No. 883,266. PATENTED MAR. 31, 1908.

J. F. WILKINSON.

STARTING CLUTCH.

APPLICATION FILED APR. 19, 1907.

3 SHEETS—SHEET 1.

Fig. 1

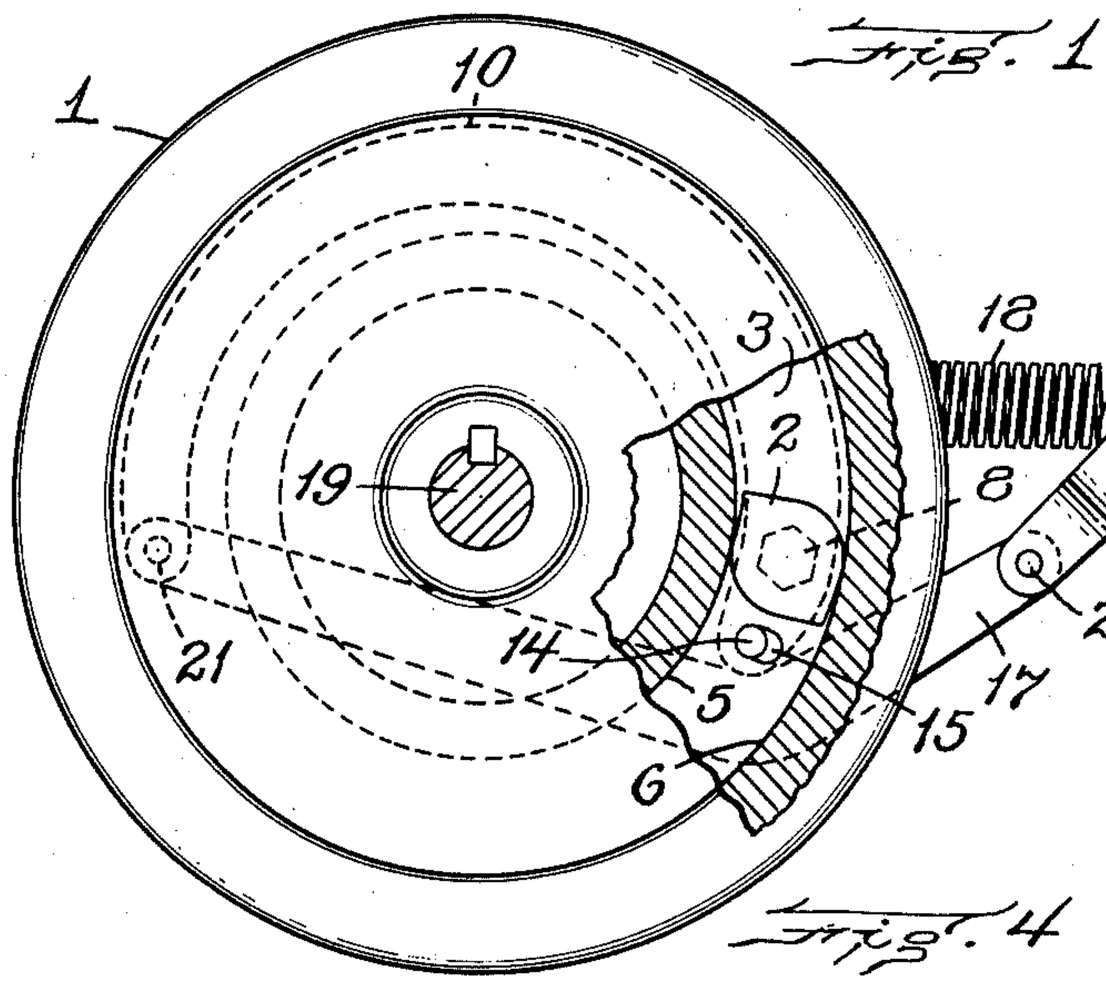


Fig. 3

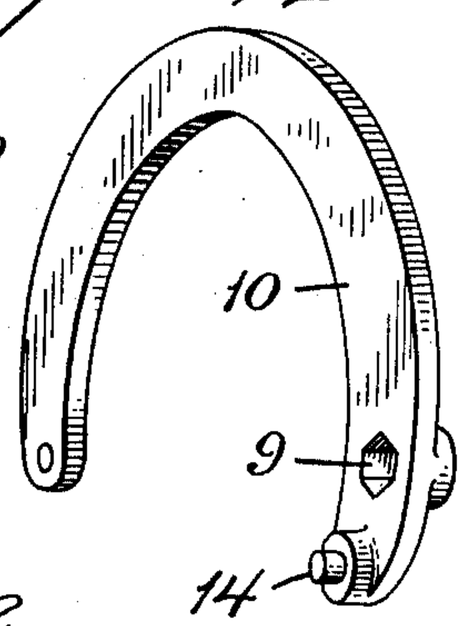


Fig. 4

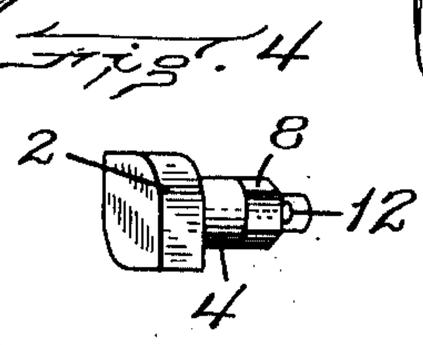
