

P. T. LINDHARD.

BELT DRIVE.

APPLICATION FILED AUG. 27, 1910.

996,022.

Patented June 20, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

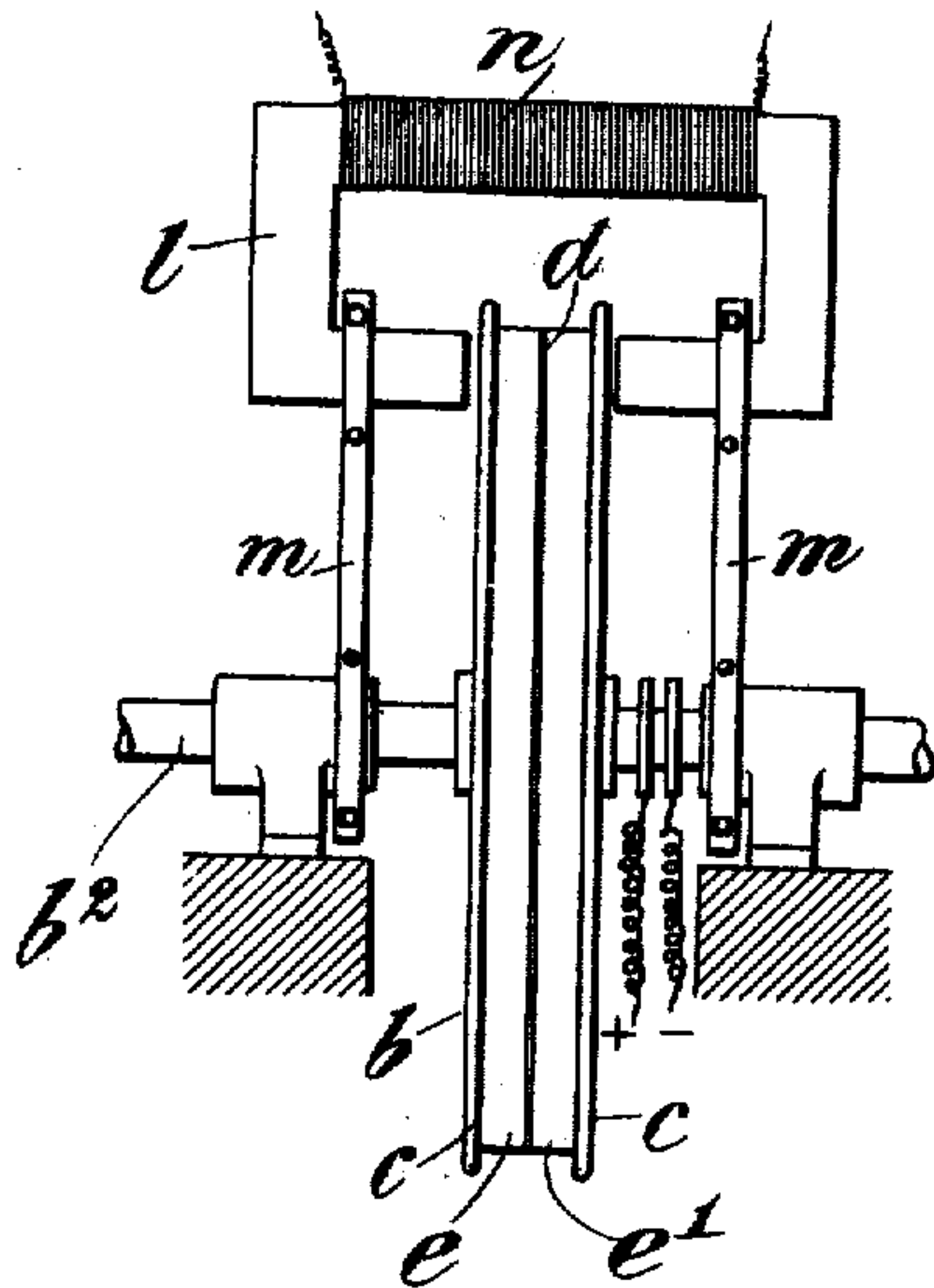


Fig. 2.

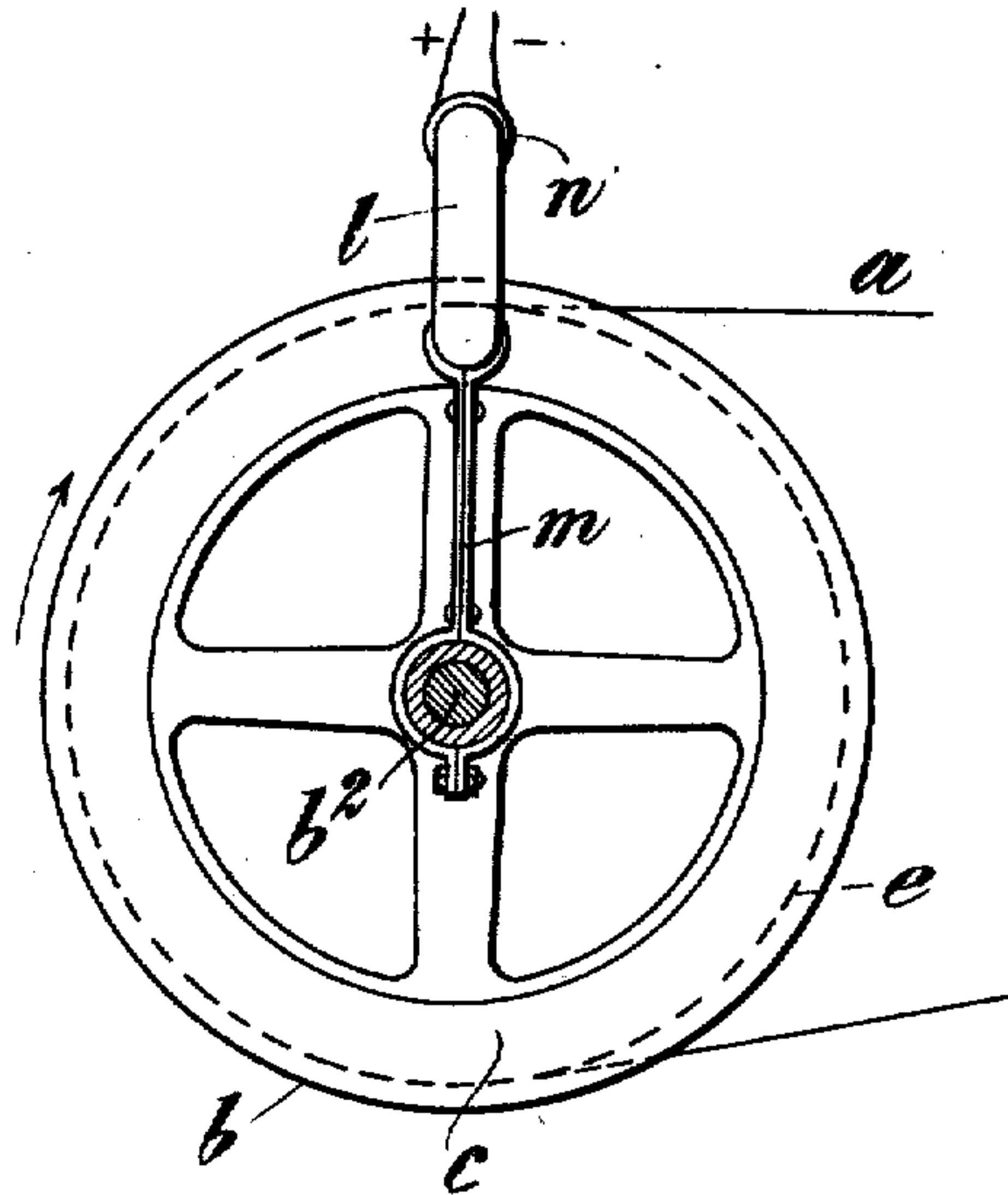
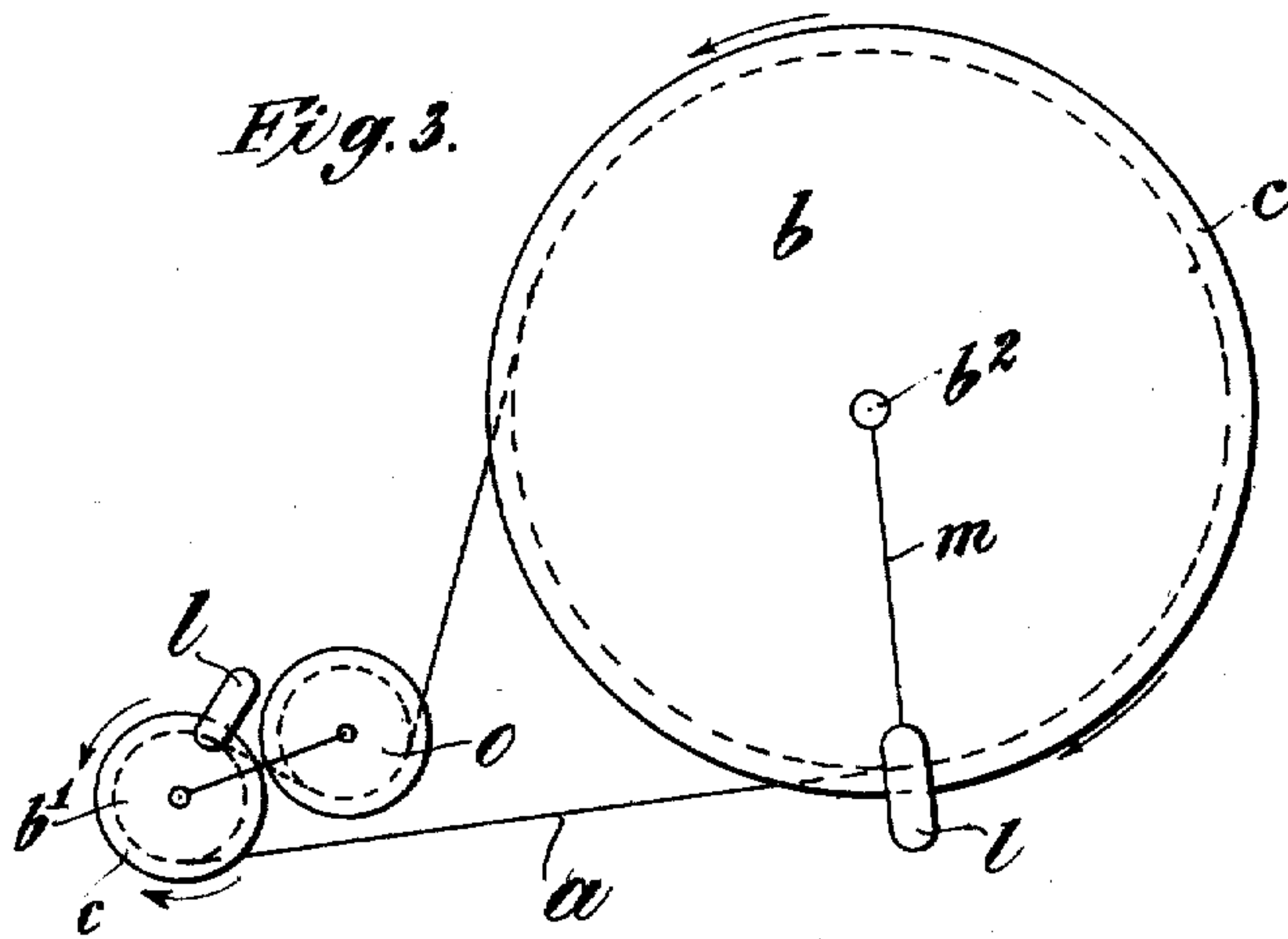


