March 10, 1942. H. W. CARDWELL 2,276,224

WELL SERVICING AND DRILLING MACHINE

Filed Feb. 24, 1939 8 Sheets-Sheet 1

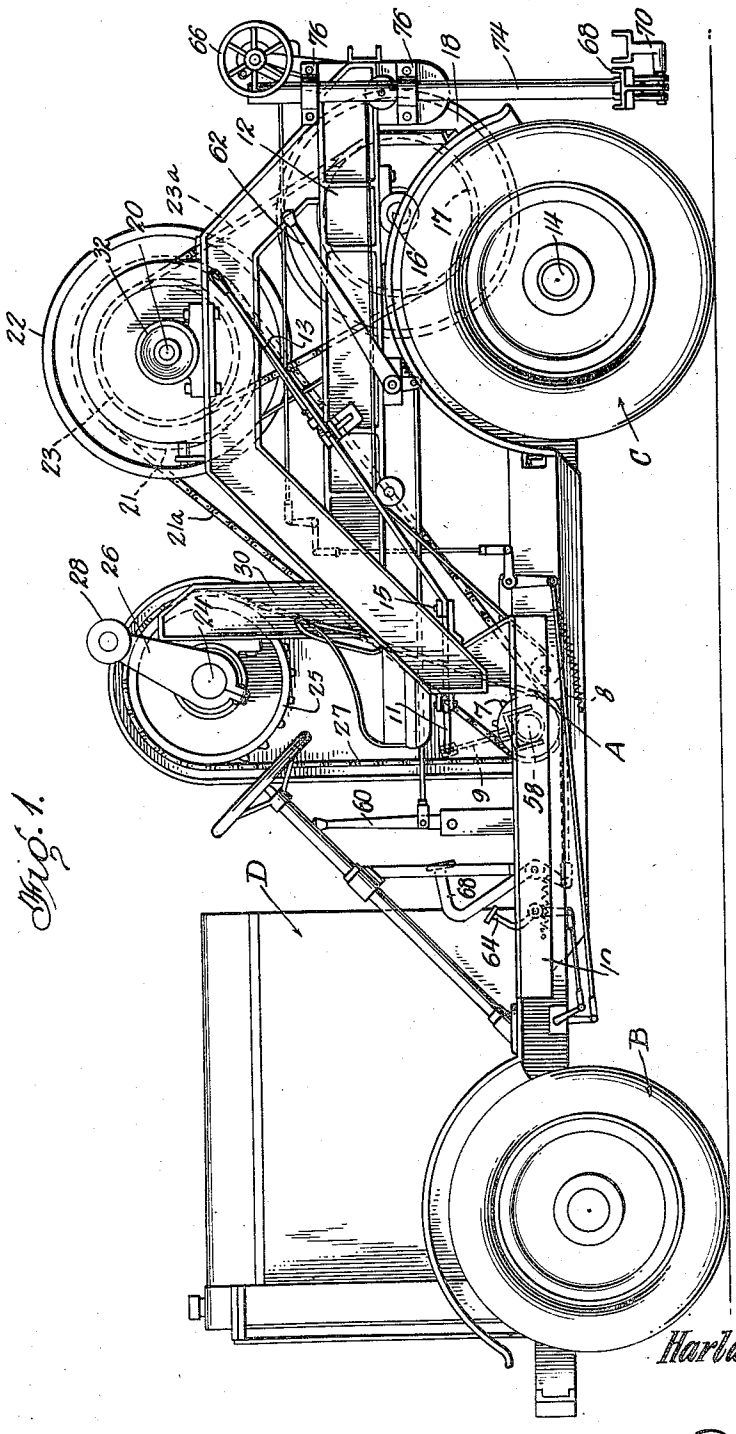


Fig. 1.

Inventor
Harland W. Cardwell

By Bacon & Thomas
Attorneys

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Fig. 2.

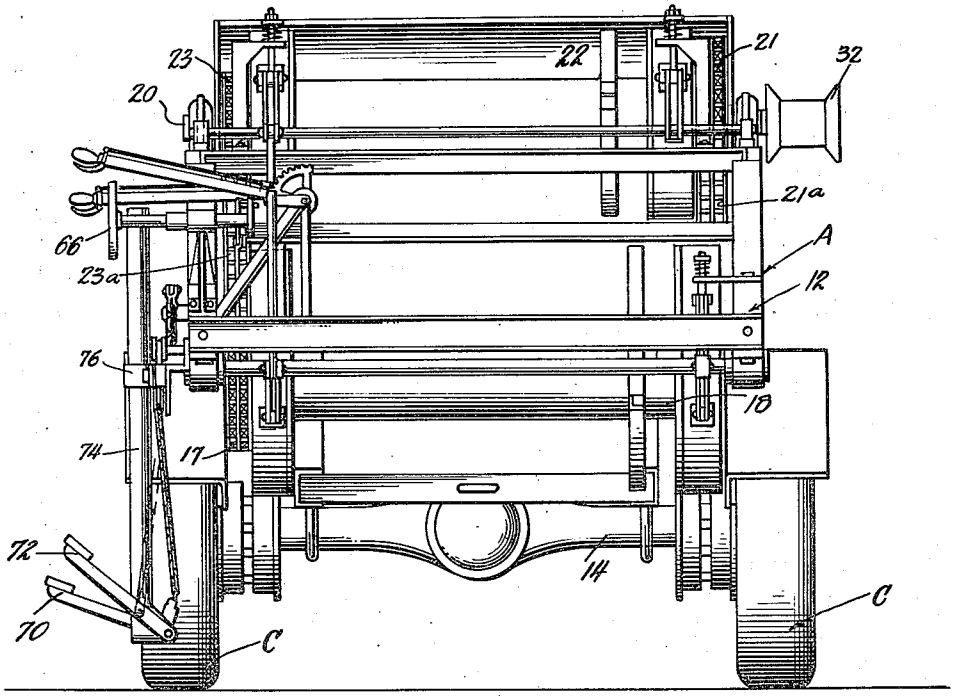
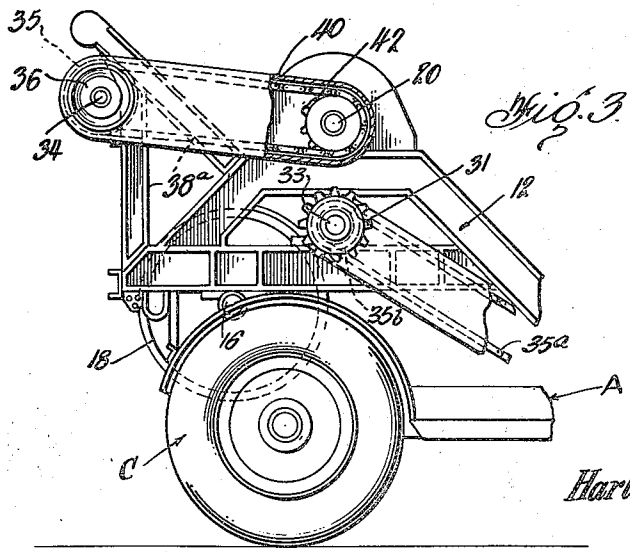