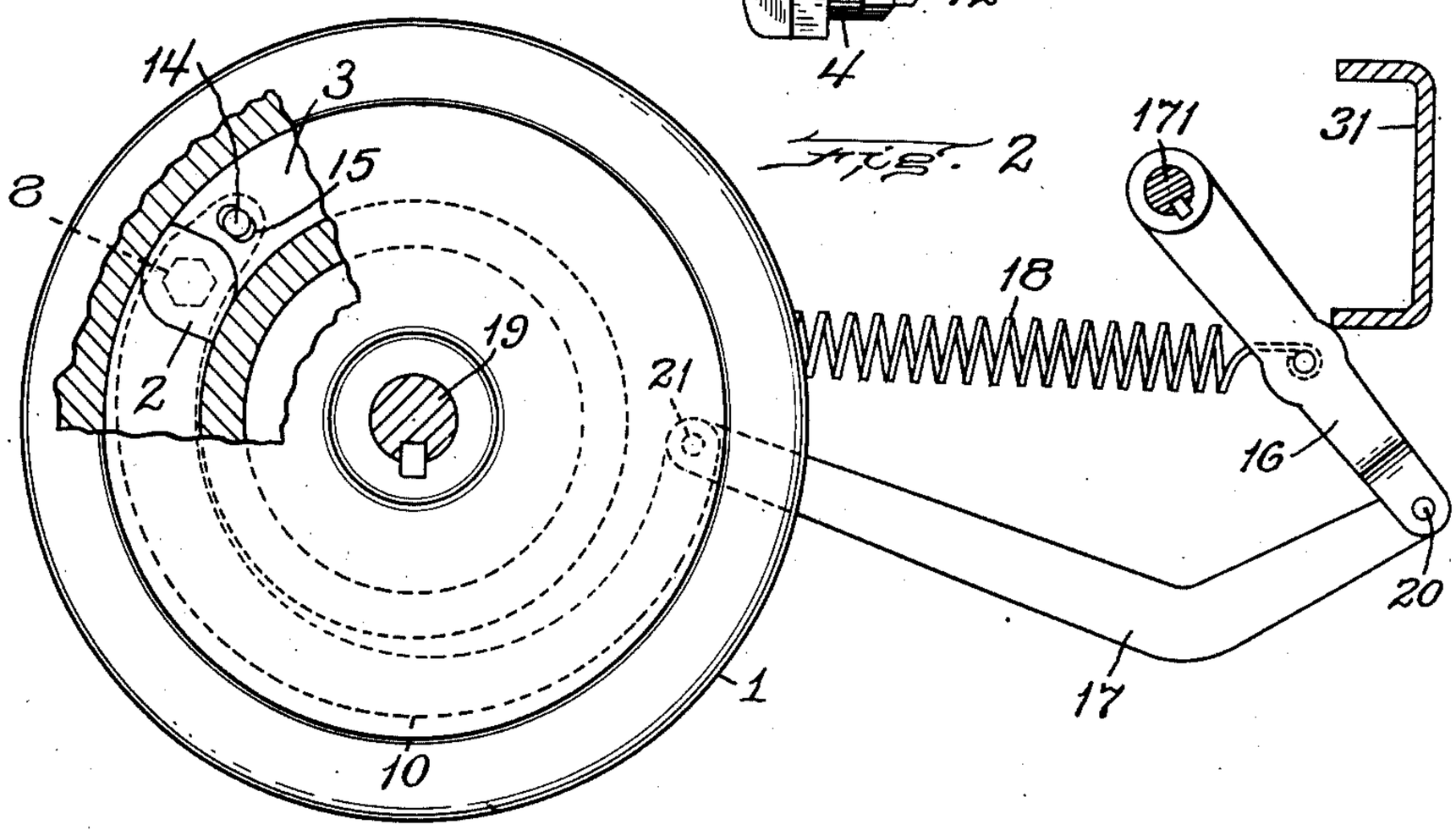


Fig. 2



Witnesses:
A. C. Religan
F. Roulstone.

Inventor
John F. Wilkinson
By Wright Brown Quinby & May
Attorneys.

No. 883,266. PATENTED MAR. 31, 1908.

J. F. WILKINSON.

STARTING CLUTCH.

APPLICATION FILED APR. 19, 1907.

