

W. H. LINDSAY.
COIL FRICTION CLUTCH.
APPLICATION FILED AUG. 26, 1904.

2 SHEETS--SHEET 1.

Fig.1.

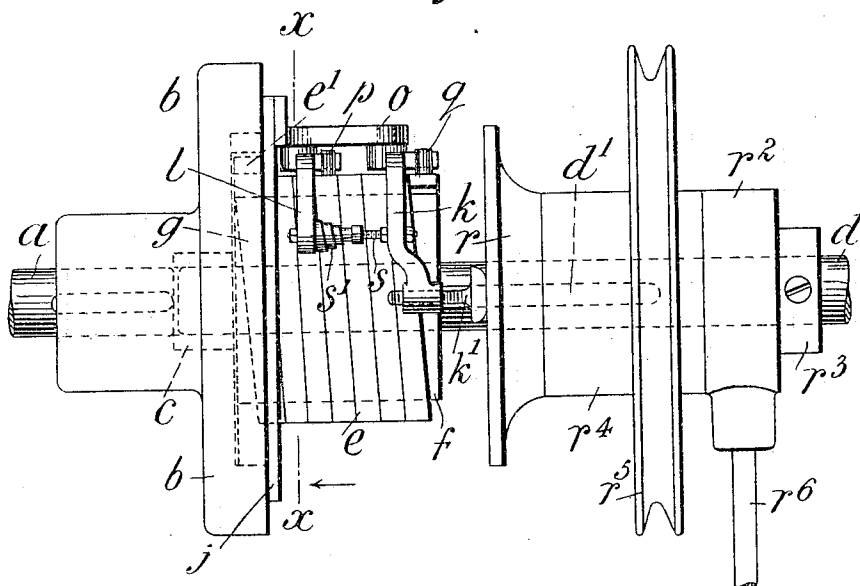
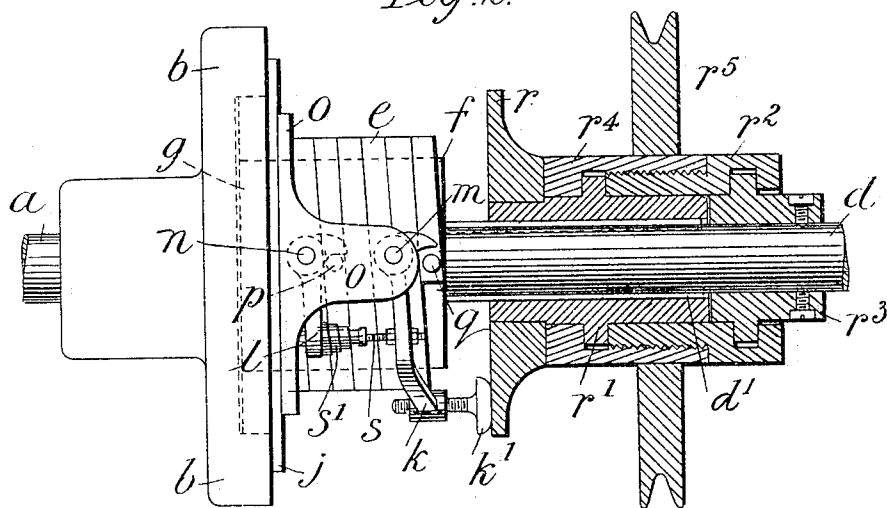


Fig. 2.



