Oct. 28, 1952 J. W. MENHALL 2,615,679

WELL DRILLING RIG

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FIG. 1.

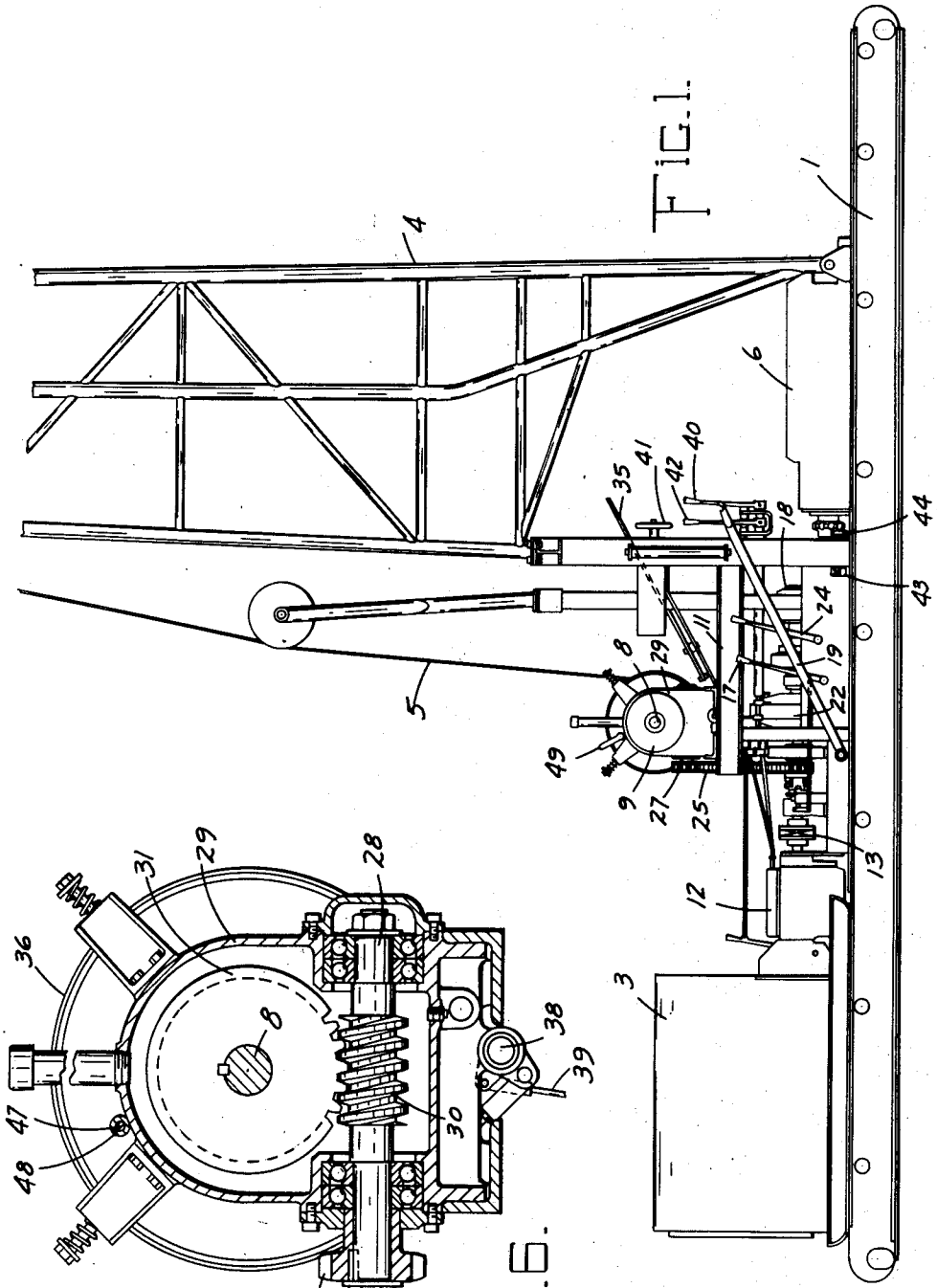


FIG. 6.

