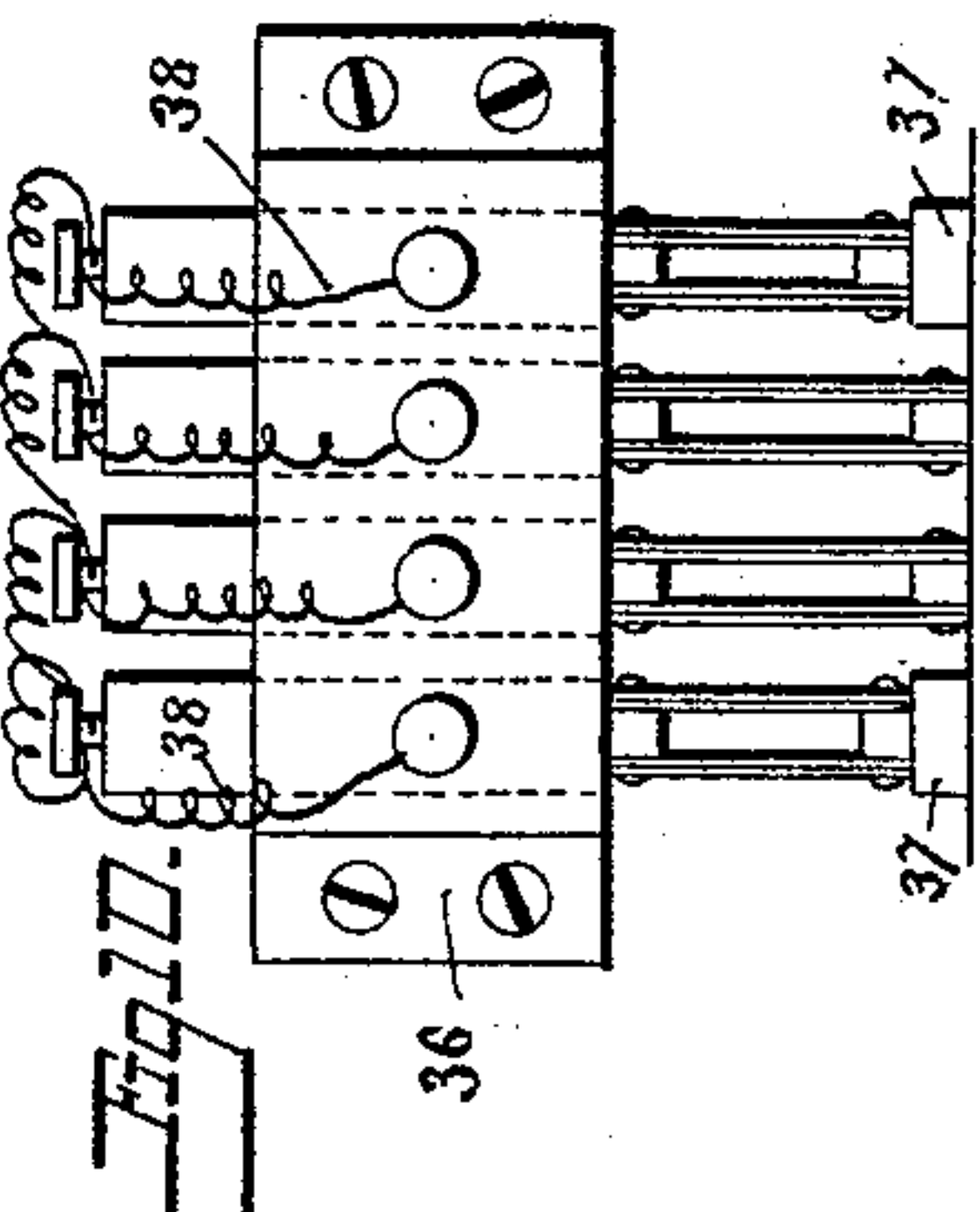
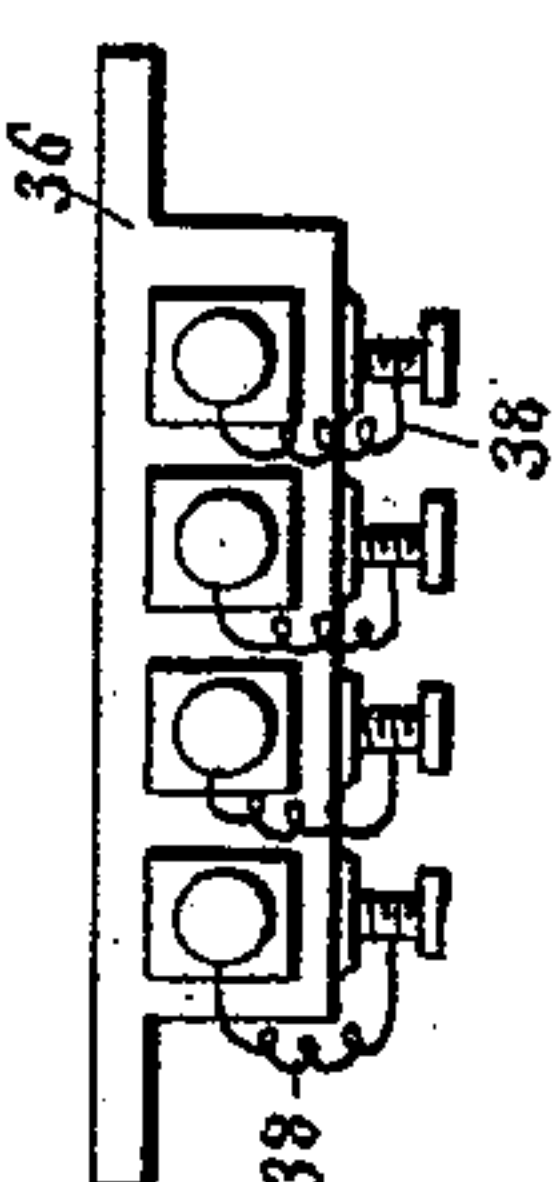


Fig. 7.