3 SHEETS—SHEET 2.

Fig. 5

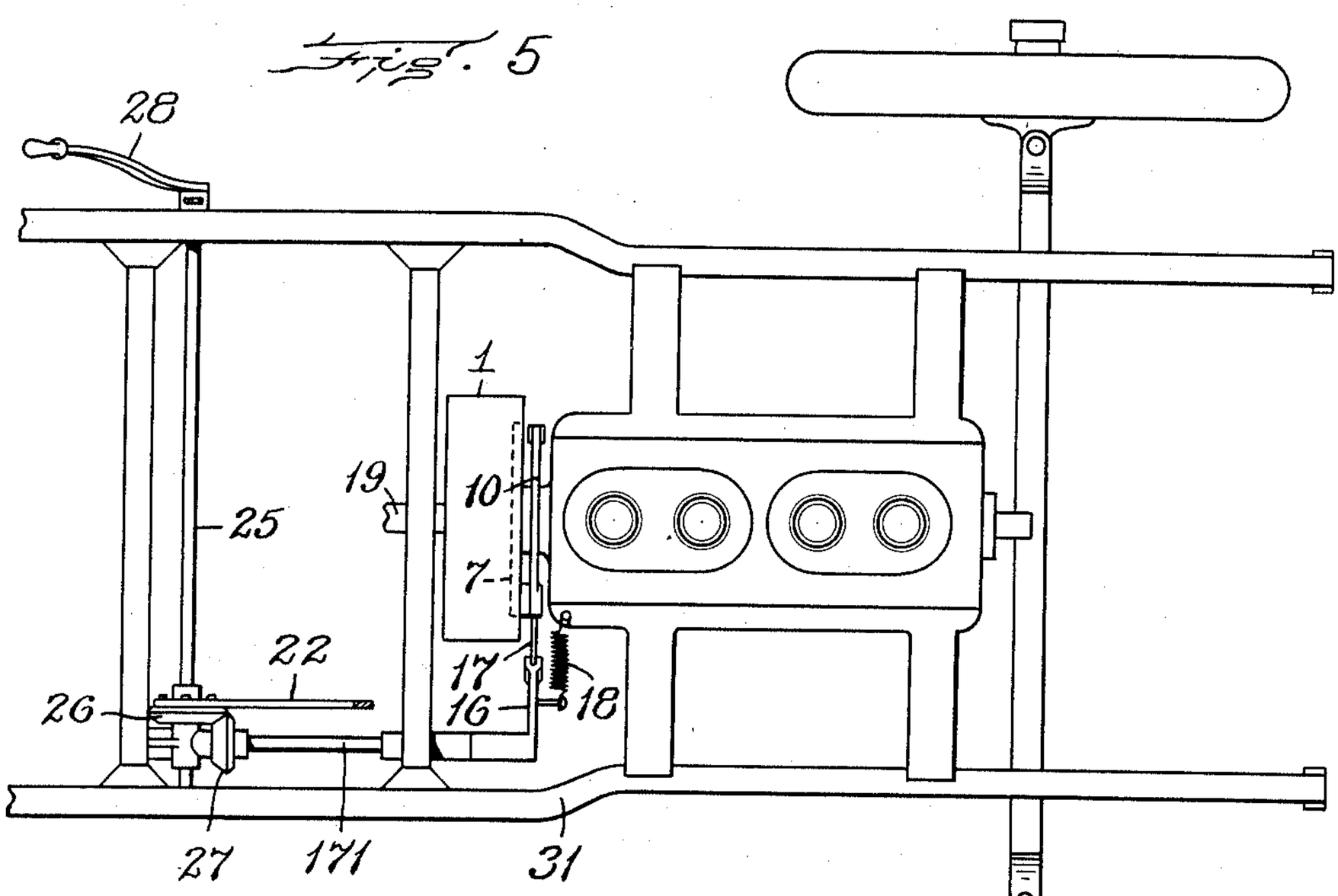
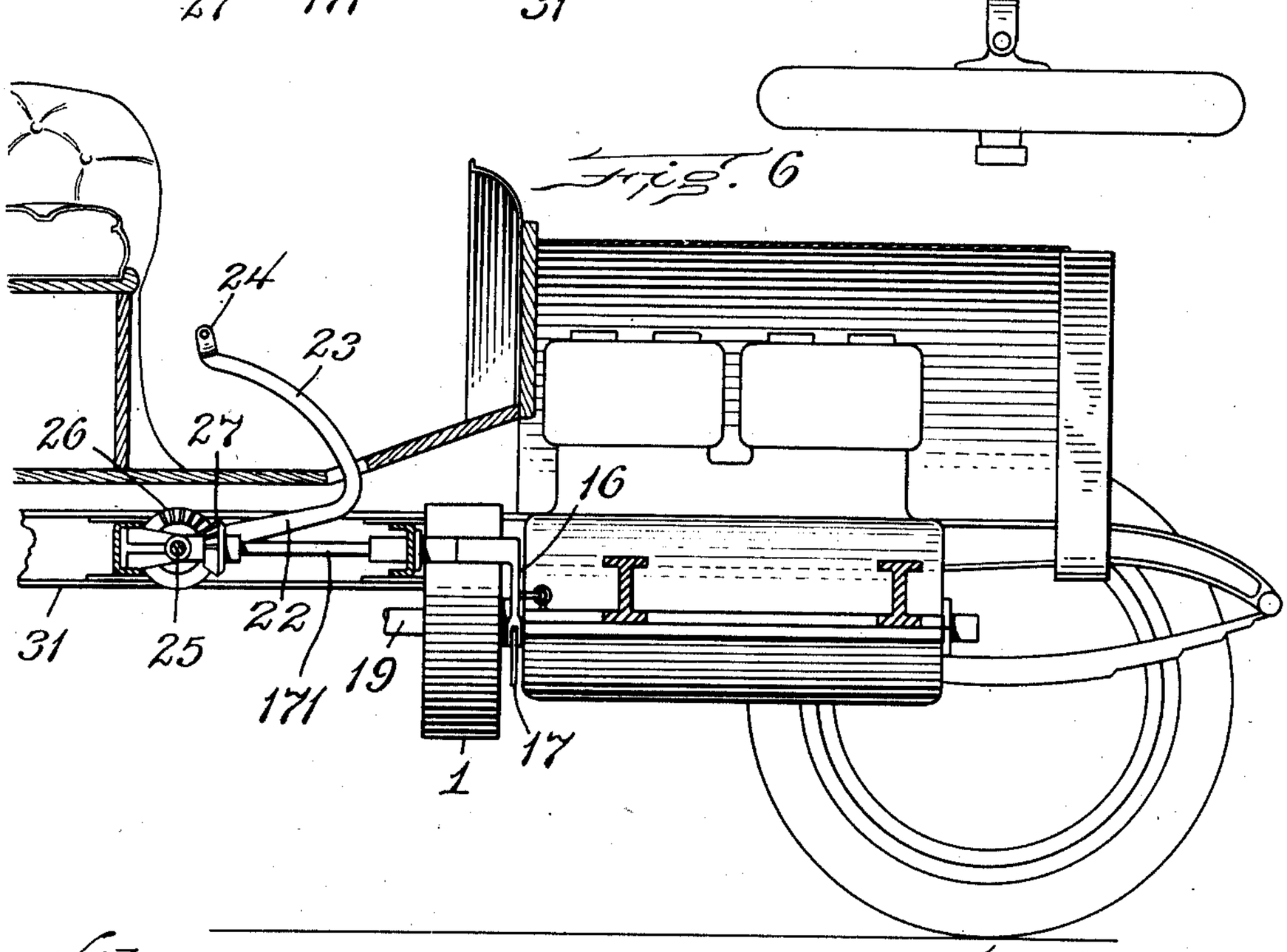


Fig. 6



Witnesses:
A. C. Ratigan
F. Rouleton.

