No. 753,073. PATENTED FEB. 23, 1904.

W. J. HILLIARD.

CLUTCH PULLEY.

APPLICATION FILED MAR. 24, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

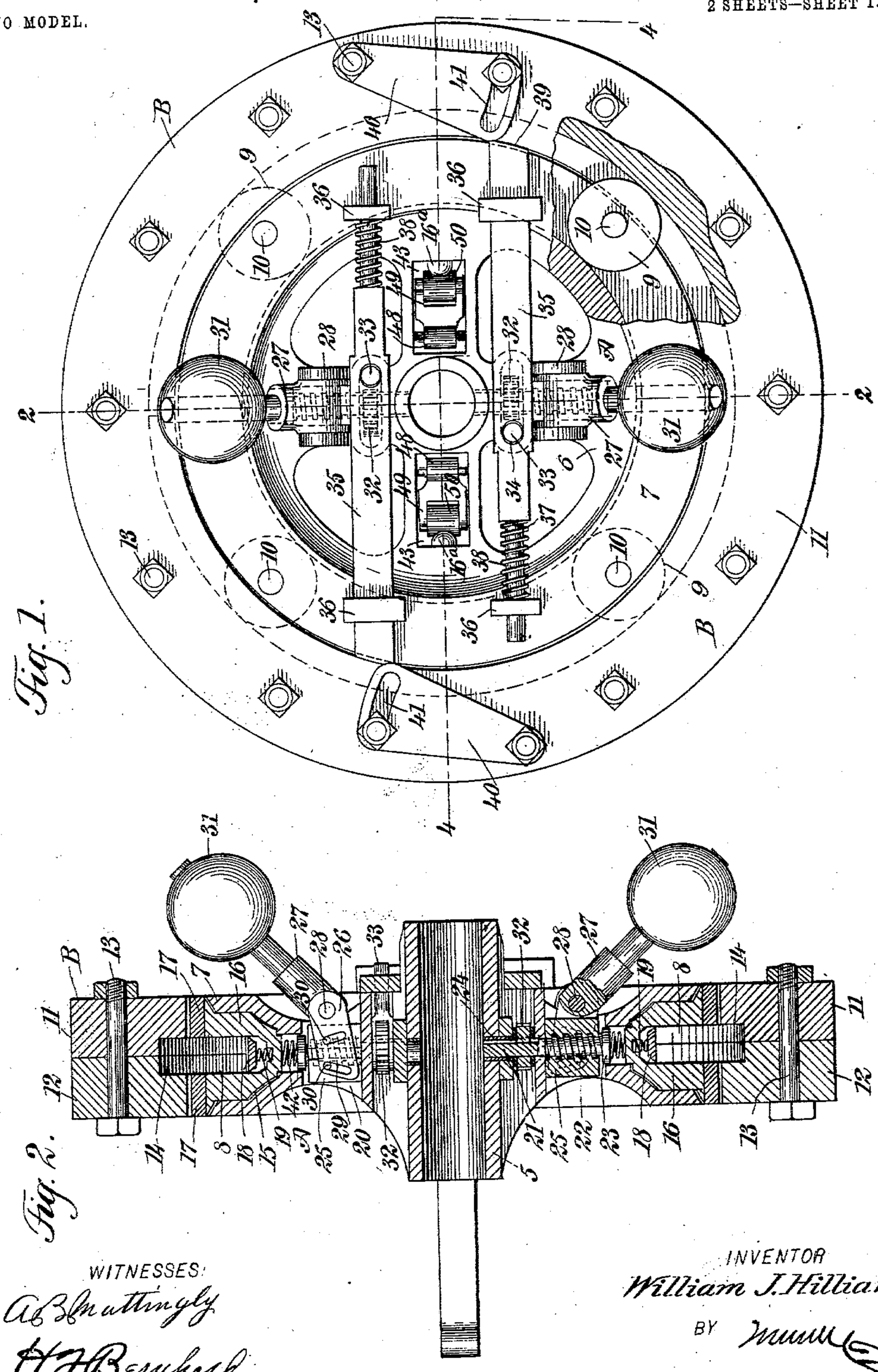

Fig. 1.