Fig. 3.



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3 SHEETS-SHEET 2.

Fig. 4.

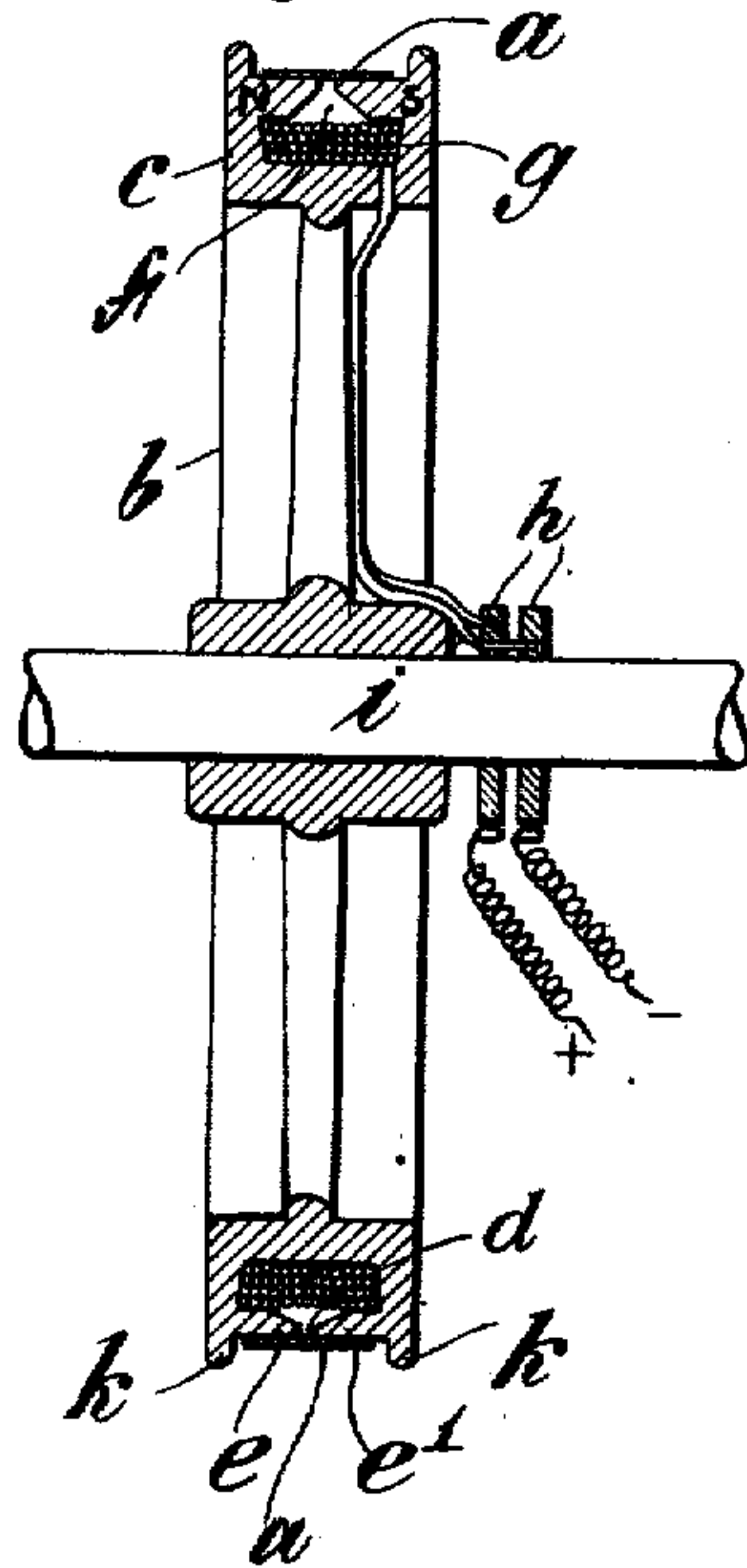


Fig. 5.