Inventor
John F. Wilkinson
By Wright Brown Quinby & May
Attorneys.

No. 883,266. PATENTED MAR. 31, 1908.

J. F. WILKINSON.

STARTING CLUTCH.

APPLICATION FILED APR. 19, 1907.

3 SHEETS—SHEET 3.

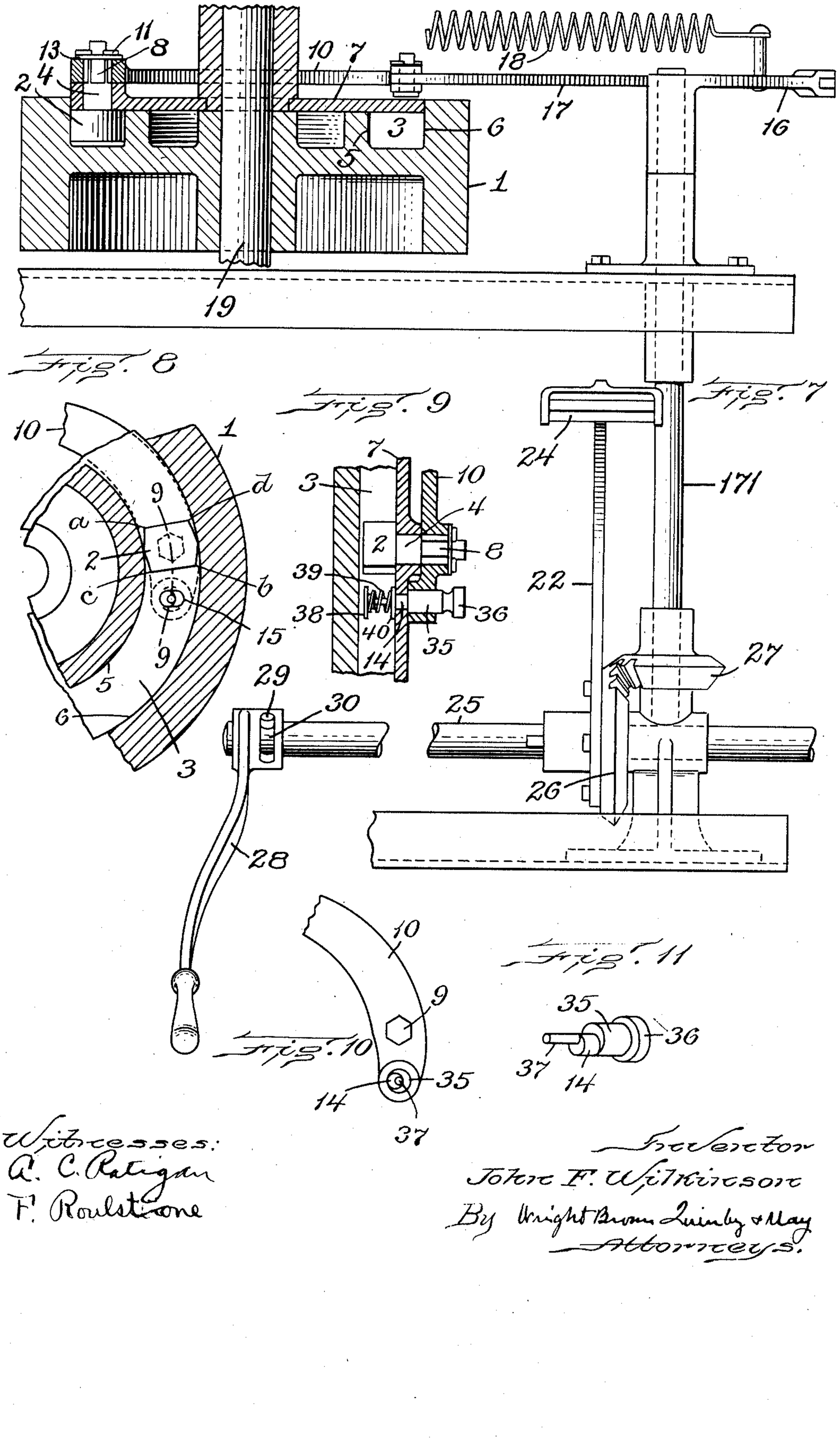


Fig. 8.

Fig. 9.

Fig. 7.

Fig. 10.

Fig. 11.

Witnesses:
A. C. Ratigan
F. Roulstone

Inventor
John F. Wilkinson
By Wright Brown Quinby & May
Attorneys.

UNITED STATES PATENT OFFICE

JOHN F. WILKINSON, OF GLOUCESTER, MASSACHUSETTS.

STARTING-CLUTCH.

No. 883,266. Specification of Letters Patent. Patented March 31, 1908.

Application filed April 19, 1907. Serial No. 369,093.

To all whom it may concern:

Be it known that I, JOHN F. WILKINSON, of Gloucester, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Starting-Clutches, of which the following is a specification.

