H. AST.

ARRANGEMENT OF WINDINGS FOR ELECTROMAGNETIC CLUTCHES.

APPLICATION FILED DEC. 26, 1908.

918,254. Patented Apr. 13, 1909.

5 SHEETS—SHEET 1.

Fig. 1

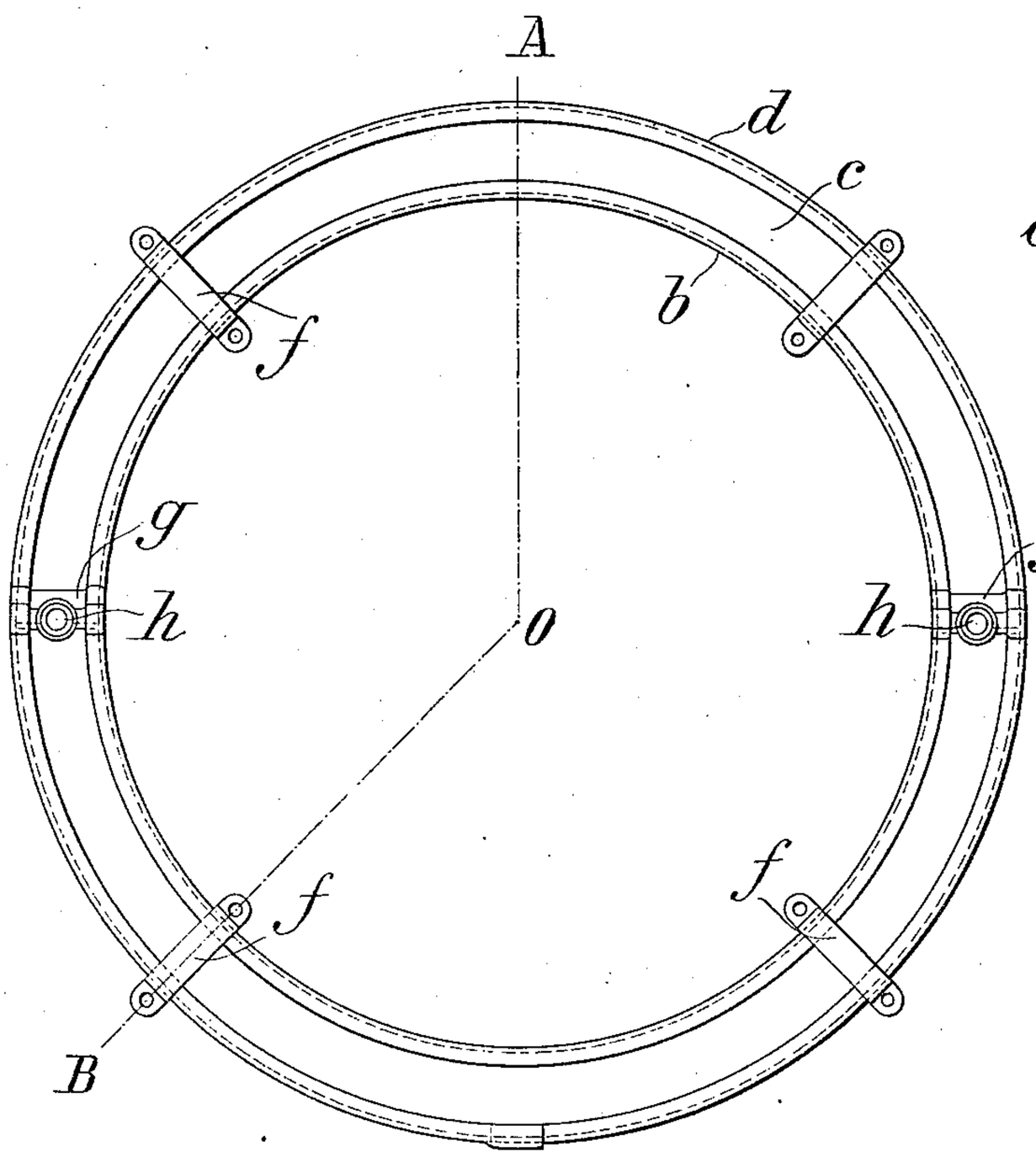
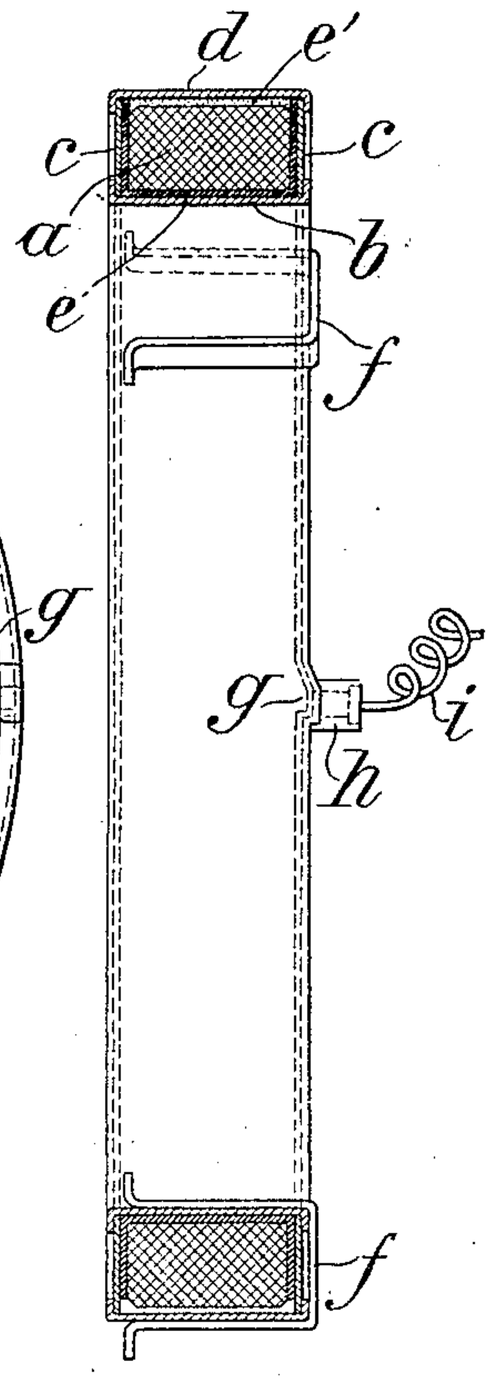


Fig. 2



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A. Faber du Faur

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5 SHEETS—SHEET 2.

