No. 656,853. Patented Aug. 28, 1900.

D. NOBLE.

FRICTION CLUTCH.

(Application filed Mar. 21, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 3.

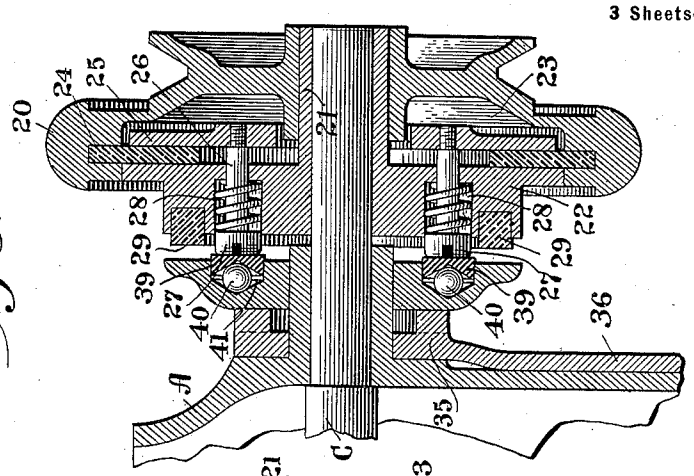


Fig. 2.

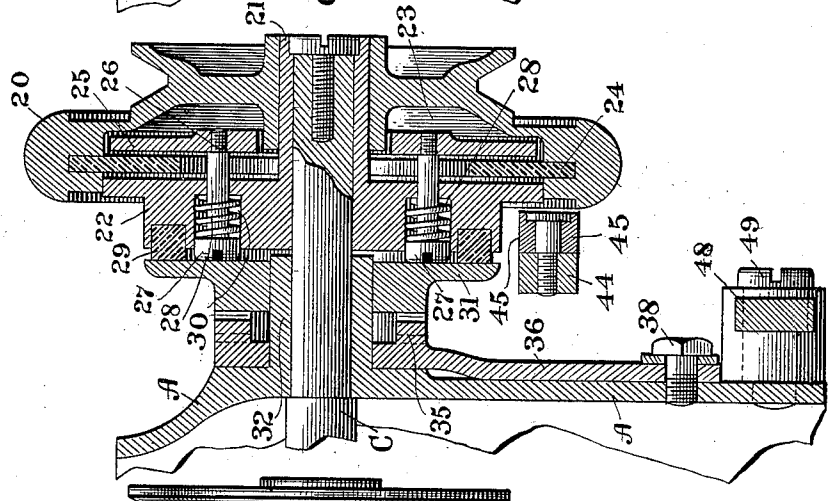
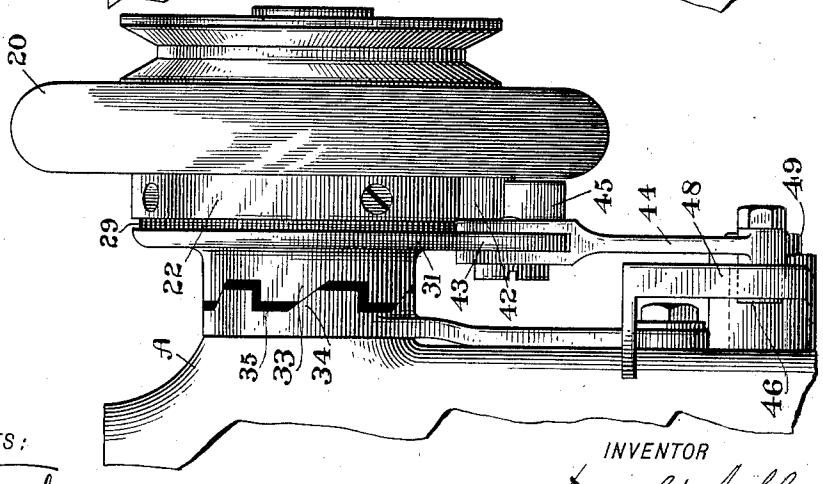


Fig. 1.



WITNESSES:

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(No Model.) 3 Sheets—Sheet 2.

Fig. 5.

