

No. 705,082.

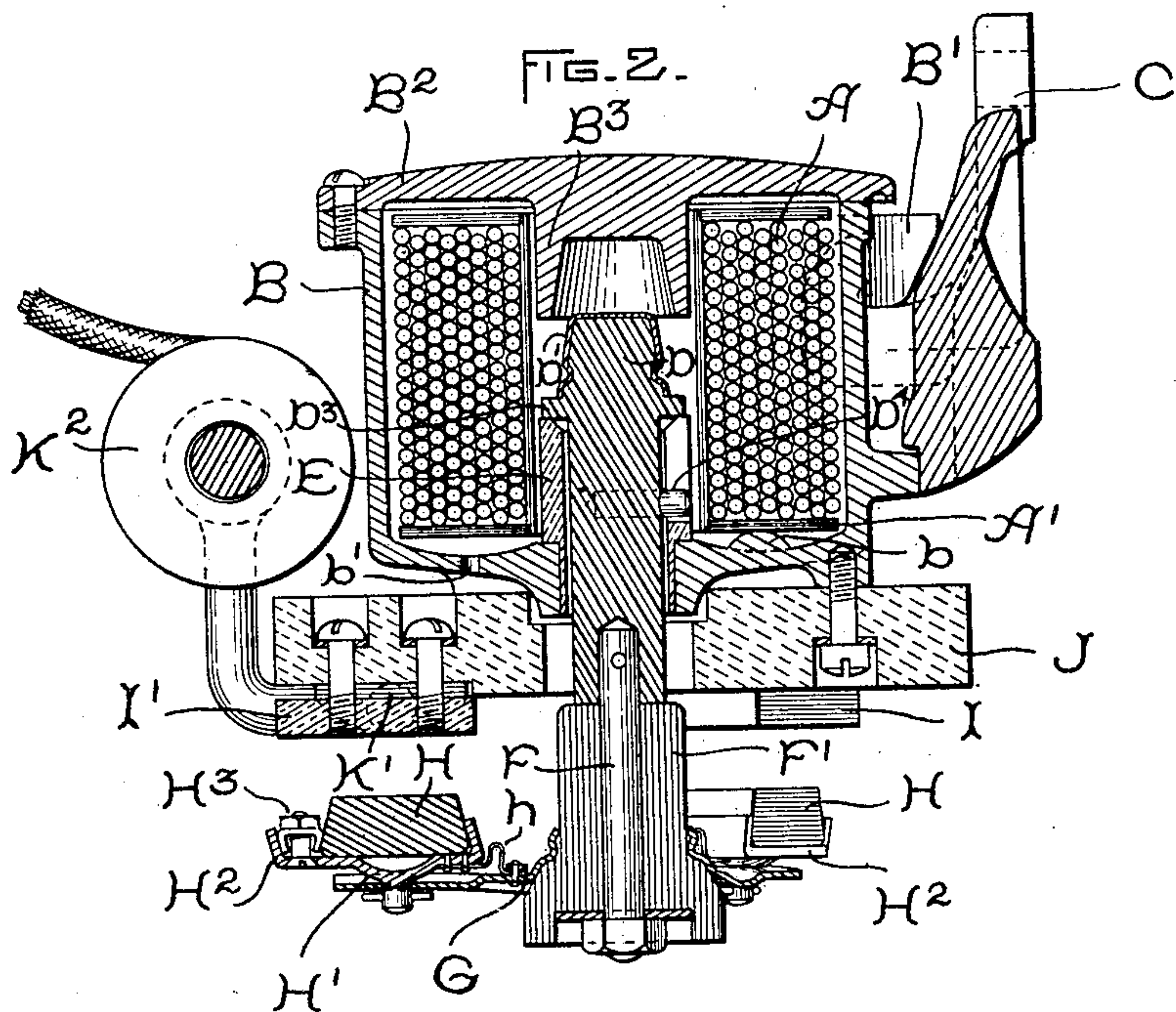