Fig. 3

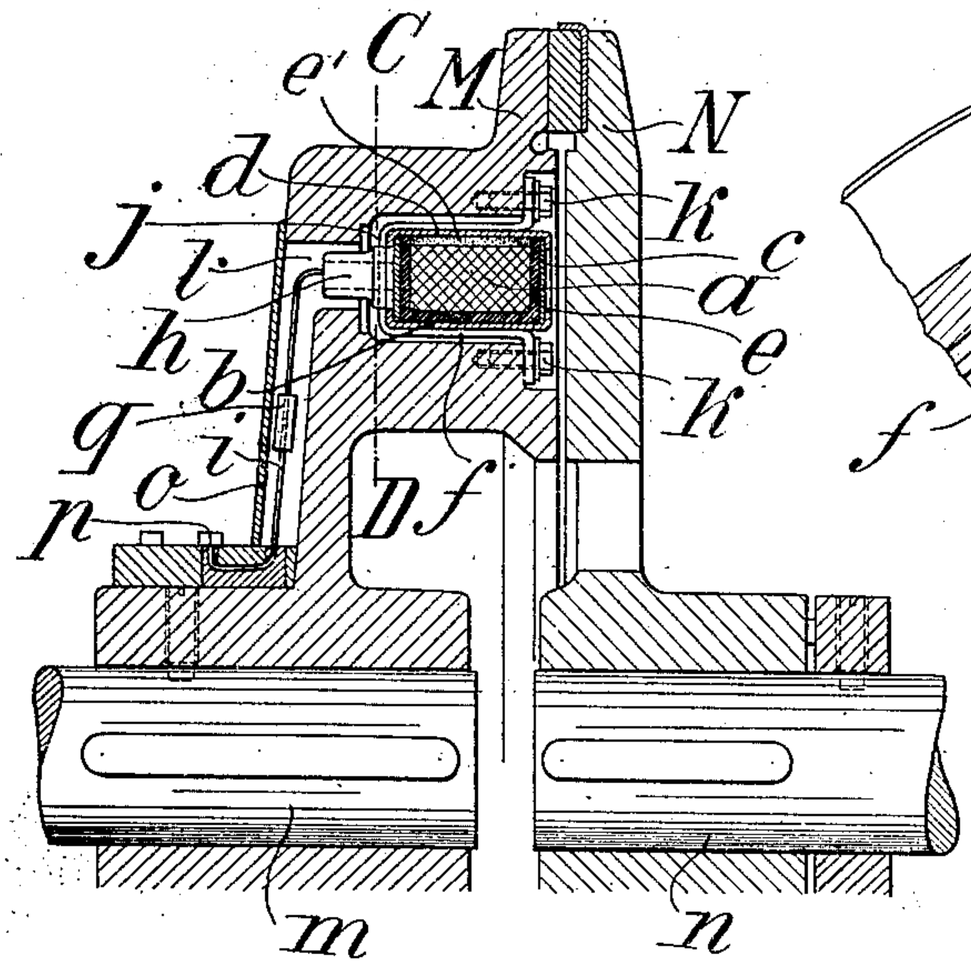


Fig. 4

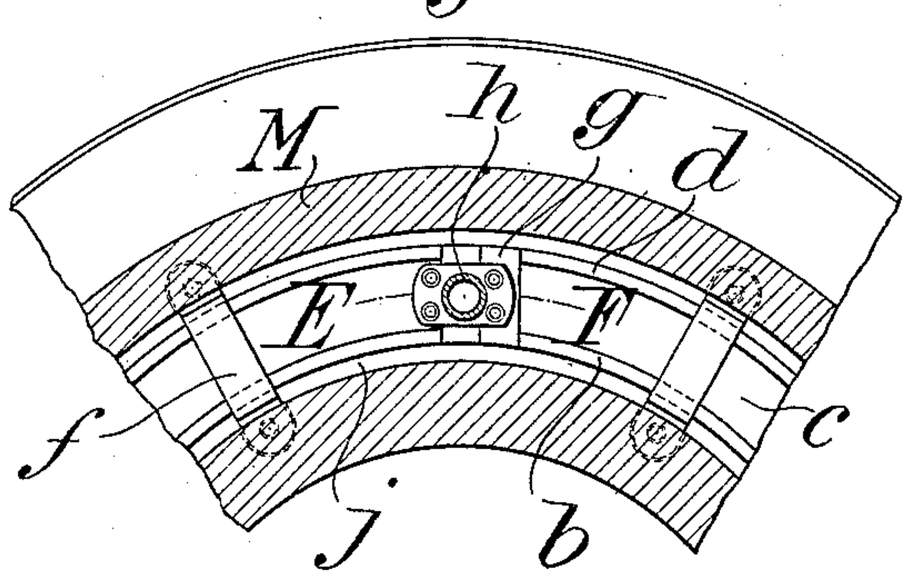


Fig. 5

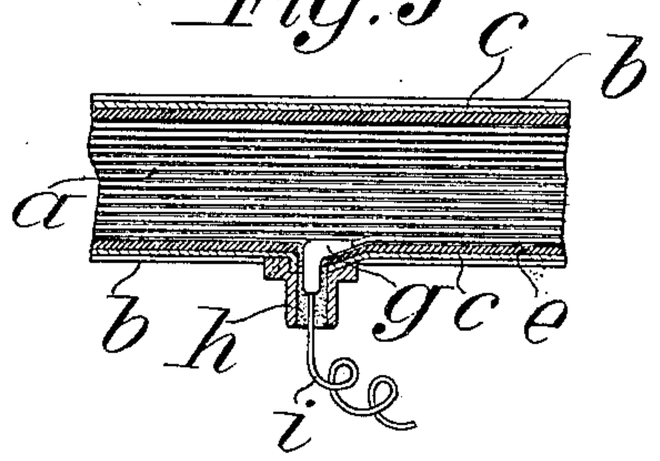


Fig. 6

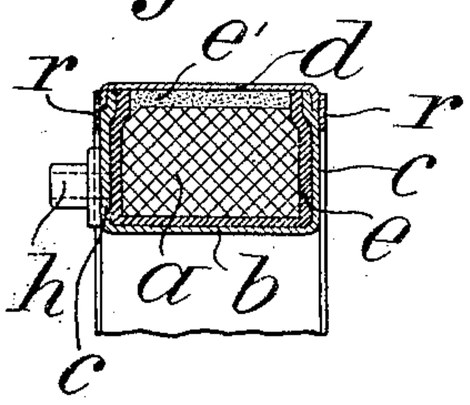


Fig. 7

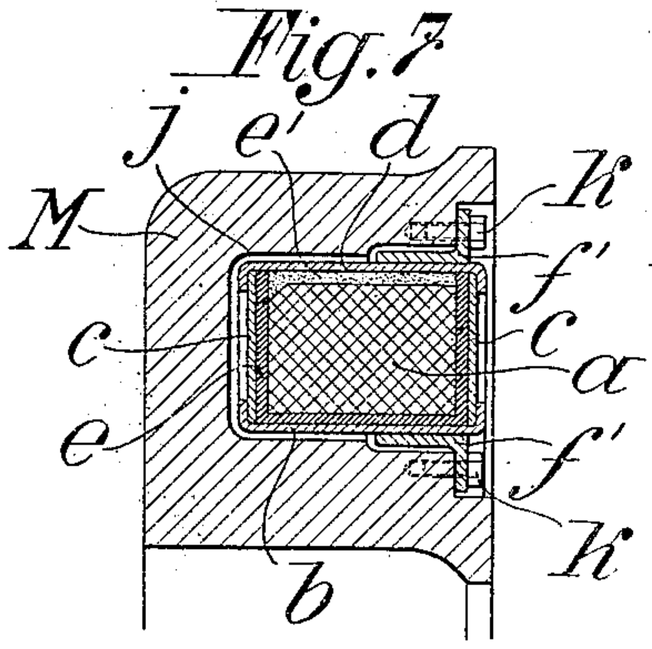