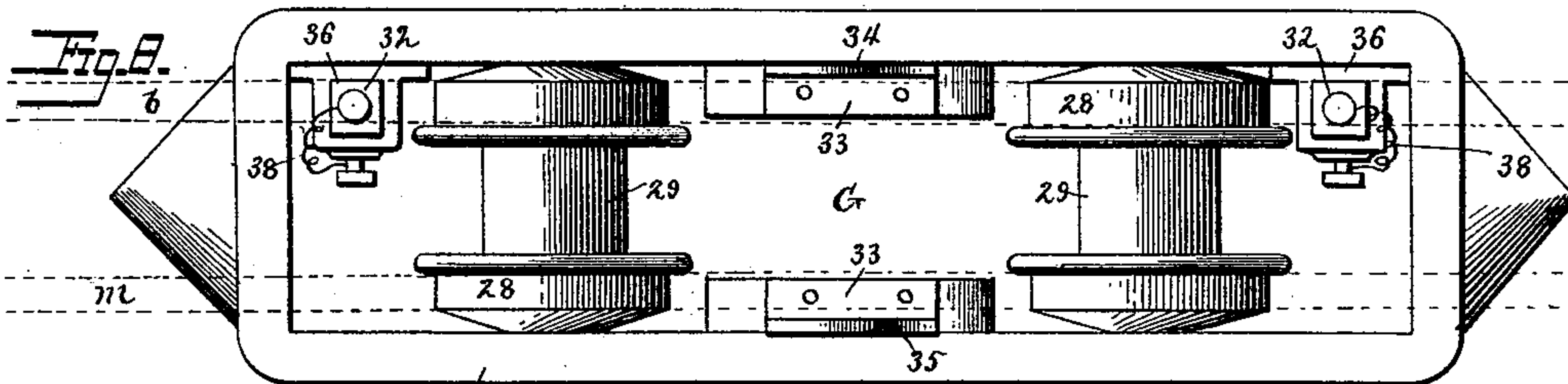
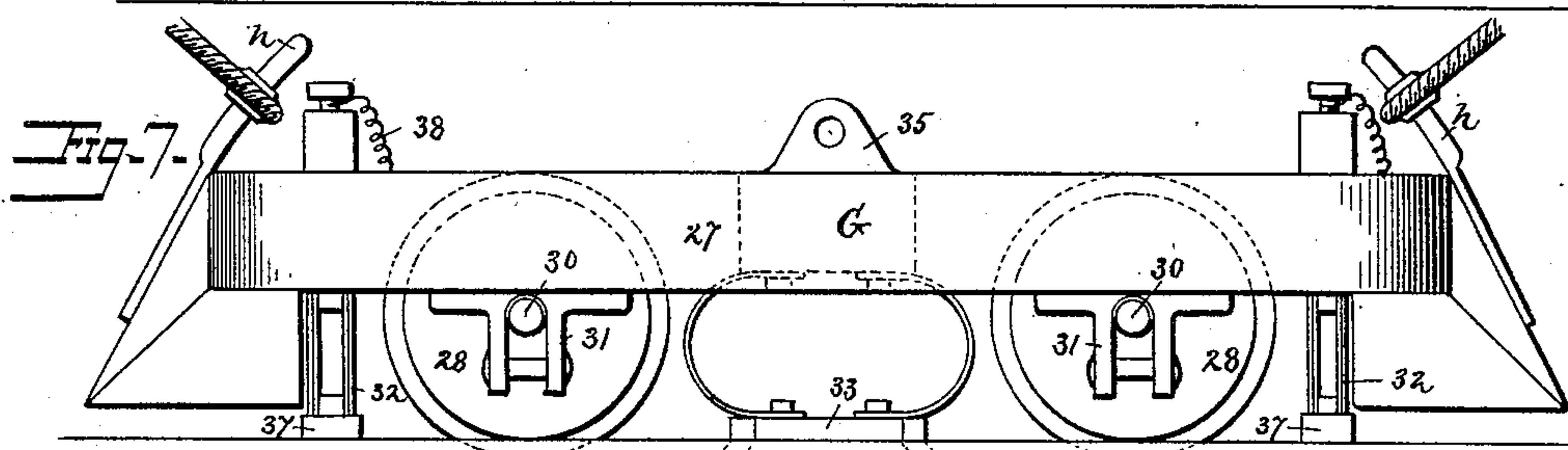
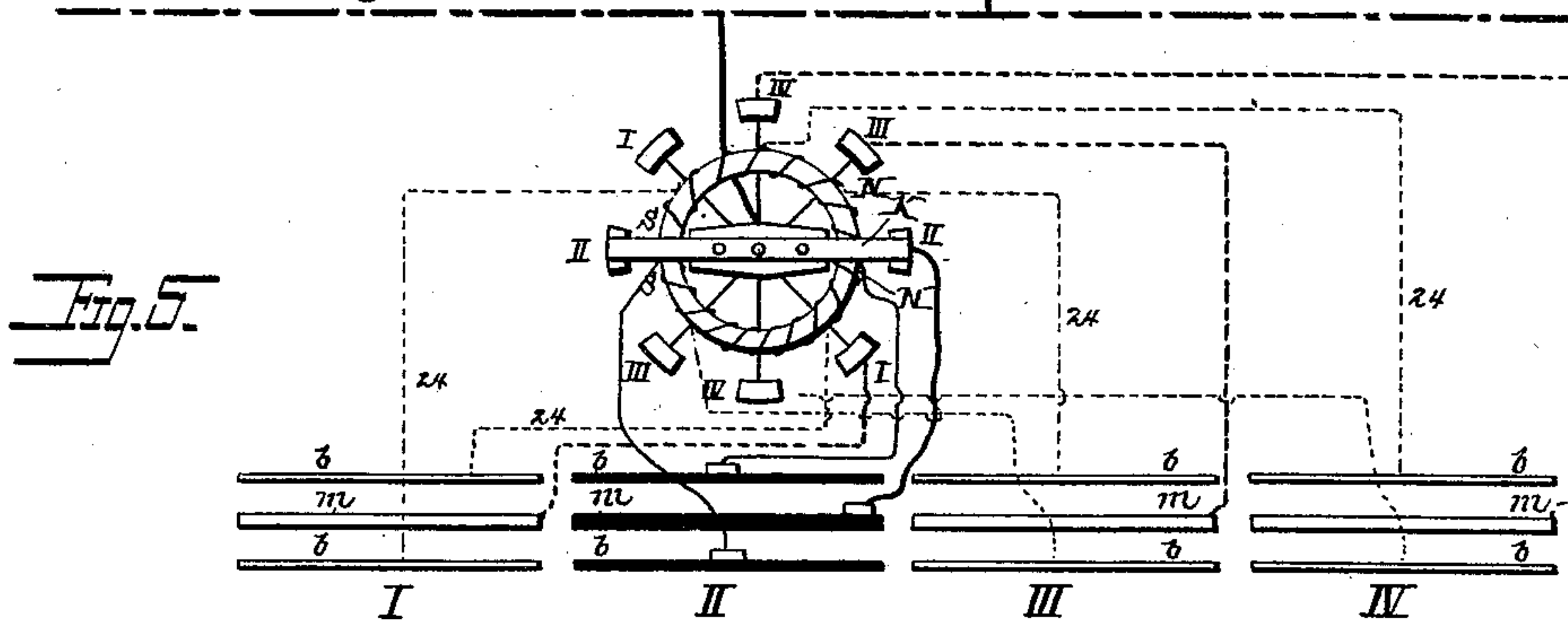
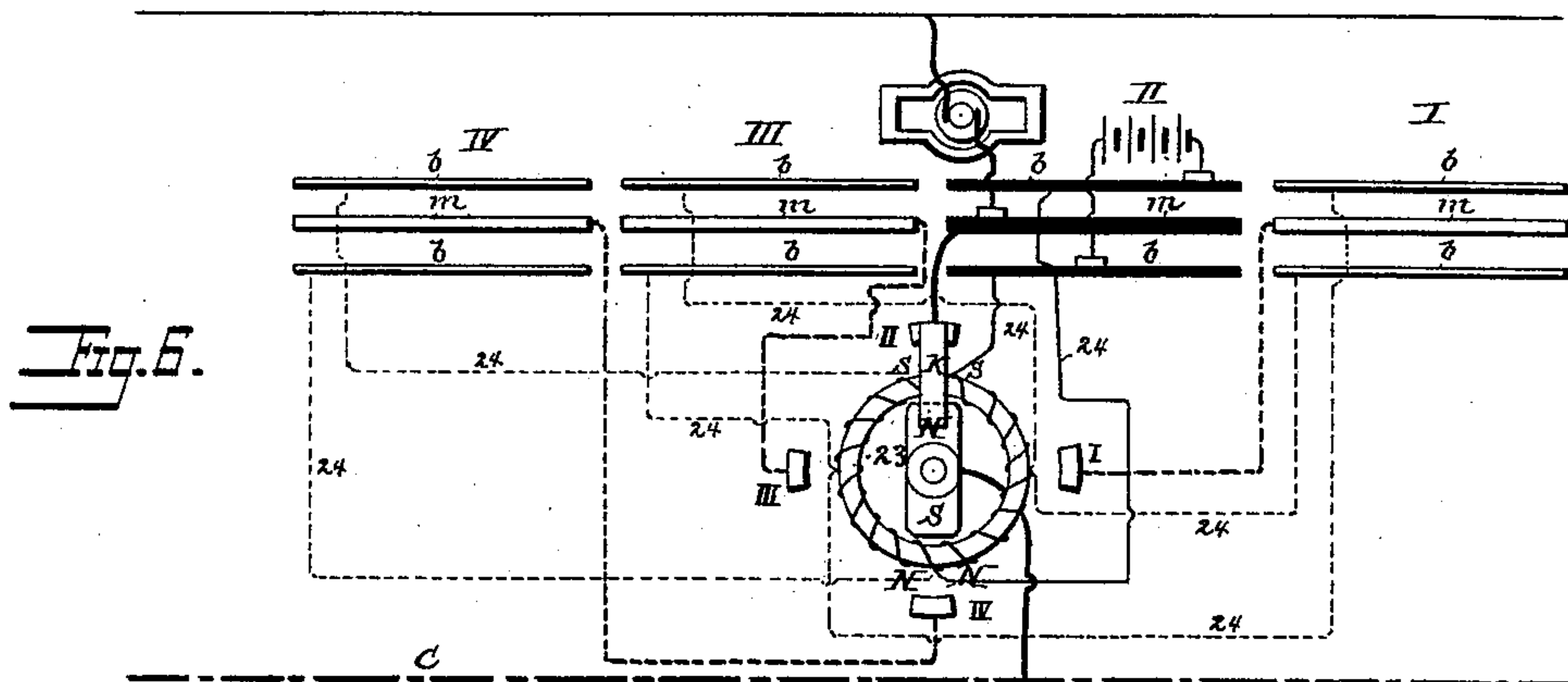
Witnesses

A. E. Farnham.
Sidney L. Johnson

Inventor

M. H. Olroyd Smith,
By Foster Freeman
Attorneys

M. H. SMITH.
SYSTEM FOR SUPPLYING ELECTRICITY TO RAILWAYS.
No. 500,256. Patented June 27, 1893.



Witnesses
A. E. F. Farnham.
Sidney L. Johnson.

