Dec. 30, 1941. C. R. ATHY 2,267,705

OIL FIELD APPARATUS

Filed Jan. 27, 1941 2 Sheets-Sheet 1

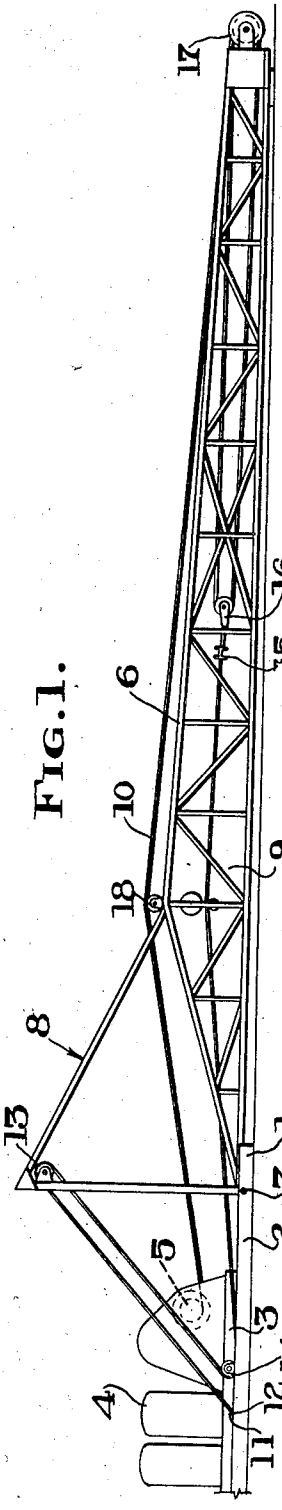


FIG. 1.

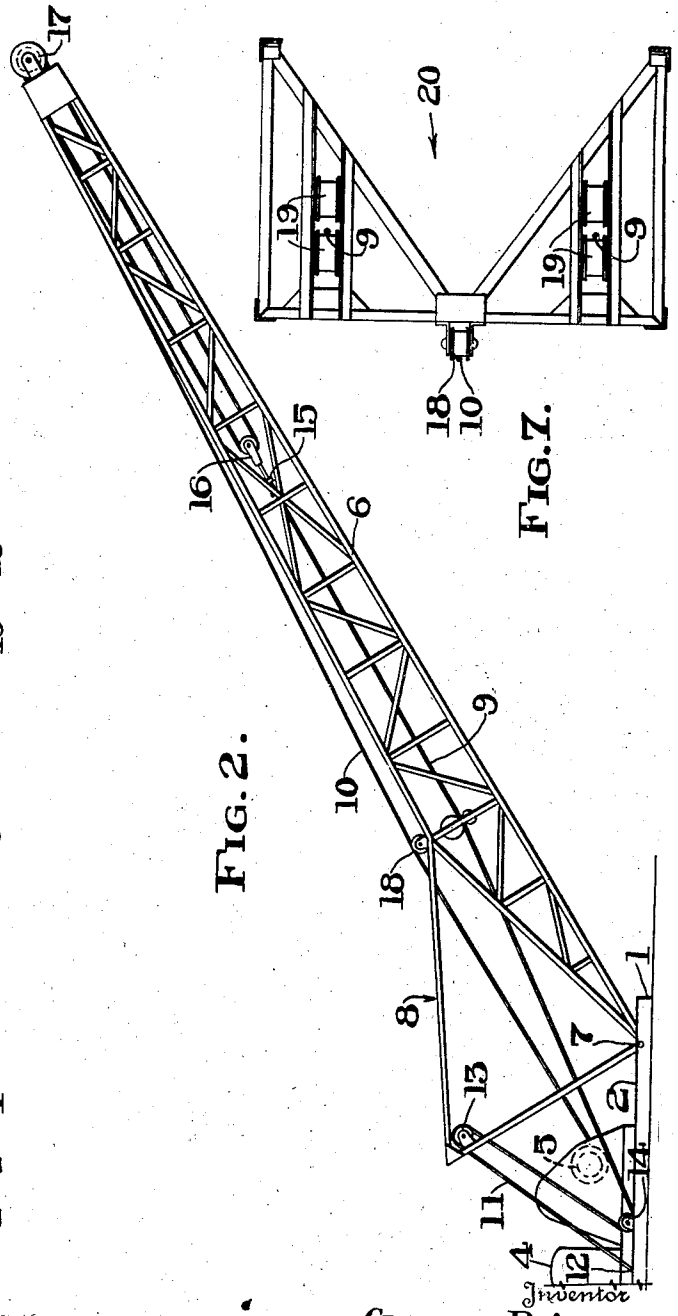


FIG. 2.

FIG. 7.

