A. P. STECKEL & F. DU P. THOMSON.

ELECTRICAL CLUTCH AND BRAKE.

APPLICATION FILED JULY 15, 1907.

912,504.

Patented Feb. 16, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

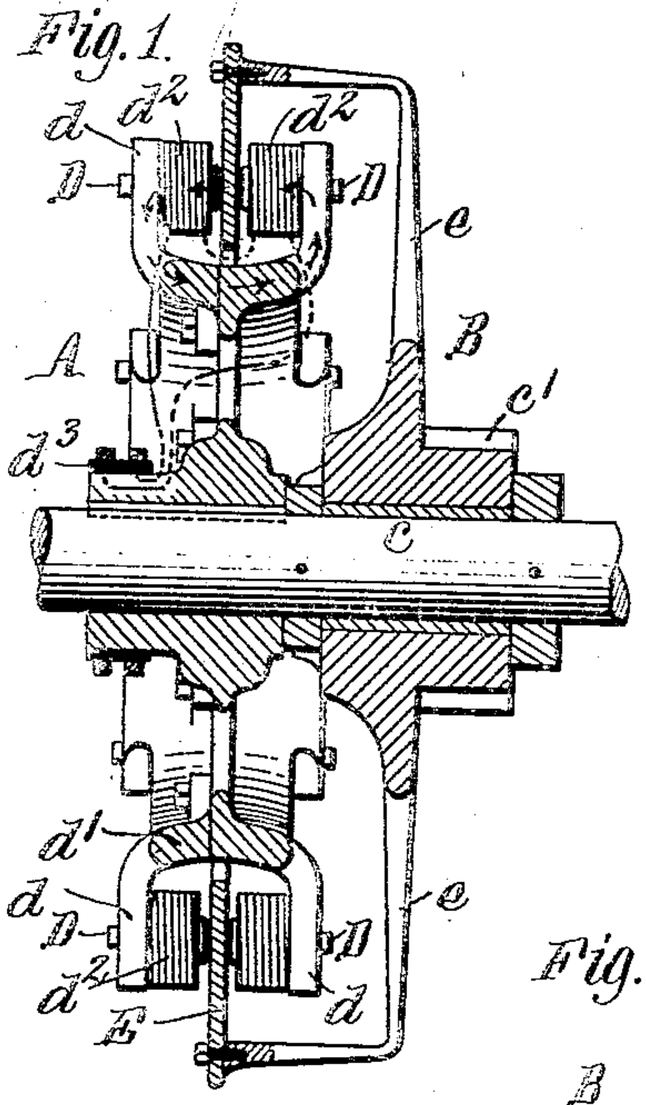


Fig. 2.

