Oct. 27, 1942. B. F. KELLEY 2,300,122

CATHEAD AND SPINNING DRUM ASSEMBLY

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Fig. 1.

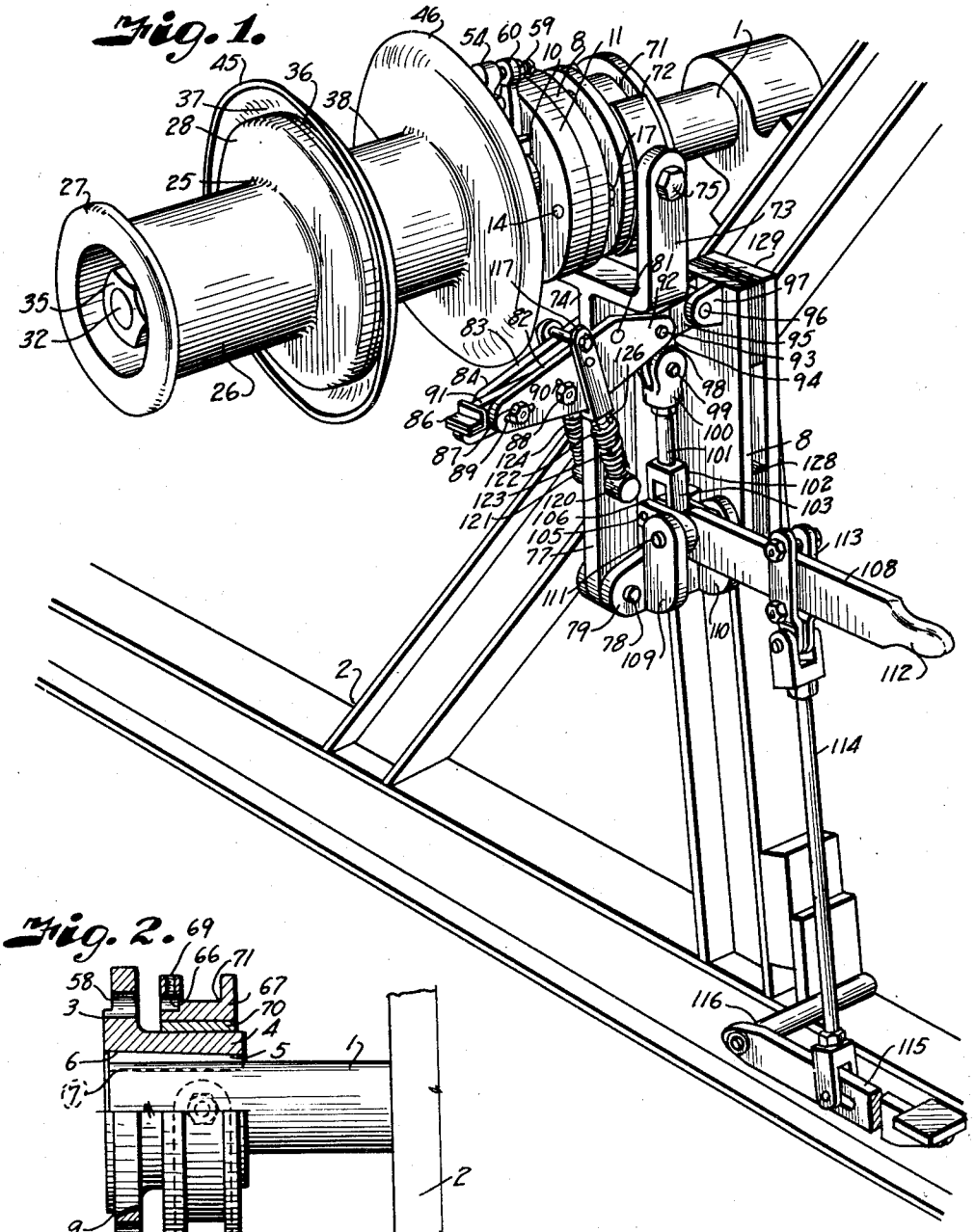


Fig. 2.

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Fig. 3.

