June 18, 1940. W. B. WOODY 2,204,716

PORTABLE DERRICK MAST

Filed March 5, 1938 3 Sheets-Sheet 1

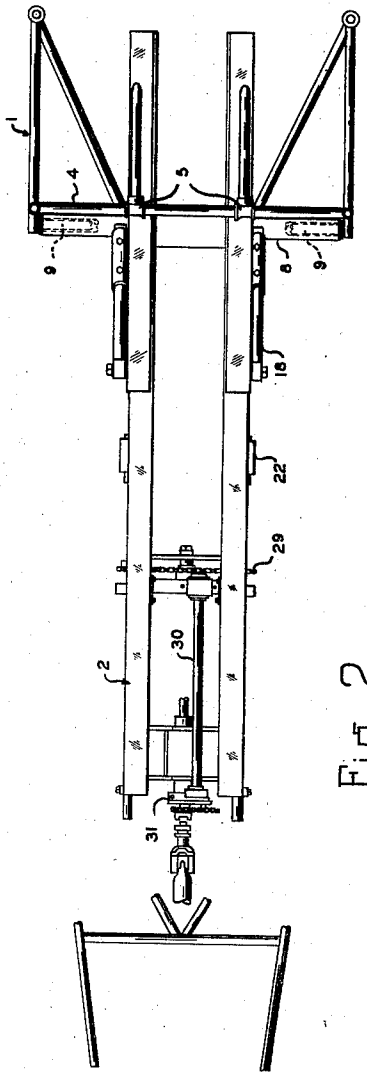


Fig 2

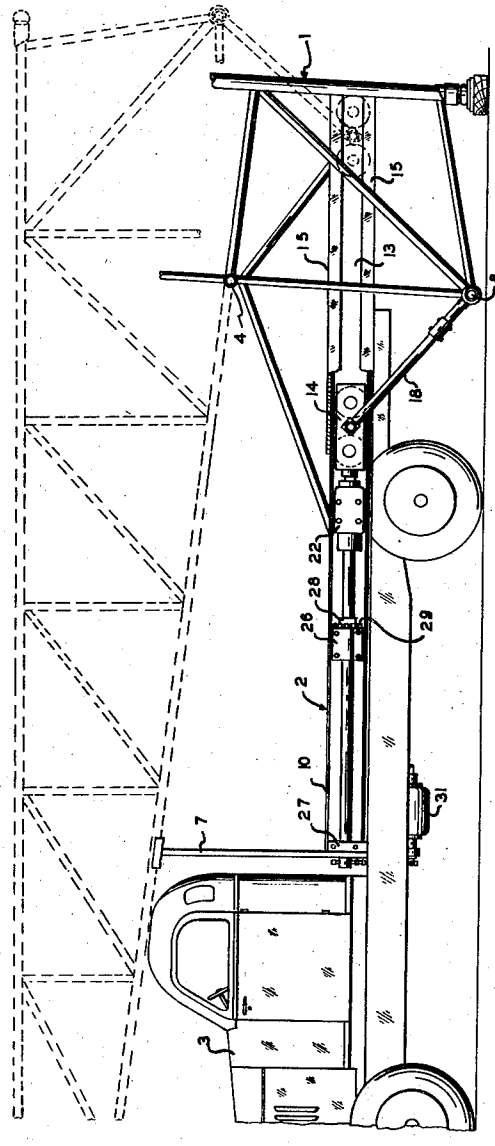


Fig 1

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PORTABLE DERRICK MAST

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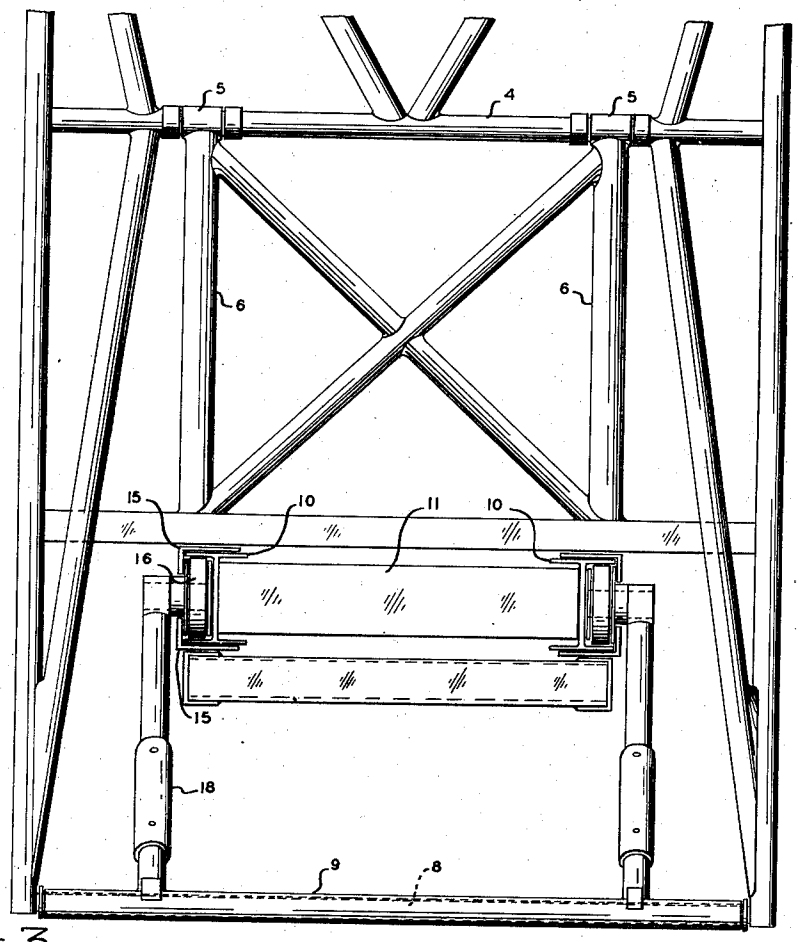


