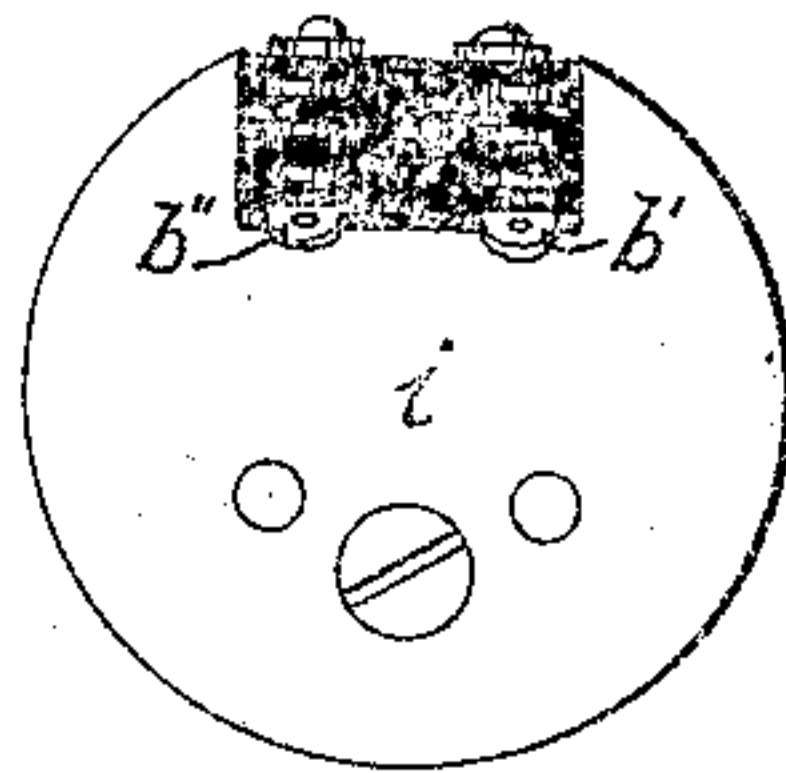
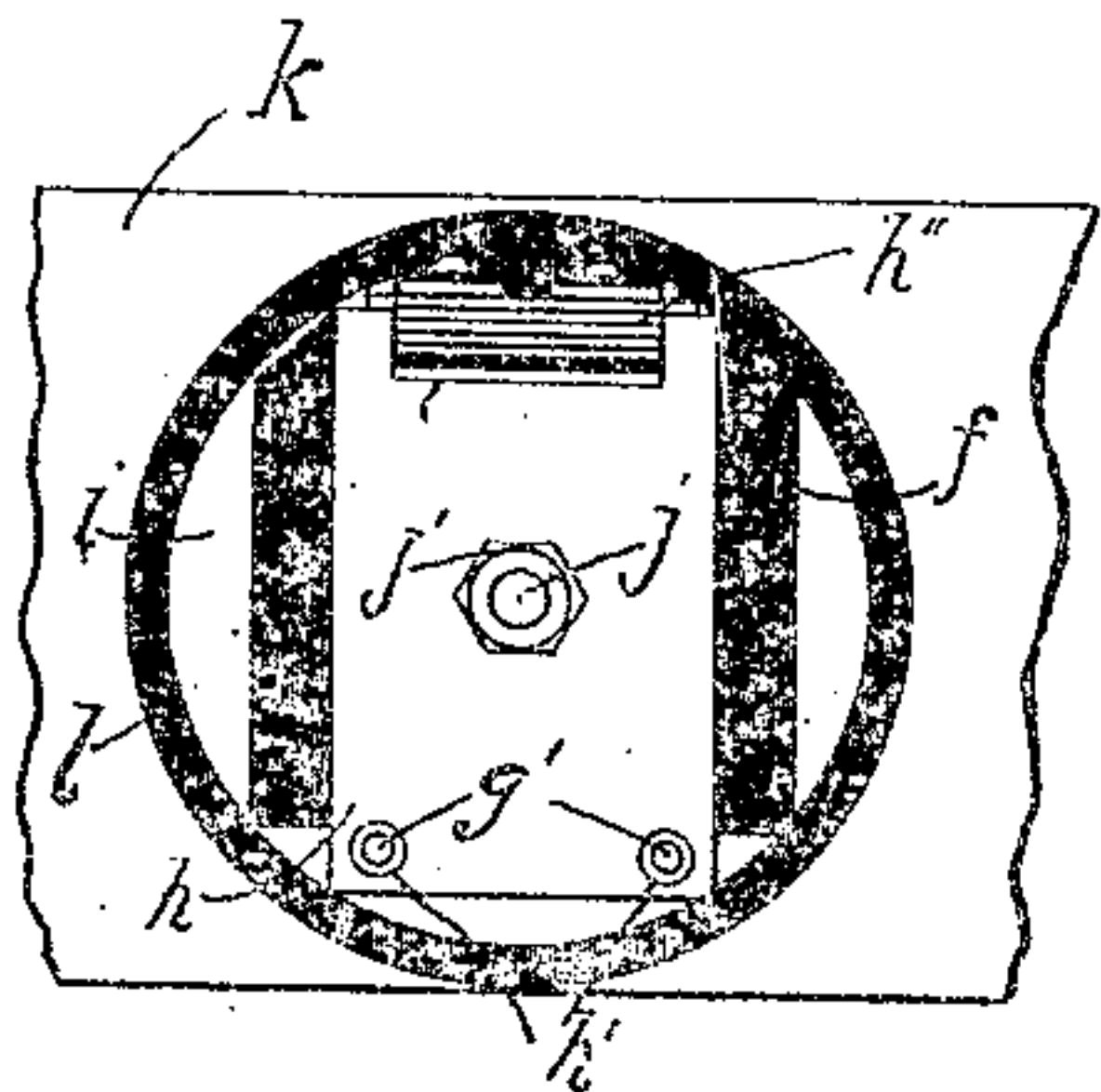