Witnesses: -
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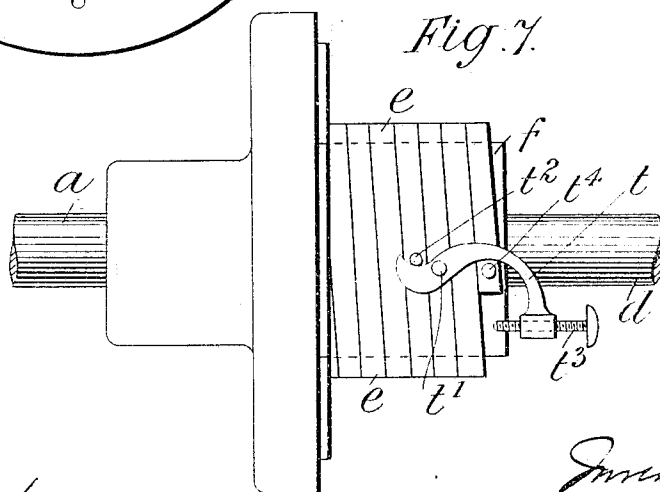
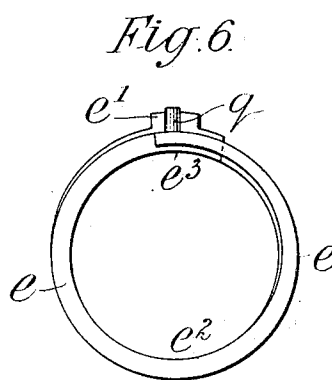
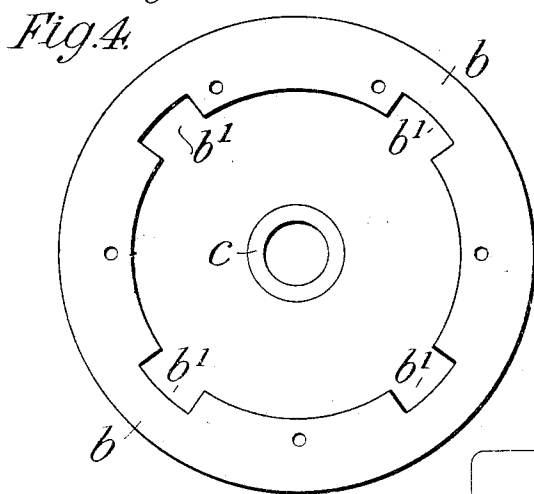
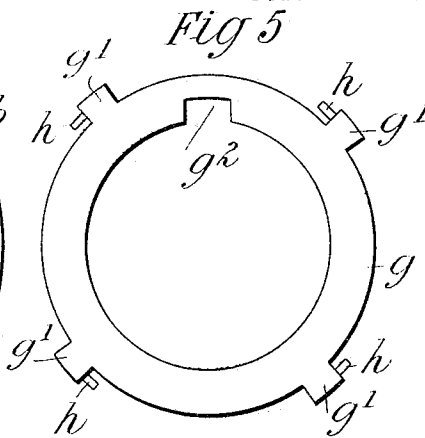
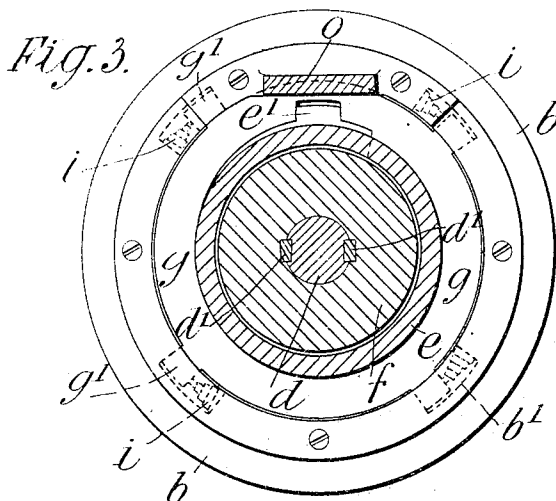
Inventor:-
William H. Lindsay
By Dickinson & Fisher
his Attorneys

No. 801,728.

PATENTED OCT. 10, 1905.

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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

WILLIAM HENRY LINDSAY, OF JOHNSTONE, SCOTLAND.

COIL FRICTION-CLUTCH.

No. 801,728.

Specification of Letters Patent.

Patented Oct. 10, 1905.

Application filed August 26, 1904. Serial No. 222,324.

To all whom it may concern:

Be it known that I, WILLIAM HENRY LINDSAY, a subject of the King of Great Britain and Ireland, residing at Johnstone, in the county of Renfrew, Scotland, have invented certain new and useful Improvements in Coil Friction-Clutches; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention consists in an improved coil friction-clutch, which by its construction and arrangement is well adapted to start at high rates of speed machinery at rest. It prevents transmission to the driving engine, motor, or machine of shocks occurring to the machinery driven. Hence the clutch is most suitable for connecting electric and other motors to heavy machinery, such as rolling-mills, crushing and stamping machinery, and the like.

Referring to the accompanying drawings, Figure 1 is a side view of the clutch. Fig. 2 is a plan, partly sectional. Fig. 3 is a cross-section on the line *xx*, Fig. 1, and looking in the direction indicated by the arrow shown at Fig. 1. Fig. 4 is an inside face view of the driving-plate. Fig. 5 is a face view of the ring which fits into the driving-plate. Fig. 6 is an end view of the coil. Fig. 7 shows in side view an alternative arrangement for tightening and relaxing the coil.

