

(No Model.)

4 Sheets—Sheet 1.

H. A. F. PETERSEN.
CONDUIT FOR ELECTRIC RAILWAYS.

No. 516,876.

Patented Mar. 20, 1894.

Fig. 1.

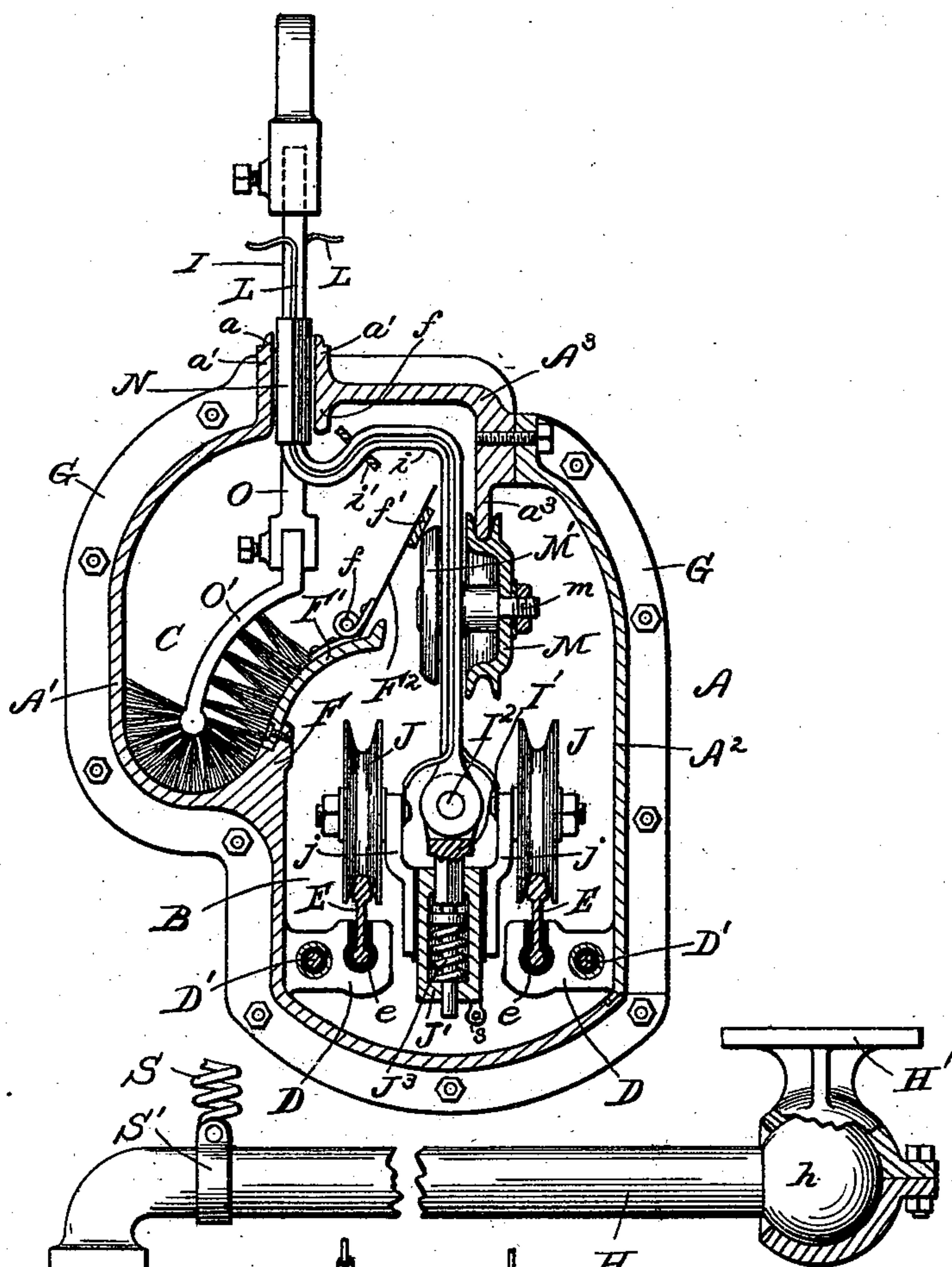


Fig. 2.

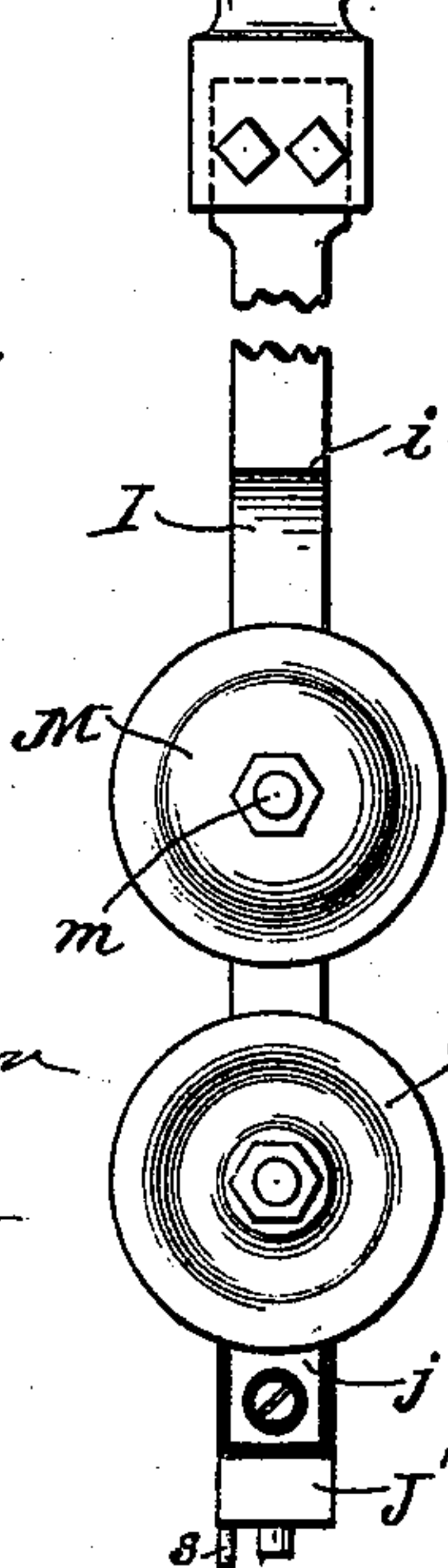


Fig. 3.