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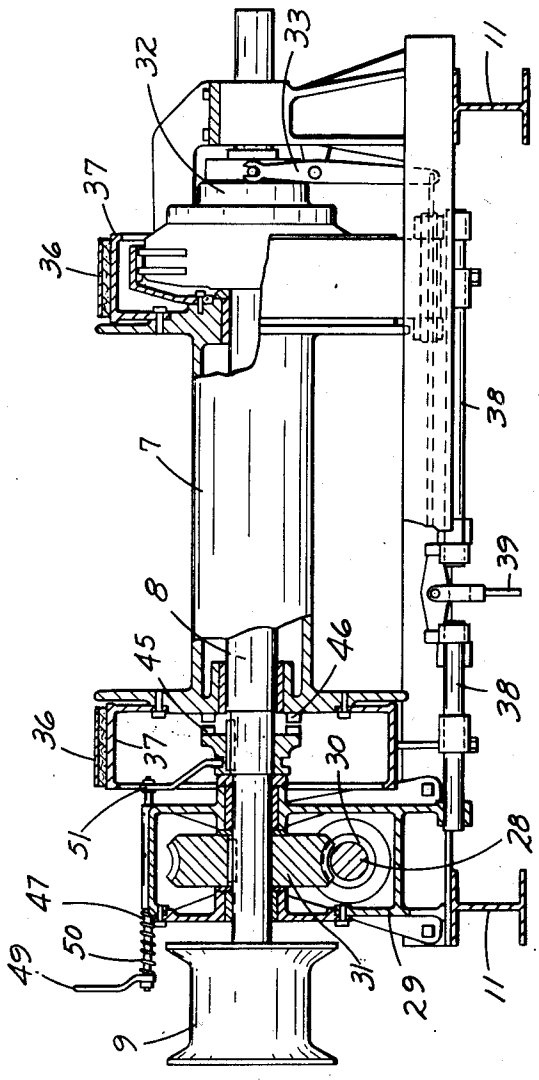


FIG. 2.

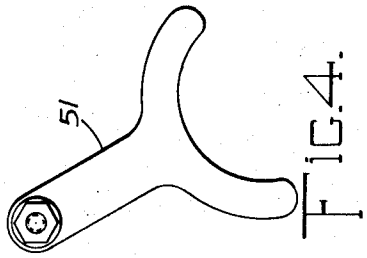


FIG. 4.

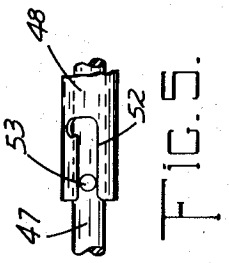


FIG. 5.

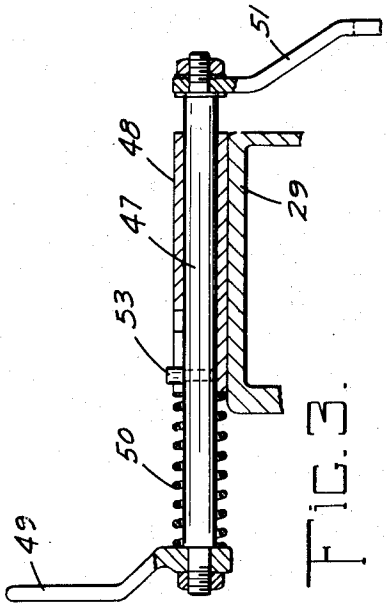


FIG. 3.

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WELL DRILLING RIG

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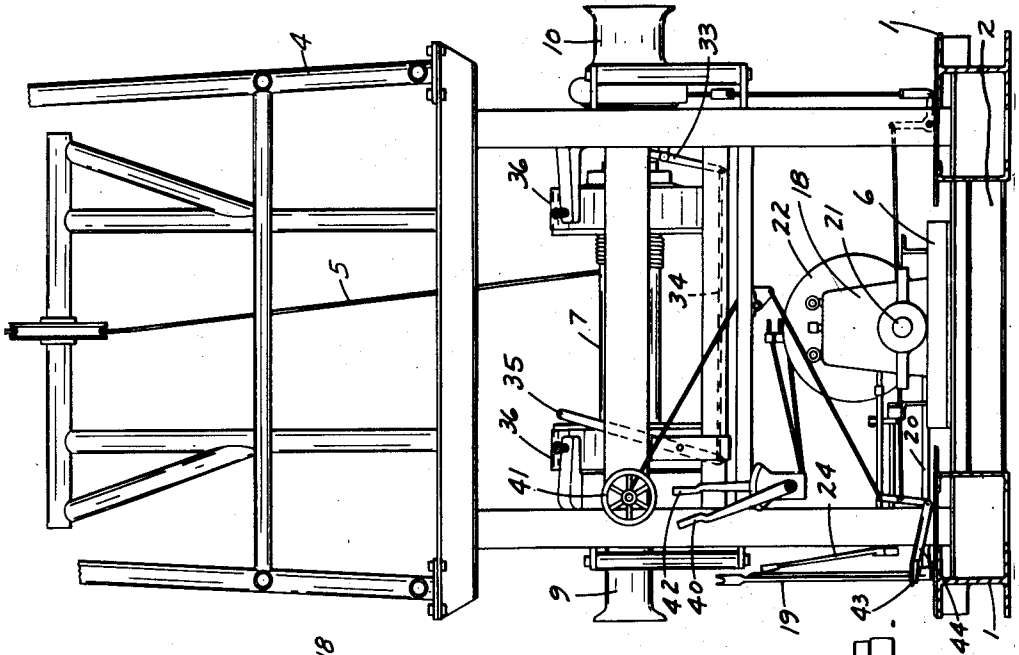