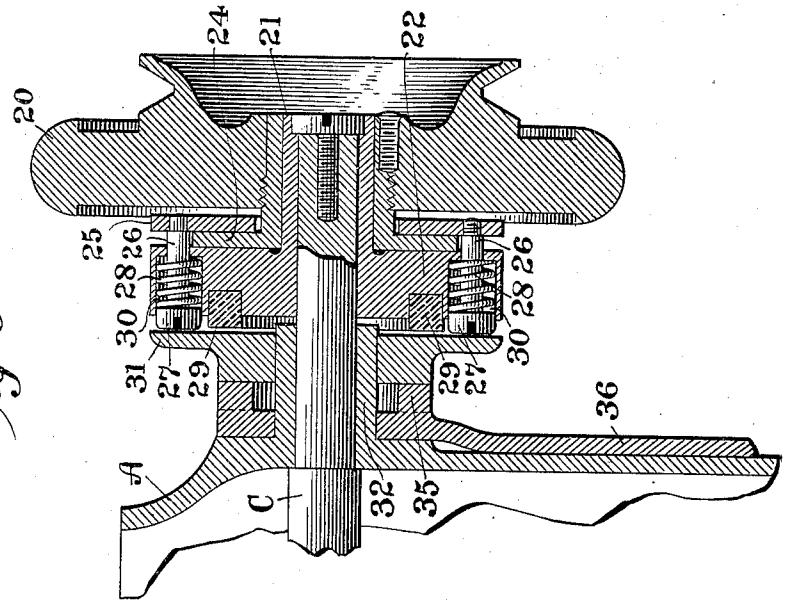
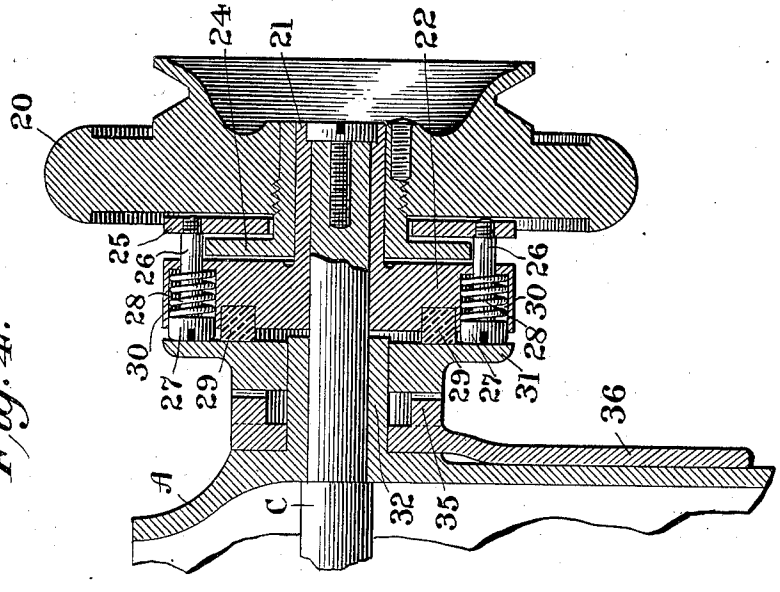


Fig. 4.



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(Application filed Mar. 21, 1900.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 6.

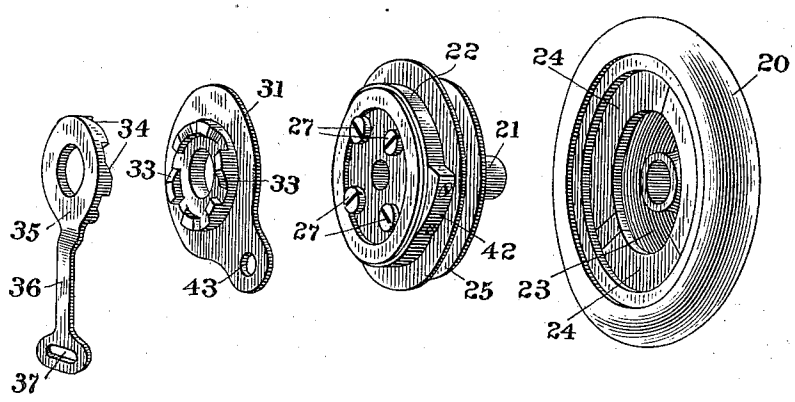


Fig. 7.

