

Aug. 12, 1952

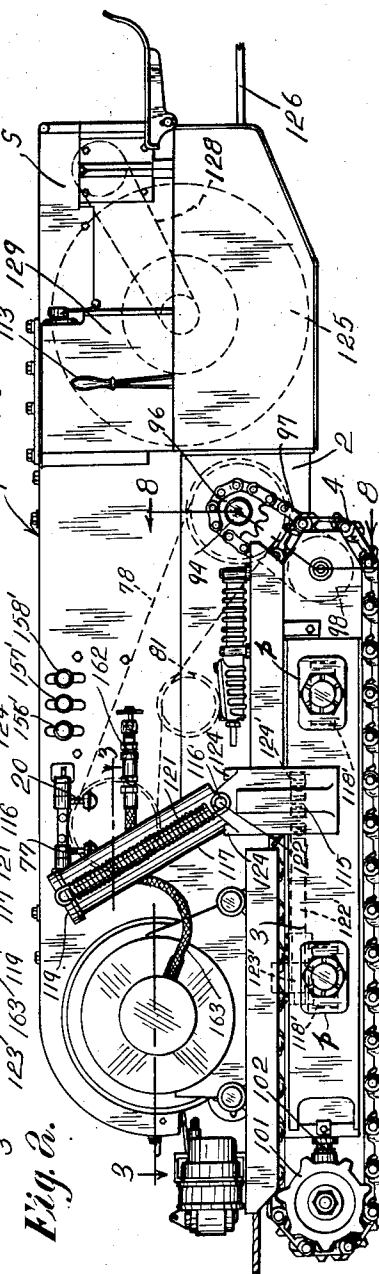
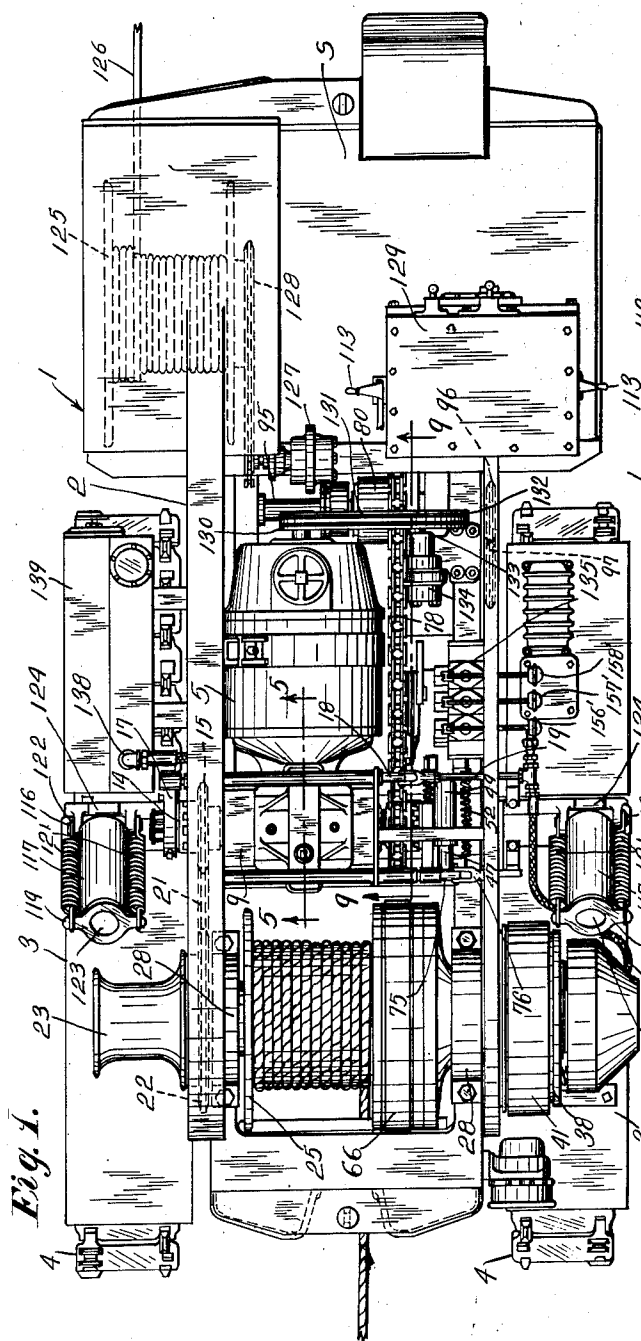
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2,606,745

MOBILE POST PULLER WINCH

Filed June 2, 1947

6 Sheets-Sheet 1



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Fig. 3.

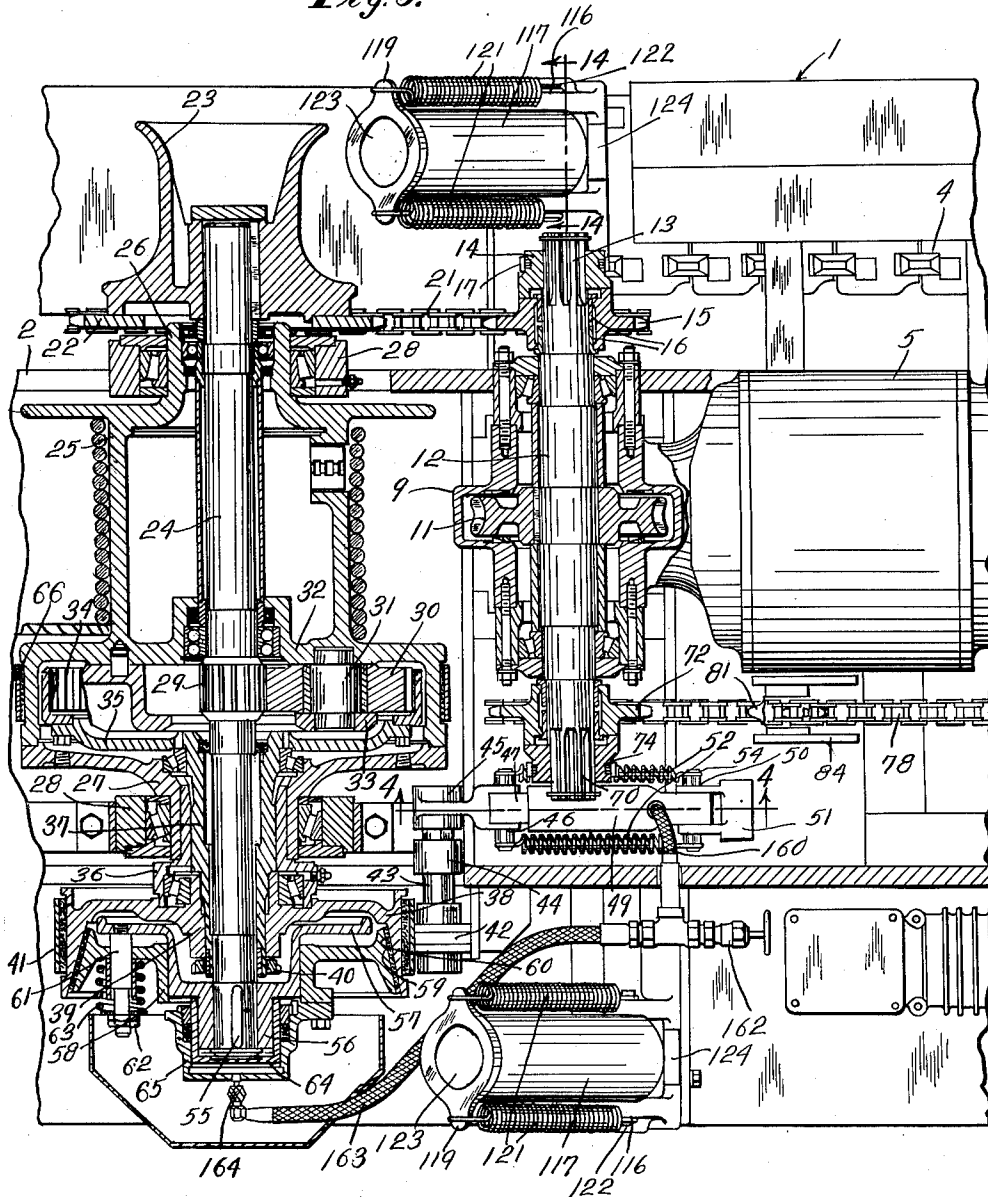
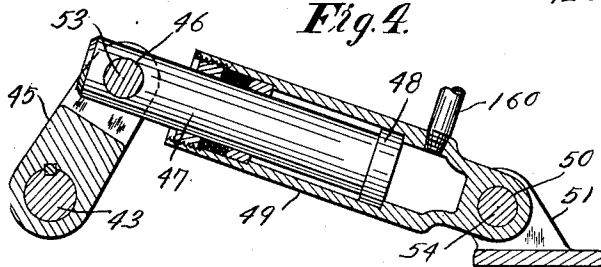