Fig. 2.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

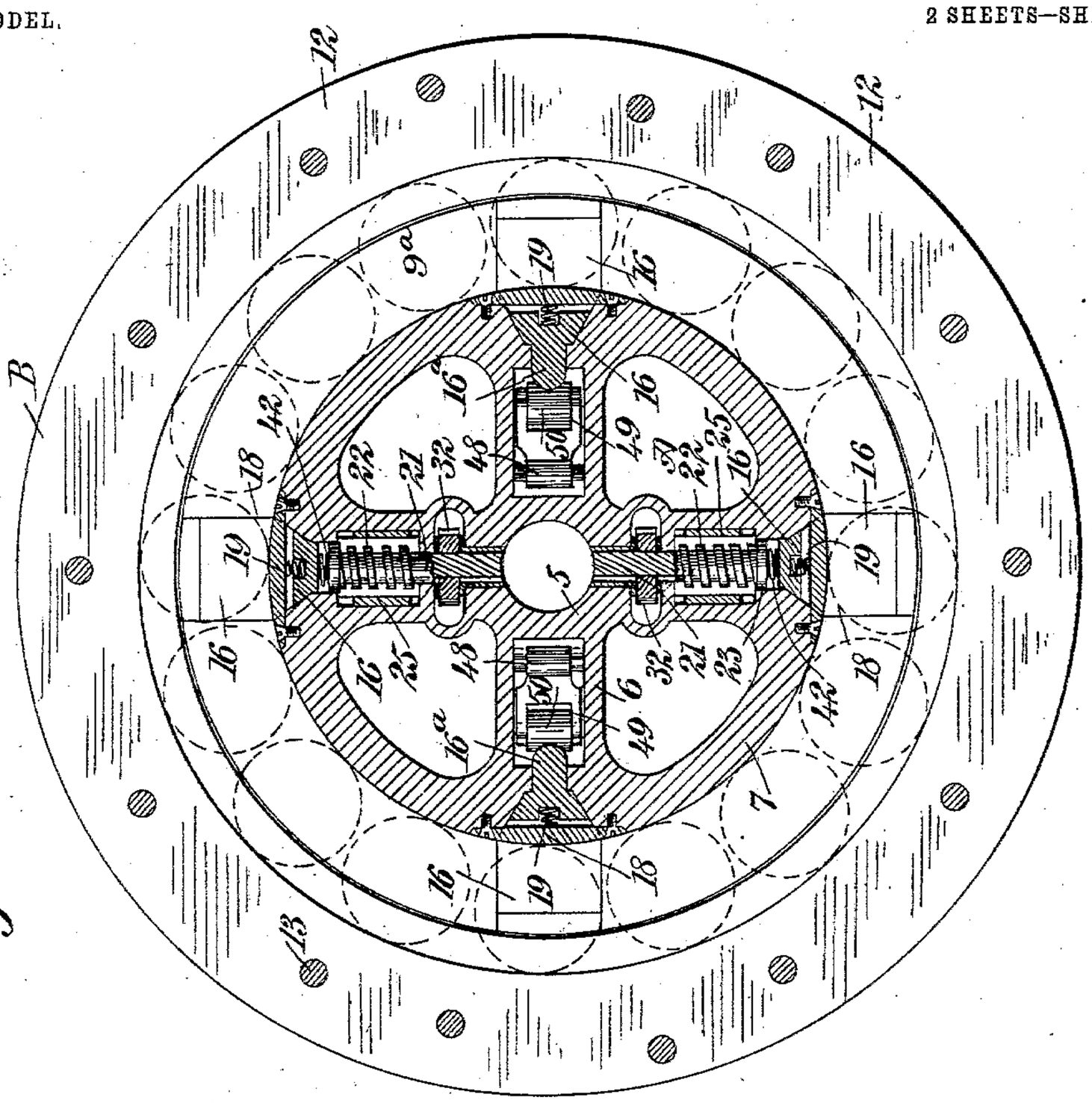
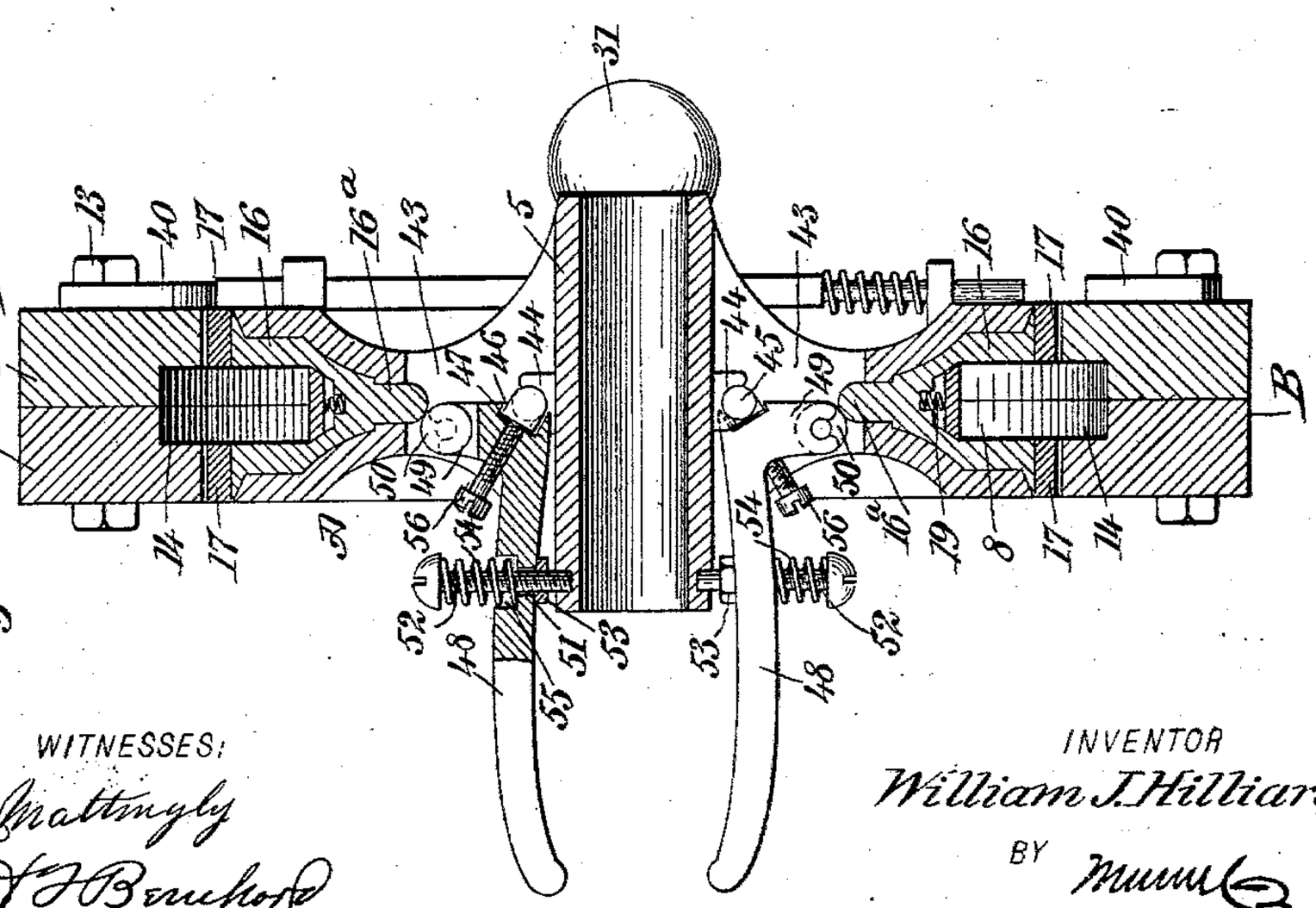


Fig. 4.