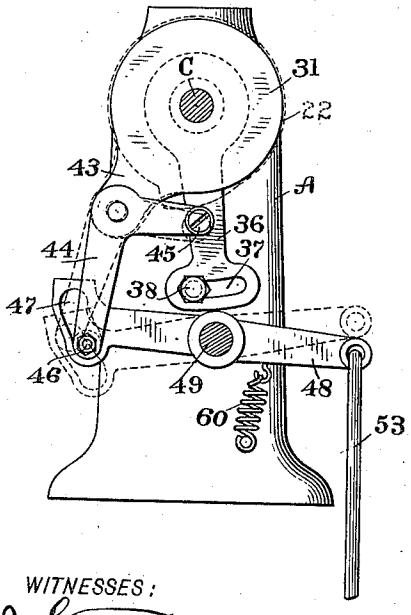
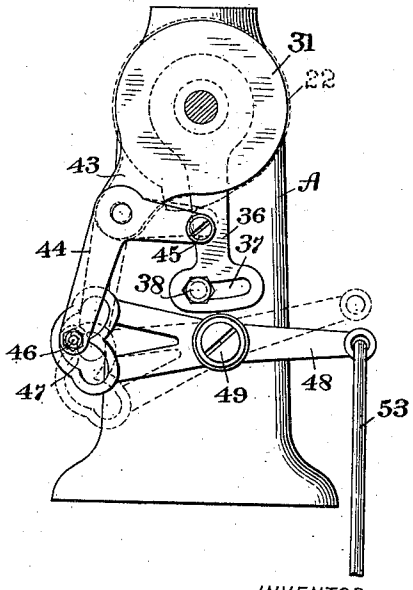


Fig. 8.



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UNITED STATES PATENT OFFICE.

DONALD NOBLE, OF LONDON, ENGLAND, ASSIGNOR TO THE WHEELER & WILSON MANUFACTURING COMPANY, OF BRIDGEPORT, CONNECTICUT.

FRICTION-CLUTCH.

SPECIFICATION forming part of Letters Patent No. 656,853, dated August 28, 1900.

Original application filed November 10, 1899, Serial No. 736,465. Divided and this application filed March 21, 1900. Serial No. 9,529. (No model.)

To all whom it may concern:

Be it known that I, DONALD NOBLE, a subject of the Queen of Great Britain, residing at Nos. 11 to 21 Paul street, Finsbury, London, E. C., England, but temporarily residing at Bridgeport, Fairfield county, Connecticut, have invented a new and useful Friction-Clutch, of which the following is a specification.

My invention relates to the class of friction-clutches illustrated and described in Letters Patent to Rossiter and Noble, No. 611,512, dated September 27, 1898, and has for its object to further improve the construction therein set forth, my present application being a division of my pending application, Serial No. 736,465, filed November 10, 1899.

With this end in view I have devised the simple and novel friction-clutch which I will now describe, referring to the accompanying drawings, forming part of this specification, and using reference characters to designate the several parts.

Figure 1 is an edge view of a driving-pulley, illustrating the application thereto of my novel friction-clutch, the parts being in the normal or releasing position—that is, a position in which the pulley will run free, the shaft remaining stationary; Fig. 2, a sectional view, the parts being in the releasing position, illustrating a form of my invention having an inwardly-extending friction-ring; Fig. 3, a sectional view corresponding with Figs. 1 and 2, the parts being in the engaging position, said view also showing a slight modification in the details of construction; Fig. 4, a sectional view, the parts being in the releasing position, illustrating a form of my invention having an outwardly-extending friction-ring; Fig. 5, a sectional view corresponding with Fig. 4, the parts being in the engaging position; Fig. 6, a perspective corresponding with Figs. 1 and 2, illustrating the driving-pulley and the parts comprising the clutch mechanism detached; and Figs. 7 and 8 are views in elevation, the driving-pulley being removed and the shaft in section, illustrating slightly-variant forms of clutch-operating mechanism.

An important feature of novelty in my present construction is that I provide automatic brake mechanism which stops the rotation of the driving-pulley when the latter is released, the momentum of the driving-pulley being utilized in applying the brake thereto after the release, so that the brake is in practice applied with a force proportional to the momentum of the driving-pulley, thereby insuring the stoppage of the driving-pulley at a definite and predetermined position and without shock or jar.

