L. J. CAMPBELL.

CLUTCH.

APPLICATION FILED APR. 27, 1912.

1,048,036.

Patented Dec. 24, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

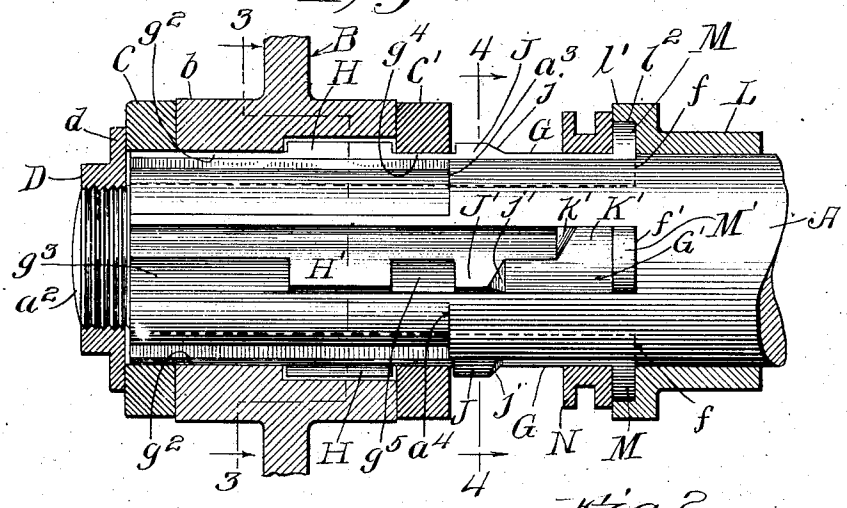


Fig. 2.

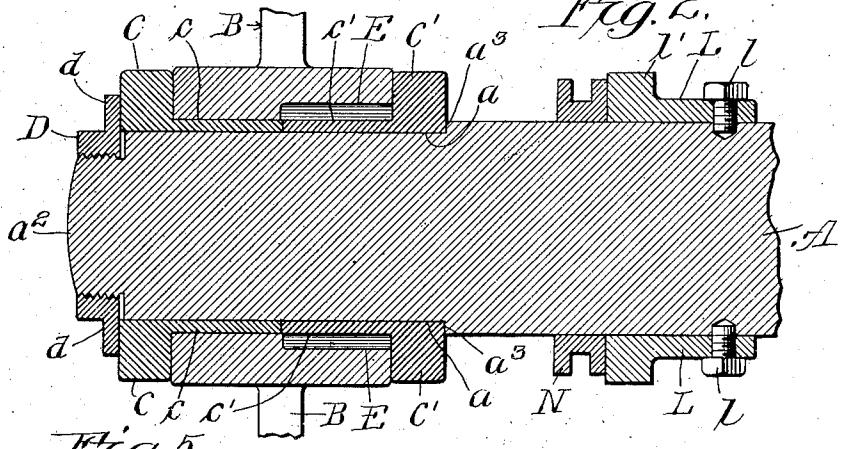


Fig. 5.

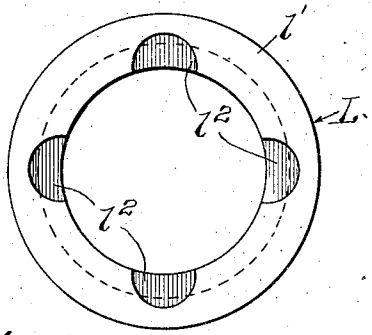
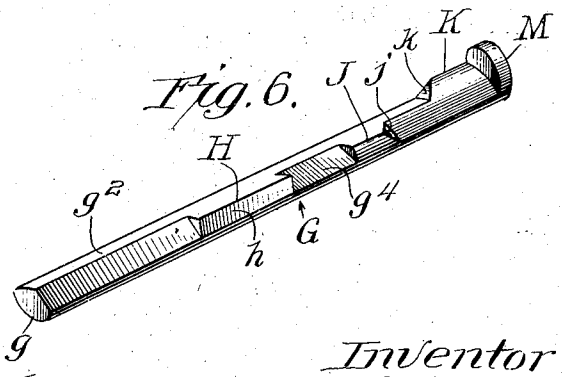


Fig. 6.