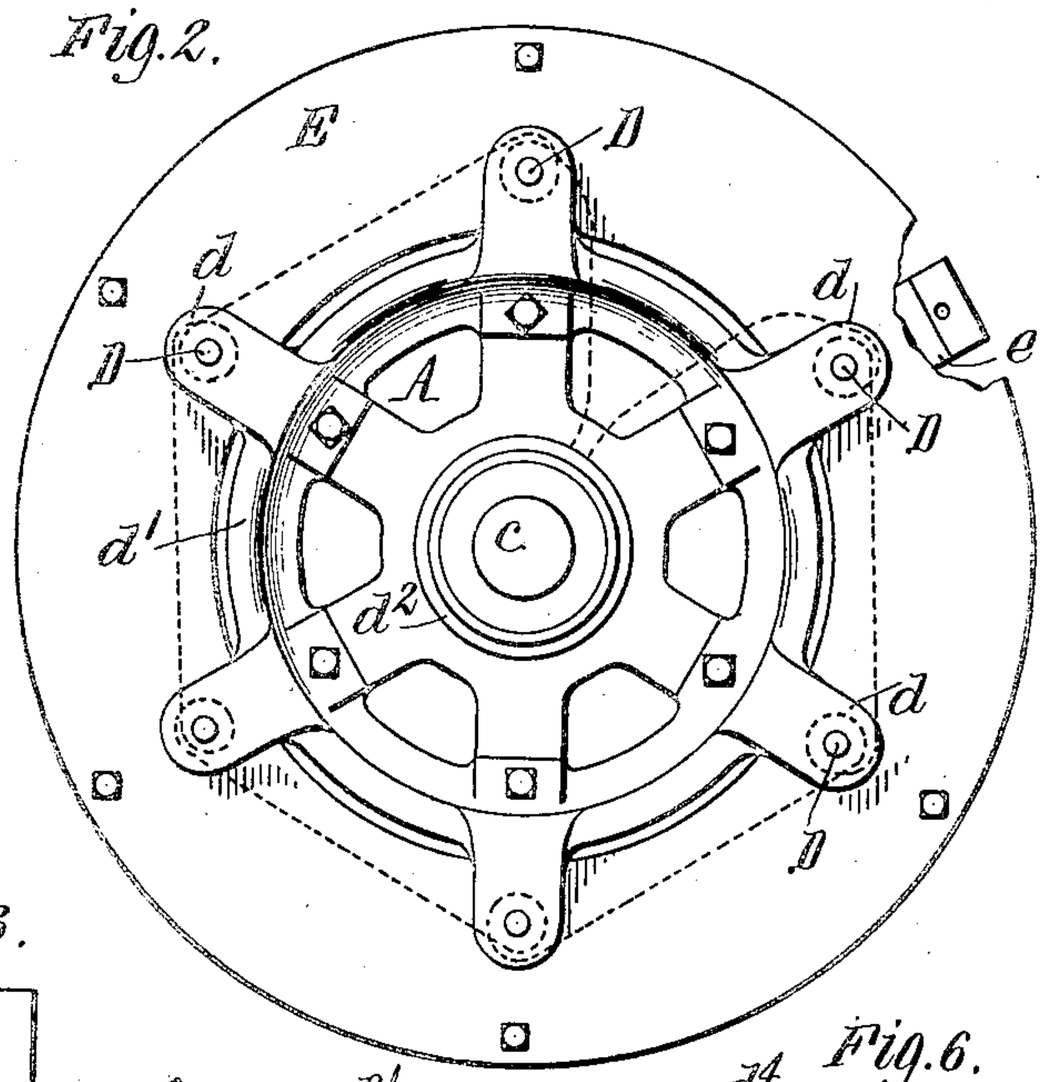


Fig. 3.

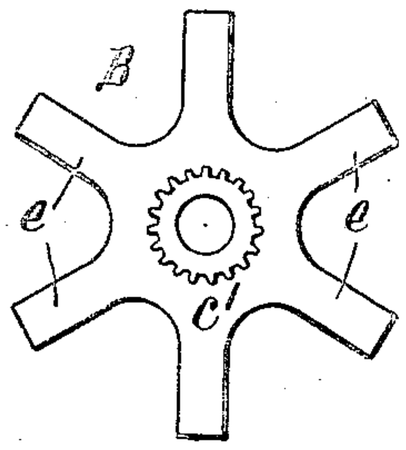


Fig. 6.

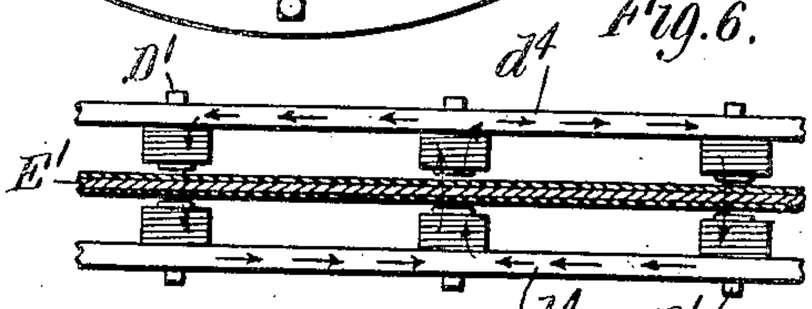


Fig. 4.