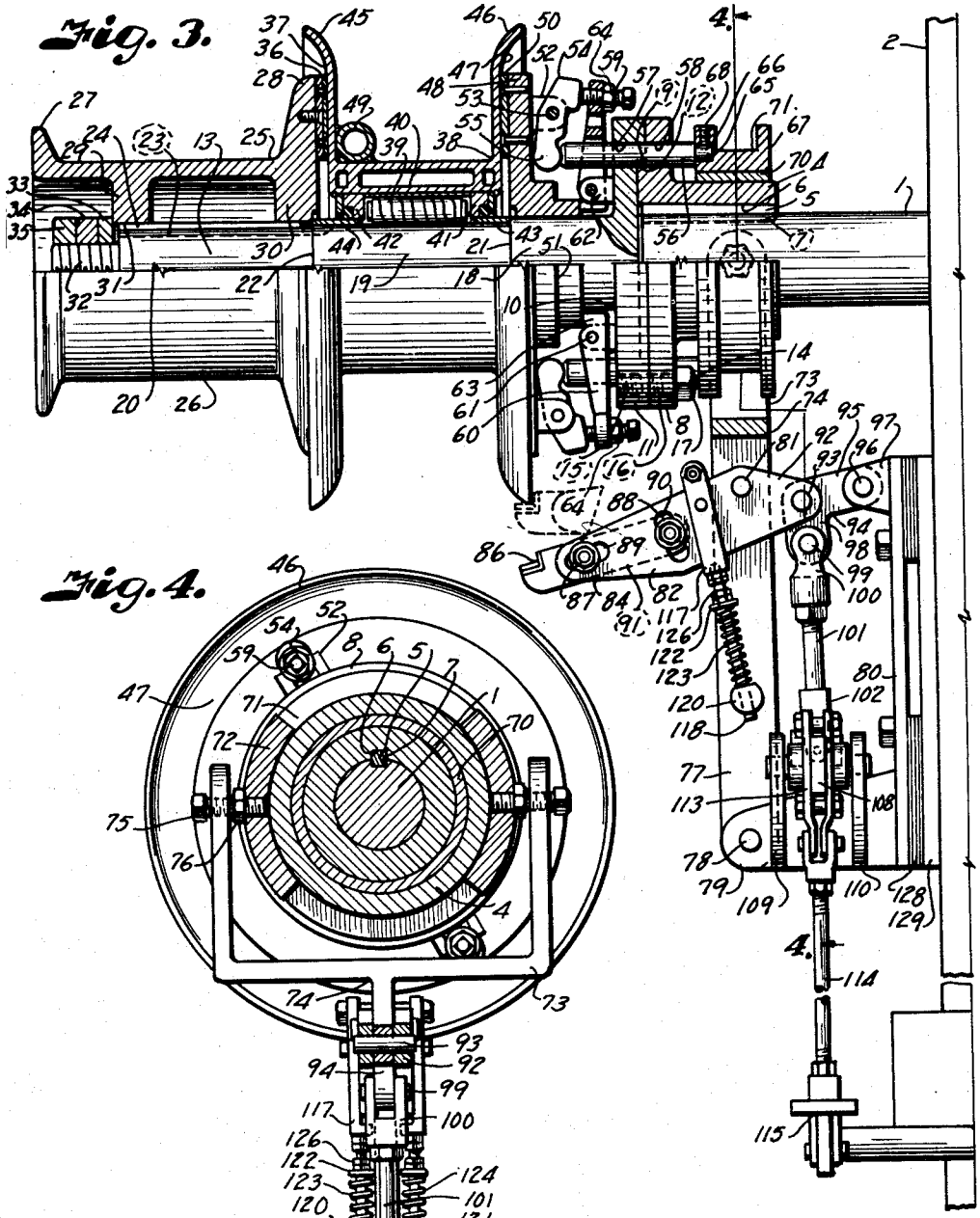


Fig. 4.

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Fig. 5.

