No. 627,627. Patented June 27, 1899.

N. SHAW.

FRICTION CLUTCH.

(Application filed May 25, 1896.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

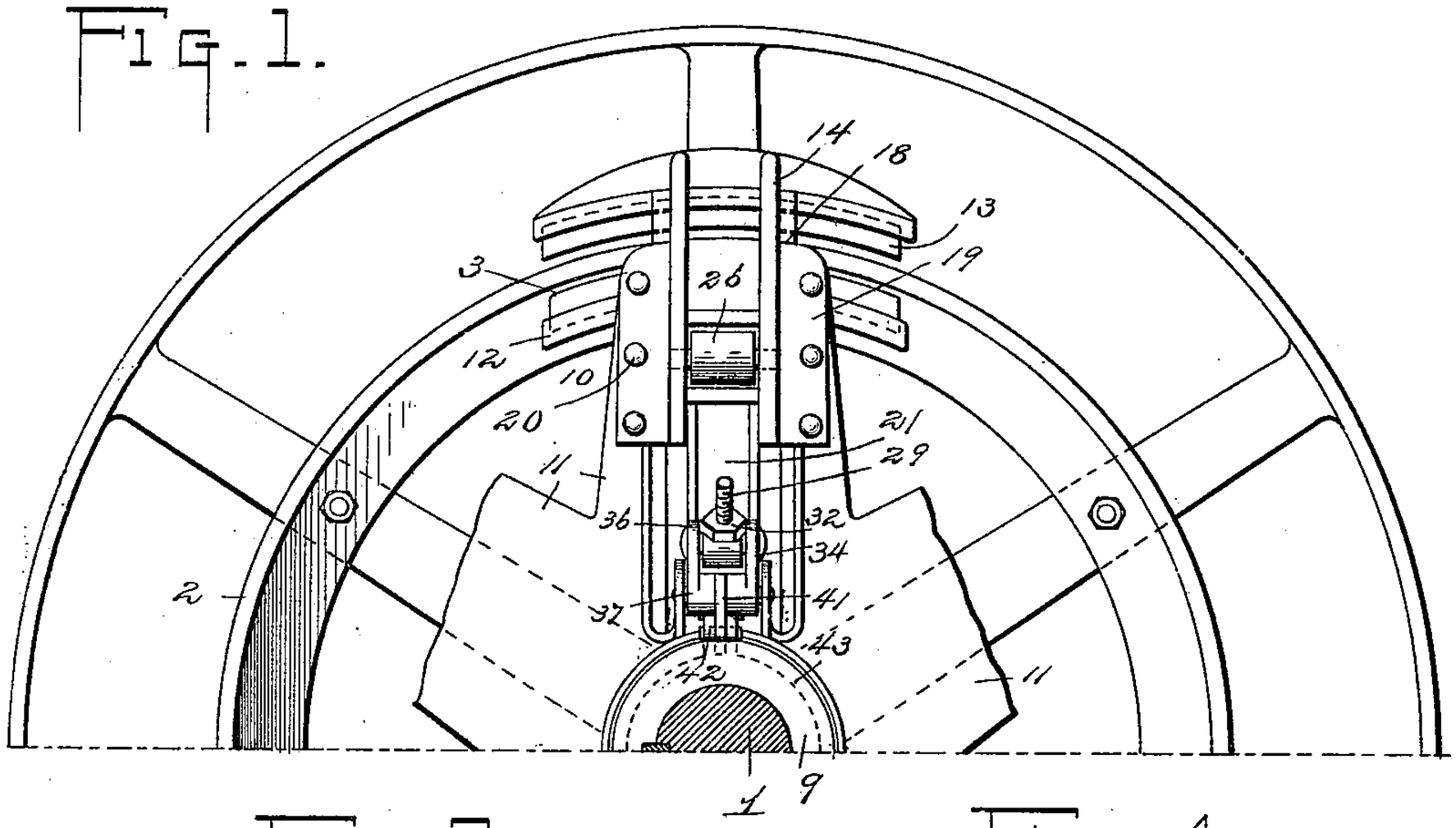

Fig. 2.

