Feb. 10, 1953 S. COCHRANE ET AL 2,627,725

HYDRAULIC OPERATOR FOR WINCHES

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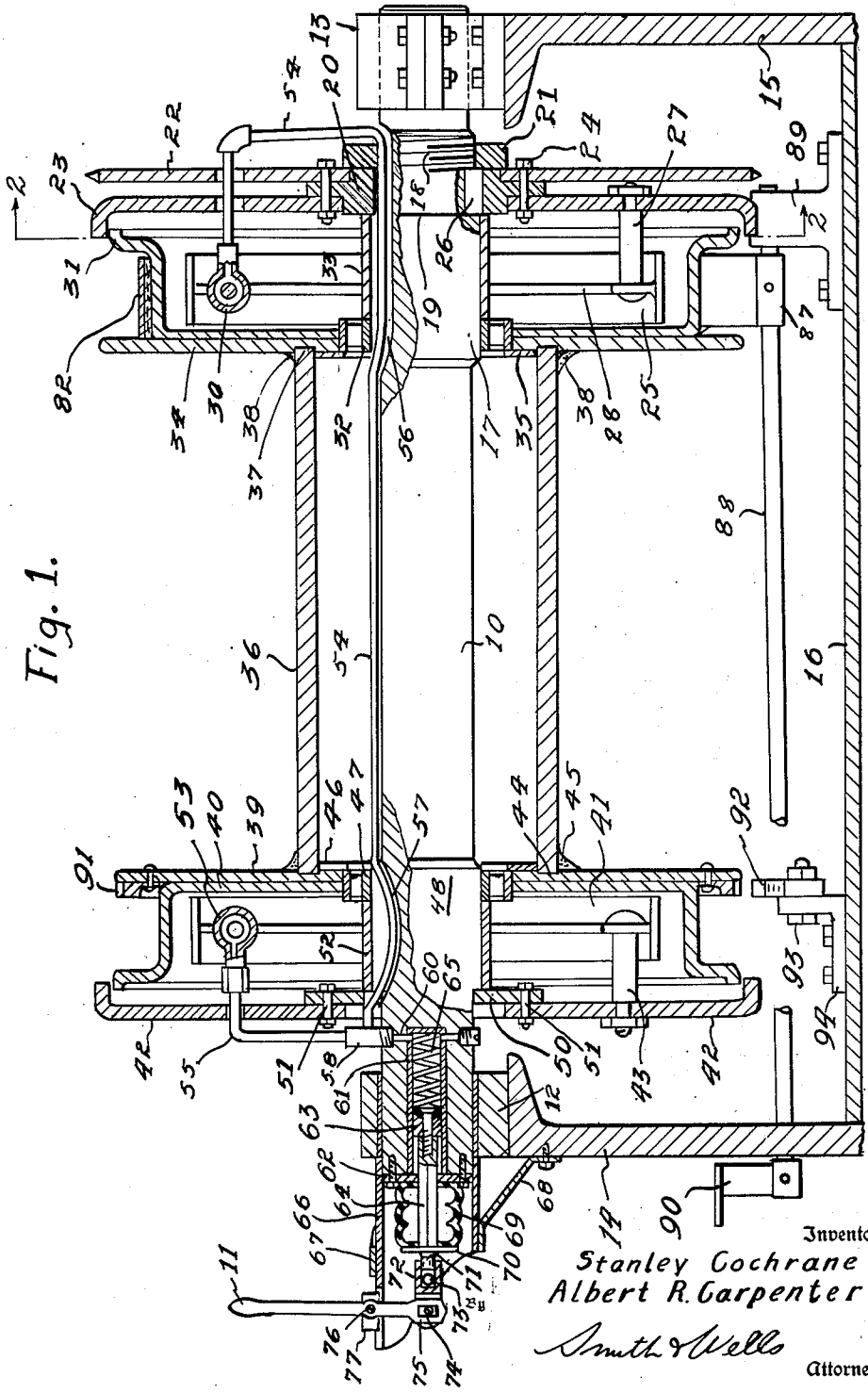


Fig. 1.

Inventors
Stanley Cochrane
Albert R. Carpenter
Smith & Wells
Attorneys

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Fig. 2.