Keyed on the shaft *a* is a driving-plate *b*, in which is a gun-metal bush *c*, in which loosely fits the shaft *d*, which is thereby steadied and kept in line with the shaft *a*. The driving-plate *b* is recessed, as seen more particularly at Fig. 4. The depth of the recess corresponds with the width of the head *e'* of the coil *e*. The coil *e* surrounds the chilled polished drum *f* and loosely fits it. The drum *f* is keyed on the shaft *d*. The inner face of the coil *e* is bored to smoothness.

In the recess provided in the driving-plate *b* lies a ring *g*, which has ribs *g'* projecting outwardly from it, as seen more particularly at Fig. 5. The ribs *g'* of the ring *g* take into niches *b'*, provided for them in the recess in the driving-plate *b*. In each rib *g'* of the ring *g* is fixed a pin *h*, on which pins *h* are arranged helical springs *i*, which bear at one end against one face of the niches *b'* and at the other end against the ribs *g'* of the ring *g*. In the ring *g* is a niche *g²*, in which is received the head *e'* of the coil *e*. The width

of the ring *g* is less than the depth of the recess in the driving-plate *b*, in which it lies. When the ring *g* and springs *i* have been put in place in the recess in the driving-plate *b*, a cover-ring *j* is bolted to the driving-plate *b*.

In the ordinary coil friction-clutch as hitherto constructed the coil is tightened on the drum by pressure brought to bear upon the tail of the coil. The coil is thus influenced throughout its length simultaneously, and coil friction is set up over the whole frictional surface of the drum at once. Thus in starting machinery from rest shocks are produced. To avoid this, the pressure for tightening the coil is applied at two or more points in succession in the coil, commencing near the head and gradually extending to the tail, so that the coil friction increases gradually until its full power is attained. Under this invention this is effected by applying tightening pressure to the coil, first, at one or more of the turns intervening between the head and the tail of the coil in succession, and, finally, at the tail.

In this invention are comprised two alternative methods of tightening the coil by the application of pressure at two or more points therein, as aforesaid. According to one of these methods two levers *k* and *l* are pivotally mounted on pins *m* and *n*, carried by a bracket *o*, fixed to the driving-plate *b*. The levers *k* and *l* engage with pins *p q*, of which, in the example shown in the drawings, *p* is fixed in the third turn of the coil *e* from the head thereof, and *q* is fixed close to the tail end of the coil. The lever *k* carries a set-screw *k'*, the head of which extends toward a collar *r*, which has axial play on the shaft *d*, but is prevented by feathers *d'* from rotating about the shaft. The collar *r* has a sleeve *r'*, which extends into and works in a tubular piece *r²*, which latter is retained in place by a collar *r³*, which is firmly secured to the shaft *d*. The tubular piece *r²* is screw-threaded throughout a part of its length, and to this part is screwed the thrusting-piece *r⁴*, on which is keyed a rope-wheel or hand-wheel *r⁵*. The tubular piece *r²* is prevented from rotating with the shaft *d* by an anchor-bar *r⁶*, which is fitted into the tube-piece *r²* and is fixed in the ground, floor, or wall, or is otherwise conveniently held fast. When by means of the wheel *r⁵* the thrust-piece *r⁴* is turned, it will either advance or retire the collar *r* along the shaft *d*, according to the direction in which the wheel *r⁵* is rotated.

To put the clutch into gear, the collar *r* is advanced toward the coil *e* and bears against the set-pin *k'*. The levers *l* and *k*, which are connected by the screw-threaded rods *s*, about which is coiled the helical spring *s'*, are by the pressure exerted by the collar *r* turned about their pivots. The arrangement is such that the lever *k* turns through a given space before coming into contact with the pin *q* and so exercising binding action at the tail of the coil *e*. The lever *l*, however, is always in engagement with the pin *p*, and accordingly the lever *l* acts on the coil *e* in advance of the lever *k*, and hence coil friction on the drum *f* is produced in the head turns of the coil *e* before it is produced in the tail turns. When the maximum pressure exercised by the lever *l* is reached, the lever *k* comes into action and contracts the coil *e* at the tail thereof. The collar *r* in continuing to press on the pin *k'* causes compression of the spring *s'* sufficiently to allow the proper amount of tail-pressure to be exerted on the coil at *q*, and thus to permit the clutch to come fully into action.