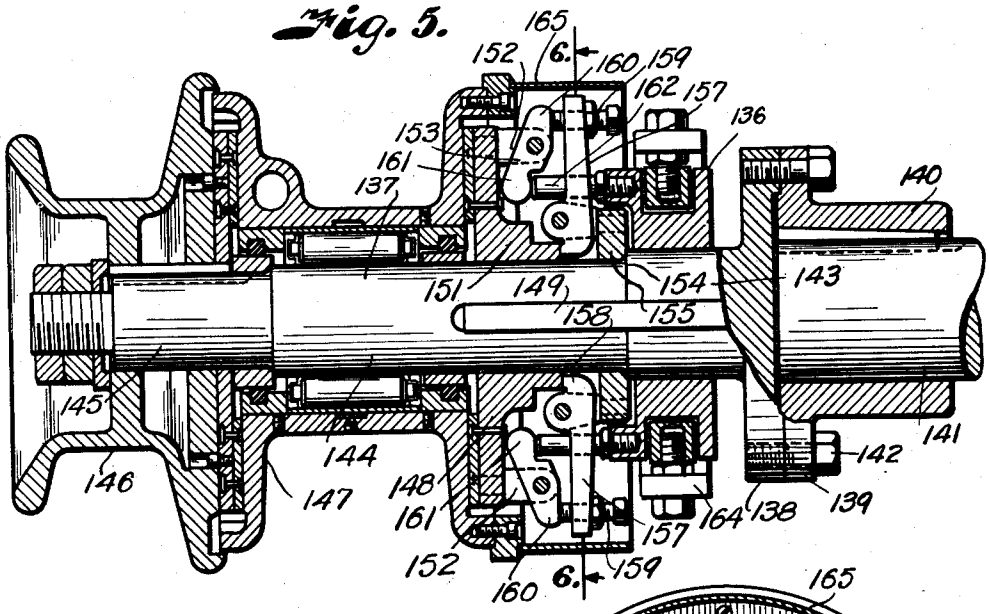


Fig. 6.

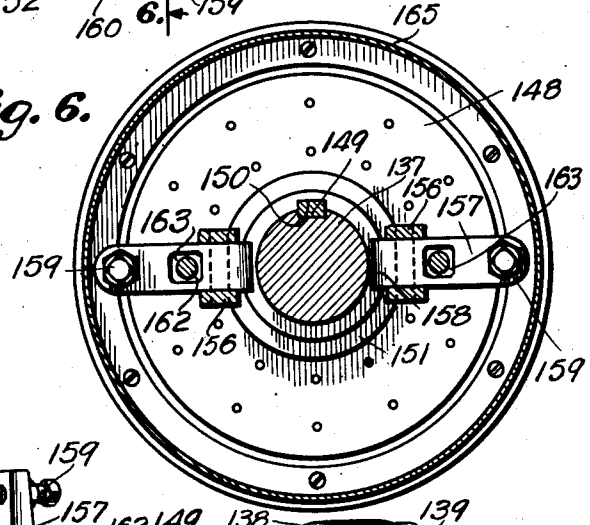
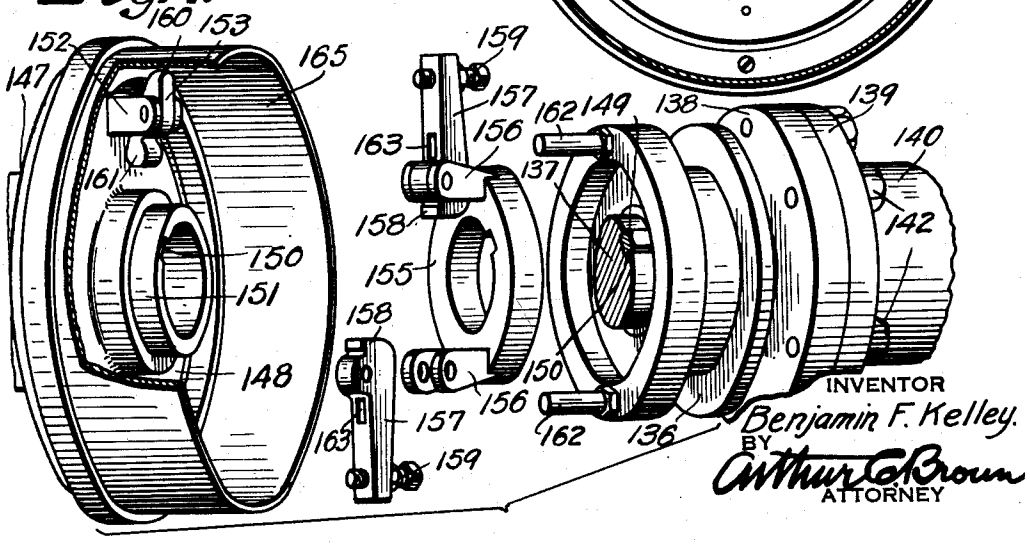


Fig. 7.



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UNITED STATES PATENT OFFICE

2,300,122

CATHEAD AND SPINNING DRUM ASSEMBLY

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Application March 23, 1939, Serial No. 263,628

10 Claims. (Cl. 254—185)

This invention relates to a draw-works such as used in well drilling rigs and particularly to a combination cathead and spinner drum therefor.