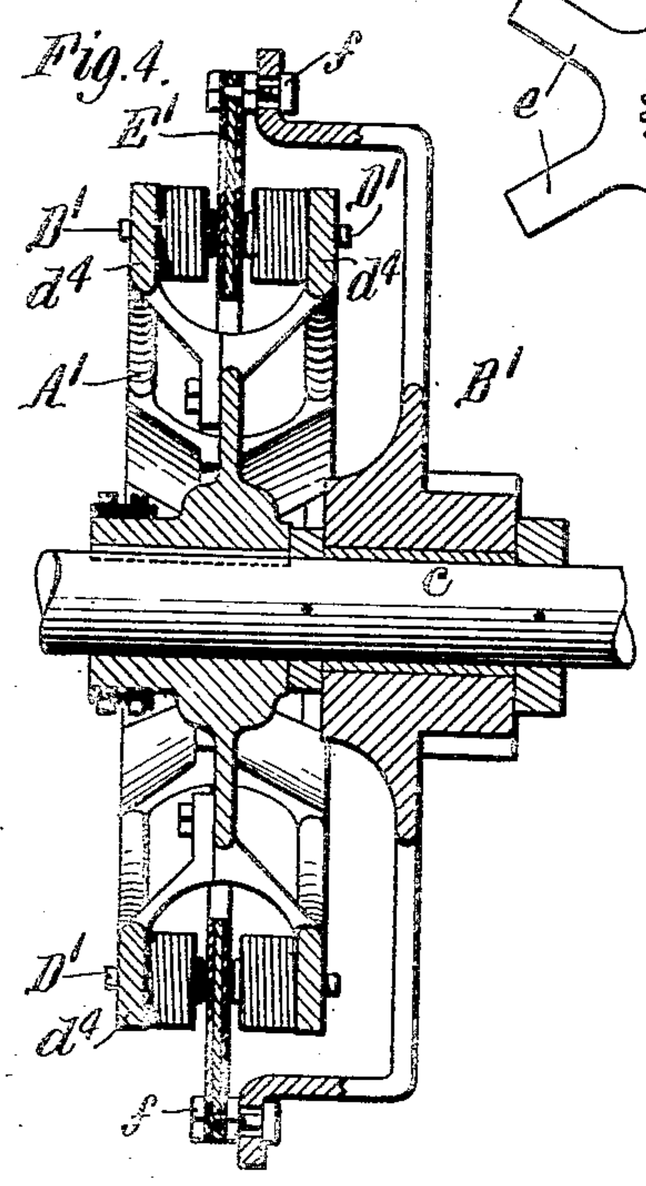
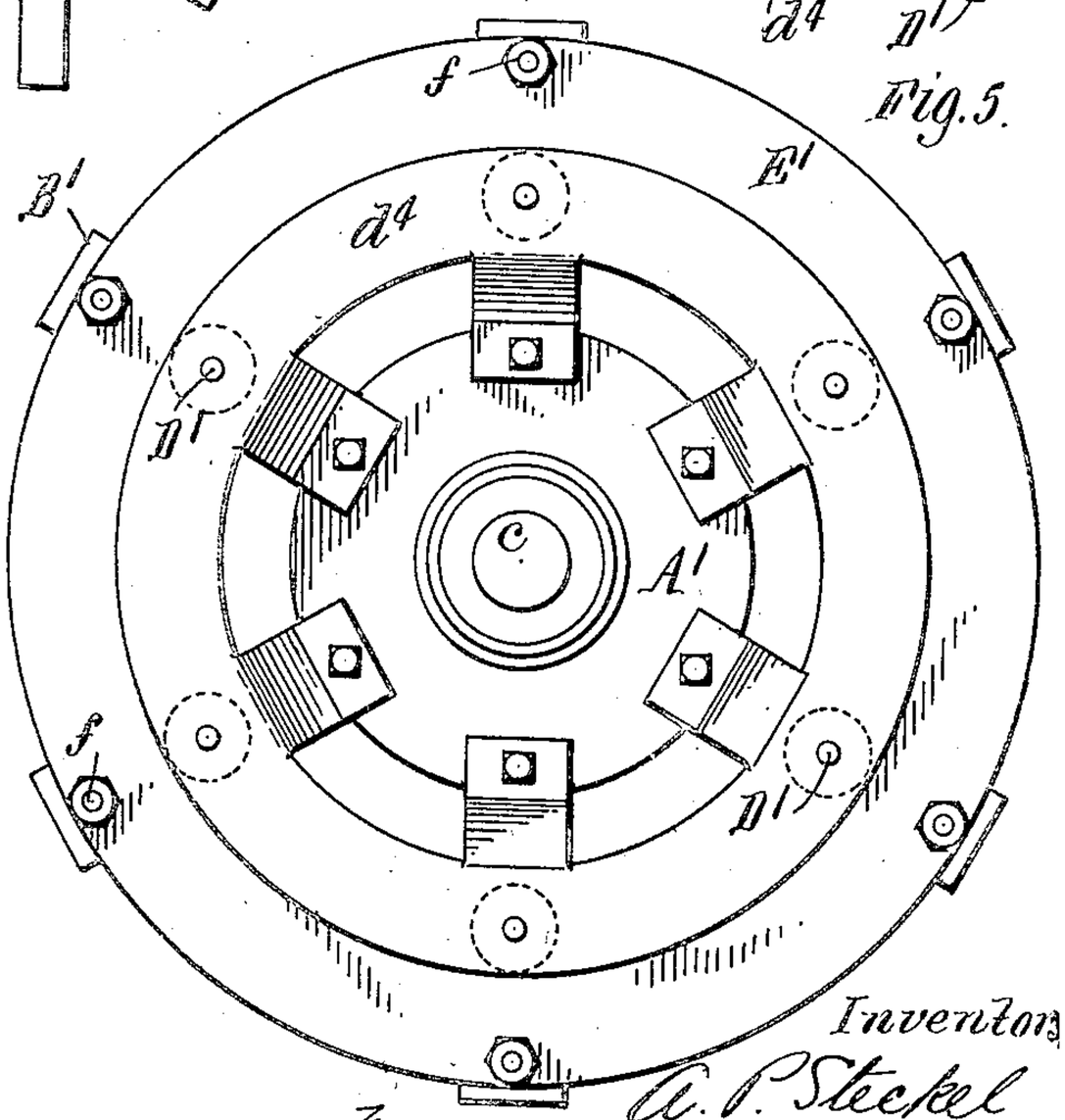