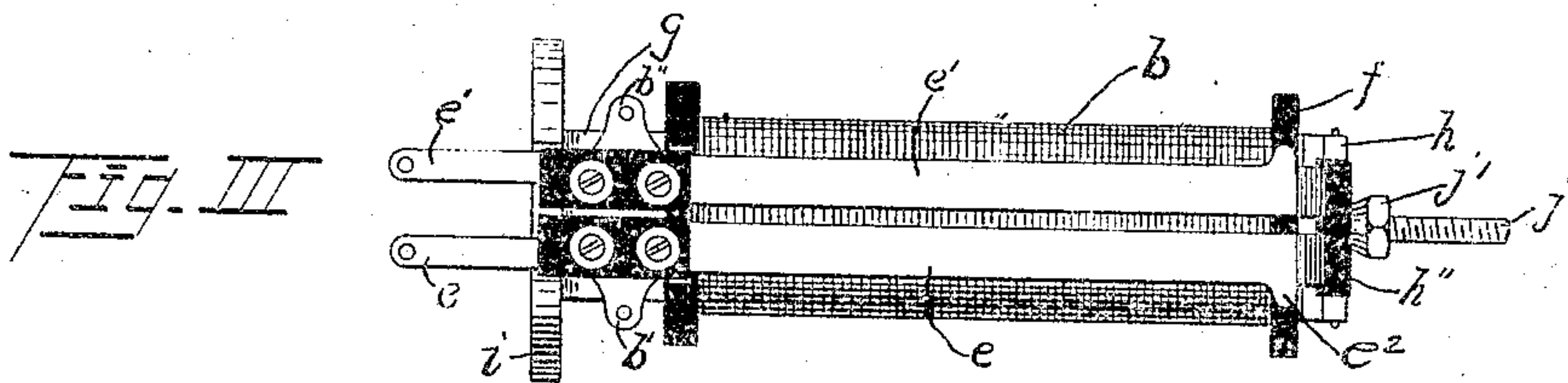