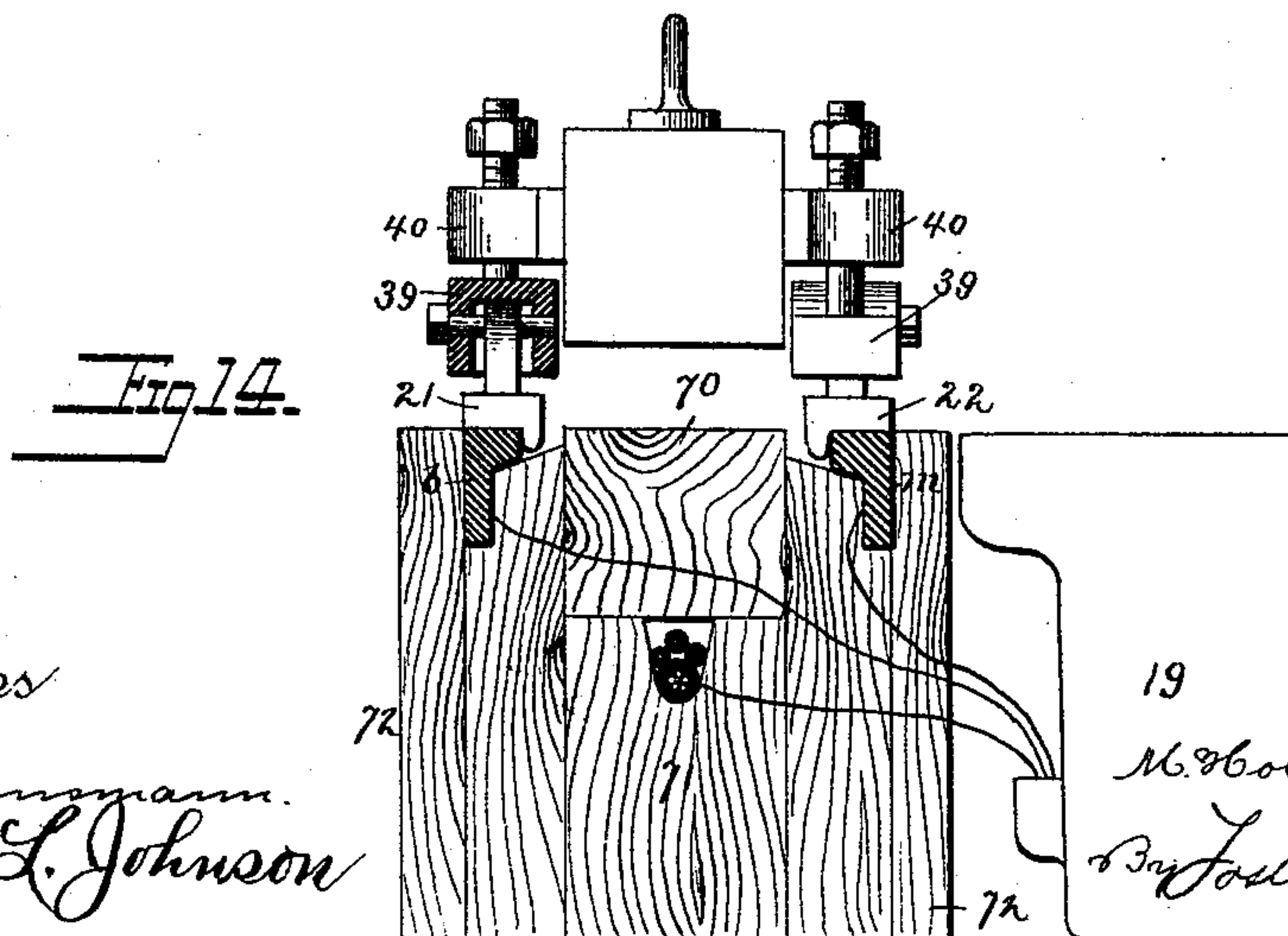
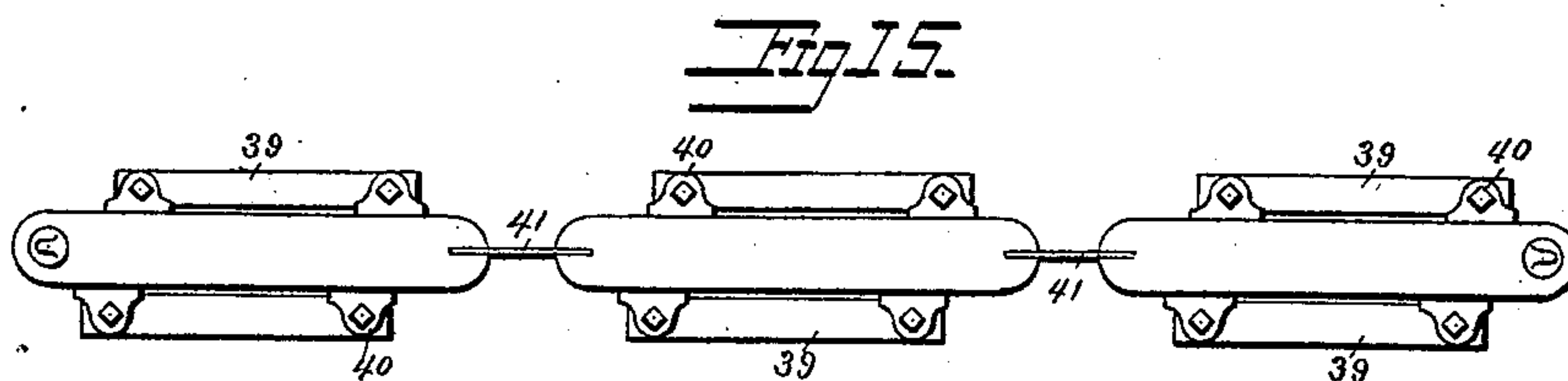
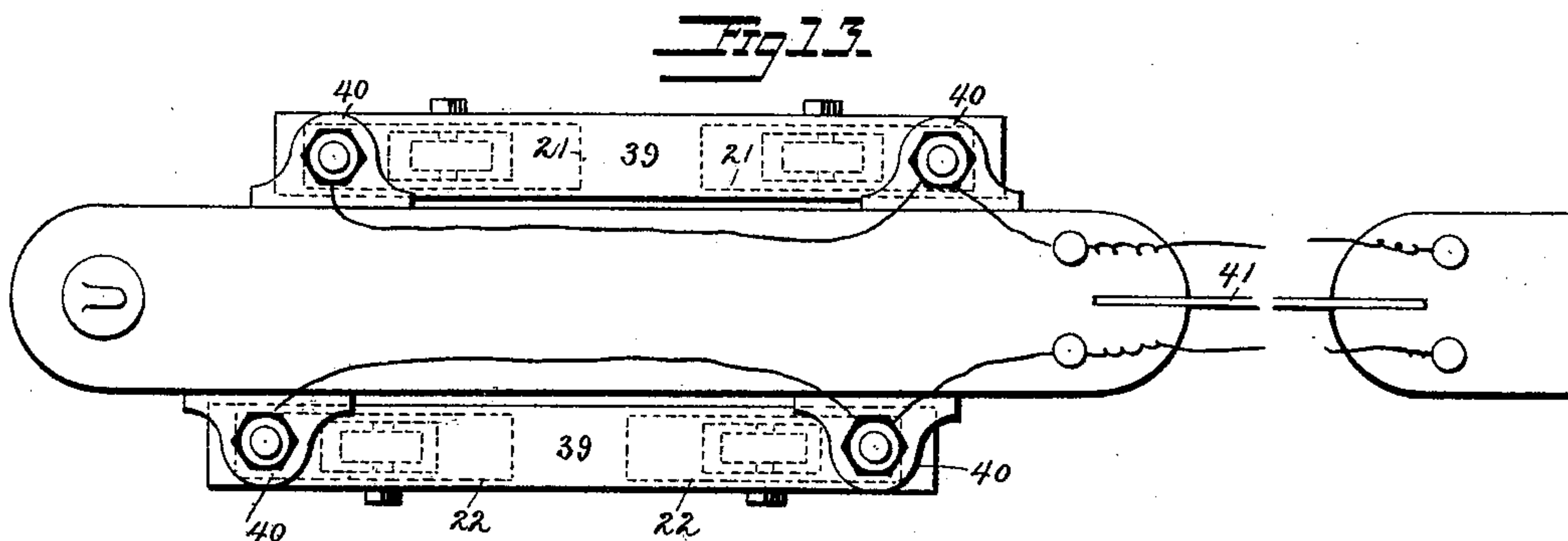
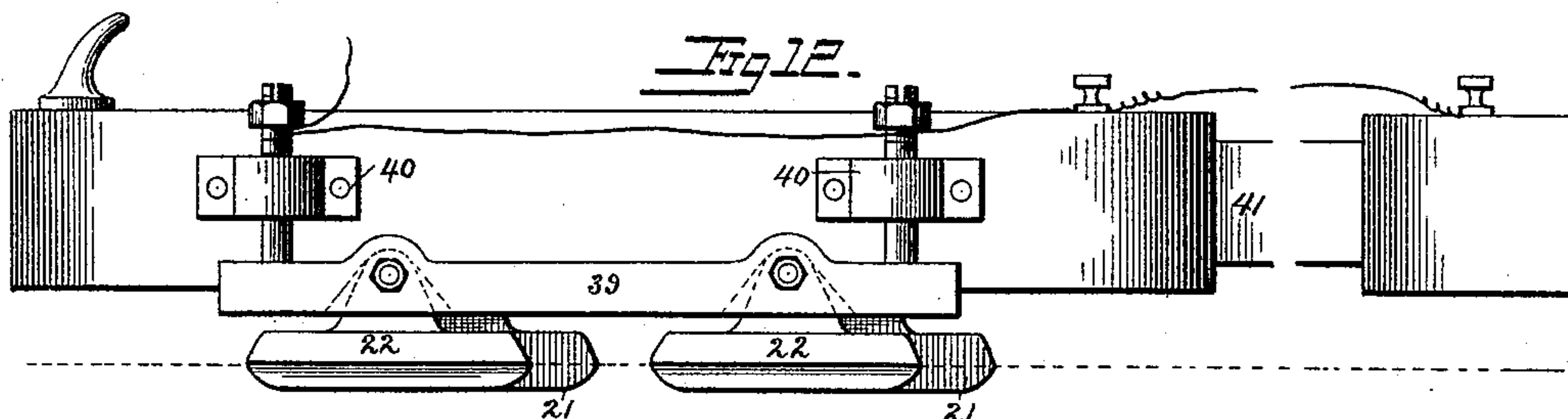
Inventor
M. H. Smith.
By Foster & Freeman
Attorneys

M. H. SMITH.

SYSTEM FOR SUPPLYING ELECTRICITY TO RAILWAYS.