Fig. 5.



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2 SHEETS—SHEET 2.

Fig. 7.

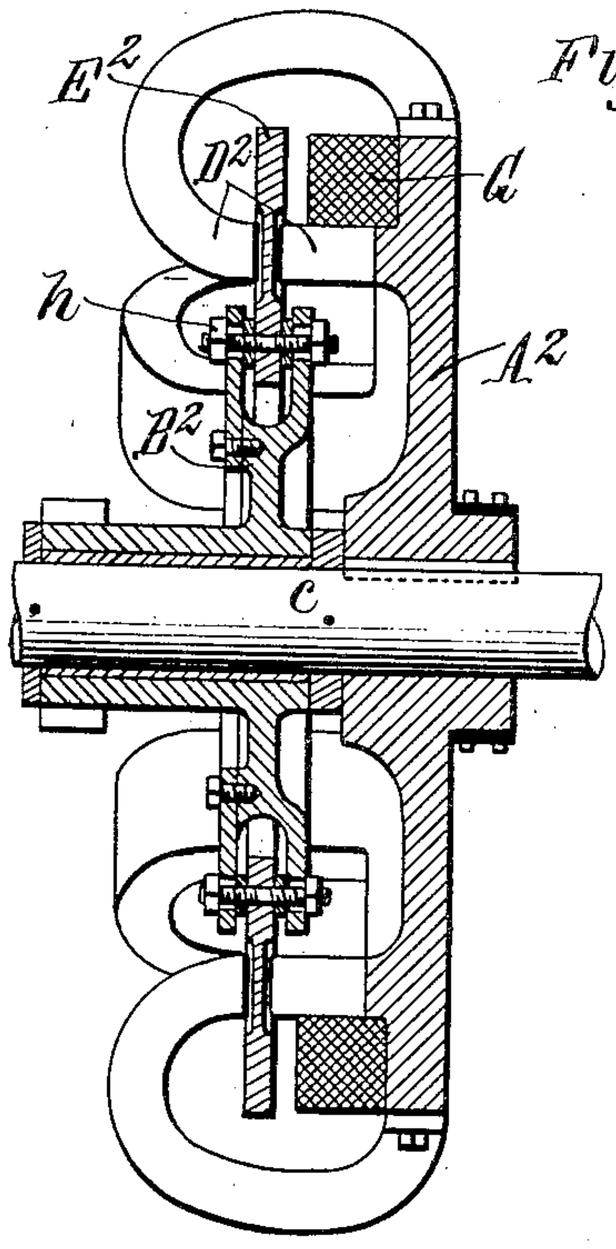


