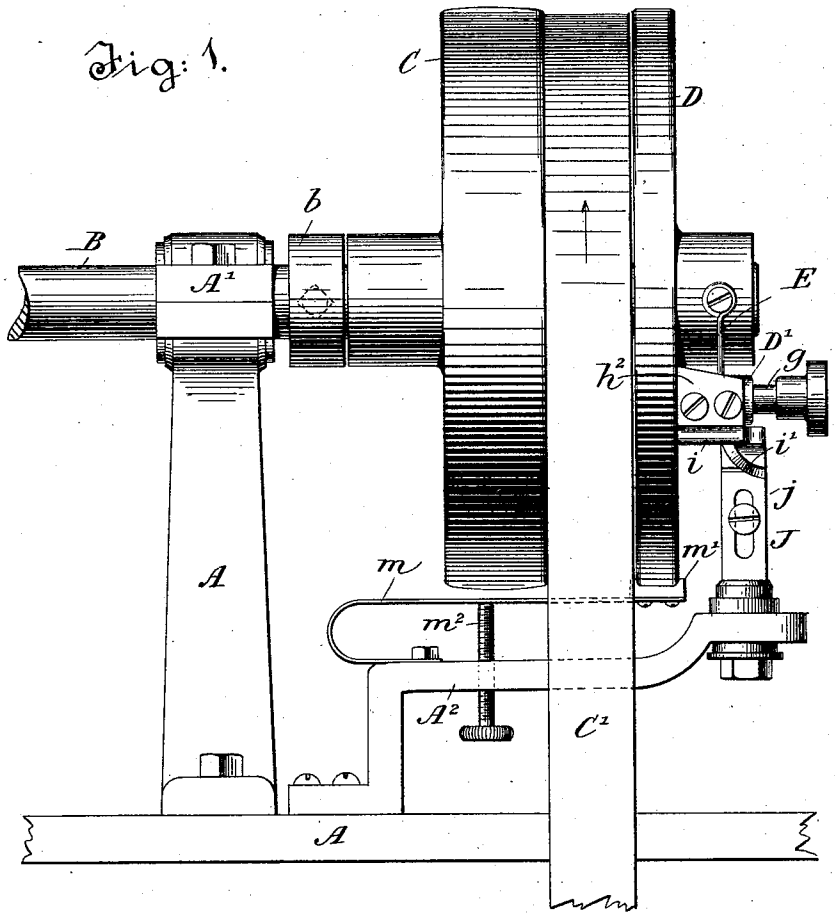
(No Model.) 4 Sheets—Sheet 1.

G. BENDER.

CLUTCH.

No. 477,985. Patented June 28, 1892.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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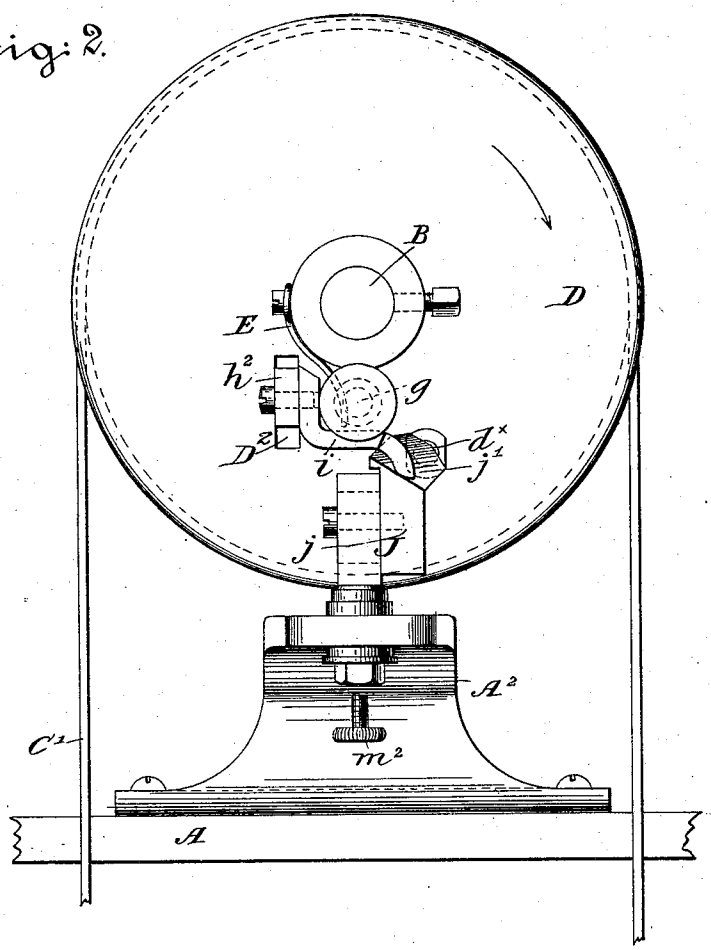
CLUTCH.