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Dec. 30, 1941. C. R. ATHY 2,267,705

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Filed Jan. 27, 1941 2 Sheets-Sheet 2

FIG. 3.

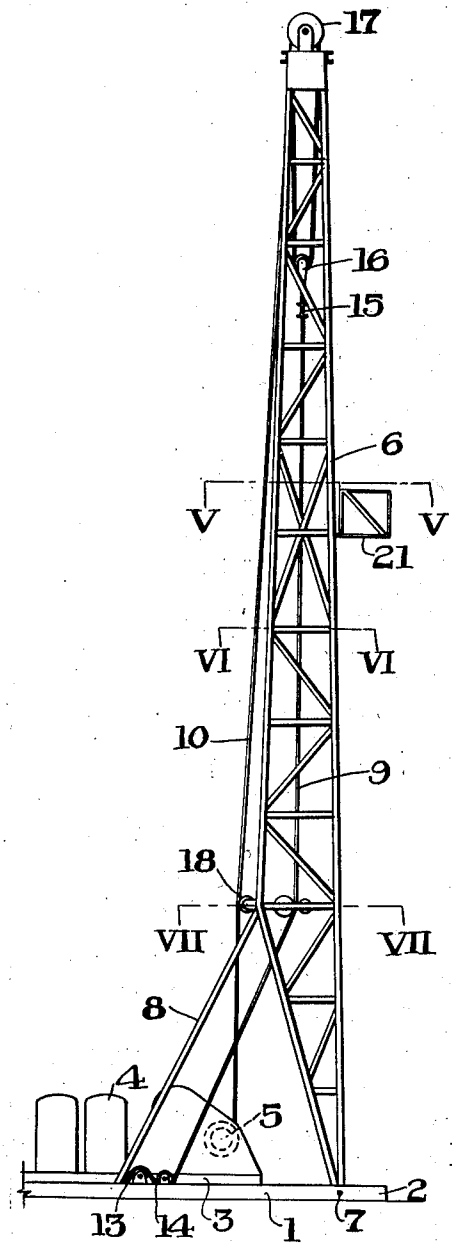


FIG. 4.

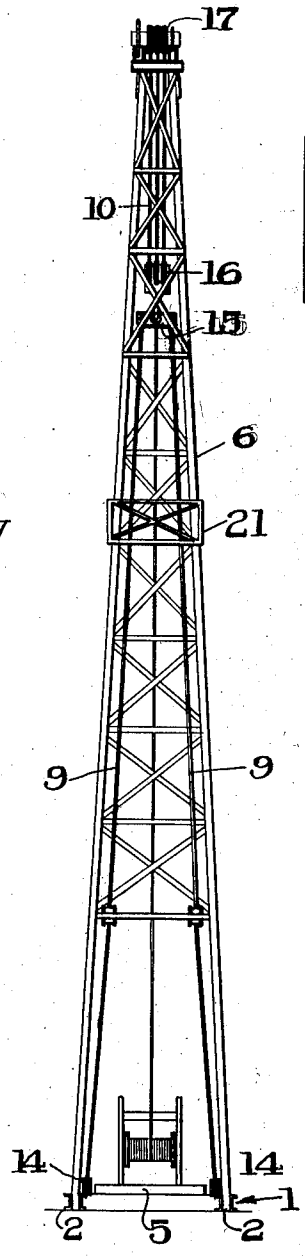


FIG. 5.

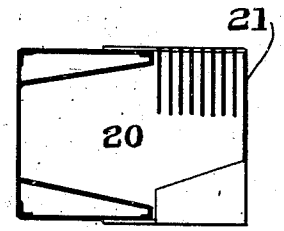
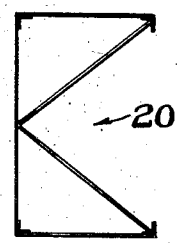


FIG. 6.



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OIL FIELD APPARATUS

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Application January 27, 1941, Serial No. 376,129

6 Claims. (Cl. 189—15)

This invention relates to oil well derricks of the fabricated structural steel type. More particularly, the derrick forming the present invention is of that type having a plurality of separable and transportable sections, the latter being adapted for assembly on the ground while in a horizontal position to form the complete rigid derrick assembly, cable and drum means being utilized to raise the assembled derrick from such a horizontal position to an upright vertical position adapted for well drilling, pipe setting, pumping and other related operations.

Derricks of this type possess the advantage of improved mobility, as well as time and labor savings in erection and removal. However, as now generally constructed, such derricks require the employment of an upright base frame or mast which is a separate and independent structural unit from the derrick proper, such base frames or masts being used as elevated supports for the reception of guide pulleys or sheaves and around which cables, joined with the derrick, are passed and united with rotary drums, so that upon the shortening of the cables, forces will be applied to the derrick for swinging the same from prone to upright positions or vice versa.