Fig. 9.

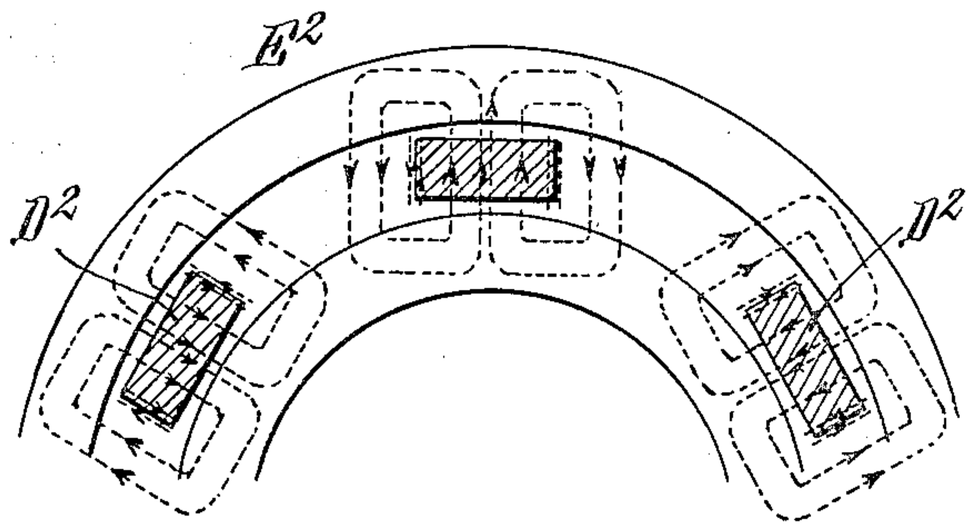
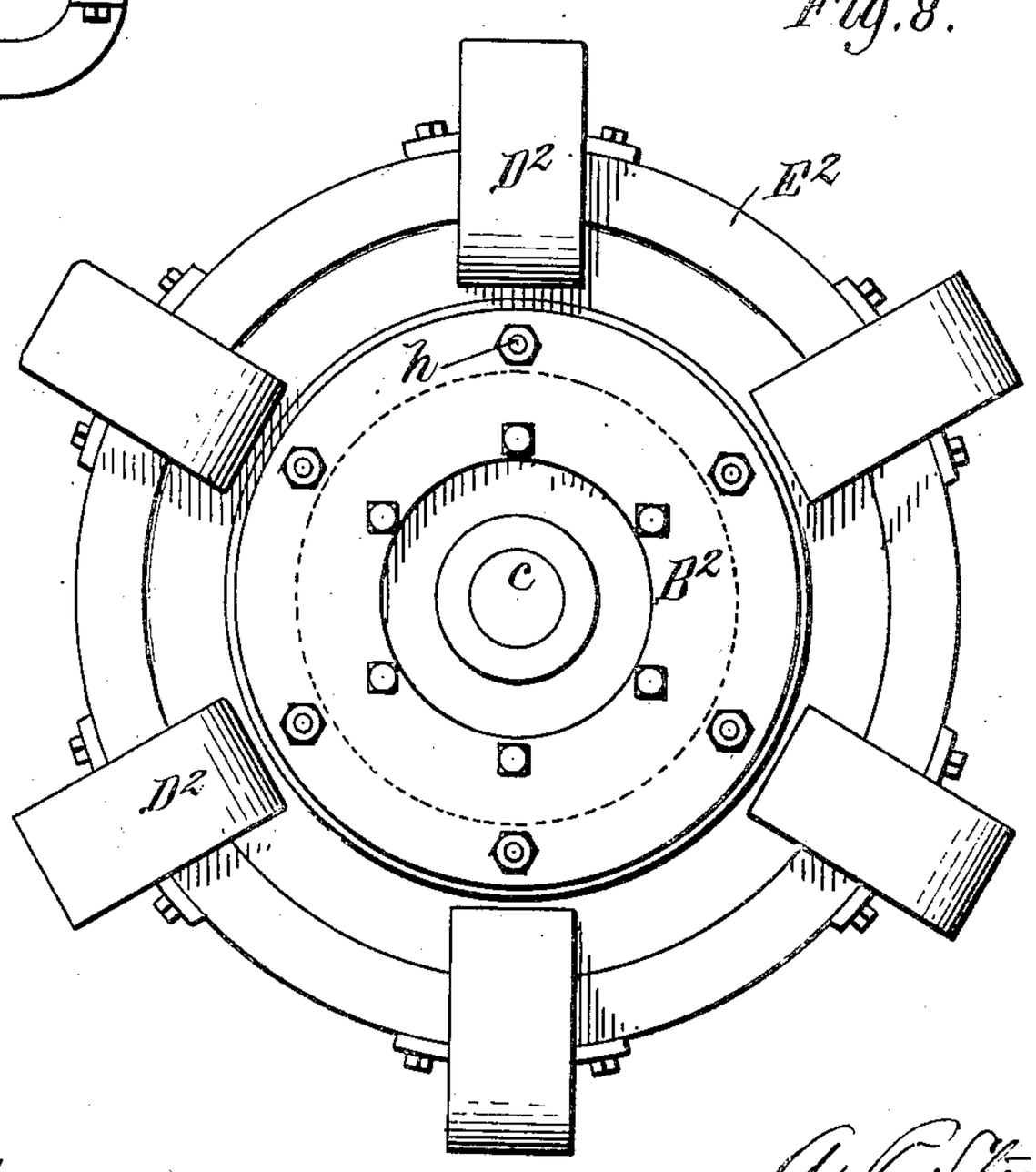