In rotary well drilling practice, the drill pipe is pulled from and run into the well-hole in stands, the joints of which are broken and made up under power applied through a spinning rope wound upon the cathead of the draw-works. Operation of the spinning rope is considered very dangerous due to the fact that the work is accomplished by hand wrapping of the spinning rope around the surface of the cathead with the operator pulling on the end of the rope to create the friction necessary to impart the required pull on the rope. Should the operator foul the spinning rope or become entangled himself, a serious accident may result before the draw-works controls may be reached.

It is, therefore, a principal object of the present invention to provide a spinning drum in combination with a cathead with the drum being driven through a friction clutch actuated by the operator. With such an arrangement the spinning line is attached to the spinning drum and the necessary friction is imparted to the drum through clutch control levers.

It is also an object of the invention to provide a combination cathead and spinner drum that is readily disconnected from the draw-works, thereby providing the necessary road clearance when the draw-works is being transported from one drilling location to another.

In accomplishing these and other objects of the invention, as hereinafter pointed out, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a portion of a draw-works equipped with a combination cathead and spinner drum embodying the features of the present invention.

Fig. 2 is a detail elevational view, partly in section, of the draw-works shaft coupler for demountably connecting the combination cathead and spinner drum.

Fig. 3 is an enlarged side elevational view, partly in section, of the combination cathead and spinner drum and its control levers.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Fig. 5 is a sectional view of a modified form of the invention which employs a different clutch actuating mechanism.

Fig. 6 is a cross-section on the line 6—6 of Fig. 5.

Fig. 7 is a perspective view of the portions of the spinner drum, draw-works shaft, and shaft extension with the clutch actuating levers shown in disassembled spaced relation.

Referring more in detail to the drawings:

1 designates the power shaft of a draw-works indicated by the side frame 2. A cathead is usually keyed to the projecting end of the shaft so that the spinning rope used in breaking and making up of the stands of drill pipe may be wrapped around the cathead and the end held by the operator to effect the necessary pull on the rope incidental to rotation of the draw-works shaft. The usual cathead creates a hazard as above pointed out, and has the further disadvantage in that it increases the over-all width of the draw-works so that it projects beyond the width allowed for road clearance when the draw-works is being moved from one location to another. The cathead must, therefore, be removed and removal thereof is usually a difficult operation for the reason that it is secured by a tapered key driven tightly into place. Another disadvantage is that removal of the key often results in damage to the shaft.

In lieu of the conventional structure, I provide the shaft 1 with a coupling member 3 having a hub 4 which is secured by a tapered wedge 5 driven into registering keyways 6 and 7 of the hub and shaft respectively. The coupling also includes a circumferential flange 8 having an annular shoulder 9 on the face thereof to center a mating coupling member 10. The mating member 10 includes a flange 11 having a recess 12 on the face thereof to engage the annular shoulder so that a shaft extension 13 carried thereby is centered relatively to the shaft of the draw-works, and secured by stud bolts 14, the studs being anchored in threaded sockets 15 within the flange 11 and extending through registering openings 16 in the flange 8 to mount nuts 17 by which the flanges are drawn into clamping contact.

The shaft extension includes offset portions 18, 19 and 20 forming stop shoulders 21 and 22 therebetween. Formed in the smaller and outer offset portion 20 is a groove or way 23 for a key 24 which secures a conventional cathead 25 in fixed relation with the shaft extension. The cathead 25 includes a cylindrical drum portion 26 on which a spinning rope is usually mounted and which is retained from end displacement by drum flanges 27 and 28. The drum portion 26 has internal annular hubs 29 and 30 provided with axial bores snugly engaging the outer offset portion of the shaft extension, and which are

provided with ways 31 engaging the key 24. The outer end of the shaft extension has a reduced threaded stud 32 which mounts a thrust washer 33, a draw-nut 34 by which the thrust washer is moved into engagement with the outer hub, and a lock nut 35 as clearly shown in Fig. 3. When the cathead is thus mounted on the shaft extension the inner end engages against the shoulder 22 and cooperates with the thrust washer to retain the cathead against longitudinal movement with respect to the shaft.

