No. 870,166. PATENTED NOV. 5, 1907.

N. S. HARTER.

ELECTRIC CLUTCH.

APPLICATION FILED JUNE 25, 1907.

2 SHEETS—SHEET 1.

Fig. 1.

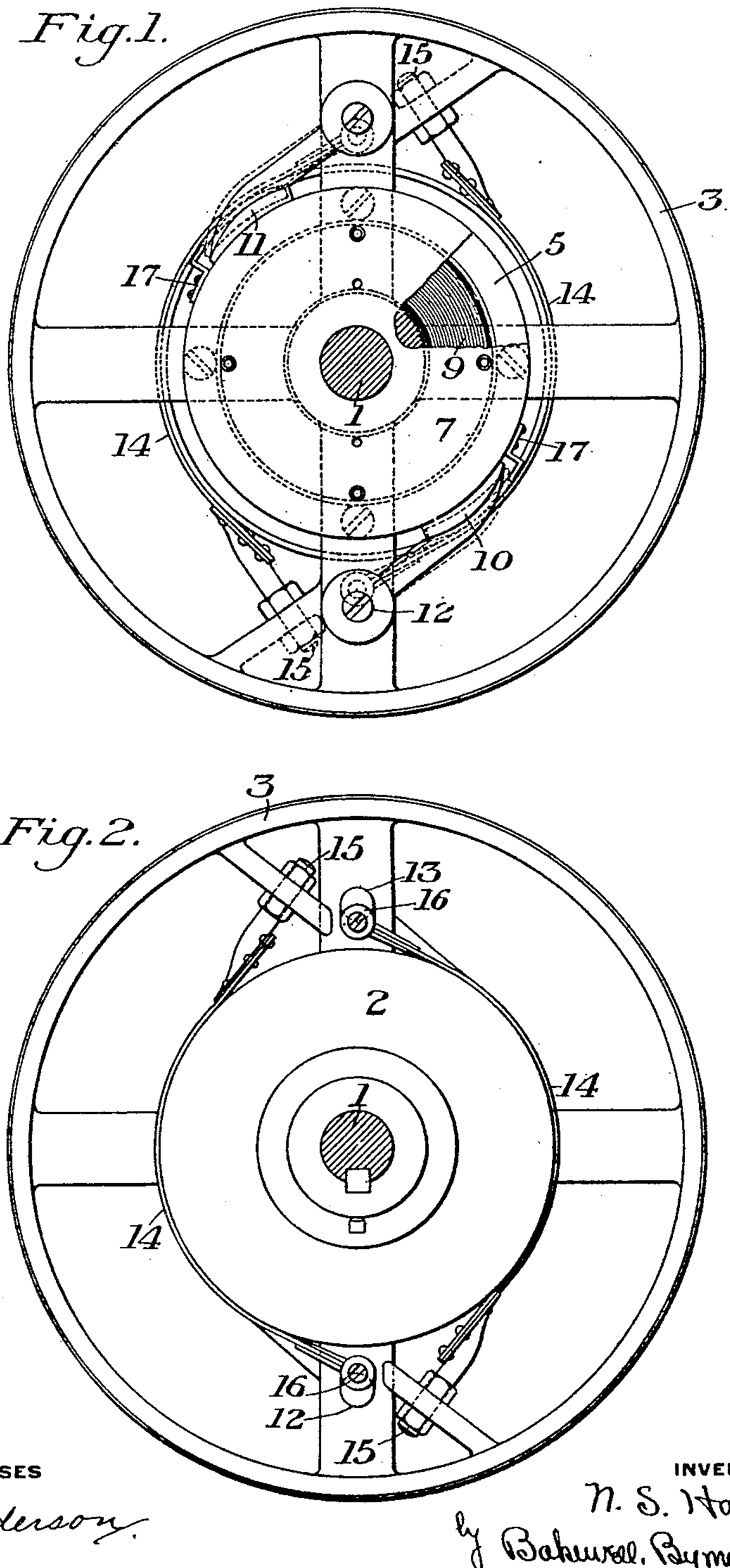

Fig. 2.

