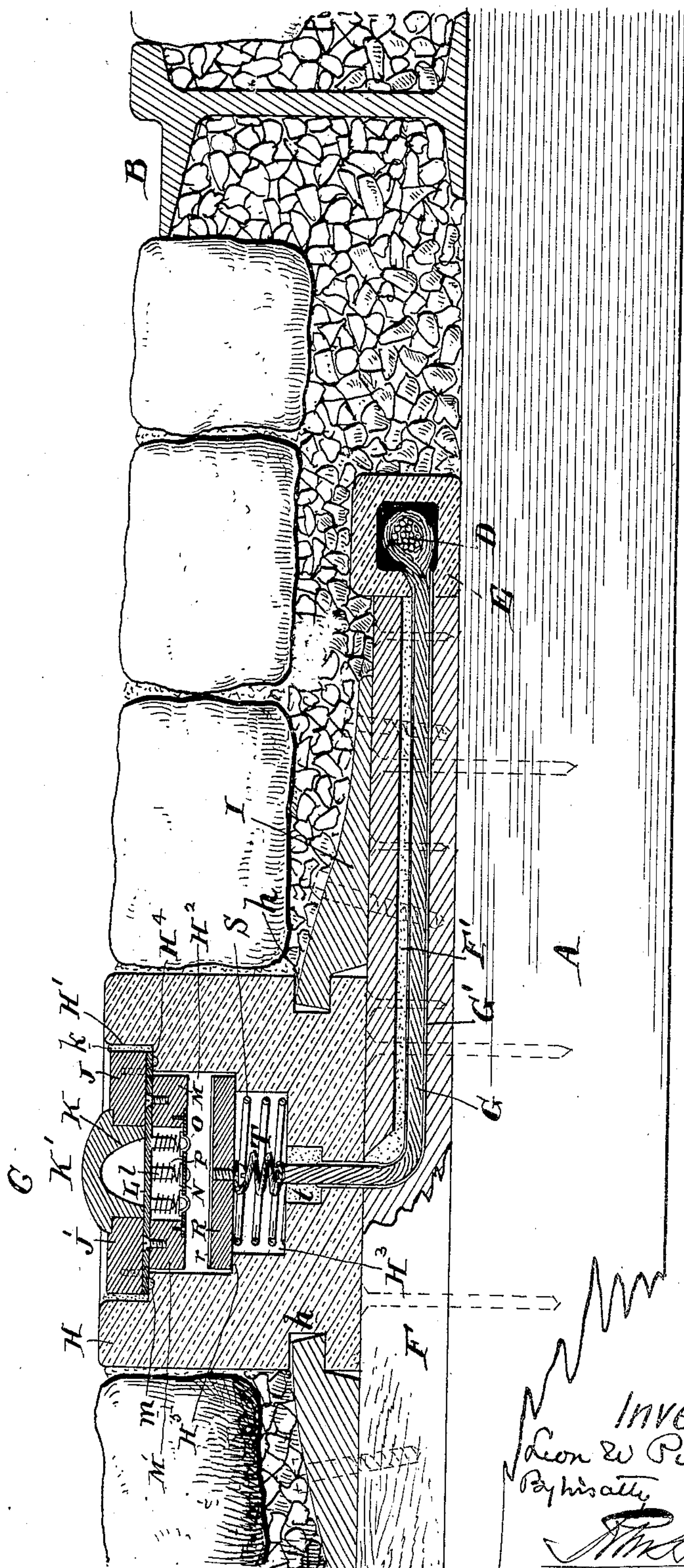


No. 832,416.

PATENTED OCT. 2, 1906.

