Aug. 6, 1940. C. L. HENRY 2,210,407

PORTABLE DERRICK

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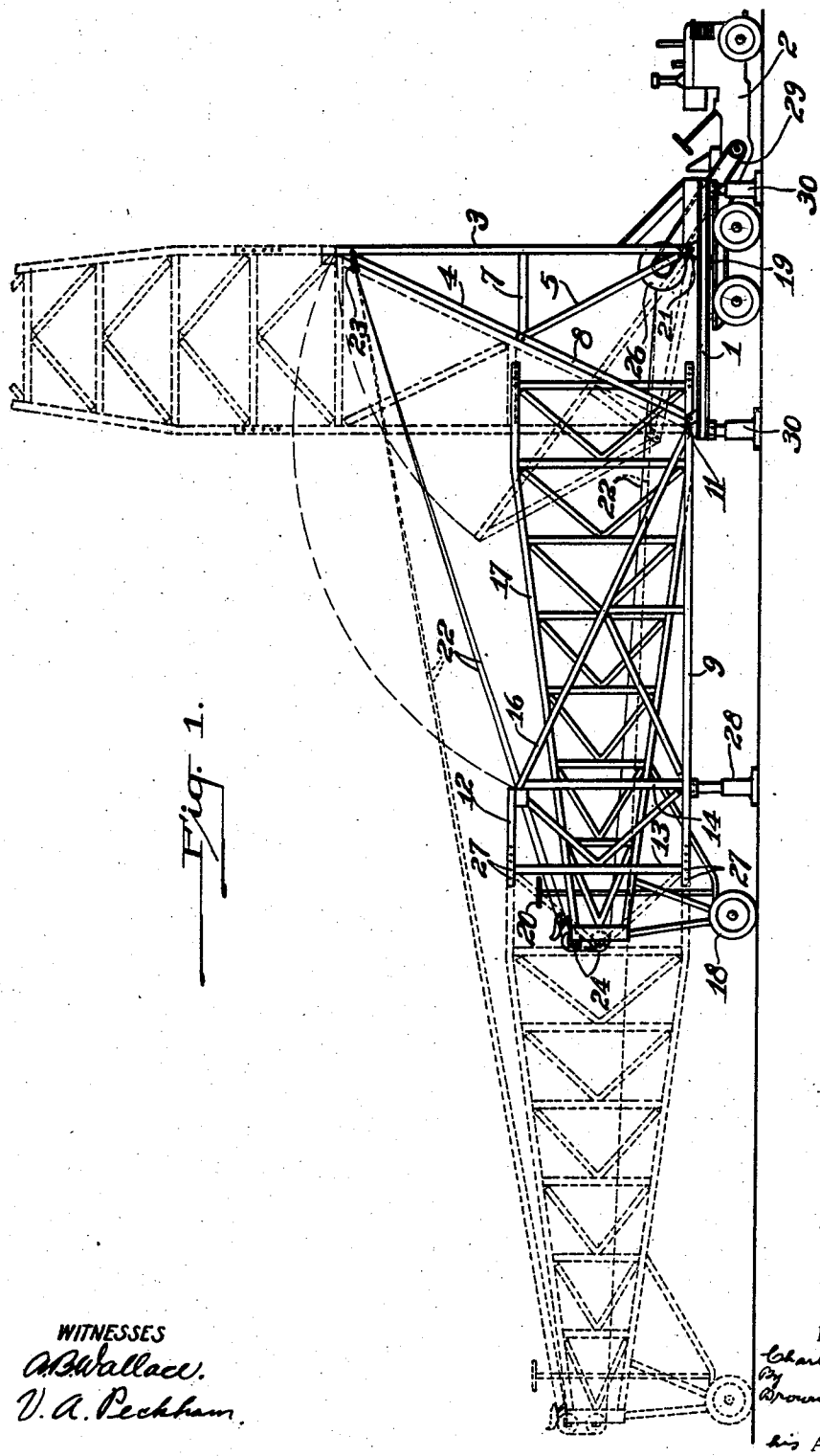


Fig. 1.