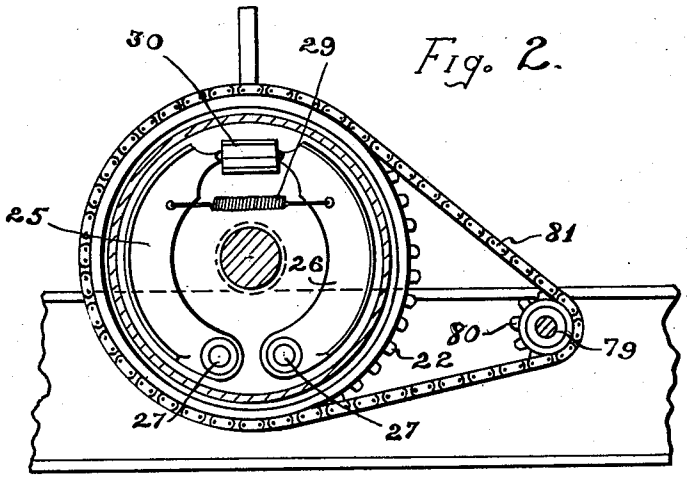


Fig. 3.

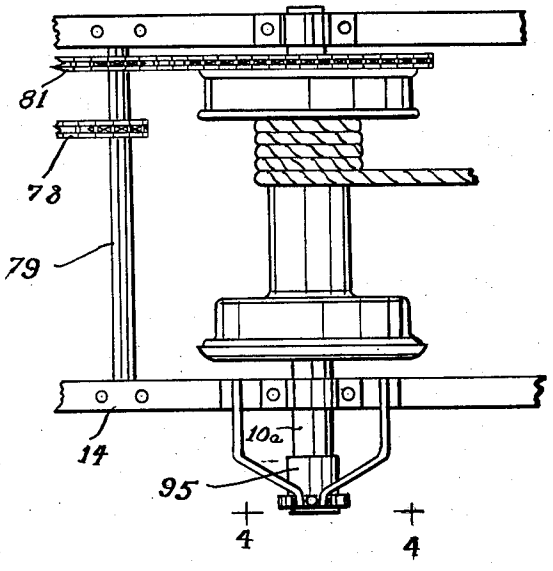
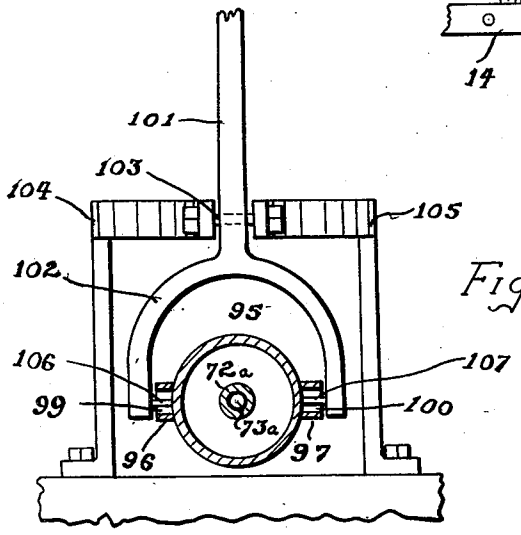


Fig. 4.



Inventors
Stanley Cochrane
Albert R. Carpenter

By Smith & Wells

Attorneys

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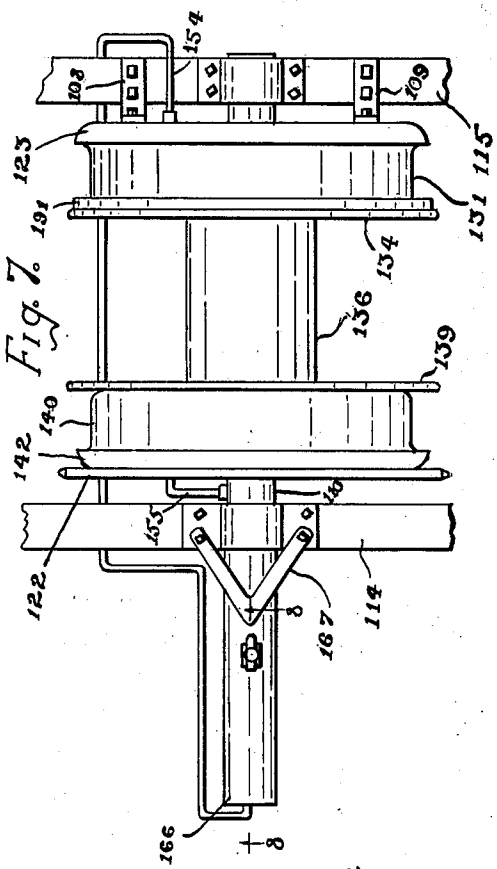


Fig. 7.