L. W. PULLEN.  
ELECTRIC RAILWAY.  
APPLICATION FILED MAY 18, 1905.

3 SHEETS—SHEET 1.



Attest,  
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Inventor  
Leon W. Pullen  
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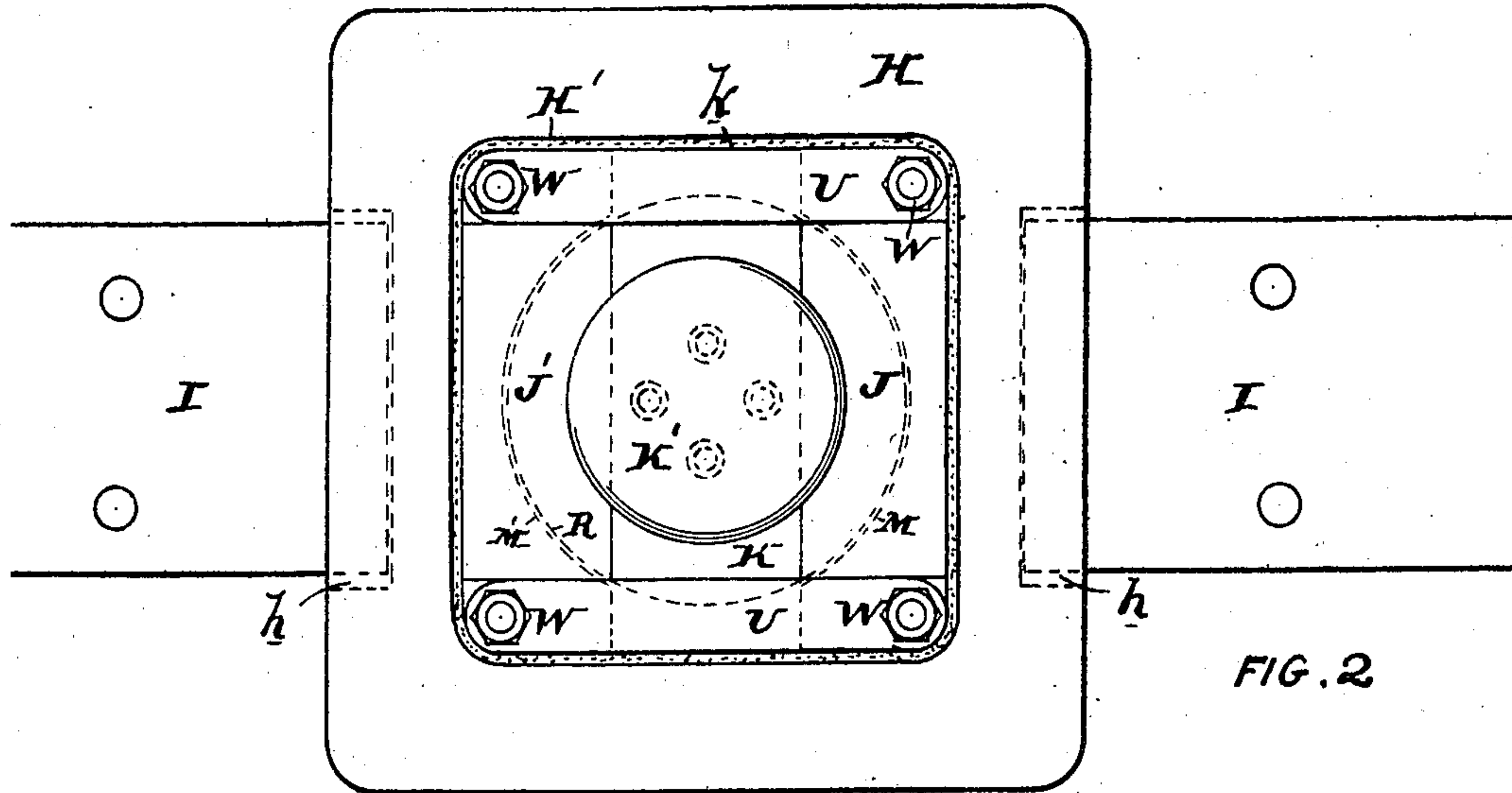