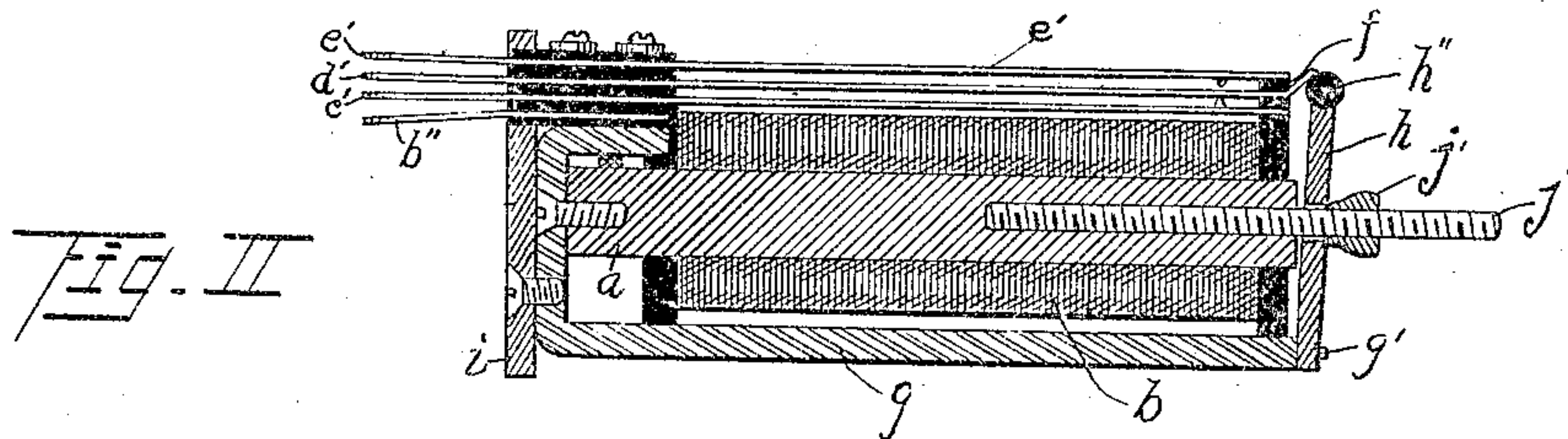
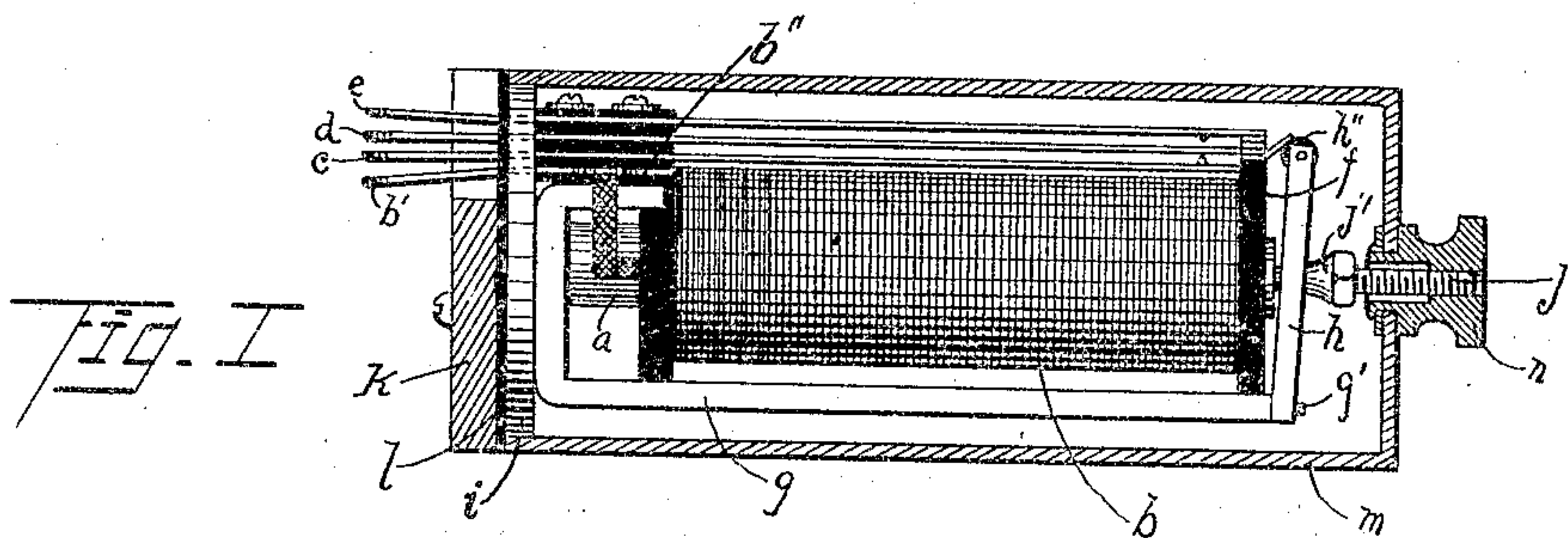