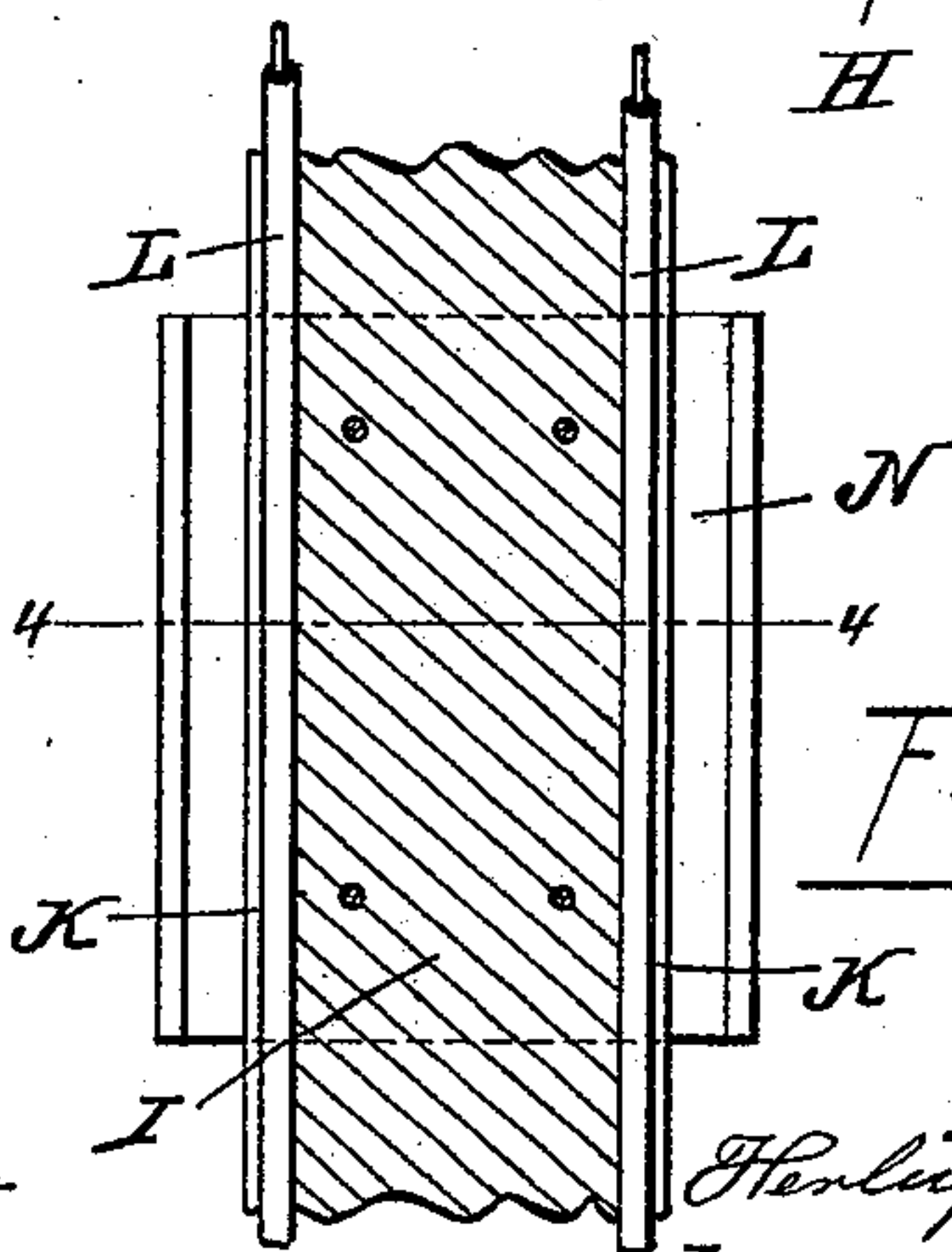
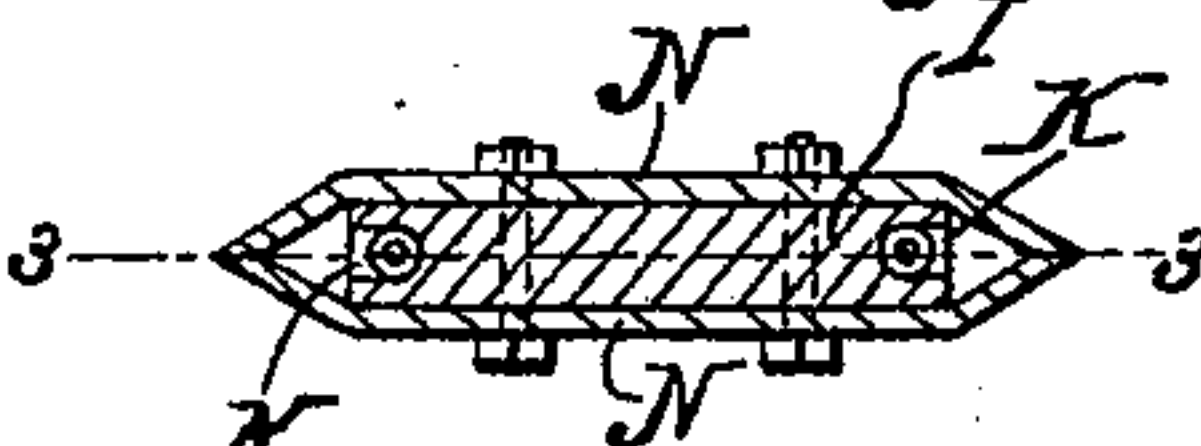


Fig. 4.



WITNESSES.