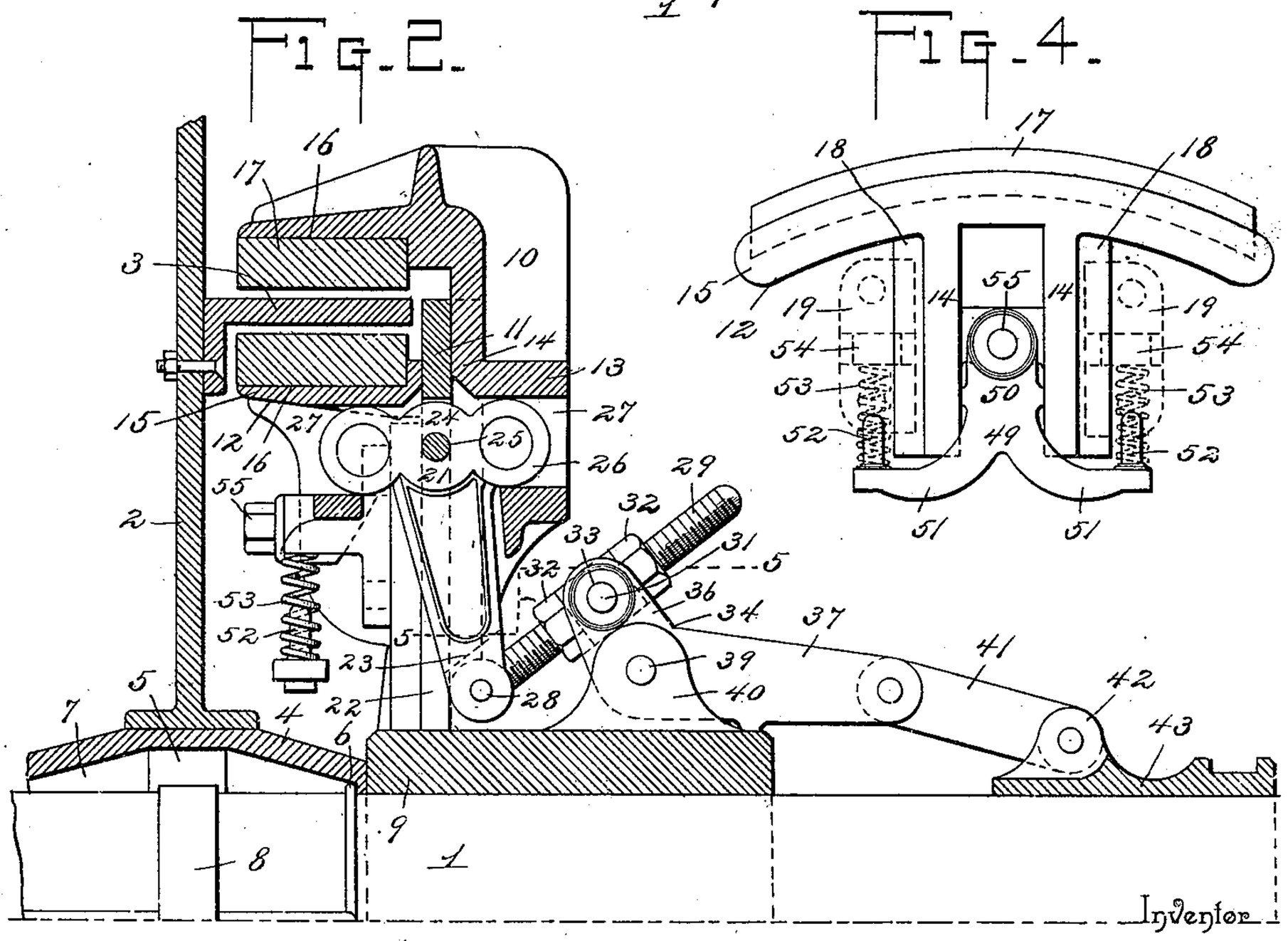

Fig. 4.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

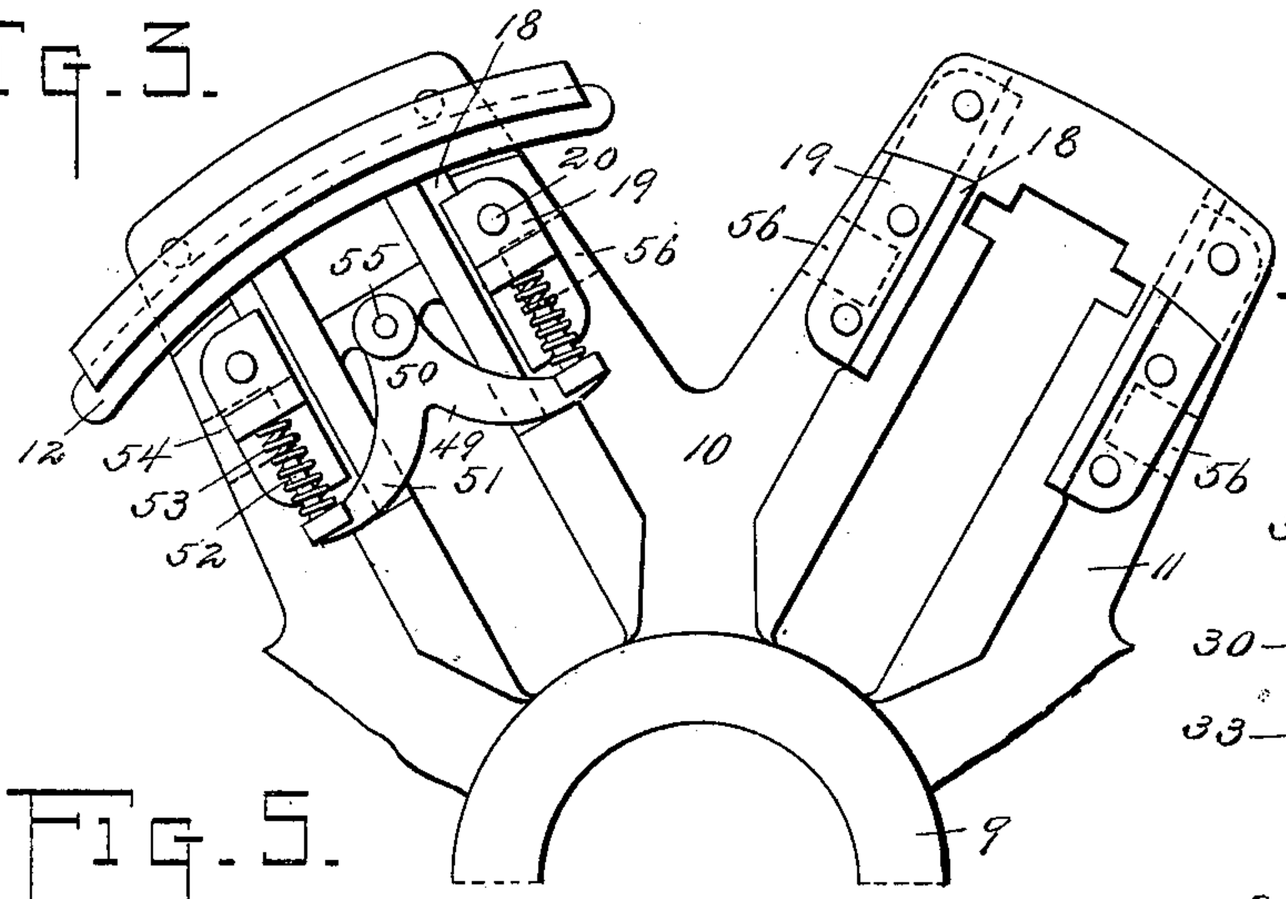


Fig. 4.