WITNESSES
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Fig. 2.

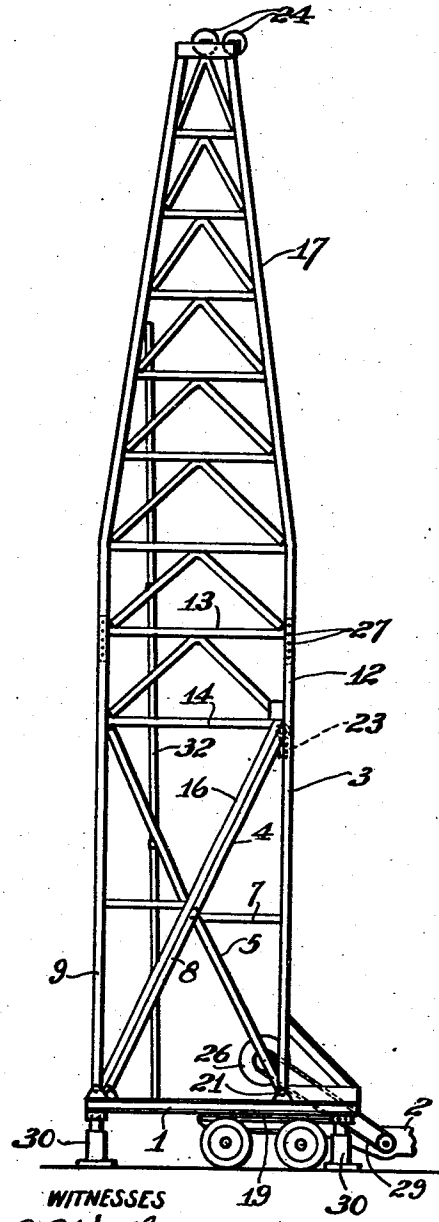
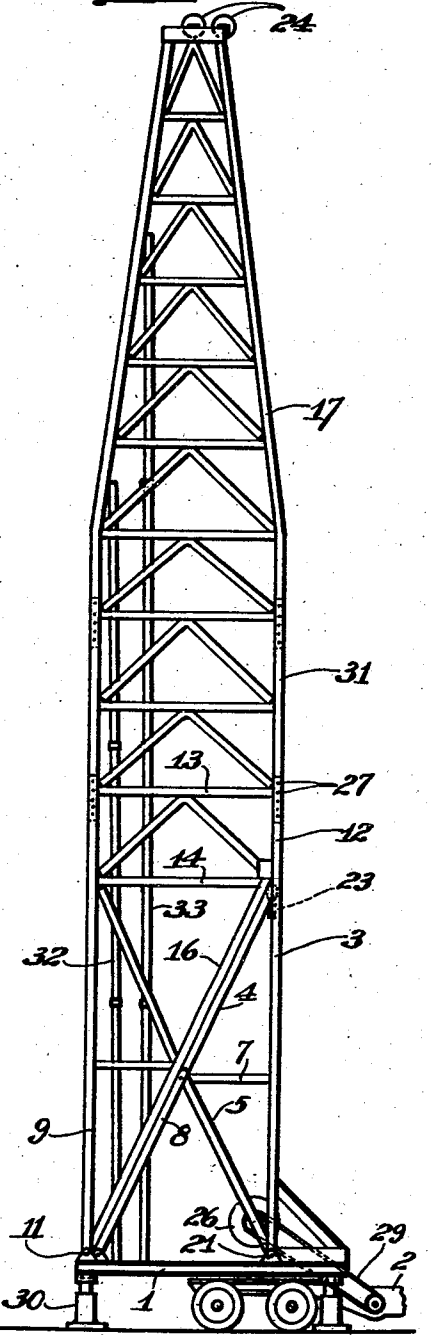


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE

2,210,407

PORTABLE DERRICK

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Application September 2, 1938, Serial No. 228,154

4 Claims. (Cl. 189—16)

This invention relates to oil well masts or derricks, it being understood that wherever the word "mast" is used herein it is to be interpreted as meaning only an oil well derrick.