No. 821,992.

PATENTED MAY 29, 1906.

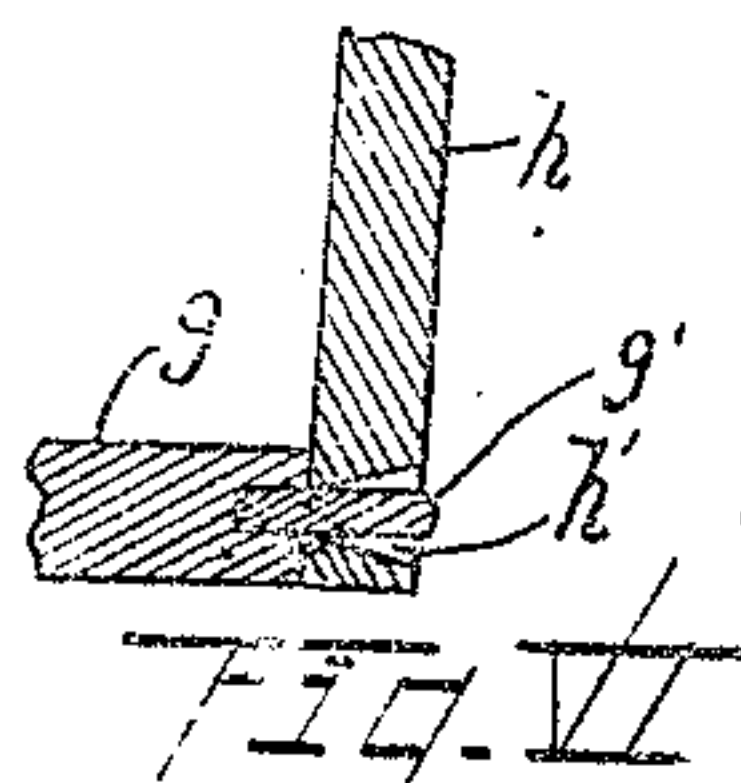
J. P. DOWNS.
RELAY DEVICE.

APPLICATION FILED MAY 1, 1902.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOHN P. DOWNS, OF CLEVELAND, OHIO, ASSIGNOR TO THE NORTH ELECTRIC COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

RELAY DEVICE.

No. 821,892.

Specification of Letters Patent.

Patented May 29, 1906.

Application filed May 1, 1902. Serial No. 105,529.

To all whom it may concern:

Be it known that I, JOHN P. DOWNS, a citizen of the United States of America, and a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Relay Devices, of which the following is a specification.