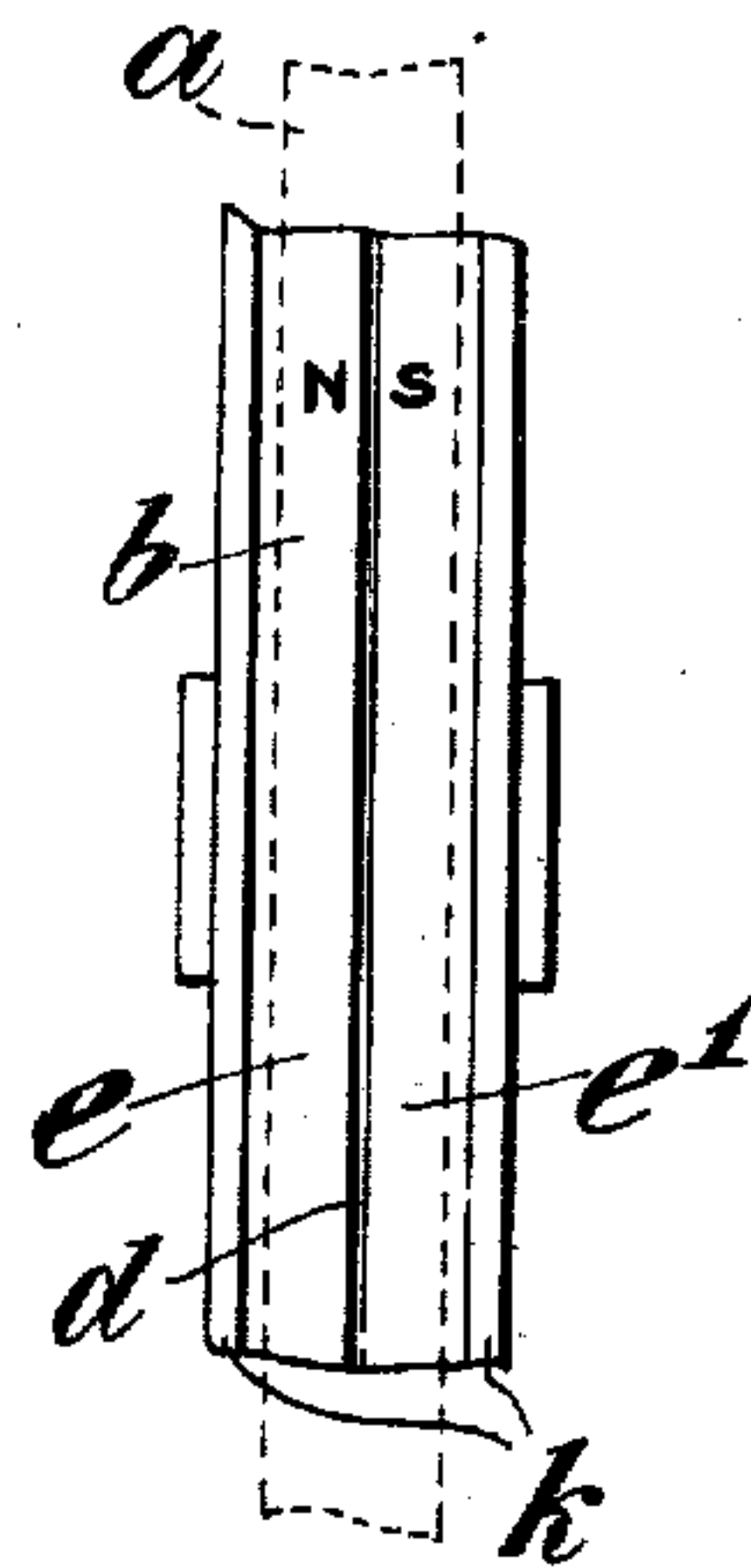


Fig. 6.

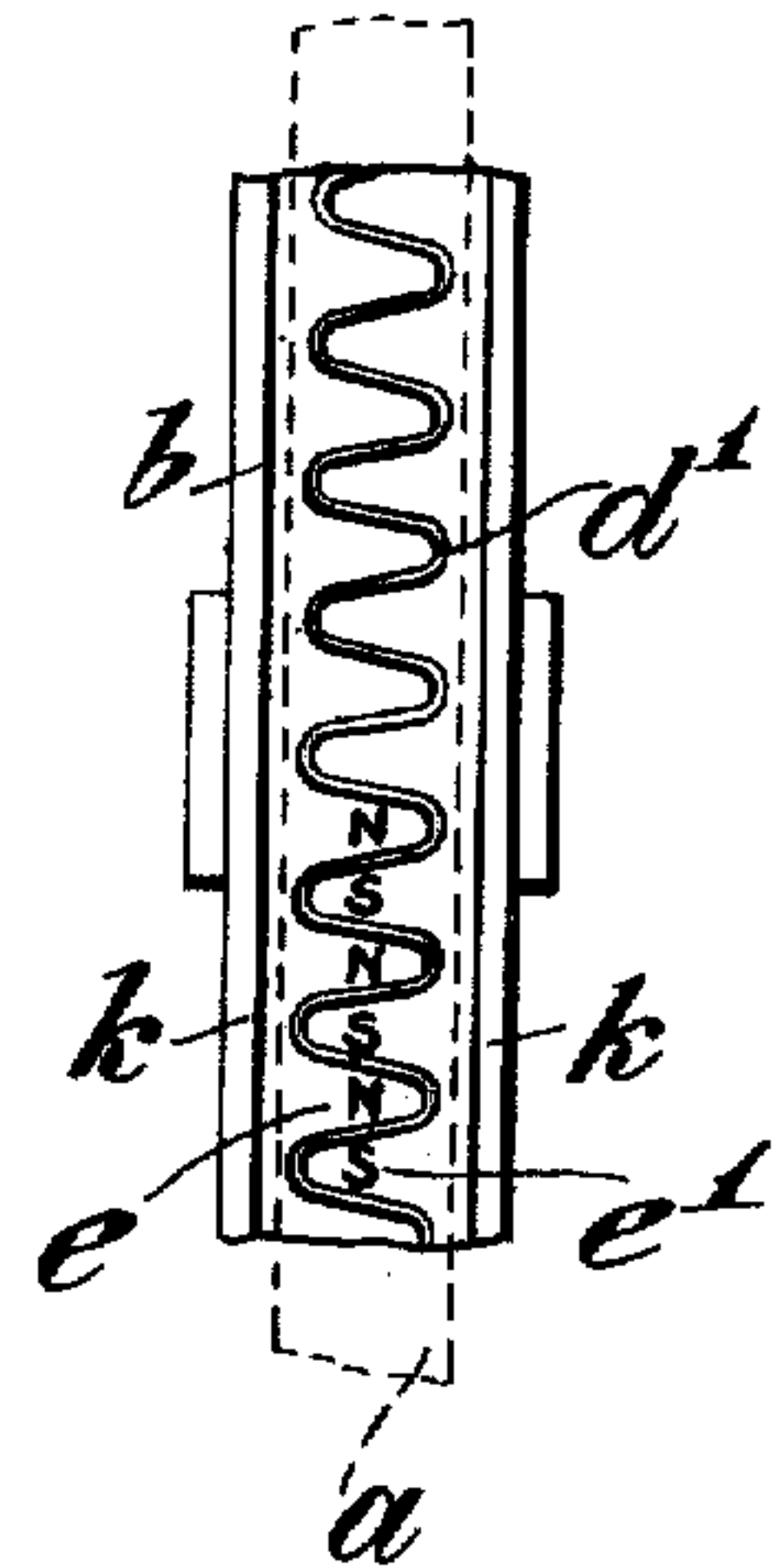


Fig. 9.