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2 SHEETS—SHEET 2.

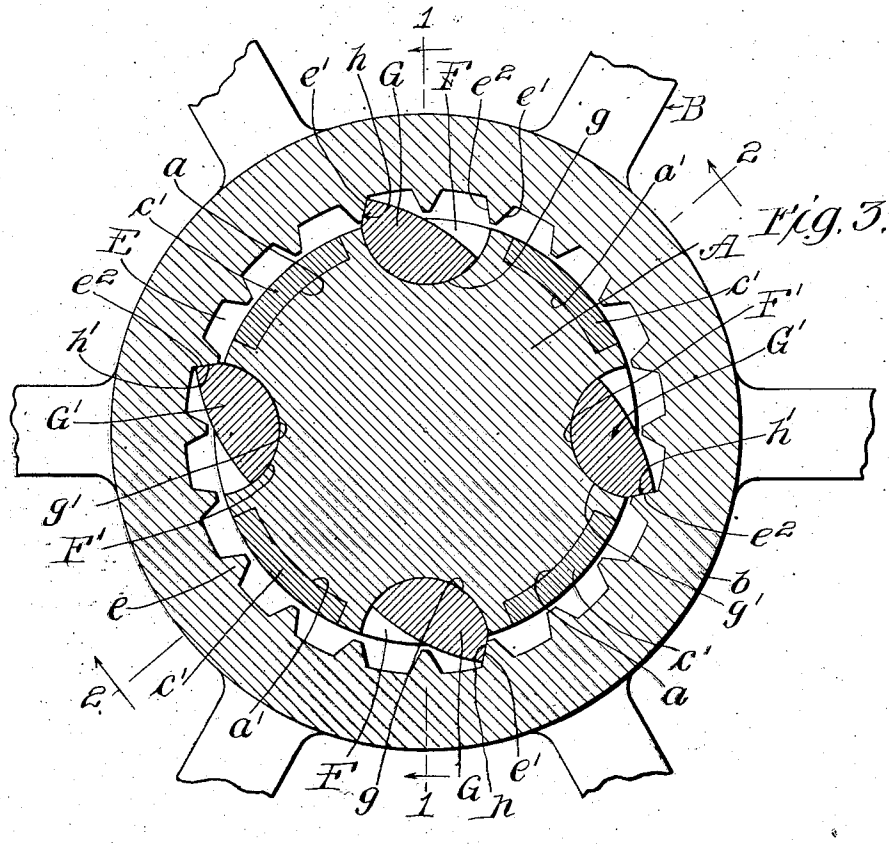

Fig. 3.

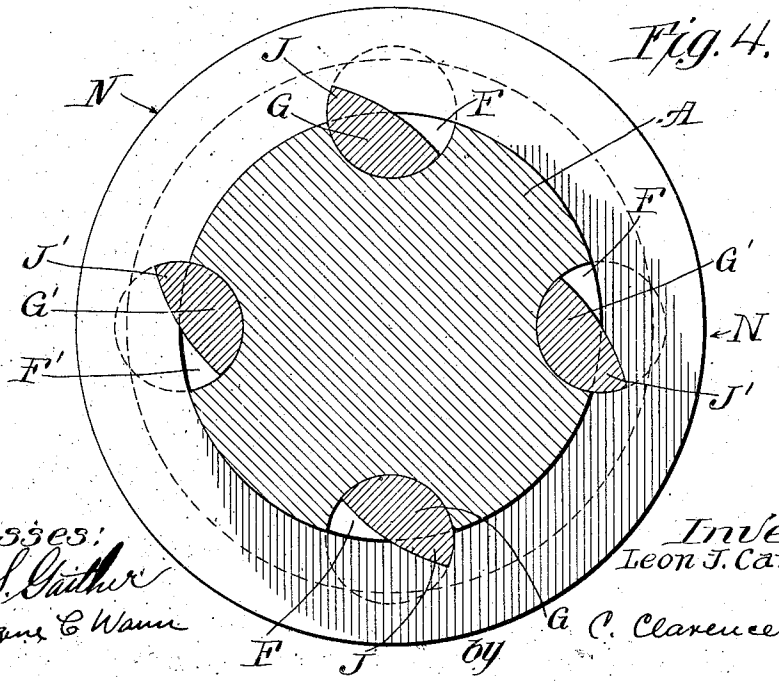

Fig. 4.