Fig. 3.



Inventor
Harland W. Cardwell

By

Bacon & Thomas
Attorneys

March 10, 1942. H. W. CARDWELL 2,276,224

WELL SERVICING AND DRILLING MACHINE

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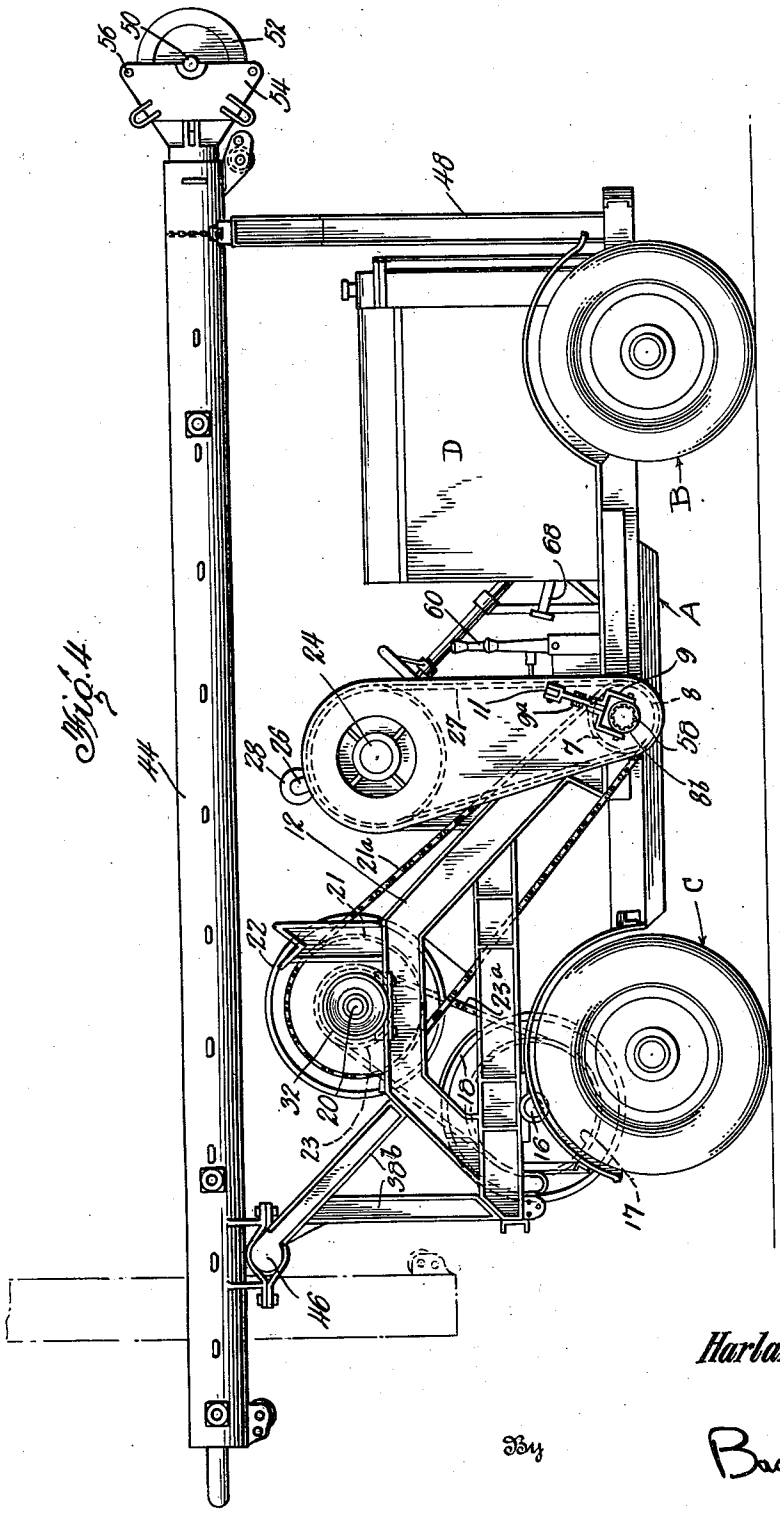


Fig. 4.

Inventor
Harland W. Cardwell

By Bacon & Thomas
Attorneys

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WELL SERVICING AND DRILLING MACHINE