Fig. 8

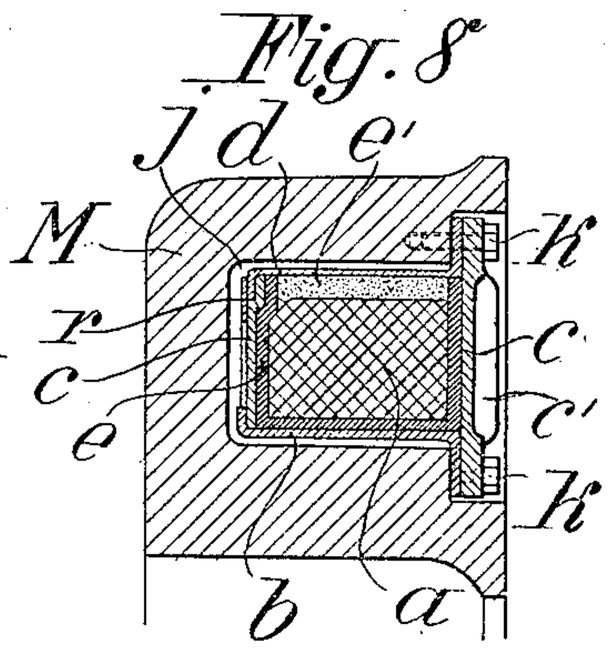


Fig. 9

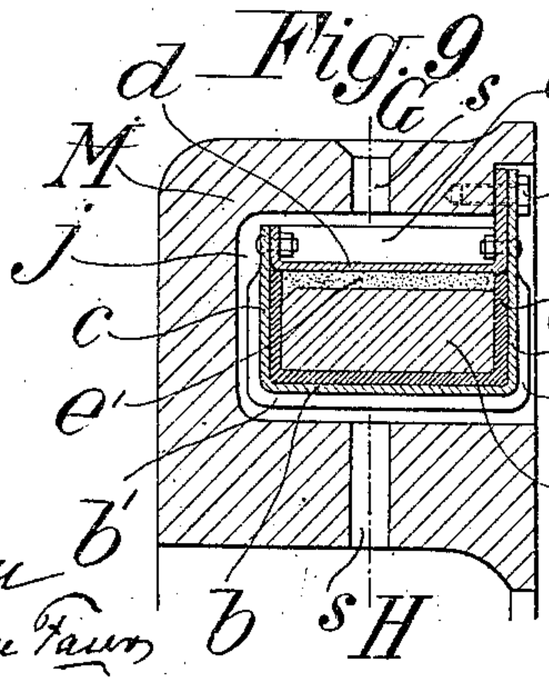
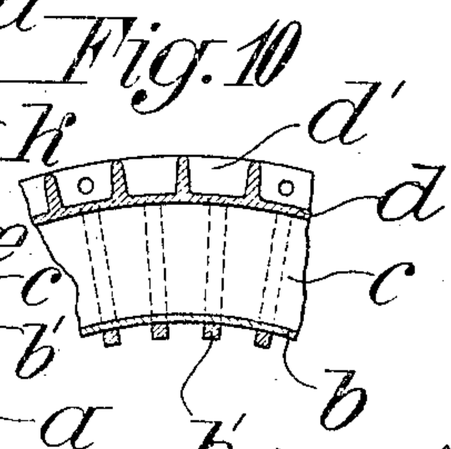


Fig. 10



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5 SHEETS—SHEET 3.