FIG. 2

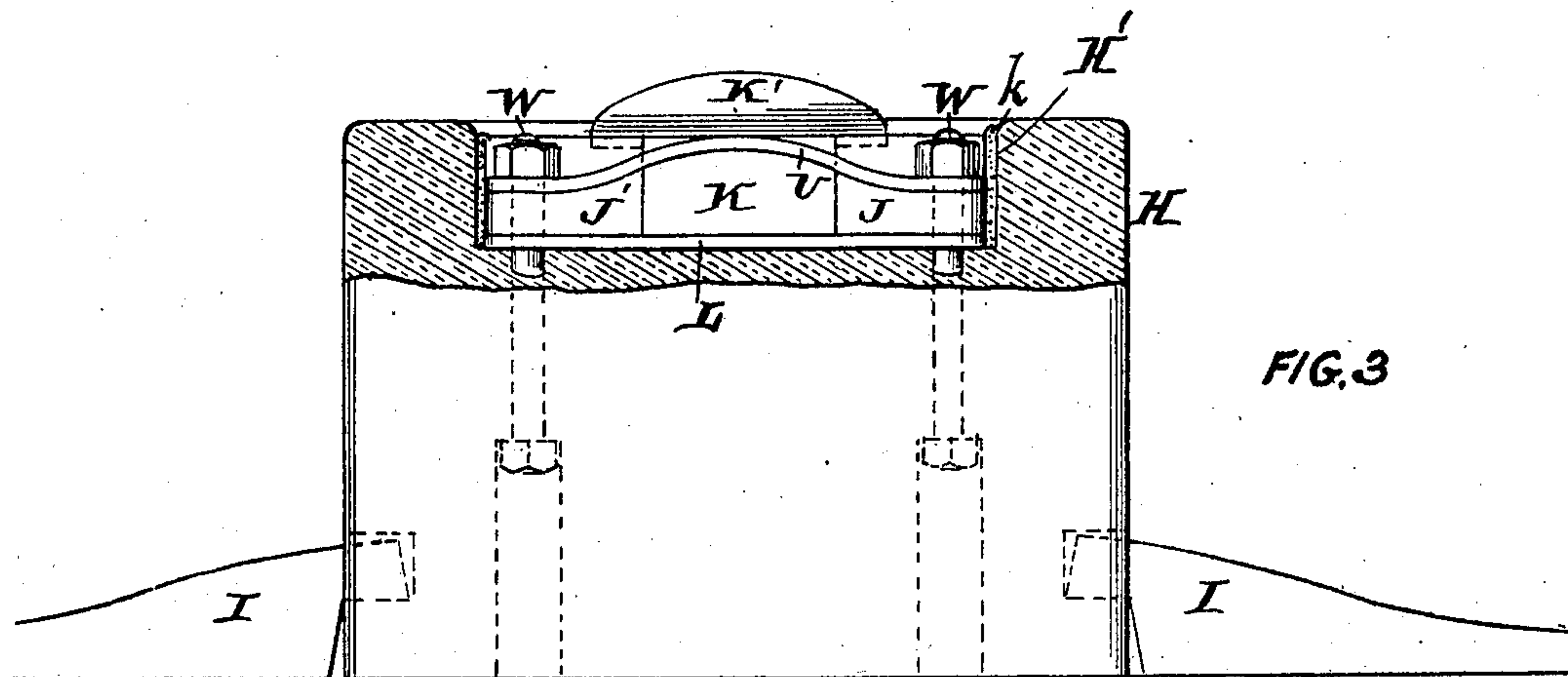


FIG. 3

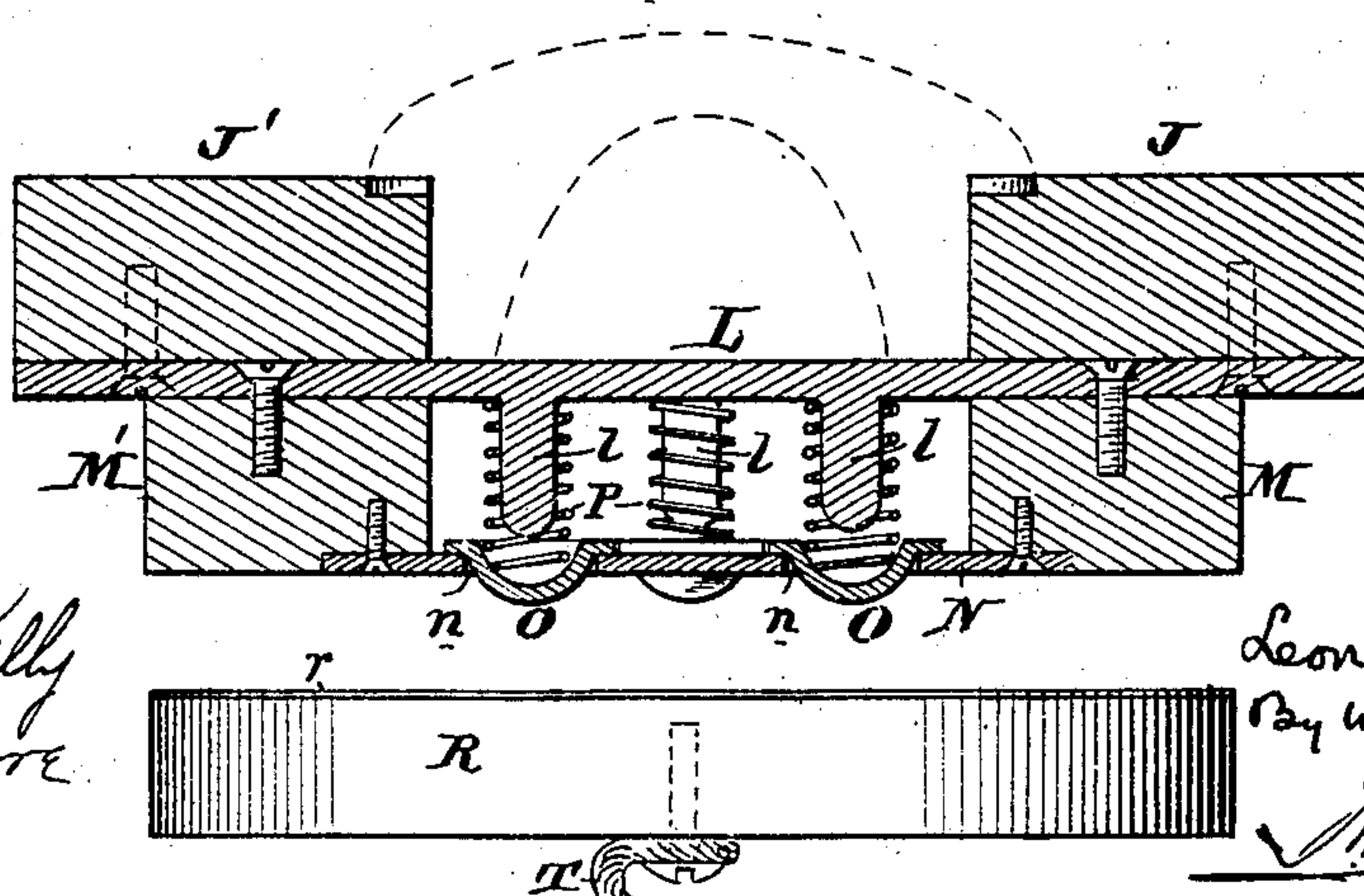


FIG. 4

Attest  
R. M. Kelly  
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Leon W. Pullen  