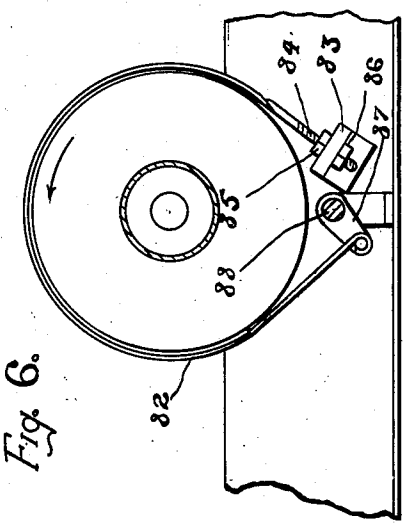


Fig. 6.

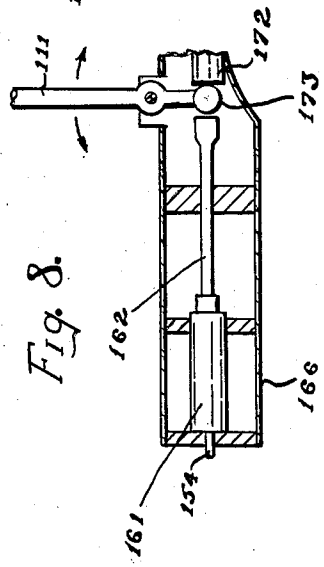


Fig. 8.

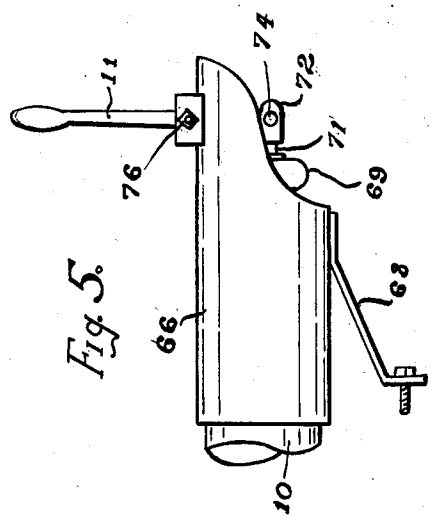


Fig. 5.

Inventors
Stanley Cochrane
Albert R Carpenter

By Smith & Wells Attorney

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UNITED STATES PATENT OFFICE

2,627,725

HYDRAULIC OPERATOR FOR WINCHES

Stanley Cochrane, Rose Lake, and Albert R. Carpenter, Cataldo, Idaho, assignors of one-third to A. E. Lunden, Coeur d'Alene, Idaho

Application June 2, 1947, Serial No. 751,890

2 Claims. (Cl. 60—54.6)

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Our invention relates to improvements in a hydraulic operator for winches.

It is the principal purpose of our invention to provide an improved winch and particularly a novel means of driving and stopping the rotary drum embodying a friction drive to the drum from a rotating shaft mounting the drum and hydraulic means for applying and releasing the friction drive.

It is a further object of our invention to provide a novel control device embodying an hydraulic fluid cylinder in the supporting shaft of a cable drum and means for forcing the fluid from said cylinder while the shaft is in continuous rotation to actuate a friction clutch between the shaft and the drum.

It is a further purpose of our invention to provide a new improved construction for combining standard internal expanding clutches and their housings with a drive shaft and a drum shell whereby to drive the drum shell from the shaft.

It is a further purpose of our invention to provide a novel mechanism for actuating the clutches referred to above by means of a lever through an hydraulic cylinder and piston carried in the drive shaft and rotating with it.

Another purpose of our invention is to provide a novel control mechanism for a winch wherein the drum may be driven from the shaft carrying it or held still by operation of a single control lever.

The novel features that we consider characteristic of our invention are set forth with particularity in the claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will be best understood from a description of a specific embodiment when read in connection with the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view through a winch embodying my invention;

Figure 2 is a somewhat diagrammatic sectional view taken substantially on the line 2—2 of Figure 1;

Figure 3 is a plan view on a reduced scale of a modified form of the invention;

Figure 4 is an enlarged sectional view taken substantially on the line 4—4 of Figure 3;

Figure 5 is a fragmentary view inside elevation of a part of the control mechanism;

Figure 6 is a fragmentary sectional view showing the application of a mechanical brake to one of the drum heads of the winch, and

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Figure 8 is an enlarged sectional view taken substantially on the line 8—8 of Figure 7.