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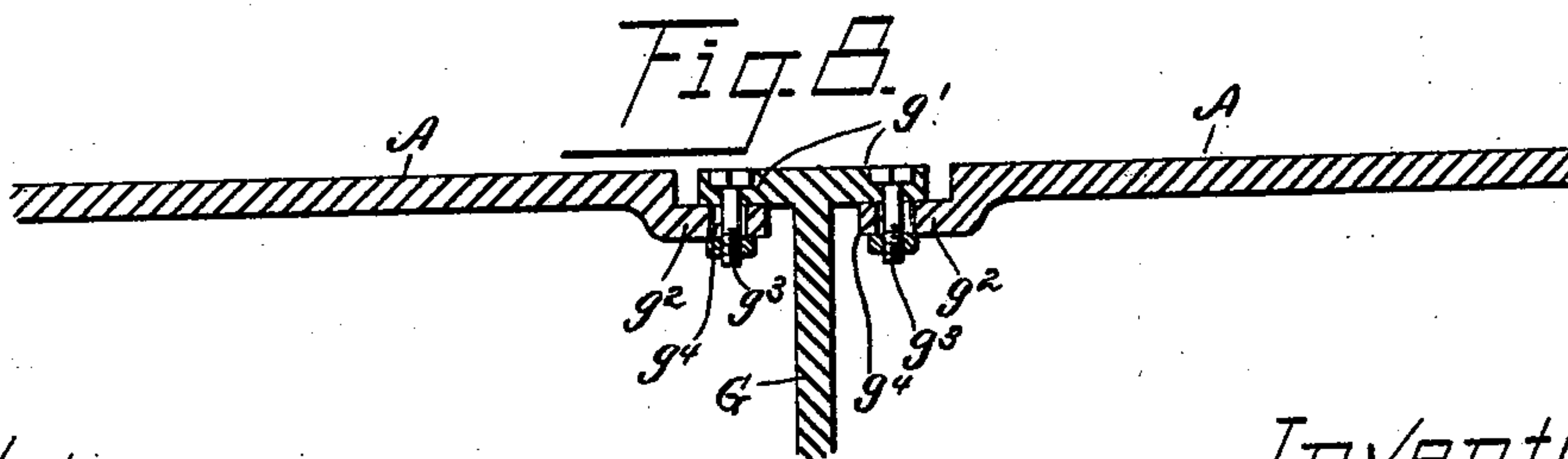
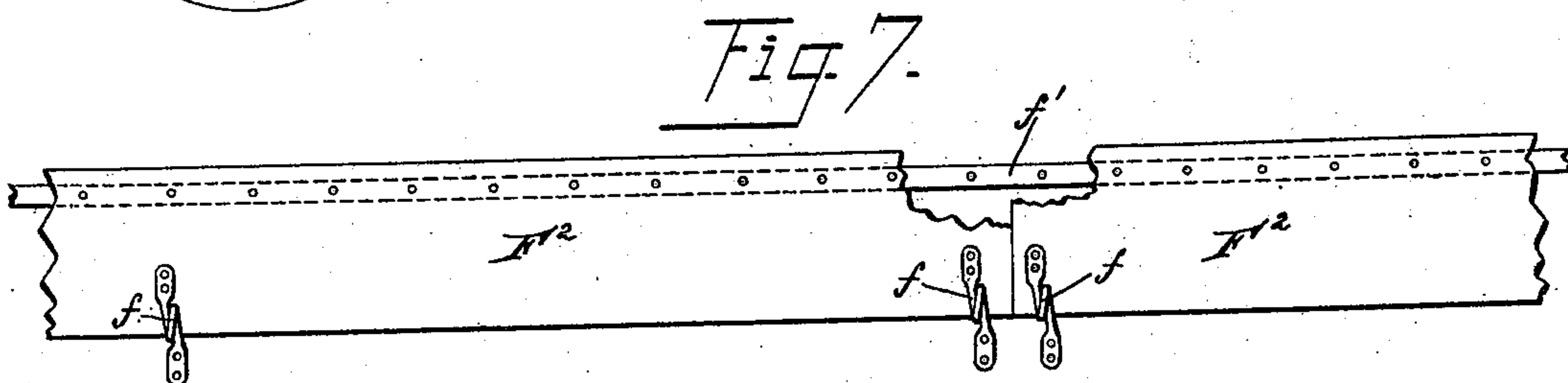
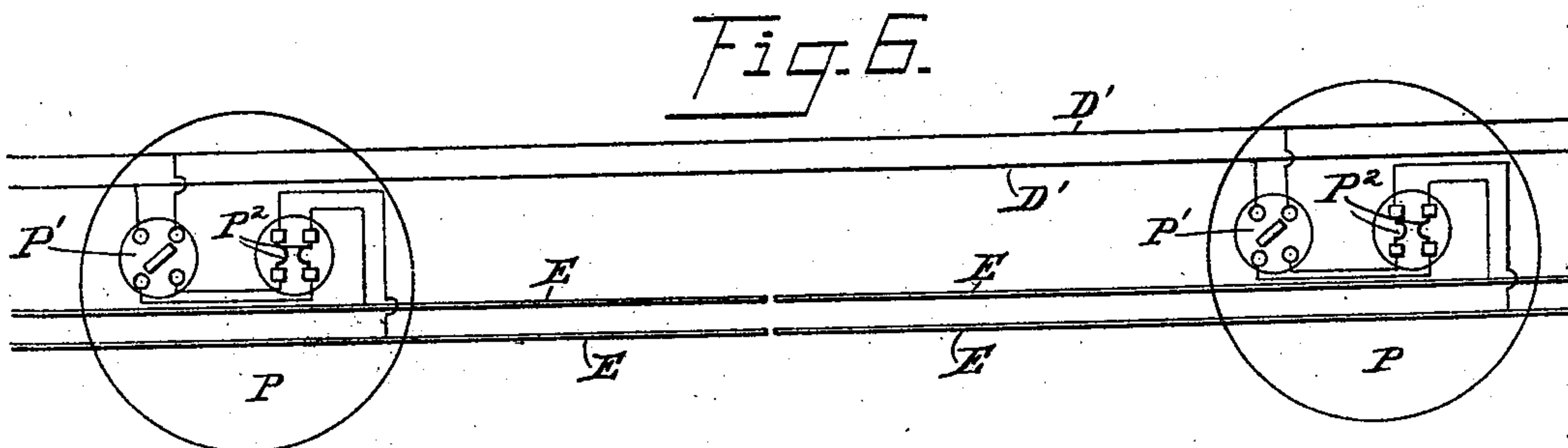
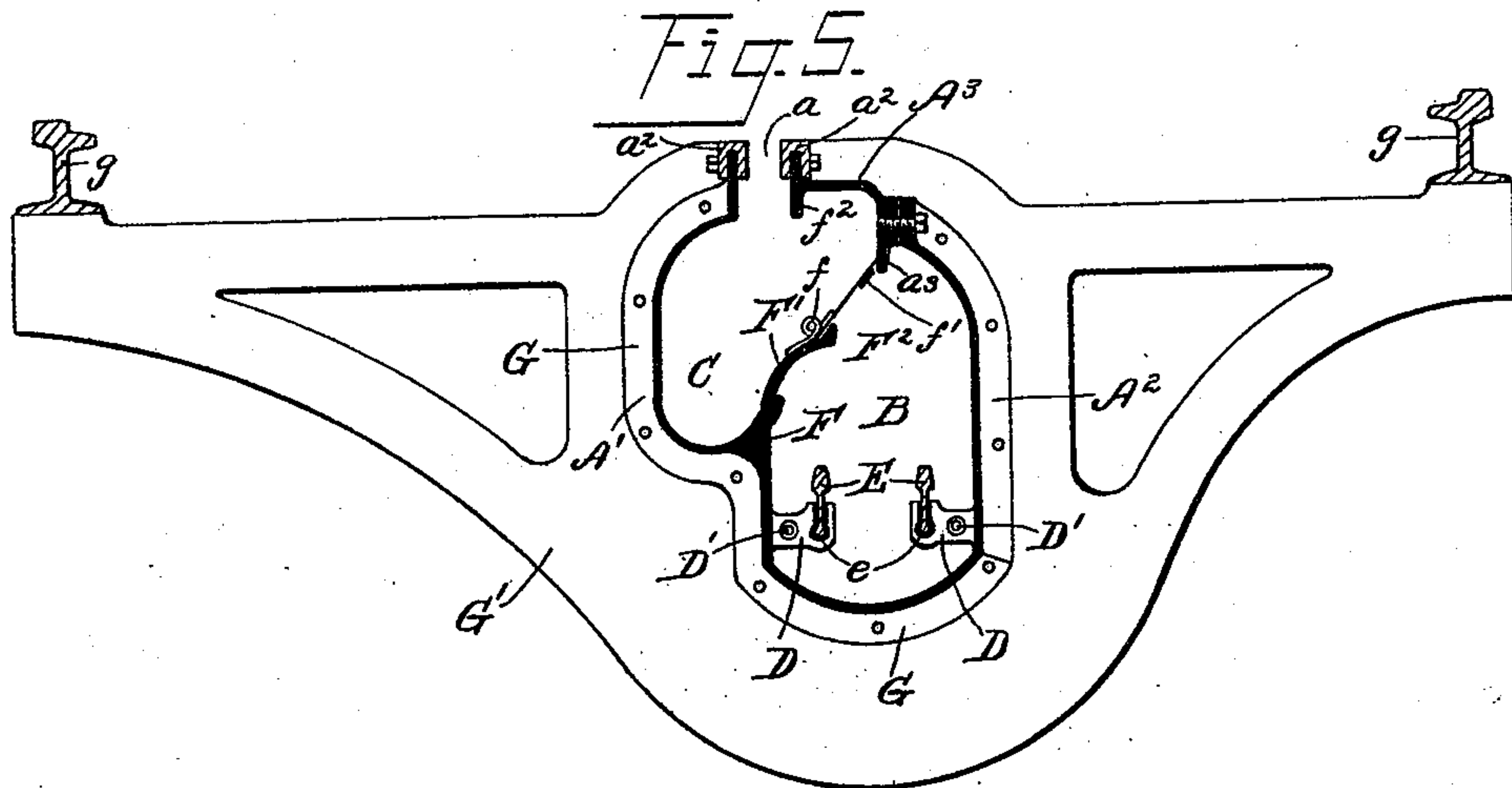
(No Model.)