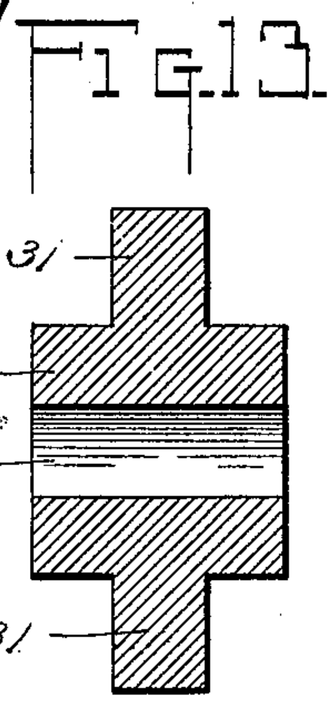


Fig. 5.

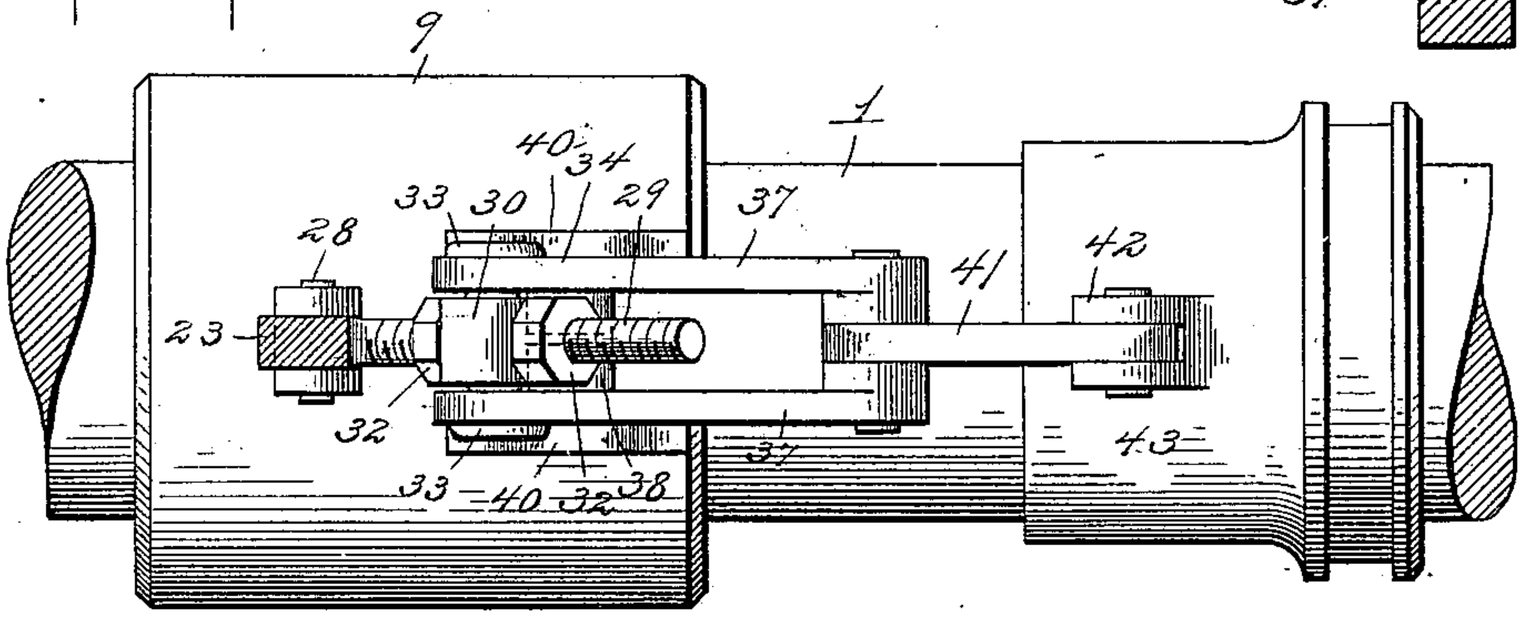


Fig. 7.

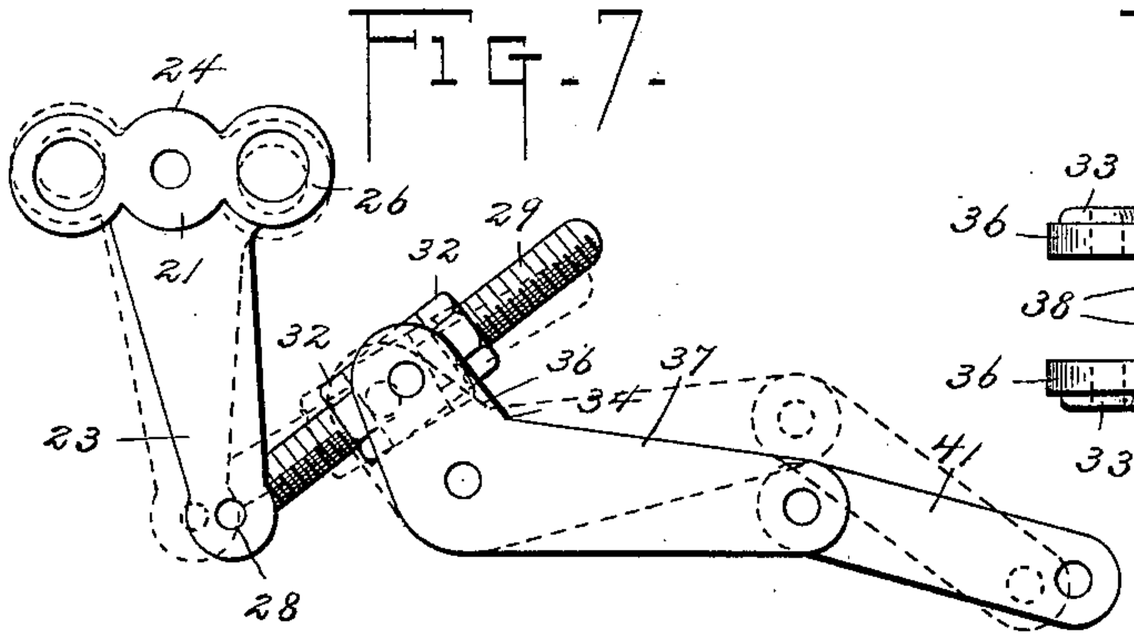
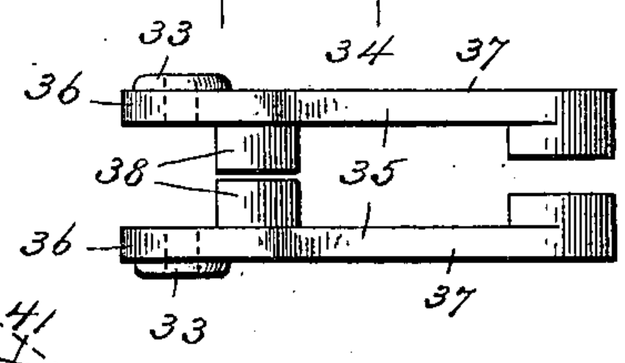


