(No Model.) 2 Sheets—Sheet 1.

F. P. CANFIELD.

FRICTION CLUTCH.

No. 560,470. Patented May 19, 1896.

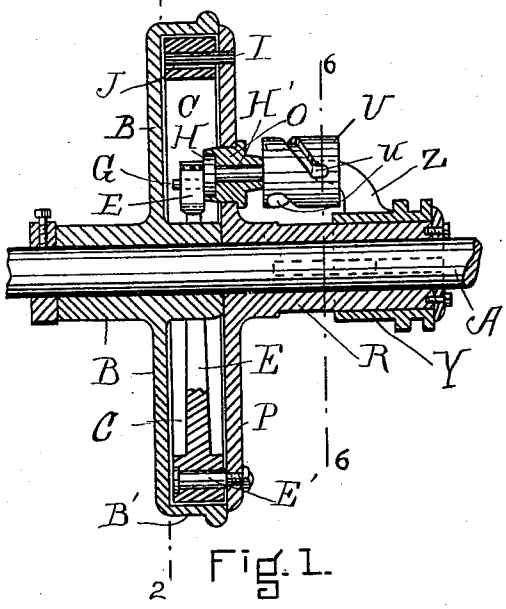

Fig. 1.

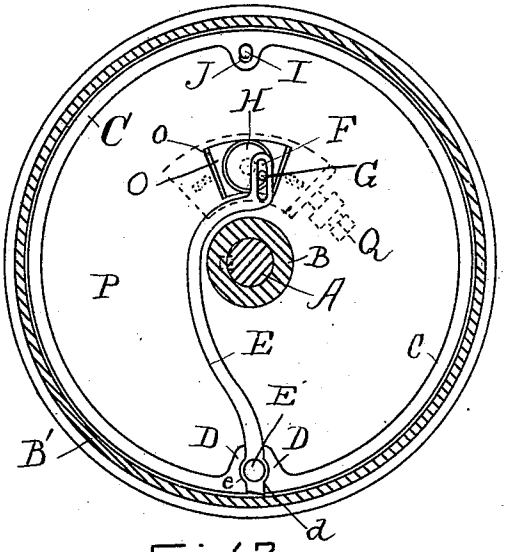

Fig. 2

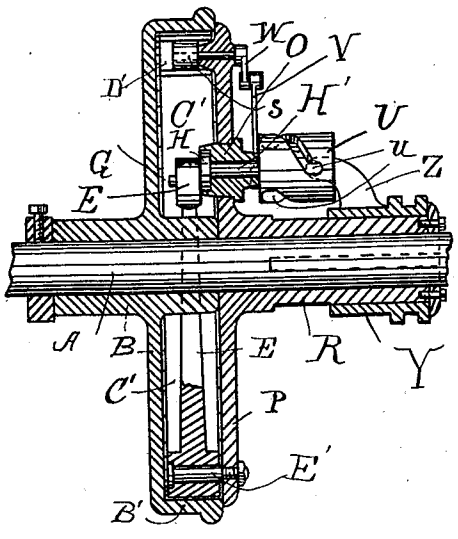

Fig. 3.

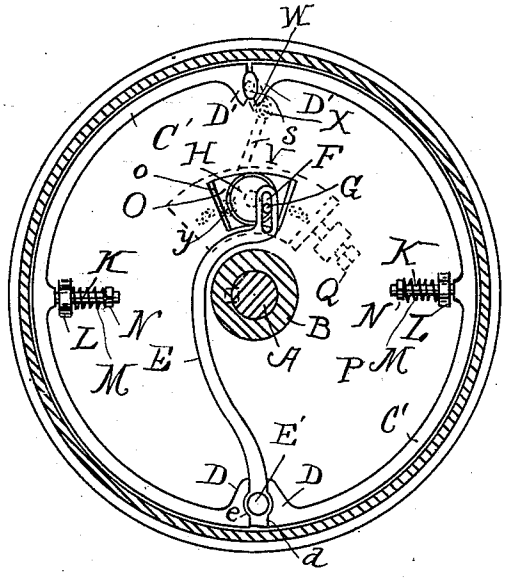

Fig. 4.