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*[Signature]*

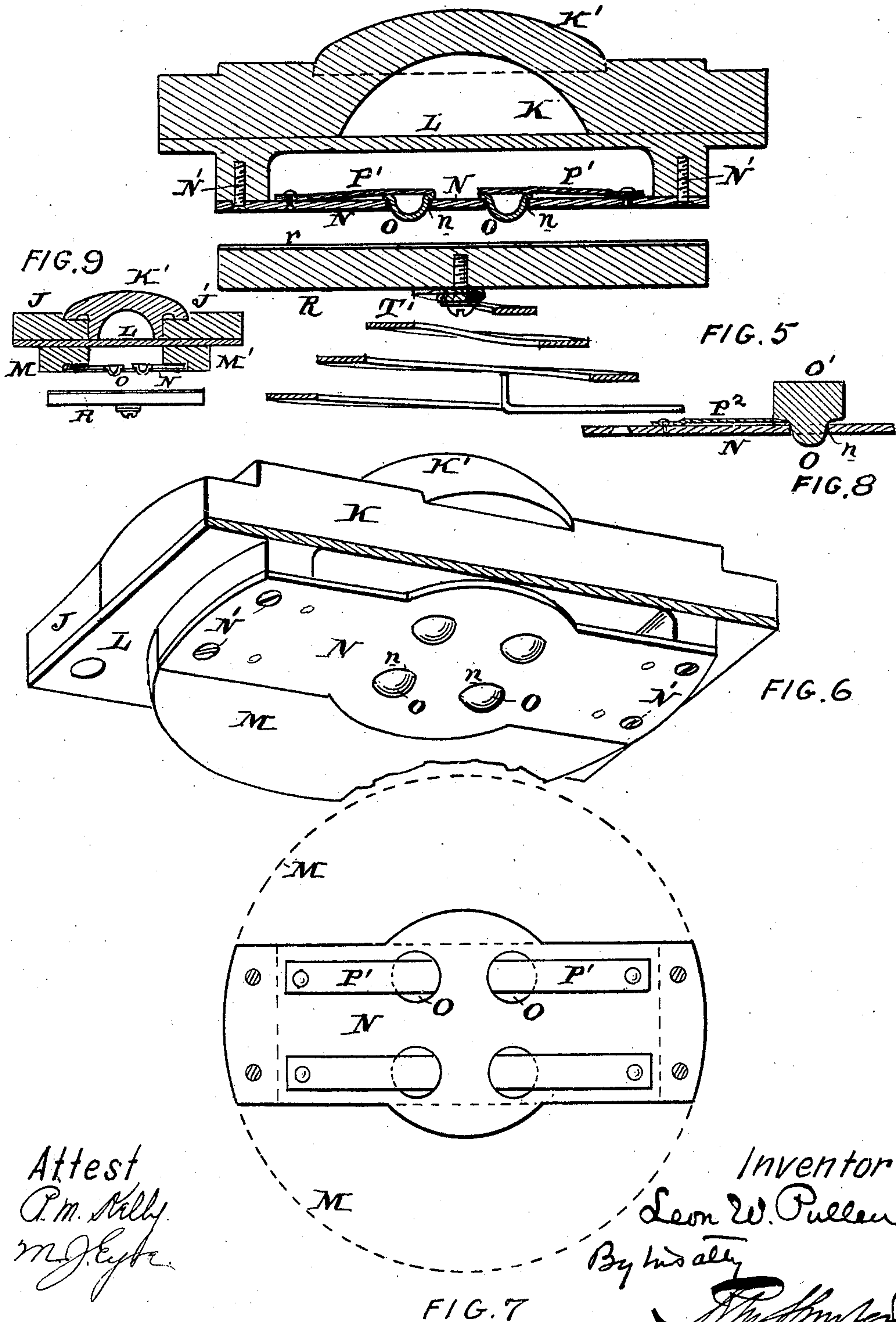


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3 SHEETS—SHEET 3.