A denotes framework, which is not of the essence of my invention and may be of any ordinary or preferred construction or design, C, a shaft journaled therein, and 20 a driving-pulley loose on said shaft or in the present instance loose upon a sleeve 21, integral with or fixed to a clutch-disk 22, which is itself rigidly secured to the shaft. Power is applied to drive this pulley in any suitable manner, as by a belt. (Not shown.)

23 in the form illustrated in Figs. 2, 3, and 6 denotes a recess in the inner face of the driving-pulley, and 24 in both forms a friction-ring which may be of any suitable material, as leather or metal, and may extend inward, as in Figs. 2, 3, and 6, or outward, as in Figs. 4 and 5.

25 denotes a movable clutch-disk lying on the inner side—*i. e.*, the right side, as shown in the drawings—of the friction-ring, so that in practice the friction-ring carried by the driving-pulley lies between the movable clutch-disk and clutch-disk 22, which is fixed to the shaft. The movable clutch-disk is rigidly secured to and is carried by bolts or rods 26, which extend past the friction-ring and through clutch-disk 22 and whose heads 27 project from the face of said disk 22, as clearly shown in the drawings.

28 denotes springs bearing against the under sides of heads 27 and against clutch-disk 22 and normally acting to draw movable clutch-disk 25 outward—*i. e*, toward the left, as shown in the drawings—so that friction-ring 24, carried by the driving-pulley, will be gripped between movable clutch-disk 25 and clutch-disk 22, and the shaft to which said disk 22 is fixed will be carried by the driving-pulley. In the present instance I have shown the springs 28 as seated in recesses 30 in clutch-disk 22.

29 denotes a brake-ring, made of leather or other suitable material, which projects from the face of clutch-disk 22.

In use the movable clutch-disk is moved toward the right to release the friction-ring upon the driving-pulley by means of a brake-disk 31, the face of which is adapted to engage heads 27. This brake-disk is loose relatively to the shaft (in the present instance it is mounted on a fixed sleeve 32) and is adapted to oscillate thereon and at the same time to move laterally thereon. This movement of the brake-disk is effected by means of inclines 33, formed thereon, which are adapted to engage corresponding inclines 34 on a disk 35, also concentric with the shaft, which is fixed to the machine. In the present instance I have shown disk 35 as provided with an arm 36, having at its outer end a slot 37, through which a bolt or screw 38 passes to lock the part in place, the slot being provided in order that the fixed inclines may be adjusted to compensate for wear in use. If preferred, a loose ring 39 may be interposed between the brake-disk and heads 27. This ring, as shown in Fig. 3, may rest upon balls or rollers 40 in a race 41 between the ring and the brake-disk. In use the parts being in the engaging position, as in Figs. 3 and 5, when the brake-disk is turned slightly inclines 33 will ride up the inclines 34, so that in addition to its axial movement the brake-disk will be moved laterally against heads 27, forcing said heads and clutch-disk 25 toward the right away from the friction-ring, and thereby releasing the friction-ring from its engagement by clutch-disks 22 and 25 and disconnecting the shaft from the driving-pulley. It will be understood that the first action of the brake-disk as it is moved toward the right is upon heads 27 to effect the release of the shaft from the driving-pulley. An instant later, however, the brake-disk comes in contact with brake-ring 29, which projects from the face of clutch-disk 22, and stops the rotation of said clutch-disk and the shaft. The brake-disk is actuated to release the shaft from the driving-pulley and stop the rotation of the shaft and also to connect said driving-pulley with the shaft in the manner which I will now describe.

42 denotes a cam-incline extending outward from the periphery of clutch-disk 22, the function of which I shall presently explain.