Fig. 8.



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UNITED STATES PATENT OFFICE.

ABRAM P. STECKEL, OF BUFFALO, NEW YORK, AND FRANCIS DU P. THOMSON, OF WHEELING, WEST VIRGINIA.

ELECTRICAL CLUTCH AND BRAKE.

No. 912,504. Specification of Letters Patent. Patented Feb. 16, 1909.

Application filed July 15, 1907. Serial No. 383,797.

To all whom it may concern:

Be it known that we, ABRAM P. STECKEL, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, and FRANCIS DU P. THOMSON, a citizen of the United States, residing at Wheeling, in the county of Ohio and State of West Virginia, have invented a new and useful Improvement in Electrical Clutches and Brakes, of which the following is a specification.

This invention relates to electrical induction clutches of the type disclosed in U. S. Letters Patent No. 744,423, dated November 17, 1903, in which two clutch members are employed, one having electrically magnetized poles and the other having a ring of conducting material which is arranged in close proximity to said magnet poles in the magnetic field established thereby, in such manner that the electrical currents set up in said ring by induction tend to prevent any relative motion between the clutch members, or to cause the members to turn together. These clutches are desirable for transmitting motion, especially when it is required to frequently start, stop and reverse the driven member, and they are also useful as brakes, where one member is fixed, to retard or stop the motion of the other member. It is essential to the efficient operation of such clutches that the conducting ring shall be close to the magnet poles to reduce the air gap to the minimum, but the parts become heated in action and, unless provision is made to prevent it, the expansion of the conducting ring is liable to warp it so as to strike the magnet poles.