Fig. 11

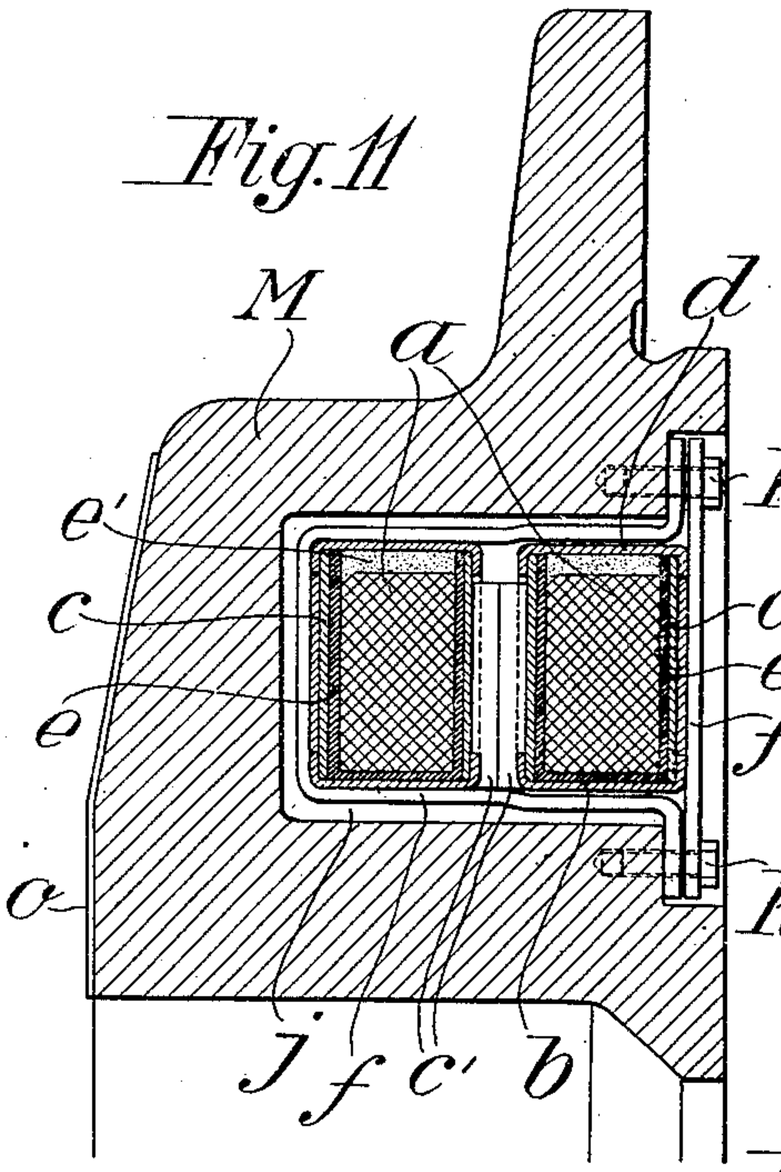


Fig. 12

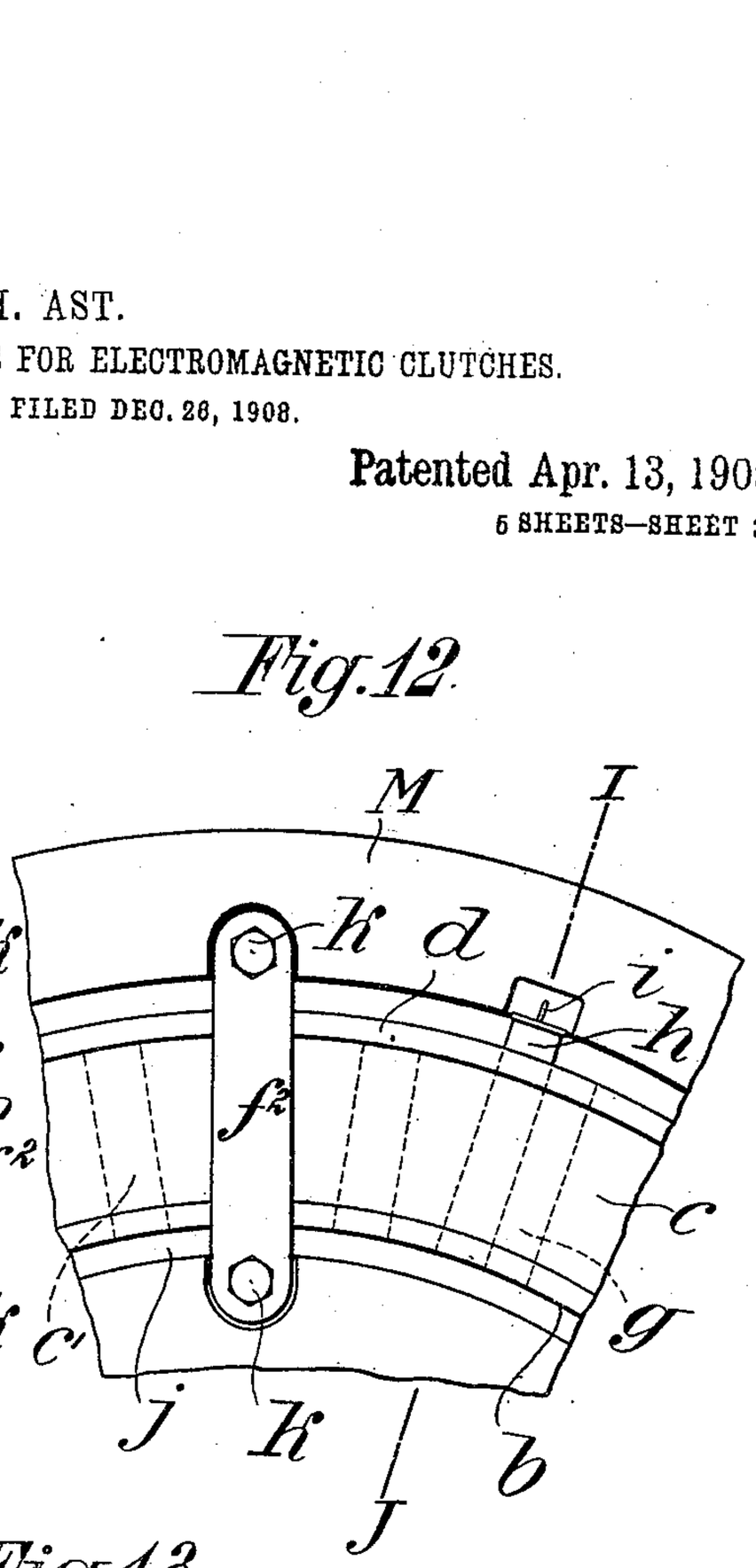


Fig. 13

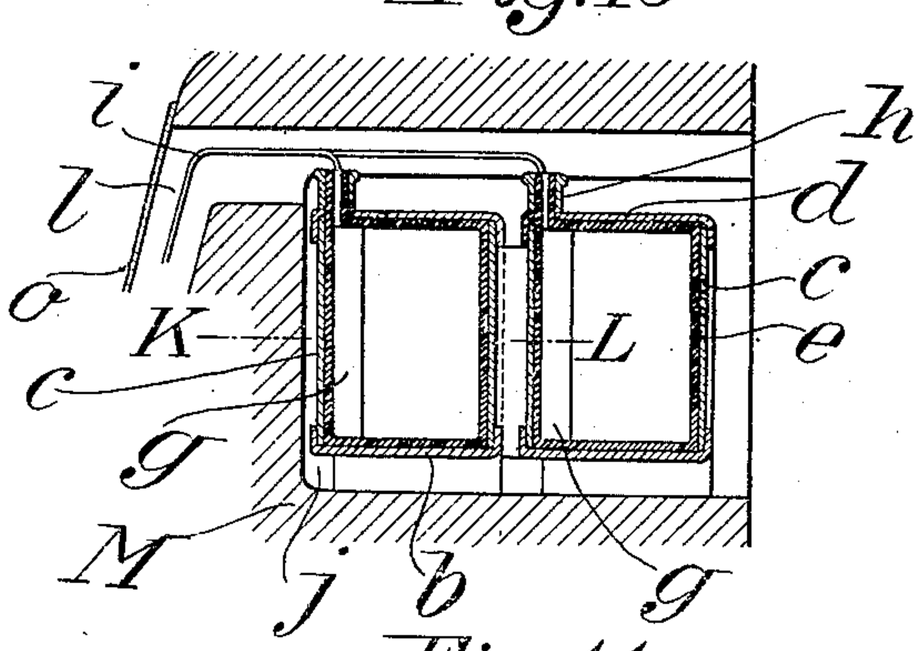
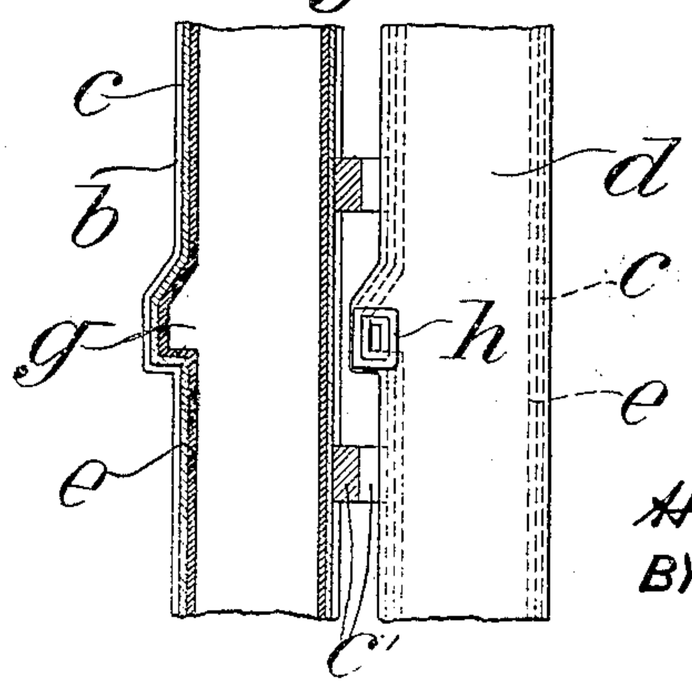


Fig. 14



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5 SHEETS—SHEET 4.