The present invention relates to clutch mechanisms for starting rotating parts from a position of rest by means of a crank or arm which is arranged to oscillate through only a part of a rotation. It is particularly adapted for starting internal combustion motors such as are used in automobiles, and one of its objects is to enable such motors to be started either by foot or hand power, and without the necessity of making a complete rotation of the operating treadle or handle.

Another object is to arrange the parts of the mechanism so that they will always be in a position from which they can be started in the right direction, and to render the clutching action more positive and readily thrown into operation than in prior devices of this character.

Of the accompanying drawings,—Figure 1 represents an elevation, partly broken away, of the essential elements of my invention, showing them in their disengaged inoperative position. Fig. 2 represents the same parts but in a different position, being here in the opposite limit of their possible movement. Figs. 3 and 4 represent detail perspective views of parts of the clutch mechanism. Figs. 5 and 6 represent respectively a plan view and a vertical section of part of an automobile, showing the device constituting my invention applied to start the motor thereof. Fig. 7 represents a sectional plan view on an enlarged scale, of the complete mechanism adapted for starting a motor arranged as in Figs. 5 and 6. Fig. 8 represents an elevation similar to Fig. 1, showing a modification of the clutch adapted to drive in either direction. Fig. 9 represents a cross section on line 9—9 of Fig. 8. Fig. 10 represents a detail elevation of one end of the clutch actuator, showing the adjustable stop pin. Fig. 11 represents a perspective view of the adjustable stop pin.

The same reference characters indicate the same parts in all the figures.

The essential features of my invention are two coöperating clutch members 1 and 2 of which the former is a disk mounted to rotate and having in one of its lateral faces an annular groove 3 into which the complemental member 2 of the clutch projects. The latter member is the integral head of a stud 4, such head being contained in the groove 3 between the inner and outer concentric faces 5 and 6.

The member 2 as shown is eccentric at opposite ends of an axis. That is, it has protuberances on opposite sides, so that it is longer in one dimension than in the dimension at right angles, the shorter dimension being less than the distance between the faces 5 and 6, while the longer dimension is greater than this distance. Accordingly the turning of the head 2 about its axis causes its eccentric portions to be crowded against the opposite faces of the annular groove and to bind against them so that movement of one member bodily will carry the other with it.

The shank 4 upon which the head 2 is formed is journaled in a holder or plate 7 which is capable of turning rotarily independently of the member or disk 1: The end of the shank which projects from the side of the holder opposite to the member 1 is noncircular, being preferably hexagonal as represented at 8 in Fig. 4, or of any convenient shape. It fits in a correspondingly shaped socket 9 in an arm 10 by which it is operated. A cotter pin 11 passing through a hole 12 and bearing against a washer 13 holds the stud in the arm. A pin 14 on the end of the latter projects through a slot 15 in the plate 7 and limits the oscillatory movement of the arm and stud relatively to the plate. If a stress is applied to the free end of arm 10 it causes the latter to oscillate about the center of the stud 4 and turn the head thereof sufficiently to bind against the walls 5 and 6 of the groove 3, whereby further movement of the arm causes the disk 1 to be moved also.

In order to operate the clutch, I provide an arm 16 keyed to a rock-shaft 171 and connected pivotally at its end with a link 17 which is also pivoted to the end of arm 10. A spring 18 connected with the crank arm 16 and any suitable stationary abutment, draws the arm toward the disk 1 and presses against the arm 10 in such a way as to free the clutch member 2 from engagement with

the faces 5 and 6. As shown in the drawings, the arm 10 is curved so as partially to encircle the hub of the disk 1 and the shaft 19 to which the latter is keyed, while the link 17 passes on the opposite side of the shaft and is bent so as to clear that end of the arm in which the pin 14 is set. Thus the arm 10 and link 17 together completely surround the shaft 19. It is to be understood, however, that this arrangement is not an essential feature of the invention, but is adopted in the illustrated embodiment for the sake of convenience and compactness. Movement of the parts under the influence of spring 18, beyond the position shown in Fig. 1, is prevented by the link 17 coming into engagement with the end of arm 10. By thus abutting, the parts are all held in a position of equilibrium.

In order to operate the clutch and set the disk 1 in motion, the rock-shaft is turned by means hereinafter described, in opposition to the tension of spring 18, pulling the pivot 20 downward and to the right, and thereby exerting a pull on the pin 21 which connects link 17 and arm 10 together so as to swing the latter arm and clamp the clutch head 2 against the faces 5 and 6. The parts are so arranged when in the position of rest illustrated in Fig. 1 that the pull exerted through link 17 when the rock-shaft and arm are actuated, will be in a direction below the line joining pin 21 with shaft 4, so that the disk will always be driven in the desired direction.

The clutch member which consists of the disk 1 may be any suitable rotating part of a machine or motor, and is illustrated in the present case as the fly-wheel of an internal explosion engine for an automobile. The shaft 19 is the main shaft of the motor and is set in operation to start the motor when the clutch members are engaged and moved. For thus connecting and driving the clutch I provide a lever 22 having an arm 23 to which is connected a foot piece 24. This arm is secured to a rock-shaft 25 which is turned by oscillation of the arm, and is connected so as to turn the rock-shaft 171 above described. In some cases where the driven shaft 19 can be arranged parallel with the axis of oscillation of the lever 22, the rock-shafts 171 and 25 may be identical, but in the arrangement illustrated, the shaft 19 is perpendicular to rock-shaft 25, and so the latter shaft is connected to shaft 171 through bevel gears 26 and 27. From the connections illustrated it will be seen that successive downward movements of the foot piece will actuate the fly-wheel 1 by successive increments in the same direction. These movements may be continued until the charge in the motor is compressed and ignited, and the engine started. The motor may also be started by hand from a position outside of the vehicle. The hand-starting device consists of a crank 28 mounted upon the shaft 25 upon which it is held by a pin 29 entering a slot 30 in the hub of the crank arm. This slot is of sufficient width to permit actuation of the foot lever through its whole stroke without moving the hand crank. But normally, when the clutch members are disengaged, the pin rests against the rear end of the slot so that any movement of the hand lever, even the shortest, will throw the clutch members into engagement and turn the fly-wheel through a certain angle.