The principal objects of this invention are to so construct the clutch that it can be made economically in large sizes and have the requisite strength and power for transmitting or resisting heavy loads; also to so mount the conducting ring on its supporting wheel or body that it can expand in the plane of rotation thereof without warping.

In the accompanying drawings, consisting of two sheets: Figure 1 is a sectional elevation of one form of clutch embodying the invention. Fig. 2 is an elevation of one side thereof. Fig. 3 is an elevation, on a reduced scale, of the driven member thereof. Fig. 4 is a sectional elevation of a modified construction of the clutch. Fig. 5 is a side elevation thereof. Fig. 6 is a fragmentary edge view, partly in section, on a reduced scale, thereof. Fig. 7 is a sectional elevation of still another modification. Fig. 8 is a side elevation thereof. Fig. 9 is a diagrammatic sectional elevation indicating the paths or the currents in the conducting ring.

Like letters of reference refer to like parts in the several figures.

A represents the fast or driving member, and B the loose or driven member of the clutch. The former, in the clutches shown, is keyed on a driving shaft *c*, while the latter is journaled to turn freely on said shaft and is provided with a gear wheel *c'* for transmitting motion to the part to be driven thereby. The manner of mounting and connecting the members to the driving and driven elements, however, forms no part of this invention and may be accomplished in any suitable way.

One of the clutch members, preferably the driving member A, consists of a wheel or body provided around its peripheral portion with oppositely facing pole pieces separated by an intervening space or air gap, and the other member consists of a spider or body and a ring of copper, or other good electrical conductor, which is arranged in a plane perpendicular to the axis of rotation thereof and in the space between the opposite pole pieces of the first member. Each member may be variously constructed.

In the construction shown in Figs. 1–3, the pole pieces D extend laterally toward each other from opposite arms *d* projecting radially outward from a circular rim *d'* of the supporting wheel or body. The pole pieces are individually excited by separate surrounding coils d^2 wound in such manner that the magnetic circuit is completed through each pair of opposite pole pieces and the arms and rim of the supporting wheel or body, as indicated by the arrows in Fig. 1, the magnetic lines of force passing transversely through the rim *d'* of the wheel or body. The terminals of the magnet windings can be connected to collector rings d^3 on the hub of the member A to receive the electric current from the supply circuit. The conducting ring E is secured to lateral extensions of radial arms *e* of the supporting spider or body, the connections being outwardly beyond the ring. The arms *e* are made relatively wide and thin whereby they have the requisite strength to resist and transmit power in a

tangential direction, while their lateral extensions can yield or spring radially to allow for the expansion and contraction of the conducting ring without causing it to warp so as to strike the pole pieces at the opposite sides thereof.

In the construction shown in Figs. 4–6, the magnet poles D′ are arranged between and connected to spaced circular iron rings or flanges d^4 at the periphery of the supporting wheel or body. Magnetic circuits are completed through each two adjacent pairs of pole pieces and the two rings, as indicated by the arrows in Fig. 6. In this construction the conducting ring E′ is also secured outside of the member A′ to lateral extensions of the spider arms of the member B′, but these arms are made rigid, and to allow for the expansion and contraction of the conducting ring it is attached to the spider arms by bolts *f* adapted to move radially in slots in said arms, or by any other suitable means allowing free expansion. This construction has an advantage over the other, in that the same weight of iron in the rings d^4 will give a greater fly wheel effect on account of their greater distance from the axis of rotation.

In both of the constructions described the magnet poles are individually excited and the conducting ring is connected outwardly beyond the same to its supporting wheel or body, but the pole pieces could be excited by a single coil winding encircling the body of the member carrying the pole pieces, and the conducting ring could be connected to a supporting wheel or body inside thereof, as shown in Figs. 7 and 8, in which A^2 is the driving member, B^2 the driven member, D^2 the pole pieces, E^2 the conducting ring, and G the exciting winding. In this construction also the expansion and contraction of the conducting ring is allowed by bolts *h* passing therethrough and adapted to move radially in slots in the supporting wheel or body.