Fig. 6.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 8.

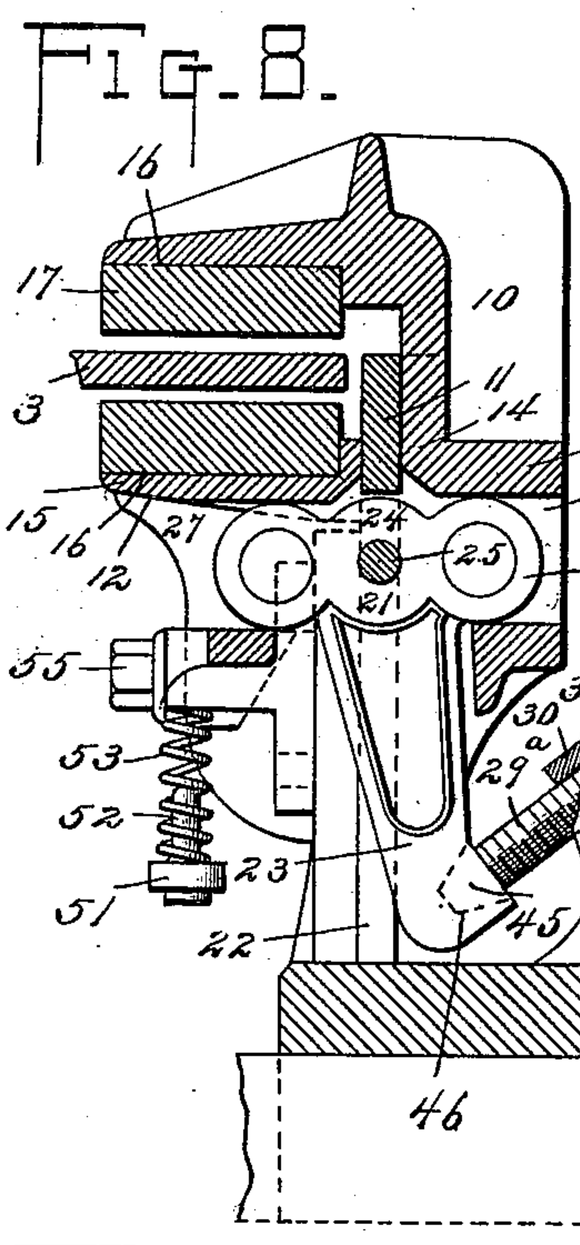


Fig. 11.

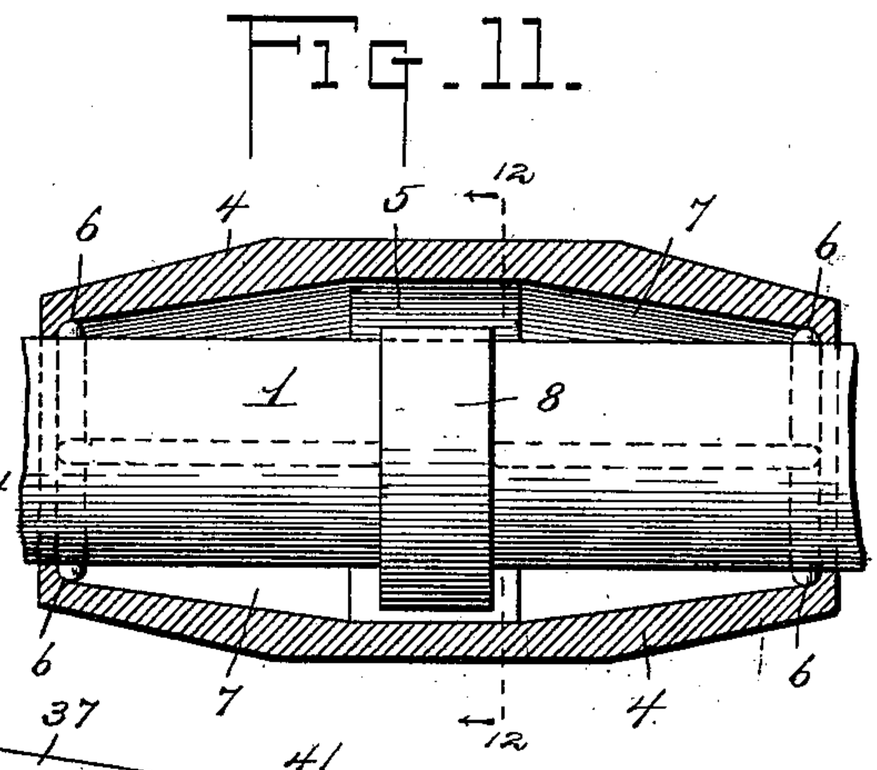


Fig. 9.