43 denotes an arm extending from the periphery of the brake-disk, to which a brake-lever 44 is pivoted. This brake-lever is in shape a bell-crank lever, one arm of said lever carrying a roller 45, which is adapted to engage cam-incline 42, and the other arm carrying a roller 46, which is adapted to engage a cam-slot 47 in an operating-lever 48, fulcrumed on a stud 49. Operating-lever 48 may be actuated by hand or mechanically, as preferred. In Figs. 7 and 8 I have illustrated constructions in which the operating-lever is actuated by means of a rod 53, which may extend to a treadle, hand-lever, or any suitable device. (Not shown in the drawings, as it is not of the essence of my invention.) In Fig. 7 I have illustrated a form in which the operating-lever is retained in the normal or releasing position by means of a spring 60, which acts to raise the end of the operating-lever in which the cam-slot 47 is formed, as shown in full lines in said figure, this position of the parts corresponding with the position of clutch-disks 22 and 25 in Figs. 2 and 4—that is to say, the position in which friction-ring 24, carried by the driving-pulley, is not gripped by the clutch-disks and the shaft remains stationary. To communicate motion to the shaft, it is simply necessary to throw the operating-lever from the position shown in full lines in Fig. 7 to the position shown in dotted lines in said figure. The effect of this oscillation of the operating-lever is to oscillate the brake-lever and brake-disk 31 and through the action of springs 28 and bolts 26 to cause the inclines 33 on the brake-disk to ride down fixed inclines 34, so that the brake-disk, as seen in Figs. 1, 2, and 4, will move slightly toward the left away from the brake-ring, said springs and bolts 26 causing movable clutch-disk 25 to clamp the friction-ring on the driving-pulley between itself and clutch-disk 22 on the shaft, so that the latter will be carried by the driving-pulley. (See Figs. 3 and 5.) So long as the operating-lever remains in the position shown in dotted lines in Fig. 7, roller 46 on the brake-lever being at the upper end of the cam-slot and roller 45 just out of engagement with cam-incline 42 on clutch-disk 22, the shaft will be carried by the driving-pulley, this inoperative position of roller 45 being clearly shown in dotted lines in Fig. 7 and also in full lines in Fig. 8. The instant, however, that the operating-lever is released spring 60 will move said lever from the position shown in dotted lines in Fig. 7 to the position shown in full lines in said figure, which will place roller 46 at the lower end of cam-slot 47 and will place roller 45 in position to be engaged by the cam-incline, this being the position of the parts in Figs. 1, 2, and 4, as well as the full-line position in Fig. 7.

In order to understand the operation which results from moving the operating-lever from the position shown in dotted lines in Fig. 7 to the position shown in full lines in said figure—*i. e.*, a change from the engaging position of Figs. 3 and 5 to the releasing position of Figs. 1, 2, and 4—it should be borne in mind that in the dotted position in Fig. 7 roller 45 upon the brake-lever is just outside the line of movement of cam-incline 42 on clutch-disk 22. Oscillation of the operating-lever, however, oscillates the brake-lever through the engagement of roller 46 with cam-slot 47 and places roller 45 in the full-line position in Fig. 7—*i. e.*, within the line of movement of the cam-incline. It follows, therefore, that the instant roller 45 is placed in this position it will be engaged by the cam-

incline, the natural effect of which would be to move roller 45 outward again. Owing to the fact, however, that the arm of the brake-lever which carries roller 45 is locked against direct outward movement by the engagement of roller 46 on the other arm of said lever with the lower end of the cam-slot in the operating-lever, the result is that the engagement of the cam-incline with roller 45 imparts a toggle movement to the brake-lever toward the right, as seen in Fig. 7, and will through the connection of arm 43 with the angle thereof oscillate the brake-disk and cause inclines 33 to ride up the fixed inclines, the effect of which is to move the brake-disk slightly toward the right from the position in Figs. 3 and 4 against the power of springs 28, so that clutch-disk 25, carried by bolts 26, will be moved away from the friction-ring on the driving-pulley, and said friction-ring will be released from its engagement by said clutch-disk and clutch-disk 22, leaving the shaft disconnected from the driving-pulley. The instant this release of the shaft is effected the rotation of the shaft will be stopped through the engagement of the brake-disk with brake-ring 29, which projects from the face of clutch-disk 22, the action of the inclines being to press the brake-disk against this brake-ring with a force proportional to the momentum of clutch-disk 22. This utilization of the momentum of clutch-disk 22 to stop its own rotation when it is in a certain definite position will be readily understood from the fact that cam-incline 42, by which the brake-disk is actuated through the brake-lever, is a fixed part of said clutch-disk 22. The momentum of said clutch-disk is communicated to the brake-lever through the engagement of the cam-incline thereon with roller 45 on said lever, and the brake-lever in turn oscillates the brake-disk, and inclines 33 and 34 move said disk laterally with more or less force against the brake-ring on clutch-disk 22, carried by the shaft. The machine is started again by another oscillation of the operating-lever—*i. e.*, throwing said lever from the position shown in full lines in Fig. 7 back to the position shown in dotted lines in said figure. This movement imparts a toggle movement to the brake-lever toward the left, as seen in Fig. 7, owing to the fact that roller 45 is still in engagement with the cam-incline on disk 22, as clearly indicated in full lines in Fig. 7. The effect of this last-described oscillation of the brake-lever is to again oscillate the brake-disk and permit springs 28, which press the heads 27 of bolts 26 against the brake-disk, to cause the inclines on the brake-disk to ride down the fixed inclines, moving said brake-disk laterally toward the left and again causing clutch-disk 25, carried by said bolts, to clamp the friction-ring upon the driving-pulley between said clutch-disk and clutch-disk 22, so that the movement of the driving-pulley will be communicated to the clutch-disks and the shaft. The instant clutch-disk 22 commences to rotate the cam-incline will move roller 45 out of the engaging position—*i. e.*, to the position shown in dotted lines in Fig. 7—in which position it will remain until it is again placed in the engaging position by an oscillation of the brake-lever, in the present instance through the action of spring 60 and the operating-lever. This last oscillation of the brake-lever oscillates the brake-disk in the opposite direction again. The inclines move it laterally toward the right, and the brake-disk by engagement with the heads 27 of bolts 26 moves clutch-disk 25 toward the right and releases the friction-ring upon the driving-pulley, the rotation of the clutch-disks and the shaft being stopped, as before, at the required position and without shock to the machine by the engagement of the brake-disk with the brake-ring.