# UNITED STATES PATENT OFFICE.

LEON W. PULLEN, OF CAMDEN, NEW JERSEY.

## ELECTRIC RAILWAY.

No. 832,416.

Specification of Letters Patent.

Patented Oct. 2, 1906.

Application filed May 18, 1905. Serial No. 260,988.

*To all whom it may concern:*

Be it known that I, LEON W. PULLEN, of Camden, county of Camden, and State of New Jersey, have invented an Improvement in Electric Railways, of which the following is a specification.

My invention has reference to electric railways; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my invention is to provide a suitable construction for automatic contacts arranged at intervals along the railway-track adapted for use in conjunction with a current-collecting device carried on the car, such as set out in my Letters Patent No. 791,816 of June 6, 1905, and in which the circuits forming a supply-conductor are automatically closed successively under magnetic attraction to energize the contact-blocks immediately under the car during its travel.

My invention consists of certain details of construction which will be better understood by reference to the drawings, in which—

Figure 1 is a sectional elevation of part of a railway-track and contact-block embodying my invention. Fig. 2 is a plan view. Fig. 3 is an elevation of my improved contact-block. Fig. 4 is a cross-section of the magnetic and circuit-closing parts of my contact-box removed from the supporting-block. Fig. 5 is a sectional elevation of the working parts of the improved circuit-closing switch mechanism of the contact-block, showing a modification of same. Fig. 6 is a perspective view of a portion of same, and Fig. 7 is a plan view of the upper member of the switch of the structure shown in Figs. 5 and 6, and Figs. 8 and 9 are sectional views of modifications.

A is the cross-tie, which supports the rails B, one only of which is shown.

C is the magnetically-operated contact-block and is supported by the cross-tie. In practice these contact-blocks are arranged at intervals along the track, so as to have one or more of them at all times under the car, as set out in my Letters Patent referred to above. More specifically, these contact-blocks are constructed as follows: A stone or concrete block H is formed with a central recess comprising the apertures  $H'$   $H^2$   $H^3$ , gradually decreasing in area and connected, respectively, by shoulders  $H^4$  and  $H^5$ . The lower outer

sides of the block H are notched, as at  $h$ , into which retaining-irons I extend and by which the said blocks are clamped down upon the timber F, resting upon the cross-tie. These retaining-irons are secured to the timber F by screws or otherwise, and said timber is held down upon the cross-tie by screws or nails. Fitting into the upper part of the stone or concrete block is the upper part of the switch and contact, and this consists of the central contact-bar K, having the upwardly-extending head and formed of manganese steel, which is non-magnetic and very durable; the two side plates J J' of magnetic metal, such as wrought or cast iron; the brass plate L, having the downwardly-extending fingers  $l$ ; the magnetic segmental plates M M', secured to the under side of the plate L; the perforated brass plate N, having apertures  $n$  and secured to and extending between the plates M M'; the movable contact-cups O, loosely fitting the apertures, and conducting-springs P, surrounding the fingers and pressing downward upon the contact-cups. The parts J, K, J', and L form a square or rectangle in plan, and the parts M N M' form a circle in the preferred form. The plate L is secured to both the parts M M' and J J' by screws. The plate L rests upon the shoulder  $H^4$  and is made liquid-tight by packing  $m$ , supported in a groove in the shoulder  $H^4$ , and by a liquid cement or sealing-packing  $k$ , poured into the spaces between the sides of the recess  $H'$  and the metal J J' K and allowed to harden. In this way no moisture can have access into the armature-chamber  $H^2$ .