Fig. 15

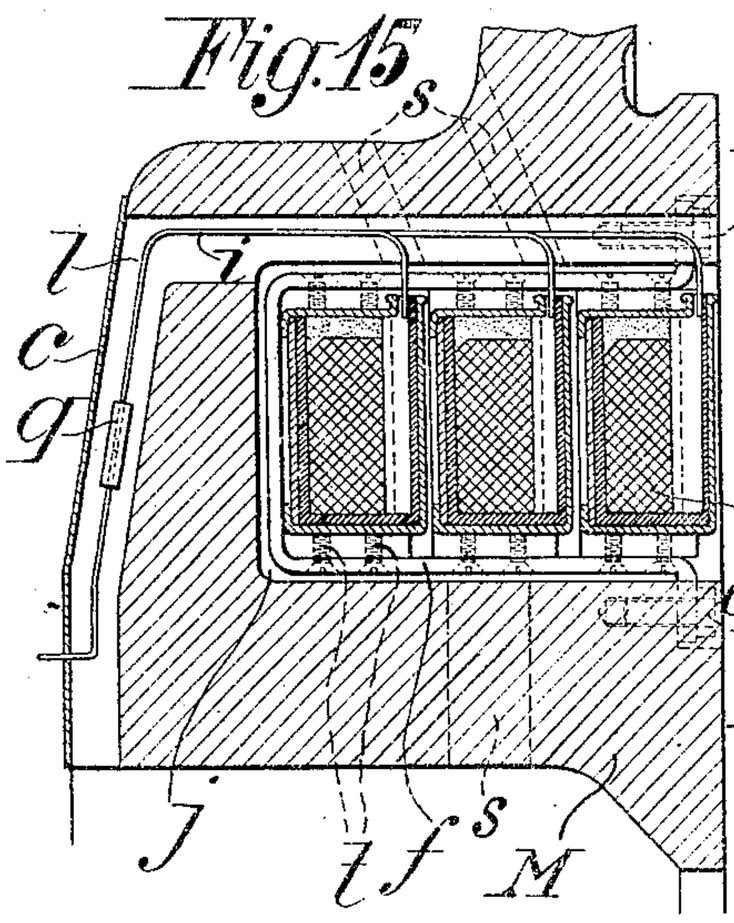


Fig. 16

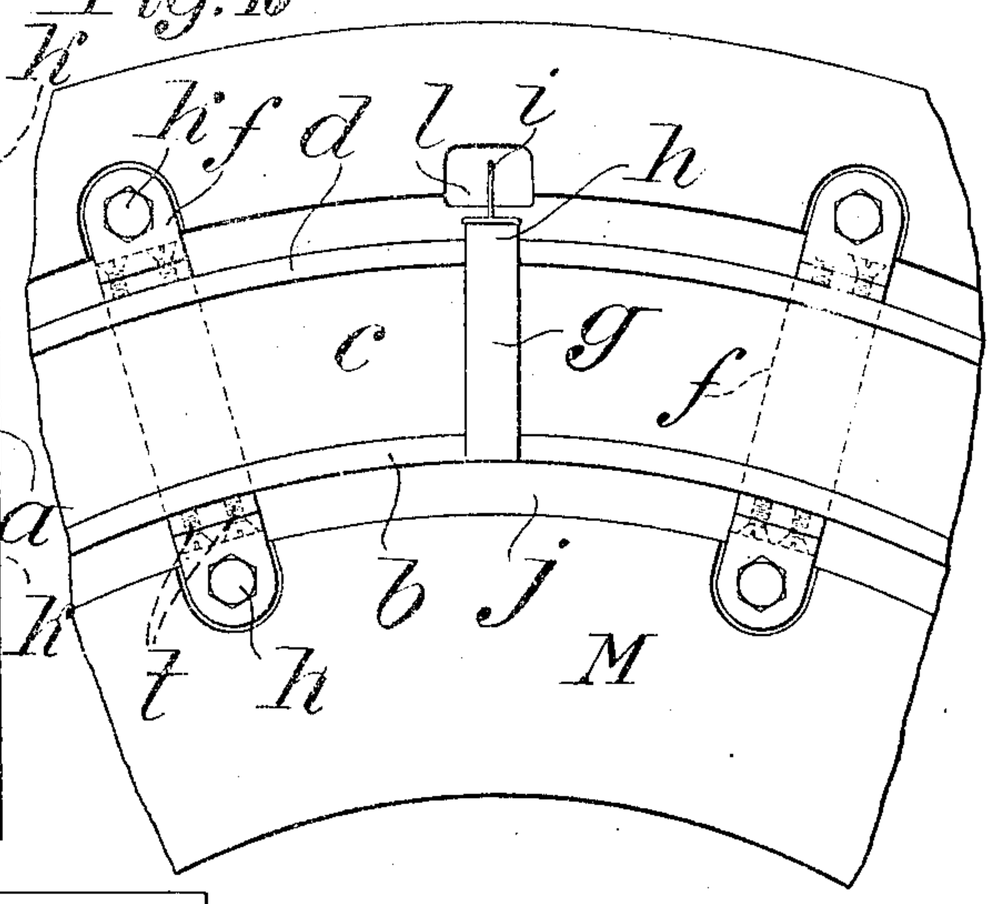
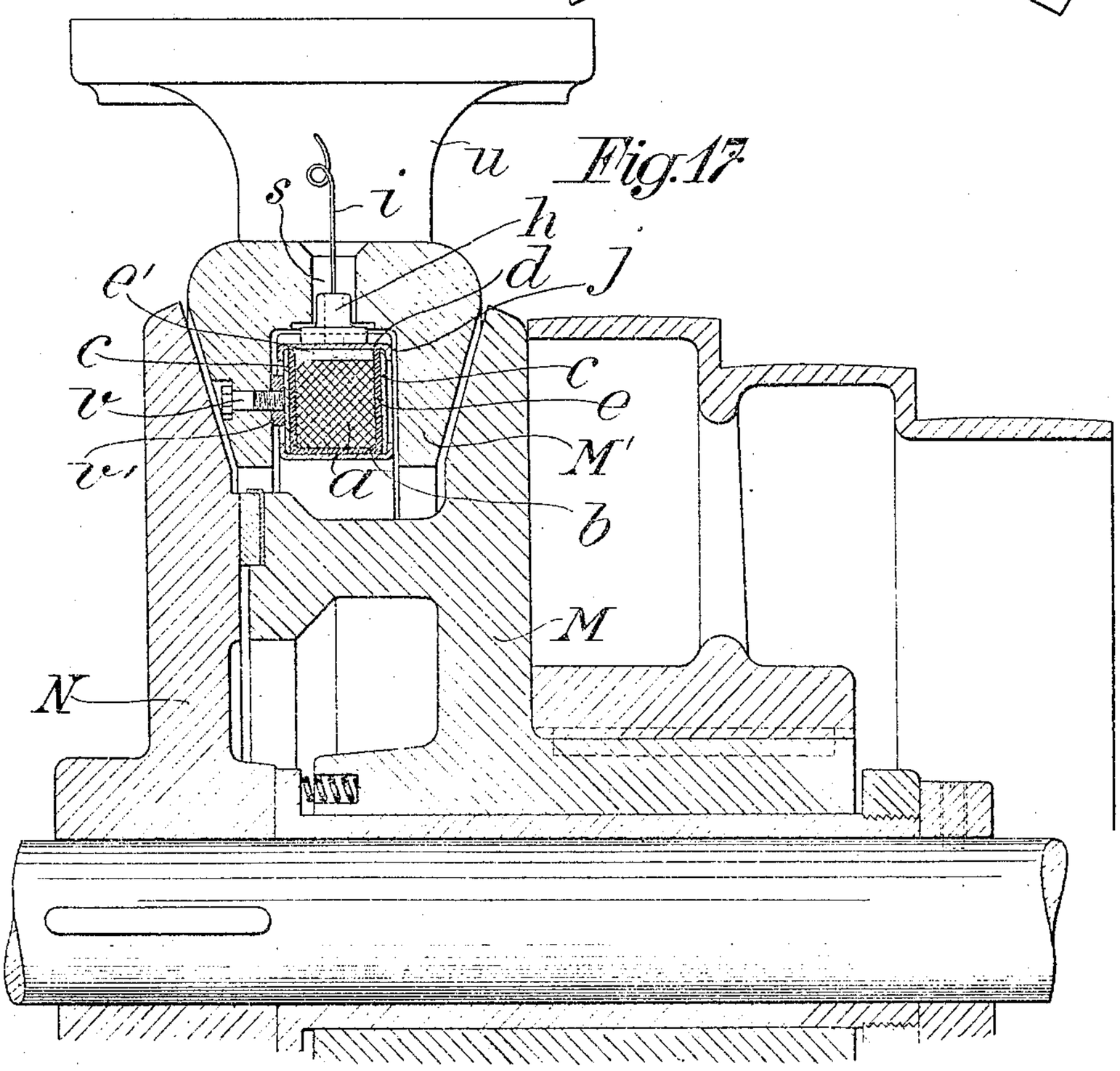