Fig. 4.



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Fig. 5.

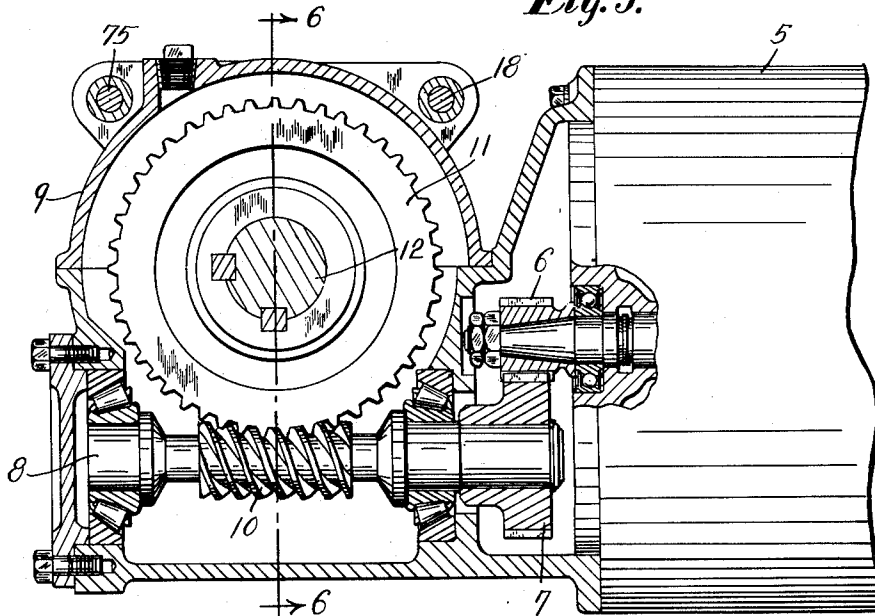


Fig. 6.

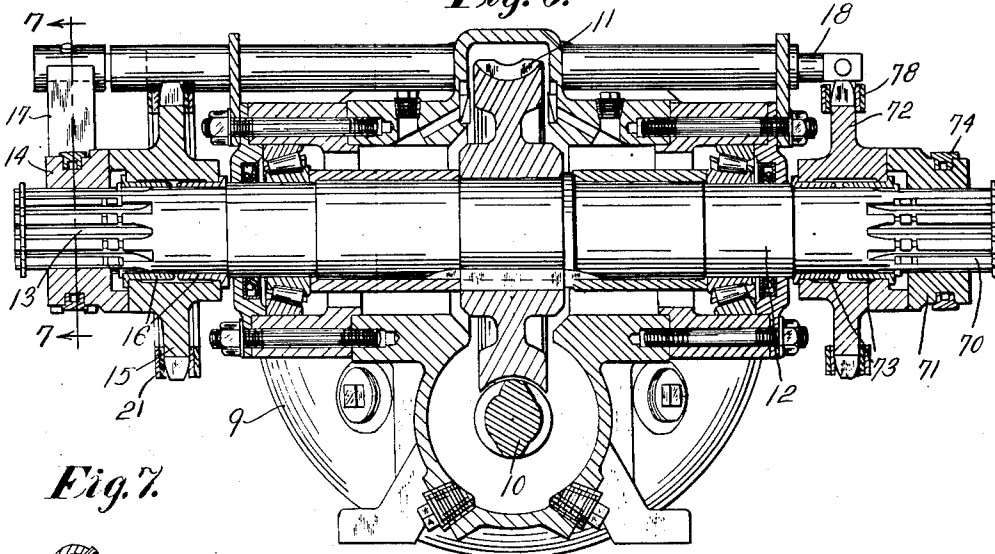
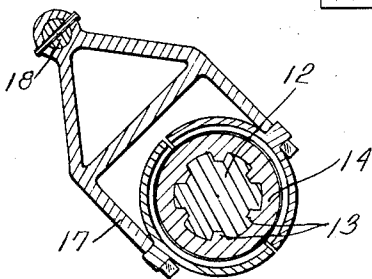


Fig. 7.

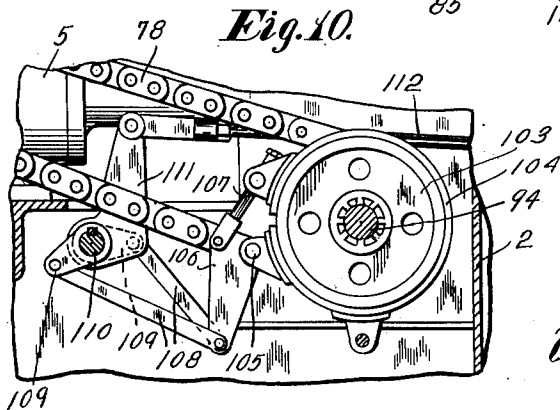
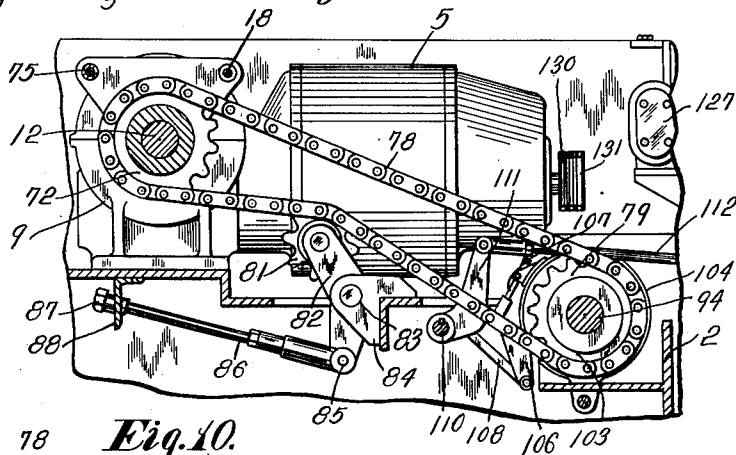
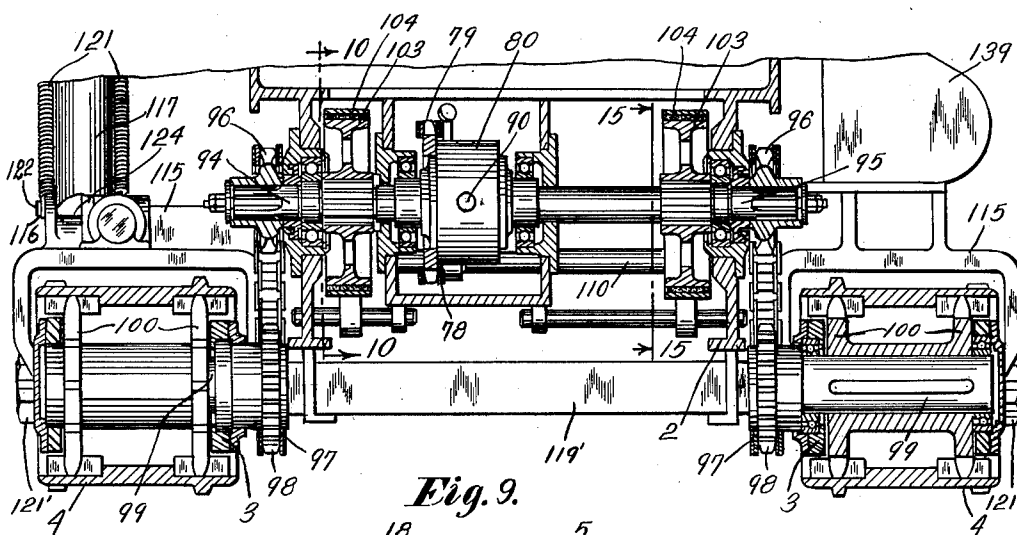