R is an armature, circular in plan and preferably having an upper surface of copper  $r$  for making a good conducting connection with the contact-cups O. This armature is loosely supported by the shoulder  $H^5$  within the armature-chamber  $H^2$  of the stone or concrete block H. A spring S is arranged in the chamber  $H^3$  below the armature and presses upward against it, so as to greatly reduce its dead weight, and thereby enable the said armature to be lifted by magnetic attraction without very great effort. This enables me to employ a strong armature and yet one which may be easily lifted. Current is supplied to the armature by a flexible conductor T, the lower end of which is secured to the branch conductor G, leading from the supply-conductor D, extending along the railway. This branch conductor G is in-



cased in an insulating-wrapping G' between  
 the bottom of the block H and the supply-  
 conductor D and passes through an aperture  
 in the timber F, as shown. This aperture  
 5 may be made quite large and after the con-  
 ductor is inserted it may be filled with an in-  
 sulating-cement. The supply-conductor D  
 is preferably inclosed in an insulating con-  
 duct or wrapper E of suitable construction.  
 10 The bottom of the spring-chamber H<sup>3</sup> is en-  
 larged where the conductor G enters, and  
 this space is sealed by a cement packing t.  
 By this means no moisture can pass upward  
 into the interior of the block H, so that all  
 15 working parts are kept dry and free from  
 dirt and rust. The contact-bar K tightly  
 fits between the magnetic plates J J' and is  
 clamped in position by the straps V V, of  
 brass or other non-magnetic metal, said  
 20 straps being held down by the nuts of the  
 bolts W at the four outer corners of the  
 plates J J' and which extend through the  
 stone or concrete block. These bolts, fur-  
 thermore, pass through the plate L.  
 25 It will be seen that the construction herein  
 set out embodies cheapness, durability, per-  
 fect contact, simplicity, and ease of repair.  
 In practice the "north" and "south"  
 poles of the magnets carried on the car pass,  
 30 respectively, over the magnetic plates J and  
 J', and these through the parts M M' convey  
 the magnetism to the armature R, which is  
 caused to rise and make contact with the cups  
 O. The current passes from the conductor  
 35 D through branch G, flexible conductor T,  
 and armature to the cups O, and from these  
 by springs P, fingers l, plate L, contact-bar  
 K, and head K' to the collector on the car,  
 which is made to travel in contact with the  
 40 head K'. As soon as the magnet-poles pass  
 out of the immediate vicinity of the plates J  
 J' the armature R falls and opens the circuit.  
 By using the spring S to counterbalance the  
 greater portion of the weight of the arma-  
 45 ture R only a small degree of magnetization is  
 required to lift the armature. For this rea-  
 son a large and heavy armature may be used,  
 and consequently a more positive contact  
 with the cups O secured.  
 50 In the construction shown in Figs. 5, 6, and  
 7 the plate L carries the perforated plate N,  
 secured to it at N'. Furthermore, in this  
 modification of my invention the coiled  
 springs P (shown in Figs. 1 and 4) are substi-  
 55 tuted by plate-springs P', riveted at one end  
 to the plate N and at the other secured to the  
 cups O, with which the armature R makes  
 contact. This construction is somewhat  
 more simple than that of Figs. 1 to 4 and has  
 60 the advantage that the path of the electric  
 current would be over parts positively se-  
 cured together, and hence there would be  
 less liability of deterioration due to wear, and,  
 furthermore, the movement of the contact-  
 65 cups O in the perforated plate N will be more

accurate and positive. While I have shown  
 four of the contact-cups O, I do not restrict  
 myself to any particular number of them, as  
 my invention would include one or more. By  
 the use of spring-contacts with an armature 70  
 which comes up positively and firmly to  
 stationary portions, such as N or M, there is  
 no possibility of arcing at the contact-cups  
 O, due to vibration, and hence the closure  
 and maintenance of closure of the circuit are 75  
 most positive and sure. The armature is  
 drawn up quickly and held firmly to the mag-  
 netic parts J M J M, and the springs P or P'  
 insure the contact-cups adjusting themselves  
 to the armature automatically and secure the 80  
 maintenance of a closed circuit so long as the  
 armature remains raised. No vibration or  
 jarring due to the passage of the car could in  
 any manner interrupt the circuit by impair-  
 ing the direct connection between the arma- 85  
 ture and contact-cups, as must occur if this  
 contact were the result of any attempted ac-  
 curate fitting of these parts relatively to each  
 other. It is evident that while the contacts  
 O are more positive when pressed downward 90  
 or toward the armature by the springs they  
 may simply be made heavy, as shown at O'  
 in Fig. 8, and connected by an arm P<sup>2</sup> with  
 the plate N, through which they project, the  
 said weight acting to keep the contacts pressed 95  
 upon the armature R when raised. The  
 arm P<sup>2</sup> may be without elasticity or may be  
 similar to springs P', as desired, the weight O'  
 of the contact being wholly or partially re-  
 lied upon to maintain the connection with 100  
 the armature. In Fig. 5 I have shown a  
 spiral spring T', of flat sheet metal, stamped  
 out of a sheet of spring brass or copper and  
 stretched into shape shown. This spring  
 105 may act as the flexible conductor connecting  
 the armature R with the conductor G alone or  
 also as the counterbalancing-spring support  
 to take the place of spring S in Fig. 1. This  
 spring T' will give to the armature R a slight  
 110 rotary motion on rising, so that when it  
 touches the contacts O it will tend to keep  
 the contact-surfaces bright and clean. This  
 same function is also accomplished by the  
 employment of the flat springs P', as it gives  
 to the contacts O an eccentric or rocking mo- 115  
 tion when pushed upward by the armature,  
 and hence causes a rubbing between the con-  
 tact-surfaces. The contact O may be of  
 metal, carbon, or other suitable material, as  
 desired. In Fig. 9 I have shown the same 120  
 general construction as that of Figs. 5, 6, and  
 7; but in this case the plate N is secured to  
 the magnetic parts M M' instead of to the  
 plate L. In all of these forms of my inven-  
 125 tion there are two elements which constitute  
 the immediate circuit-closing switch, one be-  
 ing the armature which is brought up into a  
 fixed position against a support under the in-  
 fluence of magnetic attraction and the other  
 a movable and compensating contact, which 130