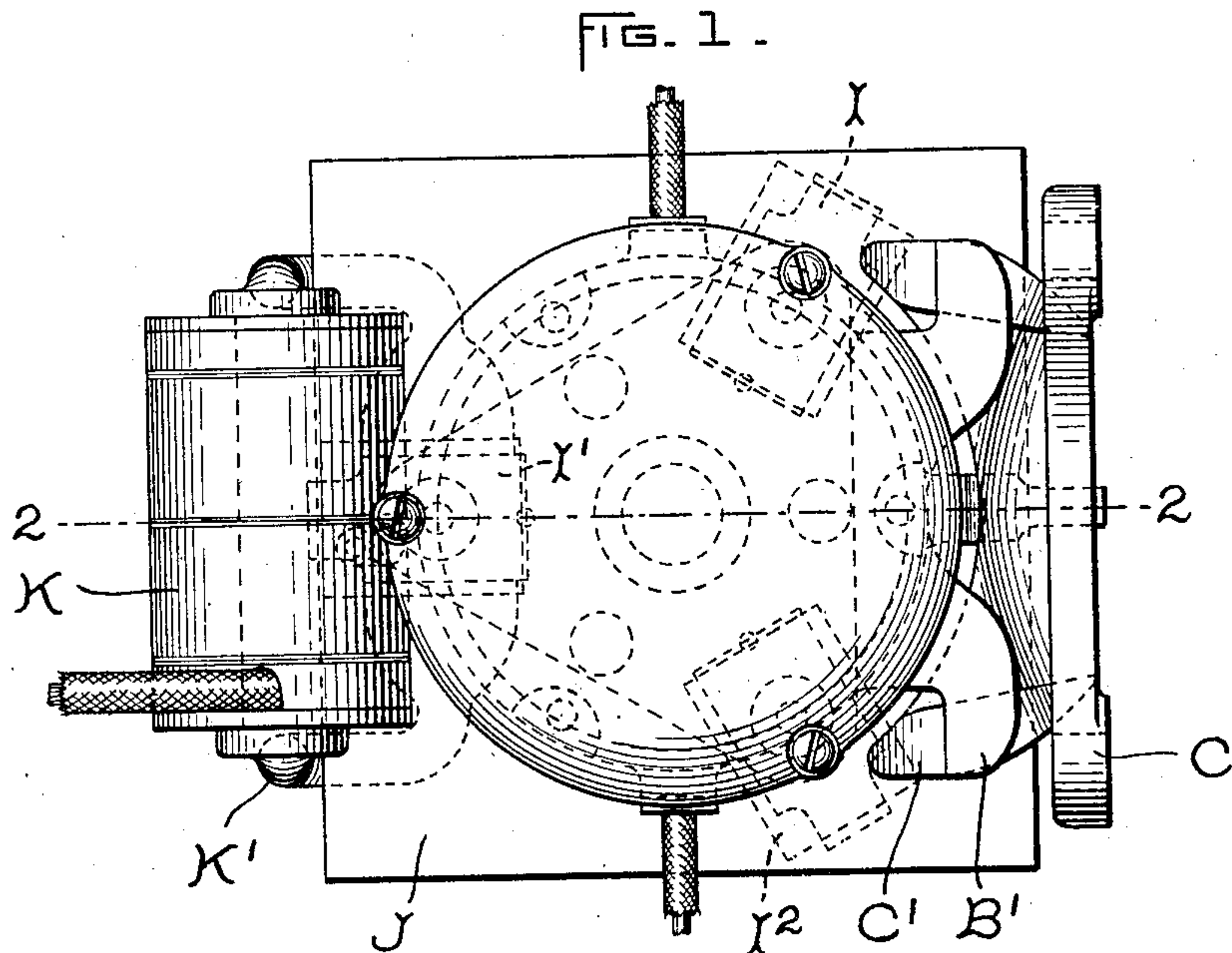
Patented July 22, 1902.

