

No. 733,305.

PATENTED JULY 7, 1903.

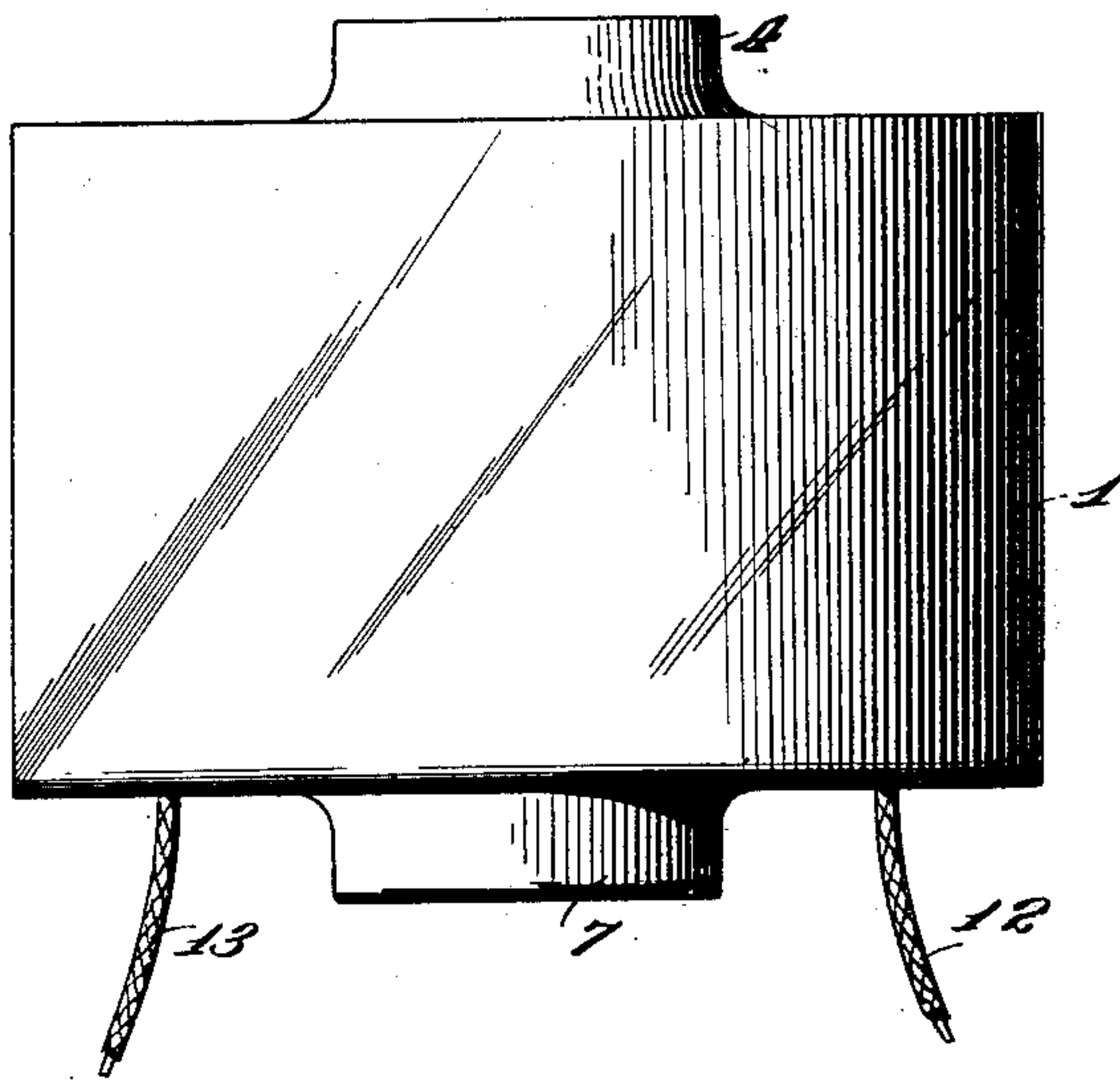
I. G. WATERMAN.  
ELECTROMAGNET.