The constructions shown in Figs. 1–6, in which the poles are individually excited, are better adapted for very large clutches, as a single large coil of wire would be bulky and unwieldy. Another advantage of the individual excitation of the poles is that it reduces the magnetic leakage which is inevitable when all of the poles are magnetized by one coil. The magnetic leakage consideration is, however, outweighed in clutches of small sizes by the more simple single coil construction. A single magnetizing coil could also be employed in the first two constructions in which the conducting ring is connected to its supporting member outside of the other member, and similarly the poles, in the construction shown in Figs. 7–9, could be individually excited.

The conducting ring E′, Figs. 4–6, is composed of two outside copper rings with an interposed steel ring, the object being to give greater mechanical strength to the ring without materially increasing the air gap, when such additional strength is required. This sort of conducting ring could be employed in either of the other constructions.

The conducting ring E^2, shown in Figs. 7–9, is reduced in thickness between its outer and inner edges opposite to the pole pieces D^2. By thus forming the ring the air gap is not widened but the cross-sectional area of the ring is much larger, thereby greatly increasing its conductivity. In the use of this ring the induced currents flow through the thick inner and outer portions of the ring, as indicated by the arrow lines in Fig. 9, and will have a path of less resistance than they would have were the disk made of the same thickness throughout as that thickness best suited to be used in the space between poles. This conducting ring likewise could be used in clutches of the character shown in Figs. 1–6.

In all of the constructions illustrated the conducting ring is arranged perpendicularly to its axis of rotation and is connected to the supporting clutch member, whether the connections be inside or outside of the other clutch member, in such manner that the ring can expand and contract in the plane thereof, to prevent it from warping and striking the magnet poles. The fact that the part in which the induced currents are set up is in the form of a ring free to expand instead of a plate or disk rigidly connected centrally to a supporting shaft, and of necessarily unequal temperature in different parts makes the expansion and contraction thereof more uniform throughout the area of the ring and lessens the tendency to warp or distort it.

The specific construction of the ring shown in Figs. 4–6 and of the clutch and ring shown in Figs. 7–9 are not claimed herein as they are the sole inventions of the applicants, Thomson and Steckel, respectively, and form the subject matter of separate applications.

We claim as our invention:

1. An electrical induction clutch or brake comprising a member having magnetized pole pieces, a second member, and a conducting ring supported thereby adjacent to said pole pieces in a plane perpendicular to the axis of said clutch, and connections between said ring and the supporting member which permit movement of said ring in the plane thereof relative to the supporting member to allow for the expansion and contraction thereof, substantially as set forth.

2. An electrical induction clutch or brake comprising a member having oppositely facing magnetized pole pieces, a second member, and a conducting ring supported thereby between said pole pieces in a plane perpendicular to the axis of said clutch, and connections between said ring and the supporting mem-

ber which permit movement of said ring in the plane thereof relative to the supporting member to allow for the expansion and contraction thereof, substantially as set forth.

3. An electrical induction clutch or brake comprising a clutch member having opposite pole pieces, electrical windings for individually exciting said pole pieces, a second clutch member, and a nonmagnetic conducting ring arranged between said pole pieces in a plane perpendicular to the axis of the clutch and connected to portions of said second clutch member located outwardly beyond said first clutch member, substantially as set forth.

4. An electrical induction clutch or brake comprising a member having oppositely arranged magnetized pole pieces, a second member having arms with lateral extensions which are flexible radially, and a conducting ring supported by said arm extensions between said pole pieces in a plane perpendicular to the axis of said clutch whereby said clutch ring is permitted movement in the plane thereof to allow for the expansion and contraction of the ring, substantially as set forth.

5. An electrical induction clutch or brake, comprising a clutch member having a body and spaced peripheral rings, pole pieces projecting toward each other from said rings, electrical windings for individually exciting said pole pieces, a second clutch member, and a non-magnetic conducting ring arranged between said pole pieces in a plane perpendicular to the axis of the clutch and connected to portions of said second clutch member located outwardly beyond said first clutch member, substantially as set forth.

Witness our hands, this 27th day of June, 1907.

A. P. STECKEL.
F. DU P. THOMSON.

Witnesses:
I. F. JONES,
H. S. BRADLEY.