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LEON J. CAMPBELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO JAMES T. HEALY, TRUSTEE, OF CHICAGO, ILLINOIS.

CLUTCH.

1,048,036. Specification of Letters Patent. Patented Dec. 24, 1912.

Application filed April 27, 1912. Serial No. 693,549.

To all whom it may concern:

Be it known that I, LEON J. CAMPBELL, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Clutches; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a device in the nature of a clutch particularly adapted for transmission gearing and has for one of its primary objects to provide an improved mechanism for locking or connecting a transmission gear to the transmission shaft upon which it is loosely mounted.

A further object of the invention is to provide an improved mechanism for operating the said means for connecting or locking said gear to its shaft.

The subject-matter of the present invention is particularly applicable to that type of transmission gearing construction shown, described and claimed in my several prior pending applications, to wit: Serial Number 633,699, filed June 17, 1911; Serial Number 640,060, filed January 23, 1911, and Serial Number 601,509, filed January 9, 1911. In said prior applications, the construction shown is such, that the means for locking or connecting the transmission gear to the transmission shaft upon which it is loosely mounted embraces a key adapted to both slide or move endwise with respect to said shaft, and to swing or rock thereon. In the device of the present application, the locking means embraces a key having rocking movement only.

The invention consists in the matters hereinafter described and more particularly pointed out in the appended claims.

In the accompanying drawings illustrating my invention—Figure 1 is a view representing a longitudinal vertical section of the several parts of a transmission gearing device constructed in accordance with my invention, parts thereof being shown in elevation, said section being taken in a plane indicated by the line 1—1 of Fig. 3; Fig. 2 is a view representing in longitudinal section, similar parts, taken in a plane indicated by the line 2—2 of Fig. 3; Fig. 3 is an enlarged, transverse, vertical section, taken in a plane indicated by the broken line 3—3 of Fig. 1; Fig. 4 is a similar section taken in a plane indicated by the line 4—4 of Fig. 1; Fig. 5 is a view in end elevation of the collar or ring secured to the shaft and against which one end of each of the locking keys, to be hereinafter described, abuts; Fig. 6 is a perspective view of one of said locking keys.

Referring to the drawings, illustrating in detail one of the preferred forms of my invention, A indicates a shaft, which may be either a driving or driven shaft, having loosely mounted thereon a gear wheel B, or other power transmitting wheel or member, which is adapted to be locked or connected to the said shaft A, by my improved locking mechanism, to be hereinafter described. As shown in the drawings, said gear wheel B is mounted on the shaft A adjacent to its outer end. In that type of transmission gearing construction set forth in my hereinbefore referred to pending applications, parts corresponding with said shaft A and said gear wheel B, constitute the power transmission shaft and gear wheel, respectively.

The gear wheel B is held from longitudinal movement on the shaft A by means of bearing collars or rings C, C′, between which the hub *b* of the said gear wheel is adapted to rotate. Said collars C, C′ have bearing engagement against the opposite sides of the hub *b* of said gear wheel B. (See Figs. 1 and 2.) The bearing collars C, C′ are each provided with circumferentially spaced laterally extending segmental webs or flanges *c*, *c*′ in alinement with the bores thereof and adapted to fit within similar spaced and shaped longitudinally extending recesses *a*, *a*′ (four being shown in the drawings) formed in the part of the shaft A embraced by the hub *b* of the gear wheel B and opening through the outer end thereof. By means of this construction, the bearing collars C, C′ are held from rotation on the shaft A. As shown in the drawings, especially in Fig. 2 thereof, the flanges or webs *c*, *c*′ abut against each other at their meeting ends and are held in such engagement by a clamp nut D applied to the reduced, screw-threaded outer end a^2 of said shaft A, said nut being provided with an outwardly extending radial, annular flange *d* adapted to bear against the outer face of