APPLICATION FILED JUNE 24, 1902.

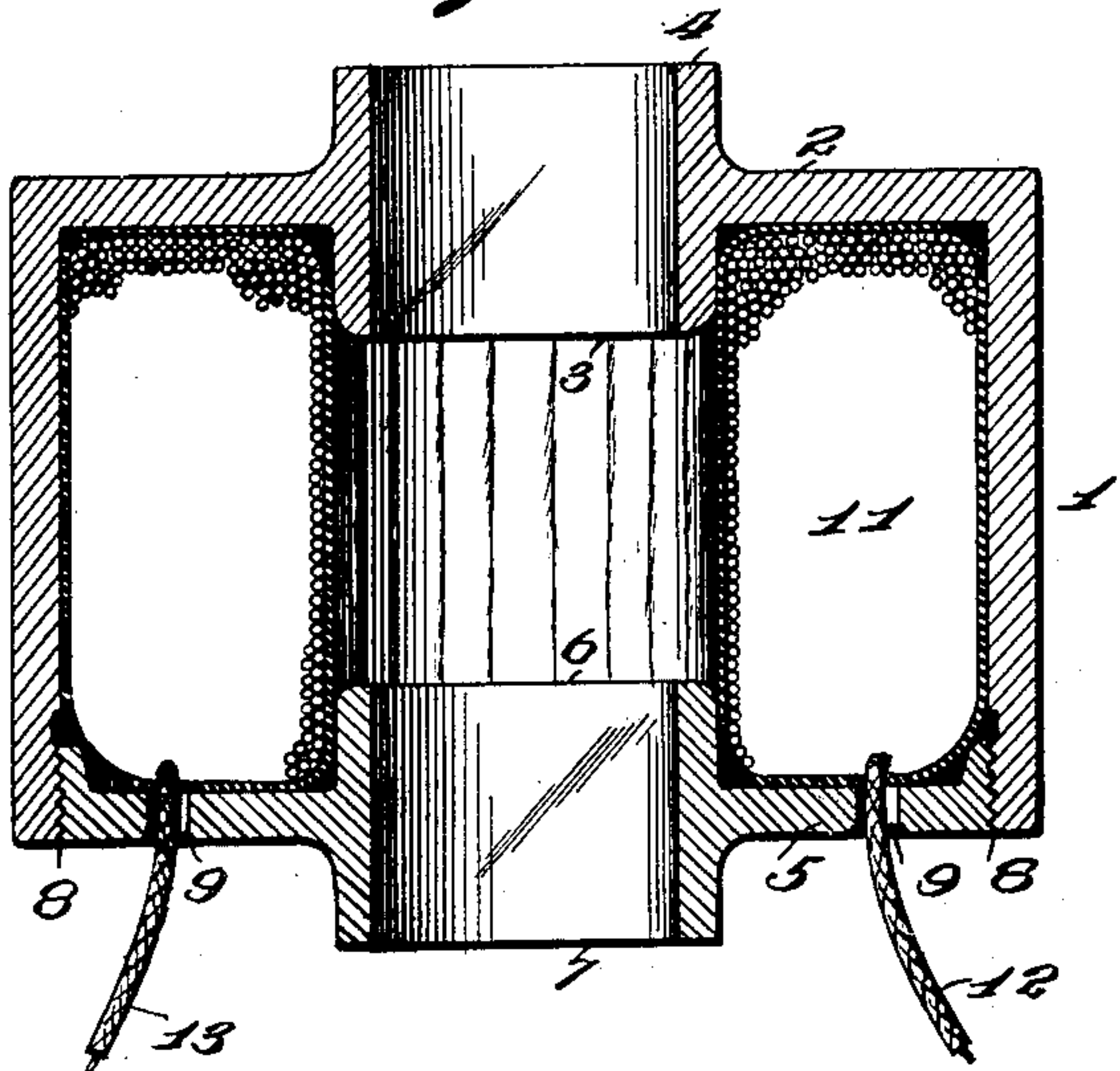
NO MODEL.