As an additional safeguard against too sudden action of the lever *k* on the tail of the coil and also as a means of promoting the gradual setting up of coil friction, the final tail turn of the coil is throughout a part of it bored to a larger diameter than the other turns, as shown at Fig. 6. The effect of this is that as the lever *k* acts upon the tail turn of the coil the said turn comes gradually into contact with the chilled drum *f* between the points *e²* and *e³*, Fig. 6.

As above stated, the points of application of pressure to the coil to make it bind are not limited to two. There may be more than two. In cases where the driving duty is heavy and the rates of speed high three or more points for exerting pressure on the coil may be provided and levers arranged accordingly to act at the points in succession, beginning with that nearest the head of the coil and finishing with that near the tail thereof.

The springs *i* in the niches *b'* of the driving-plate *b* receive and absorb any shocks which may occur in the driven machinery and prevent transmission thereof to the motor or gearing on the driving side of the clutch.

The clutch is put out of gear by retiring the collar *r* away from the set-pin *k'* of the lever *k*.

An alternative arrangement for acting on the coil *e* at two points in succession is shown at Fig. 7. In this arrangement a single lever *t* is used and is pivotally mounted on a pin *t'*, fixed in the coil. The lever *t* is always in contact with a pin *t²*, fixed in the coil *e*, and when the sliding collar by which the clutch is put into gear is pressed against the set-pin *t³*, carried by the lever *t*, binding action of the coil is set up first through the pin *t²*. A second pin *t⁴* is fixed in the coil toward the tail thereof. In the continued advance of the sliding

collar aforesaid the lever *t*, which is of spring-steel, bends and so comes into contact with the pin *t⁴* and binding action is produced in the tail turns of the coil *e*.

The pivot-pin of the lever *t* is not necessarily in the position shown in the drawings. It may be on some other turn of the coil. Similarly, with respect to the pins on which the lever acts to make the coil bind, the said pins may be otherwise placed in the coil.

What I claim is—

1. In a friction-clutch, the combination with shafting, of a friction-drum carried thereby, a coil member, comprising a plurality of convolutions, operatively connected at one end to said shafting and loosely encircling said drum, and means for exerting a positive local winding pressure successively on separate convolutions of said coil member at distant points longitudinally thereof.

2. In a friction-clutch, the combination with shafting, of a friction-drum carried thereby, a coil member, comprising a plurality of convolutions, operatively connected at one end to said shafting and loosely encircling said drum, outwardly-projecting lugs carried by separate convolutions of said coil member, and means pivotally supported independently of said lugs and adapted to so engage same as to exert a winding pressure successively on separate convolutions of said coil member.

3. In a friction-clutch, the combination with shafting, of a friction-drum carried thereby, a coil member, comprising a plurality of convolutions, operatively connected at one end to said shafting and loosely encircling said drum, and means for exerting a winding pressure successively on a plurality of the convolutions of said coil member, comprising a plurality of independently-pivoted levers, adapted to operatively engage separate convolutions of said coil member, connections between said levers for operating same one in advance of the other, when operated, and means for operating said levers conjointly.

4. In a friction-clutch, the combination with shafting, of a driving-plate carried thereby, a friction-drum carried by said shafting and normally lying at rest, a coil member, comprising a plurality of convolutions, having one end secured to said driving-plate and having its convolutions encircling said friction-drum, a bracket-support extending across said coil member, a plurality of lugs mounted on separate convolutions of said coil member, levers pivotally connected to said bracket adjacent said lugs, means operatively connecting said levers for bringing same successively into engagement with their adjacent lugs, and means for operating said levers.

5. In a friction-clutch, the combination with shafting, of a friction-drum normally lying at rest, a coil member, comprising a plurality of convolutions, operatively connected at its head end to said shafting, loosely encircling said

friction-drum, and having its tail convolution bored to a larger diameter than the remaining convolutions, and means for exerting a positive local winding pressure successively on
5 separate convolutions of said coil member at distant positions longitudinally thereof.

6. In a friction-clutch, the combination with shafting, of a flanged driving-plate formed with an annular recess on its inner face, and
10 provided in its flanged portion with a plurality of niches opening into said recessed portion, of a ring set within said annular recess and provided on its circumferential face with a plurality of ribs, operative within said niches,

buffers within said niches between said ribs 15 and driving-plate, a friction-drum on said shafting, a coil member encircling said drum and connected at one end with said ring, and means for exerting a positive local winding pressure successively on separate convolu- 20 tions of said coil member at distant positions longitudinally thereof.

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

WILLIAM HENRY LINDSAY.

Witnesses:

JNO. McFADZAN,
JOHN W. McCOLL.