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No. 753,073. Patented February 23, 1904.

UNITED STATES PATENT OFFICE.

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CLUTCH-PULLEY.

SPECIFICATION forming part of Letters Patent No. 753,073, dated February 23, 1904.

Application filed March 24, 1903. Serial No. 149,328. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. HILLIARD, a citizen of the United States, and a resident of Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Clutch-Pulleys, of which the following is a full, clear, and exact description.

My invention relates to improvements in clutch-pulleys adapted for use on shafts and machinery; and one object that I have in view is the provision of a simple and compact device which embodies in a single structure the parts necessary to drive or to be driven by a belt and to make the belt member fast or loose with a shaft.

A further object is to provide the pulley with means by which the loose member may be made fast automatically with the shaft on the rotation of the latter, thus making provision for taking up the load gradually and by the progressive action of the clutch, such form of the pulley being especially useful in connection with gas-engines and other forms of machines.

Further objects and advantages of the invention will appear in the course of the subjoined description, and the novelty will be defined by the annexed claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of a clutch-pulley constructed in accordance with my invention and showing the same equipped with means for automatically making the loose member fast with the shaft member. Fig. 2 is a vertical cross-section on the line 2 2 of Fig. 1. Fig. 3 is a vertical sectional elevation taken centrally through the construction shown by Fig. 4, and Fig. 4 is a horizontal section on the line 4 4 of Fig. 1.

A designates the fast or revoluble member, and B is the loose or idle member.

The fast member A is provided with an elongated hub or sleeve 5, adapted to be fastened in any suitable way to a shaft for the purpose of rotating therewith. This fast member has a web 6 extending outwardly from the hub and joined with a rim portion 7. The rim 7 is provided with an annular groove or channel 8, which accommodates a series of bearing-rollers 9, the latter having suitable stub-axles 10, which are mounted in any suitable way in said rim of the fast member A. As shown by Fig. 1, I employ a series of four rollers 9, which are spaced equidistant around the periphery of the member and lie partly within the annular channel 8 thereof, the rollers projecting beyond the periphery of said member A. It is evident, however, that the number of rollers employed in the series may be increased, although in Figs. 1 and 2 I have only shown the series of four rollers, the latter being sufficient to properly support the pulley member B when it runs idly on the member A.

The loose pulley member B is shown by Fig. 2 as consisting of complemental sections 11 12, which are assembled in matching relation and are secured firmly together by a plurality of through-bolts 13, the sectional construction of said pulley member facilitating its application to the rim and the rollers of the fast member A. The parts comprising the loose pulley member are provided at their inner edges and in their opposing faces with matching recesses adapted to form an annular track or way 14, in which is received the projecting portions of the rollers 9, constituting the series on the fast pulley member A. The inner edge of the sectional loose pulley member B is disposed quite close to the periphery of the rim 7 forming the part of the member A, and this member B is sustained loosely in place around the member A by the series of rollers 9, which fit in the annular track 14, provided in the inner edge of said member B, said rollers preventing lateral displacement of one member relatively to the other.

The member A is furthermore provided in its web and the rim with a series of radial openings 15, the same being equidistantly formed in the member and alternating with the rollers 9 of the series. These radial openings accommodote the shoes 16, which are fitted snugly in the openings and are free to have a limited radial movement therein. Each shoe is forked, bifurcated, or split for a part of its length, as shown by Figs. 2 and 4, in

order that the shoe may straddle or embrace the annular channel 8, which is provided in the rim, and these shoes are provided at their outer ends with friction-faces 17, which are disposed in opposing relation to the inner edges of the parts 11 12, comprising the idle member B. These friction-faces may consist of layers of compressed fiber or any other suitable material adapted to have the proper amount of frictional engagement with the idle member B, and said friction-faces are movable radially with the shoes relatively to said idle member.