At 31 is shown a member of the vehicle frame against which the arm 16 is adapted to abut when moved through its full stroke. This limits the stroke before the clutch arm 10 has been moved far enough to bring the pivot 21 into line with the stud 4 and pin 20. It is necessary that the pin 21 be below this line in order that the spring in contracting may return the parts in the opposite direction to their first position. In thus returning the arm 10 is oscillated about the center of stud 4 so to free the clutch and enable the wheel or disk 1 to continue rotating without frictional resistance of the head 2 against the walls of the groove. The construction hereinbefore described enables a continuous rotary movement to be imparted to a driven member by successive back and forth oscillations of a manually-operated driver, which is always arranged so that the operator may exert his entire strength in the most effective manner. By moving either operating arm, he can bring the motor to the point where the highest compression is about to take place, and then exert his whole strength to carry the motor through the conclusion of the compression stroke and past the dead point. There is no necessity of applying force in an inconvenient or uncomfortable position, as is the case where a motor is started by continuous rotation of a crank.

It frequently happens that in running an internal combustion motor the spark is advanced so as to explode the mixture before the end of the compression stroke. This produces no ill effect as long as the engine is running and the fly-wheel has a large momentum, but if the spark is thus advanced while the motor is being started from a position of rest, it causes the engine to be driven reversely. This is due to the fact that it is impossible to put sufficient energy into the fly-wheel when starting the same manually to carry it by the dead-center if an explosion takes place before this point is reached. It is therefore important that the time of producing the spark should be deferred before the operator starts the motor. It frequently happens, however, that the operator forgets to change the position of the spark after the engine has been stopped and before starting it again. When this happens a

back fire is caused which throws the starting crank backward and is liable seriously to injure the operator.

With a clutch of the character described, it is impossible for any injury to be occasioned by the premature explosion of the charge, for the reason that the clutch is so constructed as to be automatically disconnected when the disk or fly-wheel 1 is driven in the reverse direction by the motor. Of course a back fire of the motor will turn the disk in the opposite direction from that in which it is turned by the connections hereinbefore described with the same tendency toward causing frictional engagement of the clutch member 2 as when the latter is moved and the disk retarded by the resistance of the engine. The wedging of the clutch member 2 which is thus produced causes the said clutch member and the connected parts to be driven backward until they approach the position shown in Fig. 1, but before quite attaining that position and before the link 17 strikes the end of arm 10, the clutch becomes automatically disengaged. This occurs while pressure is applied through the arm 16, link 17 and arm 10 in the direction which would tend to bind the clutch head against the walls of the disk groove, and is due to the fact that the pivots 20 and 21 and the axis of stud 4 are so nearly in line that there will be an extremely short effective lever arm tending to turn the member 2, and consequently the friction-causing pressure is almost or quite nothing. Thus as there is nothing to bind the ends of the clutch member 2 against the faces 5 and 6 of the disk, the latter is free to rotate and is not retarded by the clutch member. In other words, the clutch becomes automatically disengaged.

It is to be understood that the clutch forming the subject of this invention is not limited in its application to starting automobile motors, but may form part of any other mechanical motion, and that it may be desirable to employ it for driving a member in either of two directions. Accordingly for this purpose I construct certain of the parts in the modified form shown in Figs. 8 to 11 inclusive. In these figures it is to be noted first that the secondary or complemental clutch member 2 instead of having two eccentric protuberances on opposite ends of a diameter, is provided with four such protuberances arranged in pairs, the members of which are diametrically or diagonally opposite to each other. Thus *a* and *b* represent the shoulders or protuberances which correspond to those shown in Figs. 1 and 2, for driving the primary member 1 of the clutch in left-hand rotation, while *c* and *d* represent a second pair of shoulders for driving it reversely. It is to be noted that the shoulders *a* and *c*, as also the inner shoulder of the former shown in Figs. 1 and 2, are active engaging parts the outer projections *b* and *d* being simply provided to press against the outer surface 6 and cause the inner shoulders *a* and *c* to bind against the inner surface, this being for the purpose of relieving the pivotal shank 4 of the clutch member from frictional resistance.

It will be observed that the active clutching shoulders *a* and *c* are on opposite sides of a plane containing the axis of the shank 4 and extending transversely of the groove 3. On account of this arrangement, whenever the actuator arm 10 is oscillated in left-hand rotation, the shoulder *a* is forced against surface 5 and the primary member caused to turn anti-clockwise. On the other hand, when the actuator is turned to the right, the shoulder *c* is engaged with the surface 5 and the primary member is reversed.

The pin 14 takes a necessary part in governing the manner of engagement of the clutch members. Referring to Fig. 1, it will be seen that when the pin is arranged as there shown, it is caused to engage with the left-hand end of slot 15 as soon as the spring 18 is allowed to act, and immediately after the protuberances of the clutch member 2 have been released from the primary member. Then the pin serves as an abutment or stop to limit the further rotation of the actuator arm, maintaining the latter rigid with the carrier plate 7 so that the pull due to the spring 18 is caused to rotate this plate reversely to the motion given to the primary member by the previous driving oscillation of the actuator. If on the other hand the pin 14 were located so as to engage with the right-hand end of the slot, it would not permit the clutch members to engage when the actuator is turned in left-hand rotation.