**E. M. HEWLETT.**  
**SURFACE CONTACT ELECTRIC RAILWAY.**

(Application filed Oct. 20, 1897.)

(No Model.)

2 Sheets—Sheet 1.



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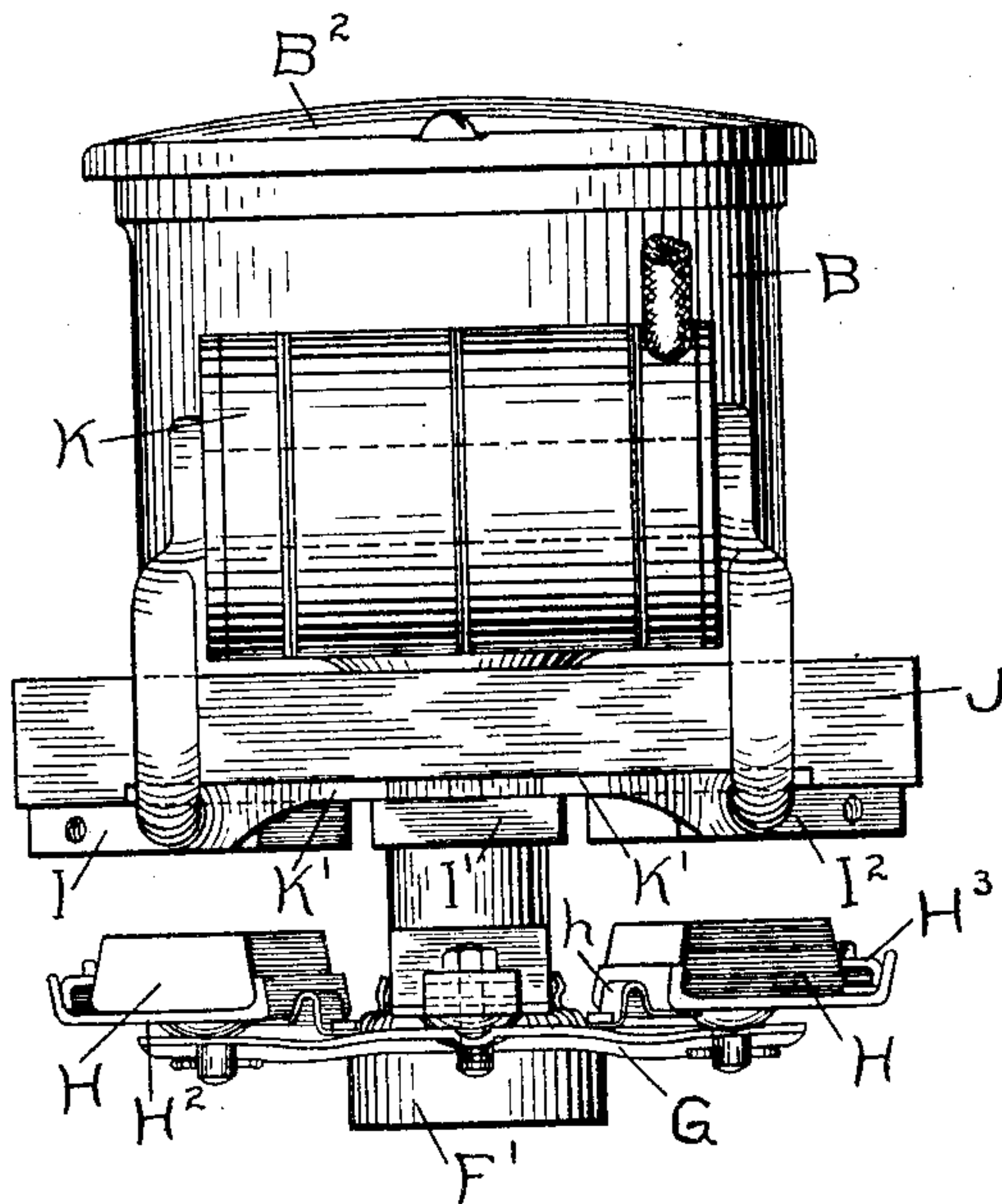
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2 Sheets—Sheet 2.

Fig. 3.



Witnesses:

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# UNITED STATES PATENT OFFICE.

EDWARD M. HEWLETT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE  
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## SURFACE-CONTACT ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 705,082, dated July 22, 1902.

Application filed October 20, 1897. Serial No. 655,777. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD M. HEWLETT, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Surface-Contact Electric Railways, (Case No. 657,) of which the following is a specification.

The object of my invention is to improve and simplify the construction of switches employed in surface-contact electric railways.

The invention relates to certain features, hereinafter described, of the type of switch disclosed in the application of William B. Potter, Serial No. 654,793, filed October 11, 1897.

In the accompanying drawings, Figure 1 is a plan view of my improved switch. Fig. 2 is a cross-section taken on line 2 2 of Fig. 1. Fig. 3 is a front elevation of the switch.

In a patent to W. B. Potter, No. 589,786, dated September 7, 1897, is shown a surface-contact electric-railway system wherein three-point switches are arranged to make and break the circuit between the source of supply and contact-studs located in the road-bed. My invention has been designed for use in connection with the above system; but certain features apply equally well to other systems.