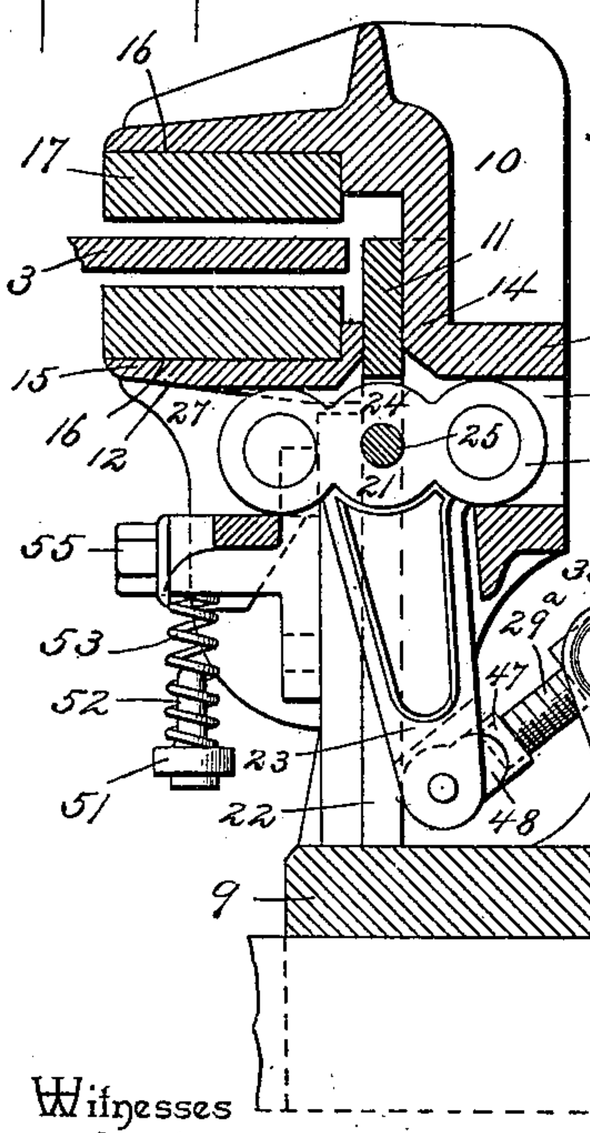


Fig. 10.

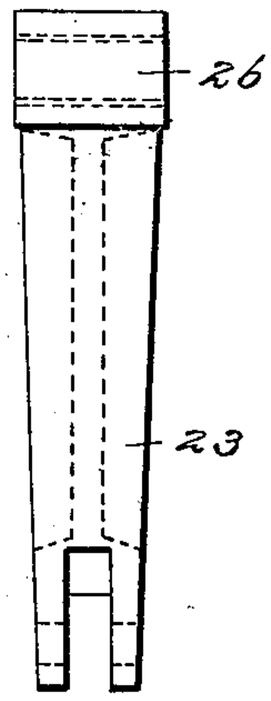
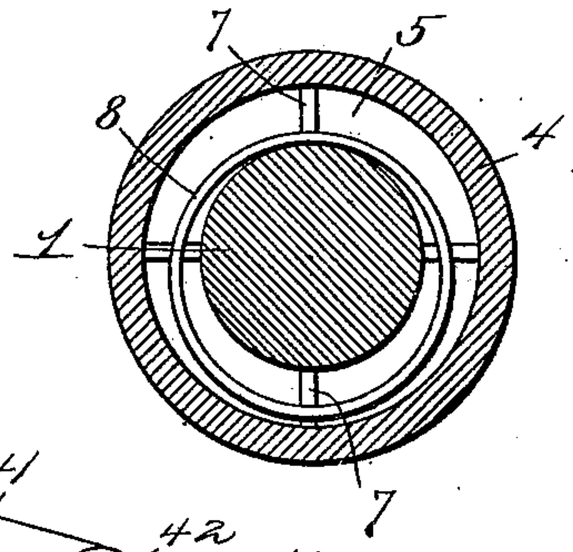


Fig. 12.



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UNITED STATES PATENT OFFICE.

NOAH SHAW, OF EAU CLAIRE, WISCONSIN.

FRICTION-CLUTCH.

SPECIFICATION forming part of Letters Patent No. 627,627, dated June 27, 1899.

Application filed May 25, 1896. Serial No. 592,970. (No model.)

To all whom it may concern:

Be it known that I, NOAH SHAW, a citizen of the United States, residing at Eau Claire, in the county of Eau Claire and State of Wisconsin, have invented a new and useful Friction-Clutch, of which the following is a specification.

This invention relates to friction-clutches for pulleys; and it has for its object to effect certain new and useful improvements in clutches of this character that shall render the same very positive and powerful in firmly clutching the pulley on the shaft; and the invention also contemplates a novel construction and arrangement of parts whereby the members or jaws of the clutch shall be positively held against centrifugal force and prevented from being thrown thereby into contact with the rim or flange of the pulley when unclutched therefrom. In the attainment of this object the invention is especially directed toward positively preventing centrifugal force from throwing the inner clutch jaw or member outward against the rim or flange of the pulley and causing fire by friction, which is of quite frequent occurrence in friction-clutches that are not positively secured against being thrown in frictional contact with the rim or flange of the pulley by centrifugal action or force.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is an end view of a pulley and an elevation of the improved friction-clutch used in connection therewith. Fig. 2 is an enlarged central longitudinal sectional view of the clutch. Fig. 3 is an enlarged detail elevation of one side of a portion of the clutch-frame, one of the frame-arms being illustrated as having fitted thereto the inner jaw or member of the clutch. Fig. 4 is a detail elevation of the inner clutch jaw or member of the clutch and its attachments. Fig. 5 is a detail sectional view on the line 5 5 of Fig. 2. Fig. 6 is a detail plan view of the sectional two-part angled toggle-lever. Fig. 7 is an enlarged detail elevation of the toggle connections for the main adjusting-lever, showing in dotted lines different positions of the connections. Fig. 8 is a longitudinal sectional view of the clutch, showing a modification in the toggle connections. Fig. 9 is a view similar to Fig. 8, showing another modification in the toggle connections. Fig. 10 is a detail elevation of the main T-shaped adjusting-lever for the clutch jaws or members. Fig. 11 is an enlarged longitudinal sectional view of the hollow self-lubricating hub of the pulley. Fig. 12 is a sectional view on the line 12 12 of Fig. 11. Fig. 13 is a detail sectional view of the knuckle-collar.