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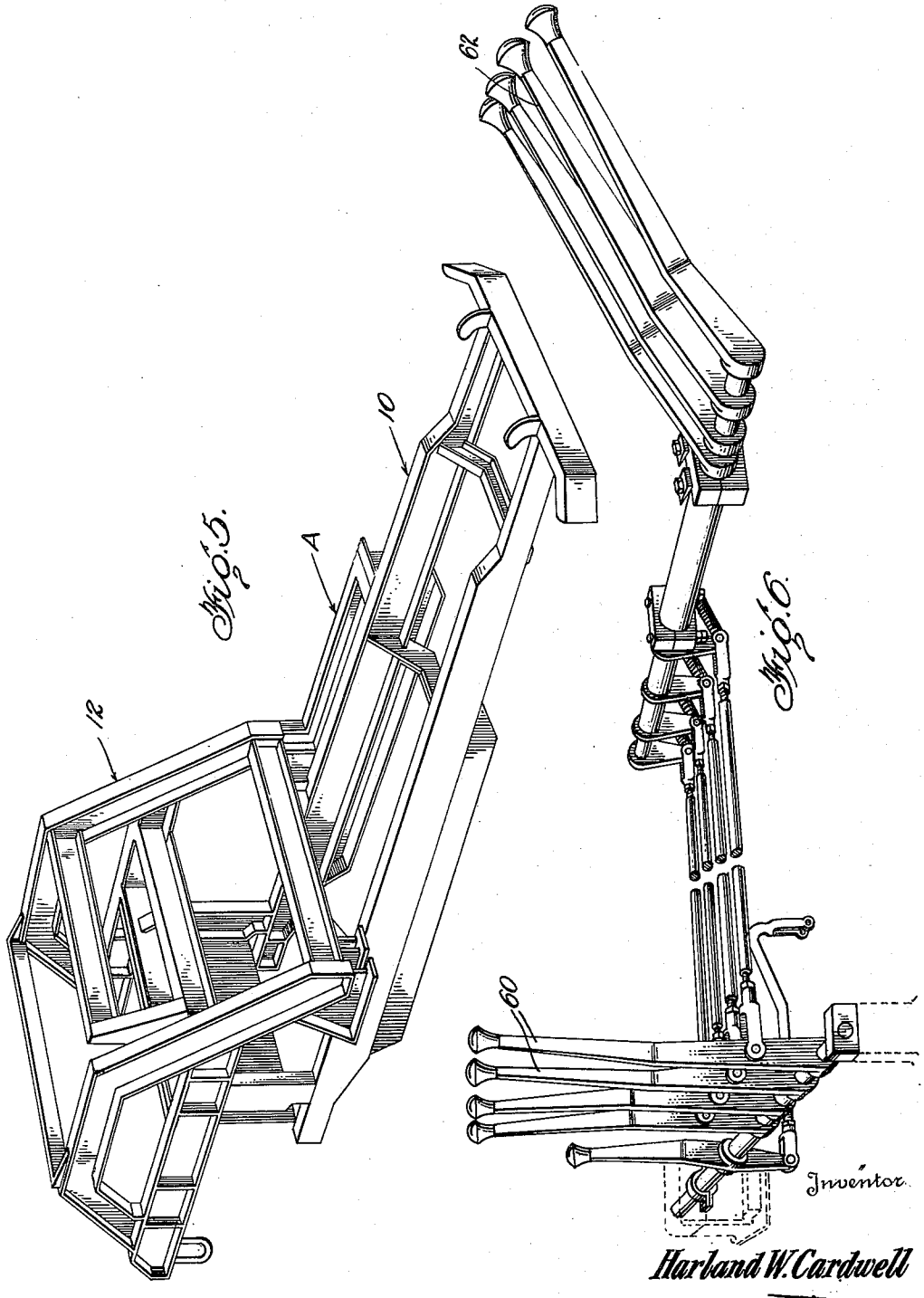


Fig. 5.

Fig. 6.

Inventor
Harland W. Cardwell
By Bacon & Thomas
Attorneys

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WELL SERVICING AND DRILLING MACHINE

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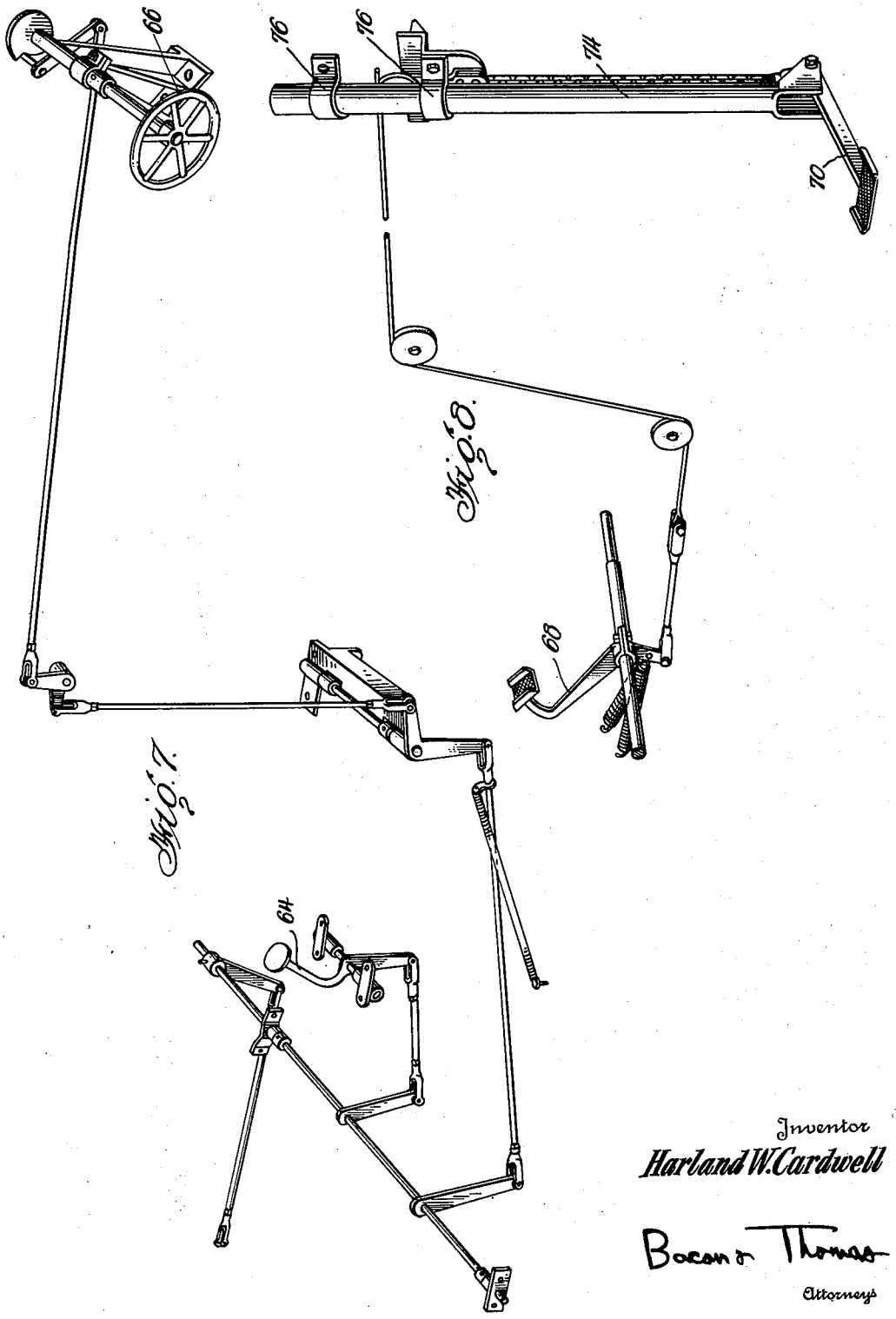


Fig. 8.