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MOBILE POST PULLER WINCH

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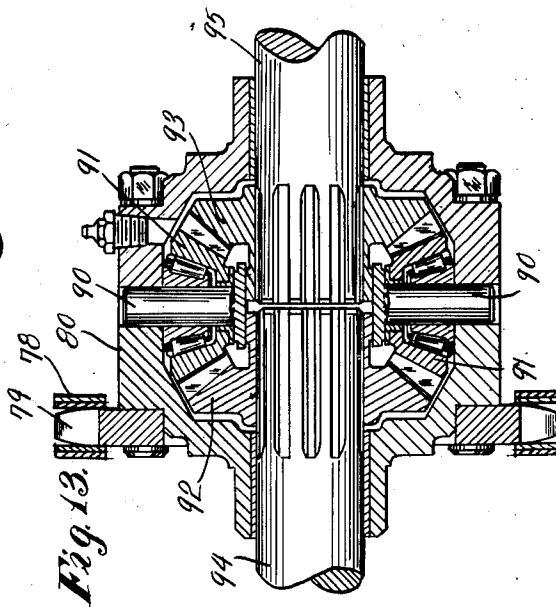
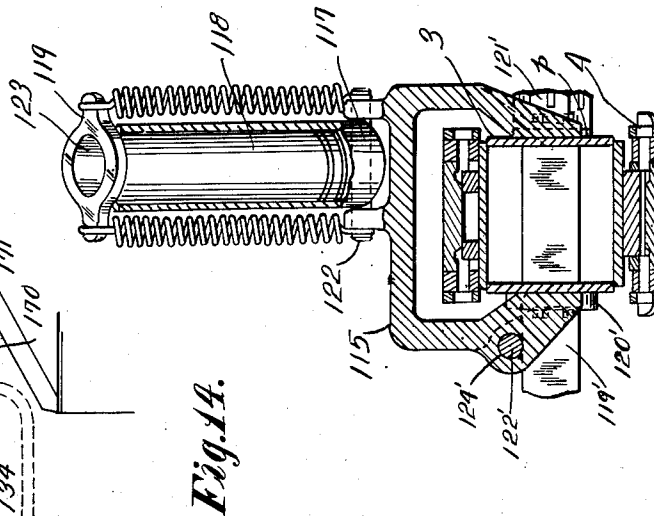
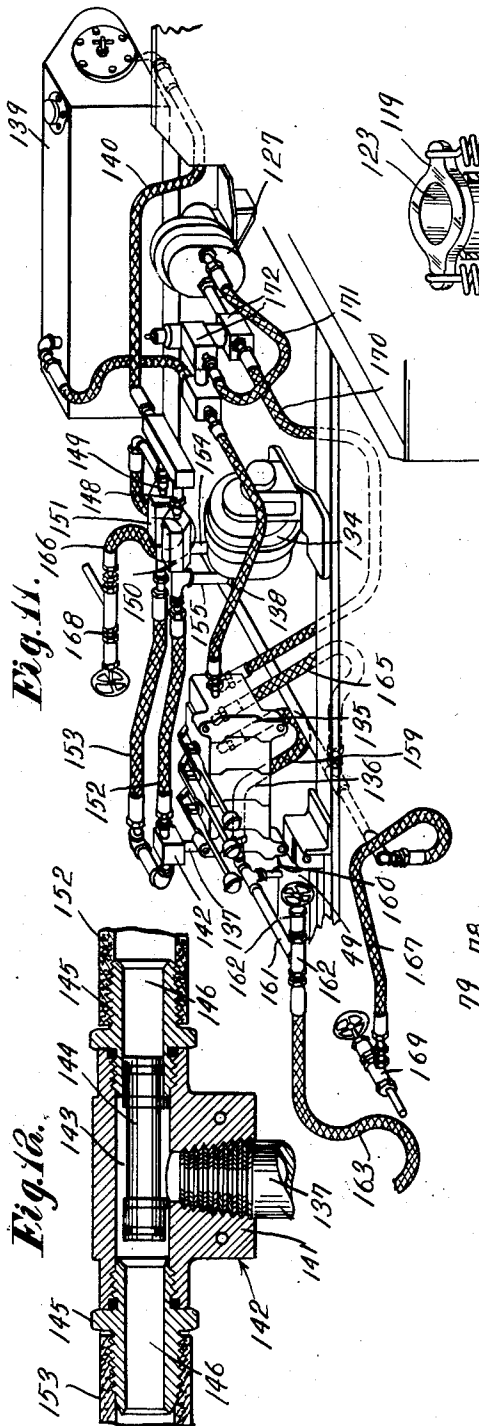
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MOBILE POST PULLER WINCH

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MOBILE POST PULLER WINCH

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Fig. 15.

