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C. L. HENRY

2,225,561

DERRICK

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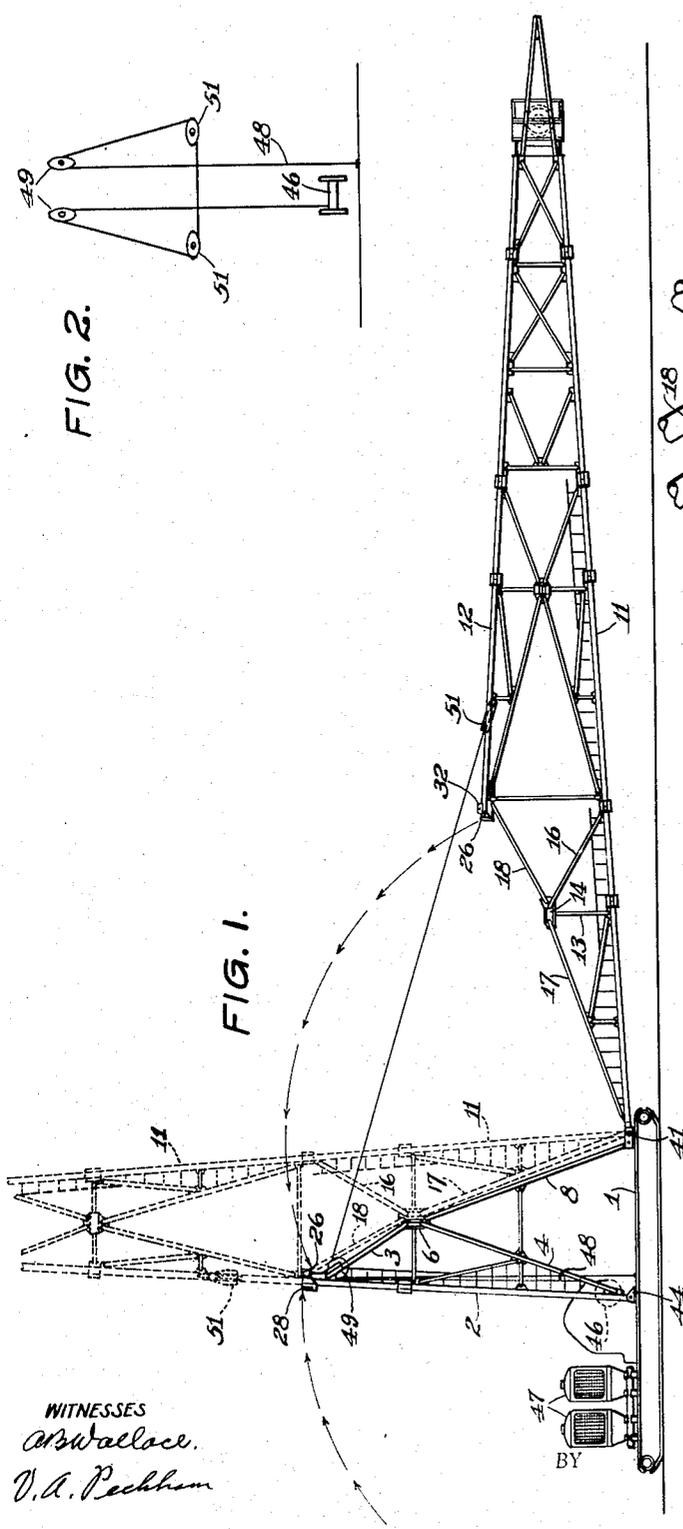


FIG. 1.

WITNESSES
C. Wallace.
V. A. Peckham

BY

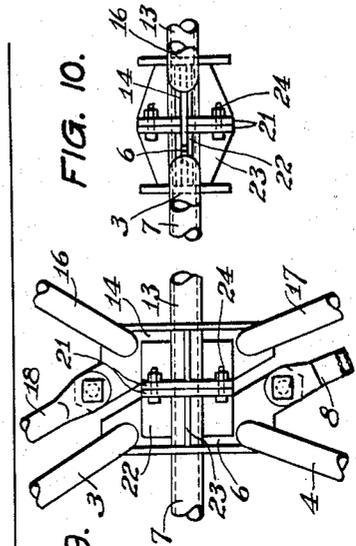


FIG. 9.