It is an object of the present invention to provide certain improvements in derricks of this category by simplifying their structure and the means for raising and lowering the same.

Another object resides in a derrick of the class set forth wherein it is structurally characterized by its single rigid design, so that all parts thereof may swing as a lever about a single pivot between prone and upright positions.

A further object is to provide a rigid derrick capable of being swung as a unit between prone and upright positions and wherein the raising and lowering mechanism is of such nature as to dispense with the employment of separate base frames, masts, or other independent cable guides.

A preferred embodiment of the invention is disclosed in the accompanying drawings, wherein:

Fig. 1 is a view in side elevation of a portable and sectional derrick formed in accordance with the present invention, the derrick being disclosed in its prone position.

Fig. 2 is a similar view disclosing the derrick in a partially elevated position.

Fig. 3 is a similar view with the derrick in its upright or operative position.

Fig. 4 is a front elevational view of the derrick when in its upright position.

Figs. 5, 6 and 7 are horizontal sectional views taken through the derrick on the planes indicated respectively by the lines V—V, VI—VI and VII—VII of Fig. 3.

Referring to the drawings, the numeral 1 designates a field portable base unit, which includes rigidly united base beams 2, carrying a horizontal platform 3, on which is mounted an engine or motor 4 and a rotary drum 5 suitably driven by the engine. A derrick 6 of the prefabricated, structural steel type, has its normally lower portion detachably and pivotally connected as at 7 to the base unit 1. The derrick may be of any suitable length or height, depending upon the particular uses to which it is to be placed. Generally, the derrick is composed of two or more sections, which are adapted to be detachably bolted together when the derrick is in a prone or horizontal position, as shown in Fig. 1, resting on the ground. Each of the sections is of such length, weight and general proportions that it may be mounted on a motor propelled or other vehicle and transported from place to place, this being also true of the base unit 1. The parts or sections of the derrick, following removal from the transporting vehicle or vehicles, may then be placed on the ground, as in Fig. 1, and bolted together in a convenient manner to constitute the assembled structure.

One of the characterizing features of the present derrick is its laterally enlarged substantially triangular bottom section 8. This section forms a structurally integral part of the lower portion of the derrick, so that in all stages of operation, the bottom section constitutes a unitary part of the derrick, does not separate therefrom and moves and functions as a unitary portion of the derrick.

The swinging movement of the derrick about the pivotal axis 7 between prone and upright positions is effected by two sets of cables. One set 9 of these cables is known as the "dead" line or constant length set, while the other set 10 is known as the "live" line or variable length set. The "dead" line cables have their ends 11 detachably anchored as at 12 to the frame elements of the base unit 1. From the anchors 12, the lines 9 extend angularly upwardly and pass around pulleys or guide sheaves 13 which are rotatably mounted on the derrick contiguous to the upper portion of the bottom section 8 when the latter is in its horizontal position. From the sheaves 13, the lines 9 extend downwardly and pass around guide pulleys or sheaves 14 mounted on the base unit 1, and from said sheaves or pulleys 14, the lines 9 extend forwardly and have their outer

ends passed around or connected with a pull-equalizing bar 15.

Connected with the central portion of the bar 15 at a point substantially midway between the lines 9 is a travelling pulley block 16 and connected with this block and trained around the pulleys carried thereby is the variable length or "live" line 10. The latter is also trained around the multiple pulleys of the fixed crown block 17 and is then trained longitudinally of the derrick, passing over a guide pulley 18, arranged at the apex of the triangular base 8 and is then joined with the drum 5.

With this arrangement of the hoisting lines, it will be seen that, following assembly of the derrick sections on the ground, the rotation of the drum 5 will shorten the effective length of the line or lines 10. This results in movement of the floating pulley block 16 in an outward direction toward the crown block 17, tensioning the "dead" or constant length lines 9. The pulley forces thus applied to the lines 9 result in rocking the derrick about its pivotal connection 7 with the base unit and the consequent raising of the derrick from a horizontal to a vertical position. As the traveling block 16 moves outwardly, the loop or loops formed by the "dead" lines 9 between the elements 12, 13 and 14 shortens and since the forces thereby established are directed downwardly and angularly from the sheaves 13, swinging movement of the derrick takes place. Depending upon line stresses and the weight of the derrick, it is preferable to use the cables 9 and 10 in multiple order so that safe loads may be carried or applied to each of the cables. The lines 9 pass around guide sheaves 19 carried by an intermediate portion of the frame, said sheaves serving to guide the lines in the various positions of movement of the derrick.

As shown in Fig. 7, the derrick may be provided with an open side 20, in order to enable sections of well-bore tubing to be conveniently grouped and handled. Also, the derrick may be equipped with the customary fourble-board platform 21, as shown in Figs. 3 and 5.