WITNESSES.

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(No Model.) 2 Sheets—Sheet 2.

F. P. CANFIELD.

FRICTION CLUTCH.

No. 560,470. Patented May 19, 1896.

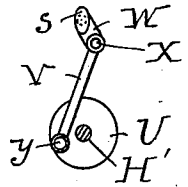

Fig. 5.

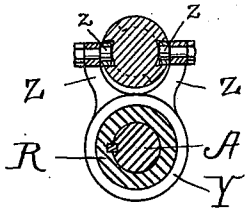

Fig. 6.

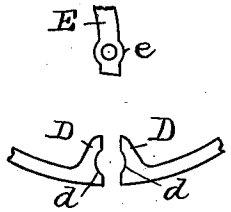

Fig. 7.

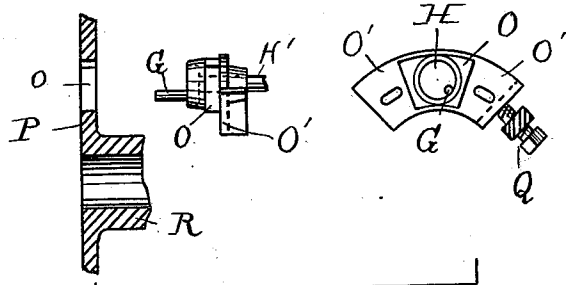

Fig. 8.

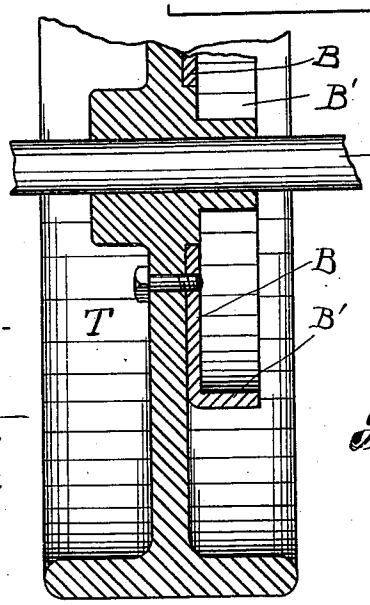

Fig. 9.

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UNITED STATES PATENT OFFICE.

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FRICTION-CLUTCH.

SPECIFICATION forming part of Letters Patent No. 560,470, dated May 19, 1896.

Application filed September 3, 1895. Serial No. 561,213. (No model.)

To all whom it may concern:

Be it known that I, FELIX P. CANFIELD, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Friction-Clutches, of which the following, taken in connection with the accompanying drawings, is a specification.

The object of this invention is to provide an improved friction-clutch adapted to unite frictionally shafts or rotating disks to like parts which are to be put in rotation and to be disconnected when desired. With my devices I employ any ordinary shipping-lever adapted to move some of the parts lengthwise of the shafting or otherwise to actuate the clutch.

My improved clutch belongs to that class in which a yielding expansible ring, severed transversely at one point or at two or more points, is provided with means acting at such points of severance for enlarging such ring, so that its outer or peripheral surface is brought into continuous frictional contact with the interior surface of an annular flange formed on or secured to the disk or pulley to be actuated or engaged. The inherent elasticity of the ring contracts it and relieves the friction when the expanding force is dormant, and such contraction may be aided by springs tending to draw the ring slightly toward the center. The special means devised by me for expanding the ring consists of a lever pivoted between the lips which form the adjacent ends of the ring where severed, its parts adjoining the pivot acting on said lips to press them apart, and the lever-pivot serving to hold the ring in place on the bearing-plate. The long arm of such lever extends in a curve inwardly beyond the shaft and is formed near its end with a slot which receives a crank-pin carried by a short shaft having a partial rotary movement. This movement, effected by suitable means, serves to vibrate said lever and thus to expand the ring or permit its contraction, thereby actuating or releasing the clutch. This short cranked shaft turns in an adjustable housing or proper bearing formed in the disk which carries the lever, and a part of my invention consists in peculiar devices for turning it, comprising a spirally-formed barrel-cam fixed on such shaft and a sliding yoke the arms of which carry studs entering the spiral grooves of the cam and serving to partially rotate it when the yoke is moved lengthwise of the main shaft by the shipping-lever. At each end of each spiral groove is a slight longitudinal extension of it, forming a rest or seat for the actuating-studs, serving to hold the clutch engaged or disengaged.