No. 500,256.

Patented June 27, 1893.



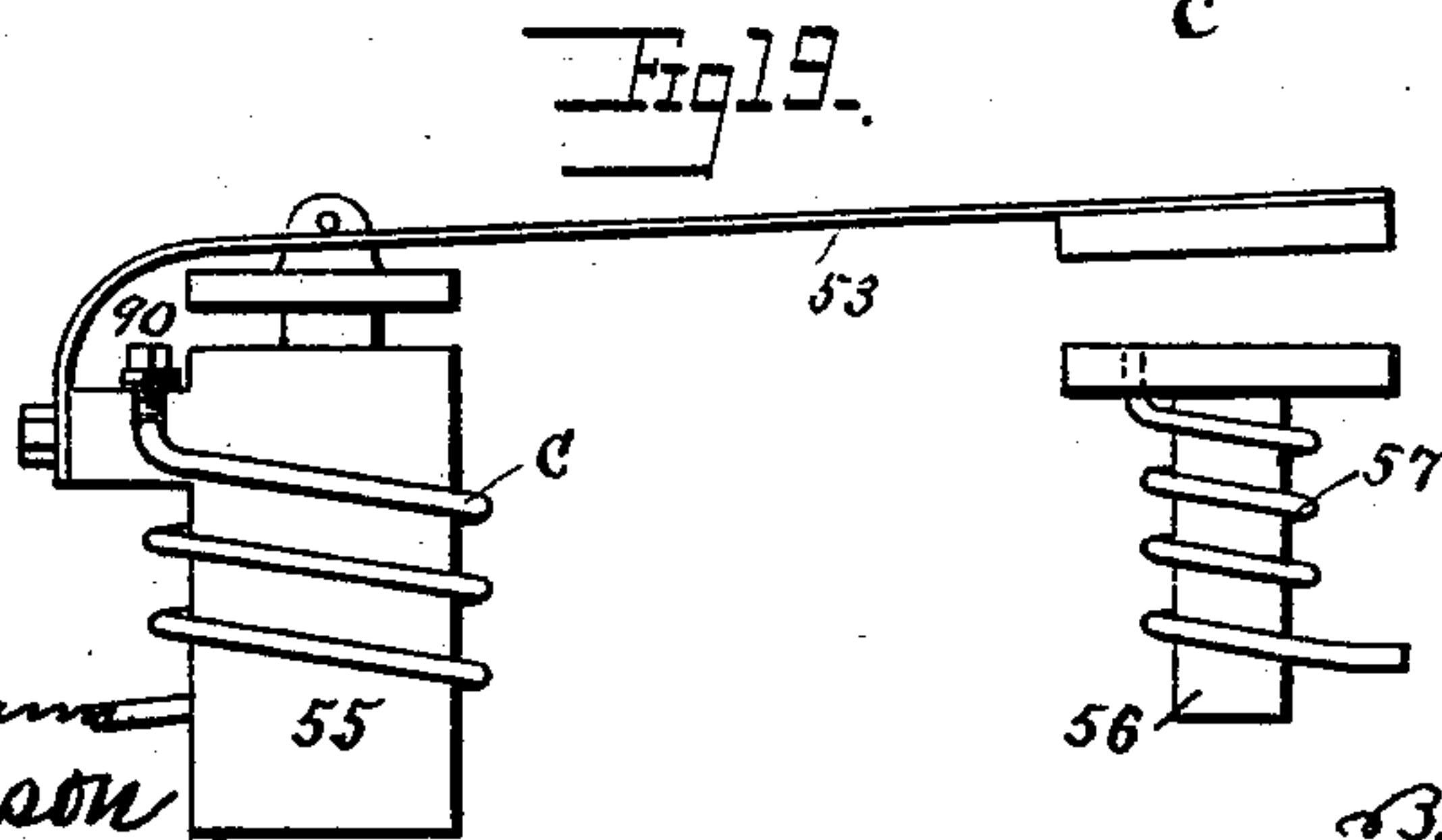
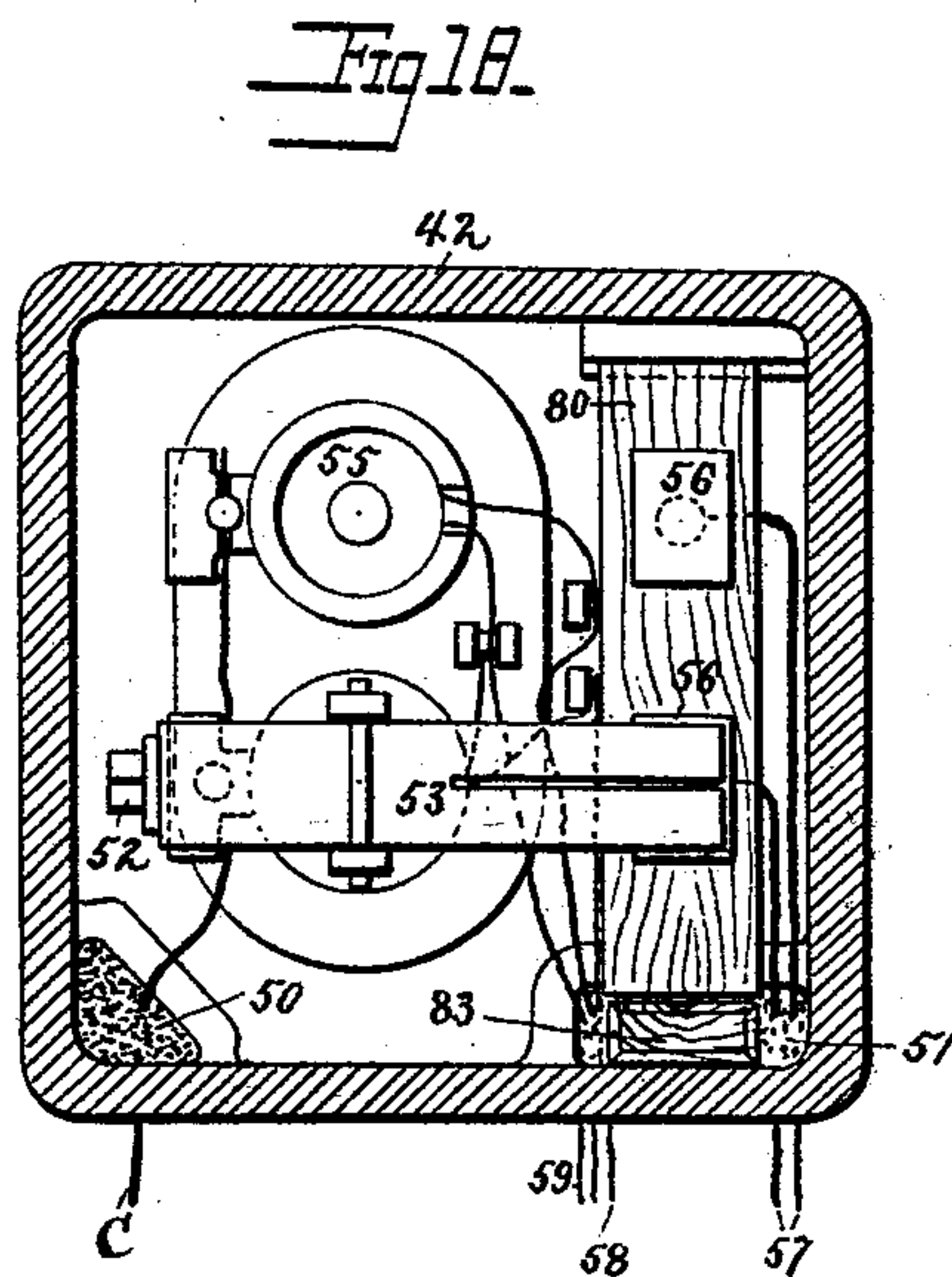