My invention relates to improvements in relay devices, and has for its object the construction of such appliances in an extremely simple manner, whereby they are rendered highly efficient, sensitive, and certain in their operation.

My improvements are peculiarly adapted to relay devices for telephone-circuits which are required to effect the control of a plurality of separate electrical circuits under the influence of a minimum operating-current, while combining the advantages of being exceedingly simple and compact in construction and affording every facility for inspection, adjustment, and repair.

Briefly described, the device embodying my invention which I herein illustrate comprises a single helix-covered core having a soft-iron continuation or pole-piece extending from the inner end of and parallel with said core to the plane of its opposite end, before which is mounted a freely-movable armature carrying a roller or other suitable part for actuating the contact-making springs of the relay, which also lie parallel with the core and are secured closely together upon the relay in insulating-mountings.

The armature is supported upon pins extending through countersunk holes therein, the engaging walls of which are the acute-angled edges presented by said countersunk holes, thus affording a practically frictionless mounting for the armature and permitting it directly to engage the extremity of the aforesaid pole-piece, whereby any air-gap therebetween is obviated. By means of this construction the armature and pole-piece or its extension engage each other over relatively large areas, presenting to each other engaging portions of practically unimpaired or full cross-section, affording paths of extremely low resistance for the passage of magnetic lines of force. An adjusting-screw secures

the proper positioning of the armature with respect to the magnetic field and the contact-springs. An external shell of soft iron, preferably provided with a permanently-attached thumb-screw, maintains the parts securely against injury and from magnetic disturbance from external sources and the entrance of foreign particles.

These and other details of my invention will be made more apparent by reference to the accompanying drawings, wherein—

Figure 1 is a view in side elevation and partially in section the better to illustrate my improved construction. Fig. 2 is a vertical sectional view thereof; Fig. 3, a plan view; Figs. 4 and 5, end views thereof, and Fig. 6 a detail of the armature-mounting.

The same character of reference is employed to designate similar parts in each of the several figures of the drawings.

Upon the core *a* is provided the usual helix or winding *b*, having its terminals *b'* *b''* mounted upon the upper rear portion of the relay. Immediately above said terminals are disposed the flat paired contact-springs *c* *c'*, *d* *d'*, and *e* *e'*, adapted to be connected with the controlled circuits, the said springs being securely mounted between thin strips of insulating material at their rear or supported ends. The opposite ends of these parallel springs are free to be brought into contact with each other. The springs *c* *c'* are normally engaged, respectively, by springs *d* *d'*, which, however, are provided with upwardly-inclined terminals and under the influence of the armature-roller are lifted from contact with the former into engagement, respectively, with springs *e* *e'*. Said springs *e* *e'* have laterally-extending ears or lugs *e²*, which, engaging the raised portions of the forward insulating-block *f*, centrally recessed or cut away to accommodate the forwardly-extending ends of the remaining springs, support these springs *e* *e'* in their normally depressed position out of contact with the actuated springs *d* *d'*.

Secured to the core *a* is the soft-iron extension or pole-piece *g*, extending downward and forward to a position even with the front end of the core. In its forward end are mounted two supporting-pins *g'*, which carry the ar-

mature *h*. The said armature is provided with two corresponding deeply-countersunk holes *h'*, the sharp edges of which rest upon the pins, thereby affording a frictionless mounting for the armature, while permitting it to remain in complete magnetic contact with the extension or pole-piece *g*, along substantially its entire face or abutting end.

A brass screw *j*, inserted in the forward end of the core, extends through a central hole provided in the armature and carries an adjusting-nut *j'* for regulating the position of the armature.