4 Sheets—Sheet 2.

H. A. F. PETERSEN.
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(No Model.)

4 Sheets—Sheet 3.

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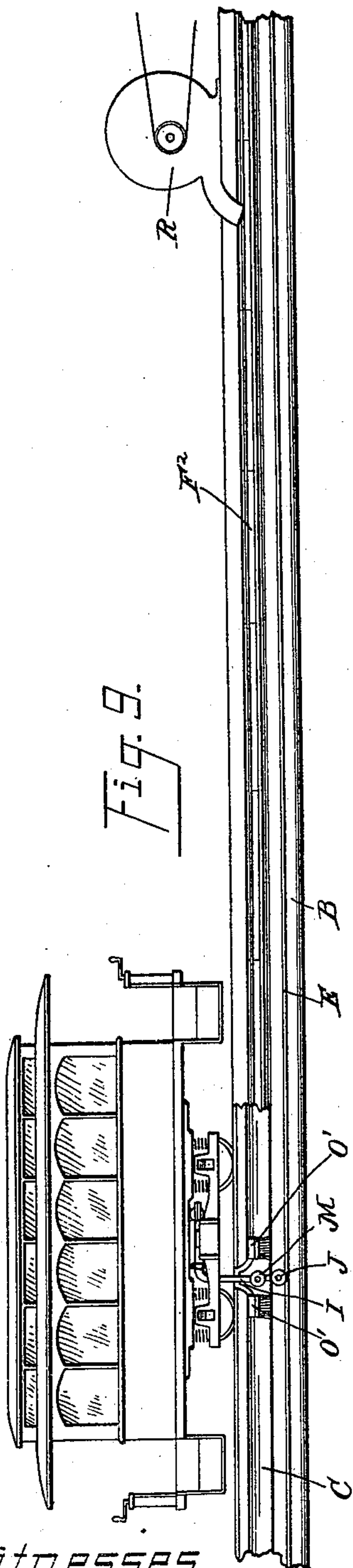
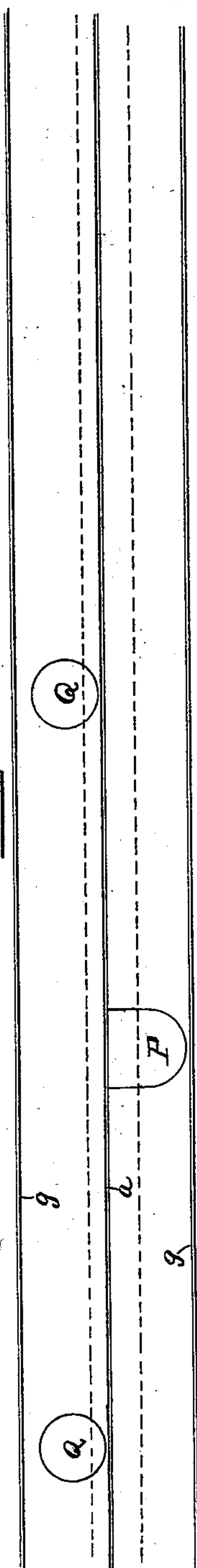
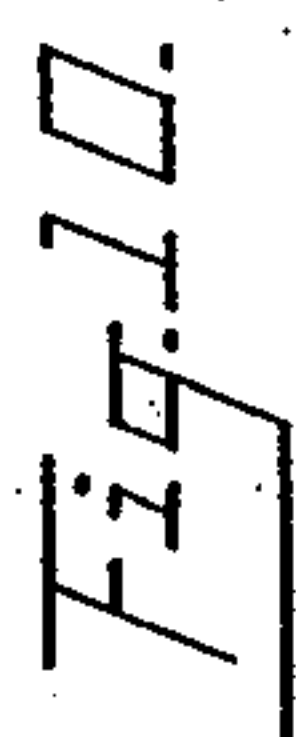


Fig. 9.