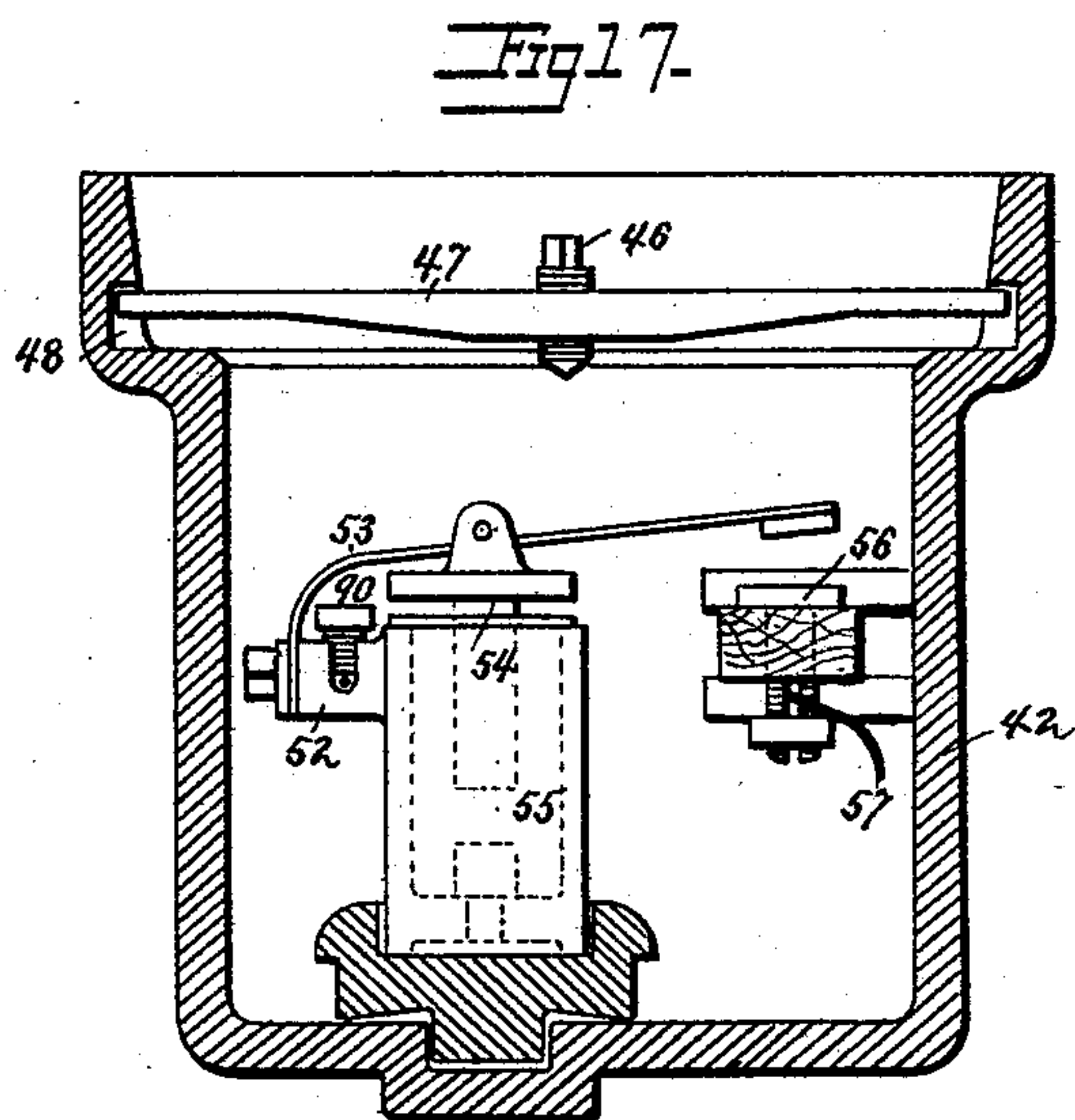
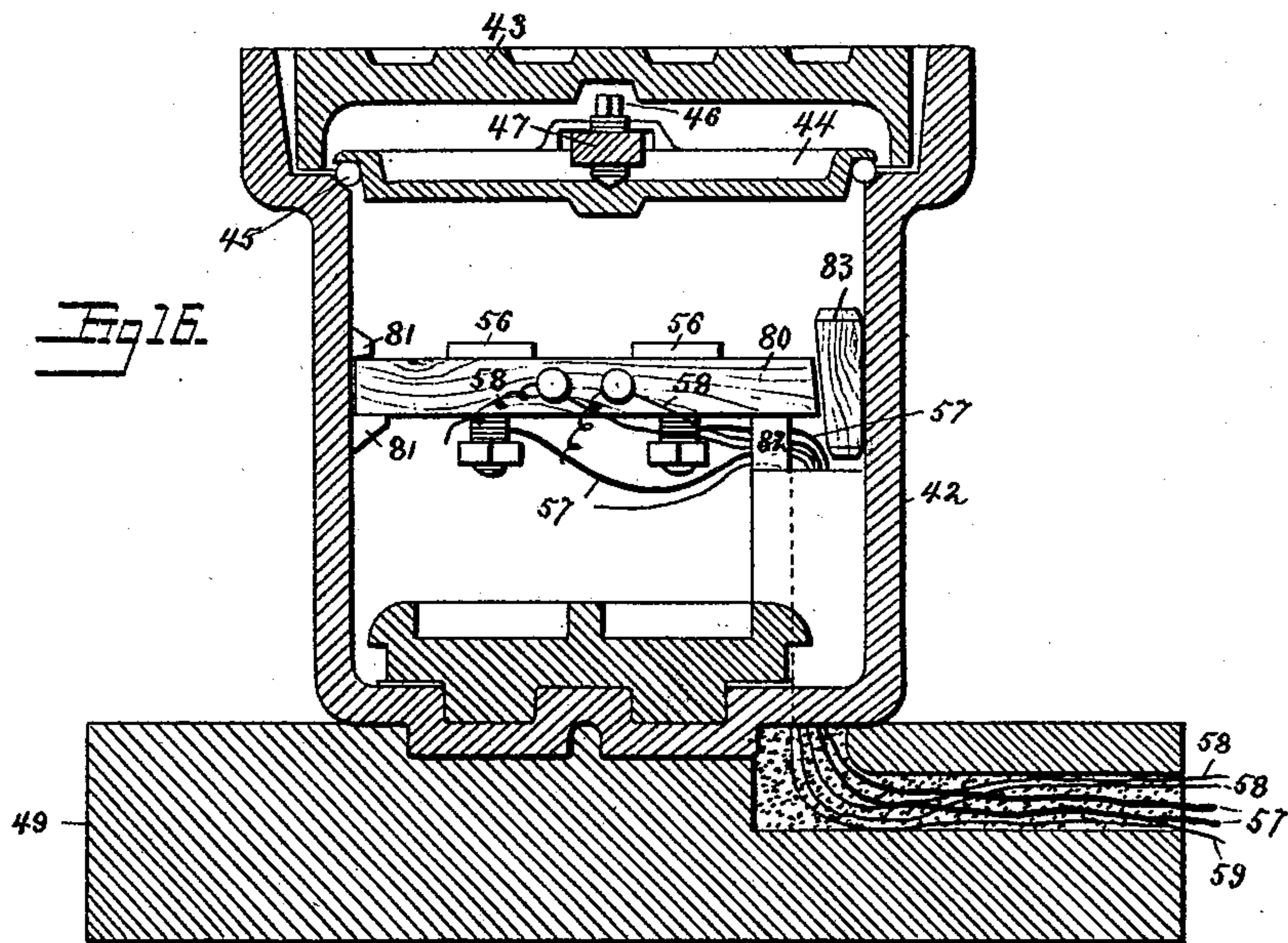
Witnesses
A. E. Farnham.
Sidney L. Johnson