the bearing collar C. The inner ends of said recesses a, a' form shoulders a^3, a^4, against which abuts that part of the outer face of the bearing collar C', which is in alinement with the flanges or webs c' thereof. This limits the movement of the bearing collar C' on the shaft A under the clamping force of the nut D. The flanges or webs c, c' hold the bearing collars C, C' apart and prevent the same from binding against the hub b of the gear wheel B under the clamping force of the said nut D. As shown in the drawings, the outer surfaces of the flanges or webs c, c' are flush with the circumferential surface of the shaft A.

Formed in the bore of the gear wheel B is an annular recess E, extending longitudinally of the hub b, and opening through that face of the hub against which the innermost collar C' has bearing engagement. Said collar C' closes the open end of the said annular recess E. Said gear wheel B is provided with internal teeth or projections e forming longitudinally extending, locking shoulders e', e^2 on the wheel. Said teeth e extend the full length of said recess E, and the opposite flat faces of each tooth, which form the shoulders e' e^2, converge inwardly toward the longitudinal axis of said shaft. As shown in the drawings, said faces e', e^2 are arranged at an acute angle to a plane passing centrally and longitudinally through each tooth e. Said internal teeth e are spaced circumferentially at equal distances apart, and are adapted to be engaged by my improved locking device to be presently referred to.

F, F' indicate longitudinally extending, parallel key seats or grooves (four being shown in the drawings, see Figs. 3 and 4), formed in the shaft A between the recesses a, a', said key seats being concave and semi-circular in cross-section. Said key seats F, F' open through the outer end of the shaft A and extend inwardly along the shaft beneath the bearing collars C, C' and gear wheel B to a point beyond the innermost bearing collar C'. All of the key seats F, F' terminate at their inner ends in the same transverse vertical plane and form shoulders f, f', against which abut the inner ends of the locking keys, which constitute a part of my improved locking mechanism.

G, G' indicate locking keys, one for each key seat F, F', mounted to rock or oscillate in said key seats, and extending throughout substantially the full length thereof. Two sets of key seats F and F', and two sets of keys G and G' are employed, in order that the device may be double-acting or lock the gear wheel from turning in both directions on the shaft, as hereinafter more fully set forth. The inner or bearing face g, g' of each of said locking keys G, G' is rounded or formed on an arc of a circle complementary to the said key seats F, F', so as to permit the said locking keys to rock freely in their seats. A portion of the outer or upper surface g^2, g^3 of said locking keys G, G', which lies directly beneath the bearing collar C and the adjacent part of the hub of the gear wheel B, and a portion g^4, g^5 of the same surface of the locking keys which lies directly beneath the bearing collar C' is cut away so that these parts of the locking keys will not project beyond the outer cylindric surface of the shaft in any position of the said locking keys. That portion of the locking keys between the cut away portions g^2, g^3, g^4, g^5, is shaped to form locking bits or lugs H, H', which are curved transversely on their outer faces in the same arc as the circumference of the shaft, so that when the locking keys are rocked in one direction in their seats by the means to be hereinafter described, to bring the locking lugs H, H' into their retracted or non-operative positions, said lugs will be flush with the outer surface of the shaft. When the said locking lugs are in this position, the gear wheel B will turn freely on the shaft. Said lugs H, H' are of a length to enter the recess E, and when the locking keys are rocked in their seats in a direction to swing the lugs H, H' outwardly beyond the cylindric surface of the shaft, each of said lugs will be brought into position to engage and abut against one of the internal teeth e of said gear wheel B, thereby locking said gear wheel to the shaft. As clearly shown in Fig. 3, that part of each locking lug H or H' which contacts with one of the internal teeth e is provided with a flat face or surface h, h' complementary to the face e' or e^2, with which it contacts. By reason of this construction, when either locking lug H or H' is in its locking position, with its surface h or h' in contact with one of the faces e', e^2 of one of the teeth e, the pressure coming on said lug will act in a line oblique to a radial line passing through the center of the shaft and the center of rotation of the locking key, and in a direction to press the opposite curved surface or side of the lug against the concave surface of the key seat F or F', with which said opposite side is in contact, as set forth in my prior application, Serial No. 601,509, filed January 9th, 1911, hereinbefore referred to.