WITNESSES

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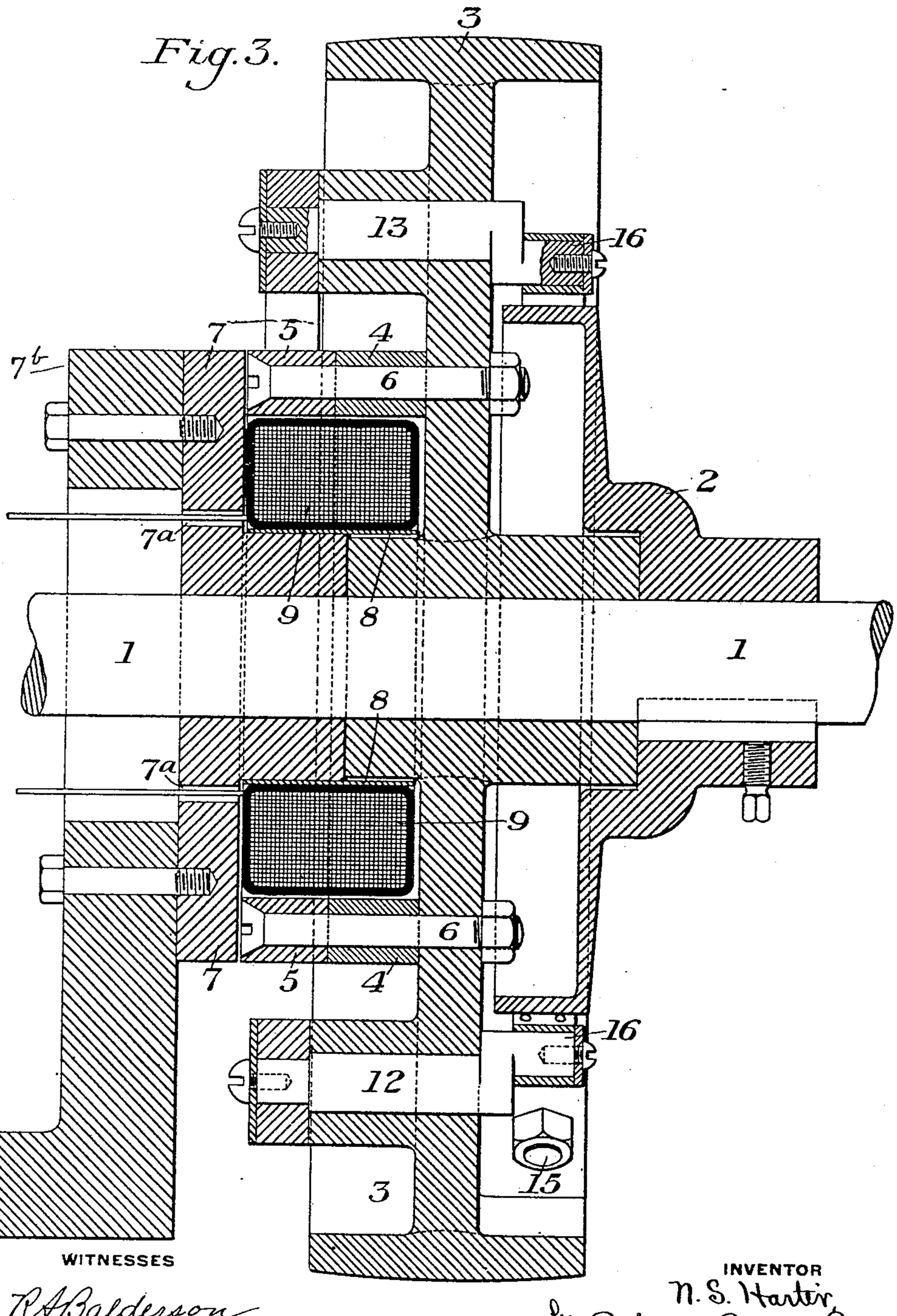
Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

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ELECTRIC CLUTCH.