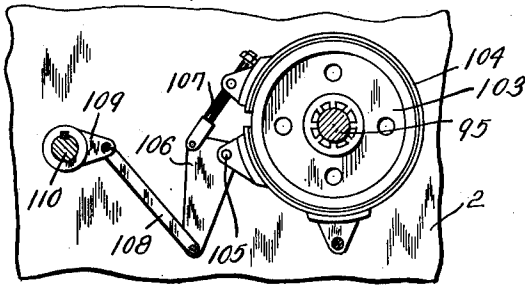
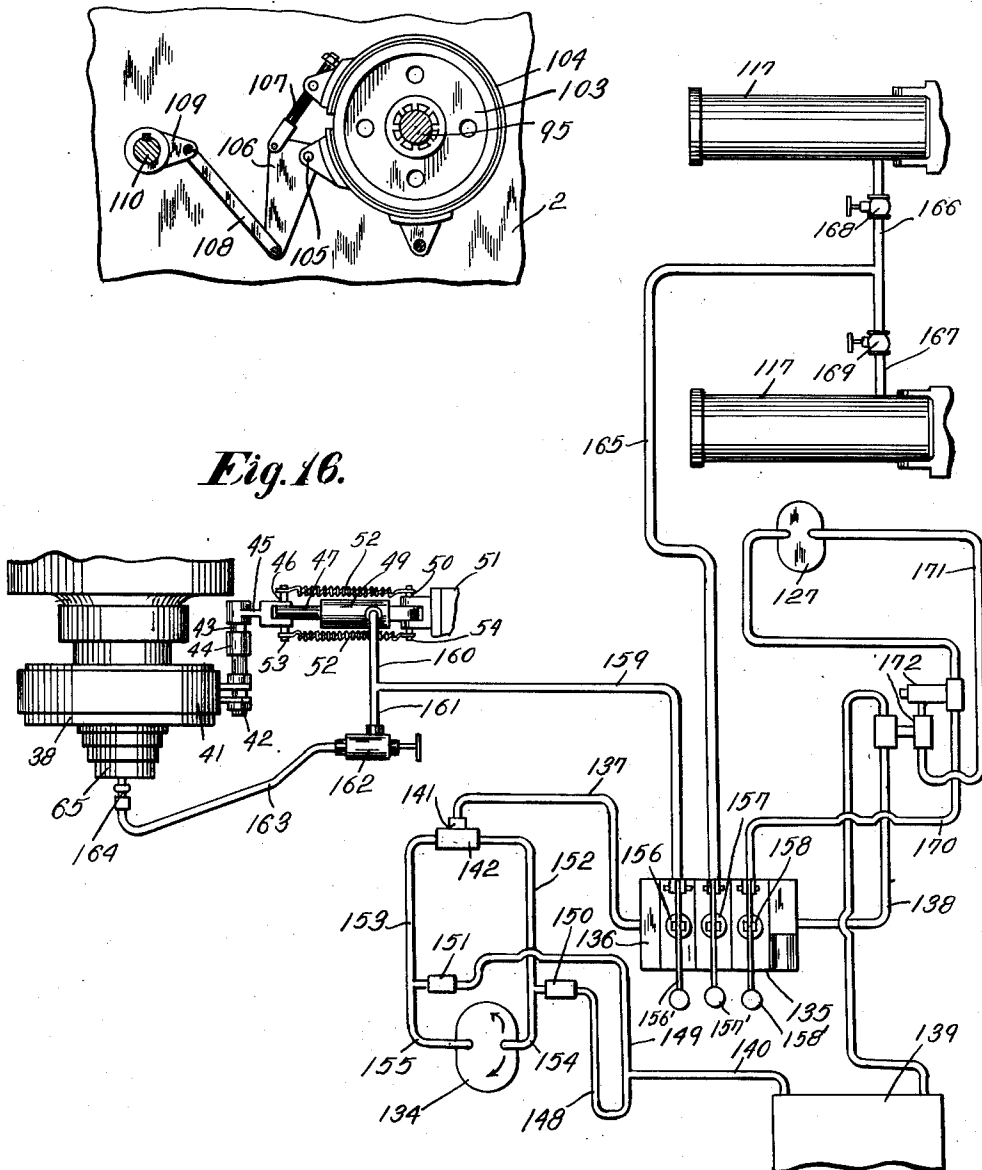


Fig. 16.



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UNITED STATES PATENT OFFICE

2,606,745

MOBILE POST PULLER WINCH

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Application June 2, 1947, Serial No. 751,854

18 Claims. (Cl. 254—166)

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This invention relates to winches and more particularly, but not exclusively, to a mobile post puller for the pulling and reclaiming of posts or props used in timbering the roofs of underground mines.

In underground mines, the roof of the working chamber is usually supported by timbers such as posts or props, and as mining progresses, as for example when robbing pillars and retreating, it is desirable to reclaim the posts or props for reuse, thereby substantially to reduce the cost of timbering. The posts or props are firmly wedged between the mine floor and roof, and great force is required to loosen or dislodge the posts or props, and when the posts are loosened, they must be quickly moved out of the way of the falling roof. Several known types of machines have been employed for pulling and reclaiming the posts or props, and the present invention contemplates improvements over such known machines. The post pulling winch of the present invention is readily mobile so that it may be moved rapidly about the mine and quickly maneuvered into position and set in place, is extremely rugged and compact, and provides for a slow and powerful pulling force to loosen or dislodge the posts and a relatively rapid winding speed to move quickly the posts from beneath the falling roof. The post puller of the present invention may also be employed in reclaiming cross bars, rails, planks and other equipment, and further may be used as a room hoist or a car puller in addition to its normal duties. The post puller of the present invention embodies features whereby it may be operated quickly and safely and with efficiency.

An object of the present invention is to provide an improved winch. Another object is to provide an improved post pulling winch for reclaiming timbering elements such as posts or props in underground mines in a safe and rapid manner. A further object is to provide an improved mobile winch having novel features of construction whereby improved operation is attained. Yet another object is to provide an improved winch of the crawler or tractor tread supported and propelled type whereby the winch may be rapidly moved about the mine and quickly maneuvered into position and set in place. A further object is to provide improved driving and controlling means for the crawler or tractor treads. A still further object is to provide improved jack devices for firmly holding the machine in a stationary position between the mine floor and roof during its operation.

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Yet another object is to provide an improved post puller having novel arrangements and combinations of parts. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

10 Fig. 1 is a top plan view of the improved post puller, with the top covers removed to show details of the internal structure.

Fig. 2 is a side elevational view of the post puller shown in Fig. 1.

15 Fig. 3 is a horizontal sectional view, on an enlarged scale, taken substantially on the planes of line 3—3 of Fig. 2.

Fig. 4 is an enlarged detail vertical sectional view taken on line 4—4 of Fig. 3.

20 Fig. 5 is an enlarged longitudinal vertical sectional view taken on line 5—5 of Fig. 1.

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 5.

25 Fig. 7 is a detail vertical sectional view taken on line 7—7 of Fig. 6.

Fig. 8 is a cross-sectional view, on an enlarged scale, taken substantially on line 8—8 of Fig. 2.

Fig. 9 is an enlarged longitudinal vertical sectional view taken on line 9—9 of Fig. 1.

30 Fig. 10 is a longitudinal vertical sectional view taken on line 10—10 of Fig. 8.

Fig. 11 is a somewhat diagrammatic, fragmentary isometric view showing the automatic pump reverse and its associated fluid connections.

35 Fig. 12 is an enlarged detail sectional view showing the automatic shuttle valve of the pump reverse.

Fig. 13 is an enlarged view in vertical section taken on the plane of Fig. 8, showing details of the differential drive.

Fig. 14 is an enlarged detail vertical sectional view taken on the planes of line 14—14 of Fig. 3, showing details of one of the jack devices.

45 Fig. 15 is a longitudinal vertical sectional view taken on line 15—15 of Fig. 8, showing details of one of the tractor tread brakes.

Fig. 16 is a diagrammatic view illustrating the fluid control system.

50 In this illustrative construction, as shown in the drawings, the improved mobile post pulling winch is generally designated 1 and comprises a main frame 2, to the sides of which are suitably adjustably secured supporting and guiding frames 3, 3 having endless crawler or tractor treads

4, 4 mounted for circulation thereon. Evidently, the winch may be mounted in other manners, as for example, on track wheels adapted to travel along a trackway laid on the mine floor. The winch of the present invention is an improvement over that of the Charles F. Ball Patent No. 2,389,177, patented Nov. 20, 1945.