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(No Model.)

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Fig. 11.

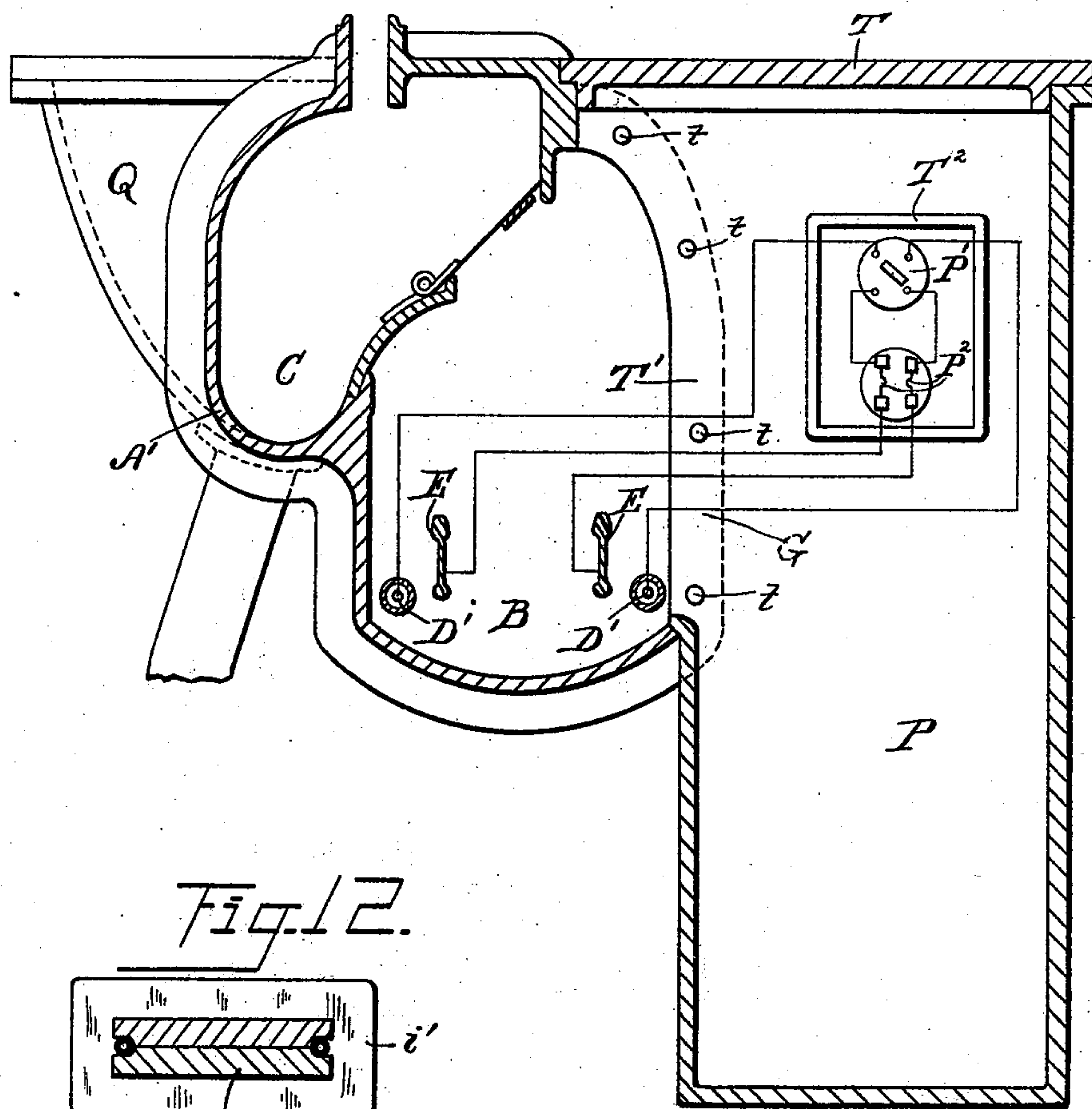
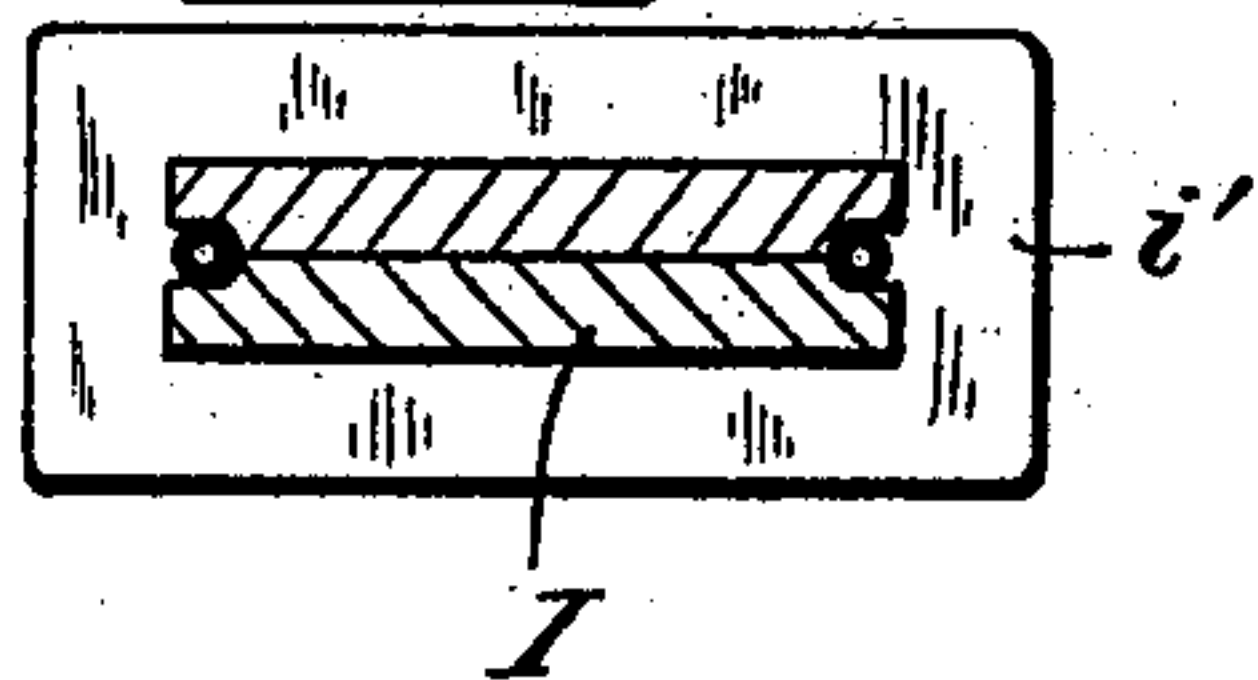


Fig. 12.