No. 870,166. Specification of Letters Patent. Patented Nov. 5, 1907.

Application filed June 25, 1907. Serial No. 380,676.

To all whom it may concern:

Be it known that I, NOAH S. HARTER, of Waukegan, Lake county, Illinois, have invented a new and useful Improvement in Electric Clutches, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are side views of one form of clutch embodying my invention, taken from opposite sides, Fig. 1 being partially broken away; and Fig. 3 is a diametrical section of the same.

My invention has relation to the class of electric clutches, and is designed to provide a clutch of this character which can be operated very quickly, and either automatically or manually by the simple opening and closing of an electric circuit at any point either adjacent to or distant from the clutch itself.

A further object of the invention is to provide a clutch of this character in which the mechanical parts are conveniently and compactly arranged, and in which certain movable parts have a limited amount of inertia and friction, said parts being so located and arranged as to be operated by means of an electromagnetic flux produced by an electric current delivered from an outside source, said parts when so operated, acting to clamp and hold a driven member, and inversely to release said member when the magnetic flux is discontinued.

A further object of the invention is to provide a clutch of this character in which the electric windings of coils may be carried by a stationary member, thereby avoiding the use of collecting rings or other moving parts for connecting the winding with a source of current.

Referring to the drawings, 1 is a shaft to be driven or released by the operation of the clutch; 2 is a flanged disk mounted on and keyed to the shaft 1; 3 is a pulley mounted on the shaft so as to turn freely; 4 is a non-magnetic ring, preferably of brass or copper; and 5 is a soft iron ring. Rings 4 and 5 are both bolted to shaft 1 with non-magnetic bolts 6.

7 is a soft iron disk with a hub sufficiently large to support the metal collar 8; 9 is a coil of magnet wire wound around collar 8 on the hub of 7. The terminals of this winding may be passed through a hole or holes 7^a in the disk 7 in any convenient place. The member 7 is mounted loosely on the shaft 1, and is fastened to an outside support such as 7^b, so that it will not turn with any of the moving parts, but remains in a stationary condition so that the connecting wires of the electric winding 9 can be connected directly without rings.

10 and 11 are armatures mounted at one end on steel pins or shafts 12 and 13 which pass through the frame of 3. These armatures 10 and 11 are directly over the iron ring 5, and are mounted so as to move over a small arc from the axis of 12 and 13.

14, 14 are steel straps permanently secured at one end by the adjustable screws 15, 15 which pass through a wing on the casting 3. These straps 14 pass around a portion of the periphery of the disk 2 and are mounted on the eccentric portion or cranks 16 of the pins 12 and 13. The screws 15, 15 are to be adjusted so that the straps 14 will clamp tightly on the face of disk 2 when the armatures 10 and 11 are drawn down on the face of 5. When these armatures move back from the face of ring 5, as indicated by the dotted lines on Fig. 1, the cranks on the pins 12 and 13 will be moved back far enough to loosen the grip of the straps 14, on the face of the member 2.

Referring to Fig. 1 of the drawings, and assuming that a current is passing through the solenoid 9, it will be seen that the magnetic flux produced by the solenoid will pass through collar 8 to the web of the pulley 3, from 3 to the armatures 10 and 11, from the armatures to the soft iron ring 5, and thence across the small air gap to 8. This completes the magnetic circuit. The non-magnetic ring 4 forms a collar between 3 and 5, and the magnetic leakage will be very slight between these two pieces.

The pulley 3 in this particular design is preferably driven by a belt at a constant speed, but this constant moving mechanism may be driven by cogs, chain or other device, or it may be keyed to the end of a shaft mounted on the axis of another shaft to which disk 2 could be mounted and keyed.