19 Inventor
M. Holroyd Smith,
By Foster Freeman
Attorneys

(No Model.)

5 Sheets—Sheet 4.

M. H. SMITH.
SYSTEM FOR SUPPLYING ELECTRICITY TO RAILWAYS.
No. 500,256. Patented June 27, 1893.



Witnesses

A. E. Farnham
Sidney L. Johnson

Inventor

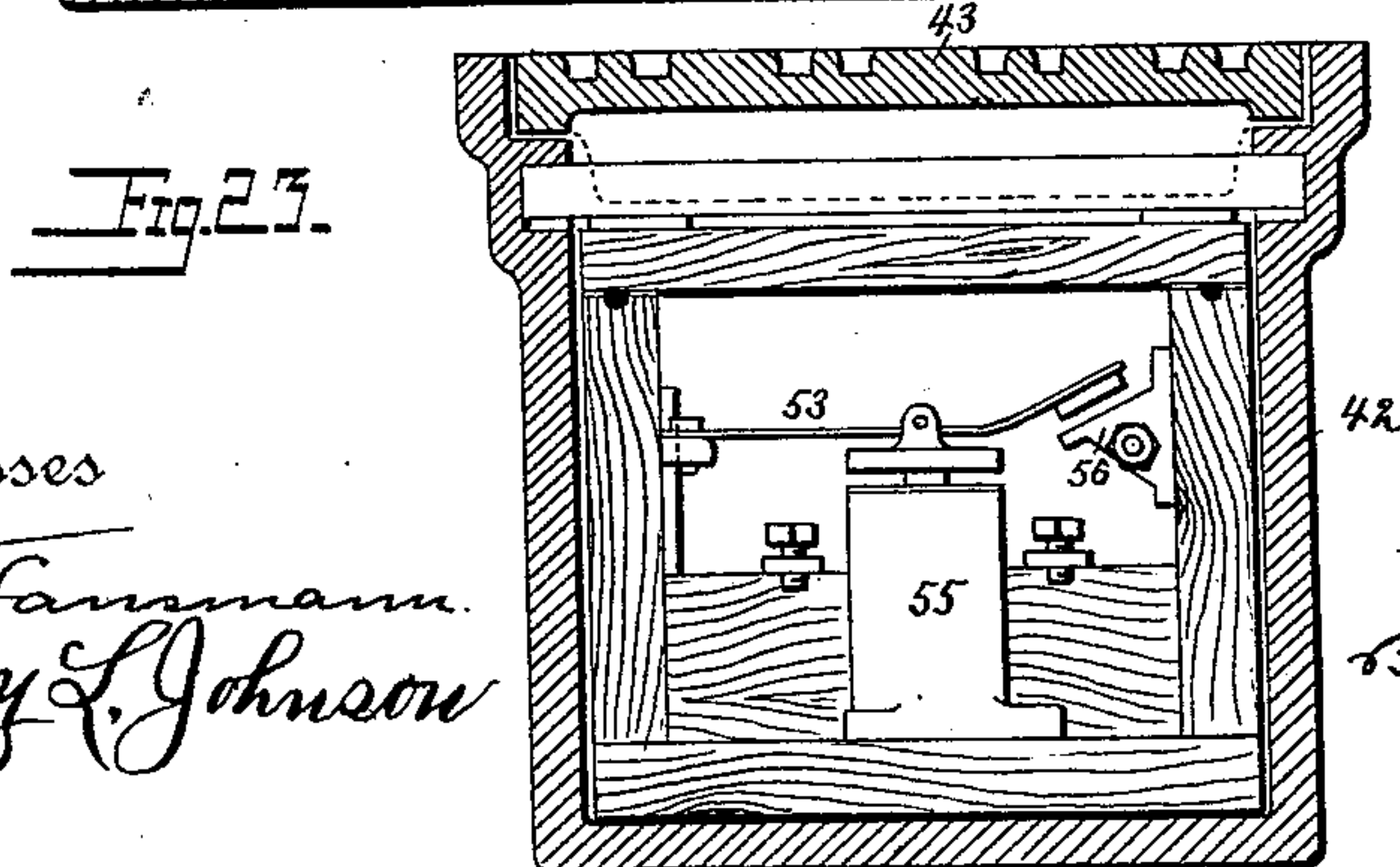
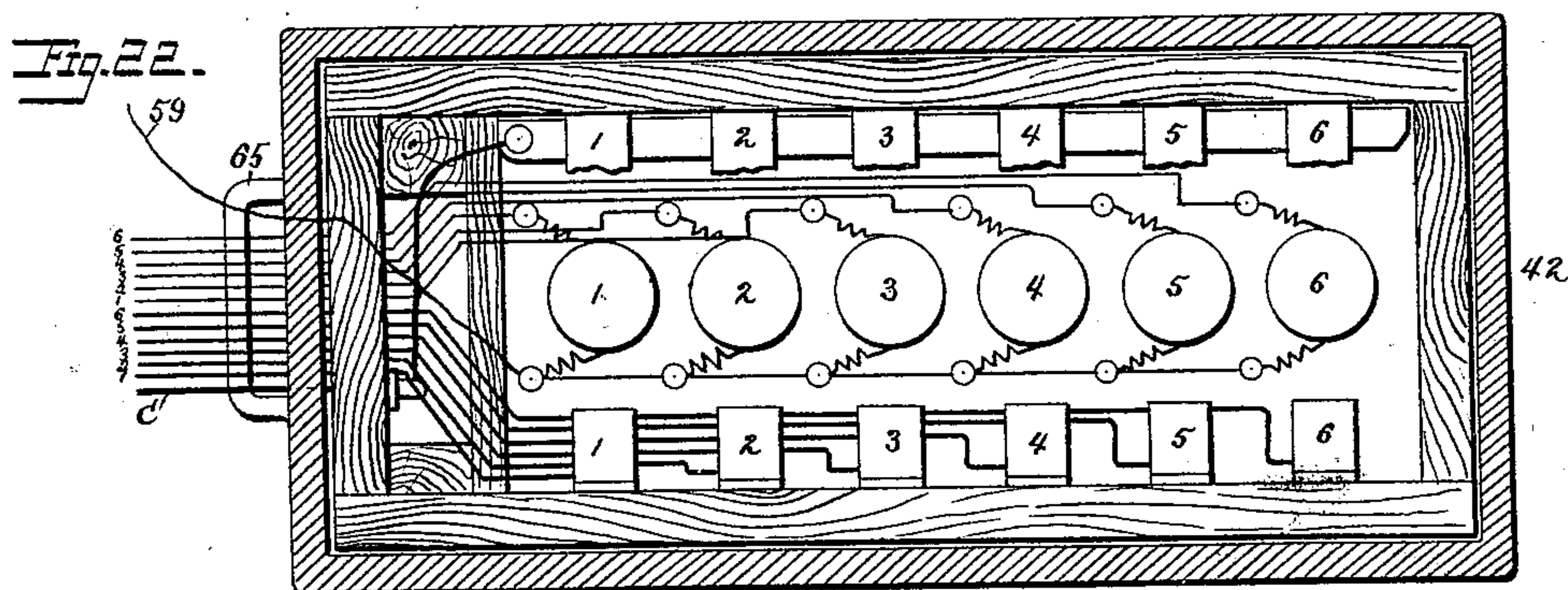
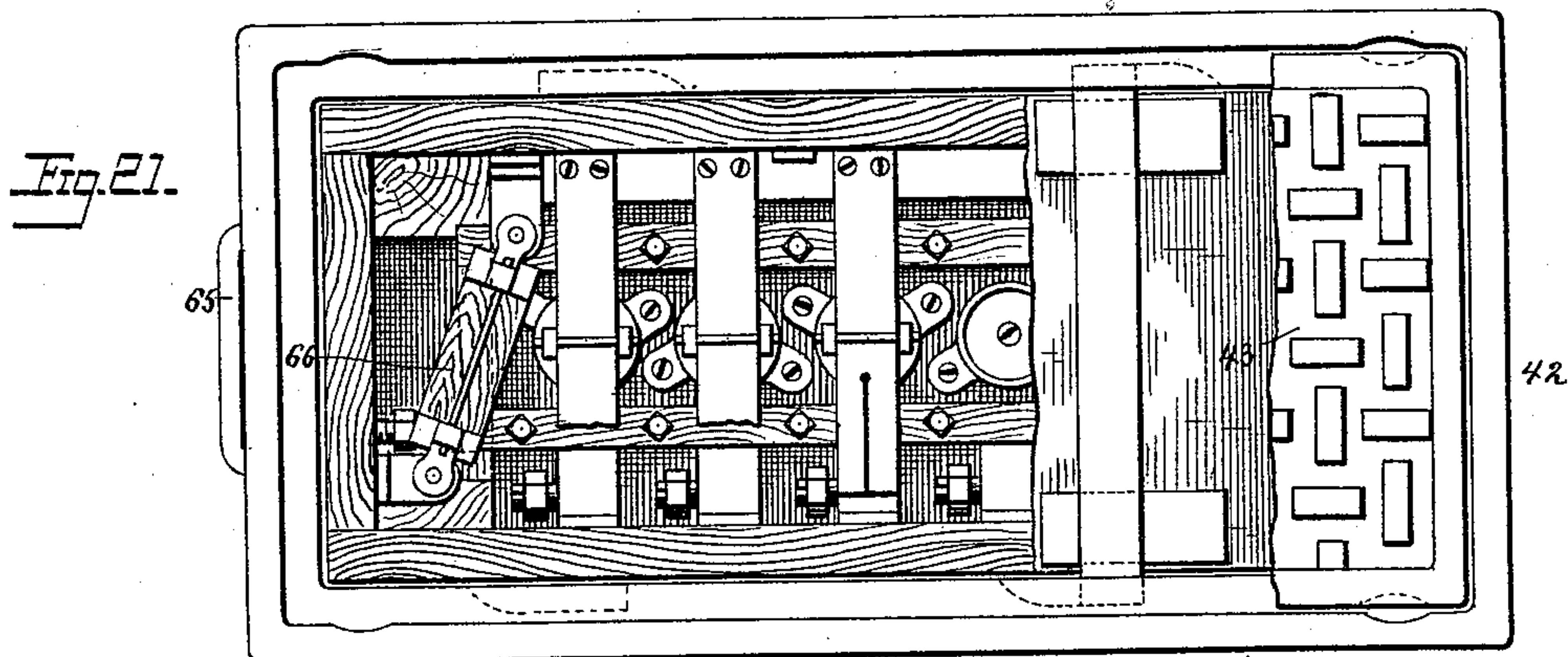
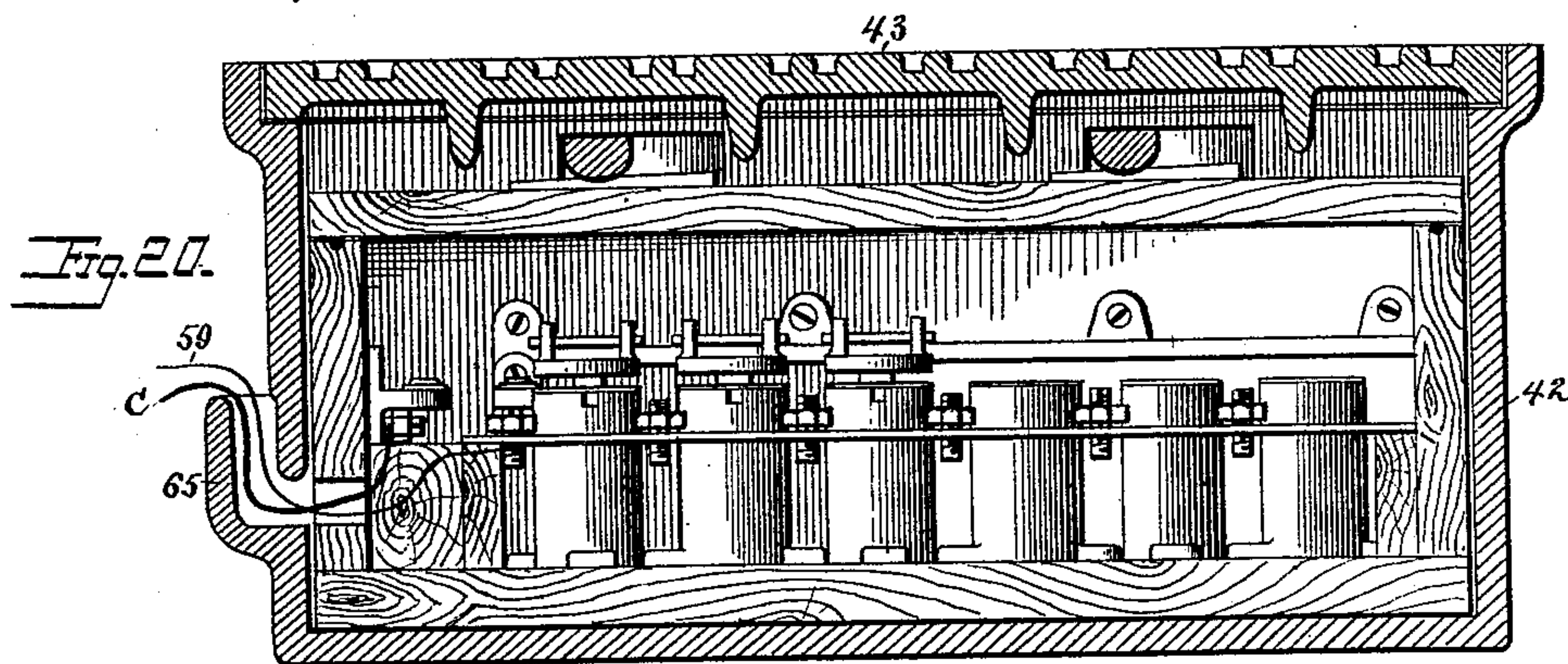
M. H. Smith,
By Foster Freeman
Attorneys