Referring to the accompanying drawings, the numeral 1 designates a shaft on which is loosely mounted a pulley 2, having at one side the usual offstanding clutch rim or flange 3 and fitted on a hollow self-lubricating hub 4. The hollow self-lubricating hub 4 is similar in construction to the hub disclosed in my former patent, No. 412,674, and is provided with a centrally-disposed annular lubricant-chamber 5, annular interior oil-grooves 6 at the ends of the hub, and interior inclined channels or grooves 7, leading from the end grooves 6 to the annular chamber 5, precisely as set forth in the patent referred to; but in the present invention the hollow hub 4 is designed to accommodate therein an oiling-ring 8, loosely encircling the shaft 1 and working within the central annular lubricant-chamber 5 of the hub. When the pulley 2 is in motion, the body of lubricant spreads itself against the inner periphery of the central chamber 5 under centrifugal influence; but when the pulley is unclutched and is at rest on the shaft the lubricant settles in the lower part of the hub, while the rotating shaft moves the oiling-ring, which insures a thorough distribution of the oil throughout the hub and on the shaft, as will be readily understood by those skilled in the art.

At one side of the hub of the pulley 2 the shaft 1 has splined or keyed thereon a frame-hub 9, carrying a clutch-frame 10, preferably of the "spider" type, and comprising a plurality of radial frame-arms 11, each of which frame-arms carries a clutch and its connection, as contemplated by this invention, and since it is well understood that friction-clutches for pulleys are used in one or more pairs with a single pulley it will simply be

necessary for the purposes of this invention to describe the clutch in connection with one of the frame-arms 11 of the spider clutch-frame 10.

Each radial frame-arm 11 is arranged parallel with the adjacent loose pulley 2 and extends from its point of connection with the frame-hub 9 to a point in reasonably close proximity to the clutch rim or flange 3 of the pulley to provide for the proper disposition of the inversely and radially movable inner and outer clutch-jaws 12 and 13, respectively. The clutch-jaws 12 and 13 are respectively arranged on opposite sides of the frame-arm 11 and are designed to slide thereon inversely or in opposite directions to clutch or unclutch the rim or flange 3 of the pulley. Both of the clutch-jaws 12 and 13 are provided with straight shank portions 14, resting flat against the sides of the frame-arm 11 and at the outer ends of said straight shank portions with the segmental clutch-heads 15, having recessed faces 16 to receive therein the wooden or other suitable clutch-shoes 17, which are also segmental in shape so as to evenly grip the inner and outer faces of the circular clutch rim or flange 3 of the pulley. It will be noted that the clutch-head 15 at the outer end of the straight shank portion 14 of the outer clutch-jaw 13 is angled in the usual way, so as to overhang the rim or flange 3 and dispose its clutch-shoe in a position so as to contact with the outer face or side of the said rim or flange, as will be readily understood by those acquainted with devices of this character. The straight shank portion 14 of each of the clutch-jaws slides flat against one side of the frame-arm 11 and is provided at its opposite side edges with the slide-flanges 18, which are overlapped by the combined guide and retaining plates 19, arranged at the opposite side edges of each jaw-shank 14, and bolted to the radial frame-arm 11 by means of the securing-bolts 20. The said combined guide and retaining plates 19 are readily attachable and detachable and provide simple and efficient means for securing the clutch-jaws respectively on opposite sides of the radial frame-arm 11, as clearly illustrated in the drawings.

Each radial frame-arm 11 is longitudinally slotted nearly its entire length to accommodate for movement therein the main T-shaped adjusting-lever 21. The main T-shaped adjusting-lever swings within the longitudinal slot 22 of the radial frame-arm 11, and is preferably of an open light construction, so as not to materially increase the weight of the clutch. The said T-shaped lever 21 essentially comprises a long lever-arm 23 and a cross-head 24 at the outer end of said long lever-arm 23, said cross-head being centrally pivoted within the outer end of the slot 22 of the frame-arm 11 on the pivot-pin 25, and provided at directly opposite sides of its pivot with the lateral bearing-rings 26, which form rounded bearing ends at the extremities of the cross-head 24 of the T-lever 21. The rounded bearing ends 26 of the cross-head of the T-lever work freely in the bearing pockets or recesses 27, cast in the shanks 14 of the oppositely-located clutch-jaws 12 and 13, and by reason of the location of the inner and outer jaw-shanks at opposite sides of the frame-arm 11 one end of the head of the T-lever engages with one jaw and the other end of the head of the T-lever engages with the other jaw, so that when the long lever-arm 23 of the T-lever is swung the two jaws will be moved inversely or in opposite directions to provide for clutching or unclutching the pulley. At this point it will be noted that the construction of the rings or rounded ends 26 working in the recesses 27 dispenses with the necessity of pivot pins or rods at these points, and it will further be observed that the manner of mounting the two jaws on the frame-arm allows the T-lever 21 to be pivoted or mounted on the frame-arm 11 at the farthest point possible from the frame-hub 9, thereby admitting of forming the lever-arm 23 of a considerable length, so that the most powerful leverage possible will be secured from the main T-shaped adjusting-lever, as heretofore adjusting-levers of this character in some makes of friction-clutches have necessarily had short lever-arms by reason of the fact that the cross-heads of the levers have been mounted considerably nearer to the frame-hub 9 than illustrated and described in connection with the present invention, and this feature of the invention is very important, for it is well known that the power of a friction-clutch is proportionate to the length of the lever that actuates the clamping-jaws or members thereof.