The main frame 2 carries a reversible motor 5, herein preferably an electric motor, having its power shaft extending longitudinally of the main frame at one side of the longitudinal center thereof, as shown in Figs. 1 and 3. Fixed to one end, preferably the front end, of the motor power shaft is a spur pinion 6 (see Fig. 5) meshing with a spur gear 7 fixed to a longitudinal shaft 8 suitably journaled within a gear housing 9 mounted on the main frame 2. Secured to the shaft 8 is a worm 10 meshing with a worm wheel 11 keyed to a transverse shaft 12 (Fig. 6) likewise suitably journaled in the gearing housing 9. Splined at 13 to one end of the shaft 12 is a shiftable jaw clutch member 14 having jaws engageable with jaws on the hub of a chain sprocket 15 suitably journaled on bearing sleeves 16 supported by the shaft 12. The clutch member 14 is engaged by a shipper member 17 secured to a transverse operating shaft 18 suitably slidably guided on the gearing housing 9 rearwardly of the shaft 12. The slidable shaft 18 is pivotally connected to a link 19 provided with a conveniently located operating handle 20. The sprocket 15 is connected by an endless drive chain 21 to a chain sprocket 22 (see Fig. 3), herein secured to a capstan 23, sometimes called a "niggerhead" or "gypsy," about which a cable is adapted to be snubbed for auxiliary hoisting purposes. This capstan is keyed to a transverse drive shaft 24, herein arranged parallel with the shaft 12 in front of the latter, and this shaft 24 is suitably journaled in bearings supported within a cable winding drum 25. The drum 25 has coaxial end hubs 26 and 27 suitably journaled in bearings supported within upstanding brackets 28, 28 secured to the main frame. The structure of the driving connections between the drive shaft 24 and the cable winding drum and the control means therefor may assume various forms but are herein similar to those described in a copending application to Charles F. Ball, Serial No. 749,715, filed May 22, 1947. As described in said application, fixed to the drive shaft 24 is a spur pinion 29 which meshes with planet gears 30 (one of which is shown in Fig. 3), each journaled on a horizontal stub shaft 31 supported at one end within the adjacent drum flange 32 and at its other end within a bracket 33 secured to the drum. These planet gears mesh with an internal gear 34 secured to a rotatable reaction member 35 coaxial with the drive shaft. Suitably fixed to the adjacent drum hub 27 is a bearing support 36, and the reaction member 35 has a tubular shaft 37 projecting axially beyond the adjacent bearing support 28 and to which a brake drum 38 is secured. The tubular shaft 37 of the reaction member 35 and the hub 39 of the brake drum 38 are journaled in suitable bearings supported respectively within the drum hub 27 and the bearing support 36. The hub 39 of the brake drum is keyed to the tubular shaft 37 near its outer end and is rigidly held in position on the tubular shaft by a retaining ring 40 suitably locked to the shaft. Cooperating with the exterior periphery of the brake drum 38 is a contractible brake band 41, and this brake band, as described in the application above referred to,

is attached at one end to a suitable support and at its other end to a lever 42 secured to a shaft 43 rotatably mounted in a bearing bracket 44 suitably attached to the main frame. Secured to the opposite end of the shaft 43 is a lever 45 (see also Fig. 4) which is pivotally connected at 46 to a piston rod 47 of a reciprocable piston 48 contained in a fluid cylinder 49, the latter being pivotally mounted on a horizontal pivot at 50 on a bracket 51, likewise attached to the main frame. Springs 52 (Fig. 3), connected between pivot pins 53 and 54 of the pivots 46 and 50 respectively, constantly urge the piston 48 toward its retracted position. Thus, when the piston 48 is moved outwardly under the influence of pressure fluid in the cylinder 49, the brake band 41 is applied, thus holding the reaction member 35 stationary, and as the drive shaft 24 is driven by the chain sprocket 42, the cable winding drum 25 is rotated in cable winding direction through spur pinion 29 and the planet gears 31 on the drum which mesh with the internal gear 34, the planet gears 30 rolling around the then stationary internal gear as a trackway to effect low speed drum rotation.

As is also described in the application above referred to, a friction clutch is provided for connecting the cable winding drum directly to the drive shaft 24 to effect high speed drum rotation in cable winding direction; and it will be noted that the drive shaft extends axially outwardly beyond the tubular shaft 37 of the reaction member, and keyed at 55 to this projecting end of the shaft is a hub 56 of a cylindrical flanged member 57. Slidably mounted on the cylindrical body of the member 57 is a hub 58 of a reciprocable clutch member 59, herein preferably a clutch cone engageable with a conical surface 60 on the brake drum 38. Studs 61, secured to the flange of the member 57, are fitted in and pass outwardly through openings in the clutch member 59, and encircling these studs and arranged between washers held on the studs by nuts 62 and the outer surface of the clutch member 59 are coil springs 63 which constantly urge the clutch member 59 toward its connected position. Rigidly secured to the hub 56 of the member 57 is a non-reciprocable sleeve-like piston 64 received in the bore of a reciprocable fluid cylinder 65, the latter rigidly secured to the hub 58 of the clutch member 59. A suitable fluid seal surrounds the piston 64 and engages the walls of the cylinder bore to prevent leakage. Thus, when fluid is supplied to the cylinder 65, the latter is moved axially outwardly with respect to the piston 64 to release the clutch member 59 against the action of the springs 63. When fluid is vented from the cylinder 65, the springs 63 automatically connect the clutch. Thus, when the clutch member 14 is connected, the cable winding drum and capstan may be driven at either a slow or a high speed, and when the clutch is disconnected, the cable may be freely unwound from the drum. When the drum is disconnected from its drive shaft, the capstan may be driven independently of the drum, and the latter is provided with a suitable contractible brake band 65 for holding the drum stationary at that time.

Now referring to the improved drive means for the crawler or tractor treads 4, it will be observed that splined at 70 to the opposite end of the transverse shaft 12 is a shiftable jaw clutch member 71, similar to the member 14, having jaws engageable with jaws on the hub of a chain sprocket 72 suitably journaled on bear-

ing sleeves 73 supported by the shaft 12. The clutch member 71 is engaged by a shipper member 74 secured to a transverse operating shaft 75, parallel with the shaft 18 and likewise slidably guided on the gearing housing but at the forward side of the latter. A link 76 is pivotally connected to the slidable shaft and is provided with a handle 77 located in adjacency to the handle 20. The sprocket 72 is connected by an endless drive chain 78 (Fig. 9) to a chain sprocket 79 secured to a differential housing 80 (see also Figs. 8 and 13). Engaging the lower run of the drive chain 78 is a chain tightener sprocket 81 carried by the upper end of a lever arm 82 pivoted at 83 on a bracket 84 secured to the main frame. Pivotally connected at 85 to the lower end of the lever arm is an adjusting rod 86. This rod is screw-threaded and is engaged by an adjusting nut 87 which, in turn, engages a bracket 88 likewise secured to the main frame. By adjusting the nut on the rod 86, the lever arm may be swung on its pivot to vary the position of the sprocket 81, thereby to adjust the chain tension. The differential housing 80 supports radial shafts 90 on which beveled planet gears 91 are journaled, and these planet gears mesh, at their opposite sides, with coaxial beveled gears 92 and 93 respectively, the latter keyed to the adjacent ends of aligned transverse shafts 94 and 95. These shafts are suitably journaled in bearings supported within the main frame and have keyed to their remote ends chain sprockets 96, 96 (Fig. 8) connected by endless drive chains 97, 97 respectively to chain sprockets 98, 98. These chain sprockets 98 are secured to transverse shafts 99 suitably journaled within the tread frames and have sprockets 100 secured thereto which engage and drive the tractor treads. The tractor treads also extend around forwardly located idler sprockets 101, and these idler sprockets are provided with suitable adjusting devices 102 connected to the tread frames for adjusting the tension of the tractor treads in a known manner. Keyed to the aligned shafts 94 and 95 are brake drums 103, 103 with which contractible brake bands 104 cooperate. Each of these brake bands is pivotally connected at 105 at one end to a lever 106 which is, in turn, pivotally connected by a link 107 to the other end of the band. A pivoted link 108 connects the lever 106 to an arm 109 keyed to an operating shaft 110. Secured to each operating shaft 110 is a lever arm 111 connected by an operating rod 112 to a hand lever 113 conveniently located near the operator's station designated S. Thus, by operating the hand levers 113, the brake bands 104, 104 may be controlled to vary the relative speeds of the tractor treads to effect steering during propulsion of the machine, and both brake bands may be applied when desired to hold the treads in a stationary position. Since the machine motor 5 is reversible, the tractor treads may be driven to propel the machine in either direction.