Referring now to the drawings and particularly to Figure 1 and Figures 5 and 6 our invention is shown as comprising a winch wherein the drum is driven from a continuously driven shaft 10 and controlled in a novel manner by a small hand lever 11. The shaft 10 is mounted in suitable bearings 12 and 13 on to supporting channel irons 14 and 15. The channel iron may desirably be a part of the frame of a truck or tractor and a floor 16 is usually provided between the channel irons and beneath the shaft 10. At one end of the shaft we provide an enlarged portion 17 which is threaded as indicated at 18 and provided with a small shoulder at 19. A hub 20 is mounted on the shaft between the threaded portion 18 and the shoulder 19 to bear against the shoulder 19. The hub is keyed on the shaft by a key 26 and is locked in place by a nut 21. The hub 20 has a sprocket wheel 22 bolted thereto and also has a back plate 23 of a friction clutch assembly bolted thereto by means of bolts 24. The back plate 23 is utilized to support friction clutch shoes 25 (see Figure 2). These shoes are fastened by studs 27 that are removably bolted to the back plate 23 and secured to flanges 28 of the shoes. The shoes are urged toward each other by a spring 29 and are adapted to be spread apart by an hydraulic cylinder 30. The shoes are housed in a clutch housing 31. The housing 31, the back plate 23 and the shoes 25 and 26 together with the spring and cylinder are a standard article of manufacture as is commonly used for internal expanding brakes on trucks and the like. The details of this assembly are well-known and no claim is made here to any novelty in the particular parts of this standard construction.

The enlarged portion 17 of the shaft also mounts a roller bearing 32. The bearing is held in spaced relation with respect to the hub 18 by a sleeve 33. A circular plate 34 is welded to the face of the housing 31 and the housing and plate rest on the outer race of the bearing 32. A narrow ring 35 is welded on the plate 34 to provide a stop for the bearing 32. A drum shell 36 is set into the plate 34 as indicated at 37 and is welded to the plate as indicated at 38.

At the other end of the shell 36 from the plate 34 a similar plate 39 is welded to a clutch housing 40 which is similar in all respects to the housing 31. Clutch shoes 41 are provided in the housing 40 and are anchored to a back plate 42. The studs 43 which fasten the shoes 41 to the back plate 42 are similar in all respects to those

shown at 27. The shell 36 is set into the plate 39 at 44 and is welded at 45. A small ring 46 is also provided on the plate 39 to form a stop for a roller bearing 47 that is mounted on an enlarged portion 48 of the shaft 10. The enlarged portion 48 of the shaft 10 forms an abutment for a flange 50 which is welded to the shaft. The back plate 42 is secured to the flange 50 by bolts 51. A spacing sleeve 52 is mounted between the flange 50 and the bearing 47. The shoes 41 are actuated in the same manner as the shoes 25 by means of an hydraulic cylinder 53.

The shaft 10 is adapted to be continuously driven by means of the wheel 22 from a suitable source of power such as the power take-off of a vehicle on which the winch is mounted. In order to supply hydraulic fluid to the cylinders 30 and 53 I provide two fluid conduits 54 and 55. The conduit 54 extends from the cylinder 30 through the back plate 23 and the wheel 22 and through a slot 56 in the shaft 10, then lengthwise of the shaft 10 and through another slot 57 in the shaft to a coupling 58. The flange 50 is cut out as indicated to permit passage of the conduit 54. The conduit 55 extends through the back plate 42 to the coupling 58.

The coupling 58 is threaded into the shaft 10 which has a passage 60 therein leading to an operating cylinder 61 that is mounted in the shaft. This small cylinder 61 is secured in place by an end plate 62 that is bolted to the end of the shaft. A piston 63 is mounted in the cylinder 61 and has a square piston rod 64 projecting through the plate 62. The plate 62 has a squared opening for the rod 64 so that the rod must turn with the shaft and the plate. A spring 65 in the cylinder 61 has sufficient strength normally to hold the piston 63 retracted to the full extent of its travel.

In order to operate the piston rod 64 we mount a shell 66 over the end of the shaft 10 by welding thereon an upper supporting strap 67 which is bolted to the bearing 12 and a lower supporting strap 68 which is bolted to the channel iron 14. A rubber diaphragm 69 is mounted between the plate 62 and a washer 70 which is secured on the rod 64 so as to keep dust and dirt away from the rod 64 and the cylinder 61. The rod 64 has a round end 71 extending beyond the washer 70 into a cup 72 that carries a thrust bearing 73. The cup 72 has two ears at the back end and a pin 74 therein to receive the slotted end 75 of a hand lever 11. This lever is pivoted on a pin 76 that is mounted on ears 77 provided on the shell 66.