The flange 28 is of larger diameter than the flange 27 and mounts a friction ring 36 adapted to frictionally engage the face 37 of a spinner drum 38, now to be described. The spinner drum is normally, freely rotatable on the portion 19 of the shaft extension and is carried on antifriction bearings 39 retained in the hub 40 of the drum by oil sealing rings 41 and 42 in cooperation with spacer sleeves 43 and 44 which are sleeved upon the shaft extension, the inner spacer sleeve 43 engaging against the shoulder 21 and the outer spacer sleeve 44 against the end face of the cathead, as shown in Fig. 3.

The spinner drum also includes flanges 45 and 46 of larger diameter than the flange 28 to respectively form the friction surface 37 and a friction surface 47 which is adapted to be engaged by a sliding clutch plate 48. Fixed within the angle of the hub portion of the spinner and the flange 45 is a line holder 49 to which the end of the spinner line is connected when setting up and breaking drill pipe joints, as later described.

The clutch plate 48 also has a friction ring 50 secured thereto to engage the flange 46. The clutch plate also includes a hub 51 that is slidably mounted upon the portion 18 of the shaft extension so that it is movable to and from the spinner drum. Projecting from the clutch plate are pairs of ears 52 carrying fulcrum pins 53, each mounting a short lever 54, the inner ends 55 of which engage pins 56 that are slidably supported within registering openings 57 and 58 of the coupling flanges 8 and 11, while the outer ends of the short levers engage adjusting screws 59 that are carried by long levers 60. The levers 60 are pivotally mounted on fulcrum pins 61 carried by ears 62 projecting from the outer face of the flange 11, as shown in Fig. 3, so that the inner ends 63 thereof engage against the hub portion of the sliding clutch plate. The adjusting screws are threadedly mounted in the ends of the longer levers 60 and are retained in adjusted position by jam-nuts 64 threaded thereon. The levers thus arranged act to compound the leverage exerted on the clutch plate incidental to actuation of the slidable pins. The opposite ends of the slidable pins 56 have reduced extensions 65 engaged in sockets 66 of a shifting collar 67, the portion 65 of the pins forming annular shoulders which are retained against the shaft collar by set screws 68, the set screws being threaded into radial openings 69 in the collar and engaging against the reduced portion 65 of the pins. The clutch collar includes a bushing 70 slidably mounted upon the hub 4 of the coupling member 3 and the periphery thereof is provided with an annular groove 71. Engaged in the groove 71 are arcuate shoes 72 that are carried in the forked ends 73 of a shifting yoke 74, the shoes being retained by pivot screws 75 having shanks threaded into the shoes and secured by jam-nuts 76 as shown in Fig. 4. The pivot screws also have bearing portions pivoted in the forks of the shift lever. The shifting lever also includes a depending arm 77 having its lower end pivotally connected by a cross-pin 78 with ears 79 projecting from a bracket plate 80 carried from the side frame of the draw-works.

Pivoted on the ends of a cross-pin 81 extending through the upper portion of the arm 77 are plate-like arms 82 and 83 having outwardly extending ends 84 carrying a brake shoe 86 therebetween. The brake shoe is adjustably supported by the arms on bolts 87 and 88 extending through slots 89 and 90 in the respective plates and through registering openings in an arm 91 carrying the shoe, so that it may be adjusted to engage the periphery of the drum flange 46 as shown by the dotted lines in Fig. 3 when the clutch is released. The plate-like arms have tail portions 92 projecting from the offset side of the shifting yoke and connect by a pin 93 with a bell crank 94. The bell crank 94 has one arm 95 pivotally connected by a pin 96 with ears 97 carried on the bracket plate 80 at a point above the ears 79 as shown in Fig. 1. The tails 92 of the arms 82 and 83 cooperate with the arms 95 of the bell-crank to form a toggle to multiply pressure on the friction faces of the clutch elements. The other arm 98 of the bell crank projects downwardly and is connected by a pin 99 with a clevis 100 on the end of an actuating rod 101. The lower end of the rod terminates in a yoke 102 having arms 103 engaging the respective sides of a universal joint block 104 which itself is pivotally supported on a pin 105 carried by the spaced ears 106 projecting from the end of a hand lever 108. The hand lever 108 is pivotally mounted between lugs 109 and 110 projecting from one of the ears 79 with the pivotal connection being formed by a pin 111 extending through the lugs and through the lever.