No. 477,985. Patented June 28, 1892.

Fig: 2.



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(No Model.) 4 Sheets—Sheet 3.

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CLUTCH.

No. 477,985. Patented June 28, 1802.

Fig: 3.

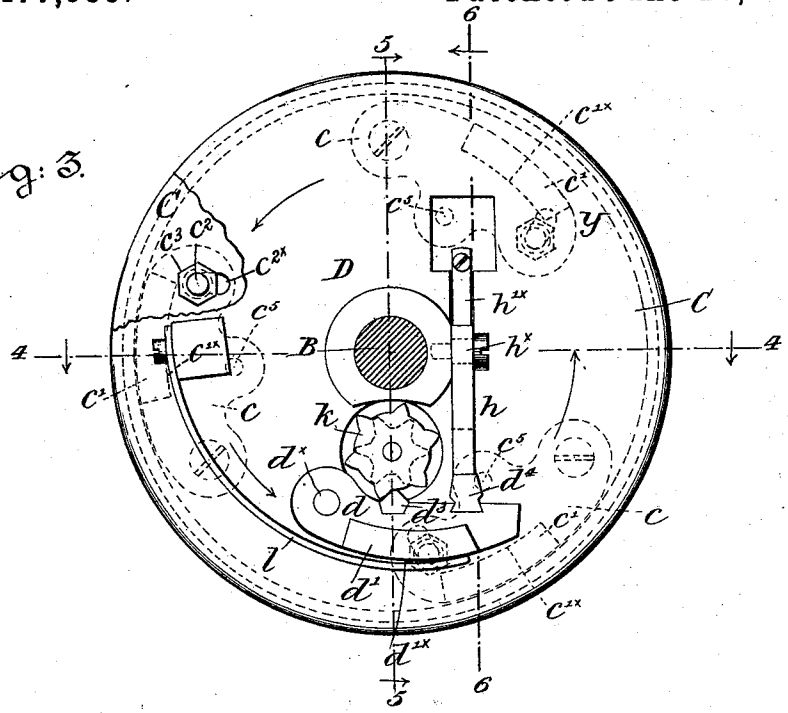
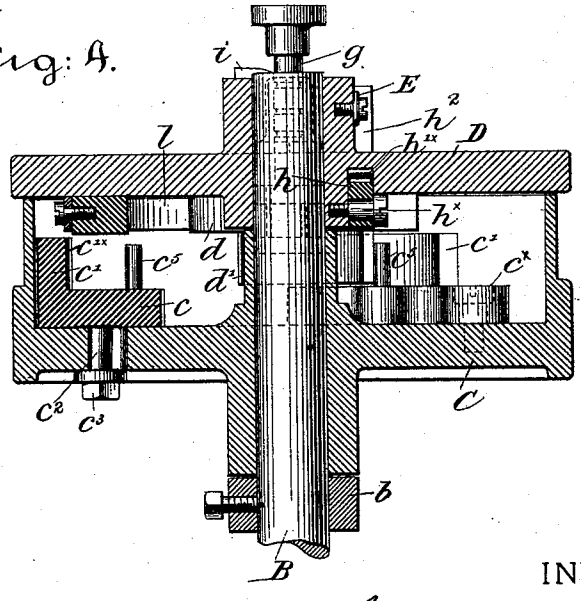


Fig: 4.



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(No Model.) 4 Sheets—Sheet 4.

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CLUTCH.

No. 477,985. Patented June 28, 1892.

Fig: 5.