The power is supplied for rotating the shaft 10 from any suitable source through a chain 78 (see Figures 2 and 3) which drives a shaft 79. The shaft 79 has a sprocket wheel 80 thereon which drives a chain 81. The chain 81 is applied to the wheel 22 to supply the motive power for the shaft 10. In winches of this character, the drum is only rotated at the desired intervals but it is highly advantageous to have the motive power available at all times in the drum. The present construction provides this motive power by the arrangement for continuously driving the shaft 10. The mounting of the control cylinder and its associated parts in the end of the shaft 10 makes it possible to use a simple hand lever control with a minimum of parts for controlling the drum.

It is necessary to have means to hold the drum stationary. In the present instance, we provide means under the control of the operator by which he may stop the drum and lock it in position. The stopping means is shown best in Figures 1 and 6 as a simple mechanical brake band 82 mounted on the housing 31. One end of the brake band is shown as fastened to a lug 83 that is mounted on the channel iron 15 and extended outwardly to receive a threaded rod 84 which is attached to the band. The rod is adjustable with respect to the lug and is locked in place by nuts 85 and 86. The other end of the band 82 is secured on a crank arm 87 which is mounted on a shaft 88. The shaft 88 is journalized in a bracket 89 that is secured to the floor 16 and extends across the floor through the channel iron 14 where it is provided with a foot lever 90. The shaft 10 rotates in the direction indicated in Figure 6 so that the pull on the band 82 is taken by the lug 83.

An additional locking means is also provided by securing a ratchet ring 91 on the plate 39 and providing a pawl 92 for engaging the ratchet ring 91. The pawl 92 is pivoted by means of a bolt 93 on a bracket 94 that is mounted on the floor 16. The pawl 92 is thrown up against the teeth of the ring 91 by hand whenever the drum is stopped and it is desired to lock it against creeping due to the continuous rotation of the shaft 10.

The preferred form of control mechanism for operating the piston rod 64 is that illustrated in Figures 1 and 5. However, another simple form of control may be used and such a control is shown in Figures 3 and 4. In this form of the invention, the shaft 10 is extended at 10*a* beyond the channel iron 14 and receives a sliding tube 95. The tube 95 is guided entirely by the shaft 10*a* and has the cup shaped member 72*a* secured therein and provided with a ball bearing 73*a* for engaging the end of the rod 64. To operate the piston rod, means are provided for sliding the tube 95 on the shaft 10*a*. These means comprise ears 96 and 97 on the tube, the ears having vertically elongated slots 99 and 100 therein. A hand lever 101 having a yoke 102 at its lower end is pivotally supported on a bolt 103 that is carried by two supporting bars 104 and 105 which are mounted on the channel iron 14. The ends of the yoke 102 have pins 106 and 107 extending into the slots 99 and 100. It will be evident that by swinging the lever 101 about its pivot the tube 95 can be moved along the shaft 10*a* to force the piston rod inwardly. In this form of the invention as well as in the preferred form previously described, the spring 65 serves to return the piston rod to its neutral position any time the control lever is released.

In some cases it is desirable to utilize hydraulic braking control to stop the drum as well as to drive it and to so arrange the parts that one lever may control the entire operation. In Figures 7 and 8 we have shown such a construction. In this case, of course, the drum is driven from only one end while the housing at the other end is utilized to provide a braking surface to stop the drum. The shaft 110 in the form of the invention shown in Figure 7 is mounted in the same manner as in the main form of the invention and contains the same hydraulic cylinder as in the main form of the invention. In this case, however, the only connection from the cylinder is the pipe 155 which leads through a sprocket wheel 122 and the back plate 142 to the clutch shoe cylinder within the housing 140. A plate 139 is welded to the housing 140 and a drum shell 136 is mounted on the plate 139 in the same

manner as in the main form of the invention. The bearings for the drum are mounted on the shaft 110 in the same manner as they are mounted in the main form of the invention.

The principal change in the construction lies in the fact that the back plate 123 instead of being secured to the shaft as in main form of the invention, is now secured by brackets 108 and 109 to the channel iron 115. The pipe 154 from the clutch shoe cylinder within the housing 131 is led through the back plate 123 and extended across the machine to a housing 166 which replaces the member 66 of the main form of the invention. The housing 166 is secured on the channel iron 114 by the same brackets as are used for securing the member 66. The top bracket 167 is shown in Figure 7, but the lower bracket 168 is not illustrated.