The switch-energizing coil A is wound on the insulating-spool A', which is mounted within an iron inclosing casing B, that forms a part of the magnetic circuit. The terminals of the coil A extend through the case B. It is customary to mount the switches of a system of this character either in vaults or iron casings situated at suitable intervals along the line of travel. To simplify the suspension of the switches within the vaults or casings, I make each switch self-contained and provide hooks B', formed on casing B. These hooks fit over similar hooks C', formed on casting C, and the switch is held in place by its own weight. Casting C is adapted to be permanently secured in place, and when for any reason it is desirable to inspect a switch the latter may be readily unhooked from its support without the aid of tools. Inclosing case B is provided with a cover B<sup>2</sup>, having a downwardly-extending core B<sup>3</sup>, serving as the fixed core of the magnet and hol-

lowed out at its lower end to receive the upper end of moving core D. The insulating-spool A' rests on lugs b, formed on the inside of the casing B. To prevent moisture from remaining in the casing, holes b' are provided in the bottom that lead to the outside.

Mounted in the lower end of the casing and surrounding the movable core D is a sleeve E, of non-magnetic material, arranged to prevent the core from sticking to the sides of the casing. Secured to the upper end of core D by spinning is a non-magnetic cap D', arranged to prevent the core from sticking to stationary core B<sup>3</sup> when attracted. A shoulder D<sup>3</sup> on the core limits its downward movement. Sleeve E is slotted on one side to receive pin D<sup>4</sup>, which is secured to movable core D. This prevents the core and switch contacts from turning.

Secured to the lower end of movable core D by bolt F is a block of insulating material F', having an enlarged head to which support G is secured. Support G is made of sheet metal and is rigidly secured to block F' by spinning. Support G has three radially-extending arms carrying carbon contacts H at their outer end and arranged to make contact with fixed metal contacts I I' I<sup>2</sup>, secured to insulating-base J. A certain amount of play is allowed between core D and sleeve E to permit the adjustment of contacts H when partially worn away by arcing. In addition to this each contact is provided with a holder H<sup>2</sup>, having a ball-joint H' permitting individual adjustment. Laminated copper strips h are employed to increase the conductivity between the carbon-holders and the support. These are flexible, as shown, in order to yield as the contact-carrier moves to its adjustment. On the under side of each holder is a rounded portion H', fitting into a hole on support G, forming a ball-joint. The sides of the carbon contacts are beveled and are retained in the holders by clamps H<sup>3</sup>.

Screwed to the under side of inclosing case B is an insulating-base J, having fixed contacts I, angularly displaced and arranged to establish electrical connection with carbon contacts H. On one side of the base is secured a blow-out magnet K, having pole-pieces K' with enlarged ends, which are extended



around the base and secured thereto by screws. By this arrangement the coil of the blow-out magnet is not liable to be injured by any arcs which may be formed, and a strong field is provided to disrupt the arc. Contact I' is connected to the source of supply through coil K<sup>2</sup> of the blow-out magnet.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

10 1. In an electric switch, the combination with a contact, of a movable support, an electromagnet for moving said support toward the contact, and a second contact on the support, one of said contacts having a ball-and-socket joint, whereby it can adjust itself to the other contact when the magnet moves the support.

20 2. In an electric switch, the combination with a contact, of a movable support, an electromagnet for moving the latter toward said contact, and a contact which has a ball-and-socket joint with said support, whereby it can adjust itself to the first contact.

25 3. In an electric switch, the combination with a contact, of an electromagnet, a contact-support adapted to be moved toward said contact by the movable member of said magnet, and a contact having a ball-and-socket joint with said support, whereby said contact can adjust itself with the first contact when caused by said magnet to engage therewith.

30 4. In an electric switch, the combination with the switch-contacts, of an electromagnet to bring said contacts into engagement, and means for permitting lateral play to at least one of said contacts, whereby it can adjust itself to the other when caused to engage therewith by the magnet.

40 5. In an electric switch, the combination with a contact, of a second contact normally held separated therefrom by gravity, one of said contacts being mounted to have lateral play, and an electromagnet for lifting the second contact into engagement with the first.

45 6. The combination with a fixed contact, of a support carrying a second contact, said support being movable to and from said fixed contact, and being normally held by gravity in such position that said contacts are separated, said second contact being adapted to adjust itself to said fixed contact when it is moved into engagement therewith, and a magnet-coil for raising said support.

55 7. The combination with a plurality of fixed contacts, of a plurality of contacts all normally separated from said fixed contacts, but adapted to be moved into engagement therewith, each being capable also of an independent movement.

60 8. The combination with a plurality of fixed contacts, of a support movable to and from said contacts, a plurality of contacts mounted on said support in ball-and-socket joints, and a coil for moving said support.