Formed on the outer end of the lever 108 is a handle portion 112 whereby the operator may grasp the lever to effect shifting of the clutch as later described. Connected with the lever by a clamp 113 is a link 114 having its other end pivotally connected with a foot lever 115 which is pivoted in a suitable bracket 116 carried by the side frame of the draw-works as shown in Fig. 1. Fixed to the lever plates carrying the brake is a yoke 117 carrying spaced rods 118 and 119 slidably movable through openings in studs 120 and 121 extending laterally from the respective sides of the arm 77. Sleeved on the rods and having one end engaging the studs and their opposite ends against washers 122 are springs 123 and 124, the washers being retained against the springs by jam-nuts 126.

When the mechanism thus described is mounted as a replacement on a conventional draw-works, the bracket plate 80 is spaced the required distance from the frame 2 by means of inserts 128 that are placed between the plate 80 and a base plate 129 which is fixed to the frame 2 as shown in Fig. 1.

In using the combination cathead and spinner drum constructed and assembled as described, the end of the spinning rope is secured to the line holder 49 when the spinner drum is in idle condition. Upon operation of the draw-works, the shaft 1 is continuously rotated as is the shaft extension 13 and cathead 25. As long as the sliding clutch plate is disengaged from the spinner drum, the spinner drum will remain idle on the shaft, however, when the hand lever 108 is moved downwardly on its fulcrum pin 111, the univeral block will be moved upwardly to shift the bell crank on its fulcrum 96. This move-

ment of the bell crank moves the shifting yoke in the direction of the spinner drum so that the pins 56 slide within the bearing openings of the coupling flanges to press against the ends 55 of the short levers 54. The opposite ends of the levers 54 press against the adjusting screws 59 so that the long levers 60 are shifted in the direction of the flange 11 to cause the lower ends thereof to press against the hub of the clutch collar to effect movement of the clutch plate into frictional engagement with the spinner drum and the spinner drum into frictional engagement with the friction ring on the flange 28 of the cathead. The spinner drum then begins to rotate with the shaft to exert pull on the spinner rope. When the actuating lever is released, the parts reverse their movement to disengage the clutch. Reversed movement of the bell crank shifts the brake carrying levers on the shifting yoke so that the shoe carried thereby is moved into braking engagement with the flange 46 of the spinner drum under action of the springs 123 and 124.

Should the spinner rope become fouled or endanger the operator, the operator may merely release his hold on the actuating lever 108 so that the clutch plate disengages and power rotation of the winding drum is stopped. Variable frictional pressure may be applied on the drum to effect the desired rotation thereof. If desired the clutch may be engaged by means of the foot lever 115 or both levers may be used together.

When the draw-works is to be transported from one location to another, the pivot screws of the shifting yoke may be removed to disengage the shoes from the shifting collar. The shifting collar may then be slid retractively from engagement with the hub of the coupling to withdraw the pins from their bearing openings in the coupling flanges. The nuts 17 are then removed from the stud bolts so that the entire combination cathead, spinner drum and shaft extension assembly may be removed as a unit from the draw-works shaft. When thus removed the total width of the draw-works is within that allowed for minimum road clearance so that it may be transported along the usual highways.

Some draw-works shafts may be as large as seven inches in diameter. Therefore, it would be inconvenient to provide a shifting collar of such large diameter as would be required with the construction shown in Figs. 1 to 4 inclusive. I have, therefore, provided a modified form of clutch actuating mechanism and shifting collar shown in Figs. 5 to 7 inclusive. In this form the clutch collar 136 is slidably supported on the shaft extension 137. The shaft extension has a flange 138 which is of sufficient diameter to engage the flange 139 on the hub 140 which is splined to the draw-works shaft 141. The flanges are connected by cap screws 142. The shaft extension may be of smaller diameter than the draw-works shaft and includes stepped bearing portions 143 and 144 and a reduced extension 145 on which the cathead 146 is secured in the same manner as the cathead shown in the first form of the invention. The spinning drum 147 is of substantially the same construction as the first form of spinning drum and is rotatably mounted on the bearing portion 144 of the shaft extension. The clutch 148 which is equivalent to the clutch plate 148, previously described, is mounted for longitudinal movement on the bearing portion 144 and is retained in driven relation therewith by a spline 149 engageable in a spline groove 150 formed in the bore of the hub 151 of the clutch plate. Extending laterally from the clutch plate are ears 152 pivotally mounting short levers 153. Also splined on the section 144 and engaging against the shoulder 154 that is formed between the bearing portions 144 and 143 is a ring 155 having laterally extending ears 156 pivotally mounting long levers 157. The inner ends 158 of the levers 157 engage against the hub 151 of the clutch and the outer ends thereof carry set screws 159 engaging against the outer ends 160 of the short levers 153. The inner ends of the short levers 153 have cam-like heads 161 engaged by actuating pins 162. The pins 162 are carried by the collar 135 and are movable through openings 163 in the long levers 157. Thus when the collar 136 is shifted on the bearing portion 143, the short levers 153 are rocked to effect movement of the long levers 157, which in turn press against the hub of the clutch plate to force the clutch plate in driving relation with the spinning drum to wind the spinning cable thereon in the manner above described in connection with the first form of the invention. The clutch collar 136 is also splined in driving relation with the shaft extension by the spline 149 and is shifted thereon in the longitudinal direction by an actuating yoke 164 which is identical in construction to the shift yoke 74 described in the first form of the invention.