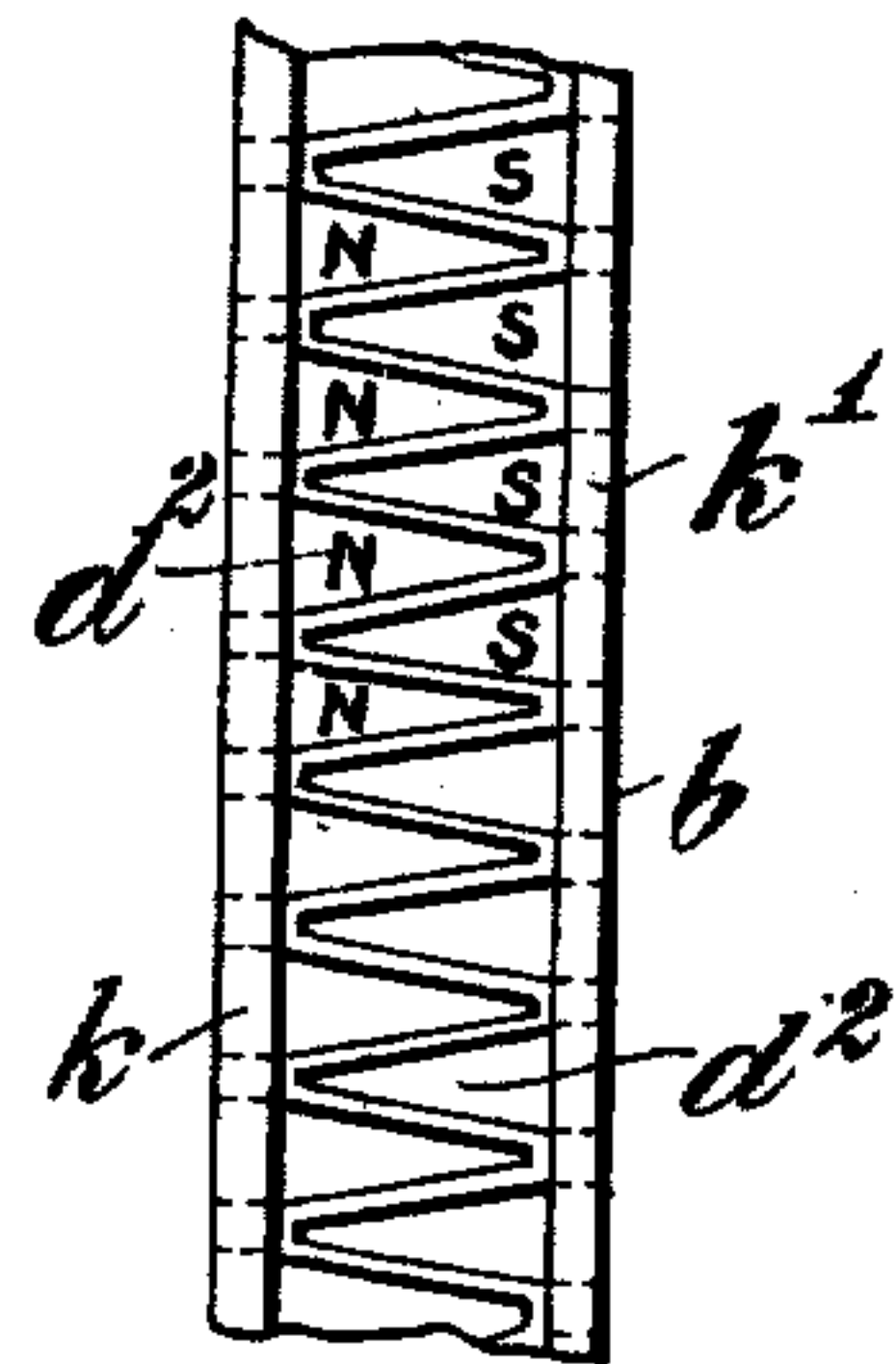


Fig. 7.

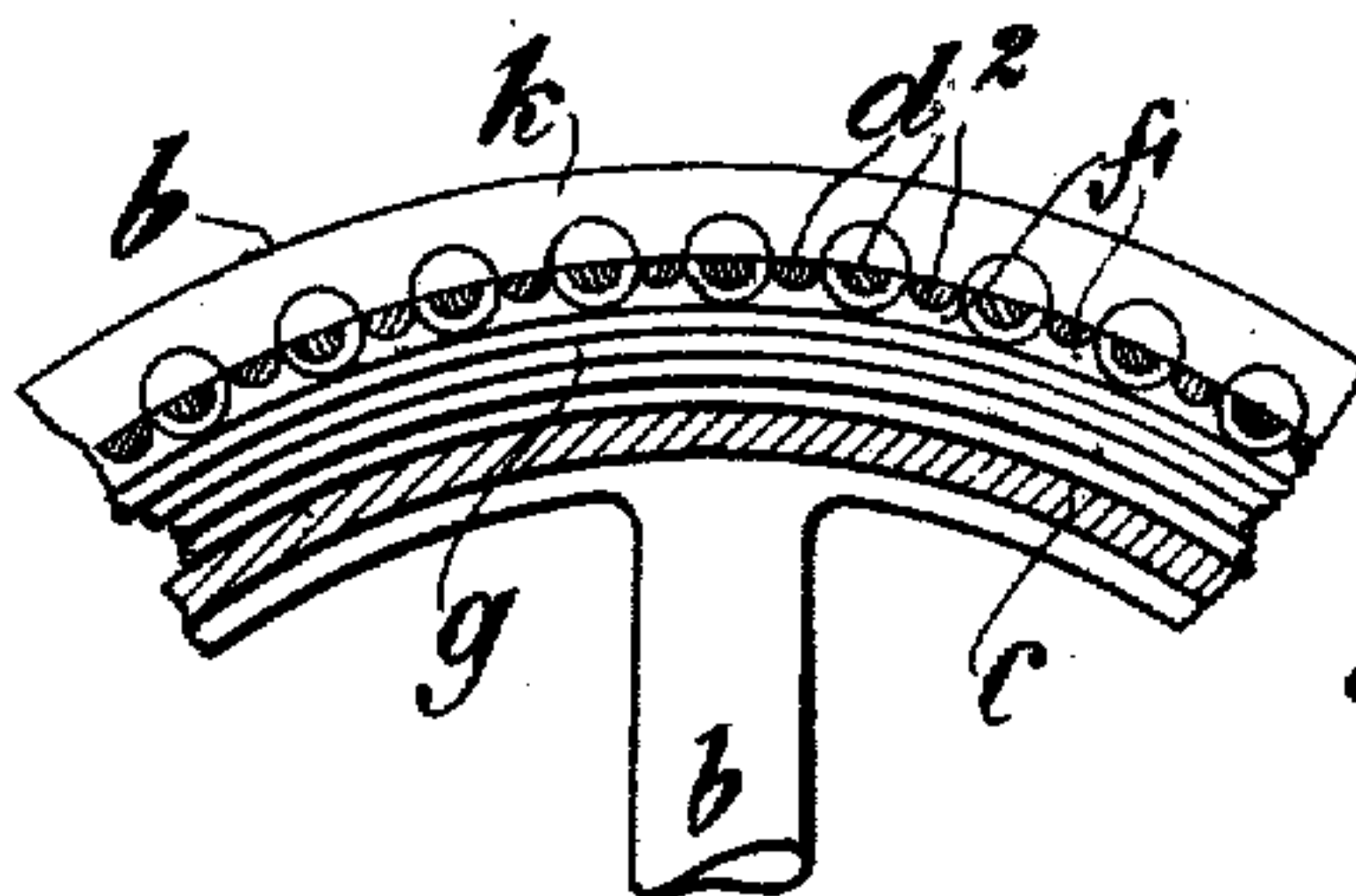
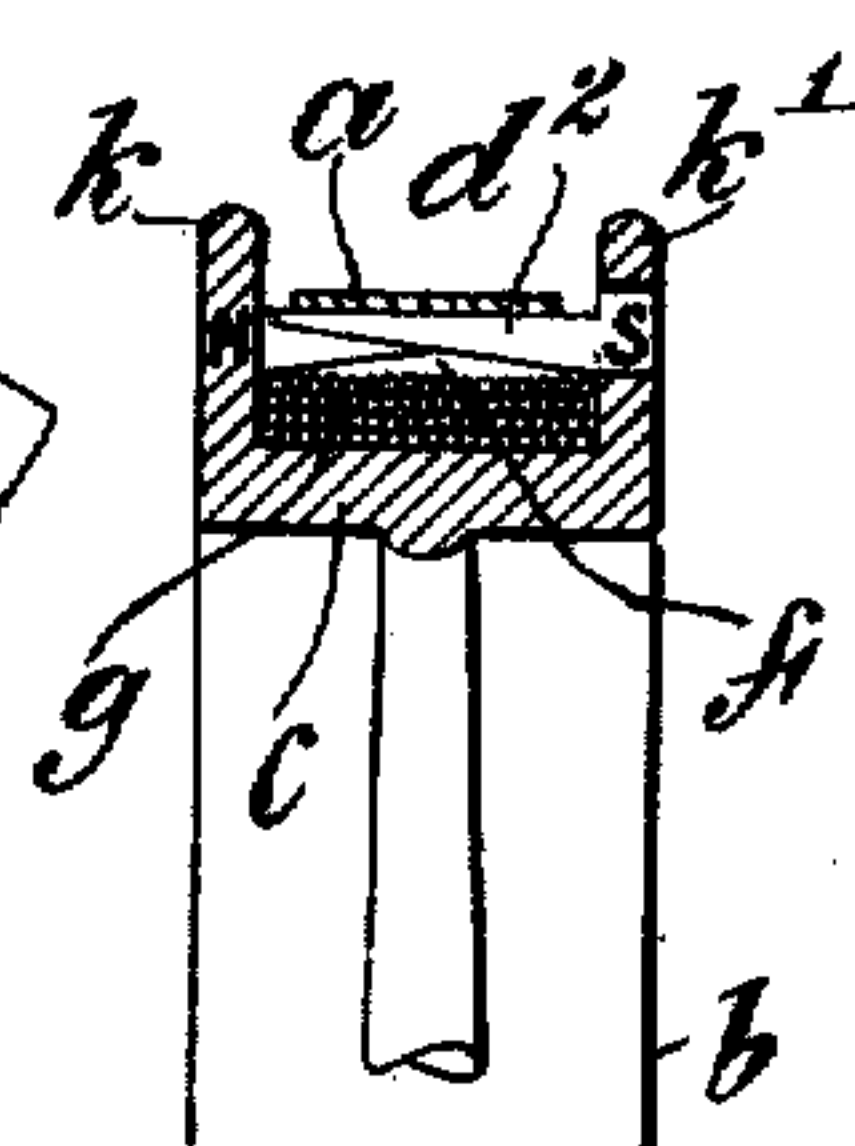