2 SHEETS—SHEET 1.

*Fig. 1.*



*Fig. 2.*



Inventor

*Isaac G. Waterman*

By

*Henry N. Copp*  
his Attorney

Witnesses

*L. G. Handy*

*Geo. N. Hamlin*

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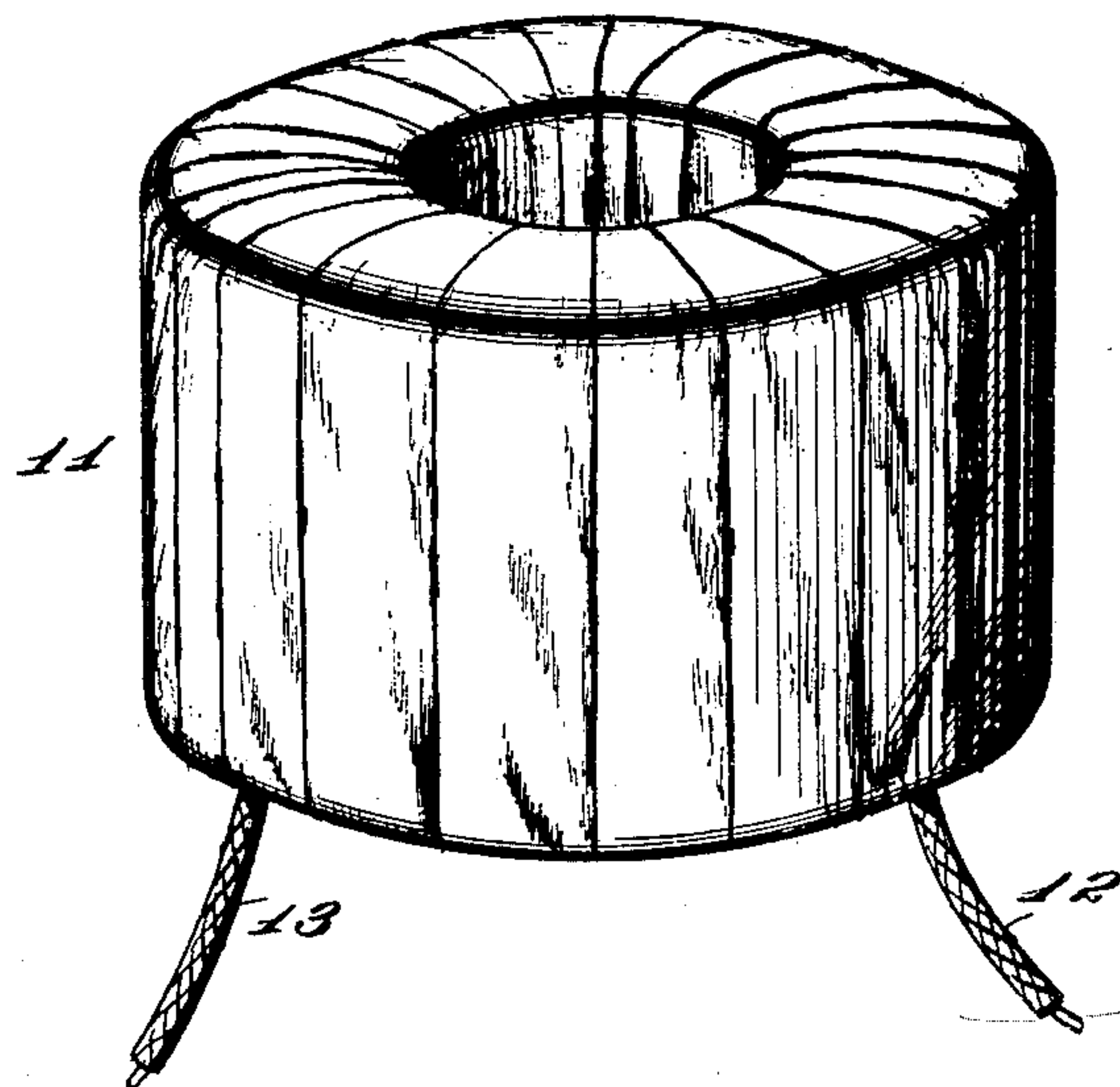
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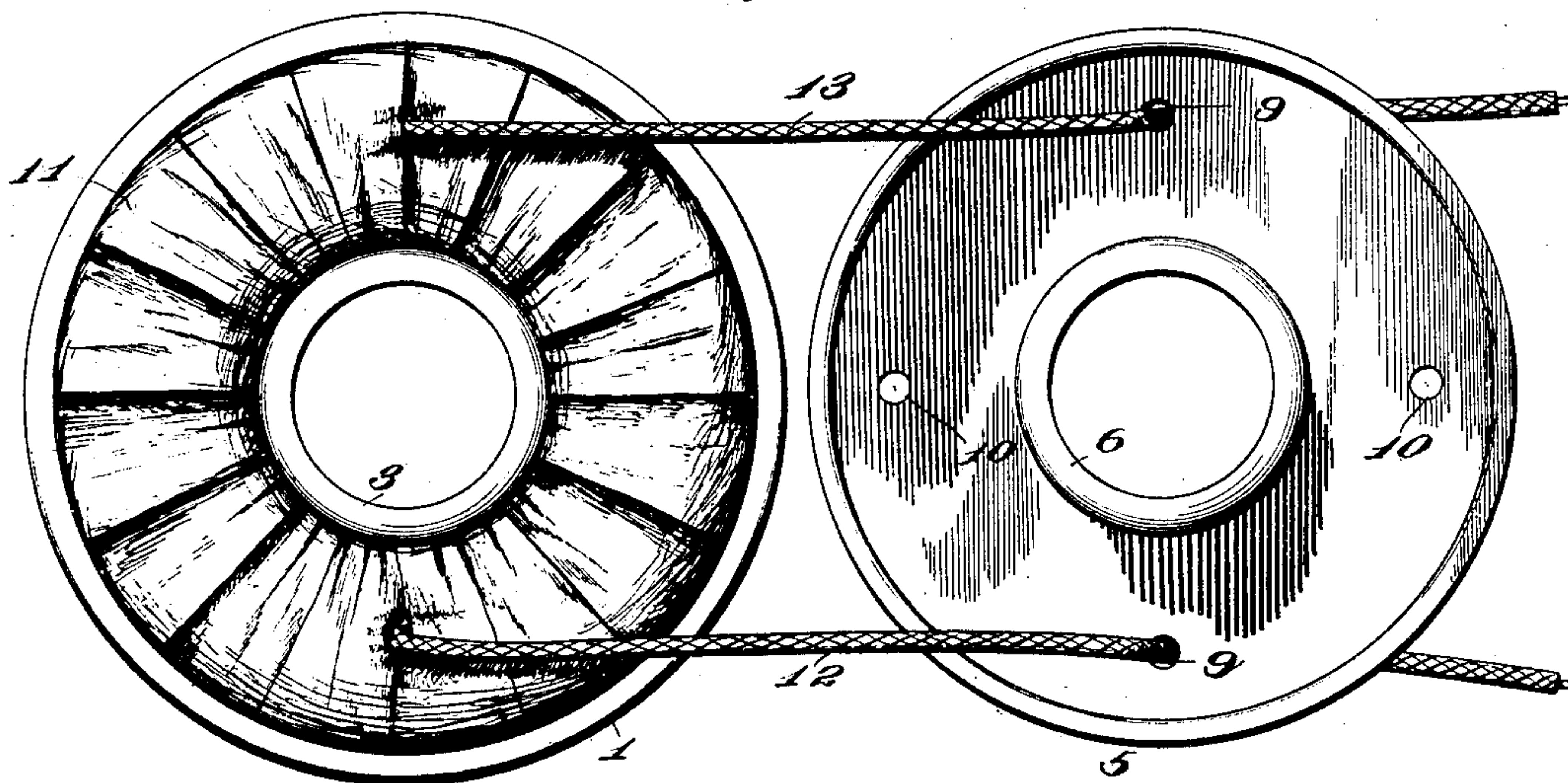
NO MODEL.