Fig 3.

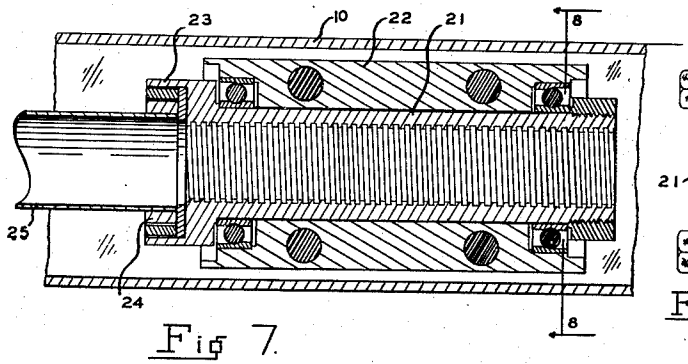


Fig 7.

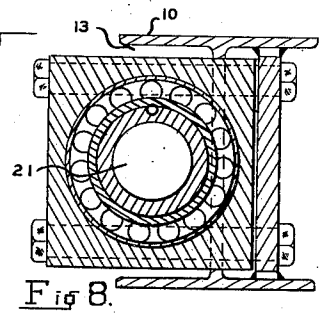


Fig 8.

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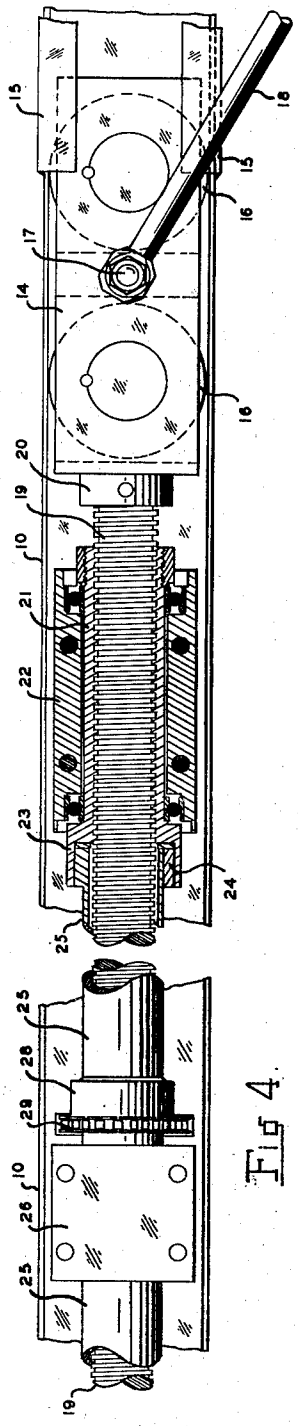


Fig 4.