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UNITED STATES PATENT OFFICE.

HERLUF A. F. PETERSEN, OF MILWAUKEE, WISCONSIN.

CONDUIT FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 516,876, dated March 20, 1894.

Application filed March 10, 1893. Serial No. 465,379. (No model.)

To all whom it may concern:

Be it known that I, HERLUF A. F. PETERSEN, a citizen of the United States, residing at Milwaukee, county of Milwaukee, State of Wisconsin, have invented a certain new and useful Improvement in Electric-Railway Systems; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to that class of electric railways in which the conductors which carry the current are located wholly underground, and my said invention consists in certain novel features of construction, which will be hereinafter described in detail, and pointed out in the appended claims.

In the accompanying drawings illustrating my invention: Figure 1. is a vertical transverse sectional view of my improved form of conduit, showing the arrangement of the conductors therein, and of the trolleys engaging with said conductors, together with the connections for conveying the current to the motor upon a car. Fig. 2. is a view in side elevation, of my improved form of trolley, with its connections. Fig. 3. is a detail vertical sectional view of a portion of the hanger which connects the trolley mechanism with the car, said section being taken on line 3—3 of Fig. 4. Fig. 4. is a horizontal detail sectional view taken on line 4—4 of Fig. 3. Fig. 5. is a transverse vertical sectional view illustrating my improved form of conduit, and the yoke for sustaining the conduit and the track rails in the proper relative positions. Fig. 6. is a diagrammatic view illustrating my improved method of forming the connections between adjacent sections of the conductors, within the conduit, and illustrates the means for enabling one or more sections to be cut out of circuit when desired, in order to enable the conduit or the conductors to be repaired. Fig. 7. is a detail view of the device for closing the part of the conduit in which the conductors are located, before and after the trolley mechanism has passed. Fig. 8. is a sectional detail view illustrating a somewhat different method of connecting the sections of the conduit with the yokes. Fig. 9. is a view repre-

senting a motor car equipped with my improved trolley mechanism, and located upon a track provided with my improved conduit, and further shows the blower for forcing dry or heated air through the conduit. Fig. 10. is a plan view of the track, and illustrates the arrangement of the man-holes which communicate with the two parts of the conduit, the conduit being represented by the dotted lines. Fig. 11 is a transverse sectional view taken through one of the man-holes. Fig. 12 is a detail cross sectional view through the trolley arm showing the arrangement of the drip collar or flange thereon.

In the construction of underground conduits for electric railway conductors or wires, as heretofore made, great difficulty has been experienced from the fact that suitable provision has not been made against the accumulation of moisture within the conduit, and hence, such systems have proved very unsatisfactory, because of the frequent short-circuiting or grounding of the current. Moreover, in such prior constructions, suitable provision has not been made for preventing the accumulation of dirt within the conduit, and the consequent liability of derangement of the mechanism.

It is the object of my present invention, to provide an improved form of underground conduit, which will effectually guard against any accumulation of moisture within the portion of the conduit occupied by the conductors or wires, and also to provide means for the ready removal of any dirt which may find its way through the slot by which the conduit communicates with the surface of the ground.

The several features of my improvement will be fully described with reference to the accompanying drawings in which—

A designates as a whole, a suitable casing or conduit designed to be located entirely beneath the surface of the ground, and conveniently constructed from sections, A' A² and A³, the abutting edges of which are arranged to fit snugly together in any desired manner so as to form water-tight joints. The sections of the casing are so constructed as to form two longitudinal passages or conduits B C, respectively. As shown more particularly in Figs. 1 and 5, the adjacent upper edges of the sections A' and A³ are arranged to termi-

nate at a suitable distance apart to leave a narrow slot a , and as shown more particularly in Fig. 1, may be provided with suitable upwardly extending guard flanges $a' a'$, arranged so as to project slightly above the surface of the ground, or, as shown in Fig. 5, the edges of said sections may be provided with suitable protecting coverings $a^2 a^2$, of channel iron, which take the wear upon the sides of the slot. The sections forming the conduit, are constructed so as to bring the slot a considerably to one side of the center of the conduit, and the portion B is located almost wholly to one side of said slot, while the portion C is located almost wholly upon the other side of said slot.

Suitable lateral supports D D are arranged within the conduit B, and suitable insulated conductors D' D' are engaged therewith, and extend longitudinally throughout said conduit. Suitable conducting rails or wires F E are engaged with said supports and arranged so as to expose their upper surfaces for contact with the trolleys, said rails or wires being insulated from said supports conveniently by being inserted at their lower edges in suitable sockets $e e$ of insulating material, which are engaged within suitable openings in the lateral supports D D.

Upon the inner surface of the section A³ of the conduit is conveniently provided a longitudinal, depending rib a^3 for engagement with a guard trolley or wheel. The section A' is shaped upon its inner surface so as to form an upwardly extending flange or rib F, thus leaving the lower part of the conduit or passage C, in the form of a smooth, semi-circular trough. To the upper edge of this flange or rib F, I secure an oblique strip or section F', and upon the upper edge of said strip or section F', I secure suitable strips F² F², of sheet metal, which are arranged so as to normally rest obliquely against the depending flange or rib a^3 . These strips F² F² are arranged end to end, and are flexibly engaged with the section F' in any desired manner, as for instance, by the springs $f f$, which serve at once in place of hinges, and to press said strips against the flange a^3 , said springs being each provided with one or more convolutions, and secured, at its lower end, to the section F', and at its upper end, to the strip F². I also prefer to provide adjacent to the upper edges of the strips F² F², suitable longitudinal straps f' , of band iron, which are riveted to the strips F² F², as shown in Fig. 7, and serve to secure the said strips together, and further serve to engage with a suitable roller carried by the trolley arm, as will presently be described. By this construction, the strips F² F² form an elastic, continuous closure for the conduit B. It follows from this construction, that any water or dirt which may find its way through the slot a , will be deflected by the cover F², and the oblique section F' into the lower part of the conduit C, instead of passing into the conduit B, which is occupied by the conduc-

tors, and the conduit C is arranged to communicate with suitable pipes or man-holes leading to the sewer, and located at suitable intervals along the line of the conduit.