Fig. 17



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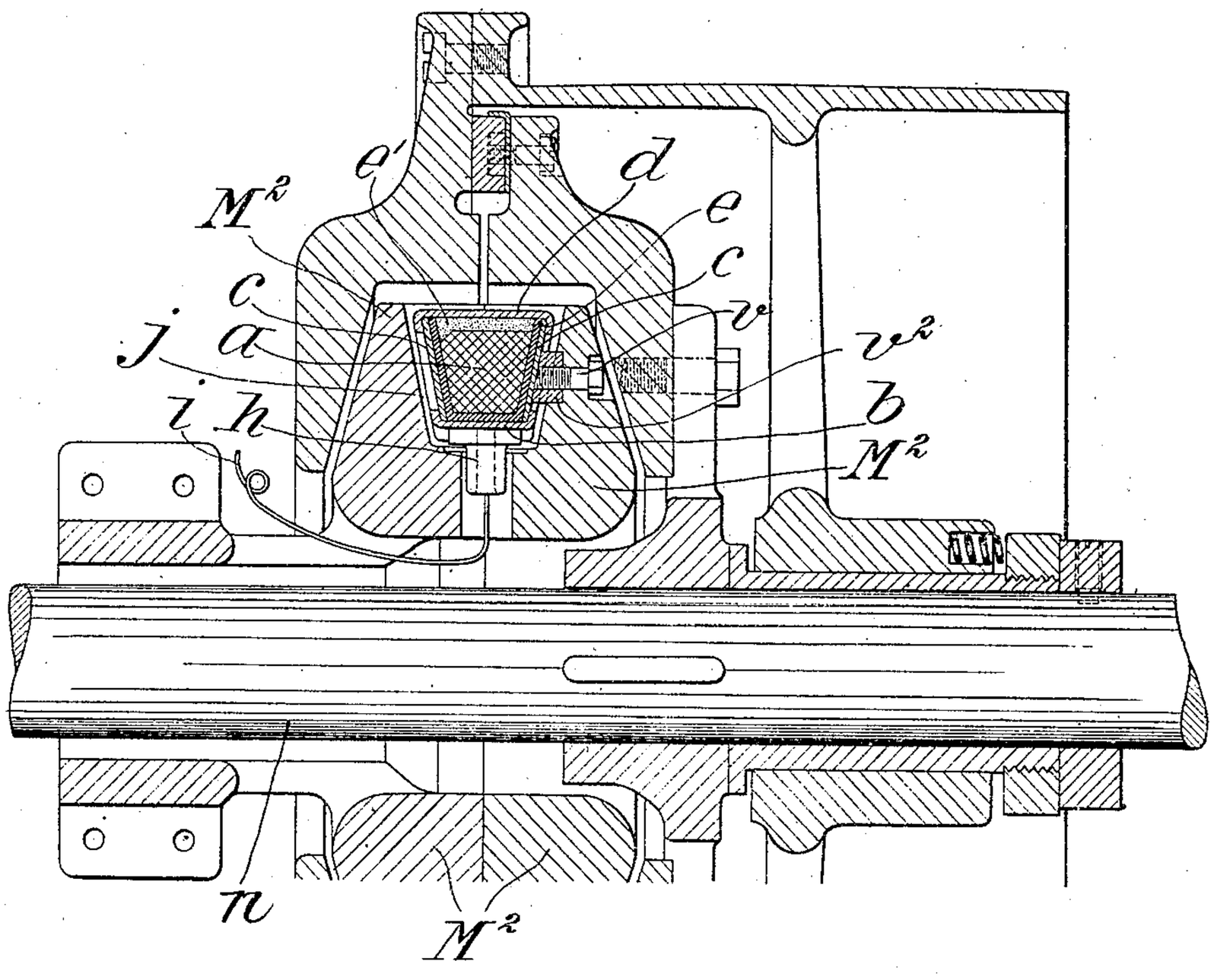
918,254. **Patented Apr. 13, 1909.**

5 SHEETS—SHEET 5.

Fig. 18



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UNITED STATES PATENT OFFICE.

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ARRANGEMENT OF WINDINGS FOR ELECTROMAGNETIC CLUTCHES.