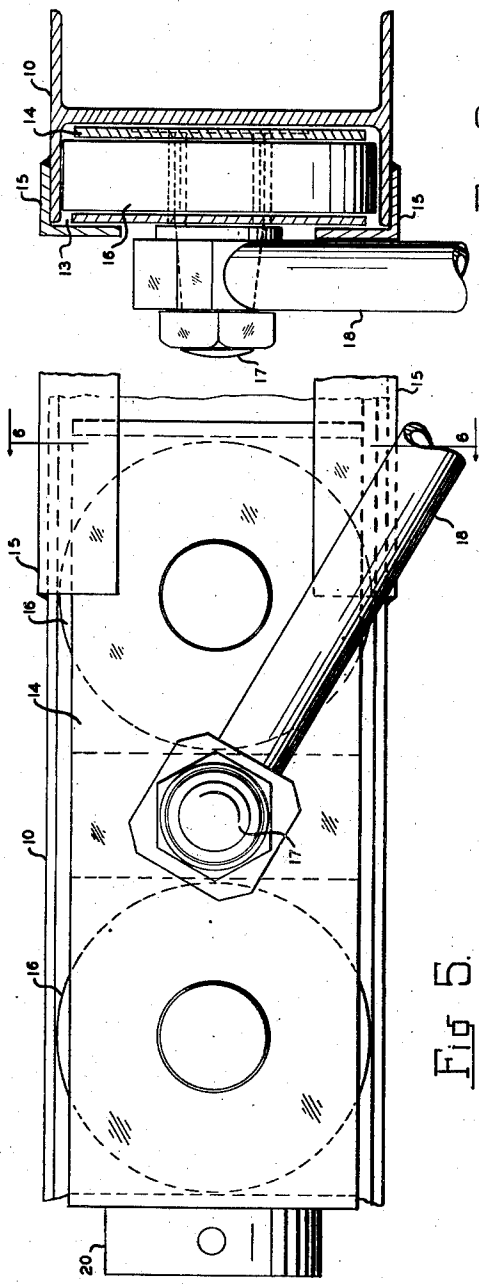


Fig 5.

Fig 6.

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UNITED STATES PATENT OFFICE

2,204,716

PORTABLE DERRICK MAST

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Application March 5, 1938, Serial No. 194,155

3 Claims. (Cl. 189—11)

This invention relates to drilling apparatus and particularly to improvements in means for raising and lowering a derrick mast of a portable drilling apparatus designed particularly for use in oil well drilling.

An object of this invention is to provide improved means for raising and lowering the derrick mast of a portable type drill.

Another object is to provide improved means for raising and lowering the derrick mast of a portable drill mounted on an automobile.

These and other objects will become apparent from the following detailed description when read in conjunction with the accompanying drawings which illustrate one form of apparatus in accordance with this invention.

In the drawings:

Fig. 1 is a side elevation showing an automobile truck having mounted thereon a derrick mast and apparatus in accordance with this invention for raising and lowering the mast between drilling position, shown in solid lines, and transport position, shown in dotted lines.

Fig. 2 is a plan view of the principal portions of the structure shown in Fig. 1.

Fig. 3 is a rear end elevation of the mast structure and the raising means therefor.

Fig. 4 is an enlarged side view of some of the details of the mast raising apparatus, some of the parts being broken away for purposes of illustration.

Fig. 5 is a detail of a cross-head element forming a part of the mast raising mechanism.

Fig. 6 is a sectional elevation taken along line 6—6 of Fig. 5.

Fig. 7 is a lonigtudinal section of a detail of the mast raising apparatus, and

Fig. 8 is a transverse sectional view taken along line 8—8 of Fig. 7.

Referring to the drawings, a derrick mast 1 is shown mounted on a frame, designated generally by the numeral 2. Mast 1 and frame 2 are in turn mounted on a transporting vehicle, such as an automobile truck 3.

The derrick mast 1, preferably, is of fabricated tubular construction built up of tubes welded together in the desired form and rigidly braced. A rigid horizontal cylindrical bar 4, secured at its ends to the side frames of the mast, extends transversely across the mast at a level above that of frame 2 and is mounted in a pair of sleeve bearings 5—5 secured to the upper ends of respective upright members 6—6 rigidly mounted on one of the cross members of frame 2. Bar 4 in its bearings forms a horizontal pivotal support for the mast whereby the latter may be swung in a vertical direction in transport or drilling position. An upright support member 7 located near the forward end of frame 2 serves to support the upper portion of the mast when in transport position.

A second rigid horizontal cylindrical bar 8 extends transversely across the lower extremity of the mast, and is secured to the side frames thereof. When the mast is in upright position, bar 8 will be below the level of frame 2. A tubular sleeve 9 encloses bar 8 and serves as a rotative connection to the mast hoisting mechanism to be later described.

Frame 2 is constructed of H-beams side members 10 connected together by cross members, such as beams 11, as shown in Fig. 3 particularly.

The outer flanges of H-beams 10 enclose a channel 13 in which is mounted a cross-head 14 which is adapted to be moved longitudinally of channel 13 toward and away from the rear end of frame 2. Angles iron members 15—15 are attached to the flanges of the H-beams so as to practically enclose the rearward end portions of channel 13 and form guide rails for cross-head 14 to retain same in the channel. Cross-head 14 is preferably mounted on rollers 16—16 to reduce friction when the cross-head is reciprocated in channel 13.

A short shaft 17 is journalled in cross-head 14 and a rigid pitman 18 has one end connected to shaft 17 and the other to tubular sleeve 9. By this arrangement, movement of cross-head 14 toward the rear end of frame 2 to the position shown in dotted outline in Fig. 1 will act through pitman 18 to move the lower extremity of mast 1 outwardly and upwardly and cause the mast to swing toward its transport position about the horizontal pivot formed by bar 4 in bearings 5—5. Movement of the cross-head in the opposite direction will act through pitman 18 to pull the mast back to the vertical position.