2 SHEETS—SHEET 2.

*Fig. 3.*



*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

ISAAC G. WATERMAN, OF SANTA BARBARA, CALIFORNIA.

## ELECTROMAGNET.

SPECIFICATION forming part of Letters Patent No. 733,305, dated July 7, 1903.

Application filed June 24, 1902. Serial No. 113,004. (No model.)

*To all whom it may concern:*

Be it known that I, ISAAC G. WATERMAN, a citizen of the United States, residing at Santa Barbara, in the county of Santa Barbara and State of California, have invented certain new and useful Improvements in Electromagnets, of which the following is a specification.

This invention relates to electromagnets.

The object of the invention is the provision of an improved and novel electromagnet in which the coil will be protected from injury, and yet be easily accessible for removal as an entirety.

A further object is to provide an electromagnet having the coil and magnetic field arranged and constructed in a novel manner, so as to be iron-clad and of great efficiency, while simple and durable.

A further object is to provide an electromagnet particularly adapted, though not necessarily so restricted, for use in connection with certain improvements in electromagnetic valve-controlling apparatus, constituting the subject-matter of my copending applications.

The invention consists of certain improved features, as set forth fully hereinafter and recited in the appended claims.

In the accompanying drawings, Figure 1 is a side elevation; Fig. 2, a section; Fig. 3, a perspective of the coil, and Fig. 4 a plan view with the removable head thrown back.

The magnetic field is composed of a cylindrical shell 1, having a solid or integral head 2, provided with centrally-disposed integral aligned hollow inner and outer polar extensions 3 and 4 and a removable head 5, having integral polar extensions 6 and 7 similar to 3 and 4. The removable head 5 is screw-threaded into the shell 1 at 8 and provided with two sets of holes 9 and 10. The coil 11 is wound in hollow cylindrical form of sufficient external diameter to easily fill the shell 1 and snugly yet easily fit over the inner polar extensions 3 and 6, while its terminals 12 and 13

are let out through one set of holes 9. The set of holes 10 are for the introduction of a spanner when unscrewing the shell and removable head. The coil can be readily removed as an entirety when necessary, but is completely incased when in the shell and protected against injury, while the construction is iron-clad.

I am aware that changes of construction could be resorted to in carrying out my invention, and I do therefore consider myself entitled to all modifications falling within the spirit and scope of the invention.

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

1. An electromagnet comprising an external casing of magnetizable material having magnetizable heads or ends provided with inwardly-extending aligned hollow poles separated from each other, and a magnet-coil within the casing.

2. An electromagnet comprising an external casing of magnetizable material having magnetizable heads or ends provided with inwardly-extending aligned hollow poles separated from each other, and a magnet-coil within the casing and into which said poles enter from opposite sides thereof.

3. An electromagnet comprising an external substantially solid cylindrical casing of magnetizable material having magnetizable heads or ends provided with inwardly-extending aligned hollow poles separated from each other by an air-gap, and a magnet-coil removably located in the casing and into which the poles enter from opposite sides thereof.

In testimony whereof I affix my signature in presence of two witnesses.

ISAAC G. WATERMAN.

Witnesses:

WM. C. DASHIELL,

THOS. M. APPLGARTH.