Fig. 8.



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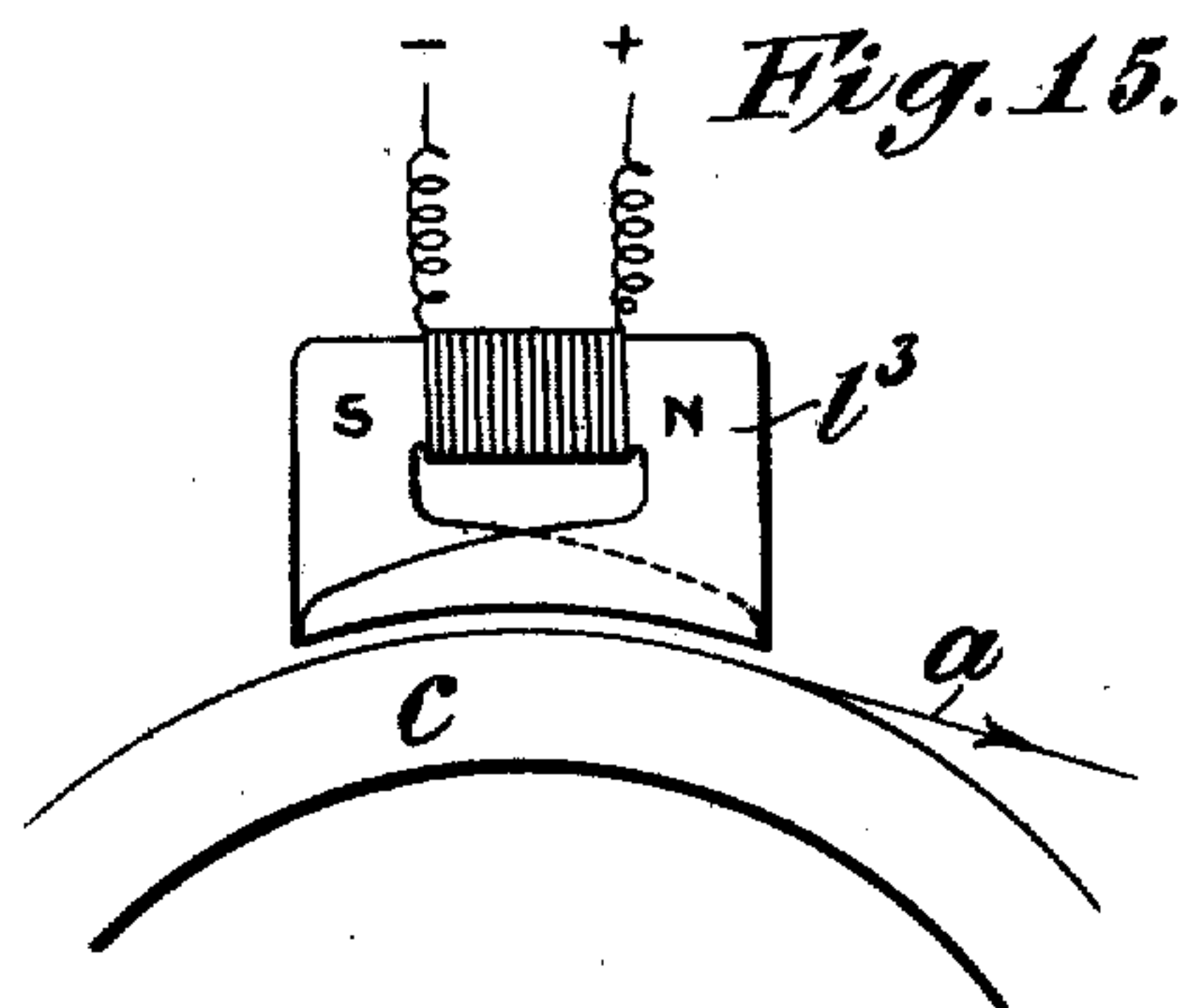
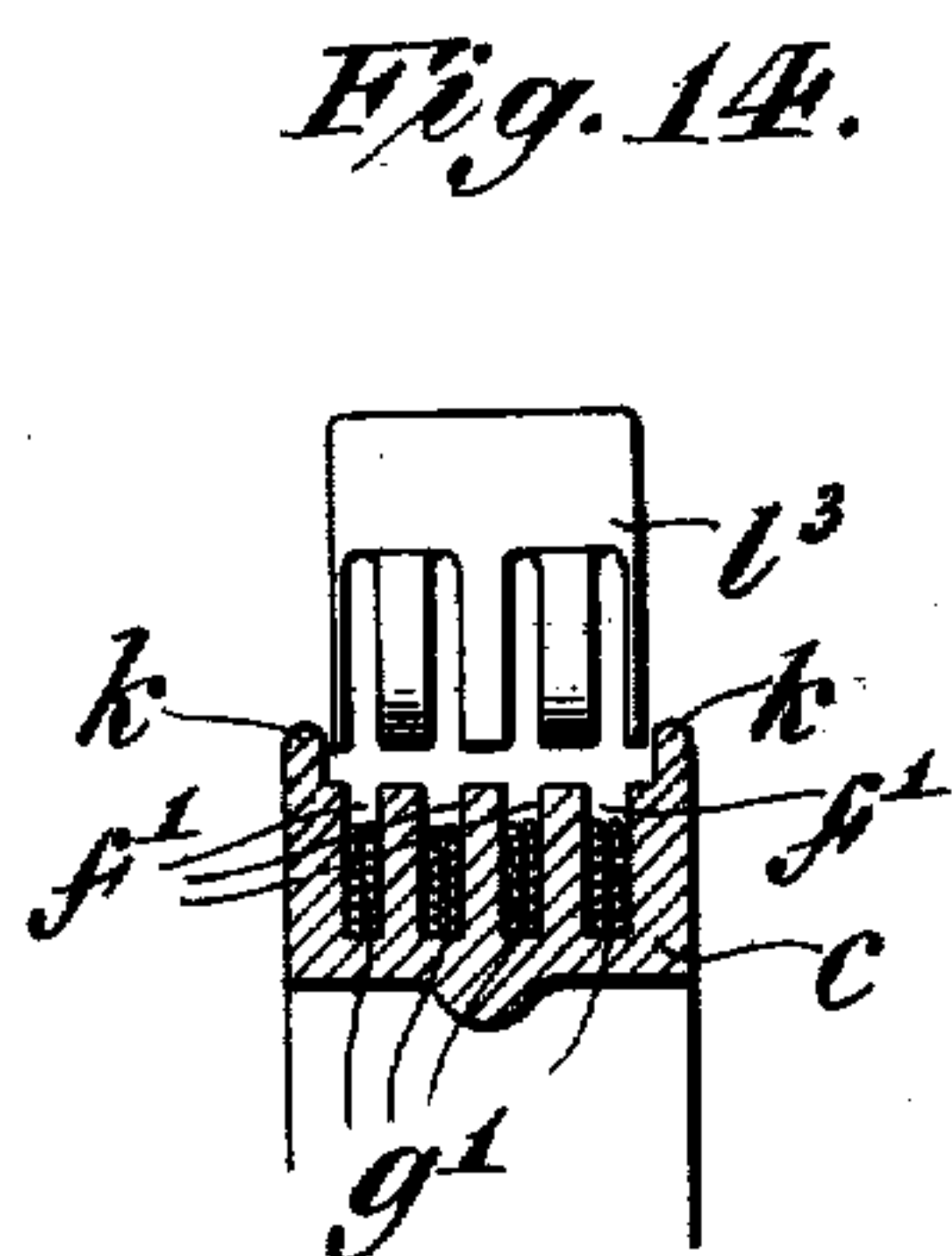