Fig. 7.

Inventor
Harland W. Cardwell

Bacon & Thomas
Attorneys

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WELL SERVICING AND DRILLING MACHINE

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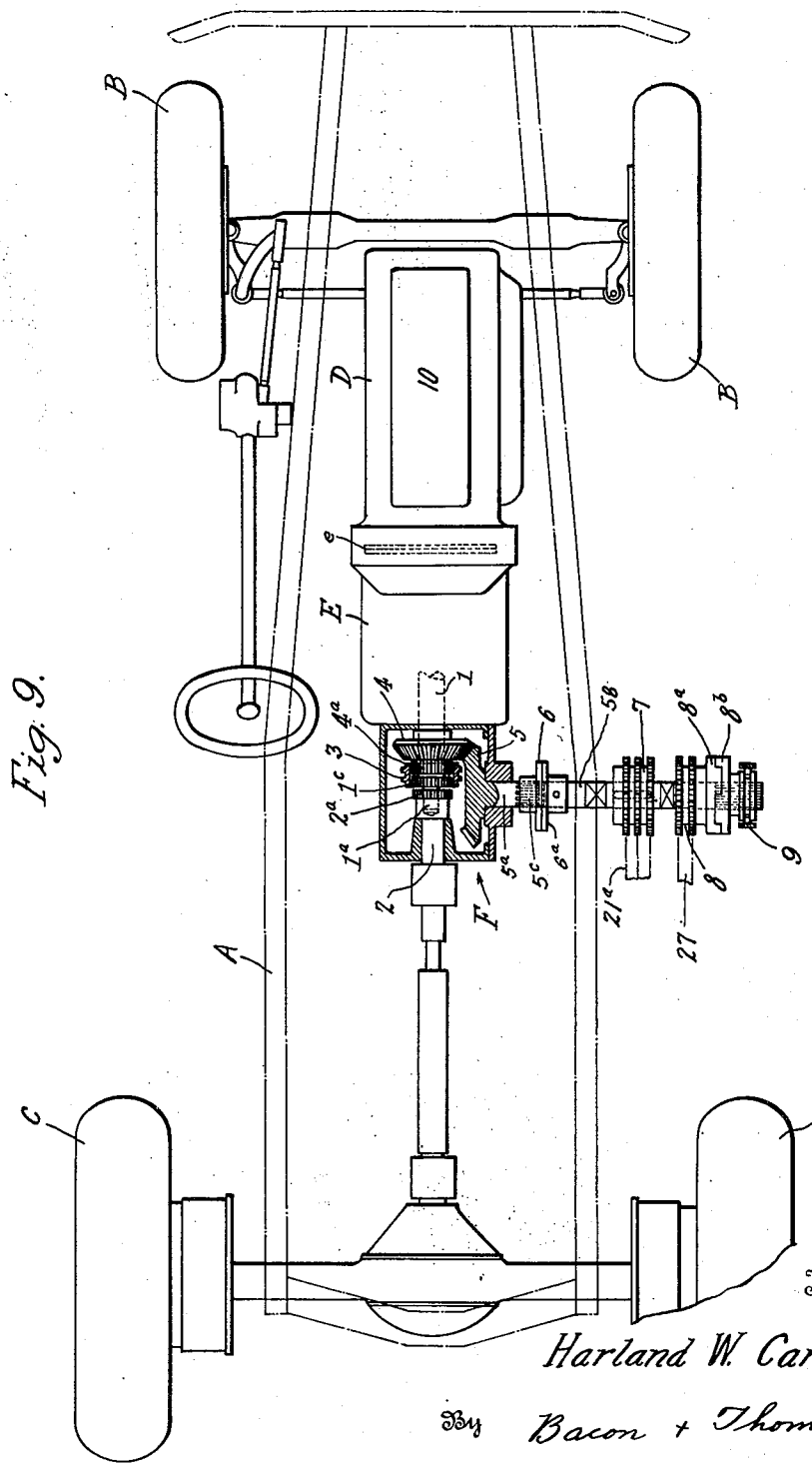


Fig. 9.