In view of the foregoing, it will be seen that my improved derrick apparatus possesses unusual structural simplicity and is devoid of the mechanical complexity usually found in portable sectional-type derricks. Essentially, my improved derrick apparatus comprises but two main parts, namely, the base unit 1 and the derrick proper, the raising and lowering cables being so disposed as to permit the derrick to be swung as a rigid unit between prone and upright positions; furthermore, the arrangement being such as to dispense with the use of separate elevated masts, frames or other kindred devices employed as cable guides.

What is claimed is:

1. In oil field apparatus, a unitary derrick composed of separably united prefabricated structural steel sections, the lower end of said derrick having diverging legs to form a widened base, a crown block carried by the upper end of said derrick, a traveling pulley block, a variable length cable trained about the sheave wheels of said traveling and crown blocks, a base unit, a rotary drum on said base unit to which said cable is attached at one end, a constant length cable joined at one end with said traveling block and at its other end portion with the base unit, whereby upon the shortening of the effective length of the variable cable, the forces applied to the derrick by said cables will cause the derrick to swing as a unit between prone and upright positions.

2. In oil field apparatus, a unitary derrick composed of separably united prefabricated structural steel units, the bottom of said derrick having sharply diverging legs to produce a widened base, a portable ground support for said derrick, a horizontal pivotal connection uniting the base of said derrick along one edge thereof with said support, a rotatable drum carried by said support, a variable length cable secured at one end to said drum, a crown block at the outer or upper end of the derrick, a traveling pulley block arranged within the confines of said derrick between the ends thereof, said variable length cable being trained about the sheave wheels of the crown and traveling blocks, a constant length cable joined at one end with said traveling block, a cable guide mounted on the widened base portion of said derrick contiguous to the highest portion of the derrick when the latter is in a prone position, and a cable guide carried by said portable support, said constant length cable being trained about said guides and anchored at one end to said base support.

3. Oil field apparatus comprising a derrick composed of separably united prefabricated structural steel sections, said sections when united forming a unitary structure, a portable base support, a pivotal connection uniting the bottom of the derrick along one edge thereof with said support, whereby the derrick may swing as a unit about a horizontal axis between prone and upright positions, a drum rotatably carried by said support, a variable length cable secured at one end to said drum, a sheave carrying crown block carried by the upper or outer end of said derrick, a sheave carrying traveling block disposed within the confines of said derrick intermediate of the ends thereof, said cable being trained about the sheaves of said crown and traveling blocks, and a constant length cable having its outer end joined with said traveling block and having its intermediate portions trained around guides carried by and movable with said derrick, the inner end portion of said constant length cable being secured to said support.

4. In oil field apparatus, a unitary derrick composed of separably united sections, the lower end of said derrick having diverging legs to form a widened base, a crown block carried by the upper end of said derrick, a traveling pulley block, a variable length cable trained about the sheave wheels of said traveling and crown blocks, a base unit, a rotary drum on said base unit to which said cable is attached at one end, a constant length cable joined at one end with said traveling block and anchored at the other end in fixed position relative to the ground, whereby upon the shortening of the effective length of the variable cable, the forces applied to the derrick by said cables will cause the derrick to swing as a unit between prone and upright positions.

5. In oil field apparatus, a unitary derrick composed of separably united units, the bottom of said derrick having sharply diverging legs to produce a widened base, a portable ground support for said derrick, a horizontal pivotal connection uniting the base of said derrick with said support, a rotatable drum carried by said support, a variable length cable secured at one end to said drum, a crown block at the outer or upper end of the derrick, a traveling pulley block arranged within the confines of said derrick between the ends thereof, said variable length ca-

ble being trained about the sheave wheels of the crown and traveling blocks, a constant length cable joined at one end with said traveling block, a cable guide mounted on the widened base portion of said derrick contiguous to the highest portion of the derrick when the latter is in a prone position, and a cable guide carried by said portable support, said constant length cable being trained about said guides and anchored at one end to said base support.

6. Oil field apparatus comprising a derrick composed of separably united sections, said sections when united forming a unitary structure, a portable base support, a pivotal connection uniting the bottom of the derrick with said support, whereby the derrick may swing as a unit about a horizontal axis between prone and upright positions, a drum rotatably carried by said support, a variable length cable secured at one end to said drum, a sheave carrying crown block carried by the upper or outer end of said derrick, a sheave carrying traveling block disposed within the confines of said derrick intermediate of the ends thereof, said cable being trained about the sheaves of said crown and traveling blocks, and a constant length cable having its outer end joined with said traveling block and having its intermediate portions trained around guides carried by and movable with said derrick, the inner end portion of said constant length cable being secured to said support.

CLIFFORD R. ATHY.