In Figs. 8 to 11 the pin 14 is shown as adjustable, being mounted eccentrically upon a stud 35 which is journaled in the end of arm 10 and has attached rigidly to it a thumb-nut 36. By turning the stud 35 through a half revolution, the pin 14 can be caused to lie either near the left-hand or the right-hand side of the slot. In Fig. 8 it is at the right-hand side. Therefore when force is applied to the actuator to move it to the left, the pin holds the clutch member 2 in the neutral position shown and causes it to travel bodily in the groove 3 without engaging or actuating the driving member 1. Upon the forward force being removed and the spring 18 allowed to act, the actuator arm before being moved bodily is first turned upon its axis in right-hand rotation, and the shoulders *c* and *d* thereby crowded against the surfaces 5 and 6 respectively, so that the disk will be driven during the return movement of the member 2. Thus by suitably reversing the pin 14, the clutch may be caused to drive the member 1 in either direction.

The details of the pin are shown in Figs. 9

and 11. It is of sufficient length to project through the slot 15 and from its inner end extends a projection 37 which is eccentric to the pin and either concentric with the stud 35 or so slightly eccentric that it can turn in the slot without binding against the narrow edges thereof. On the end of this projection is secured a washer 38 against which bears a spring 39, the other end of which presses against a plate 40 extending across the inner side of the slot 15 and bearing against the surface of the carrier plate 7. The spring will compress sufficiently to permit of the pin being withdrawn from the slot, and will return it and hold it in the slot again after it has been turned.

I claim:—

1. A clutch mechanism comprising a rotary member having an annular groove in a lateral face thereof, a stud having an eccentric head located in said groove, an arm supported so as to be movable bodily about the axis of said member by which said stud is carried non-rotatably, and driving means so engaged with the arm as to move the same both oscillatively and bodily to crowd the head of said stud between the walls of the groove and turn the said member.

2. A clutch mechanism comprising two members, one of which is provided with inner and outer concentric surfaces, and the other comprising a stud having an integral head of greater length than width located between said surfaces, said stud being mounted with capability of oscillating about a center within its own periphery, whereby the head thereof may be caused to bind against the said surfaces.

3. A clutch comprising a disk having concentric inner and outer faces, a holder mounted to oscillate concentrically with and relatively to said disk, a stud pivotally mounted in said holder and having a rigid elongated head entering the space between said faces, and an arm to which said stud is rigidly secured, adapted to swing the stud so as to bind the elongated head thereof against said faces and thereafter to rotate the disk.

4. A clutch comprising a disk having concentric inner and outer faces, a holder mounted to oscillate concentrically with and relatively to said disk, a stud pivotally mounted in said holder and having a rigid elongated head entering the space between said faces, an arm to which said stud is rigidly secured, whereby an oscillatory motion of said arm will cause the said head to bind against said concentric faces, an operating member, and a link connecting said operating member with said arm for moving the latter angularly and bodily to connect the clutch members and drive the disk.

5. A clutch comprising a disk having a groove, an elongated clutch dog arranged in said groove, a holder in which said dog is pivotally mounted, an arm rigidly connected with said dog adapted to oscillate the same and thereby cause its end to bind against the walls of the groove, an actuator, and a link pivoted to said arm and actuator, for driving the former from the latter, the parts being movable to bring the pivots of the link substantially in line with and on opposite sides of the pivotal axis of the clutch dog.

6. A clutch comprising a disk having inner and outer concentric faces, an elongated clutch dog pivotally arranged between the faces of said disk, and an arm connected with said dog so as to oscillate and bring its ends into frictional engagement with said faces, said disk being automatically disengageable from the clutch dog when driven reversely.

7. A clutch comprising a disk having inner and outer concentric faces, an elongated clutch dog pivotally arranged between the faces of said disk, an arm connected with said dog so as to oscillate and bring its ends into frictional engagement with said faces, and operating connections for said arm arranged to swing the arm so as to cause engagement of the clutch dog and then move the same bodily to rotate the disk, said clutch dog being automatically disengaged during a reverse driving movement of the disk when its axis of oscillation approaches the line of draft of said operating connections.

8. A clutch comprising a disk having inner and outer concentric faces, an elongated clutch dog pivotally arranged between the faces of said disk, an arm connected with said dog so as to oscillate and bring its ends into frictional engagement with said faces, and a connecting link pivoted to said arm arranged to exert a pull in a line at one side of the point of attachment of the lever to the dog, whereby the latter is oscillated and then moved bodily to drive the disk, said dog being disengaged upon a reverse driving of the disk by external means when such point of attachment approaches said line of pull.

9. A clutch comprising a disk having inner and outer concentric faces, an elongated clutch dog pivotally arranged between the faces of said disk, an arm connected with said dog so as to oscillate and bring its ends into frictional engagement with said faces, a swinging operator, and a link pivoted to said operator and said arm arranged to act on a line beside the axis of the disk and the point of attachment of the lever to the dog, and being movable to bring its pivots nearly in line with and on opposite sides of said point of attachment, whereby the disk is enabled to free itself from the clutch dog when driven reversely by external means.

10. A clutch comprising a disk having inner and outer concentric faces, an elongated clutch dog pivotally arranged between the faces of said disk, an arm connected with said dog so as to oscillate and bring its ends

into frictional engagement with said faces, a swinging operator, a link pivoted to said operator and arm, and yielding means acting on said operator to hold parts normally in position to be given a full-stroke movement.