As shown in the drawings, that portion of each locking key G, G' beyond the innermost bearing collar C' is provided with two longitudinally spaced, radially projecting lugs J, J', K, K', the former being adjacent to the cut away portion g^2 or g^3 of said locking key and upon the same side as the locking lug H or H', while the latter is adjacent the inner end of said locking keys and upon the opposite side of the two first-mentioned lugs. The opposed or adjacent corners of the said

lugs J, J′ and K, K′, are beveled or cut at an angle to the length of the locking key to form oppositely inclined cam surfaces *j*, *j′*, *k*, *k′*, the former extending toward the outer end of the locking key while the latter extends in an opposite direction thereto. In other words, each cam surface *k* or *k′* extends in a direction toward the inner end of its respective locking key.

L indicates a retaining ring or collar mounted on the shaft A adjacent to the inner ends of the key seats F, F′ and rigidly secured to said shaft by machine screws *l*. Said collar L is provided at its inner end adjacent to the inner ends of said key seats, with an outwardly extending radial annular flange *l′*, in the inner face of which is formed semi-circular recesses or concave sockets l^2 adapted in connection with the said inner ends of the key seats to receive the cylindric or circular parts M, M′ formed upon the inner end of each of the locking keys G, G′. (See Figs. 1, 4 and 5.) Each of said parts M, M′ is concentric with the longitudinal axis of its locking key. As shown in the drawings, there are four of said concave sockets l^2, one for each locking key. By reason of the construction above described, the inner ends of the locking keys G, G′ are held closely in their respective key seats F, F′, and the concave sockets l^2, with said key seats, form bearings for the circular parts M, M′, during the rocking movement or oscillation of the keys.

The locking keys G, G′ are rocked or oscillated in either direction to bring the locking lugs H, H′ into and out of engagement with the internal teeth or shoulders *e* of the gear wheel B by the action of an endwise slidable ring or collar N, mounted on the shaft A. Said ring or collar N is located between the bearing collar C′ and the key retaining ring L, and is grooved for the reception of the ends of a shifting yoke (not shown) forming part of a manually operable shifting device, which may be of any usual or preferred construction. By sliding the said collar N on the shaft A in either longitudinal direction, said collar will be brought into contact with and will act upon the beveled or cam faces *j*, *j′* or *k*, *k′* on the lugs J, J′ or K, K′, and thereby effect the turning or rocking of the keys in one direction or the other to advance or retract the locking lugs H and H′. The outer or bearing surfaces of the lugs J, J′ and K, K′ are curved transversely, similarly to the like surface of the lugs H, H′, so that the same will be flush with the cylindrical surface of the shaft when the same are turned inwardly into their respective key seats. The said lugs, constructed as above described, permit the collar N to slide over the same, while the contact of said collar with said surfaces will hold the keys from turning when at either limit of their rocking or oscillating movement.

As shown in the drawings, especially in Figs. 3 and 4 thereof, there are four key seats and four locking keys, one for each key seat, two of which are diametrically opposed to each other, and constitute one set of seats F and keys G, while the remaining two are similarly arranged with respect to each other and constitute the other of said sets of seats F′ and keys G′. The locking bits or lugs H on the first set of keys G are oppositely disposed with respect to the lugs H′ of the second set of keys G′, or in other words, are provided with holding or contact faces adapted to act in opposite directions circumferentially of the shaft. From the above, it will be noted, that the locking lugs or bits H, H′, as well as the lugs J, J′ and K, K′ of the respective keys of each set are reversely arranged or are rights and lefts. By reason of this construction and arrangement of the keys, the same are double-acting, that is, the locking lugs H or H′ of one set lock the gear wheel B to the shaft A against rotation in one direction while the locking lugs or bits H or H′ of the other set of keys lock the said gear wheel to the shaft against rotation in the opposite direction.