When the severed ring is formed of a single piece, I make a short transverse slot at a point diametrically opposite to the point of severance, and introduce a guide-pin to assist in holding such ring firmly. Such pin and the pivot of the clutch-lever are mounted on the bearing-plate, the lever having a convex enlargement fitting a curved recess in the lips, so that the ring, whether engaged or at rest, will be concentric with the main shaft, supported against gravitation, and when at rest will be entirely free from frictional strains.

In the modification shown the ring is in two parts with a pivoted spreader acting between the lips at both points of severance, so that increased scope or movement is provided for. One of these spreaders is the lever device already referred to. The other is a short lever similarly pivoted on the bearing-plate and having an oval head working between the lips and a short arm connected by a link or pitman to a crank-pin on the partially-rotating barrel-cam. Each section of the spring-ring has an inwardly-extending stem passing through an eye on the bearing-plate, assisting to anchor the ring thereto, and a spring surrounding said stem between such eye and the terminal nut and tending to hold the section free from contact peripherally.

It should be understood that the construction of the C-shaped spring, whether entire or in two semicircular sections, is such as to keep the lips formed at its ends firmly pressed against the pivot and adjacent parts of the lever which actuates it; also that there is a curved recess in said lips to receive the convex enlargement of the lever surrounding its pivot.

The location of the actuating-lever within the plane of the C-shaped spring avoids any twist and gives firmness. The extension of

this lever to a length exceeding a semidiameter of the loose pulley allows the required pressure to produce a firm contact without undue strain on the parts which actuate the lever. The crank-pin in the lever-slot secures it either outwardly or inwardly in a fixed position against the force of gravity and centrifugal power.

The spiral cam and the cranked shaft which vibrate the slotted lever are mounted in a laterally-adjustable housing controlled by set-screws, so that the frictional grip of the clutch may be increased or decreased by slightly changing the normal position of these parts which control the action of the clutch-lever. The weight of said parts is offset or counterbalanced by that of the lever, which is heaviest where pivoted near the outer margin of the bearing-plate, so that said plate is balanced for rotation.

In the drawings, Figure 1 is a longitudinal section of a friction-clutch embodying my invention and shown mounted upon a continuous shaft for operation. Fig. 2 is a sectional elevation thereof on line 2 2 of Fig. 1, looking to the right. Figs. 3 and 4 are similar views of a modified form of my invention in which the spring-ring is divided and adapted to be expanded at two different points. Fig. 5 is a detail elevation of the additional expanding device therein. Fig. 6 is a transverse section on line 6 6 of Fig. 1, showing the yoke in elevation and its engagement with the grooved cam. Figs. 7 and 8 are details, respectively, of the expanding-lever and lips and of the adjustable housing, as hereinafter described. Fig. 9 illustrates the connection of the flanged disk or clutch-casing to the web or spokes of a larger pulley.

A represents the main shaft, upon which the clutch is mounted. Ordinarily it will be continuous, one member of the clutch being fast and the other loose thereon; but if preferred the shaft may be discontinuous, each section of the shaft having a member of the clutch secured to it, the object being, as usual, to connect and disconnect the parts at will by the action of the clutch mechanism.