It is often desirable to move a mast of this character from one well to another, especially since the mast may no longer serve any purpose after the well has been brought in. However, it is a long and expensive task to disassemble a derrick and truck its component parts to a new location and then re-erect it. On the other hand, it is also very difficult to lower a completely assembled mast from upright to prone position and then transport it as a unit to a new site. This is especially true where the terrain over which it must be carried is rough. Furthermore, an ordinary type of mast may not be tall enough for efficient drilling of a deeper well to which it is moved.

It is among the objects of this invention to provide an oil well mast which can be conveniently raised and lowered as desired, which is readily portable over the ground from one location to another, which can be easily and safely fabricated along the ground before erection, and the height of which can be readily altered at will.

In accordance with this invention a mast having any desired number of legs is formed of a plurality of independent sections, preferably three, which can be independently assembled on the ground and which are detachably connected together when the mast is in operative position. Preferably, all of these sections are first fabricated along the ground, and what is later to become the lower ends of two of the sections is hinged to a support in such positions that when those two sections are stood upright they cooperate to form a complete lower portion of a mast. The supporting member is connected to or mounted on apparatus for transporting it across an oil field. During transportation the longer of the two hinged sections of the mast is carried over the ground in prone position behind the supporting member. To decrease the length of the entire apparatus, the third section, which forms the top portion of the mast, is telescoped in the prone hinged section and its rear end is supported by detachable wheels or the like.

To erect the mast, the shorter hinged section is first mounted in upright position which can be done without difficulty because of its relatively small size and weight. After that and during transportation this section can be left in upright position or can be lowered if overhead clearance makes it necessary. A cable is strung over pulleys in the upper end of this section and connected to the prone sections and to a drum mounted on the supporting member. After the prone sections are extended and connected rigidly together, the cable is reeled in, whereby it pulls the long portion of the mast upwardly and swings its outer free end through a great arc until that portion is in upright position against the shorter section. These two parts are then clamped together to form a unitary mast which can be readily taken down by reversing the procedure just mentioned. The lower portion of the mast preferably has substantially parallel legs so that interchangeable sections with similar legs can be mounted thereon between it and the tapered top section to easily increase the height of the mast without increasing the area of its base.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a side view of my mast structure as it appears in its portable state; Fig. 2 is a side view of the mast in upright operative position; and Fig. 3 is a similar view of the mast with a section added to it to increase its height.

Referring to Fig. 1 of the drawings, a supporting platform 1 is shown mounted on the rear end of a truck or tractor 2 from which it extends rearwardly. Connected to this support so as to be movable therewith is an oil well derrick or mast shown in collapsed condition for transportation across an oil field. The mast is made in at least three separate fabricated sections adapted to be detachably connected together into an upright unitary mast such as shown in Fig. 2. The upright section shown in Fig. 1 is relatively short and, as a four-legged mast is illustrated, it includes the lower portions 3 of two of the mast legs and suitable diagonal bracing members 4 and 5 connected thereto. The adjacent ends of each set of bracing members are connected to one end of a horizontal girt 7 and also to the upper end of a bracing member 8 the lower end of which is connected to the supporting platform. The purpose of braces 8 is to brace the short section of the mast in upright position independently of the remainder of the mast.

The other two sections of the mast form the remaining portion thereof and are shown in substantially horizontal or prone position. One of these sections, referred to herein as the hinged section, includes the lower portions 9 of the other two mast legs which are hinged in brackets 11 to the rear end of the supporting platform for a purpose to be described later. This section is also provided with short leg sections 12 which

become the central portions of the first two legs when the mast is erected. Legs 9 and 12 are connected by girts 13 and 14, and by diagonal bracing members 16.