The operation of my transmission gearing is as follows: When the parts of my device are in the position shown in the several figures of the drawings, the gear wheel B is locked or connected to the shaft A by the locking lugs H, H′ of the locking keys G G′, having their engaging corners or flat faces *h*, *h′* in engagement with one of the correspondingly flat faces *e′*, e^2 of the internal teeth or shoulders *e* of the said gear wheel. As shown in Fig. 3, the locking lugs H, H′ on the diametrically opposed locking keys are reversely arranged or are oppositely disposed with respect to each other. In other words, the engaging edges or corners *h*, *h′*, of each of the diametrically opposed locking keys are on opposite sides of a plane passing through the longitudinal axis of the said locking keys. By reason of this arrangement, the locking lugs H, on one set of diametrically opposed locking keys, engage two of the internal teeth *e* of the gear wheel B, on the faces *e′* thereof, facing the direction of rotation of the said shaft A, while the locking lugs H′, of the remaining two locking keys, engage two other of the said teeth *e*, on their faces e^2, directed against the rotation of said shaft. It follows, therefore, that two of the locking lugs afford driving connection of the said gear wheel with the shaft, while the remaining two locking lugs prevent any back lash or turning of the said gear wheel on the shaft in a direction contrary to the direction of rotation of the said shaft. The said locking keys G, G′ are held with their locking lugs H, H′ in lock-

ing position, by the sliding collar N, bearing on the convex bearing surfaces of the lugs K, K′ of the locking keys. (See Fig. 1.) When the collar N is in this position, the lugs K, K′ are held down, and the locking keys are prevented from turning in their key seats. The opposite lugs J, J′ at this time project above the surface of the shaft in the path of movement of said collar N.

By sliding the collar N from its position shown in the drawings, longitudinally of the shaft A in a direction toward the outer end thereof, or, in other words, toward the bearing collar C′, said collar N will come into contact with the beveled or cam faces *j*, *j*′ on the lugs J, J′ of the locking keys. A continued endwise movement of said collar N will carry the same over said cam faces *j*, *j*′ and rotate or rock the locking keys in their key seats in an opposite direction. This withdraws the locking lugs H, H′ out of the recess E of the gear wheel B and from engagement with the internal teeth *e* thereof. Said collar N then acts on the lugs J, J′ to retain or hold the locking keys in position with their locking lugs retracted or out of engagement with the gear wheel. When the collar N covers the lugs J, J′ of the locking keys, the lugs K, K′ project outside of the surface of the shaft.

The sliding collar N is of such a width that it will be clear of the lugs K, K′ before it acts upon the lugs J, J′. This is also true when the said collar N is moved or shifted in an opposite direction to rock the said locking keys and cause their locking lugs to lock or connect the said gear wheel B to the shaft. Manifestly, to provide for such an operation, the lugs J, J′, K, K′ are spaced apart longitudinally a distance slightly greater than the width of the sliding collar N.

It is obvious from the above description of my invention, that should the shaft A be used as a drivin gshaft, the gear wheel B when locked or connected to the same by the locking lugs, will transmit power from said shaft to a driven shaft, to which the said gear wheel may be connected by an intermeshing gear, or a train of differential gearing. Upon the other hand, should the shaft A be used as a driven shaft, the said gear wheel B, when locked or connected to the said shaft, will transmit power to the same from the driving shaft. In either of the above-mentioned cases, the action of the locking keys is the same; said keys having rocking movement only with respect to the shaft.