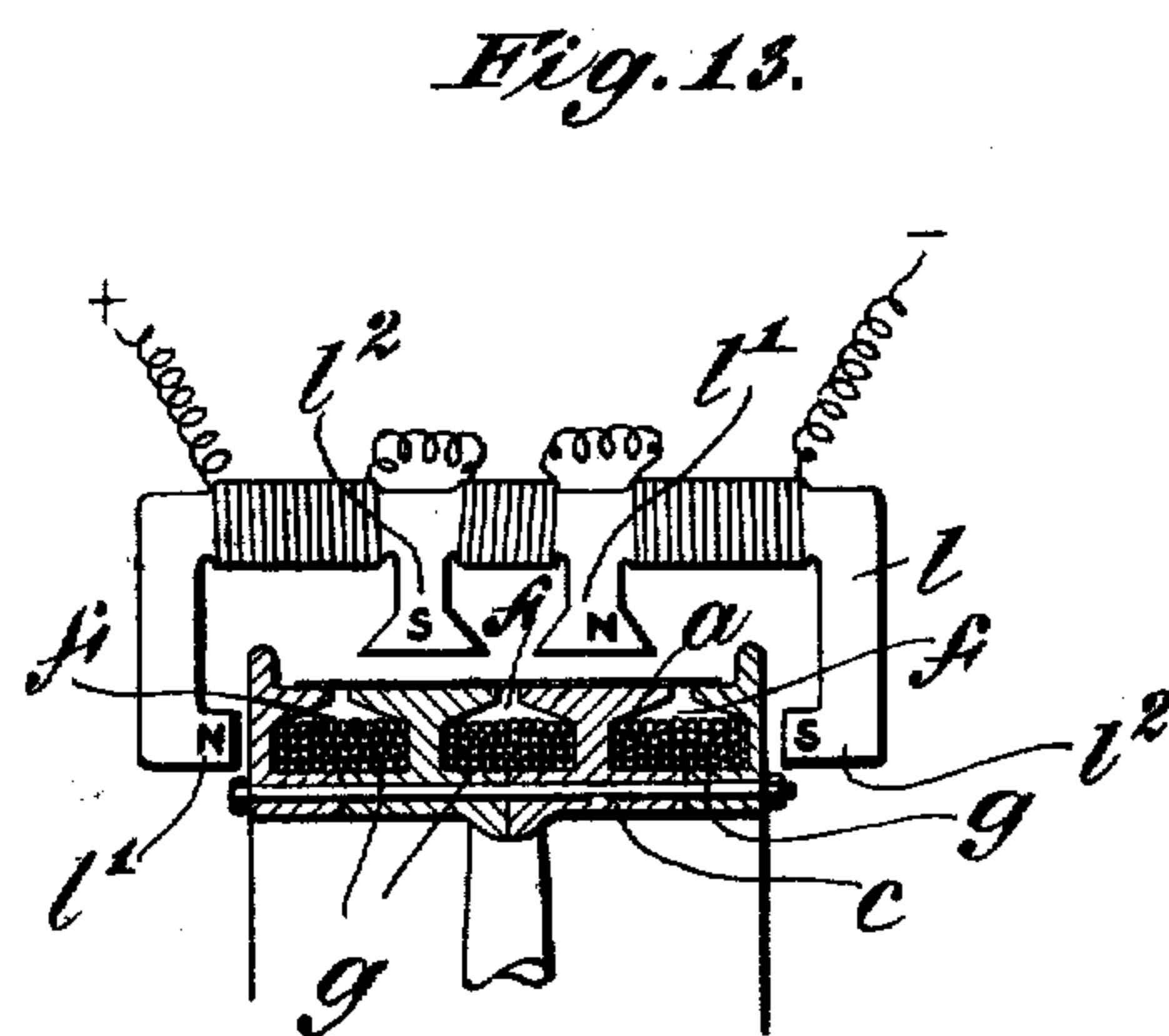
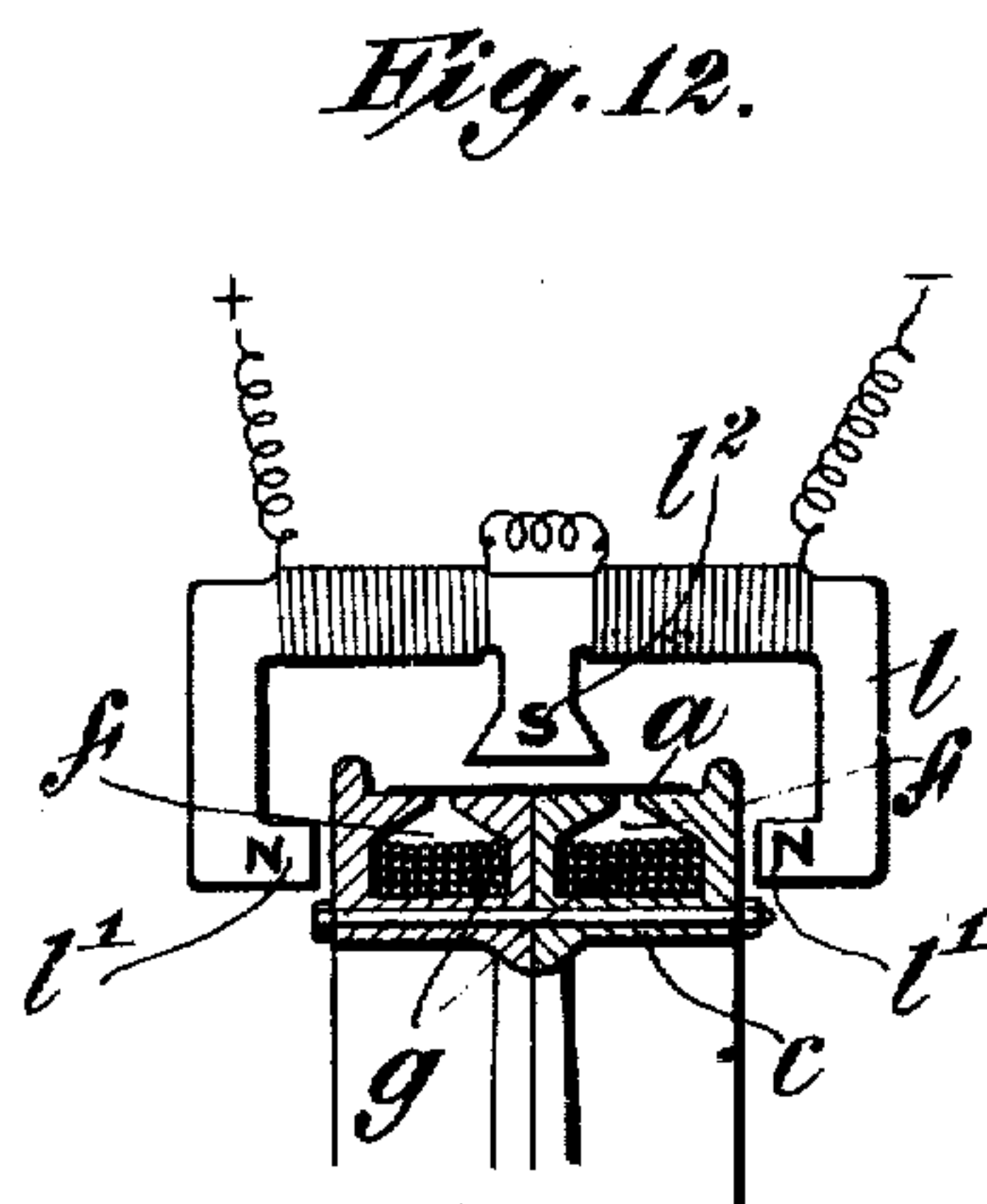
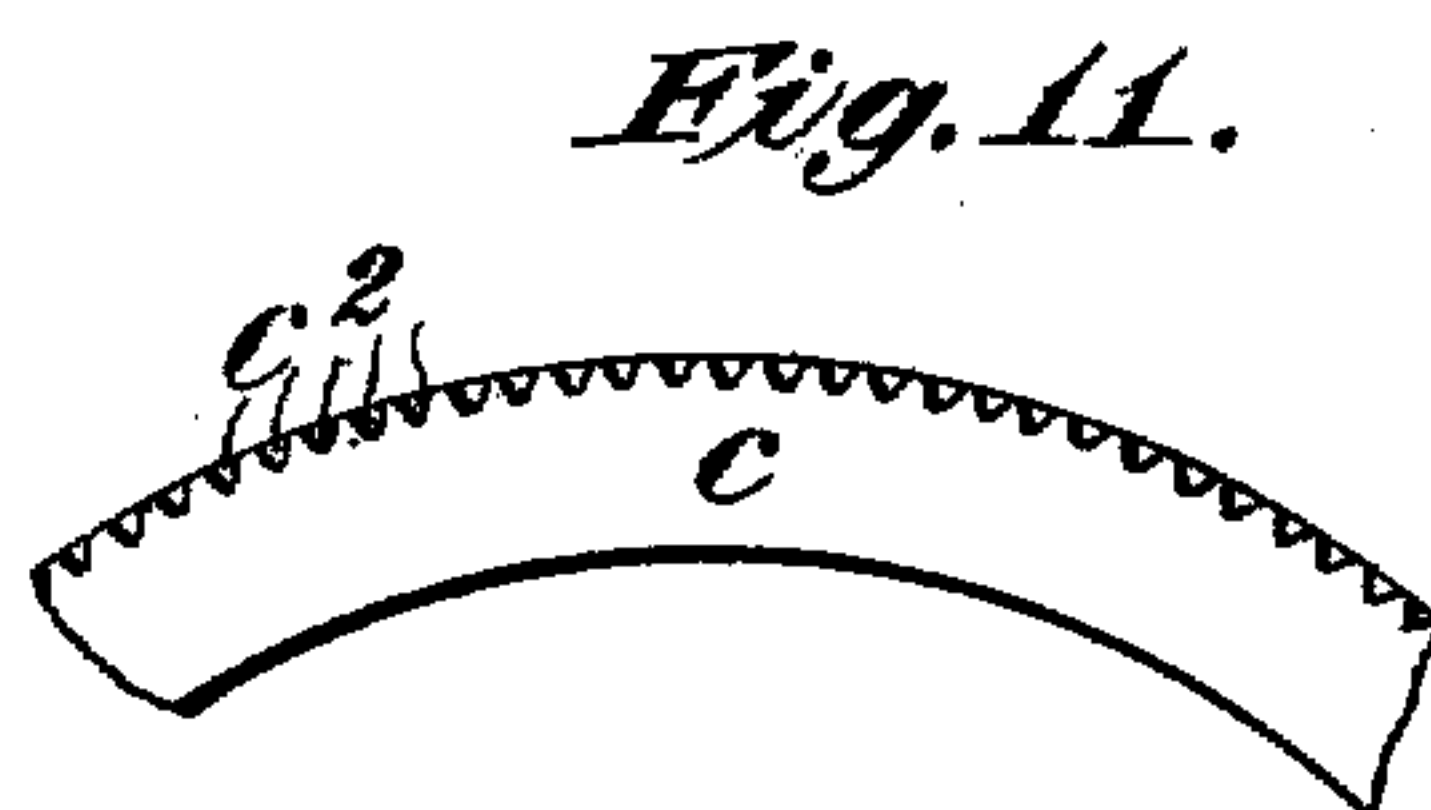