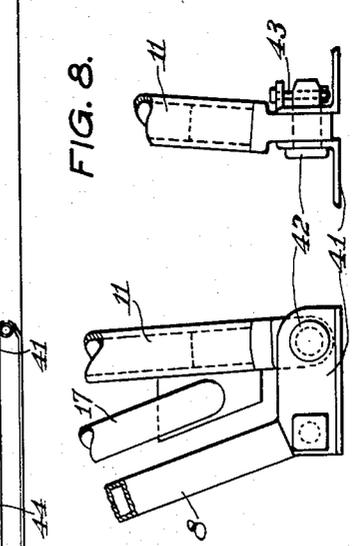


FIG. 8.

FIG. 7.

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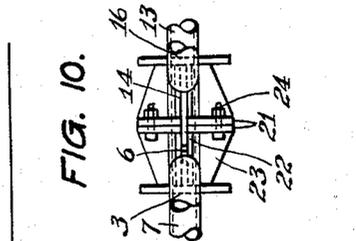


FIG. 10.

UNITED STATES PATENT OFFICE

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DERRICK

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a corporation of Pennsylvania

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2 Claims. (Cl. 189—15)

This invention relates to fabricated derricks used in connection with oil well drilling.

Derricks of this character are generally built up from the ground in operative position, but their erection, especially of the very tall ones, is fraught with difficulty and danger as the construction proceeds. This is chiefly because the derrick builders must work farther and farther from the ground. On the other hand, if the derrick is fabricated in prone position along the ground, it is difficult to raise it to upright position and it requires the erection of a special support or secondary mast for supporting the cables by which the main derrick is raised. Such a support is an additional expense and is in the way, unless removed, after the derrick has been set upright. Furthermore, due to overhead obstructions it is often impossible to transport well derricks bodily from one well to another, whereby dismantling and re-erection costs are incurred.

It is among the objects of this invention to provide an oil well derrick which can be easily and safely fabricated along the ground, which can be conveniently raised and lowered, which does not require a separate elevated support for the raising and lowering cable, and which is portable.

Another object is to provide a method of erecting an oil well derrick which permits it to be fabricated in prone position along the ground and then swung upwardly into upright position by a cable supported in elevated position by a portion of the derrick itself.

In accordance with this invention a derrick having any desired number of legs is formed of a plurality of independent sections, preferably two, which can be independently assembled on the ground and are detachably connected together when the derrick is in operative position. One of these sections is relatively short and includes part of the lower portion of the derrick, i. e., the lower portion of at least one but less than all of its legs. The other section consists of the remainder of the derrick with the complete remaining leg or legs. Preferably, both of these sections are first fabricated along the ground with what is later to become their lower ends hinged to a supporting member in such positions that when the two sections are stood upright they cooperate to form a complete derrick. To erect the derrick, the short section is first mounted in upright position which can be done without difficulty because of its relatively small size and weight. This section is then securely braced in position and a cable is strung

over pulleys mounted in its upper end and in the other section. The cable may be conveniently connected to a winding drum or the like by means of which it pulls the tall section of the derrick upwardly and swings its outer free end through a great arc until this section is in upright position against the shorter section. The two sections are then clamped together to form a unitary derrick which can be readily taken down by reversing the procedure just mentioned. By using a portable platform as the support for the derrick and hitching a truck to the tall section of the derrick when in its lowered or horizontal position, the entire structure can be moved from place to place without regard to possible overhead obstructions.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a side view of my oil well derrick structure with the major portion of the derrick readiness to be swung upwardly to upright position; Fig. 2 is a diagram of the cable arrangement for raising the derrick; Fig. 3 is a fragmentary enlarged side view of the derrick in upright operative position; Fig. 4 is a fragmentary side view of the derrick as seen from the left of Fig. 3; Fig. 5 is a still further enlarged side view of the means by which the legs of the derrick sections are clamped together; Fig. 6 is a plan view of the clamp; Fig. 7 is an enlarged side view of the hinge by which the leg of the taller derrick section is connected to its support; Fig. 8 is an end view of the hinge; Fig. 9 is an enlarged side view of the means by which the leg braces of the two derrick sections are clamped together; and Fig. 10 is a plan view of the latter clamp.