FIG. 8.

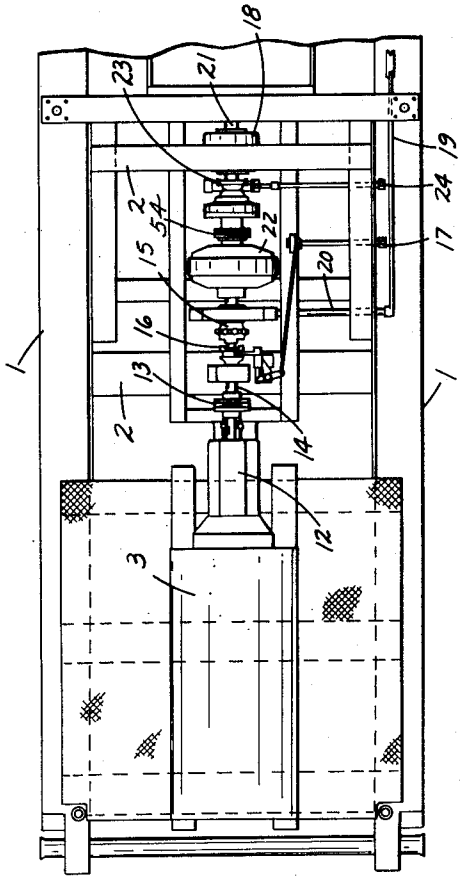


FIG. 7.

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WELL DRILLING RIG

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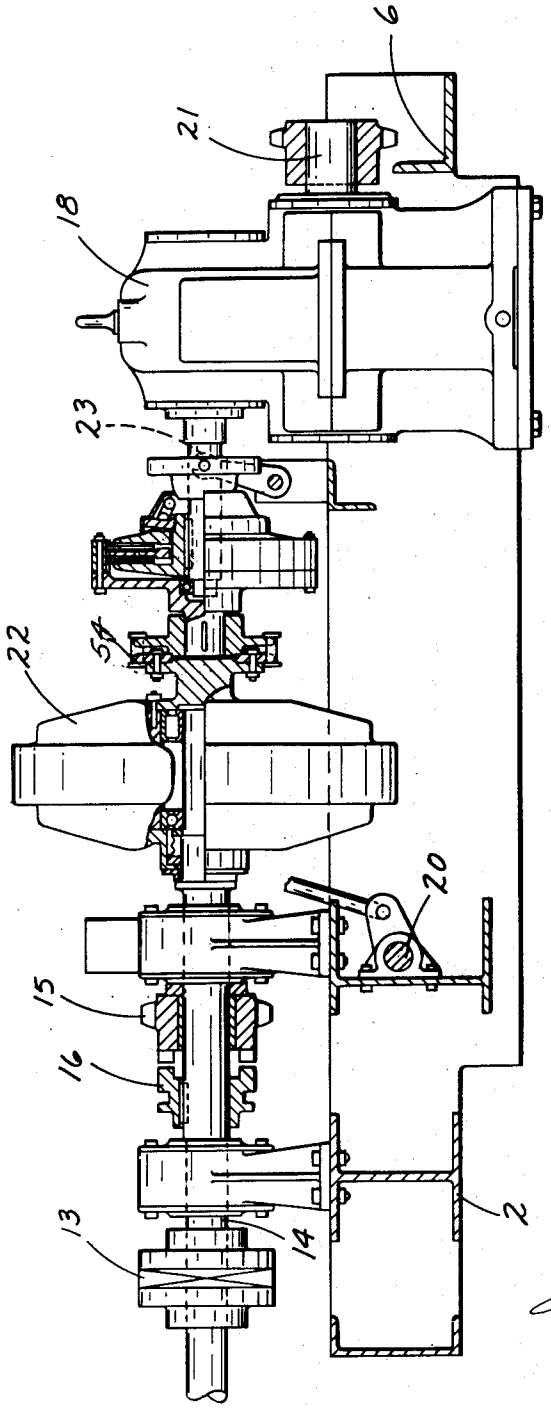


FIG. 9.