Through the forked shoes extend the bridge-plates 18, which are fastened to the rim portion of the member A and afford the track-surfaces for the travel of the rollers 9 in case it is desired to allow these rollers to run idly in the coincident channels 8 14 of the members A B. These bridge-plates have arcuate outer edges disposed flush with the bottom of the channel 8 in the rim, as indicated more clearly by Fig. 3.

Between the fixed bridge-plates 18 and the radially-movable shoes 16 are disposed the coiled springs 19, which tend to normally impel the shoes inwardly with respect to the member A, and thus withdraw the friction-faces 17 from engagement with the member B.

I will now proceed to describe the means by which the shoes are automatically and positively moved radially in outward directions. The web 6 of the member A is provided with transverse slots 20, and across these slots are disposed the radially-movable stems 21, each having a coarse multiple thread 22 for a part of its length and terminating in a head 23 at its outer end. A portion of each stem 21 plays loosely in a guide sleeve or socket 24, provided in the hub portion 5 of the member A, each stem being free to rotate axially and to have a radial movement. In each slot 20 of the web is arranged a two-part or split nut 25, which when closed is adapted to have its threads engage with the male threads 22 of the stem. The members or parts of the divided nut are embraced by the bifurcated end 26 of a lever 27, the latter being fulcrumed on a suitable pin or bolt 28, supported on the member A. The arms 26, formed by the bifurcation of the lever, are provided with cam-slots 29, which are engaged by the pins or studs 30, attached to the members of the nut 25, and when the member A is in motion the centrifugal force developed by said member throws the lever 27 in outward direction, thus imposing the action of the levers on the studs and allowing the members of the nut to close, so as to have engagement with the threaded stems 21. Each lever 27 is provided with a weight 31, and in the drawings I have shown the fast member A as having two of these levers adapted to control a like number of nuts which actuate the stems 21, placed on diametrically opposite sides of the pulley. Each stem is furthermore provided with a ratchet 32, which is engaged by a lever 33, the latter fitting loosely on the stem to turn freely thereon and extending outwardly from the pulley member A, so as to fit in an opening 34, which is provided in a slidable bar 35. One of these slidable bars is used in connection with each stem, and each bar is loosely held for endwise movement in a pair of guide-lugs 36, provided on one face of the member A. The bar 35 has a shoulder 37, against which acts one end of a coil impelling-spring 38, the other end of which is seated against one lug 36. The free end of each slidable bar has a curved or beveled nose 39, and this bar is normally impelled by the spring 38 in one direction, so that its nose will ride against the projecting edge of a cam-plate 40, carried by the idle member B. This cam-plate is loosely fitted on one of the through-bolts 13, and it is provided with a curved slot 41, which loosely receives another of the bolts 13 of the series. The plate 40 is held adjustably in position by the bolts; but it should be adjustable for one edge or corner thereof to project beyond the inner edge of the member B, to which said plate is attached. Between the head 23 of each stem and the inner end of one of the shoes is interposed a coil-spring 42, which serves to return the stem to its normal position; but on the outward movement of the stem the spring is compressed and imparts a like movement to the shoe 15.

With the parts in their normal positions the stems 21 are pressed toward the hub of the member A by the springs 42, and the weighted levers 27 are thrown inwardly in order to release the members of the nuts from engagement with the threaded portions of the stems. The member A rotates with the shaft of an engine or other part of machinery, while the member B remains at rest, owing to its engagement with the belt which is to be driven. On the rotation of the member A the levers 27 move outwardly by the centrifugal energy developed by said member, and these levers turn on their fulcra 28 to make the cam-slots 29 act on the pins 30, thus securing the desired closing of the nuts 25. The bars 35 rotate with the member A, and as they pass the cam-plates 40 these bars are moved inwardly against the energy of the springs 38. By pressing the bars 35 backwardly the levers 33 are moved in order to turn the ratchets 32 and impart like movement to the stems 31. The continued rotation of the pulley member A imparts a progressive step-by-step movement to the stems 21, which work in the closed nuts 25, thus gradually moving the stems 21 in radial directions against the shoes 16. The shoes are thus forced outward to press the friction-faces 17 against the member B, and the continued radial movement of the stems under the action of the feed mechanism here-

tofore described operates to clutch the member B tightly to the member A, whereby the load is gradually taken up and the member B is closed to rotate with the member A.