Inventor

Harland W. Cardwell

By Bacon + Thomas

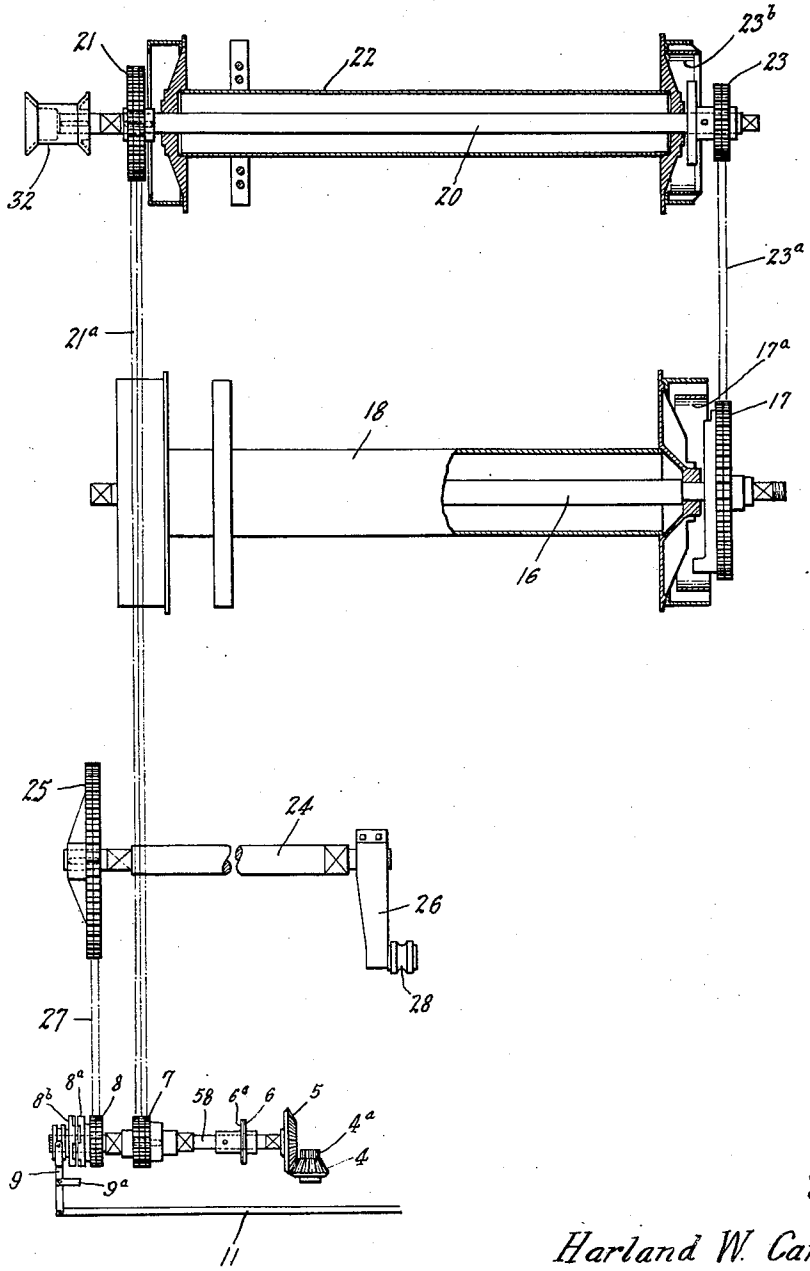
Attorney

March 10, 1942. H. W. CARDWELL 2,276,224

WELL SERVICING AND DRILLING MACHINE

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Fig. 10.



Inventor

Harland W. Cardwell

By Bacon & Thomas

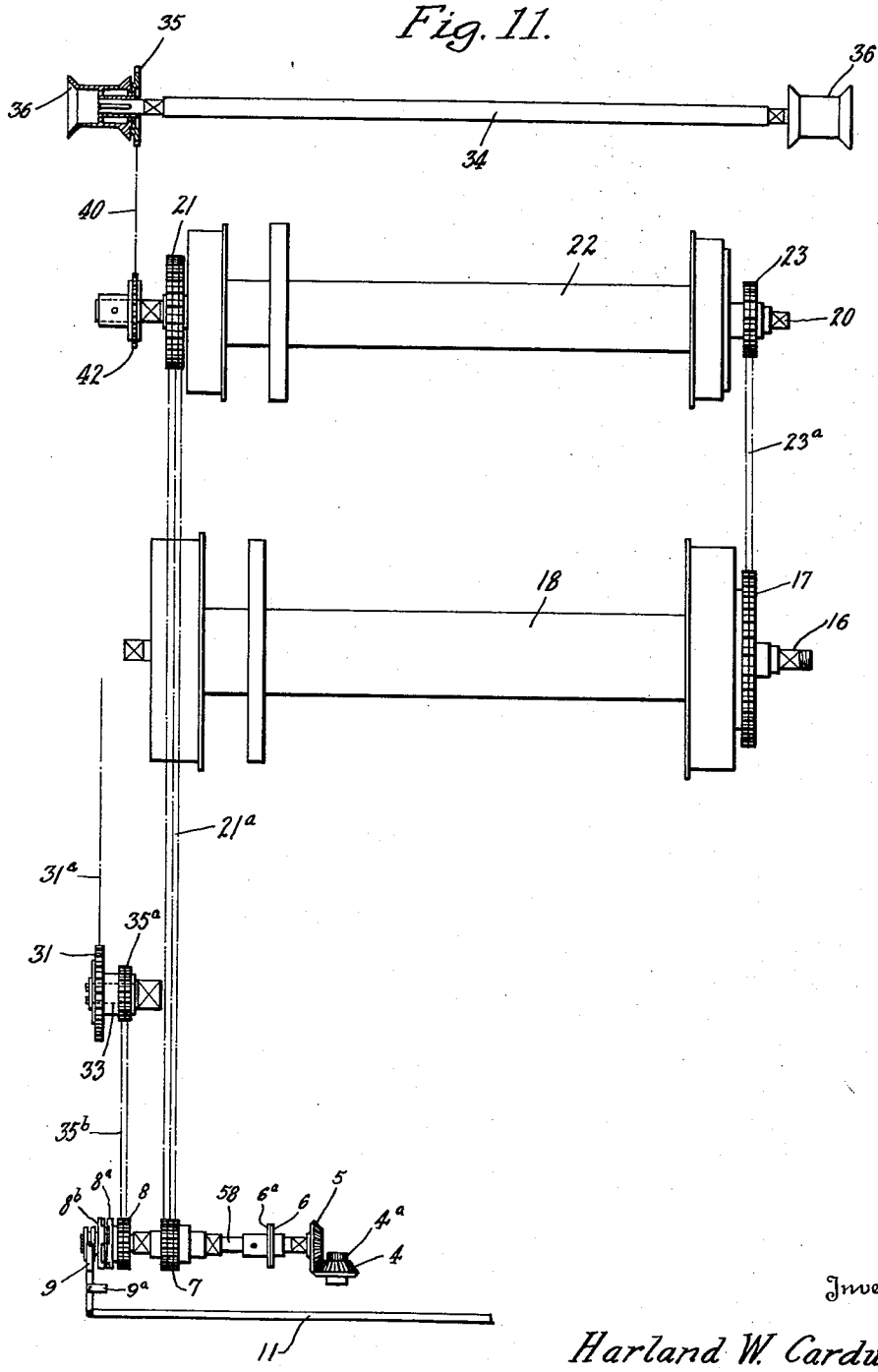
Attorneys

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WELL SERVICING AND DRILLING MACHINE

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Fig. 11.