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Patented Oct. 28, 1952 2,615,679

UNITED STATES PATENT OFFICE

2,615,679

WELL DRILLING RIG

James W. Menhall, Benton, Ill.

Application November 14, 1947, Serial No. 786,122

1 Claim. (Cl. 254—187)

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My present invention is a continuation in part of the invention of my pending application for Patent Serial No. 713,789 filed December 3, 1946, and embodies certain improvements in the drill rig of said application from which desirable functions are derived that are advantageous in the practical operation of the rig.

More specifically setting forth the present object of this invention it is noted that my rig of the type of my said application contemplates the use of certain rotary table driven by line shafting, and gearing, leading from a suitable motor, all on the base frame of the rig. The customary draw-works operating winch, carried on a winch and cathead shaft, is employed. Provisions are made by a power take-off to carry the drive of the motor from the line shafting leading to the table, to the winch and catheads, said power take-off including worm gearing for positive uncushioned driving of the winch drum shaft and winch. For operating the table with cushioned drive effect from said line shafting suitable means are employed.

In the above construction a friction clutch unit is utilized to operate the draw-works winch drum, as is customary in present well rig design. It is desirable in the fishing of drill pipe, drill collar and bit stuck in a hole, and under other conditions to have repeated, sudden and positive pulls on the line to jerk the stuck parts loose. When the friction clutch between the drum shaft and winch drum is employed, there is sometimes slippage which reduces the effectiveness of the pull required to jar a bit, etc., loose. Therefore, I have combined in my present improved rig, a special auxiliary clutch of the positive or jaw type, designed to be used only in the case of such an emergency as above mentioned, and by which to operate the winch drum and draw-works in event of failure of the friction clutch to accomplish desired results along the lines above set forth.

In carrying out my invention I employ both friction and positive jaw type clutches, cooperable with the winch drum and shaft, to transmit the uncushioned drive of positive worm or like gearing from the winch shaft to the drum, and usable preferably alternatively, for the purposes above outlined.

A complete understanding of my invention will be had on reference to the following detailed description, and the annexed drawings.

In the accompanying drawings:

Figure 1 is a view in side elevation showing a drilling rig embodying the essential features

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of the operating mechanism of my invention, the upper portion of the derrick being shown broken away, the draw-works cable leading off of the winch drum being also broken away.

Figure 2 is a vertical longitudinal sectional view taken through the winch drum shaft and the drum thereon, said view showing the friction and positive clutch units associated with these parts.

Figure 3 is a sectional view of fragmentary nature illustrating the operating rod for shifting the movable member of the jaw clutch.

Figure 4 is a side view of the shifting arm carried by the jaw clutch actuating rod.

Figure 5 is a detail fragmentary plan view showing more clearly the lock pin carried by the jaw clutch shifting rod and which cooperates with a bayonet slot in the sleeve bearing for said rod, for locking the jaw clutch in engagement in relation to the movable and stationary parts thereof.

Figure 6 is a view taken vertically through the worm drive gear unit and disclosing the latter in sectional view, said unit being a part of the power takeoff from the main line shafting of the rig to carry the drive therefrom to the winch drum and cathead shaft.

Figure 7 is a fragmentary top plan view bringing out more clearly the arrangement of the motor and the drive line shafting which leads to the rotary and has associated therewith the power takeoff that leads to the winch drum shaft.

Figure 8 is a view taken cross sectionally through the base frame of the rig adjacent to a point outwardly of the rotary table and bringing out more clearly the disposition of certain of the control lever and other parts.

Figure 9 is a view partly in section showing the drive arrangement from the engine output shaft to the rotary.

Referring first to Figures 1 and 7 of the drawing the general construction of my drilling rig may be characterized as including a base frame comprising base longitudinal sills 1 and a plurality of cross pieces or bars 2. Mounted on this base frame is the prime mover or motor 3 and the derrick 4 which supports the draw-works the cable 5 of which is shown in Figures 1 and 8. There will be seen to be mounted upon the base frame aforesaid the driving means intermediate the engine 3 and the rotary table 6 likewise supported by the base frame, which driving means is also employed for the operation of the winch drum 7 mounted on the winch and cathead shaft

8. Co-operating with the shaft 8 and mounted in connection therewith after the customary practice are the plain cathead 9 and the automatic cathead 10, the latter being of the type generally known in the art today as "Simplomatic."