65 9. In an electric switch, the combination with a contact, of an electromagnet, a contact-support normally separated from said con-

tact, but adapted to be moved theretoward by said magnet, and a contact so mounted on said support that it is adapted to adjust itself to the first contact by movement in the arc of a circle when it is moved into engagement therewith. 70

10. In an electromagnetic switch, the combination with a support of magnetic material, of an energizing-coil mounted on said support, fixed contacts insulated from said support, a movable core having one end which has a normal position beyond said support, a non-magnetic support inside the coil for the core, and contacts carried by the projecting end of the core which are adapted to engage with said fixed contacts. 80

11. An electric switch which comprises a support provided with hooks for suspension, an energizing-coil mounted on said support, fixed contacts mounted on the support, a movable core normally resting on the support and having a lower end which depends below the support, and contacts mounted on said lower end adapted to engage with said fixed contacts. 90

12. The combination with a casing of magnetic material, of a magnet-coil inclosed and supported by said casing, a movable core, passing through an opening in the bottom of said casing, and a hole in the bottom of the casing for the escape of condensed moisture. 95

13. The combination with a casing of magnetic material provided with holes in its bottom, of a magnet-coil mounted on an insulating-spoolsupported in a raised position in said casing, and a movable core passing through an opening in the bottom of said casing. 100

14. The combination with a casing of magnetic material, of a magnet-coil inclosed and supported by lugs on the inside of said casing, fixed contacts located outside said casing, and contacts mounted on the end of the core which is outside of the casing and adapted to engage with said fixed contacts. 105

15. In an electric switch, the combination with a contact, of an electromagnet, a conducting-support connected in circuit and adapted to be moved toward said contact by the magnet, a contact movably mounted on said support, whereby it can adjust itself to the first contact, and a flexible electric connection between said movably-mounted contact and its support. 115

16. In an electric switch, the combination with the contacts, of a support movable with respect thereto through different planes, a contact-holder movably mounted upon said support, and a contact secured in said holder. 120

17. In an electric switch, the combination with a contact, of a support movable with respect thereto, and a contact having a ball-and-socket joint with said support. 125

18. In an electric switch, the combination with an electromagnet, of a block of insulating material secured to the end of the movable core, a switch-piece support having a central hole fitting over said block, so that 130



the support rests on the block, and a plurality of switch-contacts mounted on said support.

19. In an electric switch, the combination with an electromagnet, of a magnetic casing therefor having a hole through which the core of the magnet extends, switch-contacts carried by the core, and a non-magnetic sleeve arranged to prevent the core from sticking to the sides of the hole in the casing, said sleeve being of sufficient inner diameter to permit play for the core, whereby the switch-contacts can adjust themselves when they become worn by arcing.

20. In an electric switch, the combination with an electromagnet, of a casing therefor having a hole through which the magnet-core extends, and switch-contacts carried by the core, the hole in the casing being of sufficient diameter to permit play for the core, whereby the switch-contacts can adjust themselves when they become worn by arcing.

21. In an electric switch, the combination with an electromagnet having a movable core, of a support carried by the core, contact-holders mounted on said support, and clamps for holding the contacts in the holders.

22. In an electric switch, the combination with a support formed with depressions, of contact-holders having rounded portions fitting said depressions, to form ball-and-socket joints, and a flexible electric connection between said holders and the supports.

23. In an electric switch, the combination with a plurality of fixed contacts, of an electromagnet, a contact-support adapted to be moved toward said contacts by the movable member of said magnet, and a plurality of contacts each of which is independently and movably mounted on said support.

24. In an electrically-operated switch, the combination with the energizing-coil, of fixed contacts, a movable core for the coil, contacts carried by the core each non-concentric with the axis of the core, a stationary sleeve of non-magnetic material between the coil and core, a longitudinal slot in said sleeve, and a pin carried by the core and engaging in the slot in the sleeve to prevent rotation of the core.

25. An electric switch, which comprises a box of magnetic material provided with a hole, a coil inclosed and supported thereby, an insulating-base on which said box is mounted, said base being provided with a hole registering with the hole in the box, contacts on the side of the base opposite to the box, a core for the coil, which moves through the holes in the box and base, and contacts carried by the core to engage the contacts on the base.

In witness whereof I have hereunto set my hand this 19th day of October, 1897.

EDWARD M. HEWLETT.

Witnesses:

B. B. HULL,

M. H. EMERSON.