The fluid operated jacks for holding the machine in a stationary position between the mine roof and floor during operation of the winch comprises bottom frames 115 of inverted generally U-shape extending across the top runs of the tractor treads and suitably rigidly secured to the sides of the tread frames 3 (see Fig. 14). Pivotally mounted at 116 on horizontal pivots at the tops of these frames and arranged at opposite sides of the machine are fluid cylinders 117 arranged to swing in longitudinal planes and

containing reciprocable pistons 118. Annular plates 119 secured to the upper ends of the piston rods 120 have lateral ears engaged by the upper ends of coil springs 121, and these springs are connected at their lower ends to a pin 122 providing the pivot 116. These springs constantly urge the pistons toward their lowermost retracted position. The piston rods have axial sockets 123 for receiving sections of jack pipe, not shown. When the jack pipes are placed against the mine roof and fluid under pressure is supplied to the lower ends of the cylinder 117, the pistons are moved upwardly to force the jack pipes firmly against the roof, thereby holding the treads down against the floor; it being understood that the tractor treads are, at that time, held against movement by the brakes 103, 104. The frames 115 have spaced stop lugs 124, 124 at the opposite sides of the pivots 116, and the lower heads of the cylinders are engageable with these lugs to limit swinging movement of the jacks. When fluid is vented from the cylinders, the springs retract the pistons to release the jacks.

The tread frames 3 have individual limited adjustment longitudinally relative to the main frame 2 for adjusting the tension of the drive chains 97. To accomplish such tread frame adjustment, the tread frames have longitudinally elongated transverse slots 118' which receive the projecting ends of square cross shafts 119' (Figs. 8 and 14) fixed to brackets beneath the main frame. The square shafts have collars or abutments 120' with which the inner sides of the tread frames are engageable, and threaded on the outer ends of these cross shafts are tightening nuts 121' for rigidly securing the tread frames inwardly against the collars. Arranged longitudinally along the outer sides of the main frame are adjusting screws 122' (Fig. 2) rotatably mounted in luglike projections 123' extending from the side of the main frame, and these screws are threaded at 124' within the bottom frames 115 of the roof jacks (see also Fig. 14), which are rigidly secured to the tread frames. When the nuts 121' at the outer ends of the cross shafts are loosened, the screws 122' may be adjusted to slide the tread frames 3 bodily longitudinally on the square cross shafts relative to the main frame, thereby to tighten the drive chains 97. When properly adjusted, the tread frames may be tightly clamped against the shaft collars 120' by the nuts 121'. Rectangular plates *p* on the cross shafts close the outer sides of the slots 118' and are held in position by the nuts 121'. This adjustable mounting means for the tractor treads is being claimed in a co-pending application Serial No. 202,996, filed December 27, 1950, which is a division of this application.

An electric cable reel 125 is adapted to supply electric current to the machine motor 5, and this reel has wound thereon an electric conductor cable 126 adapted for attachment to a trolley line or other power source in the main entry in a known manner. The reel is driven in cable winding direction by a conventional fluid motor 127 mounted on the main frame and having its power shaft connected through a chain and sprocket connection 128 to the cable reel. When fluid under pressure is supplied to the motor 127, the reel is rotated in cable winding direction; and when the cable reel is rotated as the cable is pulled off from the reel, the motor runs backwards and acts as a pump at a reduced back pressure to maintain the cable under suitable tension. Thus, when the tractor treads are

driven by the motor 5 to propel the machine in a forward direction, the conductor cable is unwound from the cable reel; and when the motor 5 is reversed to effect drive of the tractor treads to propel the machine in the reverse direction, the conductor cable is wound in by the reel. Also located at the operator's station S is an electric control apparatus 129 provided with conveniently located handles.

Now referring to the improved fluid system of the machine as shown diagrammatically in Figs. 11 and 16, it will be noted that fixed to the rear end of the motor power shaft is a triple pulley 130 (see also Figs. 1 and 9) connected by endless belts 131 to a triple pulley 132 secured to the drive shaft 133 of a conventional gear pump 134. A conventional control valve mechanism 135 on the main frame includes a valve box 136 having its pressure passage connected by a conduit 137 to the discharge side of the pump and its discharge passage connected by a conduit 138 to a fluid tank 139 which contains a hydraulic fluid, preferably a light oil. The suction side of the pump is connected by a conduit 140 to the tank. Since the machine motor 5 which drives the pump is reversible, it is necessary to provide an improved automatic pump reverse whereby fluid under pressure may be supplied to the pressure conduit 137 irrespective of the direction in which the pump is driven. To accomplish this, the conduit 137 leads to a central connection 141 on the casing of suitable valve mechanism, herein for illustrative purposes a conventional shuttle valve device 142. The valve casing has a valve chamber 143 in which a fluid actuated shuttle valve 144 is reciprocably mounted (see Fig. 12). Instead of the single shuttle valve, separate, oppositely seating check valves may be employed. Threaded within the casing at the opposite ends of the chamber 143 are members 145 having axial passages 146 and provided with seats surrounding the inner ends of the passages and with which the ends of the shuttle valve 144 are alternately engageable, depending upon the direction of fluid flow. The suction conduit 140 has branches 148 and 149 connected through conventional check valves 150 and 151 to conduits 152 and 153 connected to the passages 146 at the opposite ends of the casing of the shuttle valve casing. Conduits 154 and 155 lead from the opposite sides of the pump to the check valves 150 and 151; and the latter automatically prevent reverse fluid flow from conduits 154 and 155 to the suction conduits 148 and 149. When the pump 134 is running in one direction, as indicated by the arrows in Fig. 16, the conduit 154 acts as the suction conduit and the conduit 155 acts as the pressure conduit, and the check valve 151 closes so that fluid under pressure may flow from conduit 155 through the branch conduit 153 to the left hand end of the valve casing (Fig. 12), and the fluid then acts on the left hand end of the shuttle valve 144 to throw the latter to its right hand seated position, as viewed in Fig. 12. Fluid under pressure may then flow past the shuttle valve to the pressure conduit 137. When the pump is reversed, the conduit 155 acts as the suction conduit and the conduit 154 acts as the pressure conduit, and the check valve 150 closes so that pressure may flow from conduit 154 through the branch conduit 152 to the right hand end of the casing of the shuttle valve, and the fluid acts on the right hand end of the shuttle valve to throw the latter to its left hand seated position, as viewed in Fig. 12. Fluid under pressure may then flow past the shuttle valve to