The inner end of the long lever-arm 23 of the T-lever 21 has pivotally fitted thereto, as at 28, one end of a toggle-link 29, which is illustrated as being exteriorly threaded and extending through a knuckle-collar 30, provided with oppositely-disposed trunnions or pivot-pins 31 and having the threaded toggle-link 29 adjustably secured therein by means of the threaded locking-nuts 32, engaging the threaded link 29 at opposite sides of the collar 30 and providing means for readily adjusting the distance between the lower end of the lever-arm 23 and the knuckle-collar 30 and for securing the toggle-link 29 in its adjusted position. The opposite trunnions or pivot-pins 31 of the knuckle-collar 30 loosely turn in the bearing-openings 33 at one end of an angled toggle-lever 34. The angled toggle-lever 34 is sectional and consists of the duplicate or twin members 35, angled near one end to form the short and long arms 36 and 37, respectively, and at their angles the duplicate or twin members 35 of the toggle-lever 34 are provided with the inwardly-extending pivot-collars 38, receiving the pivot-pin 39, mounted in a bearing-lug 40, formed on the frame-hub 9 near one end of said hub. The knuckle-collar 30 loosely works at one

end of the lever 34 between the short arms 36 thereof, and at the end opposite the knuckle-collar 30 the lever 34 has pivotally connected thereto one end of a second toggle-link 41, the other end of which toggle-link is pivotally connected at 42 to the slide-block 43, feathered on the shaft 1 and adjusted in the usual manner to provide for clutching and unclutching the pulley.

Slight modifications of the toggle-link connection between the inner end of the T-lever 21 and one end of the toggle-lever 34 may be observed, as illustrated in Figs. 8 and 9 of the drawings.

In Fig. 8 of the drawings the knuckle-collar 30 is illustrated as being interiorly threaded, and the toggle-link 29^a is represented as being provided at one end with a wrench-head 44 and at its other end with a tapered bearing-pin 45, loosely fitting in the pin-socket 46, formed in one side and at the lower end of the long lever-arm 23 of the T-lever 21, and in this construction to provide for the adjustment of the T-lever and the toggle-link connection between the same and the angled toggle-lever it is simply necessary to turn the link 29^a in the threaded collar 30 and secure said link in its adjusted position by the lock-nut 32^a, mounted thereon and working against one side of the threaded collar 30.

The modification illustrated in Fig. 9 is somewhat similar to that illustrated in Fig. 8, the essential difference between the two modifications being that the bearing-pin 45, at one end of the link 29^a, works in the socket 47 of a separate socket-plate 48, pivotally fitted to the inner end of the lever-arm 23 in the same manner as one end of the link 29, hereinbefore referred to.

In the several modifications of the toggle connections with the main adjusting T-lever 21 the toggle action is precisely the same and provides for imparting to the T-lever 21 a variable motion, by which greater power and a greater clearance are secured. It will further be observed that by reason of the particular arrangement of the toggle connections, and especially the knuckle connection between the toggle-link 29 and the outwardly-disposed arm of the toggle-lever 34, the first movement of the slide-block 43 in a direction toward the frame-hub 9 to close the clutch-jaws onto the rim or flange 3 gives a very rapid movement to the T-lever 21 at the start; but as the slide-block continues to move the second toggle-link 41 and the link 29 assume such positions that the said lever 21 takes a very slow movement, which while varying from the quick movement first imparted thereto nevertheless exerts a very powerful leverage on the two jaws, so as to clamp the same with a firm grip onto the rim or flange 3 of the pulley. On the other hand, the adjustment of the slide-block 43 away from the frame-hub 9, in connection with the long length of the lever-arm 23, provides for giving the two clutch jaws or members a wide clearance from the clutch rim or flange 3 of the pulley.

A very important feature of the present invention is the spring arrangement in connection with the inner clutch jaw or member 12, and to provide for the proper support and positioning of the springs a spring-holding yoke 49 is employed. The spring-holding yoke 49 essentially comprises a plate 50, having a pair of oppositely-extending arms 51, provided at their extremities with outwardly-disposed studs or pins 52, on which studs or pins 52 are fitted the inner end of retaining-springs 53, the outer ends of which springs bear against the shoulder-flanges 54, projected outwardly from one side of the combined guide and retaining plates 19, that slidably secure the shank of the inner clutch-jaw 12 on the frame-arm 11. The yoke-plate 50 of the spring-holding yoke 49 is secured by means of a bolt 55 to the outer side of the shank 14 of the inner movable clutch jaw or member 12, as clearly illustrated in the drawings.

The tension of the springs 53 is adjusted by the adjustment of the toggle-link 29, as will be obvious, and said tension of the springs is always exerted in a direction to force the inner clutch jaw or member away from the clutch rim or flange of the pulley, thereby holding the inner clutch jaw or member against the centrifugal force away from the rim when the clutch is thrown off and maintaining the same clearance from the rim or flange by both jaws or members of the clutch, notwithstanding that there may be lost motion in the toggle connections and levers. In the construction of friction-clutches it has been the practice in some makes of clutches to apply a spring to the outer jaw or member, as set forth in my former patent, No. 412,674, and at the same time to also make the outer jaw or member heavier than the inner jaw or member, so that the centrifugal force, together with the spring, will hold the clutch-jaws apart when the clutch is thrown off; but in practice lost motion and the wear of the different parts is such that very frequently the inner clutch jaw or member is not prevented from being thrown outward by centrifugal force and rotated in frictional contact with the rim or flange 3 and often producing fire. The construction herein described obviates these disadvantages and further permits the weight of the outer jaw or member to be materially reduced, as whatever the weight of the outer jaw or member may be the centrifugal force is always ample to hold it out of contact with the rim or flange when the clutch is released.