B B′ is the clutch shell or casing, adapted to serve also as a tight or loose pulley, as in Figs. 1 to 4, or to be formed as an annulus and bolted to the web or spokes of a pulley, as in Fig. 9. Such shell or casing is formed with a strong annular flange B′ concentric with the shaft, smooth and perfectly circular on its inner face to form a frictional surface and to constitute with the part B one member of the clutch.

C, Figs. 1, 2, and 9, and C′, Figs. 3 and 4, represent a C-shaped spring or transversely-severed expansible ring, forming, with its supporting and actuating devices, the other member of the clutch. This spring-ring is mounted in the plane of and in immediate proximity to the inner surface of the annular flange B′, and when contracted to its normal dormant condition it gives simply clearance to said flange, so that it may revolve without engagement; but when it is expanded by separation of its parts, where severed, its periphery is thereby caused to bear frictionally within said flange and form a powerful clutch.

D and D′ indicate lips or inwardly-extending portions of the spring-ring at its point or points of severance. These lips are formed to receive the spreading device, which acts between them to expand the ring into frictional engagement, or to permit its inherent elasticity to act by contraction in reducing its diameter when the spreading device is dormant and the clutch disengaged. In the form of apparatus shown in Figs. 1 and 2 the spring-ring is severed at one point only, and hence one pair of lips and one spreading device only is required. In Figs. 3 and 4 the ring is in two semicircular parts, with lips at both ends of each part and an additional spreader. The spreading or clutch-actuating device common to both the forms is the vibrating lever E, having a pivot and fulcrum pin E′, securing it in operative position upon the bearing-plate P, which is shown as a broad radial disk integral with a hollow sleeve R, surrounding the shaft A, and adapted to be fixed rigidly thereon, or to be loose thereon if the shell or casing B B′ is made fast. This disk and sleeve support all the clutch mechanism, except the shell or casing, as will be understood.

In addition to its function as fulcrum for the lever E the pivot-pin E′ serves to receive and transmit to the bearing-plate P the frictional strains incident to the use of the clutch, or in other words to anchor the spring-ring in its operative position. Other anchorage and support is shown at a point diametrically opposite thereto in Figs. 1 and 2 by a guide-pin I, passing through a transverse slot J, formed in an enlargement of or eye on the spring-ring, and in Figs. 3 and 4 such anchorage and support is afforded by the pivot of an additional spreader *s* and by pins K, extending inwardly from the sections C′ of the ring through eyes L, formed on the bearing-plate, springs M being applied on said pins between the eyes L and terminal nuts N to draw such sections slightly inward when the clutch is released. These latter devices may be employed also with the continuous spring C shown in Figs. 1 and 2 if preferred.

The actuating-lever E has a convex enlargement *e* at its pivotal point, and the lips D have a concave recess *d*, fitting thereon. (See Fig. 7.) This conformation of the parts serves to hold the spring-ring free from contact with the flange B when the clutch is disengaged and allows it to yield when the vibration of the lever forces the lips apart, the parts of the lever adjacent to the pivot E′ bearing forcibly against said lips.

The lever E is peculiar in form and location, its short arm being very short and its

long arm extending inwardly in a curve beyond the shaft A, and at its extremity having a longitudinal slot F, where power is applied to actuate it. This extension of the long arm beyond the axis gives extra leverage and enables a limited vibrating power to act with great force on the clutch.

G is a crank-pin projecting into the slot F from the cylindrical head H or from an equivalent crank-arm fixed on a partially-rotating shaft H′, mounted in a bearing, as hereinafter described, in the disk or bearing-plate P. The opposite end of this shaft has a barrel-cam or grooved cylinder U fixed upon it, the grooves *u* running in a spiral direction nearly half-way around the cylinder and having a slight longitudinal extension at each end forming a seat for the actuating-studs to lock the cam in each of its two positions for operation of the clutch and for its release.