the pressure conduit 137. Thus fluid under pressure in the pressure passage of the valve box is maintained irrespective of the direction in which the pump is driven. The valve box has three bores containing conventional slide valves 156, 157 and 158, respectively having suitable operating handles 156', 157' and 158' located near the handles 20 and 77. The valve 156 controls the frictional control devices 38, 41 and 59, 60 for the two-speed drum drive in the manner explained in the above mentioned application; the valve 157 controls the jacks; and the valve 158 controls the reel motor 127. Leading from the valve box bore receiving the valve 156 is a conduit 159 having branches 160 and 161, the former connected to the fluid cylinder 49 and the latter connected through a conventional hand valve 162 to a conduit 163 connected through a fluid-tight swivel connection 164 to the fluid cylinder 65. When the valve 156 is positioned to supply fluid under pressure to the conduit 159 and through branch conduits 160 and 161 to the cylinders 49 and 65, the clutch member 59 is released while the brake 41 is applied, thereby to effect drum drive in cable winding direction through the planetary reduction gearing at relatively low speed to apply a powerful loosening or dislodging force to a post or prop to be pulled. When the valve 156 is positioned to connect conduit 159 to the discharge conduit 138, the springs 52 effect release of the brake 41 while the springs 63 effect connection of the clutch member 59, thereby to drive the drum directly from the shaft 24 at a relatively high speed to move the loosened or dislodged post or prop relatively rapidly from beneath the falling roof. When it is desired to drive the capstan 23 independently of the drum for auxiliary hoisting purposes, fluid may be supplied to the fluid cylinders 49 and 65 and then the hand valve 162 may be closed to trap the fluid in the cylinder 65 with the clutch member 59 disconnected. The valve 156 may then be positioned to connect the conduits 160 and 159 to the discharge line 138 so that the springs 52 release the brake 41. The drum drive shaft 24 to which the capstan 23 is fixed may then revolve freely relative to the cable drum while the latter is maintained stationary by the brake band 66. When desired, the clutch member 14 may be released to disconnect the sprocket 15 from the drive shaft 12 so that the cable drum 25 may freely rotate, thereby to permit unwinding of the cable from the drum by hand. The valve box bore receiving the valve 157 is connected by a conduit 165 and branch conduits 166 and 167 to the lower ends of the jack cylinders 117. These branch conduits 166 and 167 have conventional hand valves 168 and 169 which may be closed to trap fluid in the jack cylinders to hold the jacks in position, and these hand valves may be opened to bleed fluid from the jack cylinders when the valve 157 is positioned to connect the conduit 165 to the discharge conduit 138. The valve box bore receiving the valve 158 is connected by a conduit 170 to the reel motor 127, and the reel motor discharge is connected by a conduit 171 to the discharge conduit 138. Automatic control valve devices 172 are connected between the reel motor conduits 170 and 171 for automatically maintaining a reduced back pressure on the reel motor when the latter is driven backwards and acts as a pump, to maintain the power conductor cable 126 on the cable reel 125 under suitable tension when the cable is pulled off from the reel. Since these automatic control devices do

not enter into the present invention, description thereof herein is unnecessary.

The general mode of use of the improved post puller will be clearly apparent from the description given. The machine may be propelled about the mine and maneuvered into position by the tractor treads 4, 4 driven by the reversible motor 5 through the differential gearing under the control of the brakes 103, 104. By suitably controlling these brakes, the tractor treads may be driven at relatively different speeds through the differential gearing to effect steering of the machine in a known manner. As the machine moves into a mine chamber which has no trolley line or other source of electricity, the conductor cable 126 may be suitably attached to the trolley line or other power source in the main entry, and as the machine moves forwardly under the propulsion of the tractor treads, the conductor cable is pulled off from the reel and, at that time, the reel motor 127 runs backwards and acts as a pump under a reduced back pressure as automatically regulated by the automatic valve devices 172 to maintain the conductor cable under the desired tension. When the machine is properly positioned, the clutch member 71 of the tractor tread drive is disconnected and the tread brakes 103, 104 are set to hold the tractor treads against movement relative to the tread frames. Jack pipes are then inserted in the sockets 123 in the piston rods of the jack pistons, and fluid is then admitted to the jack cylinders 117 to move the jack pistons outwardly to bring the jack pipes into firm engagement with the roof to hold the machine rigidly in position between the mine floor and roof, and the jacks may be firmly locked in position by closing the hand valves 168 and 169. The cable on the winding drum 25 may then be extended to a post or prop to be pulled, and when properly attached to the post, the clutch member 14 of the winch drive may be connected and fluid may be vented from the cylinder 65 to effect application of the high-speed clutch 59, 60 to drive the winding drum 25 in cable winding direction at a relatively low speed to apply a powerful pulling force to the post or loosen or dislodge the latter. Immediately upon loosening of the post, the high-speed clutch 59, 60 may be released by fluid pressure in the cylinder 64 and fluid under pressure may be admitted to the cylinder 49 to effect application of the brake 38, 41 thereby to drive the winding drum at a relatively fast speed in cable winding direction to pull the dislodged post rapidly from beneath the falling roof. The jacks may then be released by venting fluid from the cylinders 117 under the control of the hand valves 168 and 169 and the slide valve 157 and the clutch member 14 may then be disconnected and the clutch member 71 connected, and upon reversal of the motor 5, the machine may be propelled by the tractor treads rearwardly toward the main entry. The automatic pump reverse including the automatic shuttle valve device 142 maintains fluid under pressure in the pressure passage of the valve box 136 during reverse running of the motor 5 so that the reel motor 127 may be operated to rotate the cable reel 125 in a direction to wind in the conductor cable 126 as the machine moves rearwardly toward the main entry. When the frictional controls 38, 41 and 59, 60 for the two-speed drum drive are both released under the control of the valves 156 and 162, the capstan 23 may be driven independently of the cable winding drum 25 for auxiliary hoisting purposes;

and when the clutch member 14 is disconnected, the cable may be pulled freely off from the winding drum 25 by hand.

As a result of this invention, an improved winch is provided, having a two-speed drive for the cable winding drum and improved control means whereby the drive may be easily and quickly shifted from one speed to the other. It will further be evident that an improved post puller is provided, having improved propelling and steering means and improved jack means associated therewith for firmly holding the machine in a stationary position during operation of the winch. By the provision of the automatic pump reverse, fluid under pressure in the pressure passage of the valve mechanism is maintained irrespective of the direction of operation of the pump, thereby enabling drive of the pump directly from the reversible machine motor. It will further be noted that the improved post puller is extremely rugged and compact and has exceptional maneuverability as a result of the tractor tread mounting. The tread frame adjusting means provides a simple and effective adjustment for the tread drive chains. Other manners of use and advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What we claim as new and desire to secure by Letters Patent is:

1. In a mobile winch, a tractor base comprising a base frame having endless tractor treads for supporting and propelling the same and side frames on which said treads are guided, motor operated tread driving means, means for adjustably mounting said side frames on said base frame for movement in longitudinal vertical planes relative to said base frame, brake devices for locking said treads against movement relative to said side frames when disconnected from said driving means, and roof jack devices mounted on and movable relative to said base frame with said side frames respectively and engaging the mine roof for securing said tractor base in a stationary position between the mine floor and roof.

2. In a mobile winch, a main frame, endless tractor tread devices for supporting and propelling said main frame including side tread frames arranged at the opposite sides of said main frame and endless tractor treads guided for circulation on said tread frames, means for adjustably mounting said side tread frames on said main frame for movement in longitudinal vertical planes relative to said main frame, and extensible roof jack devices having bottom frames secured to and supported by said tread frames respectively, said bottom frames of said jack devices movable relative to said main frame with said side tread frames.

3. In a mobile winch adapted to exert a pull on a cable, a main frame, endless tractor tread devices for supporting and propelling said main frame including tread frames arranged at the opposite sides of said main frame and endless tractor treads guided for circulation in orbital paths on said tread frames, and extensible roof jack devices inclined in longitudinal planes with

respect to the vertical and in a direction opposed to the direction of pull exerted on the cable for securing the winch in a stationary position between the mine roof and floor, said jack devices having bottom frames secured to and supported by said tread frames respectively and fluid cylinders carried by said bottom frames and containing reciprocable pistons having sockets adapted to receive sections of jack pipes.

4. In a mobile winch, a main frame, endless tractor tread devices for supporting and propelling said main frame including tread frames arranged at the opposite sides of said main frame and endless tractor treads guided for circulation on said tread frames, and extensible roof jack devices having bottom frames secured to said tread frames and fluid cylinders pivotally mounted on said bottom frames to swing in planes extending longitudinally of said main frame and containing reciprocable pistons having sockets adapted to receive sections of jack pipes.

5. In a mobile winch, a main frame, endless tractor tread devices for supporting and propelling said frame including tread frames arranged at the opposite side of said main frame and endless tractor treads guided for circulation on said tread frames, and extensible roof jack devices having bottom frames of inverted generally U-shape extending above the top runs of said tractor treads and having the legs of the U secured to the opposite sides of said tread frames.