The winch and cathead unit referred to forming a part of the draw-works operating means of the rig are suitably mounted upon a superstructure generally designated 11 which is carried on the base frame including the sills or longitudinal members 1.

I now refer to the driving means including certain line shafting which connects the engine 3 with the rotary 6, and which is adapted to drive the winch drum and cathead shaft 8.

The motor 3 is any conventional type of hydrocarbon engine. Its shaft is connected through the means of conventional transmission gearing of differential speed type located in the transmission housing 12 adjacent to the inner end of the engine said transmission unit including a driven shaft connected by a flexible coupling 13 with the line shaft 14 supported in suitable bearings on the base frame of the rig and having thereon loosely mounted in relation thereto the chain driving sprocket 15. The sprocket 15 has a clutch member at its outer side adapted to be engaged by a movable clutch member 16 splined or otherwise connected to the shaft 14 whereby to operatively connect the shaft 14 to drive the sprocket gear 15 under the control of a suitable lever 17 adapted to be manually operated. The said lever 17 operates the clutch member 16, since it is connected thereto in a conventional mechanical manner by a cross shaft on which the lever is mounted, and a rod which operates a pivoted link in turn connected to a suitable clutch yoke member as seen in Figure 7.

The sprocket 15 is a part of transmission mechanism for driving the winch drum and cathead shaft 8 previously referred to.

Intermediate the line shaft 14 and the output shaft 21 which is gear connected, through reducing gearing unit 18, to the rotary table 6, there is located the fluid coupling or torque convertor unit 22. This unit may be of any known type and there is preferably used for its purpose the well known unit called the "twin disc" hydraulic coupling. By the use of fluid coupling 22 the drive from the line shaft 14 to the driven shaft 21, which directly drives the rotary table, may be cushioned as set forth in my previous application, the cushioning affording certain advantages in the operation of the rotary under different conditions of service. The shaft 14 is adapted to be clutch connected to the shaft 21 by means of the clutch 23 which is operable by the lever 24 at the side of the rig adjacent to the operator's station.

By the use of the clutch 23 the operator of the rig has under his control the transmission of driving forces to the rotary table and if it is desired to discontinue the drive to the said table clutch 23 may be rendered inactive, at which time the rotary table will be at rest. Under certain conditions of service this control is desirable and advantageous.

The operating means between the winch driving sprocket gear 15 and the winch and cathead unit is seen best in Figure 6 and Figure 1 and in the latter figure it will be perceived that a sprocket chain 25 leads from the sprocket gear 15 to a sprocket gear 27 on a worm shaft 28 in the worm gear housing 29 (see Figure 6). The worm 30 on the shaft 28 engages a worm

wheel 31 on the winch drum and cathead shaft 8 previously mentioned, the gear 31 being keyed to the latter shaft.

From the foregoing it will be seen that the positive drive from the line shaft 14 may be transmitted through the clutch 16, sprockets 15 and 27 and worm 30 and worm wheel 31 to the winch drum shaft 8 on which the wheel 31 is keyed. The said drive is an uncushioned drive and enables the full driving forces of the motor to be transmitted to the winch drum and cathead shaft 8.

Referring to Figure 2 of the drawings it will be noted that the winch and cathead unit of my construction is very similar in nearly all respects to units of this type now in use and as set forth in my previous application. The winch drum 7 about which the draw-works cable or line 5 passes and which controls the operation of the draw-works is loosely mounted upon the shaft 8. The shaft 8 as stated before carries the plain cathead 9 and the "Simplomatic" cathead 10, at opposite ends thereof, and the driving operation of the winch drum 7 is effected by the employment of the friction clutch unit 32 which may be any conventional and suitable type of friction clutch for conveying the drive of the shaft 8 to the drum 7. The clutch of the unit 32 is operable manually by means of a clutch shifting yoke 33 with which is connected a link rod 34 shown in dotted lines in Figure 8 that leads to the manually operable clutch throw lever 35 at the operator's station.