M. H. SMITH.

SYSTEM FOR SUPPLYING ELECTRICITY TO RAILWAYS.

No. 500,256.

Patented June 27, 1893.



Witnesses

A. E. Farnham

Sidney L. Johnson

Inventor

M. Holroyd Smith,

By Foster & Freeman

Attorneys

UNITED STATES PATENT OFFICE.

MICHAEL HOLROYD SMITH, OF HALIFAX, ENGLAND.

SYSTEM FOR SUPPLYING ELECTRICITY TO RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 500,256, dated June 27, 1893.

Application filed October 26, 1887. Serial No. 253,458. (No model.) Patented in England December 28, 1886, No. 17,018, and in Belgium June 13, 1887, No. 77,792.

To all whom it may concern:

Be it known that I, MICHAEL HOLROYD SMITH, a subject of the Queen of Great Britain, and a resident of Halifax, in the county of York, England, have invented certain new and useful Improvements in Electric Railways, (for which I have obtained a Belgian patent, No. 77,792, dated June 13, 1887, and for which British Letters Patent No. 17,018, dated December 28, 1886, have been granted to me,) of which the following is a specification.

This invention relates to an improved method and appliances for transmitting electric currents especially designed for supplying electric force for the propulsion of tram or railway cars; the object being to obviate the necessity of using a central channel and to work economically and with safety to the public.

The system relates generally to that class of electric railways wherein are employed main underground conductors conveying the operating current, with which conductors electrical connection is made by the passage of the car or train. Located between the rails, upon which the car runs, are short sections of conductors through which connection is made with the car or vehicle and the current supplied to the motor thereon. These short sections are normally out of connection with the main electric conductor and the sections are brought into connection with the main conductor automatically as the car passes over them. In this way I provide an electric railway system in which but a short portion of the track or rails upon the surface is charged with electricity at one time, and if desired these sections may be no longer than the car or train so that it is practically impossible that accidental connection with the main conductors shall be made by unauthorized persons coming in contact with the charged conductor. While this general principle may be embodied in various forms of construction, I have illustrated in the accompanying drawings by diagrammatic representations a theoretical embodiment of my invention and by detailed drawings means whereby it may be practically carried out.

In the accompanying drawings: Figures 1,

2 and 3, are diagrams illustrating the arrangement of the rails and circuit connections. Fig. 4, is a diagram illustrating the circuits. Figs. 5 and 6, are diagrams illustrating another form of switch. Figs. 7 and 8, are side and plan views of the gatherer. Fig. 9, is a cross section of the same. Figs. 10 and 11, are side and plan views of the gatherer shoes. Figs. 12, 13, 15 and 14, are views representing another form of collector, the latter figure showing one form of arranging the conductor rails. Figs. 16, 17 and 18, are views illustrating one form of switch box. Fig. 19, is a detail of the same; and Figs. 20, 21, 22 and 23, are views illustrating another form of switch box.

I will first describe the theoretical arrangement of a system embodying my invention, referring especially to diagrammatic Figs. 1, 2, 3 and 4, and will then describe one form of device for embodying said theoretical construction. Referring to said figures R, R represent the ordinary track rails upon which the car or train runs and which rails may be used, if desired, for returning the current to the generator. C represents the main insulated electric cable carrying the current from the generator, which cable is buried or carried overhead and arranged in some convenient manner in proximity to the rails. *m* represents the short sections of rails which are arranged somewhere along the way, being shown between the main track rails, and which furnishes the motor current to the car. These sections are properly insulated from each other and may be insulated to a greater or less extent from the surrounding earth. As the car moves onto any one of these sections *m*, it is automatically brought into electrical connection with the main current conductor C, and I have shown in this instance electromagnetic switches 19, which are arranged in switch boxes conveniently located along the track, as hereinafter more particularly described. In order to operate these switches I make use of a source of electricity, as a battery B, upon the car or train T, and I arrange one or more conductor bars *b* alongside the motor bar and the current from the generator on the car is supplied to these bars by means of suitable connecting or gathering devices, as brushes and the like, as hereinafter set forth.

As shown in Fig. 1, the current from the generator B on the car passes through the gatherers to the rails b, b , located on opposite sides of the motor rail m , and the electro-magnetic device 19 is included in the circuit in the manner shown, so that when the current from the generator or battery on the car energizes this electro-magnetic device it operates to move the switch S, which is connected with the main current conductor, so as to make contact with one or the other of the contact pieces 20, connected to the motor rail, so that the moment the circuit is completed through the bars b, b , the corresponding motor bar m is charged from the main conductor C, and remains charged as long as the current is completed through the said bars b , and as soon as the current is broken by any means, as by the passage of the gatherer from the bars b , the electro-magnetic device operates automatically to disconnect the motor section from the main conductor.

In Fig. 2 I have shown but one bar b , for the operating current, the return current from the generator on the car passing through the motor section rail m . In Fig. 3, I have shown a similar arrangement in which but one bar b is used, the circuit being completed through one or both of the ordinary track rails R. From this it will be seen that various modifications of the circuits may be made which are evident to those skilled in the art and which would not depart from the general principles of my invention, and which need not be specifically set forth herein. I have also shown in Fig. 3, a switch box A, in which are arranged a series of switches connected to successive motor rails so that the said rails may be successively brought into connection with the main conductor in a manner clearly indicated by the connection shown. By this arrangement I am enabled to greatly reduce the number of switch boxes when deemed expedient.

In order that the currents may be more easily traced, reference is made to Fig. 4, in which D represents the stationary generator supplying current to the main conductor C, and connected to one of the rails R as a return conductor. When the circuit is closed through the battery B on the car the current therefrom passes through the connectors or gatherers G, having contacts or shoes 21, 21, bearing on one of the sections b , and thence it passes through the electro-magnetic device 19, back through the rail R to the battery B. This energizes the electro-magnetic device 19, operates the switch S and connects the corresponding section m to the main conductor C, so that the current from said main conductor passes through the electro-magnetic device to the section m , thence through the contact device or shoe of the gatherer 22, to the motor M on the car, and thence by the rail R to the generator.