No. 918,254. Specification of Letters Patent. Patented April 13, 1909.

Application filed December 26, 1908. Serial No. 469,371.

To all whom it may concern:

Be it known that I, HEINRICH AST, subject of the Emperor of Austria-Hungary, residing at Vienna, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in the Arrangement of Windings for Electromagnetic Clutches, of which the following is a specification.

This invention relates to wire windings of that kind which, as is particularly the case in windings intended for electromagnetic clutches, are arranged in more or less closed channels, which may under some circumstances be located in moist or cool places or may be so arranged as to come of necessity into contact with the lubricating material or which are otherwise subjected to influences detrimental to the insulation.

The object of the invention consists in surrounding wire windings of this kind with an insulating envelop in such a manner that the winding together with the envelop forms a body which is closed air-tight and moisture-tight, can be made on any place outside of the place of its use, can be conveyed with ease and security and can be mounted up at the place of its use even by unskilled assistants without danger for the integrity of the insulation. At the same time the windings arranged according to the present invention do not admit the access of any gases, vapors or liquids dangerous to the insulation nor do they admit within the more or less closed seats of the winding arrangements the formation of moisture which would most certainly take place in consequence of the heat developed internally by the action of the current and on the other hand in consequence of the cold environment.

The above mentioned envelop consists of a metallic casing or sheath the interior winding space of which, that is intended for the reception of the insulated wire, is lined with insulating layers and is covered on its exterior periphery by a tightly closing or soldered case or cover, the arrangement being such that the places of outlet of the ends of the windings can be easily and tightly stopped up.

For enabling the easy and convenient carrying away of the heat originated by the current, the said metallic casing can be formed at its outer surface with ribs and is provided at the places of outlet of the ends of the windings with enlargements so as to secure an air-tight and moisture-tight outlet of the winding ends and in particular a secure insulation of the joints of these outlet ends to the leading-in wires.

In the accompanying drawings Figure 1 shows by way of example a form of execution of an improved winding arrangement in a side elevation and Fig. 2 is a cross section on the line A—O—B of Fig. 1. Fig. 3 is a partly cross sectional view made through an electromagnetic clutch and shows the arrangement of the winding in one member of the clutch. Fig. 4 is a section on the line C—D of Fig. 3. Fig. 5 is a section through a part of Fig. 4 on the line E—F. Figs. 6, 7, 8 and 9 are cross sections made through modified forms of execution of a winding arrangement according to the present invention. Fig. 10 is a cross section through the winding arrangement shown in Fig. 9 on the line G—H of Fig. 9. Fig. 11 is a cross section through a clutch member provided with a double winding arrangement embedded within the same. Fig. 12 is a side elevation of a part of this winding arrangement. Fig. 13 is a cross section on the line I—J of Fig. 12. Fig. 14 is a plan of the arrangement shown in Fig. 13 and partly a section through the same on the line K—L of Fig. 13. Fig. 15 is a cross section through a clutch member with a triple winding arrangement embedded within the same and Fig. 16 is a side view of a part of this arrangement. Figs. 17 and 18 show electromagnetic clutches in sectional views presenting further forms of execution of winding arrangements according to the present invention.

As may be seen from Figs. 1 and 2 the winding *a* made of insulated wire is arranged within a metallic casing *b* provided with flanges *c*, *c*, the said casing being previously lined with insulating layers *e*. The space intended for the reception of the winding is closed by a second casing or cap *d* which after being slid upon the flanges *c* of the casing *b* is rigidly fixed onto the same or may besides be soldered to it. In order to obtain a better and tighter connection of the said parts the walls *b*, *d* and one of the flanges *c* can be encompassed at several places by clips *f* which besides serve for the fitting up of the whole winding arrange-

ment at the place of its use and can be screwed on within the annular channel of a member of an electromagnetic clutch in which the winding should be fitted.

One of the flanges *c* or both flanges are provided with enlargements *g* in which can be conveniently and easily located the thickened parts produced by the joints of the ends of the windings with the leading-in wires. In order to enable a tight closure or stuffing up of the ends of the windings at the places of outlet of the leading-in wires the latter are conducted through short tubes *h* which are connected to the outlet openings in the flange *c* above the widened parts *g* and can be easily stopped up. In this manner the possibility is afforded to have the winding manufactured quite independently and in a professionally correct manner in the proper manufacturing establishment and to be delivered in a condition ready for use and for transportation. The winding arrangement can then be handled and mounted up in its proper place of use even by unskilled hands without having to fear a deterioration of the insulation; spare windings can be easily and permanently stored in any place whatever. Furthermore the improved winding arrangement prevents any damage of the insulation by the precipitation of moisture which, as is well known, is frequently formed upon the surrounding iron parts particularly when the arrangement is working intermittently.

Figs. 3 and 4 represent the way in which a winding arrangement of the kind referred to is fitted up in an electromagnetic clutch. This clutch consists of the two coupling members M and N (the magnet body and the armature disk, respectively) that are fitted upon the shafts *m*, *n*. The winding *a* incased in the metallic casings *b*, *c* and *d* in the manner above described and surrounded by insulating layers *e* is mounted in the annular channel *j* of the magnet member M and fixed therein by fastening the clips *f* that surround the casings to the magnet member M by means of screws. Each of the two leading-in wires *i* issuing out of a short tube piece *h* is led through a recess *l* of the magnet member to the corresponding terminal *p*; the recess *l* may be covered by a plate *o*. The leading-in wire *i* is made preferably in two parts for the purpose of facilitating the mounting up of the same and the two parts of this wire are connected by a sleeve *q*. Fig. 5 is a sectional view showing the connection of one end of the winding *a* with the leading-in wire *i* by means of a short tubular piece *h* of the enlarged part *g* at one of the two flanges *c*.

According to Fig. 6 the connection of the two casings *b* and *d* at the edges of the flanges *c* is effected by soldering thereto annular strips *r*. These strips produce a tight closure in such a manner that they overlap the adjacent parts of the flanges *c* as also the bent down edges of the casing *d* that are placed upon the inwardly bent down edges of the flanges *c*. The space left between the winding and the socket *d* can be filled with a suitable heat conducting material, preferably with gypsum *e'*.

Fig. 7 shows a winding arrangement embedded in the annular channel *j* of the magnet member M of the clutch the casings *b* and *d* of the same overlapping the annular lateral flanges *c* and carrying the angular pieces *f'* soldered thereto and through which pass the screws *k* intended for fixing the winding to the magnet member M.

The heat generated by the current, in conjunction with the cold environment of the winding, frequently produce a precipitation of the moisture of the atmosphere onto the more or less closed seats (channels and the like) in which the casings *b*, *d* connected together are arranged. In order to rapidly carry away the said heat generated by the current in the casings *b*, *d* may be provided with suitable refrigerating ribs or with a suitable ventilating device or they may be cooled by means of refrigerating liquids.