It will of course be understood that in the form illustrated in Fig. 7 the parts will remain in the engaging position—that is, the shaft will be carried by the driving-pulley so long as the operating-lever remains in the position shown in dotted lines—and that to stop the rotation of the shaft the operator allows the spring 60 to return the operating-lever to the position shown in full lines, for example, by removing his foot from or relieving pressure upon a treadle. The form illustrated in Fig. 8 differs from the other form only in that cam-slot 47 consists of a double incline instead of a single incline. In this form the clutch mechanism will be in the engaging position only when the operating-lever is in the position shown in full lines in said figure. When the parts are in this position, oscillation of the operating-lever in either direction will place the clutch mechanism in the releasing position and stop the rotation of the shaft. This form is adapted to be used with a rocking treadle. When the operator desires to connect up his machine or a shaft to which my novel clutch is applied, he places the treadle in a horizontal position, roller 46 being at the mid-position in cam-slot 47, and retains it there so long as he wishes the machine or shaft to run. Movement of the treadle in either direction will now stop the machine and the return movement will start it again. Where it is required to stop and start the machine or shaft quickly, complete movement of the operating-lever—that is to say, a movement that will change roller 46 from one end of slot 47 to the other—will start the machine and also stop it, and the return movement of the treadle will start and stop it again.

Having thus described my invention, I claim—

1. A friction-clutch comprising a driving-pulley having a friction-ring, clutch-disks on opposite sides of said friction-ring, bolts by which one of said clutch-disks is carried and which pass through the other clutch-disk, means whereby said clutch-disks are caused

to grip the friction-ring and an oscillatory laterally-movable disk adapted to engage the bolts whereby the clutch-disks are caused to release the friction-ring.

2. A friction-clutch comprising a driving-pulley having a friction-ring, clutch-disks on opposite sides of said friction-ring, bolts by which one of said clutch-disks is carried and which pass through the other clutch-disk, springs which normally cause the clutch-disks to grip the friction-ring and an oscillatory laterally-movable disk adapted to engage the bolts whereby the clutch-disks are caused to release the friction-ring.

3. A friction-clutch comprising a loose driving-pulley having a friction-ring, clutch-disks on opposite sides of said friction-ring, one of which is fixed to the shaft to be carried and the other carried by bolts passing through the fixed clutch-disk, springs which normally cause the movable clutch-disk to grip the friction-ring and an oscillatory laterally-movable disk adapted to engage the bolts whereby the clutch-disks are caused to release the friction-ring.

4. A friction-clutch comprising a driving-pulley having a friction-ring, clutch-disks on opposite sides of the friction-ring, one of which is movable relatively to the other, springs which normally cause the clutch-disks to grip the friction-ring, an oscillatory laterally-movable disk by which the clutch-disks are caused to release the friction-ring and which is provided on its outer face with inclines, fixed inclines corresponding therewith and means for oscillating said laterally-movable disk.