adapts itself to the position of the armature either in open or closed circuit and is limited in its movement only in a direction toward the armature. The downward limit to the movable contacts O prevents any possibility of a "live" box when the armature has fallen.

While I prefer the construction shown, I do not limit myself to the details, as these may be modified without departing from the spirit of the invention.

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

1. A circuit-closing contact-block for an electric railway consisting of a hollow block of insulating material open at the top, combined with a compound plate structure sealing the opening at the top comprising two side plates of magnetic material a central contact-bar of non-magnetic material with which the collector on the car may make contact and a sealing-plate fitting the opening in the top of the hollow block and upon which the side plates and contact-bar rests, one member of a circuit making and breaking switch secured to the under side of the sealing-plate of the compound plate structure, a movable armature of magnetic material forming the other member of the switch extending under each of the side plates of magnetic material, and a flexible conductor extending through the lower part of the hollow block and connected to the armature whereby the latter may rise and close the electric circuit.

2. A circuit-closing contact-block for an electric railway consisting of a hollow block of insulating material open at the top, combined with a compound plate structure sealing the opening at the top comprising two side plates of magnetic material and a central contact-bar of non-magnetic material with which the collector on the car may make contact, one member of a circuit making and breaking switch secured to the under side of the compound plate structure and comprising a series of spring conducting-surfaces, a movable armature of magnetic material forming the other member of the switch extending under each of the side plates of magnetic material, and a flexible conductor extending through the lower part of the hollow block and connected to the armature whereby the latter may rise and close the electric circuit through the spring conducting-surfaces.

3. A circuit-closing contact-block for an electric railway consisting of a hollow block of insulating material open at the top, combined with a compound plate structure sealing the opening at the top comprising two side plates of magnetic material and a central contact-bar of non-magnetic material with which the collector on the car may make contact, one member of a circuit making and breaking switch secured to the under side of

the compound plate structure, a movable armature of magnetic material forming the other member of the switch extending under each of the side plates of magnetic material, a flexible conductor extending through the lower part of the hollow block and connected to the armature whereby the latter may rise and close the electric circuit, and a counterbalance-spring to counterbalance a material portion of the weight of the armature.

4. A circuit-closing contact-block for an electric railway consisting of a hollow block of insulating material open at the top and having a shoulder H<sup>4</sup>, combined with a compound plate structure resting upon the shoulder and sealing the opening at the top comprising two side plates of magnetic material a central contact-bar of non-magnetic material with which the collector on the car may make contact and a sealing-plate fitting down upon the shoulders of the hollow block and upon which plate the side plates and contact-bar rests, a plastic liquid-tight seal between the compound plate and block, one member of a circuit making and breaking switch secured to the under side of the sealing-plate of the compound plate structure, a movable armature of magnetic material forming the other member of the switch extending under each of the side plates of magnetic material, and a flexible conductor extending through the lower part of the hollow block and connected to the armature whereby the latter may rise and close the electric circuit.

5. A circuit-closing contact-block for an electric railway which consists of a hollow block of insulating material, combined with a sealing-plate structure comprising the central contact-bar K K' the side plates J J' of magnetic material, the plate L uniting the plates J J', the parts M M' of magnetic material below the respective plates J J', and the perforated plate N between the parts M M', contact-cups O supported in the apertures of the plate N, springs connecting the cups electrically with the plate L, an armature of magnetic material arranged within the hollow block and below the contact-cups and parts M M', and a conductor for supplying electricity to the armature.