Fig. 8 shows a winding arrangement embedded in the annular channel *j* of the magnet member M, the two casings *b*, *d* of the said winding arrangement being connected with the annular lateral flange *c* that lies nearest to the bottom of the annular channel *j* by sliding the same upon this flange or by soldering onto the same a ring *r*, whereas the second lateral flange *c* that is arranged on the exterior is widened and, together with the edges of the casings *b* and *d* bent off at right angles, is fastened to the magnet member M by means of the screws *k*. This lateral flange is provided on its exterior surface with projecting ribs *c'* having for purpose the ventilation and consequently the better cooling of the winding arrangement.

Figs. 9 and 10 show a winding arrangement in which the flanges *c* of the casing *b* are screwed on to the edges of the casing *d* that are bent in the same direction and the pairs of the casing edges lying on the outside of the annular channel *j* of the magnet member M are enlarged to such an extent that they can be affixed to the magnet member by means of screws *k*. The casing *b* is provided with cooling ribs *b'* extending over the flanges *c* of the same and in a like manner the casing *d* between the pairs of casing edges connected together is provided with cooling ribs *d'*. For affording the exterior air an easy access to the cooling ribs and for permitting a rapid exhaustion of the air from the winding arrangement the

magnet member M is provided with perforations *s* leading from the exterior into the annular channel *j*.

In all cases it is advisable to give the casings a suitable coating, preferably of black color, in order to facilitate the exhaustion of the heat. Since the above arrangement is such that it prevents the admission to the winding of lubricants, for instance of oil, as also of liquids or vapors that may endanger the integrity of the electrical insulation and preserve the same from the influence of mechanical interference, the winding remains permanently unaltered and is therefore always ready for working.

For larger installations of electromagnetic clutches 2 or more of the windings as above described, each winding closed for itself, can be arranged, the said multiple windings being separated from each other preferably by free annular spaces facilitating the cooling of the windings. The windings themselves are in this case connected with each other and for this purpose it is preferable to provide the casings at their exterior periphery with outlet openings and with short tubular pieces capable of being stuffed up in a similar manner as has been described in the foregoing with reference to the outlets of the leading-in wires.

Figs. 11 to 14 show a similar double winding arrangement. M is the magnet member of an electromagnetic clutch of larger dimensions. In the annular channel *j* of the magnet member M are located one aside of the other two winding arrangements of the kind above described, each comprising a casing by way of example of the kind shown in Fig. 2. On their lateral flanges *c* adjacent to each other they are provided with refrigerating ribs *c'* that serve as distancing pieces for creating ventilating channels between the two winding arrangements. The clips *f* encompass both winding arrangements and each clip is covered on its ends by a fish plate f^2 and together with the latter is affixed to the magnet member by means of screws *k*. The short tubular pieces *h* for the outlet of the leading-in wires *i* that are made so as to be capable of being stuffed up, are arranged near one edge of each casing *d* as is shown in Figs. 13 and 14 the sectional views showing also the enlargement *g* with which the tubular piece *h* communicates.

Figs. 15 and 16 show three winding arrangements fitted up one aside of the other in the annular channel *j* of the magnet member M and all encompassed by clips *f* common to all winding arrangements. Each individual winding arrangement is affixed to the clips *f* by means of screws *t* which pass through the clips *f* and are screwed into the casings *b* and *d* respectively. The clips *f* are themselves affixed to the magnet member M by means of screws *k* and the annular channel *j* communicates with recesses *s* made in the magnet member and leading to the outward atmosphere for the purpose of ventilating the winding arrangements.

Figs. 17 and 18 illustrate the manner in which winding arrangements of a modified construction are fitted up in a stationary part of electromagnetic clutches. According to Fig. 17 the winding arrangement is located in a magnet member M' of annular shape composed of two halves fitted between the clutch members M and N and affixed to a sealing bracket *u* or the like. The casing *d* of the winding arrangement carries on its periphery the tubular pieces *h* for the leading in wires *i* that are conducted through the perforations *s* of the magnet member M'. A number of screws *v* that are screwed into a flat ring *v'* affixed to the lateral flange and that pass through the magnet member M' are bearing against one of the lateral flanges *c* so that the winding arrangement is rigidly held in the annular chamber *j* of the magnet member M'. In the modification shown in Fig. 18 the winding arrangement is equally located in a stationary magnet member M^2 made of two halves and encompassed on the exterior by the clutch members M and N which are of a larger diameter than the magnet member M^2. The winding arrangement as also the annular channel in which it is embedded possess in this case not a quadrangular but a trapezoid cross section, in order to facilitate the introduction of the winding arrangement in the annular channel and the removal of the same from the said channel. The short tubular pieces *h* for the leading-in wire *i* are in this case arranged on the periphery of the casing *b* and are directed with their free ends against the shaft *n*. The winding arrangement is affixed in the annular channel *j* by means of screws *v* that pass through the magnet member M^2 and are screwed into nuts v^2 affixed to one of the lateral flanges *c*.

Claims.

1. In an electromagnetic clutch: a protected magnetizing coil sealed against gases, liquids or other external influences detrimental to the insulation of said coil, and comprising an insulated winding; leading-in wires; a metallic casing and suitable flanges or side pieces adapted to retain said winding; insulating material enveloping said winding; a closing second casing or cap fitted over said flanges or side pieces; enlargements in the inclosing casings to accommodate the connection of the leading-in wires with the ends of said winding; and tubes secured to said enlargements and through which said leading-in wires are conducted, said tubes being sealed and thereby insulating said leading-in wires.

2. In an electromagnetic clutch: a magnet

member; a protected magnetizing coil sealed against gases, liquids or other external influences detrimental to the insulation of said coil, and comprising an insulated winding; leading-in wires; a metallic casing and suitable flanges or side pieces adapted to retain said winding; insulating material enveloping said winding; a closing second casing or cap fitted over said flanges or side pieces; enlargements in the inclosing casings to accommodate the connection of the leading-in wires with the ends of said winding; tubes secured to said enlargements and through which the said leading-in wires are conducted, said tubes being sealed and thereby insulating said leading-in wires; and means carried by said casings to secure said coil to said magnet member.

3. In an electromagnetic clutch: a magnet member; a protected magnetizing coil sealed against gases, liquids or other external influences detrimental to the insulation of said coil, and comprising an insulated winding; leading-in wires; a metallic casing and suitable flanges or side pieces adapted to retain said winding; insulating material enveloping said winding; a closing second casing fitted over said flanges or side pieces; enlargements in the inclosing casings to accommodate the connection of the leading-in wires with the ends of said winding; tubes secured to said enlargements and through which the said leading-in wires are conducted, said tubes being sealed and thereby insulating said leading-in wires; means carried by said casings to secure said coil to said magnet member; and means in connection with said casings to promote ventilation of the space occupied by said coil and to assist in the dissipation of the heat generated.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HEINRICH AST.

Witnesses:
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ROBERT W. HEINGARTNER.