5. A friction-clutch comprising a driving-pulley having a friction-ring, fixed and movable clutch-disks on opposite sides of said ring, springs which cause the clutch-disks to grip the friction-ring, an oscillatory laterally-movable disk 31 by which the clutch-disks are caused to release the friction-ring and which is provided with inclines, a disk 35 provided with corresponding inclines, means for adjusting said disk to compensate for wear and means for oscillating disk 31.

6. A friction-clutch comprising a driving-pulley having a friction-ring, fixed and movable clutch-disks on opposite sides of the friction-ring, said fixed clutch-disk having on its outer face a brake-ring, means for causing the clutch-disks to grip and release the friction-ring, and an oscillatory laterally-movable brake-disk which engages the brake-ring to stop the rotation of the clutch-disks when said disks release the friction-ring.

7. A friction-clutch comprising a driving-pulley having a friction-ring, clutch-disks on opposite sides of the friction-ring, one of which is movable relatively to the other, the outer clutch-disk having on its outer face a brake-ring, springs which normally cause the clutch-disks to grip the friction-ring and an oscillatory laterally-movable brake-disk by which the clutch-disks are caused to release the friction-ring and which engages the brake-ring to stop the rotation of the clutch-disks when the friction-ring is released.

8. A friction-clutch comprising a driving-pulley having a friction-ring, clutch-disks on opposite sides of the friction-ring, the inner clutch-disk being movable relatively to the outer, and the latter having on its outer face a brake-ring, springs which normally cause the clutch-disks to grip the friction-ring, a brake-disk having inclines upon its outer face, corresponding fixed inclines engaged thereby and means for oscillating the brake-disk whereby the clutch-disks are caused to release the friction-ring and their rotation is stopped by engagement of the brake-disk with the brake-ring.

9. A friction-clutch comprising a driving-pulley having a friction-ring, a clutch-disk 22 lying on the outer side of the friction-ring, a movable clutch-disk on the inner side of the friction-ring, bolts by which the movable clutch-disk is carried and which pass the friction-ring and engage the fixed clutch-disk and are provided with heads 27, springs bearing against said heads and the fixed clutch-disk whereby the friction-ring is normally gripped between the clutch-disks and an oscillatory laterally-movable disk lying in contact with said heads whereby the movable clutch-disk is caused to release the friction-ring.

10. The combination with a shaft and a driving-pulley loose thereon and having a friction-ring, of fixed and movable clutch-disks both of which are carried by the shaft, said fixed clutch-disk having on its outer face a brake-ring and said movable clutch-disk being carried by bolts which pass the friction-ring and engage the fixed clutch-disk, springs bearing against the bolt-heads and the fixed clutch-disk and an oscillating laterally-movable brake-disk which by engagement with the bolt-heads causes the movable clutch-disk to release the friction-ring and an instant later by engagement with the brake-ring stops the rotation of the fixed clutch-disk and the shaft.

11. The combination with a shaft, a driving-pulley loose thereon and carrying a friction-ring, a clutch-disk fixed to the shaft, a movable clutch-disk lying on the opposite side of the friction-ring and bolts by which the movable clutch-disk is carried, of a brake-disk adapted to engage the bolt-heads, for the purpose set forth, a ring 39 between the bolt-heads and the brake-disk and a ball-race and balls which support ring 39.

12. The combination with a shaft, a driving-pulley loose thereon and fixed and movable clutch-disks which lie on opposite sides of the pulley and both of which move with the shaft, of a brake-disk and means for imparting oscillatory and lateral movement thereto whereby the driving-pulley may be gripped and released and the rotation of the shaft stopped.

13. The combination with a driving-pulley

having a friction-ring, clutch-disks 22 and 25, said clutch-disk 22 having on its periphery a cam-incline, and springs which normally cause the clutch-disks to grip the friction-ring, of an oscillatory laterally-movable disk 31 by which the clutch-disks are caused to release the friction-ring and which is provided with an arm 43, an operating-lever having a slot 47 and a brake-lever pivoted to arm 43, one arm of said brake-lever being adapted to be engaged by the cam-incline and the other to engage slot 47.