11. A clutch comprising a disk having inner and outer concentric faces, an elongated clutch dog pivotally arranged between the faces of said disk, an arm connected with said dog so as to tilt the dog and bring its ends into frictional engagement with said faces, and a link connected to said arm for oscillating the same, said arm and link together when in normal stationary position, surrounding the axis of the disk.

12. A clutch for starting internal combustion motors, consisting of a disk secured to the shaft of the motor and having a groove, a clutch dog supported independently adjacent said disk and extending into said groove, arranged to turn about an axis within its periphery and engage frictionally the walls of said groove, and an actuator operated oscillatively by the operator of the motor for turning and engaging the dog successively at different points with the disk and thereby moving the latter.

13. A clutch for starting internal combustion motors, consisting of a disk secured to the shaft of the motor and having a groove, a personally-operated actuator adapted to be moved bodily and oscillatively, and a friction dog supported adjacent the center of oscillation of said actuator so as to enter said groove and caused by the oscillations of said actuator to turn so as to bind frictionally against the walls of said disk and move the latter, whereby successive oscillations of the actuator are enabled to drive the disk continually in the same direction.

14. A clutch for starting internal combustion motors, consisting of a disk secured to the shaft of the motor and having a groove, a clutch dog supported independently adjacent said disk and extending into said groove arranged to engage frictionally the walls of said groove upon being oscillated, and an actuator operable oscillatively by the motor driver or attendant for engaging the dog successively at different points with the disk and thereby moving the latter, said dog being automatically disengaged by reversed motion of the disk due to back-firing of the motor.

15. A clutch for starting internal combustion motors, consisting of a disk secured to the shaft of the motor, a complemental clutch member, an actuator movable oscillatively, arranged to engage said clutch member frictionally with the disk to drive the latter, and provisions whereby the friction-producing pressure is caused to diminish until the clutch member becomes disengaged from the disk when the latter is driven reversely by a back fire of the motor.

16. A clutch consisting of a primary member having engaging surfaces, a complemental member contained between said surfaces having eccentric protuberances, a carrier in which said complemental member is oscillatively mounted, an actuator connected to said complemental member for oscillating the same to engage said surfaces and moving the clutch members bodily, and stops on the carrier and actuator for limiting relative movement thereof, whereby the complemental member may be moved reversely independent of the primary member.

17. A clutch consisting of a primary member having engaging surfaces, a complemental member contained between said surfaces having eccentric protuberances, a carrier in which said complemental member is oscillatively mounted, an actuator connected to said complemental member for oscillating the same to engage said surfaces and moving the clutch members bodily, and stops on the carrier and actuator for limiting oscillation of the latter in the direction of disengagement of the clutch member, whereby said actuator is caused to turn the carrier and move the complemental clutch member reversely while out of contact with the primary member.

18. A clutch consisting of a primary member having engaging surfaces, a complemental member contained between said surfaces having a plurality of eccentric protuberances on different sides of a plane passing through its axis of oscillation, of which different ones are adapted to be alternately engaged with said surfaces by movement in either direction from a neutral position, a carrier in which said complemental member is oscillatively mounted, an actuator connected to said complemental member for oscillating the same to engage said surfaces and moving the clutch members bodily, and stops on the carrier and actuator for limiting the oscillative movement in one direction at the neutral position.

19. A clutch consisting of a primary member having engaging surfaces, a complemental member contained between said surfaces having a plurality of eccentric protuberances on different sides of a plane passing through its axis of oscillation, of which different ones are adapted to be alternately engaged with said surfaces by movement in either direction from a neutral position, a carrier in which said complemental member is oscillatively mounted, an actuator connected to said complemental member for oscillating the same to engage said surfaces and moving the clutch members bodily, and stops on the carrier and actuator for limiting the oscillative movement in one direction at the neutral position, said stops being adjustable to permit movement of the complemental member to either one of the engaging, or active, positions.

20. A clutch consisting of a rotary primary member provided with engaging surfaces, a

carrier mounted concentrically with said primary member, a complemental member pivotally supported and oscillative in said carrier having eccentric protuberances on different sides of a plane passing through its axis of oscillation, an actuator engaged with said complemental member so that oscillation thereof in either direction will bind one or another of the protuberances against a surface of the primary member, whereby to turn the latter in either direction, a plurality of stop shoulders on the carrier, and a stop on said actuator between said shoulders, arranged to be arrested by one of them to prevent one of said protuberances being engaged with the primary member.

21. A clutch consisting of a rotary primary member provided with engaging surfaces, a carrier mounted concentrically with said primary member, a complemental member pivotally supported and oscillative in said carrier having eccentric protuberances on different sides of a plane passing through its axis of oscillation, an actuator engaged with said complemental member so that oscillation thereof in either direction will bind one or another of the protuberances against a surface of the primary member, whereby to turn the latter in either direction, a plurality of stop shoulders on the carrier, and a stop on said actuator between said shoulders, capable of adjustment so as to be arrested by either of the shoulders to prevent one, and permit another, of said protuberances being engaged with the primary member, whereby the latter may be driven continuously in either direction.

22. A clutch comprising a rotary member having cylindrical concentric clutch surfaces, an oscillative and bodily movable arm, a complemental clutch dog rigidly carried by said arm so as to project between said surfaces, and reciprocally moving driving means connected eccentrically with said arm for giving the latter alternately opposite movements, whereby it is turned so as to engage the dog with, and release it from, said clutch surfaces and moved to give a step-by-step movement in one direction to said rotary member.

In testimony whereof I have affixed my signature, in presence of two witnesses.

JOHN F. WILKINSON

Witnesses:

A. C. RATIGAN,

ARTHUR H. BROWN