The pulley is also equipped with means for moving the shoes radially, such means being adapted for operation by hand. The pulley may also be equipped with an increased number of rollers 9^a, which are fitted loosely in the coincident channels of the two members, and these rollers are adapted to travel on the bottom of the channel 8 and on the bridge-plates 18. The shoes 16 are four in number, and two of these shoes are provided with inwardly-extending stems 16^a. (See Figs. 3 and 4.) These stems project into radial slots 43, which are provided in the web of the member A, and in the slots are formed or secured the bearing-lugs 44. The lugs are disposed in pairs to receive pintles 45 and an adjustable thrust-block 46, the latter fitting in recesses 47, which are provided at the knees of angular levers 48, each lever having an offstanding arm 49, which carries an antifriction-roller 50. The levers are disposed on opposite sides of the hub and extend outwardly from the pulley. (See Fig. 4.) Each lever is provided with a slot or opening 51 at a point intermediate of its length, and through this slot passes a fulcrum-bolt 52, which is screwed into the hub, said bolt having a nut 53 and supporting the coiled spring 54, which fits in a socket 55, provided in the lever. The lever is held loosely on the fixed bolt and pressed against the nut 53 by the action of the spring 52. Said lever is also provided with a take-up screw 56, which finds a threaded bearing in the inner portion of the lever and which acts against the pivoted block 46 in a way to take up the lost motion due to wear of the parts.

Any suitable means may be provided for simultaneously moving the pair of levers 48 in one direction and making the rollers 50 ride against the stems 16^a of the shoes, thus moving the latter outwardly against the energy of the springs 19 and making the friction-faces 17 of the shoes engage with the member B. By reference to Fig. 4 it will be seen that in the normal positions of the levers 48 the rollers 50 lie a little to one side of the stems 16^a on the shoes; but when the outer ends of the levers 48 are pressed apart these inner arms 49 are moved, so as to make the rollers 50 lie against the stems 16^a and force the shoes radially in outward directions, thus making the friction-faces 17 press forcibly against the inner edge of the member B. The desired movement of the levers 48 may be effected by the employment of a slidable member on a shaft, such as a cone adapted to ride against the levers 48 and to be changed in position by the operation of a suitable shifting lever.

The pulley of the form shown by Figs. 3 and 4 is adapted for use on a line-shaft or the shaft of an engine, whereas the pulley equipped as in Figs. 1 and 2 may be advantageously employed on the driving-shaft of a gas-engine or other motor. In fact, the pulley of Figs. 1 and 2 may be employed wherever it is desired to have the load gradually taken up by the application of the clutch mechanism forming a part of a loose pulley.

The construction of the pulley may be modified within wide limits; but where the pulley is to be used as a tight and loose pulley alternatively I prefer to employ a continuous series of rollers between the fast and loose members, as indicated in Fig. 3, thus equalizing the bearing and minimizing the friction of the member B on the member A.

My improved construction obviates the necessity of oiling the bearings of pulleys and wholly overcomes the cutting or wearing out of the hub where it engages with the shaft, because there is no friction between the shaft and the pulley, and the parts cannot become clogged or worn. The clutch mechanism cannot slip in the rotary motion of the pulley, because any slipping will insure the rotation of the screw, which thereby tightens the parts and increases the frictional engagement of the shoes with the loose member.

Any suitable means may be associated with the automatic devices for working them positively, such as a hand-lever adapted to engage with the arms or levers 27.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A clutch-pulley having a fast member, a loose member, coincident channels in the opposing surfaces of said members, a series of rollers in said channels of the members, forked shoes slidably mounted in the fast member to straddle the roller-channel and having faces adapted to engage the inner surface of the loose member, and means for adjusting said shoes.