14. The combination with a driving-pulley having a friction-ring, clutch-disks 22 and 25 on opposite sides of the friction-ring, said clutch-disk 22 having on its periphery a cam-incline and on its outer face a brake-ring and springs which normally cause the clutch-disks to grip the friction-ring, of oscillatory laterally-movable disk 31 having an arm 43, an operating-lever having a slot 47 and a brake-lever pivoted to arm 43, one arm of said brake-lever being adapted to be engaged by the cam-incline and the other to engage slot 47, whereby when the operating-lever is in such position that the brake-lever will engage one end of the slot the other arm of said brake-lever will be retained out of engagement with the cam-incline and the clutch-disks will grip the friction-ring, and when the operating-lever is oscillated to place the brake-lever in engagement with the other end of the slot the other arm of said brake-lever will be placed in position to be engaged by the cam-incline, which imparts a toggle movement to the brake-lever and an oscillatory and lateral movement to disk 31 and causes the clutch-disks to release the friction-ring and stops the rotation of the clutch-disks by engagement with the brake-ring.

15. The combination with a shaft, a driving-pulley loose thereon, clutch-disk 22 fixed to the shaft and having on its periphery a cam-incline, an oscillatory brake-disk having an arm 43 and inclines 33, fixed inclines corresponding therewith, and devices coacting with disk 22 and the brake-disk to connect and disconnect the shaft and driving-pulley and to stop the rotation of the shaft when released, of an operating-lever having a cam-slot, a brake-lever to which arm 43 is pivoted and one arm of which is provided with a roller 45 adapted to engage the cam-incline and the other with a roller 46 engaging the cam-slot, so that when roller 46 is in the engaging position in the cam-slot roller 45 will be out of the path of the cam-incline and when roller 46 is in the releasing position in the cam-slot roller 45 will be in position to be engaged by the cam-incline, the action of the operating-lever when moved in either direction being to actuate the brake-lever with a toggle movement which in turn oscillates the brake-disk.

16. The combination with a disk 22 having on its periphery a cam-incline, an oscillatory laterally-movable brake-disk, an independent driving-pulley and clutch and brake mechanism controlled by the brake-disk, of an operating-lever having a cam-slot, and a brake-lever to which the brake-disk is connected, one arm of said brake-lever being adapted to engage the cam-incline and the other to engage the cam-slot, oscillation of the operating-lever in either direction imparting a toggle movement to the brake-lever and oscillating the brake-disk, so that clutch-disk 22 and the driving mechanism are connected and disconnected and said disk is stopped when released.

17. The combination with a disk 22 having on its periphery a cam-incline and an oscillatory laterally-movable brake-disk, of an operating-lever having a cam-slot, a brake-lever to which the brake-disk is connected, one arm of said brake-lever being adapted to engage the cam-incline and the other to engage the cam-slot and clutch and brake mechanism intermediate the brake-disk and disk 22, substantially as and for the purpose set forth.

18. The combination with a disk 22 having on its periphery a cam-incline, an oscillatory laterally-movable brake-disk and clutch and brake mechanism intermediate the brake-disk and disk 22, of a brake-lever to which the brake-disk is connected, one arm of said brake-lever carrying a roller 45 adapted to engage the cam-incline and the other arm carrying a roller 46, an operating-lever having a cam-slot engaged by roller 46, said cam-slot having engaging and releasing positions for said roller and a spring 60 normally acting to hold the operating-lever in such a position that roller 46 will be in the releasing position in the cam-slot.

19. In a device of the character described the combination with a shaft and a driving-pulley loose thereon and having a recess in its inner face and a friction-ring extending into said recess, of fixed and movable clutch-disks carried by the shaft, an oscillating laterally-movable brake-disk and connections intermediate the movable clutch-disk and the brake-disk for the purpose set forth.

20. In a device of the character described the combination with a shaft, a driving-pulley loose thereon and carrying a friction-ring and a clutch-disk fixed to the shaft, one side of which carries a brake-ring the other lying in contact with the friction-ring, of a movable clutch-disk lying on the opposite side of the friction-ring, a brake-disk, connections intermediate the brake-disk and the movable clutch-disk and means for actuating the brake-disk so that the friction-ring will be alternately gripped and released and when released rotation will be stopped by engagement of the brake-disk with the brake-ring.

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

DONALD NOBLE.

Witnesses:
A. M. WOOSTER,
S. W. ATHERTON.