The yoke actuating mechanism is not illustrated in connection with the modified form of invention but may be of the same construction as the mechanism shown and described in connection with the first form of the invention.

With the modified form it is clearly obvious that the shaft extension, being of smaller diameter, may mound a relatively small diameter clutch actuating collar so that it is more readily shifted on the shaft than would be a large diameter collar applied to the hub of the coupling 140. The flange of the spinning drum adjacent the clutch plate 148 may be provided with a ring-like shroud 165 to house the clutch lever mechanism as clearly shown in Figs. 5 and 7.

From the foregoing it is obvious that I have provided a combination cathead and spinner drum which is safe to operate in that it is not necessary for the operator to hold the end of the spinner rope, and should he become entangled with the rope, or the rope become fouled, the spinner drum is readily released from driving engagement with the shaft merely by releasing pressure on the clutch actuating lever. It is also obvious that the cathead and spinner assembly is readily removed to provide road clearance, without injuring the draw-works shaft since there are no keys to be drawn.

What I claim and desire to secure by Letters Patent is:

1. In combination with a shaft of a draw-works, a coupling member fixed to the end of said shaft, a shaft extension including a complementary coupling member, means interconnecting said coupling members to centeringly retain the shaft extension with respect to the draw-works shaft, a spinning drum rotatable on the shaft extension, a friction clutch slidable on the shaft extension for driving said spinning drum, a clutch actuating means slidably supported on said coupling members, a collar connected with said slidable means and mounted on the first coupling member, a shifting fork connected with

the collar, means pivotally supporting the shifting fork, and means for actuating the shifting fork.

2. In combination with a shaft of a draw-works, a coupling member fixed to the end of said shaft, a shaft extension including a complementary coupling member, means interconnecting said coupling members to centeringly retain the shaft extension with respect to the draw-works shaft, a spinning drum rotatable on the shaft extension, a friction clutch mounted on the shaft extension and having driving engagement with said drum, clutch actuating pins slidably supported by said coupling members, means connecting the pins with the clutch, a collar connected with the pins, a shifting fork connected with the collar, means pivotally supporting the shifting fork, a brake mechanism carried on the shifting fork for engagement with the spinning drum, and means for actuating the shifting fork including said brake mechanism.

3. In combination with a shaft of a draw-works, a coupling member fixed to the end of said shaft, a shaft extension including a complementary coupling member, means interconnecting said coupling members to centeringly retain the shaft extension with respect to the draw-works shaft, a spinning drum rotatable on the shaft extension, a clutch supported on the shaft extension and having engagement with said spinning drum, clutch actuating pins slidably supported by said coupling members, means connecting the pins with the clutch, a collar connected with the pins, a shifting fork connected with the collar, means pivotally supporting the shifting fork, a supporting bracket, a toggle mechanism connecting the shifting fork with the supporting bracket, and operating means connected with the toggle mechanism for moving the shifting fork to effect driving engagement of said clutch with the spinning drum.

4. In combination with a shaft of a draw-works, a coupling member fixed to the end of said shaft, a shaft extension including a complementary coupling member, means interconnecting said coupling members to centeringly retain the shaft extension with respect to the draw-works shaft, a cathead fixed on the shaft extension, a spinning drum rotatable on the shaft extension and adapted to frictionally engage the cathead, friction means on the shaft extension engageable with the spinning drum, actuating pins slidably supported by said coupling members and having connection with said friction means, a collar connected with the pins, a shifting fork connected with the collar, means pivotally supporting the shifting fork, a supporting bracket, a toggle mechanism connecting the shifting fork with the supporting bracket, and operating means connected with the toggle mechanism for moving the shifting fork to effect driving connection of said friction means with the spinning drum and frictional contact of the spinning drum with said cathead.