A sliding sleeve Y, mounted upon the fixed sleeve or hub R of the bearing-plate, is provided with raised arms Z, each having at its extremity an inwardly-extending stud *z*, entering and working in the spiral grooves *u* of the cam U. When the sleeve Y is reciprocated by the operator moving the shipper-lever, which engages in a groove in said sleeve, the studs *z* cause the spiral cam to make a partial revolution, carrying with it the shaft H′ and crank-pin G, thereby actuating the clutch-lever E and engaging or disengaging the clutch, such studs entering the seats formed for them at either end of the stroke and holding the clutch locked or unlocked. I provide also for adjusting the clutch mechanism to compensate for wear or to correct any inaccuracy in normal position of the lever E by mounting the shaft H′ and connected parts in an adjustable housing. (Illustrated in Fig. 8 and in full and dotted lines, Figs. 2 and 4.) An arc-shaped slot *o* is formed in the bearing-plate P to receive the housing-block O in which the shaft H′ is mounted. This housing has lateral extensions O′, having slots to receive the fastening-bolts which normally secure it in position on the plate P. An adjusting-screw Q, bearing against the edge of the extension O′, serves to adjust the position of the housing when the bolts are slackened for the purpose.

Fig. 9 illustrates my clutch-casing B B′ as an annulus bolted to the web of a pulley T, to which the clutch imparts motion when operated, as already described. In this form the sleeve or hub fitting on the shaft is part of the pulley and not of the annulus B B′.

The additional spreader *s* shown in Figs. 3 and 4 in connection with the two-part spring-ring C′ C′ is an oval or elongated block pivoted on the bearing-plate P and having a rigid crank-arm W extending obliquely therefrom. The crank-pin X at the extremity of this arm is joined by a pitman or connecting-rod V to a crank-pin *y*, fixed in the end of the cam U. (See Fig. 5.) These devices give a quick spreading action between the lips D′ D′ of the expansible ring simultaneously with the actuation of the lever E by the same cam.

I claim as my invention—

1. In a split-ring clutch, an actuating-lever pivoted on the bearing-plate and extending inwardly toward the main shaft, and adapted, when operated, to expand the split ring, in combination with a crank-arm to which said lever is pivotally connected, said arm being carried on an axis journaled in the bearing-plate parallel with the main shaft, and means controlled by the shipping-lever for partially rotating said axis and thereby expanding the split ring, substantially as set forth.

2. In a friction-clutch mechanism the shaft A and the flanged disk or pulley B B′ mounted thereon the bearing-plate P and the transversely-severed yielding ring adapted to engage peripherally with the inner surface of the pulley-flange, and formed with inwardly-extending lips where severed, in combination with the lever E pivoted on said bearing-plate between the lips of said severed ring, extending inwardly beyond the axis and having a terminal slot F, and with the crank-pin G working in such slot to vibrate said lever and actuate the clutch, substantially as set forth.

3. In a friction-clutch mechanism, the flanged disk or pulley B B′ and the bearing-plate P, respectively loose and fast on the shaft, the transversely-severed elastic ring C and the actuating-lever E adapted to expand said ring into engagement with said flange, such ring and lever being secured on said plate, in combination with the sliding yoke Y reciprocated by the shipping-lever, the spirally-grooved cam U and its shaft, partially rotatable by engagement of the studs of said yoke with such groove, and the crank-pin G serving to vibrate the lever E and thereby actuate the clutch, substantially as set forth.

4. In a split-ring clutch mechanism, the combination of the sliding yoke Y provided with the studs *z*, *z*, the barrel-cam U supported on said yoke and having the spiral grooves *u*, *u* engaged by said studs *z*, *z*, the shaft H′ on which said cam is fixed, the crank-arm G carried by said shaft H′, the adjustable housing O forming a bearing for the shaft H′ in the bearing-plate, and the lever E actuated by said crank-arm and adapted to expand the ring, substantially as set forth.

5. In a split-ring clutch, the anchorage for the ring on the bearing-plate consisting of the eye L on said plate, the pin K on said ring and extending inwardly through the eye L, and the adjustable spring M, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FELIX P. CANFIELD.

Witnesses:
A. H. SPENCER,
E. S. BEACH.