The sections of the conduit may be provided with flanges G, as shown in Figs. 1 and 5, for engagement, by means of suitable bolts, rivets or screws, with the yoke G', which supports the track rails $g g$, in which case the sections A' and A² of the casing are preferably provided with overlapping flanges, in the manner shown in Fig. 1. Where the sections are thus secured to the yokes, the bolts, rivets or screws which secure the sections A' and A² to said yokes will obviously serve to securely hold said sections in position with respect to each other. If desired, as shown in Fig. 8, the yokes G' may be provided with suitable flanges $g' g'$ around the margin of the opening for the conduit, and the ends of the sections of the conduit provided with suitable apertured, marginal flanges $g^2 g^2$, and the sections of the conduit secured to the yokes by suitable bolts $g^3 g^3$ passed through said flanges g' and g^2 . It may also be found desirable to make the apertures $g^4 g^4$, through which the bolts pass, of somewhat elongated form, so as to permit of expansion and contraction of the lengths of the conduit, due to changes in temperature.

My improved trolley mechanism comprises a suitable arm H, having a movable engagement, as by means of a ball and socket connection h , with a support or hanger H', and provided with a depending arm I arranged to extend downwardly into the conduit, and carrying trolley wheels J J, which are arranged to engage with the conducting rails or wires E E. This depending arm I is bent laterally, and preferably, somewhat upwardly, as shown in Fig. 1, at i , so as to bring its lower end to the center of the conduit B. The trolley wheels J J are conveniently journaled upon suitable arms or brackets $j j$, which are secured to, but insulated from a suitable supporting block J'. At the lower end of the arm I, I secure a pendulous pin I', by means of a flexible joint I², and this pin is sleeved through the supporting block J' as shown in Fig. 1, and a spring J³ is arranged within said block, between a collar upon said pin and the lower end of the block, and serves to exert a downward pressure upon said block to hold the trolley wheels J J in firm engagement with the conducting rails or wires E E. The edges of the arm I are provided with longitudinal grooves K K, extending throughout the length of said arm, and insulated conducting wires L L are electrically connected with the arms or brackets $j j$, which carry the trolley wheels, and extend upwardly through said grooves K K to a point above the slot in the conduit, from whence the wires are led off to the motor.

Journaled upon the arm I, is a grooved pulley or roller M, arranged to engage with the depending rib or flange a^3 in the top of the

conduit B. This pulley or roller M, by its engagement with said flange, serves to prevent any upward movement of the arm I, and thus holds the trolley wheels always in firm engagement with the conducting rails, while by reason of the flexible connection I², of the support for said trolley wheels, said wheels are permitted to adjust themselves so as to accommodate any unevenness in said rails.

Upon the axle *m*, of the guard pulley M, and upon the opposite side of the arm I, I provide a roller M', which, as the trolley arm passes along the conduit, engages with the strap *f'*, and opens the cover F², in the manner shown in Fig. 1, so as to permit the passage of the trolley arm and connected mechanism. By the described construction of the cover F², the springs *f f* serve to press the said cover against the flange or rib *a*³, both in front and in rear of the advancing arm I, the flexibility of said cover obviously serving to permit it to bend outwardly as the trolley arm advances, and the springs returning the cover to its closed position as soon as said arm has passed. At the point where the arm I passes through the slot *a*, it is incased between suitable protecting plates N N, which serve to take the wear against the sides of the slot.

One or more suitable depending arms O O are arranged to extend through the slot *a* into the conduit C, and carry brushes O' O', arranged to engage with the bottom and sides of said conduit C, said arms O O being conveniently secured to the trolley arm I, as indicated in Fig. 9, although said arms might be arranged upon independent supports beneath a car, if preferred. These brushes are conveniently arranged to travel immediately in front and in rear of the trolley arm, as shown in Fig. 9.

Suitable scrapers may be used instead of the brushes O' O', if desired.

At suitable intervals along the track, I provide man-holes P P, which may be of any convenient construction, and are located in the line of the conducting wires D' D' and the conducting rails E E. Within each man-hole is conveniently provided a suitable switch P', and a loop is carried from the circuit wires D' D' to said switch and from thence to the rails E E, as shown in diagram in Fig. 6, said rails being constructed in sections insulated in any desired manner from each other.

In practice I find it convenient to construct each of the man-holes in substantially the manner illustrated in Fig. 11, in which said man-hole is shown as constructed from a vertically arranged casing open at its top, and provided with a suitable cover or plate T. This casing is conveniently provided at one side with an opening T' corresponding in size and shape with the section A² of the casing of the conduit, and said casing P being secured by bolts *t t* at opposite sides of said opening to the flanges G G of the sections A². I also prefer to interpose between the switch P' and the rails E E, suitable safety fuses P²

P² of a predetermined carrying capacity, one of said fuses being preferably connected with each wire of the loop. Any suitable or desired form of switch or cut out, and any desired form of safety fuse may be employed, and said devices may be arranged in any desired manner within the man-holes P P. It follows from this construction, that when desired, any one of the sections of the rails E E may, by means of the switch, be cut out of the circuit to enable workmen to repair the line or apparatus, without danger of shock from the current. Furthermore, by means of the safety fuses, in case of a short circuit, said fuses will melt and thus sever the connection between the line wires D' D' and the respective sections of the rails E E, so as to render said sections dead. As shown in Fig. 11, the switch and the cut out device are conveniently arranged at one side of the man-hole, and may, if desired, be located in a suitable box or casing T², and the connections or loops leading from the conductors D' D' and the rails E E carried through said switch and cut out device in the manner illustrated in diagram in said figure.

As a further provision against the admission of moisture to the conduit B, I provide upon the inside of the section A³ of the conduit, a depending flange *f*², which extends along one side of the slot, and from which water will drip directly into the conduit C, instead of creeping along the under surface of the said section A³ into the conduit B, and in order to prevent water which enters the slot, from finding its way along the arm I into said conduit B, I provide a flange *i'* upon the upwardly curved part of said arm. Water will obviously drip from this flange directly into the conduit C, instead of creeping along the arm I into the conduit B.

As shown in Figs. 1 and 5 of the drawings, I prefer to make the section A³ of the conduit removable so as to afford ready access to the interior of the conduit at places other than the man-holes, and to this end, I find it convenient to secure said section to the upper edge of the section A² by bolts in the manner shown. As an additional precaution against dampness, I may provide at one or more convenient points along the line, suitable blowing apparatus R, for blowing heated or dry air through the conduit B which contains the conductors.

By my improved construction, I am enabled to effectually guard against the admission of water, moisture or dirt, to the interior of the conduit B, and this insures effectually against short circuiting or grounding of the current. Moreover, by arranging the conduit C to communicate at intervals with the sewer, water is readily carried off by said sewer connections, from the conduit C, while by the arrangement of the arms O O and brooms or scrapers O' O', any dirt which finds its way through the slot into the conduit C, will be carried thereby to the nearest sewer.

connection Q, as the car passes, and deposited therein.