Each frame-arm 11 of the spider clutch-frame 10 is provided in opposite side edges with weight-receiving pockets 56, which are preferably filled with soft metal, such as lead or babbitt. The filling of the weight-pockets 56 with metal provides for balancing the weight of each clutch-arm and the clutch de-

vices carried thereby and avoids the necessity and expense of fastening an unsightly piece of iron on the clutch-frame for this purpose.

In order to provide for a proper balancing of the weight of each clutch-arm and of the clutch devices carried thereby, it is preferable that the pockets 56 be formed in the opposite side edges of each radial arm. Furthermore, it will be observed that the pockets 56 partially pierce the side portions of the arm and have their open sides facing the spaces between the arms, so as to be exposed in a manner that they may be conveniently filled with molten metal, a sufficient quantity of which metal is poured into the different pockets until the clutch-frame is properly balanced. It is also to be noted that by reason of having the pockets 56 formed directly in the clutch-arm the soft-metal fillings are entirely housed or concealed and practically form a homogeneous part of the spider clutch-frame, and by reason of said weight-pockets being disposed in the plane of rotation of the clutch-frame there is no tendency of the metal fillings to work loose and fly out of the pockets under centrifugal force.

Changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a friction-clutch, a pair of inversely and radially movable clutch-jaws, a pivotally-supported T-lever having a pivotal connection with each of said jaws and provided with a straight lever-arm, a suitably-supported angled toggle-lever having a short arm disposed in an outward direction, a straight toggle-link having a connection with the inner extremity of the T-lever, a pivotal knuckle connection with the outwardly-disposed arm of said toggle-lever, a slide-block, means for adjusting the toggle-link longitudinally within its knuckle connection, and a toggle-link connection between the slide-block and the other arm of the toggle-lever, thereby completing a system of levers providing for imparting a variable motion to the straight lever-arm of the T-lever, substantially as set forth.

2. In a friction-clutch, the combination with a shaft and a pulley having a clutch-rim, of a clutch-frame having a longitudinally-slotted frame-arm, inner and outer oppositely-movable clutch-jaws mounted to slide on opposite sides of the frame-arm and each provided with a shank portion having therein a bearing pocket or recess, a T-shaped adjusting-lever having a straight lever-arm and a cross-head at the outer end of said lever-arm, said cross-head being centrally pivoted in the slotted frame-arm and provided with rounded ends having a peripheral pivotal bearing in the bearing pockets or recesses of said jaw-shanks, a suitably-supported angled toggle-lever, a toggle-link having a connection with the straight lever-arm of the T-lever and a knuckle connection with one end of said toggle-lever, a slide-block, and a toggle-link connection between said slide-block and the other end of said toggle-lever, substantially as set forth.

3. In a friction-clutch, the combination with a shaft and a pulley having a clutch-rim; of a clutch-frame having a frame-arm, the inner and outer oppositely-movable clutch-jaws, a T-lever pivoted at the center of its cross-head to the frame-arm and having a pivotal connection with each of said jaws in recesses thereof, a suitably-supported angled toggle-lever, a knuckle-collar pivotally mounted at one end of the outwardly-disposed arm of said toggle-lever, a toggle-link having an adjustment throughout its entire length within said knuckle-collar and having a pivotal connection at one end with the inner extremity of said T-lever, a slide-block, and a toggle-link connection between said slide-block and said toggle-lever, substantially as set forth.

4. In a friction-clutch, the combination with a shaft and a pulley having a rim; of a clutch-frame having a frame-arm, inner and outer oppositely-movable jaws, a T-shaped adjusting-lever pivoted at the center of its cross-head to the frame-arm and having the opposite ends of its cross-head pivotally engaging with said jaws in recesses thereof, a suitably-supported angled toggle-lever comprising a pair of twin-spaced members angled to form short and long arms, a knuckle-collar having an unthreaded opening therethrough and oppositely-disposed trunnions pivotally engaging the short outwardly-disposed arms of the angled toggle-lever, a straight toggle-link threaded from end to end and extending through the opening in the knuckle-collar, said threaded toggle-link having a pivotal connection with the inner extremity of the T-shaped lever, locking-nuts mounted on the threaded link at opposite sides of the knuckle-collar, a slide-block, and a toggle-link connection between the slide-block and said toggle-lever, substantially as set forth.

5. In a friction-clutch, the combination with a shaft and a pulley having a clutch-rim; of a clutch-frame having a frame-arm provided with a pair of offstanding projections, the inner and outer oppositely-movable jaws, a separate yoke-plate fixedly secured to the inner jaw and provided with a pair of oppositely-extending arms, and springs fitted to the separate arms of the yoke-plate and bearing against the projections of the frame-arm, substantially as set forth.

6. In a friction-clutch, the combination with a shaft and a pulley having a clutch-rim; of the clutch-frame having a frame-arm provided with outwardly-projected shoulder-flanges, the inner and outer oppositely-movable jaws, a separate yoke-plate fixedly secured at its outer end to the inner jaw and provided with a pair of oppositely-extending arms having at

their extremities outwardly-disposed studs or pins, springs arranged over said studs or pins and bearing at one end against said shoulder-flanges, and means for adjusting the jaws toward and against said rim, substantially as set forth.

7. In a friction-clutch, the spider clutch-frame provided in the opposite edges of each radial arm with weight-pockets disposed in the plane of rotation of the frame, said pockets partially piercing the side portions of the arms, and having their open sides facing the spaces between the arms, and soft-metal weights filling and concealed within said pockets, to provide for balancing the weight of each arm and of the clutch devices carried thereby, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

NOAH SHAW.

Witnesses:
H. G. STEARNS,
J. ANDERSON.