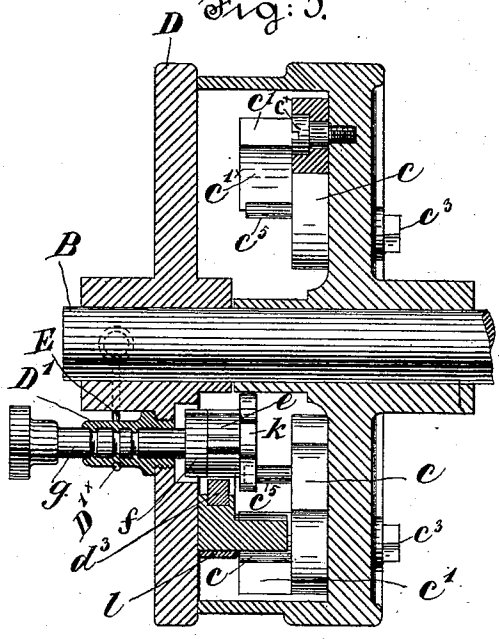


Fig: 6.

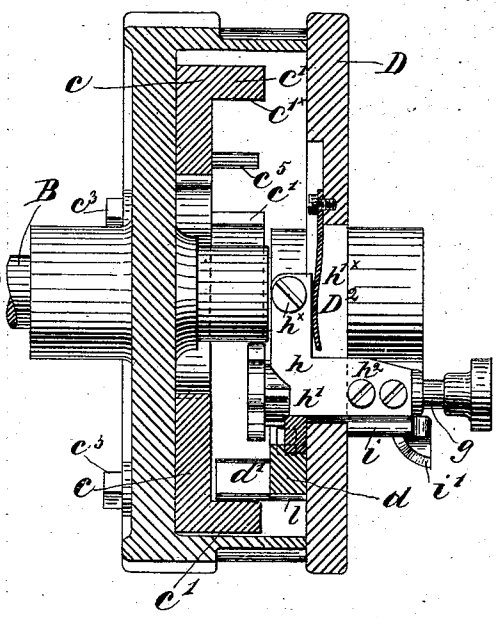


Fig: 7.

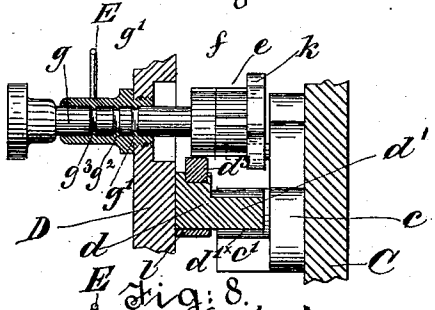


Fig: 8.

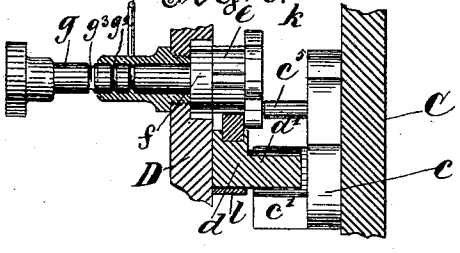
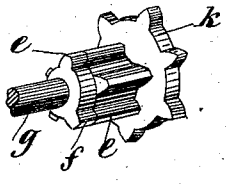


Fig: 9.



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UNITED STATES PATENT OFFICE.

GEORGE BENDER, OF BROOKLYN, NEW YORK.

CLUTCH.

SPECIFICATION forming part of Letters Patent No. 477,985, dated June 28, 1892.

Application filed February 18, 1891. Serial No. 381,824. (No model.)

To all whom it may concern:

Be it known that I, GEORGE BENDER, a citizen of the United States, residing at Brooklyn, Kings county, New York, have invented certain Improvements in Automatically-Operating Positive Friction-Clutches, of which the following is a specification.

My invention relates in the main to that class of friction-clutches which are positive in their action and do not depend altogether upon the friction between the two clutch-surfaces for their action, but wherein said surfaces positively engage one another, friction being employed only to lessen the noise and strain caused by the impact between the moving suface and the stationary surface at the moment of starting of the machine or driven shaft.

The object of my invention is in part to provide a friction-clutch of this general character which shall be both noiseless and positive in its action and which shall be especially applicable to so-called "stop-motions" or mechanisms such as are employed to stop the rotating cam-shaft or driving-shaft of various machines—such as type-casting, button-making machines, &c.—while some operation not requiring the working of said machine or its elements is in progress, such as the cooling of the molten material, &c.