Inventor

Harland W. Cardwell

By Bacon & Thomas

Attorneys

Patented Mar. 10, 1942

2,276,224

UNITED STATES PATENT OFFICE

2,276,224

WELL SERVICING AND DRILLING MACHINE

Harland W. Cardwell, Wichita, Kans., assignor to Cardwell Manufacturing Company, Inc., Wichita, Kans.

Application February 24, 1939, Serial No. 258,338

4 Claims. (Cl. 255—7)

The present invention relates to improvements in well servicing and drilling apparatus, and more particularly is concerned with tractor type general well servicing units, pneumatic tired if desired, which may be readily driven into and out of operative association with a well or the like which it is intended to drill or service.

The primary object of the invention is to provide a combined truck and well drilling and servicing unit which may for the latter apparatus include merely a single revoluble drum and a countershaft together with appropriate controls therefor but which is adapted to have assembled therewith additional equipment such as a second drum, drive means for a rotary cable drive assembly, a cathead shaft and catheads, a crank spudder and/or a telescoping pipe mast. Upon embodiment therewith of assemblies such as above described, and which the unit is designed and readily adapted to receive, the machine of the present invention may be usable for well drilling and servicing operations such as cleanout, deepening, or "drilling in" with cable tools and also for drilling rotary wells and core drilling operations.

Another object of the invention is to provide a combined truck and winch combination chassis comprising an integral frame novelly designed for the purpose intended as distinguished from any conventional truck or tractor chassis upon which well drilling or servicing equipment may be mounted.

A further object of the invention is to provide a unit in which the load of the drums and their lines, which generally weighs about 4000 pounds, may be located over the rear drive axle where the load may be most efficiently supported and the drums so disposed that they may be operated in the derrick with both lines running direct from the drums inside of the derrick to the crown pulley on top of the derrick. Further, in the preferred construction, the lower drum is disposed slightly upwardly and rearwardly of the rear axle and overlapping with the peripheries of the drive wheels to lower the center of gravity of the unit, and, to more equally distribute the load upon the rear axle, the upper drum may be disposed above and slightly to the opposite side of the rear axle. Thus the single or double drums are, if desired, so located with respect to the chassis that the unit may be not only backed into the derrick and the drum cables operated over the crown pulley, but it may be set away from the derrick and its fire hazards and operated through a floor block. With the prime mover disposed conventionally at the forward end of the chassis, no added counterweights are necessary to effect a well balanced unit which will not tilt backwardly when transported with a drum full of line, and one which may be readily driven over sidling or uneven ground without danger of turning over due to its low center of gravity.

Another object of the invention is to provide a unit having a countershaft which is an active countershaft adapted to drive the lower standard equipment drum but upon which may be mounted, if desired, an upper drum for a sand line or the like.

The unit contemplated by the present invention is adapted to receive, and the invention includes within its scope, a cathead shaft and catheads disposed at the extremity of the chassis extending outwardly of the drum whereby the catheads are more accessible to the operating crew and the likelihood of cathead rope interference is minimized. The unit is further adapted to receive and the invention includes within its scope spudding apparatus having a crank spudder disposed forwardly of the single or double drums at an intermediate point in the length of the chassis and which may be used for cable tool cleanout and deepening operations. In its preferred embodiment, the invention contemplates the provision of a single prime mover including a transmission for driving the rear wheels of the chassis and a power takeoff shaft from which the spudder arm and a driving means for a rotary drive assembly associated with the unit may be directly selectively operated.

The provision of two sets of controls, or dual controls; one set convenient to the driver's seat and an auxiliary set disposed at the rear end of the machine and operable from the ground, whereby the unit operator is available to assist the crew, is also contemplated by the invention, and more particularly the invention provides for pedal clutch controls adjustable relative to the ground whereby such controls may be elevated so as to clear the ground during transportation of the unit or lowered into position for ready access by the operator when the unit is employed for well drilling or servicing operations.

Other and further objects and advantages of the invention will become apparent from the following detailed explanation, taken in conjunction with the accompanying drawings, wherein preferred embodiments of the principles of the invention have been selected for exemplification.

In the drawings:

Figure 1 is a side elevational view of a unit as contemplated by the invention having a crank spudder associated therewith;

Figure 2 is a rear elevational view of a unit such as illustrated in Figure 1 and having an upper drum associated with the countershaft;

Figure 3 is a fragmentary side elevational view of the rear portion of a unit having drive means for a rotary assembly, and a cathead shaft and cathead associated therewith;

Figure 4 is a side elevational view of a unit such as illustrated in Figure 1 but having a mast and supports therefor assembled therewith;

Figure 5 is a perspective view of an integral combination truck and winch chassis as contemplated by the invention;

Figure 6 is a perspective fragmentary view of transmission gear shift dual controls;

Figure 7 is a perspective view of the dual throttle control;

Figure 8 is a perspective view of the dual clutch controls, illustrating the adjustable pedal controls associated with the rear end of the unit;

Figure 9 is a somewhat diagrammatic view of the invention, particularly illustrating the power takeoff means for driving the drums, etc., and the spudder arm and/or the drive for the rotary assembly;

Figure 10 is a schematic view of the drive for the various drums and particularly showing the power takeoff arranged for driving the spudder arm; and

Figure 11 is a schematic view showing the drive for the drums, the cathead shaft at the rear of the vehicle, and the drive connection between the power takeoff and the means for driving a rotary assembly.

Referring more particularly to the drawings, wherein like numerals refer to like parts, a chassis indicated in its entirety by letter A is supported by front steering wheels B and rear drive wheels C and in turn supports at its forward end 10 a prime mover such as an internal combustion engine, indicated in its entirety by the letter D. A conventional transmission E is connected behind the engine 10. A master clutch *e* is interposed between the transmission and engine. This transmission may have any number of desired forward speeds, say five, and a reverse speed. A power taffeoff unit F is associated with the transmission E, and will be described in further detail hereinafter.