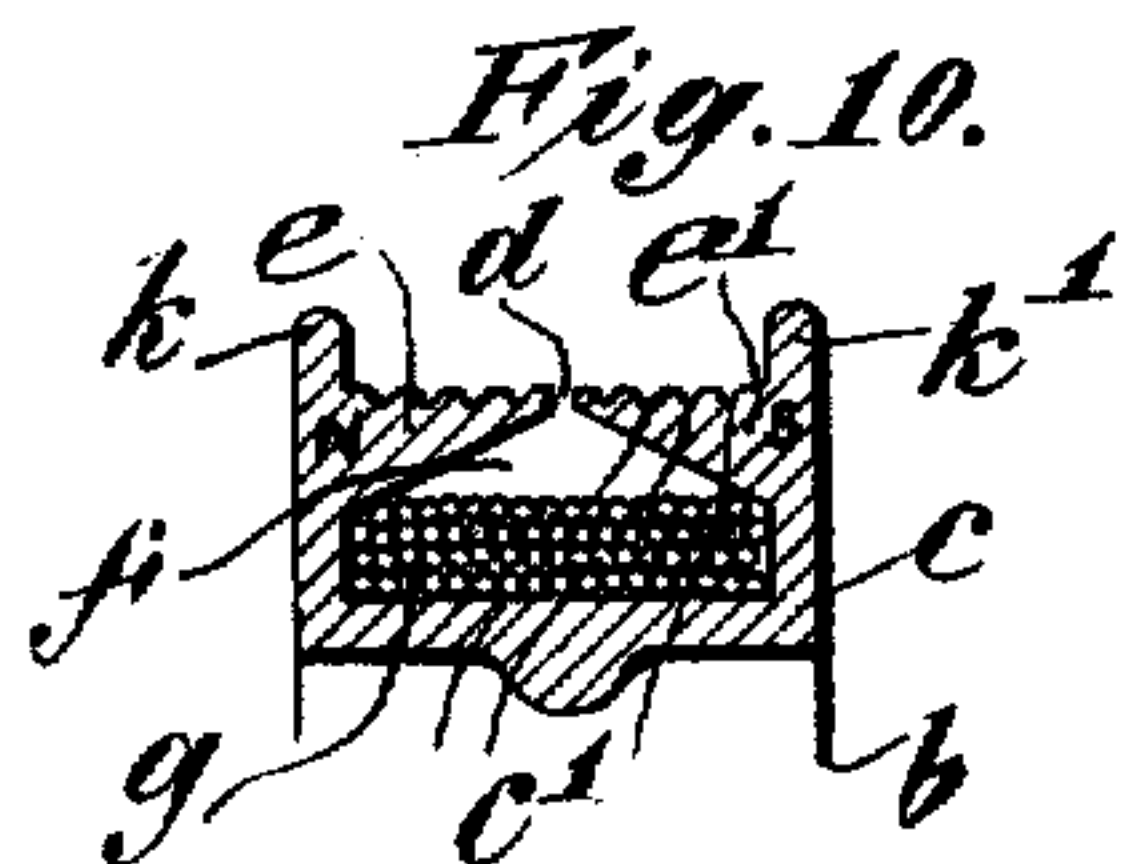
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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BELT-DRIVE.