Cross-head 14 is reciprocated in channel 13 by means of a power operated screw 19, which is mounted in channel 13 forwardly of frame 2. The rearward end of screw 19 is connected to the adjacent end of cross-head 14 by connection 20 which permits the cross-head, to be reciprocatingly moved in accordance with the longitudinal movements of the screw.

Screw 19 threadedly engages a nut member 21 which is fixed against longitudinal movement relative to screw 19 and frame 2 by mounting in a bearing box 22 fixedly attached to the web of

H-beam 10. The forward end of nut member 21 is provided with a hollow spline connection 23 which engages a complementary spline 24 mounted on the rearward end of a hollow shaft 25, the bore of which is in registration with screw 19. Shaft 25 is mounted longitudinally in channel 13 forwardly of bearing box 22 and is journalled in bearings 26 and 27 attached to H-beam 10. A sprocket 28 is rigidly mounted on shaft 25 and connected by a drive chain 29 to a drive shaft 30 which is in turn driven from the transmission 31 of the truck.

By this arrangement of drive mechanism, hollow shaft 25 if rotatively driven from the power transmission of the truck and by means of the cooperating splined connection turns nut member 21, which, by its threaded engagement with screw 19 reciprocates cross-head 14 in a direction depending upon the direction of rotation of hollow shaft 25.

When cross-head 14 is moved forwardly of the frame to bring mast 1 into operating position, screw 19 will telescope in hollow shaft 25 and thus will be protected from the sand and mud usually present during drilling operations.

The manner of mounting the mast elevating mechanism in the frame channels will also protect the mechanism from the hazards of road shock when the apparatus is being moved and from injury by objects falling from the mast or other drilling equipment.

By pivotally connecting pitman 18 to the lower extremity of mast 1 and by driving the cross-head 14 in the manner described, maximum leverage may be applied to the lower end of the mast and the mast easily swung between its operating and transport positions.

By arranging the mast swinging mechanism in channel 13, all of the moving parts except the pitman will be protected from conflict with the other parts of the drilling mechanism, not shown, but conventionally mounted on frame 2, and will provide advantages in space saving and compactness which is highly important in the unitized forms of drilling rigs, which are ordinarily mounted on transporting vehicles.

While only one side of the mast elevating mechanism has been described above, it will be apparent from the drawings that duplicate mechanisms are used, one being mounted on each side of the frame, to increase the safety factor and to more uniformly distribute the mast-swinging load.

It will be understood that various modifications and alterations may be made in the size, form and arrangement of the details of the device of this invention, all without departing from the scope of the appended claims.

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

1. In a portable derrick mast structure, a mobile base, a frame on said base including horizontally spaced parallel side members having longitudinal guide members extending outwardly therefrom, a derrick mast pivotally mounted on said frame adjacent its rearward end and movable relative thereto between transport and vertical operating positions, means for pivotally moving said derrick mast, said means comprising a cross head member slidably mounted in one of said guide members and constrained thereby to move longitudinally of said frame, a rigid crank member having one end journaled in said cross head member and the other end rotatively attached to the lower extremity of said derrick mast, and means mounted within said guide members for moving said cross head member longitudinally thereof.

2. In a portable derrick mast structure, a mobile base, a frame on said base including horizontally spaced parallel side members having longitudinal channels therein opening outwardly of said frame, a derrick mast pivotally mounted on said frame adjacent its rearward end, and movable relative thereto between transport and vertical operating positions, means for pivotally moving said derrick mast, said means comprising, a cross head member slidably mounted in one of said channels and constrained to move therein longitudinally of said frame, a rigid crank member having one end journalled in said cross head member and the other end rotatively attached to the lower extremity of said derrick mast, and means mounted within said channel for moving said cross head member longitudinally thereof.

3. In a portable derrick mast structure, a mobile base, a frame on said base including horizontally spaced parallel side members having longitudinal channels therein opening outwardly of said frame, a derrick mast pivotally mounted on said frame adjacent its rearward end, and movable relative thereto between transport and vertical operating positions about a horizontal axis positioned above said frame, the lower extremity of said derrick mast when same is in vertical operating position being below said frame, and power operated means for swinging said derrick mast about said axis, said means comprising, a cross head member slidably mounted in each of said channels and movable therein longitudinally of said frame, a pair of rigid crank members each having one end journalled in one of said cross head members and the other end rotatively attached to said lower extremity of said derrick mast, and power operated screw means mounted within each of said channels for moving said cross head members longitudinally thereof.

WAYLAND B. WOODY.