The rear elevated portion 12 of the chassis A supports in a position slightly upwardly and rearwardly of the rear axle 14 a dead shaft 16 upon which is revolubly mounted a drum 18 upon which may be wound a well drilling or servicing tool cable (not illustrated).

As best shown in Figure 1, drum 18 is only slightly spaced from rear axle 14 and is disposed between the rear drive wheels C with the peripheries of the drum and wheels in intersecting or overlapping arrangement in order to effect an extremely low center of gravity. An active countershaft 20 is also supported upon the elevated portion 12 of the chassis A in a position above the drum 18 and slightly to the opposite side of the rear axle 14. If desired, an upper drum 22 may be mounted upon the countershaft 20 to receive another well servicing tool cable such as a sand line or the like (not illustrated). The drums 22 and 18 preferably are disposed respectively, one above the other, and approximately equally spaced from a vertical plane passing through the axle 14, so that the load of the drums and their cables bears directly upon the axle 14 to thereby best distribute stress or strain upon the chassis A or its wheel and axle supports.

It will be understood that the wheels B—C, chassis A, prime mover D, drum 18 and countershaft 20, together with appropriate controls therefor, constitute a standard combined truck and well drilling and servicing unit which is adapted to have associated therewith well drilling and servicing equipment such as an upper drum 22 (already described); and a spudder, driving means for a rotary drive assembly, and mast, any or all of which may be directly attached or supported by suitable brackets which may be bolted or otherwise secured to the chassis A, as will be clear from the following.

Disposed forwardly of the drum 18 and countershaft 20 at a point intermediate the ends of the chassis A is a spudding assembly comprising a spudder shaft 24, supporting a spudding arm 26 and a spudding sheave 28, and in turn supported by a standard 30 which is bolted or otherwise secured to the chassis A.

The power for driving the lower drum 18, the upper drum 22, and the spudding assembly is derived through the power takeoff unit F. The power takeoff shaft and its relation to the transmission is best illustrated in Figure 9, and the arrangement of the drives for the drums and spudding apparatus from said power takeoff is best illustrated in Figure 10.

Referring now more particularly to Figure 9, the transmission E includes a drive shaft 1 having a reduced end portion 1*a* received in a recess formed in one end of a section of a propeller shaft 2. The shaft 1 carries a toothed portion 1*c* in fixed relation thereto. The end of the propeller shaft 2 is provided with teeth 2*a*. An internally toothed sleeve 3 is arranged to be shifted by means (not shown) so as to bring the teeth 1*c* and 2*a* in positive driving relation. This may be effected by moving the sleeve 3 to the left as viewed in Figure 9. When the sleeve is in this position, the transmission is connected to transmit a drive to the propeller shaft 2. At this time, it will be understood that when the propeller shaft is being driven to maneuver the vehicle, the power takeoff shaft is disconnected. This will be clear from the following: A bevel gear 4 is rotatably mounted upon the transmission shaft 1. This gear is provided with an integral toothed extension 4*a* which is arranged in telescoping relation with the sleeve 3, as clearly shown in the drawings. When the sleeve is in the position illustrated, the drive to the propeller shaft 2 is disconnected and the apparatus is in position for drive of the power takeoff shaft, the teeth 1*c* transmitting drive through the sleeve 3 to the extended tooth portion 4*a*. A second bevel gear 5 has its axis of rotation disposed at right angles to that of the transmission shaft 1 and the propeller shaft 2 and is adapted to mesh with the gear 4. The gear 5 has an integral extension 5*a* splined as indicated at 5*c*. One element of a coupling 6 is mounted upon the splined portion 5*c*. Another element 6*a* of said coupling is fixed to a shaft 58. A compound sprocket 7 is keyed to the shaft 58 and a second compound sprocket 8 is rotatably mounted upon said shaft. An element 8*a* of a jaw clutch is formed integral with the sprocket 8, and a complemental ele-

ment 8b of a jaw clutch is slidably mounted at one end of the shaft 58. The clutch element 8b is preferably splined upon the shaft 58 so that when it is engaged with the clutch element 8a the sprocket 8 will be positively driven by the shaft 58. A yoke 9 is operatively associated with the clutch element 8b for shifting the same longitudinally of the splined portion of the shaft 58 to effect operative engagement with the clutch element 8a. The yoke 9 may be fulcrumed at 9a as indicated in Figure 4.

The yoke 9 is connected to one end of an operating link 11. The opposite end of the link 11 is connected to a lever 13 pivotally mounted upon a pin 15, as best shown in Figure 1. Thus, when the lever 13 is manually actuated, the clutch elements 8 and 8a may be engaged or disengaged at the will of the operator.

Referring now to Figure 10, it will be noted that the countershaft 20 has a compound sprocket wheel 21 keyed thereto, and that said countershaft is driven by the sprocket 7 through a chain 21a. A second sprocket 23 is also fixed to the countershaft 20 and is arranged to drive a sprocket 17 through a chain 23a. The drums 18 and 22 are mounted for free rotation upon their respective shafts 16 and 20, as has already been stated. However, the drum 18 may be rotated through any suitable clutch means 17a associated with the sprocket 17. Likewise, the drum 22 may be driven through any suitable clutch arrangement 23b associated with the sprocket 23. It will be understood that any conventional brake mechanism may be provided for holding the drums 18 and 22 in any desired stationary position.

The spudding assembly is driven from the power takeoff shaft 58 through the sprocket 8 and the jaw clutch elements 8a and 8b. More specifically, the spudder shaft 24 carries a sprocket 25 keyed on one end thereof. A chain 27 is trained over the sprockets 8 and 25 so that when the clutch elements 8a and 8b are engaged, the sprocket 8 is driven and in turn imparts rotation to the spudder shaft 24.

It will be apparent from the foregoing that the countershaft 20 is continuously driven so long as power is applied to the power takeoff shaft 58 and that the drums 18 and 22 may be rotated independently upon actuation of suitable clutches. Such clutch arrangements are conventional and well understood in the art, and therefore have not been illustrated in detail in the drawings.