5. In combination with a draw-works shaft, a shaft extension having stepped bearing portions forming an annular shoulder, therebetween, a flange carried by the shaft extension in spaced relation with said shoulder, a hub on the draw-works shaft having a mating flange, fastening devices connecting said flanges, a spinning drum rotatably mounted on the smaller of said bearing portions, a clutch slidably keyed on said bearing portion carrying the spinning drum, an actuating collar slidable on the other bearing portion, a ring engaging said shoulder, lever mechanism connecting the ring with the clutch, and pins on said collar to engage the lever mechanism for effecting engagement of the clutch with the winding drum.

6. In combination with a shaft of a draw-works, a coupling member fixed to the end of the shaft, a shaft extension including a complementary coupling member, means interconnecting said coupling members to centeringly retain the shaft extension with respect to the draw-works shaft, a cathead fixed on the outer end of the shaft extension, a spinning drum rotatable on the shaft extension and adapted to frictionally engage the cathead, friction means on the shaft extension engageable with the spinning drum, a collar slidably keyed on the shaft extension and having connection with the friction means, a shifting fork connected with the collar, means pivotally supporting the shifting fork, a supporting bracket carried by the draw-works, a toggle mechanism connecting the shifting fork with the supporting bracket, operating means connected with the toggle mechanism for shifting the fork to effect driving connection of said friction means with the spinning drum and frictional contact of the spinning drum with the cathead, and a brake supported on the shifting fork for engaging the spinning drum and having operating connection with said toggle mechanism.

7. In combination with a shaft of a draw-works, a coupling member fixed to the end of said shaft, a shaft extension including a complementary coupling member, means interconnecting said coupling members to centeringly retain the shaft extension with respect to the draw-work shaft, a spinning drum rotatable on the shaft extension, a clutch supported on the shaft extension and having driving engagement with said spinning drum, clutch actuating pins slidably supported by said coupling members, means operably connecting the pins with the clutch, a collar connected with the pins, a shifting fork connected with the collar, means pivotally supporting the shifting fork, a supporting bracket, toggle mechanism connecting the shifting fork with the supporting bracket, a brake member on the toggle mechanism for engagement with the spinning drum, and operating means connected with the toggle mechanism for moving the shifting fork to effect driving engagement of said clutch with the spinning drum and for releasing said braking mechanism.

8. In combination with a shaft of a draw-works, a spinning drum assembly including a shaft extension, means detachably connecting the shaft extension with the draw-works shaft, a spinning drum rotatable on the shaft extension, a clutch supported on the shaft extension and having driving engagement with the spinning drum, a collar operatively connected to said clutch and slidable relatively to the axis of said shafts, a shifting fork connected with the collar, means pivotally supporting the shifting fork, a supporting bracket adapted for attachment to the draw-works, a toggle mechanism connecting the shifting fork with the supporting bracket, a brake member on the toggle mechanism for engagement with the spinning drum, and operating means connected with the toggle mechanism for moving the shifting fork to effect driving engagement of the clutch with the spinning drum and for releasing said brake mechanism.

9. In combination with a draw-works including a frame and a solid shaft rotatably supported by

the frame and having an end projecting only a short distance from said frame, a spinning drum assembly including a spinning drum, a friction clutch for driving the spinning drum, a solid shaft member carrying the spinning drum for rotatable support thereon and slidably supporting the clutch for movement to and from driving relation with the spinning drum, coupling means removably connecting the shaft member in abutting axial alignment with the projecting end of the draw-works shaft with the spinning drum and clutch in overhanging relation with the projecting end of the draw-works shaft, slidable clutch actuating means carried by said shaft member, and clutch operating means on the frame detachably connected with the clutch actuating means.

10. In combination with a draw-works including a frame and a solid shaft rotatably supported by the frame and having an end projecting only a short distance from said frame, a spinning drum assembly including a spinning drum, a friction clutch for driving the spinning drum, a solid shaft member carrying the spinning drum for rotatable support thereon and slidably supporting the clutch for movement to and from driving relation with the spinning drum, coupling means removably connecting the shaft member in abutting axial alignment with the projecting end of the draw-works shaft with the spinning drum and clutch in overhanging relation with the projecting end of the draw-works shaft, slidable clutch actuating means carried by said shaft member, clutch operating means on the frame detachably connected with the clutch actuating means, and a conventional cathead mounted on the shaft member.

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