In applying my improved locking mechanism to that type of transmission gearing construction set forth in my above-referred to pending applications, in which a number of selective gears are loosely mounted on the transmission shaft, a set of locking keys extending longitudinally of the shaft, will be provided for each of said gears. In this case, a single endwise sliding collar may be arranged to ride over and act upon lugs formed on the keys of the several sets of keys so as to separately lock any one of the gears to, or disconnect it from the transmission shaft.

While I have shown and described herein certain specific features and mechanical details of construction, it will, of course, be understood, that these details of construction and the specific arrangement of parts shown, may be variously modified without departing from the spirit of my invention, and I do not wish to be limited to the same except in so far as pointed out in the annexed claims.

I claim as my invention—

1. A clutch, comprising a shaft, a rotative member mounted on the shaft and provided with an internal locking shoulder, a rocking key extending longitudinally of the shaft and provided with a lug adapted to engage said shoulder, and means movable in a direction endwise of the said shaft and acting on the key to rock the lug into and out of position for engagement with said shoulder and to hold or lock the lug positively in both its engaged and disengaged positions.

2. A clutch, comprising a shaft, a rotative member mounted on said shaft and provided with an internal locking shoulder, a rocking key extending longitudinally of the shaft and provided with a lug adapted to engage said shoulder, said key being provided with two radial projections provided with cam surfaces, and means acting on said cam surfaces to rock the key in opposite directions.

3. A clutch, comprising a shaft, a rotative member mounted on said shaft and provided with an internal locking shoulder, a rocking key extending longitudinally of the shaft and provided with a lug adapted to engage said shoulder, said key being provided with oppositely inclined cam surfaces, and a manually operable member movable endwise of the shaft and adapted to act on said cam surfaces to rotate the key in opposite directions.

4. A clutch, comprising a shaft, a rotative member mounted on the said shaft and provided with an internal locking shoulder, a rocking key extending longitudinally of the shaft and provided with a locking lug adapted to engage said shoulder, said key being provided with two radial projections having oppositely inclined cam surfaces and a ring mounted to slide endwise in the shaft and adapted to engage said cam surfaces for turning the key in opposite directions.

5. A clutch, comprising a shaft having a concave keyway extending longitudinally thereof, a rotative member mounted on the shaft and provided with an internal locking

shoulder, a key seated in said keyway and provided with a locking lug adapted to engage said shoulder and with two radial projections provided with oppositely inclined cam surfaces, and an endwise sliding ring on said shaft adapted for engagement with said cam surfaces to rock the key in opposite directions.

6. A clutch, comprising a shaft having a concave keyway extending longitudinally thereof, a rotative member mounted on the shaft and provided with an internal locking shoulder, a key seated in said keyway and provided with a locking lug adapted to engage said shoulder and with two radial projections provided with oppositely inclined cam surfaces, and an endwise sliding ring on said shaft adapted for engagement with said cam surfaces to rock the key in opposite directions, said key having adjacent to said projections, convex bearing surfaces adapted for contact with the inner surface of said ring to hold the key from turning when the key is at either limit of its rocking movement.

7. A clutch, comprising a shaft having a concave keyway extending longitudinally thereof, a rotative member mounted on the shaft and provided with an internal locking shoulder, a key seated in said keyway and provided with a locking lug adapted to engage said shoulder and with two radial projections provided with oppositely inclined cam surfaces, and an endwise sliding ring on said shaft adapted for engagement with said cam surfaces to rock the key in opposite directions, said key having a circular part concentric with its longitudinal axis of rotation, and a ring surrounding the shaft and provided with a concave socket to receive the said circular part on the key.

8. A clutch comprising a shaft, a rotative member mounted on said shaft and provided with two oppositely facing internal locking shoulders, two rocking keys extending longitudinally of the shaft and provided with reversely arranged locking lugs, and means for giving rocking motion to said keys, adapted to give equal turning movement to said keys in opposite directions.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 24th day of April A. D. 1912.

LEON J. CAMPBELL.

Witnesses:
GEORGE R. WILKINS,
EUGENE C. WANN.