My invention also contemplates means whereby said clutch may be rendered operative or inoperative automatically, according as the operation of the machine may require, as well as the provision of means of adjustment whereby said clutch may be rendered operative or inoperative during different times and at different times in the revolution of the shaft.

My invention will be hereinafter fully described, and its novel features carefully defined in the claims.

In order that my invention may be the better understood, I have illustrated in the accompanying drawings a part of the frame of some machine to which my improvements have been applied, but have omitted all parts of such machine which are not connected therewith directly in order to render said drawings as simple as possible.

Figure 1 of said drawings is a side view of my improved automatically-operating friction-clutch. Fig. 2 is a front view of the same. Fig. 3 is a view similar to Fig. 2, but looking in the opposite direction, the frame being removed; and Fig. 4 is a cross-section on line 4 4 in Fig. 3, looking downward. Fig. 5 is a section on line 5 5 in Fig. 3, and Fig. 6 is a similar section on line 6 6 in Fig. 3. Figs. 7, 8, and 9 are detail views showing the parts in different positions, which will be hereinafter referred to.

In the drawings, A represents the machine-frame, herein shown in part only, as said frame may be of any construction, or may be a part of the frame of the machine to which my improvements are applied. Journaled in bearings at A′ on this frame is the machine-shaft B, which bears at its projecting free end the elements of the clutch, herein shown in the form of tight and loose pulleys D and C, respectively. These pulleys, as herein shown, are constructed of a solid web and periphery, the loose pulley or driving element C being hollowed out on that face which lies next to pulley or disk D in order to form an inclosing casing for the working parts therein. The driving element C is somewhat wider than pulley D, being recessed about its periphery in order to receive a belt C′ from a counter-shaft below, (not shown,) and in order to prevent said driving element C from working lengthwise along shaft B, I prefer to provide said shaft with a set-collar *b*. Pulley D is keyed or otherwise secured to the end of shaft B in order that the two may rotate together. On the inner face of the driving element C are pivoted three clutch blocks or shoes *c c*, which are all exactly alike both in form and operation, and as only one of these blocks is in operation at one time I will describe but one of them, setting forth hereinafter the difference in operation when two or three are in action from that where but one is in action. The block *c* consists, as herein shown, of a flat metal plate of sufficient strength to sustain the strain upon it at the starting of the machine-shaft, and is pivoted at $c^{\times}$ to the solid web of element C, being provided with a screw-threaded shank c^2 on that side which lies against said web, which shank projects through a slot $c^{2\times}$ in the web and receives a set-nut c^3 outside for setting the block in position on the web of the pulley. When the block is to be set in its operative position, the set-nut c^3 is loosened and the block *c* allowed to fall the length of

the slot in which the screw-threaded shank c^2 plays toward the pulley-boss, and then said nut c^3 is tightened; but when the block is to be set in its inoperative position the said nut is set at the outer end of said slot $c^{2\times}$. From the inner face of the shoe c or that side facing pulley D projects a stout stud or pin c^5, the operation of which will be explained hereinafter, and from the same side thereof projects a stout clutch-shoe c', provided with a smooth curved bearing or clutch-face $c'^{\times}$, which face is on that side of shoe c' nearest the pulley-axis. The curve of said surface $c'^{\times}$ when the block is set in its inoperative position is concentric with the curved periphery of the driving element or pulley C, but when said block is in its operative position said surface is eccentric to said periphery, said block falling from its pivot $c^{\times}$ as a center.