The general mechanisms and construction of my well rig as thus far set forth is substantially the same as embodied in my previous application herein identified and the control of the driving of the drum 7 for pull-out operations in respect to the drill line and all other ordinary operations usually performed will be under the control of the operator in the actuation of the lever 35 for the friction clutch. The paying out of the cable 5 from the drum 7 is ordinarily controlled, as customary by the employment of brake bands 36 cooperating with brake drum surfaces 37 rigid with the drum 7, the operating means for said brake bands 36 including the manual lever 19, the same having operating connections leading to both of the bands 36 after the manner shown in Figure 2 of the drawings illustrating the drum and cathead unit. The shaft on which the lever 19 is mounted, designated 20, is connected to the actuating shafts 38 of the brake bands 36 by means of a pull rod 39 (see Figure 2).

Other conventional features of my rig construction as shown include the customary engine clutch lever 40 (see Figure 8), the hand throttle wheel 41, the transmission control lever 42, the foot throttle lever 43 and the jerk line foot lever 44 which controls the automatic or "Simplomatic" cathead 10. The above features of my rig are substantially those as set forth in my previous application but by reference to Figure 2 it will be observed that I employ in conjunction with the left hand end of the windlass drum 7 the auxiliary or special clutch previously referred to herein as the improvement feature of my present invention. This clutch comprises a movable clutch member 45 splined to slide upon the shaft 8 for the catheads and the drum 7 and therefore rotating with the shaft 8. Said movable clutch member 45 is a positive locking or jaw clutch and its jaws or teeth are adapted to move into and out of engagement with a stationary clutch member comprising jaws or teeth 46 formed on

the adjacent or left hand of the windlass drum 7.

For shifting the clutch member 45 I employ a hand operated shifter rod 47 mounted to slide longitudinally in a sleeve bearing 48 supported on the housing of the worm gear unit at the adjacent end of the drum 7. The rod 47 has a push and pull handle 49 attached to its outer end. A spring 50 is interposed between the handle 49 and the adjacent end of the sleeve bearing 48 and normally by expanding action tends to hold the handle in an outwardly adjusted position in relation to the bearing 48. On the inner end of the shifter rod 47 is carried a shifting arm 51 having a projection which enters the groove in the movable clutch or jaw member (see Figure 2).

It is obvious from the foregoing that by pushing inwardly toward the windlass drum 7, upon the handle 49 the jaw 45 may be caused to interengage the jaws or teeth portions of the clutch member comprising the teeth 46 on the drum 7. Under these conditions the positive drive of the shaft 8 operated from the worm gearing shown in Figure 2 may be transmitted with the full force of the driving of the engine 3, to the drum 7. By the sudden engaging action of the clutch member 45 with the clutch part 46 of the drum vigorous and positive jerking action may be transmitted to the drum 7 in a rotative direction in regard to its pullout action on the draw-works cable 5 and the positive forces thus created may be transmitted to the pipe line and adjuncts connected with the latter, in an obvious manner.

If found desirable dependent upon the particular exigencies which arise and the operations which are required to be performed by the drum 7, the friction clutch unit 32 may be operated by its lever 35 in conjunction with the operation of the handle 49 and the clutch member 45, or independently, as found necessary, the latter being its customary operation.

Since the drum shaft 8 is driven positively through the takeoff unit 15 on the shaft 14 the driving forces that may be imparted to the shaft 8 through the employment of the clutch member 45 will be uncushioned, this being due to the fact that the driving connections are positive in action at all times.

As distinguished from the foregoing the driving

forces transmitted from the shaft 14 to the rotary table are effected through the fluid coupling or torque convertor 22 and are cushioned forces preferably. It is within the contemplation of my invention however that if deemed necessary the torque convertor 22 might be dispensed with insofar as the utility of my conjoint clutch units 45—46 and 32 are concerned.

To hold clutch member 45 engaged with clutch member parts 46, a bayonet slot 52 is formed in the top of bearing sleeve 48, see Figure 5, and a pin 53 rotatable with the rod 47, is engageable with the offset part of said slot. When the pin 53 is disengaged from said offset section of the slot 52, the spring 50 will move the rod 47 and its handle 49 outwardly and disengage the clutch member 45 from the member 46, in an obvious manner.

The line shafting between the coupling 22 and the speed reduction gear unit 18 may include a conventional chain or like coupling 54 if desired.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

In a wall drilling rig, in combination, a motor, draw-works comprising a winch drum, a cable adapted to wind on said drum, a drum shaft on which the drum is loosely mounted, positive worm gearing connecting the motor and drum shaft for driving the latter, a friction clutch to connect the drum with said shaft and a non-slipping clutch to connect the drum with said shaft, for effecting drill string pull out operation of the cable, manual control devices for said clutches for independently or simultaneously shifting same to connect and disconnect the shaft and drum, and a cathead on said drum shaft.

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The following references are of record in the file of this patent:

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