The reason for driving the pulley 3 at a constant speed instead of driving the member 2, is that the former carries with it a large portion of the weight of the entire apparatus, which weight develops much inertia of momentum which is objectionable for starting and stopping. The member 2 can be made strong, but light, so as to start and stop quickly.

Assume that it is desired to drive the shaft 1 (which may be a shaft of a particular machine or a shaft for any other purpose), and that it be desired to allow it to stop at certain intervals; also assume that an electric current is supplied from some outside source, and that the pulley 3 is also driven from an outside source so as to rotate around the shaft 1. The centrifugal force of the armatures 10 and 11 will normally cause them to swing away from the ring 5, thus shifting the cranks 16 on 12 and 13, and loosening the straps 14 so that they have no grip on 2. Non-magnetic angle pieces 17 are located on 5 and over the ends of 10 and 11 to keep them from swinging too far from 5.

On passing an electric current through the coil or winding 9, a magnetic flux is produced through the magnetic circuit before described, thereby pulling the armatures tightly against the face of the ring 5. This

movement will turn the pins 12 and 13 sufficiently to clamp the straps 14 tightly around the periphery of the member 2, thus holding and turning it and the shaft 1 with the constantly driven member 3. As soon as the electric circuit in 9 is opened, or the current discontinued, the armatures 10 and 11 will be released, thus loosening the grip of the straps 14 on disk 2, which in turn allows shaft 1 to stop.

It will be seen that while 3 is driven at a constant speed, shaft 1 will not be driven except at such intervals as a current may be passing through the electric winding 9. It may also be seen that the clutch will lock, practically instantly, when a current is applied to 9, and that it will release very quickly when the current is discontinued; also that the limited amount of time required for the clutch to operate will always be the same. Furthermore the straps 14 may be adjusted by the screws 15 so as to drive a desired load without making undue shock on the driven mechanism, which is an item of much importance in mechanics. The application of current through coil 9 may be governed either automatically or manually, as desired.

Various changes may be made in the details of construction and arrangement without departing from the spirit and scope of my invention, since

What I claim is:—

1. In a clutch, a driving member, a member to be driven thereby, friction straps for connecting said members, and electro-magnetic means carried by a third and stationary member and arranged to operate the friction straps; substantially as described.

2. In a clutch, a constantly driven pulley loosely mounted on the shaft to be driven, a clutch member fixedly secured to said shaft, a stationary coil surrounding said shaft, a ring of magnetic material surrounding the coil, a plurality of pivoted armatures carried by the pulley, and friction devices connected to the armatures and arranged to engage the relatively fixed clutch member; substantially as described.

3. In a clutch, a constantly driven driving member, a member to be driven thereby, friction straps for connecting said members, a non-rotating coil or winding, and armatures actuated by the coil or winding and arranged to actuate the straps; substantially as described.

4. In an electric clutch, a constantly driven driving member, a member to be driven thereby, friction straps carried by the constantly driven member and arranged to engage the member to be driven thereby, and electro-magnetic means for actuating said straps; substantially as described.

5. In an electric clutch, a member to be driven, a driving member, pins or shafts journaled in the driving member, straps connected to the pins or shafts and arranged to frictionally engage the member to be driven, a fixed coil or winding, and armatures actuated thereby and connected to the pins or shafts; substantially as described.

6. In a clutch of the character described, a stationary member, a coil carried thereby, a constantly driven member, pivoted armatures carried by the constantly driven member, a member to be driven, and friction devices operated by said armatures for connecting the member to be driven with the constantly driven member; substantially as described.

7. In an electric clutch, a fixed member having a coil, a magnetic ring surrounding said coil, a constantly driven member, armatures carried by the constantly driven member and arranged to engage said ring, shafts to which the armatures are connected, and clutch devices connected to said shafts; substantially as described.

In testimony whereof, I have hereunto set my hand.

NOAH S. HARTER.

Witnesses:
F. T. PULSE,
A. C. WARD.