On the inner hollowed face of pulley D is pivoted a second clutch block or member d of the clutch, which is very similar in form to the blocks c and is pivoted at $d^{\times}$ to the web of the pulley D. This block d is also provided with a clutch or bearing surface $d'^{\times}$, the curve of which corresponds with the curve of the surface $c'^{\times}$ on shoe c, but which is, however, on the outer side of shoe d' or that side facing surface $c'^{\times}$ when the shoes are in engagement. On the inner face of block d is secured a rounded nose of hardened steel by preference, which, when said block is in its operative position, rests between two adjacent teeth of one or the other of two toothed wheels e and f. A spring l, secured to a suitable projection cast on the inner face of the web of pulley D, serves to keep the block d pressed down normally with its nose d^3 between said teeth. The wheels e and f are secured on the inner end of a stem g, and these wheels, together with a six-toothed star-wheel k, are all secured together, so that the rotation of one will impart a corresponding movement to all. Said star-wheel k is arranged when the parts are set in their operative position in the path of the studs c^5 on block c, so that as said block passes around during the rotation of the driving element C it will through its stud c^5 impart one-sixth of a revolution to star-wheel k for purposes to be explained. The stem g passes through the web of pulley D and through an inclosing sleeve D′ thereon and is adapted to be set in or out at varying positions for purposes of adjustment, which I will hereinafter describe.

In order to secure stem g in position when set, it is provided at the proper points along its length with three annular grooves g' g^2 g^3, which coincide as the stem is pushed in or drawn out with an opening or saw-cut $D'^{\times}$ in the wall of sleeve D′. A spring E, secured on the boss of pulley D, is arranged to bear at its free end in said opening $D'^{\times}$ and in that one of the grooves on stem g which may be beneath it, thus holding said stem firmly in place while allowing it to be drawn out or pushed in by merely raising the end of said spring. When said stem is pushed in, so as to present groove g^3 beneath said opening, the nose of the block d will rest between the teeth of wheel e, and when said stem is drawn out, so as to present groove g^2 beneath said opening, the nose d^3 will rest between the teeth of wheel f. When the stem is drawn out to its fullest extent, the star-wheel k will be withdrawn out of the path of the studs c^5, and said studs will pass around during the rotation of the driving element without actuating the mechanism.

On its outer end, beyond the nose d^3, the clutch-block d is provided with a depending finger or projection d^4, which is arranged in the path of the upper end of a lever or lifter h, pivoted at $h^{\times}$ on the boss of pulley D, the upper end of which is kept pressed in or toward the driving element C by a leaf-spring $h'^{\times}$, set on the casing and arranged to bear under said lever beyond the pivot $h^{\times}$ thereof. Said upper arm h' of lever h is of an L shape, and its angular portion h^2 projects out through an opening D^2 in the web of pulley D and bears on its outer side a tripper-plate or buffer i, provided with an inclined volute bearing-surface i', which as the pulley D rotates strikes upon an inclined bearing-plate j, fixed on a bracket J on frame A. The bearing-surface j' of plate j is inclined or beveled in the opposite direction to the surface i' on buffer i, and consequently as the pulley D rotates the two surfaces j' and i' will contact, and buffer i will be drawn out laterally away from pulley D by reason of such inclines compressing spring $h'^{\times}$ within said pulley.

I will now describe the operation of the devices, premising that only one of the blocks c is in its operative position, the other two being set up concentrically with the periphery of the driving element C, as seen in Fig. 2.

Rotary motion is imparted to the driving element from the counter-shaft (not shown) through the medium of the belt C′. As said element rotates (in the direction of arrow x in Fig. 2) the block c (seen at y, this being the one set in its operative position) moves around until its pin c^5 impinges against one of the teeth of the six-toothed star-wheel k on stem g. This star-wheel being secured to the wheels e and f, said stem g being, as represented in Fig. 5, set so as to bring wheel e, which has six teeth also, under the nose d^3, said wheel k, together with wheel e, will be rotated one-sixth of a revolution, raising said nose, as seen in full lines in Fig. 2. The upper end of the lifter h will now be pressed under the projecting finger d^4 on block d, said lifter having previously been prevented from passing under said finger by the lowered position of block d. Said block will now be upheld in its elevated position by the lifter h, and as the shoe c' is brought around by the continued rotation of the element C the bearing-surface $c'^{\times}$ thereof will impinge upon the bearing-surface $d'^{\times}$ of shoe d', and the pulley D will also