By blowing dry or heated air through the conduit B, the dryness of the walls of said conduit, and all the parts contained therein, is greatly increased.

The trolley arm may be supported in operative position beneath the car in any desired manner, as for instance, by means of a spring S, engaged with a revoluble collar S' on the arm H, which permits the trolley arm to be raised and then turned sidewise beneath the car body, if desired. When it becomes necessary to raise the trolleys out of the conduit, the car is run to the nearest man-hole P, and the trolley arm raised, when it may be secured beneath the car, by means of an eye or ring s upon the arm, and arranged to engage with a hook or suspension device beneath the car. By this construction, if it is necessary to propel the car by any other means than the current carried by the underground rails, the trolley arm may be raised out of the slot and the car propelled in any other desired manner.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The herein described conduit for underground conductors for electric car lines, comprising a suitable casing divided into two longitudinal conduits or passages, one of which is arranged to contain the conductors, and the other provided with a longitudinal slot in its upper wall, arranged out of line with said conduit or passage containing the conductors and a suitable longitudinal cover arranged to normally close the conduit or passage in which the said conductors are located, substantially as described.

2. The herein described conduit for underground conductors for electric car lines, comprising a suitable casing divided into two longitudinal conduits or passages, one of which is arranged to contain the conductors, and the other provided with a longitudinal slot in its upper wall, arranged out of line with said conduit or passage containing the conductors, an oblique partition between said conduits or passages and arranged to terminate at a sufficient distance from the top of the conduit containing the conductors to afford a longitudinal slot for the passage of the trolley arm, and an elastic cover flexibly secured to the upper edge of said partition, and arranged to normally close said slot, substantially as described.

3. The herein described conduit for underground conductors for electric railways, comprising a suitable casing divided into two longitudinal conduits or passages, suitable conducting rails or wires located in one of said conduits or passages, suitable connections leading from the other passage or conduit and communicating with a sewer, and arranged to carry off any water that may find its way to the interior of said casing, a longitudinal slot in the upper wall of said conduit

or passage, arranged out of line with the conduit or passage containing the conductors and a suitable longitudinal cover arranged to normally close the passage or conduit in which the said conducting rails or wires are located, substantially as described.

4. The herein described conduit for underground conductors for electric railways, comprising a suitable casing divided into two longitudinal conduits or passages, suitable insulated circuit wires located within one of said conduits or passages, longitudinal conducting rails constructed in sections insulated from each other, said sections being independently connected with said circuit wires, suitable switches for throwing said sections into or out of circuit, suitable means for normally closing the conduit or passage in which said wires are located a longitudinal slot in the upper wall of the other conduit or passage, arranged out of line with the opening into the conduit or passage containing the conductors and suitable connections leading from the conduit or passage having the slot to a sewer, substantially as described.

5. In an electric railway, the combination with a conduit having two longitudinal passages, of suitable conductors located in one of said passages, a longitudinal slot in the other passage, arranged out of line with the passage containing the conductors connections leading from said other passage to a sewer, a suitable arm arranged to extend to the inside of the first mentioned passage and adapted for connection with a car, trolley wheels carried by said arm and arranged to engage with said conductors, and one or more brooms or scrapers carried by said arm and arranged to extend into the other one of said passages and adapted to carry any accumulation of dirt therein, to said sewer connections, substantially as described.

6. In an electric railway, the combination with a suitable casing located beneath the surface of the ground, and provided with two longitudinal conduits or passages, of suitable conducting rails or wires located in one of said conduits or passages, a longitudinal rib or flange located in the top of said conduit or passage, a slot communicating directly with the other one of said conduits or passages and located to one side of the conduit in which the said conductors are located, an arm arranged to extend through said slot and provided with a lateral bend arranged to bring its lower end into line with said conduit containing the conductors, trolley wheels carried by said arm and arranged to engage with said conductors, and a guard pulley or wheel also carried by said arm and arranged to engage with said longitudinal rib or flange, substantially as described.

7. In an electric railway, the combination with a suitable casing located beneath the surface of the ground, and provided with two longitudinal conduits or passages, of suitable conductors located in one of said conduits or

passages, a longitudinal rib or flange located in the top of said conduit or passage above said conductors, a slot in said casing communicating directly with the other conduit or passage and out of line with the conduit containing said conductors, suitable connections leading from said conduit to a sewer, an arm arranged to extend through said slot and provided with a lateral bend arranged to bring its lower end into line with the conduit containing the conductors, trolley wheels carried by said arm and arranged to engage with said conductors, a guard pulley or wheel also carried by said arm and arranged to engage with said longitudinal rib or flange, an oblique elastic cover for normally closing the upper part of the conduit containing the conductors, and a suitable roller carried by said arm for engaging with said cover to raise it as the said arm advances, substantially as described.

8. In an electric railway, the combination with a suitable casing located beneath the surface of the ground, and provided with two longitudinal conduits or passages opening into each other at their upper sides, of suitable conductors located within one of said conduits, suitable connections leading from the bottom of the other conduit to a sewer, a depending rib or flange located in the top of the conduit containing the wires, an elastic, continuous cover flexibly secured to the dividing wall between the lower portions of said conduits, and arranged to rest obliquely against said rib or flange so as to normally close the opening into the top of the conduit containing the conductor or wires, a slot in the top of said casing arranged out of line with said conduit and communicating directly

with the other conduit, an arm adapted to be operatively connected with a car, and arranged to extend through said slot and provided with a lateral bend arranged to bring its lower end into line with said conduit in which the wires or conductors are located, trolley wheels carried by said arm and arranged to engage with said conductors, a guard pulley or wheel also carried by said arm and arranged to engage with said longitudinal depending rib, and suitable brushes or scrapers carried by said arm and arranged to extend into the other conduit or passage to sweep any dirt in said conduit to and discharge the same into said sewer connections, substantially as described.

9. The combination with an underground conduit comprising two longitudinal passages, one of which is arranged to contain the conductors, and the other provided with a longitudinal slot in its upper wall, arranged out of line with the conduit containing the conductors and arranged to communicate at suitable intervals with a sewer, so as to carry off accumulations of dirt and moisture, and an elastic cover for normally closing the opening between said passages, of suitable apparatus located at one or more points along the line of the conduit, and adapted to force a circulation of dry or heated air through the passage within which the conductors are located, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

HERLUF A. F. PETERSEN.

Witnesses:

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J. E. WILES.