As best illustrated in Figure 3, drive means for a rotary drive assembly including a sprocket 31 may be attached to the chassis A in a suitable manner and is adapted to drive a rotary table of any conventional construction (not illustrated) by means of a chain 31a. The sprocket 31, as best illustrated in Figure 11, is rotatably mounted upon a stud shaft 33. The sprocket 31 is preferably formed integral with a sprocket 35a. The sprocket 35a is adapted to be driven by the sprocket 8 on the power takeoff shaft through a chain 35b.

It will be clear from the foregoing that the sprocket 8 may be utilized selectively as the drive for the spudder shaft 24, and the sprocket 35a which in turn drives the sprocket 31 supplying power for operating a rotary drive assembly. Accordingly, it is desirable from an economic standpoint that the axis of rotation of the sprocket 31 be positioned such distance from the axis of the power takeoff shaft 58 that the drive chain 27 for the spudder arm may be utilized and serve as the chain 35a for driving the sprocket 31.

If desired, catheads 32 may be keyed to either or both ends of the countershaft 20, but for certain operations it is desirable to omit these catheads and embody with the unit a cathead shaft 34 having catheads 36 keyed to either or both its ends and supported by means of arms 38a bolted or otherwise secured to the rear extremity of the upstanding portion 12 of the chassis A so that the cathead shaft 34 and catheads 36 may be positioned rearwardly of the drum 18 to avoid any possibility of cathead rope interference, the catheads thus being conveniently positioned overhead and otherwise more accessible to the operator. As shown in Figure 3 and Figure 11, cathead 36 at one end of the shaft 34 carries a sprocket 35 and may be driven by an associated sprocket chain 40 trained over a sprocket wheel 42 keyed or otherwise secured to the countershaft 20. It will be noted, upon comparison of Figures 10 and 11, that the cathead 32 of Figure 10 has been replaced by the sprocket 42 in order to provide a drive for the more conveniently located cathead shaft 34.

If desired, as illustrated in Figure 4, a telescoping mast 44 may be associated with the unit and, in its rest position, clamped to and pivotally supported by a horizontal bar 46 secured to the ends of an opposed pair of supporting arms 38b. An upstanding pedestal 48 may be bolted or otherwise secured to the forward end of chassis A to support the forward or top end of mast 44. In its preferred construction, mast 44 is a single or two-legged telescoping seamless pipe mast with a sheave shaft 50 to which is journaled a plurality of crown pulleys or sheaves 52 over which may be trained the well drilling or servicing tool cables. At the axial ends of sheaves 52, a pair of opposed guard plates 54 are provided connected by bolts 56 which may support rolling sleeves to guide the cables in the sheave grooves. The construction is such that the sheaves 52 are preferably open at their tops and the bolts or sleeves 56 are positioned at or below the axis of the sheaves at a point best retaining the cables in their grooves, since the weight of the cables will normally hold them in the upper portion of the sheave.

A further feature of the invention includes the provision of dual controls; one set of controls being accessible to the driver of the unit from the seat adjacent the steering wheel and the other set accessible to the well drilling and servicing apparatus operator from a position on the ground at the rear of the unit where the operator is in a position to observe more readily the tool operations and to assist the well crew. Accordingly, the usual transmission gear shifters 60 are connected by suitable links and the like, as clearly shown in Figure 6, with a second set of control levers 62 positioned at the rear and to one side of the unit. Similarly, the conventional throttle pedal 64 is connected by a suitable link and rod arrangement shown in Figure 7 to a wheel 66 supported upon the rear of chassis A. Also, the conventional engine master clutch pedal 68 may be connected by suitable cable means or the like illustrated in Figure 8 with a pedal control 70 carried by the rear end of the unit in a convenient position for the operator. Since it is desirable that the rear pedal control be capable of elevated movement with respect to the ground when the unit is being

moved, and capable of being lowered with respect to the ground in a position accessible to the operator when the unit is stationary, the invention provides for an adjustable support for the pedal comprising a supporting bar 14 having pedals pivoted thereto at its lower end and capable of vertical adjustment in brackets 16 which may be, in turn, secured to the chassis A at the rear portion of the unit. While Figure 8 shows a single pedal control such as for the engine master clutch, it will be understood that a plurality of pedals may be in like manner supported by rod 14 and, as illustrated in Figure 2, one or more additional pedals 12 may be provided such as for operating the various drum clutches, if desired.

It will be understood that the specific device herein illustrated and described is exemplary only of the principles of the invention and is capable of such modifications in construction and arrangement of parts as are within the scope of the following claims.

I claim:

1. A combined truck and well drilling and servicing unit comprising, a chassis, rear drive wheels and axle supporting said chassis, well drilling and servicing tool operating means mounted upon said chassis, and control means for said operating means operable from the ground adjacent the chassis and vertically adjustable with respect to the ground.

2. A combined truck and well drilling and servicing unit comprising, a chassis, rear drive wheels and axle supporting said chassis, well drilling and servicing tool operating means including a clutch mounted upon said chassis, a prime mover for said unit including a transmission, and master clutch and pedal controls for said clutch operable from the ground adjacent the chassis and vertically adjustable with respect to the ground.

3. A mobile well drilling and servicing unit comprising, a chassis having supporting drive wheels including an axle, a lower drum mounted upon the under side of said chassis slightly obove and to one side of said axle and disposed between said wheels, and an upper drum mounted upon the upper side of the chassis slightly above said lower drum and to the opposite side of said axle, the axes of said drums being approximately the same distance from a vertical plane passing through said axle, whereby the load of said drums is distributed on said chassis so as to lie upon the opposite sides of said axle and whereby the unit may be backed into a derrick and the cables of the drums operated over a crown pulley or may be set away from the derrick and its fire hazards and the cables of the drums operated through a floor block.

4. A mobile well drilling and servicing unit comprising, a chassis having supporting drive wheels including an axle, a lower drum mounted upon the chassis above and to one side of said axle, and an upper drum mounted upon the chassis slightly above said lower drum and to the opposite side of said axle, the axes of said drums being approximately the same distance from a vertical plane passing through said axle, whereby the the load of said drums is distributed on said chassis so as to lie upon the opposite sides of said axle and whereby the unit may be backed into a derrick and the cables of the drums operated over a crown pulley or may be set away from the derrick and its fire hazards and the cables of the drums operated through a floor block.

HARLAND W. CARDWELL.