At the upper end of the said armature is inserted a small rubber roller *h''*, adapted when the relay is excited and the armature attracted to engage or roll beneath the inclined ends of springs *d d'*, thereby raising them out of engagement with springs *c c'* and into contact with the upper springs *e e'*, thus opening and closing the respective controlled circuits. This, it will be seen, is quite readily and easily effected, for the armature is supported in a manner to be very easily actuated and slips readily beneath the superposed ends of the springs without encountering any appreciable friction. The magnetic circuit, too, being practically complete renders the device extremely sensitive and efficient. In practice numbers of these relays are mounted upon a common slotted supporting-strip *k* by screws inserted in their pole-pieces, interposed brass end plates *i* and insulating-washers *l* serving to complete the rear ends of the relays.

Over the entire relay is disposed a protective tubular shell *m*, of soft iron, which is drawn closely to its seat, formed by said slotted washer and end plates by means of a tapped thumb-screw *n*, permanently and rotatably secured in the front end of the shell and engaging the outer extremity of screw *j*. By thus attaching the thumb-screw to the shell its displacement and loss are prevented.

The relay is protected by the surrounding shell from injury from the entrance of dust and dirt and from external magnetic influences. It is, however, readily accessible for the purposes of inspection and repair merely by removing the said shell, while the terminals may be reached from the opposite side of the supporting-strip through slots in which said terminals extend. Moreover, any relay may be removed from the common strip *k* simply by withdrawing a couple of screws.

In the telephone-relay above set forth it will be seen that the contact spring-roller presents a simple and almost frictionless means for actuating the springs, that the armature is freely, though rigidly, supported upon the knife-edges and pins and by its adjusting-nut in proper position to react

against the springs, that such mounting permits a closed magnetic circuit along its base not obtainable with a hinge-mounting or a simple knife-edge bearing, for example, and that said contact-springs are so mounted as to insure the certain opening and closing of the connected circuits.

The precise arrangement, relation, and number of the contact-springs will of course vary with different applications of my improvement and the character of the circuits to be controlled. It is obvious that such springs may be omitted or altered in various ways without departing from my invention, as, indeed, may the relay device itself, which I have shown to typify my said invention, and I therefore claim such modifications.

I desire to secure by Letters Patent the following:

1. The combination with a helix-wound core having a polar extension, of an armature responsive thereto, magnetically engaging the extension in normal condition substantially throughout an area equal to their effective cross-sections, a knife-edge being provided for and freely supporting the armature, and contact parts adapted to be actuated by the said armature substantially as set forth.

2. The combination with a helix-wound core having a polar extension, of an armature responsive thereto, magnetically engaging the extension in normal condition substantially throughout an area equal to their effective cross-sections, a knife-edge being provided for and freely supporting the armature, contact parts adapted to be actuated by the said armature and a protective shell inclosing the said parts substantially as set forth.

3. The combination with a helix-covered core, of its polar extension, an armature mounted before and responsive thereto, the same magnetically engaging the extension in normal condition substantially throughout an area equal to their effective cross-sections, a countersunk or beveled portion of the armature providing a practically frictionless support therefor and a movable spring or part actuated by the armature substantially as set forth.

4. In a relay device, the combination with its helix-wound core, of a polar extension thereof, contact-springs disposed substantially parallel therewith, and an armature mounted between said parts substantially at right angles therewith; said armature and polar extension abutting in their normal position over areas substantially equal to their unimpaired or effective cross-section, the armature being positioned to rock between an opposing contact-spring and the polar extension and react against the former to effect a change of electrical contact, upon the excita-

tion of the helix-wound core, substantially as set forth.

5. The combination with a helix-wound core, having a supporting polar extension, of an armature movable under the influence of the excited helix, the same being mounted before the extremity of the polar extension in position to present a maximum magnetic circuit therebetween, electrical contact parts positioned for actuation by said armature, and an interposed roller part associated therewith, substantially as described.