Referring to Fig. 3 of the drawings, the lower portion of a vertical oil well derrick is shown mounted on a platform support I so formed as to be slidable along the ground from one location to another if desired. The derrick is made in two independent fabricated sections detachably connected together. One of these sections is relatively short and, as a four legged derrick is illustrated, it includes the lower portions of two of the derrick legs and suitable bracing members connected thereto. As viewed in Fig. 3, this short section of the derrick is bounded by the lower portion 2 of a leg and diagonal bracing members 3 and 4. The adjacent ends of these bracing members are connected to a vertical plate 6 secured to one end of a horizontal girt 7. Also connected to plate 6 is the upper end of a bracing member 8 the lower end of which is con-

ected to supporting platform 1. The purpose of brace 8 is to brace the short section of the derrick in rigid upright position independently of the remainder of the derrick. Of course, the opposite side of the short section of the derrick is formed and braced in like manner.

The other or tall section of the derrick consists of the remaining portion thereof and includes two complete legs 11 which are mounted on the supporting platform, and the upper portions 12 of the other two legs. This section of the derrick is also provided with horizontal girts 13 in line with girts 7 of the short section, and with vertical end plates 14 to which diagonal bracing members 16 and 17 are similarly connected. To help support upper portions 12 of the divided legs on the incomplete side of the tall section, diagonal bracing members 18 are connected thereto and to plates 14.

The horizontal girts 7 and 13 of the two sections of the derrick are detachably connected together in order to form a unitary bracing system for the derrick. This is preferably done, as shown in Figs. 3, 9 and 10, by means of laterally projecting vertical plates 21 having flanges 22 welded or otherwise secured to the opposite sides of the vertical plates 6 and 14 above and below the girts. These laterally extending plates are reinforced by substantially horizontal ribs 23 welded to the girts. Plates 21 connected to girt 7 are disposed flat against those connected to girt 13, and the two pairs are joined together by bolts and nuts 24.

The preferred means for rigidly connecting together the adjacent ends of upper and lower portions 2 and 12 of the divided legs are shown in detail in Figs. 5 and 6. Substantially horizontal plates 26, having inwardly diverging sides and reinforced by vertical gusset plates 27, are secured to the adjacent ends of the two sections of each divided leg from which they project laterally. Welded to the sides of lower leg portion 2 and to the sides of the lower horizontal plate 26 above which they project are vertical plates 28 having inwardly diverging portions and outwardly extending parallel portions, as shown in Fig. 6. The outer edges of these two vertical plates are connected by a tie-plate 29 provided at its upper end with a vertical slot 31. Welded to upper leg portion 12 is a substantially U-shaped bracket 32 adapted to telescope between the parallel outer portions of vertical plates 28 attached to the lower leg portion. This bracket is provided with a vertical slot 33 that registers with the slot in the tie-plate for the reception of a bolt 34. The bracket and vertical plates 28 are also provided with registering transverse openings through which a bolt 36 extends. The top horizontal plate 26 is reinforced, and the top leg section is guided into cooperating position with the lower section from the position shown in dotted lines in Fig. 5, by inwardly diverging gusset plates 37 welded at their outer edges to the upper leg portion. When the two leg portions are in alignment, these gusset plates lie flat against vertical plates 28 secured to the lower leg section, as shown in Fig. 5. Adjoining horizontal plates 26 at the ends of the leg sections are also secured together by bolts 38. This type of clamp not only securely connects the divided leg sections together, but also, due to its shape, it guides the upper leg portion into alignment with the lower leg portion, especially when the wind is blowing against the rising tall section of the derrick.

It is a further feature of this invention that,

due to the formation of the derrick in the two independent but detachably connected sections just described, the derrick can be erected by fabricating it along the ground and then readily raising it to upright position. Accordingly, the lower ends of each of the two derrick sections are hinged to supporting platform 1 to permit them to be swung in a vertical plane. A suitable hinge for this purpose is illustrated in Figs. 7 and 8. It comprises parallel angle irons 41 secured to the supporting platform and spaced apart to receive the lower end of one of legs 11 of the tall derrick section. This leg and the angles are pivotally connected by means of a pin 42 extending therethrough and detachably locked in position by a vertical bolt 43. The angles are long enough to also receive the lower end of member 8 that braces the short section of the derrick. The hinges 44 for the short derrick section are the same as the one just mentioned, except that they are shorter because no bracing member is connected to them.