The remaining section of the mast, referred to herein as the top or telescoping section, is bounded by the upper portions 17 of all four legs connected together by suitable girts and braces. As portability of the mast is a feature of this invention, the top section is telescoped within the hinged section so as to materially decrease the length of the prone part of the mast during transportation. For this purpose the lower or inner ends of top legs 17 are adapted to be slidable longitudinally within legs 9 and 12. To prevent the flanges of the girts and braces of the telescoping sections from interfering with each other, the flanges of the hinged section extend outwardly, while those of the top section extend inwardly.

The outer end of the telescoping sections of the mast is carried during transportation by a two-wheel truck 18 detachably connected to the outer end of the top section which is temporarily secured to the hinged section in any suitable manner in order to support it. Platform 1 is pivotally mounted on tractor 2 by means of a king pin 19 so that it can turn relative thereto, and to further aid manipulation of the telescoped sections of the mast during transportation, the two-wheel truck is provided with any suitable means 20 for steering it, similar to the tiller truck at the rear end of a hook and ladder fire truck. If lack of adequate overhead clearance makes it necessary, the short upright section of the mast may also be lowered during transportation. For this purpose the lower ends of leg 3 are hinged in brackets 21 to the supporting platform, and braces 8 are removable to permit this section to swing backwardly and downwardly to the broken line position shown in Fig. 1.

In accordance with this invention the short section of the mast, when braced in upright position as shown in Fig. 1, serves as an elevated support for a line or cable 22 by which the remainder of the mast is raised after it has been extended along the ground. Accordingly, pulleys 23 are suspended from the top of the short mast section, and the cable, which is anchored at one end to the outer end of the telescoping section, is led over these pulleys, back around two blocks 24 mounted on the outer end of the telescoping section and through this section to a winding drum 26 to which its free end is connected. Of course, other methods of reeving the cable can be used.

Before the prone sections of the mast are raised, the telescoping section is disconnected from the hinged section and pulled backwardly to the broken line position shown in Fig. 1. The adjoining ends of the mast legs are then bolted together at 27 to form a single rigid prone mast section. During this process the outer end of the hinged section may be supported on jacks 28. The tiller truck is then removed from the mast and a source of power is connected to drum 26. Preferably, this power is supplied by tractor 2 through a sprocket chain 29. Rotation of the drum winds up cable 22 and thereby swings the prone section of the mast upwardly on hinges 11 and into upright position against the upright short section, as indicated by the broken lines in Fig. 1 above the supporting platform. These two sections are then rigidly connected together by any suitable clamping means to form a unitary upright mast, as shown in Fig. 2. To take the weight of the upright mast off the wheels of the tractor, the supporting platform is preferably supported on jacks 30.

During the raising of the long 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 mast or derrick with the short section helping to support the taller one. By merely reversing the procedure just described, the tall section of the mast can be lowered to the ground without difficulty, and the top section disconnected from the hinged section and telescoped therein. After the tiller truck is added to the telescoping section and the various jacks have been removed the entire apparatus is ready to be transported to a new location either with the short section of the mast in upright or lowered position. The hinge connection between the telescoped sections and the supporting platform permit those sections to accommodate themselves to the surface of the ground they pass over. The relatively short length of the prone sections during transportation makes the apparatus easier to handle, prevents the mast from sagging, and also prevents it from scraping on a high spot of ground between the tiller truck and the tractor.