be put into rotary motion. The elasticity of the parts will allow the surfaces $c'^{\times}$ and $d'^{\times}$ to slide over one another, and this sliding motion, or rather the friction between said surfaces before the positive final engagement of the shoes, will to a great extent reduce the noise and strain of the working parts. Now the pulleys and of course the shaft B move around together for a full revolution or until the tripper i comes into contact with plate j, when the opposite inclines on said parts will draw the end h^2 of lever h outward from the face of pulley D, compressing spring $h'^{\times}$ until the upper end h' of said lever passes out of the plane of the arm d^4 on the block d, when said block will fall by the pressure of the spring l thereabove, the nose d^3 again entering between the next two teeth of wheel e, as will be readily understood. Now, the shoes c' and d' being no longer in engagement, the rotation of pulley D and shaft B will cease; but in order to insure the immediate cessation of the motion of pulley D and shaft B after the shoes have been disengaged I prefer to provide the brake device illustrated in Fig. 1, wherein a leaf-spring m, bent into a U shape and secured at one end to a tie-bar A^2 of frame A, bears at its free end a brake-shoe m', which presses elastically upon the periphery of pulley D at all times, and in order that the pressure of said shoe m' may be adjusted to a nicety I prefer to provide an adjusting-screw m^2, which passes through said bar A^2 and presses at its tip against the free end of spring m. When all three of said blocks c are set in operative position, the operation will be as follows: The driving element C will first communicate one entire revolution to pulley D and shaft B, then there will be a stop in the motion of said shaft of one-third of a revolution, then a complete revolution, then a stop of one-third of a revolution, then a complete revolution, and, finally a stop of one-third of a revolution. When but two of the shoes are in their operative positions, there will first be communicated to shaft B one complete revolution, then a stop of a third of a revolution, then another full revolution, and then another stop of two-thirds of a revolution. When all three shoes are set in their inoperative positions, of course there will be no rotary motion imparted to shaft B.

In order to further vary the movements imparted to shaft B, I have provided the stem g, bearing the two wheels e and f, before referred to. The wheel e, as before stated, has six teeth, and its function is to raise the block d each time the stud c^5 passes around and actuates the star-wheel k; but the wheel f has only three teeth, although these teeth are of the same length as the teeth of wheel e. When the stem g is pushed in so as to bring wheel f under the nose d^3, the duration of the stop in the shaft B will be increased one full revolution, as will be readily understood, for said wheel having but three teeth the pin c^5 at the time of first actuating star-wheel k will only serve to bring the next tooth on said wheel up to the nose d^3, but will not serve to carry it thereunder in order to set the shaft in motion. At the next full revolution, however, the tooth of wheel f being up against the nose d^3, said tooth will be carried under said nose, raising the latter and allowing the lifter h to be pressed by its spring in under finger d^4, whereby the block d is held in its raised position and the shoes will engage and shaft B receive rotary motion.

Of course I do not wish to be understood as limiting myself to any particular number or arrangement of the blocks c or any particular number or arrangement of the teeth of the wheels e and f, as these may be varied according as the working of the machine to which my invention is applied may require.

The form of the parts herein shown is not essential to my invention, particularly that of pulley C and disk D. The construction herein illustrated, however, is especially adapted for the purpose for which it is designed, said pulley and disk forming a convenient inclosing casing for the working parts. However, this casing may be dispensed with and the clutch members be secured directly to the respective shafts in some cases; nor do I wish to be understood as limiting myself to that particular device herein shown for engaging and disengaging the clutch-shoes automatically; but that illustrated herein I believe to be the best adapted for automatically operating said clutch-shoes. However, I may employ means other than automatic for this purpose.

Having thus described my invention, I claim—

1. In a positive friction-clutch, the combination, with the driving element provided with one member or shoe of the clutch, of the driven or machine shaft provided with the other member or shoe of the clutch, said shoes being provided with eccentrically-set clutch-faces, substantially as described, and moving and adapted to engage one another in a path at right angles to the axis of rotation, and means, substantially as described, for throwing said shoes into or out of engagement, substantially as and for the purposes set forth.

2. In a positive friction-clutch, the combination, with the driving element provided with one set of shoes or members of the clutch, of the driven or machine shaft provided with the other member or shoe of the clutch, said shoes being provided with eccentrically-set clutch-faces, substantially as described, and moving and adapted to engage one another in a path at right angles to the axis of rotation, means, substantially as described, for setting either of the shoes on the driving element into or out of operative position, and means, substantially as described, for throwing said shoe on the driven shaft into or out of operative position, substantially as and for the purposes set forth.