Fig. 1 shows the derrick when only partially erected. That is, both sections of the derrick have been fabricated along the ground and the short section has been swung upwardly on hinges 44 to upright position and rigidly secured therein by bolting the lower end of its bracing member 8 to the hinge brackets 41 for the tall section shown in prone position. The draw-works for the well are shown mounted on the open end of the supporting platform 1, and comprise a winding drum 46 and suitable engines 47 for rotating it.

In accordance with this invention the short section of the derrick, when braced in upright position as shown in Fig. 1, serves as an elevated support for a line or cable 48 by which the tall section of the derrick is raised. Accordingly, as shown in Figs. 1, 3, and 4, a pair of pulleys 49 is suspended from the top girts of the short derrick section, and another pair of pulleys 51 is secured to a girt of the tall derrick section near the lower ends of the top portions 12 of the divided legs. Cable 48 is anchored at one end to supporting platform 1 and is led over one of the pulleys 49 in the short section, around the two pulleys 51 connected to the tall section, back over the other pulley 49 in the short section and down to winding drum 46 to which its free end is connected. This arrangement of the cable is clearly shown in Fig. 2, but other methods of reeving the cable could be used. To lift the tall section of the derrick into upright position as indicated by the dotted lines in Fig. 1, drum 46 is rotated, whereby the cable draws the tall section upwardly and toward the short section. The various clamps previously described herein are then connected together to form a unitary derrick as shown in Fig. 3. The weight of the draw-works on the other end of the platform, which acts as a lever fulcrumed at its derrick end, is generally sufficient to resist the overturning moment of the derrick without the necessity for a heavy platform or earth anchors.

During the raising of the tall section of the derrick in this manner the short section acts as an independent mast for supporting the cable, but as soon as the two sections come together they merge into a single derrick with the short section helping to support the taller one. By merely reversing the procedure just described, the tall section of the derrick can be lowered to the ground without difficulty, followed by the short section. They can then be transported to a new location after their legs have been disconnected from the supporting platform

at hinges 41 and 44. Or, the short section can be left upright after the tall section has been lowered, and the entire structure moved as a unit by skidding the supporting platform along the ground. In either case the difficulty and expense of dismantling the derrick is avoided.

As is well known to be standard practice in this art, oil well drilling derricks of the kind herein shown and described are used for lifting drilling tools, casing, etc. out of the well, and lowering them therein. This is done by a cable extending over a pulley mounted in the top of the derrick as indicated in Fig. 1. This results in the working loads on the derrick being suspended substantially along or close to the line of the vertical axis of the derrick in its normal upright operative position.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiments. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. An oil well derrick structure adapted to support its working loads substantially along the line of its vertical axis and comprising a support, a derrick formed of two independent complementary overlapping sections of different heights hinged at their lower ends to said support and forming when secured together in upright posi-

tion a complete unitary derrick, the short section including the lower portion of a derrick leg, the tall section including the remaining portion of said leg, means for detachably connecting said two portions of the leg together when said sections are in upright position, means independent of said tall section for bracing the short section in upright position, and means connected to the top of said short section for swinging the other section about its hinge connection from horizontal to vertical position and vice versa as the derrick is erected to operative position and dismantled for moving.

2. An oil well derrick structure adapted to support its working loads substantially along the line of its vertical axis and comprising a support, a derrick formed of two independent complementary overlapping sections of different lengths forming when secured together in upright position a complete unitary derrick, the short section including the lower portion of a derrick leg, the tall section including the remaining portion of said leg and hinged at its lower end to said support, means for detachably connecting said two portions of the leg together when said sections are in upright position, means independent of said tall section for bracing the short section in upright position, and means connected to the top of said short section whereby to raise and lower said tall section about its hinge connection when said tall section is disconnected from the short section.

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