6. In a mobile winch, a tractor base having endless tractor treads for supporting, propelling and steering the same, a cable winding drum mechanism arranged on said base on a transverse axis, a motor on said base, a transverse shaft having its axis arranged parallel to the axis of said drum mechanism between said drum mechanism and said motor, driving connections between said shaft and said drum mechanism, and driving connections between said shaft and said tractor treads including a transverse shaft parallel with said first transverse shaft and spaced longitudinally of said base from said drum mechanism and said first shaft, said motor located on the base in the space between said parallel transverse shafts, and said first shaft located nearer to said drum mechanism than said second shaft.

7. In a mobile winch, a tractor base having endless tractor treads for supporting, propelling and steering the same, a cable winding drum mechanism arranged on said base on a transverse axis, a motor on said base, a transverse shaft having its axis arranged parallel to the axis of said drum mechanism between said drum mechanism and said motor, driving connections between said shaft and said drum mechanism, and driving connections between said shaft and said tractor treads including aligned shafts arranged with their axes parallel to the axis of said drum mechanism at the side of said motor remote from said drum mechanism and differential gearing between said aligned shafts.

8. In a mobile winch, a tractor base having a pair of endless tractor treads for supporting, propelling and steering the same, a cable winding drum mechanism on said base, a motor on said base, a drive shaft operatively connected to said motor and arranged on said base between said drum mechanism and said motor, clutch controlled connections between one end of said shaft and said drum mechanism, and clutch controlled connections between the other end of said shaft and both of said tractor treads including a drive shaft spaced longitudinally of said base from

said drum mechanism and said first shaft, said motor located on said base in the space between said drive shafts, and said first shaft located nearer to said drum mechanism than said second shaft.

9. In a mobile winch, a tractor base having endless tractor treads for supporting, propelling and steering the same, a cable winding drum mechanism on said base, a motor on said base, a drive shaft operatively connected to said motor and arranged on said base between said drum mechanism and said motor, clutch controlled connections between one end of said shaft and said drum mechanism, and clutch controlled connections between the other end of said shaft and said tractor treads including aligned shafts arranged at the side of said motor remote from said drum mechanism, one shaft operatively connected to each tractor tread and a differential gearing between said aligned shafts.

10. In a mobile winch, a tractor base having endless tractor treads for supporting, propelling and steering the same, cable winding drum mechanism on said base near one end thereof, a differential gearing arranged near the opposite end of said base, aligned shafts operatively connecting elements of said differential gearing to said tractor treads respectively, a motor on said base between said drum mechanism and said differential gearing, a transverse shaft on said base between said motor and said drum mechanism and operatively connected to said motor, clutch controlled connections between said transverse shaft and said drum mechanism, and clutch controlled connections between said transverse shaft and said differential gearing.

11. In a mobile winch, a tractor base having endless tractor treads for supporting, propelling and steering the same, cable winding drum mechanism on said base near one end thereof, a differential gearing arranged near the opposite end of said base, aligned shafts operatively connecting elements of said differential gearing to said tractor treads respectively, a motor on said base between said drum mechanism and said differential gearing, a transverse shaft on said base between said motor and said drum mechanism and operatively connected to said motor, clutch controlled connections between said transverse shaft and said drum mechanism, clutch controlled connections between said transverse shaft and said differential gearing, and brake devices connected to said aligned shafts respectively for controlling the relative speeds of said tractor treads.

12. In a mobile winch adapted to exert a pull on a cable, a tractor base having endless tractor treads for supporting and propelling the same and side frames on which said treads are guided for circulation in orbital paths, motor operated tread driving means, brake devices for locking said treads against circulatory movement relative to said base when disconnected from said driving means, and roof jack devices mounted on said tread frames respectively and secured to the latter within the orbits of said treads and including jack elements inclined in longitudinal planes with respect to the vertical in opposition to the direction of pull on the cable by the winch for securing said tractor base in a stationary position between the mine roof and floor.

13. In a mobile winch adapted to exert a pull on a cable, a main frame, endless tractor tread devices for supporting and propelling said main frame including tread frames arranged at the

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opposite sides of said main frame and endless tractor treads guided for circulation in orbital paths on said tread frames, and extensible roof jack devices having bottom frames secured to said tread frames respectively within the orbits of said treads and including cooperating jack elements inclined in longitudinal planes with respect to the vertical in a direction opposite to the direction of pull exerted on the cable of the winch, said jack devices acting during operation of the winch firmly to secure said main frame in a stationary position between the mine roof and floor.

14. In a mobile winch adapted to exert a pull on a cable, a main frame, endless tractor tread devices for supporting and propelling said main frame including tread frames arranged at the opposite sides of said main frame and endless tractor treads guided for circulation in orbital paths on said tread frames, and extensible roof jack devices disposable in positions inclined with respect to the vertical in a direction opposed to the direction of pull exerted on the cable for securing the winch in a stationary position, said jack devices having bottom frames secured to and supported by said tread frames respectively, and extensible jack elements pivotally carried by said bottom frames respectively, and swingable into relatively inclined positions in planes extending longitudinally of said main frame, said jack elements engageable with the mine roof in either pivoted position thereof with respect to said bottom frames.

15. In a mobile winch, a main frame, endless tractor tread devices for supporting and propelling said frame including tread frames arranged at the opposite sides of said main frame and endless tractor treads guided for circulation on said tread frames, and extensible roof jack devices having bottom frames of inverted generally U-shape extending above the top runs of said tractor treads and having the legs of the U secured to the opposite sides of said tread frames, extensible jack elements pivotally mounted on the upper portions of said bottom frames to swing about transverse axes in planes extending longitudinally of the winch, and stop means on said bottom frames for limiting the swinging movement of said jack elements in either direction.

16. In a mobile winch, a mobile base having supporting and propelling means, a cable winding drum mechanism arranged transversely of said base near one end thereof, a motor mounted on said base and having its power shaft horizontally disposed and extending longitudinally of said base, clutch controlled driving connections between the adjacent end of said motor and said drum mechanism and including a transverse shaft journaled on said base intermediate said drum mechanism and said motor, and clutch controlled driving connections between said shaft and said supporting and propelling means including a transverse shaft arranged transversely of said base at the end of said motor remote from said drum mechanism, said motor located on said base longitudinally in the space between said parallel transverse shafts, and a cooperating driving connection extending longitudinally of said base along one side of said motor in longitudinal vertical planes parallel with the motor shaft.

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17. In a mobile winch, a mobile base having supporting and propelling means, a cable winding drum mechanism arranged transversely of said base near one end thereof, a motor mounted on said base and having its power shaft horizontally disposed and extending longitudinally of said base, clutch controlled driving connections between the adjacent end of said motor and said drum mechanism and including a transverse shaft journaled on said base intermediate said drum mechanism and said motor, and clutch controlled driving connections between said shaft and said supporting and propelling means including a connection extending longitudinally of said base along one side of said motor, aligned relatively rotatable shafts driven by said latter connection and arranged transversely of said base at the end of said motor remote from said drum mechanism, differential gearing connecting said shafts, and separate driving connections between said aligned shafts and said supporting and propelling devices respectively.

18. In a mobile winch, a mobile base having supporting and propelling means, a cable winding drum mechanism arranged transversely of said base near one end thereof, a motor mounted on said base and having its power shaft horizontally disposed and extending longitudinally of said base, clutch controlled driving connections between the adjacent end of said motor and said drum mechanism and including a transverse shaft journaled on said base intermediate said drum mechanism and said motor, and clutch controlled driving connections between said shaft and said supporting and propelling means including a connection extending longitudinally of said base along one side of said motor, a transverse shaft driven by said latter connection and arranged transversely of said base at the end of said motor remote from said drum mechanism, said first mentioned transverse shaft having its axis lying in a horizontal plane disposed above a horizontal plane including the motor axis and said second mentioned transverse shaft lying in a horizontal plane below said horizontal plane including said motor axis.

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