It is another feature of this invention that the legs of the short section and hinged section, as seen in Fig. 2, are substantially parallel rather than being inclined upwardly as is the usual case. Because of this the height of the mast can be easily increased by merely inserting braced leg sections 31 of the desired length, as shown in Fig. 3, between the top portion of the mast and the underlying portion. The section or sections that are thus added are preferably prefabricated so as to require but little time in the field to insert them between the hinged and top sections of the mast before they are raised from the ground. The three main sections of the mast can therefore be made of standard size, and the height of the mast varied at will by standard insert sections. The reason for thus increasing the height of the derrick is to provide more room for racking drill pipe therein, or to provide room for longer sections of drill pipe. As is well known, every time a new section of drill pipe is added to a rotary drill the drilling operation must be stopped. Consequently, it is desirable to use as long lengths as possible to decrease the number of shut-downs. Furthermore, whenever a new set of pipes has to be racked in the mast it is also necessary to shut down the drilling, so that it is desirable to rack as many pipes at once as is possible. The number and length of pipes that can be racked in a mast is controlled by its taper which limits head room for the pipes; therefore, if the tapered portion of the mast is raised its pipe capacity is increased. For example, there is room to rack more pipes 32 in the tall mast of Fig. 3 than in the shorter one of Fig. 2. Likewise, longer pipes 33 can be racked in the former than in the latter. According to this invention this increase in the height of the mast is obtained without increasing the area of the base which remains standard. When this mast is used with relatively shallow wells the matter of racking pipes is not of great importance and therefore a relatively short mast may be used. However, if the mast is transported to a location where it is expected to drill a deep well it is then desirable

to increase the height of the mast for the reasons just given.

Another advantage of this invention is that, due to the formation of the mast in the independent sections described, it can be initially erected by fabricating it along the ground and then readily raising it to upright position. This is especially desirable because the usual erection of masts by building them up from the ground in operative position becomes more difficult and dangerous as the distance that the men must work from the ground increases. Furthermore, rig builders who work a material distance above the ground require greater pay than those who can work close to the ground.

According to the provisions of the patent statutes, I have explained the principle and mode of construction of my invention, and have illustrated and described what I now consider to represent its best embodiment. 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 comprising a portable support, a prone derrick portion hinged at one end thereto, means for carrying the opposite end of said portion during transportation of the derrick, said portion being divided into a plurality of sections adapted to be telescoped during transportation to decrease its length, another portion of the derrick mounted on said support and adapted to support a cable attached to said prone portion for raising it from prone position in erecting the derrick, and means for connecting said two portions together to form an upright derrick.

2. An oil well derrick structure comprising a portable support, a prone derrick portion hinged at one end thereto, means for carrying the opposite end of said portion during transportation of the derrick, said portion being divided into a plurality of sections adapted to be telescoped during transportation to decrease its length, and an upright portion of the derrick mounted on said support and being shorter than said prone portion, said upright portion being adapted to support a cable attached to said prone portion for raising it to upright position, said two portions being adapted to be rigidly connected together in upright position to form a unitary derrick.

3. In combination, a vehicle, a supporting platform mounted thereon for turning in a horizontal plane, a short base section of an oil well derrick mounted on said platform, means for bracing said section in upright position, a long base section of the derrick hinged at one end to the platform and forming with the short section a complete base portion, said hinged section being adapted to be transported over the ground in prone position, a top section of the derrick adapted to be telescoped in the hinged section during transportation, means for carrying the outer end of the telescoping sections during transportation, and means supported by said short base portion for raising the prone sections to upright position.

4. An oil well derrick structure comprising a portable support, a derrick formed of two independent portions of different heights hinged at their lower ends to said support and forming when in upright position a complete unitary derrick, the short portion including the lower section of at least one derrick leg, the tall portion including the remaining section of said leg, means for detachably connecting said two sections of the leg together when said derrick portions are in upright position, means independent of said tall portion for bracing said short portion in upright position, means carried by said short portion for supporting a cable connected to said tall portion, said cable being adapted to be connected to means for paying it out and pulling it in whereby to lower and raise said tall portion when it is disconnected from the short portion, said tall portion being divided into a plurality of sections when lowered and adapted to be telescoped during transportation to decrease its length, and detachable means for carrying the outer end of said telescoping sections during transportation of the derrick.

CHARLES L. HENRY.