996,022.

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Application filed August 27, 1910. Serial No. 579,361.

To all whom it may concern:

Be it known that I, POVL T. LINDHARD, a subject of the King of Denmark, residing at Flatbush, in the borough of Brooklyn of the city of New York, in the State of New York, have invented certain new and useful Improvements in Belt-Drives, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

The efficiency of any belt drive is dependent upon the friction between the belt and the belt pulley, either driver or driven, or both, the ratio between the tension of the tight or driving side of the belt and the slack side of the belt, which determines the efficiency of the driving, being increased with the friction. It is possible to increase the friction between the belt and the pulley either by increasing the arc of contact between the belt and the pulley, by the use of idlers on the slack side of the belt, or by increasing the co-efficient of friction between the belt and the pulley.

Various devices are resorted to for the purpose of increasing the co-efficient of friction between the ordinary leather, rubber or woven belts and pulleys with which they cooperate and the results secured are more or less satisfactory. Greater difficulties have heretofore presented themselves, however, in the attempts to increase the co-efficient of friction between metallic belts or belts which embody metal in their structure, and their cooperating pulleys, and it has been proposed, for example, to provide such belts with a surface covering of cork, leather or other material, but thus far such means have not proved satisfactory because of the great expense of manufacture and limited durability of the belts.

It is therefore the object of this invention to provide improved means for increasing the co-efficient of friction between a metallic belt, that is, a belt which embodies in its structure more or less metal which is capable of being magnetized, and its cooperating pulley and in accordance with the invention the pulley or the rim thereof is magnetized so that the belt may be made thereby to hug closely the periphery of the pulley and the

total friction between the belt and the pulley be thereby increased, with the ultimate result of increasing largely the efficiency of the drive. Means are also provided for neutralizing the magnetism of the pulley or demagnetizing the pulley at the point where the belt should leave the periphery of the pulley so that there shall be no waste of power nor unnecessary strain upon the belt in causing it to separate from the periphery of the pulley.

The invention will be more fully explained hereinafter with reference to the accompanying drawings in which it is illustrated, and in which—

Figure 1 is a view in elevation showing a driving pulley mounted in bearings and provided with means for magnetizing its rim and with means for demagnetizing its rim at a determined point. Fig. 2 is a view in side elevation of the parts shown in Fig. 1, a portion of the belt being also represented. Fig. 3 is a view showing two driving pulleys and their belt with an idler applied to the slack side of the belt and demagnetizing devices supported in proper position with respect to the pulleys. Fig. 4 is a detail view in diametrical section and on a larger scale than Fig. 1, showing the construction of the pulley with the belt in position thereon. Fig. 5 is a detail edge or face view of a portion of the pulley shown in Figs. 1 and 4. Fig. 6 is a view similar to Fig. 5 but showing a modification in the form of the face of the pulley. Figs. 7, 8 and 9 are detail views in circumferential section, in radial section and in face view respectively, showing still another modification in the form of the pulley. Figs. 10 and 11 are detail views illustrating still other modifications. Fig. 12 is a detail view showing the pulley provided with two parallel exciting coils and with a corresponding demagnetizing device. Fig. 13 is a view similar to Fig. 12 but showing the pulley provided with three exciting coils. Figs. 14 and 15 are detail views illustrating a modification in the arrangement of the demagnetizing device.

The belt *a*, as will be well understood, is formed of or has incorporated in its struc-

ture a magnetizable metal and for convenience is referred to herein as a metallic belt. The pulley or pulleys *b*, or *b'*, or each of them, with which the metallic belt *a* co-operates, may be constructed in any usual or suitable manner, either wholly or in part of metal, its rim *c*, at least, being formed in whole or in part of a metal which is capable of being magnetized so as to draw to it the metallic belt which coöperates with it. Obviously the rim of the pulley may be magnetized in any suitable manner. As shown in Figs. 1, 4 and 5, the rim of the pulley is divided circumferentially, as by a circumferential slot *d*, forming thereby two magnetic poles of opposite polarity. The rim is also preferably chambered circumferentially, as at *f*, to receive an exciting coil *g* of wire, the ends of which may be connected to slip rings *h* mounted on the supporting shaft *i*, so that a current of electricity may be thereby passed through the exciting coil from any suitable source. Flanges *k* may be provided, if desired, to prevent the belt from working laterally on the face of the pulley.

As indicated hereinbefore, means are provided for neutralizing the magnetism of the pulley or for demagnetizing the pulley at the point where the belt *a* leaves the periphery thereof, in order that the belt may not be strained unnecessarily and that there may be no loss of power in the separation of the belt from the pulley. The neutralizing or demagnetizing device may be constructed and arranged in any suitable manner. As shown in Figs. 1 and 2 it may consist of a horseshoe magnet *l* with its poles so placed in relation to the rim of the pulley as to divert the lines of magnetic force at the point where the belt leaves the face of the pulley. This magnet may be supported by arms *m* from the shaft *b²* of the pulley and held in the desired position by any suitable means. It is shown as wound with a coil of wire *n* through which an exciting current may be passed from any suitable source.

The demagnetizing device should be positioned properly with respect to the point where the belt leaves the pulley. Thus, in the arrangement shown in Fig. 3 in which a large pulley *b* and a small pulley *b'* are connected by a belt *a* with a weighted idler *o* on the slack side of the belt, the demagnetizing device *l* should be placed with respect to the pulley *b* as shown in the drawings when the pulley *b* is driven from the pulley *b'*. The small pulley *b'* being then the driver, its demagnetizing device *l* should be placed as shown in the drawings and may be conveniently supported by the arm which carries the idler *o*. On the other hand if the large pulley is the driver and the small pulley is driven the positions of the demagnetizing devices obviously should be changed. Such an arrangement as that shown in this

Fig. 3 of the drawings possesses a very high efficiency, for not only is the arc of contact between the belt and each pulley the maximum possible, but the co-efficient of friction between the belt and the pulley is also very high.

In the modification of the pulley shown in Fig. 6 the slot *d'* between the pole pieces *e* and *e'* is serpentine instead of straight, thereby increasing the number of magnetic lines of force which pass through the belt and therefore increasing the co-efficient of friction.

In the modification shown in Figs. 7, 8 and 9, tapered pins *d²* are secured in flanges *k* and *k'* in alternation, pointing inward and flattened on the outer surface to give a smooth bearing to the belt. These pins or pieces may be made of a different quality of iron or steel from that employed in the formation of the wheel rim and therefore be better adapted to serve as magnetic poles and secure a higher efficiency.

In the modification shown in Fig. 10 the face of the pulley is formed with longitudinal grooves *c'*, while in the modification shown in Fig. 11 the face of the pulley is formed with transverse grooves *c²*, these grooves serving to increase the frictional contact between the belt and the face of the pulley.

As shown in Figs. 12 and 13 the rim *c* may be provided with two or more chambers *f* and exciting coils *g* therein as the width of the pulley face may require and the demagnetizing device *l* will have its north and south poles *l'* and *l²* suitably arranged to coöperate with the pulley rim as represented.

In Figs. 14 and 15 a comparatively narrow pulley is shown as provided with a plurality of narrow chambers *f'* and corresponding coils *g'* and the demagnetizing device *l³* has its poles suitably arranged to coöperate with the pulley rim.

Various other embodiments of the invention will readily suggest themselves in view of the foregoing and it is to be understood, therefore, that the invention is not restricted to any particular form but may be embodied in a great variety of structures suited to the particular requirements of different uses.

I claim as my invention:

1. A belt pulley having a rim of magnetizable metal, means to magnetize the rim and means to demagnetize the rim.

2. The combination of a magnetic belt, a belt pulley having a rim of magnetizable metal, means to magnetize the rim and means to demagnetize the rim.

3. The combination of a magnetic belt, belt pulleys, means to magnetize one of said pulleys, a belt tightener applied to the slack side of the belt, and means to demagnetize the magnetic pulley.

4. A belt pulley having a rim divided circumferentially in a zigzag line to form magnetic poles.

5. A belt pulley having a rim divided circumferentially in a zigzag line to form magnetic poles and exciting coils applied to the rim.

This specification signed and witnessed this 30th day of July, A. D., 1910.

POVL T. LINDHARD.

Signed in the presence of—

AMBROSE L. O'SHEA,
E. A. GERKEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