6. The combination of the insulating hollow block with two plates of magnetic material separated a short distance apart and arranged at the upper part of the hollow block, a non-magnetic contact portion arranged intermediate of said plates and having one member of a circuit-closing switch extending downward into the hollow space of the block, an armature of magnetic material forming the other member of the circuit-closing switch and arranged below the magnetic plates, a flexible connection for supplying electricity from a source outside of the block to the armature therein, and a counterbal-



ancing-spring for supplying a large portion of the weight of the armature whereby it may be easily raised by magnetic attraction through the magnetic plates.

5 7. In a contact-block for electric railways, the combination of a hollow block, a transverse plate having downwardly-extending fingers, a surface contact extending above the plate, springs surrounding said fingers, a  
10 perforated plate below the fingers, contact-cups supported by the perforated plate and projecting through the apertures therein and also in connection with the springs, and  
15 plate adapted to be brought into electrical connection with the contact-cups to close an electric circuit, and a source of electric supply connecting with the armature.

8. In a contact-block for electric railways,  
20 the combination of a hollow block, a transverse plate having downwardly-extending fingers, a surface contact extending above the plate, springs surrounding said fingers, a perforated plate below the fingers, contact-  
25 cups supported by the perforated plate and projecting through the apertures therein and also in connection with the springs, two side plates of magnetic material respectively arranged upon opposite lateral sides of the fin-  
30 gers springs and contact-cups, and an armature of magnetic material arranged below the perforated plate adapted to be brought into electrical connection with the contact-cups to close an electric circuit, and a source of  
35 electric supply connecting with the armature.

9. In a contact-block for electric railways, the combination of an insulating-block, two magnetic side plates J J' and an intermediate contact-bar K of non-magnetic material ar-  
40 ranged at the upper part of the block, bolts W for the plates J to hold them to the insulating-block, and transverse clamping-strips V extending over the ends of the bar K.

10. In a contact-block for electric railways,  
45 a hollow block of insulating material open at the top, combined with a magnetic armature within the hollow block, a conductor of electricity connecting with the armature, a magnetic compound structure sealing the open  
50 top of the hollow block and composed of two magnetic parts separated by a non-magnetic contact part, and an adjustable contact arranged above the armature and secured to the under part of the compound structure.

55 11. In a contact-block for electric railways, a hollow block of insulating material open at the top, combined with a magnetic armature within the hollow block, a counterbalancing-spring for the armature, a conductor of elec-  
60 tricity connecting with the armature, a magnetic compound structure sealing the open top of the hollow block and composed of two magnetic parts separated by a non-magnetic contact part, and a series of adjustable con-  
65 tacts arranged above the armature and se-

cured to the under part of the compound structure.

12. A circuit-closing contact-block for an electric railway consisting of a hollow block of insulating material open at the top, com- 70  
bined with a compound plate structure sealing the opening at the top comprising two side plates of magnetic material and a central contact-bar of non-magnetic material with which the collector on the car may make 75  
contact, one member of a circuit making and breaking switch secured to the under side of the compound plate structure and movably supported by a spring, a movable armature of magnetic material forming the other mem- 80  
ber of the switch extending under each of the side plates of magnetic material, and a flexible conductor extending through the lower part of the hollow block and connected to the armature whereby the latter may rise and 85  
close the electric circuit.

13. In a circuit-closing block for an electric railway, the combination of a contact part for directly supplying current to the car, an armature adapted to be raised by mag- 90  
netic attraction, a support against which the armature is positively drawn when raised, and a spring-contact electrically connected with the contact part and having a circuit-closing part spring-pressed against the arma- 95  
ture only when in its raised position.

14. In a circuit-closing contact-block for an electric railway, the combination of a contact part for directly supplying current to the car, an armature adapted to be raised by 100  
magnetic attraction, a support against which the armature is positively drawn when raised, and a spring-contact consisting of a spring, a perforated plate carrying the spring and electrically connected with the contact part and 105  
a circuit-closing part secured to the spring and extending through the perforation in the perforated plate whereby it is spring-pressed against the armature only when in its raised position. 110

15. In a contact-block for an electric railway, a compound plate comprising two magnetic portions and a non-magnetic contact part between them for supplying current to the car, combined with an armature adapted 115  
to be raised by magnetic attraction and in circuit with the supply-conductor of the railway, and a spring-actuated circuit-closing part electrically connected to the non-magnetic contact part and adapted to press 120  
against the armature when raised to form a spring-pressed contact to close the electric circuit.

In testimony of which invention I hereunto set my hand.

LEON W. PULLEN.

Witnesses:

R. M. KELLY,  
M. J. EYRE.