6. In a relay device, the combination with a helix-wound core, of its polar extension, contact-springs disposed substantially parallel with said core and extension, an armature part bodily positioned at right angles between the springs and extension, and a knife-edge bearing for the armature permitting its engagement with the extension over an area substantially equal to their effective cross-sections; said armature thus being positioned to rock between an opposing contact-spring and the supporting polar extension, and react against the spring to effect a change of its electrical contact, upon the magnetic excitation of the said extension, substantially as set forth.

7. In a device of the class described, the combination with the helix-covered core, of an extension thereof substantially parallel and terminating in practically the same plane therewith, an armature freely movable before the said core and extension and in magnetic contact with the latter throughout substantially their entire effective cross-sections, a knife-edge mounting provided therebetween, and a plurality of contact-springs adapted to move into and out of engagement with each other under the influence of said armature, substantially as set forth.

8. In an electric relay device the combination with the exciting-helix, of its core, a polar extension thereof, an armature mounted before the same in position to be attracted by the core, the said armature contacting with the pole-piece substantially throughout their widths and resting freely upon a knife-edge formed by a countersunk hole in the armature, and a plurality of contact-springs adapted to be actuated into and out of electrical engagement by the movements of the armature, substantially as set forth.

9. In a device of the class described the combination with an exciting-helix, of a pole-piece adapted to be energized thereby, an armature abutting or magnetically engaging the same and adapted to be actuated when the helix is excited, said armature being provided with a countersunk or beveled opening and hung or mounted upon the sharp edge thereof in position to be attracted when the helix is excited and contact-springs adapted

to be moved into and out of electrical engagement by the armature, substantially as set forth.

10. In a telephone-relay the combination with a helix-wound core, of a polar extension substantially parallel therewith an armature having a countersunk opening supported from the acute edge thereof before said polar extension and in magnetic contact therewith substantially throughout their widths, a roller part carried thereby and a plurality of contact-springs adapted to be actuated into and out of electrical engagement by the movements of the armature, substantially as set forth.

11. In a telephone-relay the combination with a helix-wound core of a polar extension substantially parallel therewith an armature having a countersunk opening supported from the acute edge thereof before said polar extension and in magnetic contact therewith substantially throughout their widths, a roller part carried thereby a plurality of contact-springs adapted to be actuated into and out of electrical engagement by the movements of the armature and a protective casing therefor inclosing the relay parts substantially as set forth.

12. The herein-described telephone-relay, comprising a single helix-wound core, a polar extension parallel therewith, an armature supported at the end of, and magnetically engaging the same, in position to be attracted by the core, the armature having knife-edges formed therein to support it, an adjusting screw and nut, a rotatable roller part carried by the armature, contact-springs adapted to be actuated by the roller part into and out of electrical engagement, and a protective casing for the relay parts, substantially as set forth.

13. In a relay device, the combination with a helix-wound core, of its polar extension, an armature mounted before the core and extension, and magnetically engaging the abutting end of the latter, countersunk or beveled holes in the armature providing acute-angled supporting portions therefor, and contact parts adapted to be actuated into and out of electrical engagement by the movements of the armature, substantially as set forth.

14. In a relay device, the combination with a helix-wound core, of its polar extension terminating approximately in the plane of the forward end of said core, an armature mounted before the core and extension, and magnetically engaging the abutting end of the latter, beveled or countersunk holes in the armature providing acute-angled supporting portions therefor, an actuating part operated by the armature, and contact parts adapted to be actuated thereby into and out

of electrical engagement, substantially as set forth.

15. In a relay device, the combination with a helix-wound core, of its polar extension, an armature mounted at the end of said
5 extension, and magnetically engaging the same throughout an area substantially equal to their effective cross-sections, and contact parts adapted to be actuated into and out of

electrical engagement by the movements of the armature, substantially as set forth.

Signed by me, in the presence of two subscribing witnesses, at Cleveland, Ohio, this 23d day of April, A. D. 1902.

JOHN P. DOWNS.

Witnesses:

I. P. LIME,

ALBERT LYNN LAWRENCE.