In the housing 166 there is, of course, the same control mechanism for the main cylinder 161 as has already been described with this exception, that the cup 172 now merely bears against an enlarged rounded end 173 on the operating lever 111.

A second cylinder 161 similar in all respects to the cylinder 61 is mounted in the housing 166 and has a piston rod 162 therein. The pipe 154 leads to the cylinder 161 at its end most remote from the lever 111. The piston rod 162 is also pushed by the spring in the cylinder 161 to engage the head 173 on the lever. The operation of this control mechanism is substantially as follows. Assuming that the shaft 110 is being driven and that the drum is to be stationary. The lever 111 would normally be in the position shown in Figure 8, that is, a neutral position where the springs in the cylinders 61 and 161 have pushed their respective piston rods outwardly to where they center the lever 111 from both sides. Now if the lever 111 is moved in a counterclockwise direction it will cause the cup 172 to shove the piston rod 64 inwardly against its spring 65 to supply fluid to the clutch cylinder in the housing 140. This will cause the shoes in this housing to engage the housing, thereby coupling the drum to the shaft 110 for rotation. When it is desired to stop the rotation of the drum, the lever 111 is turned back in a clockwise direction to engage the piston rod 162 and force it into the cylinder 161 against the pressure of the spring 65 therein. This in turn will supply fluid to the control cylinder for the clutch shoes within the housing 131 to cause this housing to be held stationary since the back plate 123 on which the shoes are mounted is secured by the brackets 108 and 109 to the channel iron 115. It is thus possible to start and stop the drum by the manipulation of the lever 111 alone.

Referring now to the main form of the invention as shown in Figure 1 the manner in which the winch is assembled will be described. The shaft is provided with the flange 50 and, of course, the plates 34 and 39 are welded to the shell 36 and to the housing 31 and 40 before the assembly is commenced. The shaft is fitted with the connection 58 and the pipe 54 is fitted into the slots 56 and 57. A flexible copper tube is entirely satisfactory for the pipe 54 since it may be bent to the desired shape. The back plate 42 with its shoes 41 and associated parts is next bolted to the flange 50. This back plate has to slide over the left hand end of the shaft as shown in the Figure 1. The pipe 55 is then connected up to the cylinder 53 and the coupling 58. Next the spacing sleeve 52 and the bearing 47 are put in place. Then the assembly of the drum shell and end plates with

the housings 31 and 40 is moved onto the shaft 10 until the ring 46 engages the bearing 47. The bearing 32 is then put in place and the sleeve 33 is placed against it. The pipe 54 is, of course, extended endwise beyond the end of the shaft at this time.

The assembly is completed by mounting the back plate 23 and the sprocket wheel 22 on the hub 20 and sliding the hub onto the shaft. The key 26 secures the hub against rotation on the shaft. The coupling of the pipe 54 to the cylinder 30 is not made until the nut 21 is tightened up to lock the parts together. When the pipe 54 is connected up the shaft 10 is then mounted in the bearings 12 and 13 and the control mechanism is mounted.

It is believed that the nature and advantages of our invention will be clear from the foregoing description. Having thus described our invention we claim:

1. In a winch operating means, the combination with the frame and the power shaft of a winch, of an hydraulic control cylinder within the shaft, a piston in said cylinder, a piston rod secured to the piston, said rod being non-rotatably mounted in said shaft and projecting therefrom, a thrust bearing member rotatably receiving the projecting end of said rod, spring means in the cylinder urging the piston rod against the thrust bearing member, and manual means on the frame for moving the bearing member endwise of the shaft toward the cylinder, said manual means comprising a shell over the rod and bearing and a lever pivoted in the shell and operably engaging the bearing member.

2. In a winch operating means, the combination with the frame and the power shaft of a winch, of an hydraulic control cylinder in the shaft, a piston in the cylinder, an operating rod secured to the piston, coaxial with the shaft and projecting therefrom, spring means in the cylinder bearing against the side of the piston opposite the rod, manually operable means for pushing the rod inward in opposition to said spring means, said manually operable means comprising a cup rotatably receiving the end of the rod, a hand lever on the frame, carrying the cup and operable to push the cup and the piston rod axially of the shaft, said rod having a non-circular cross section in the shaft, an end plate secured on the shaft, having a guide opening slidably and non-rotatably mounting the piston rod, a rubber diaphragm around the rod and seated against said end plate, and a washer secured on the rod outwardly of said plate holding the diaphragm against the end plate.

STANLEY COCHRANE.
ALBERT R. CARPENTER.

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