In the arrangement shown I have supplied the gatherer G with two contact devices or

shoes 21, one in advance and one in the rear of the motor connector shoe 22, and by this arrangement it will be observed that the operating current will be connected to the next section b' , so as to energize the corresponding motor section m' before the motor connector shoe 22 reaches said section, and it will also be seen that the said section m will remain charged a short time after the motor connector shoe 22 passes from said section and in this way I am enabled to prevent any dead points and to insure the motor section being properly charged whenever the car is over said section and it remains charged until the motor connector passes off the section and ceases to require a current through the switch 19, and thus avoiding flashing or sparking of the switch contacts.

In Figs. 5 and 6, I have illustrated diagrammatically another form of electro-magnetic switch device for operating in connection with my system. In said Fig. 5, 23 is a magnetic ring, the coils of which instead of being coupled to a commutator are by means of the wires 24, 24, 24 coupled to the battery sections of the operating circuit rails b , the connectors or gatherer shoes taking the place of the brushes. When the gatherers are upon section II, the iron of the ring becomes two magnets having their S S and N N poles together, as shown, carrying with it the contact piece K, which makes a connection between the main current cable C and the terminals II, II, the wires from these terminals taking the main current to the motor strips m . The contact piece K is made to bridge two terminals I, I, II, II, III, III, IV, IV, because the armature being of soft iron may assume the position required with either end to N or S of the magnet ring, thus necessitating eight divisions of the armature for four sections of line.

In order to make each coil section available for each road section, I employ a permanent polarized or electro-magnet, as shown in Fig. 6, whereby it will be seen that if the connection or gatherer is shifted from road section II to road section IV the direction of the current through the coils of the ring magnet would be reversed, S S becoming N N and N N becoming S S; the electro-magnet would also reverse, bringing the contact maker K upon terminal IV and so conveying the main current to road section IV.

Having thus described the main principles of my invention I will now describe one practical means of carrying out the same, and it will be understood that my invention is not limited to the special means herein described as other devices may be used for the same purpose.

In Figs. 7, 8 and 9, I have shown in side elevation, plan and cross section, a connector or gatherer G consisting of a wooden frame 27, carried upon four wheels 28, which wheels are shown as hollow shells secured by screws or other devices to axles 29 consisting of hard

wood treated and coated with any insulating and waterproof composition. Studs 30, shown more particularly in Fig. 9, are screwed or riveted into the face of these wheels and engage in a block or bar 31, attached to the wood frame work 27. The wheels run upon the iron bars *b*, *m*, making contact therewith, but in order to further secure the making and maintaining of good contact rubbers or sliders 32, 33 are also provided on either side of the frame, 32 being those for the battery current, and 33 those for the main current. The sliders or rubbers 32 may be of various forms. Two are shown, the one in the center consisting of an iron shoe attached by springs to the fixings 33, 34 attached to the wooden frame. The outer one consists of a square box 36, shown more in detail in Figs. 10 and 11, in which a square bar of iron or other metal is free to slide. These bars or plungers may be used in groups as illustrated in Figs. 10 and 11. To avoid occasional interruption of the current by the shaking or sliding of the plunger in its case or box, wires 38 connect the top of the plunger with the case 36. The gatherer or connector is hauled along with the car, the hooks *h*, *h* being used for this purpose.

Another form of gatherer is illustrated in Figs. 12, 13, 14 and 15, where the contact making shoes 21, 22 are jointed to iron bars 39, free to slide up and down in the fixings 40 bolted to the wooden frame work of the gatherer. The wires from the battery and from the motor are connected immediately to the studs of these iron bars. To insure constant contact a number of these may be coupled together, as shown in Fig. 15, preferably by leather bands 41.

Figs. 16, 17 and 18 illustrate a switch box controlling two sections of surface bars in which 42 is a casing preferably of cast iron covered by an outer lid strong enough to resist the ordinary street traffic. 44 is the inner lid which is pressed down upon india rubber or other suitable packing 45, by the screw 46, passing through the bar 47, held in recesses 48, to make the box water tight. The box rests upon a wooden base which is grooved for the passage of wires from the main cable to and from the surface bars and rails, the box having channels or passages 50 and 51 cast in it through which these wires pass, as shown in Fig. 18, and after the wires have been fixed the channels or passages are filled with pitch or other suitable material in order to prevent the entrance of moisture into the box, and to further secure insulation. The cable wire C is taken to the terminals 52 which are connected to the clappers 53, and when these are drawn by the plunger keeper 54 of the magnet against the terminals 56 the current can pass by the wires 57 to their motor bars.

The magnets 55 rest upon a block of insulating material and in order to facilitate the attachment of the cable wire C the terminals 52 are provided with holes, drilled and tapped,

and having a nick or slot cut through them into which the wire is laid and firmly secured by a screw plug 90, fitting in the hole.

The terminals 56 are shown as being mounted or embedded in a bar 80 of wood or other insulating material one end of which engages in lugs 81 upon the inside of the box and the other end rests upon the lip 82 of the conductor passage and it is secured in its place by a wedge 83. This furnishes a simple and effective means of securing these parts and they may be readily taken out for adjustment of the parts and connections by simply withdrawing the wedge which releases the bar.

The description of the gatherer given heretofore shows that provision is made for closing the clappers 53 before the main or motor current is required and for keeping them closed until after the main or motor current has ceased to flow, but inasmuch as it is possible (through the obstruction on the line or accidental derangement of the gatherer or battery) that the magnet should cease to act and release the clapper while the motor current is passing and so break contact and cause flashing and fusing of the terminals 56, I may cause the wire that brings the current from the main cable to be wound around the outer core of the magnet, as indicated in Fig. 19, so that as long as any current is passing to the motor the plunger keeper shall be held down, or I may make the terminal 56 into a magnet also shown in Fig. 19, by winding it with the wire leading to the motor bar so that when the iron face of the clapper is brought down upon the terminal it shall be held there as long as any current is passing.

The magnets are operated by the battery wires 58, which give from their respective battery bars *b* the necessary current returning by a wire 59 to the rails or other battery bar *b*. Various kinds of magnets may be used for this purpose.

In Figs. 20, 21, 22 and 23, I have shown an end elevation, side elevation, plan and section of a large switch box containing in the present instance six magnets controlling six sections of the road surface bars. It is in essence similar to the box just described, but in this case the instruments are further protected by being placed in a wooden box and the wires are passed in and out through the siphon trap 65, in which the cable lead C and the battery return 59 are shown in Fig. 20, in order to avoid confusion. The method of wiring the box is fully illustrated in Fig. 22, wherein C is the cable lead and 59 the battery return, the main current wires and battery wires connecting the magnets and terminals with each surface bar each being numbered respectively from 1 to 6. For avoidance of damage by short circuiting a fusible cut out 66 is placed in the box at any convenient point, although I have shown it located in the main current wire just after it enters the box.

In Fig. 14, is a section of the road, showing

the sectional conductors with an end view of a gatherer in position. *b* and *m* are the surface bars firmly secured to and embedded in creosoted wood coated with pitch. The wood is preferably made in the form shown, because it readily bends itself to the formation of curves which would be difficult were the wood a solid block. The center portion is in two parts 70, 71, the bottom hollowed or grooved for the reception of the leading wires the top forming a good road surface for which purpose the blocks are put in with the grain upward. The outer case or board 72 is for the retention of pitch in order to further secure the insulation of the iron bars. One of the switch boxes 19 is shown in position by the side of the road.

While I have thus described the general principles of my invention and some of the features which I preferably make use of in carrying it out, I wish it to be distinctly understood that my invention is not limited to the devices set forth nor to the specific arrangement thereof as the main features of my invention may be embodied in several forms and the devices may be used separately or in combination with other equivalent devices in carrying out the general principles of my invention.

What I claim is—

1. The combination with a series of motor rails and a series of circuit controlling rails, of a car carrying a motor and a connector conveying current from the motor rails to said motor, an independent source of electricity upon the car, and a connector between the independent source of electricity and the controlling rails having two contacts with the controlling rail, one in advance and one in the rear of the motor connector, substantially as described.

2. The combination with a main conductor,

motor rail sections arranged to be connected with said conductor, a series of circuit controlling rails, and a switch box containing a series of electro-magnetic switches controlling the current from the main rail to the series of motor rails, each switch being connected with a separate section of the controlling rails, substantially as described.

3. In an electric railway switch box, having a magnet therein, independent circuit wires controlling said magnet, a clapper controlled by said magnet and included in another or main circuit, and channels for the passage of said circuit-wires, substantially as described.

4. A switch box having a water-tight top, an electro-magnet mounted therein, a clapper bar mounted upon the electro-magnet, a contact piece mounted on a removable bar, the said bar being supported in lugs at one end and having a wedge piece at the opposite end for securing it in place, substantially as described.

5. In an electric railway, a switch box containing a series of electro-magnetic switches, each consisting of a magnet operated by an independent circuit, and each magnet provided with a clapper included in the main circuit or a branch thereof, substantially as described.

6. In an electric railway having a series of short rail sections, a support for said rails consisting of blocks of wood coated and insulated as set forth, the central block being made in two parts and having a channel for the passage of the main electric conductors, substantially as described.

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

M. HOLROYD SMITH.

Witnesses:

F. L. FREEMAN,
J. S. BARKER.