2. A clutch-pulley having fast and loose members provided in their opposing faces with coincident channels, bearing-rollers fitted in said channels and supporting the loose member on the fast member and against lateral displacement thereon, forked shoes mounted for radial movement on the fast member and straddling the roller-channel therein, said shoes having divided friction-faces presented to the loose member, and means for adjusting said shoes.

3. A clutch-pulley having fast and loose members, movable shoes carried by the fast member, means also carried by the fast member for moving said shoes into engagement with the loose member, and coöperating devices mounted on the fast and loose members for automatically actuating the shoe-adjusting means, whereby the rotation of one member brings certain of said coöperating devices into engagement with other parts of the coöper-

ating devices on the other member for automatically clutching the pulley members one to the other.

4. A clutch-pulley having fast and loose members, friction-shoes on the fast member, threaded stems for moving said shoes, divided nuts adapted for engagement with said stems, means operable by the rotation of the fast member for closing said nuts around the stems, and coöperating devices on the fast and loose members and operable by the rotation of the fast member for rotating the stems in the nuts, whereby the stems are moved radially and adjust the shoes automatically.

5. A clutch-pulley having fast and loose members, shoes on the fast member, threaded stems for moving said shoes, nuts in which the stems work, ratchets on the stems, slidable bars on the fast members, levers engaging the bars and the ratchets, and tappets carried by the loose member in the path of the slidable bars.

6. A clutch-pulley having fast and loose members, ball-bearings between said members, forked shoes having radial stems associated therewith and arranged to straddle the ball-bearings for presentation to the loose member, and means engaging said stems for moving the shoes radially.

7. A clutch-pulley having a shaft member, a loose member, forked shoes movable radially in the shaft member, bridge-plates carried by the shaft member and extending through said shoes, bearing-rollers fitted to the members and adapted to ride on the bridge-plates, and means for moving said shoes into frictional engagement with the loose member.

8. A clutch-pulley having a shaft member provided with a channel, a loose member consisting of complemental sections united laterally to complete said member and produce an internal channel which coincides with the channel of said shaft member, bearing-rollers fitted in said channels of the members, forked shoes mounted in the shaft member, bridge-plates spanning the shoes and affording track-surfaces for the rollers, and means for adjusting the shoes.

9. A clutch-pulley having a shaft member, a loose member, radially-movable shoes, threaded stems to move the shoes outwardly, nuts in which said stems work, and means for imparting a step-by-step rotation to the stems on the rotation of the shaft member.

10. A clutch-pulley having a shaft member, a loose member, shoes movable radially in the shaft member, stems engaging said shoes, divided nuts in which the stems are arranged to work, centrifugal levers connected with said nuts to automatically open the same on the stoppage of the shaft member, and means for imparting a step-by-step movement to said stems.

11. A clutch-pulley having a shaft member, a loose member, radially-movable shoes on the shaft member, threaded stems provided with ratchets and adapted to engage with said shoes, slides carried by the shaft member and connected operatively with the ratchets of the stems, and cams on the loose member and in the path of said slides.

12. A clutch-pulley having a shaft member, a loose member, friction-shoes on said shaft member, threaded stems arranged to impel the shoes outwardly, a divided nut engaging with each threaded stem, weighted levers connected with said divided nuts, and means for imparting a step-by-step rotation to the stems on the rotary motion of the shaft member.

13. In a clutch-pulley, the combination with a shoe, of a threaded stem, a divided nut adapted for engagement with said stem, a lever having arms provided with cam-slots, and projections on the members of the nut and fitting in said cam-slots of the levers.

14. In a clutch-pulley, the combination with fast and loose members, and a shoe carried by one member and adapted for engagement with the other member, of a stem, a nut in which the stem works, a ratchet on said stem, a ratchet-lever engaging with said ratchet, a bar slidably fitted on the shaft member and engaging with the ratchet member, a spring for impelling said bar in one direction, and an adjustable cam carried by the loose member in the path of said bar.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM J. HILLIARD.

Witnesses:
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SYLVEEN V. NYE.