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G. K. CLAIRE

2,176,731

FOLDING MAST FOR PORTABLE WELL DRILLING AND OPERATING APPARATUS

Filed Jan. 25, 1937

4 Sheets-Sheet 2

Fig. 3.

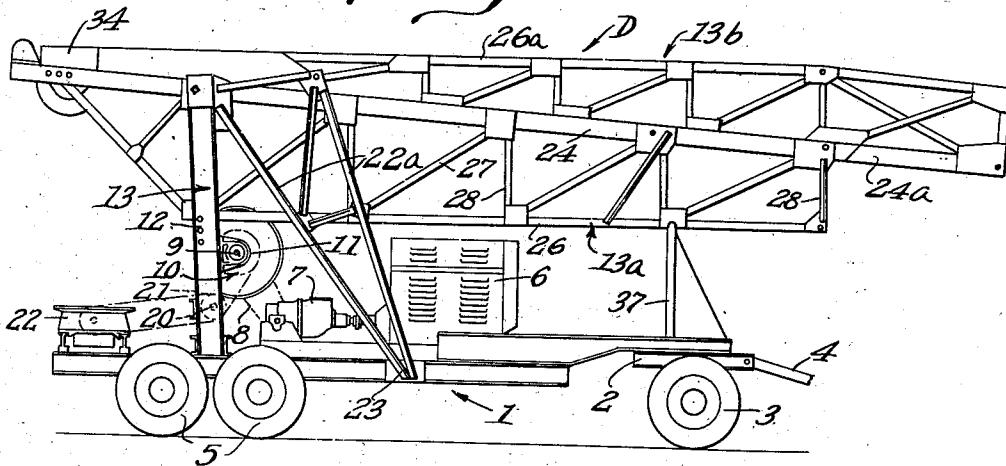


Fig. 4.

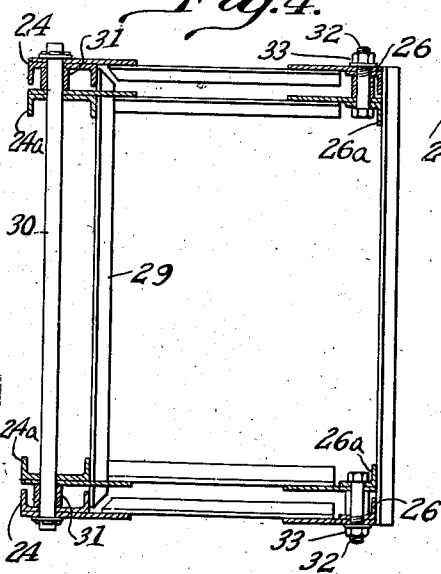
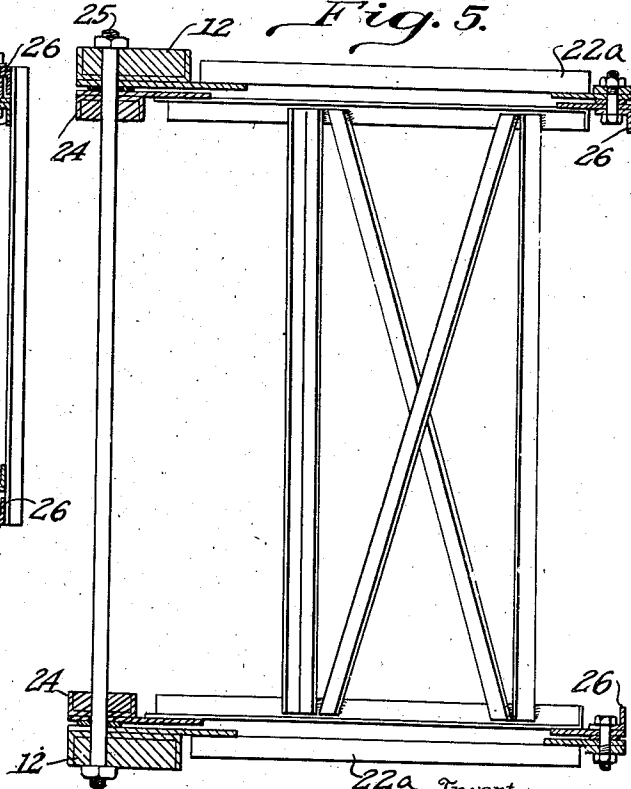


Fig. 5.



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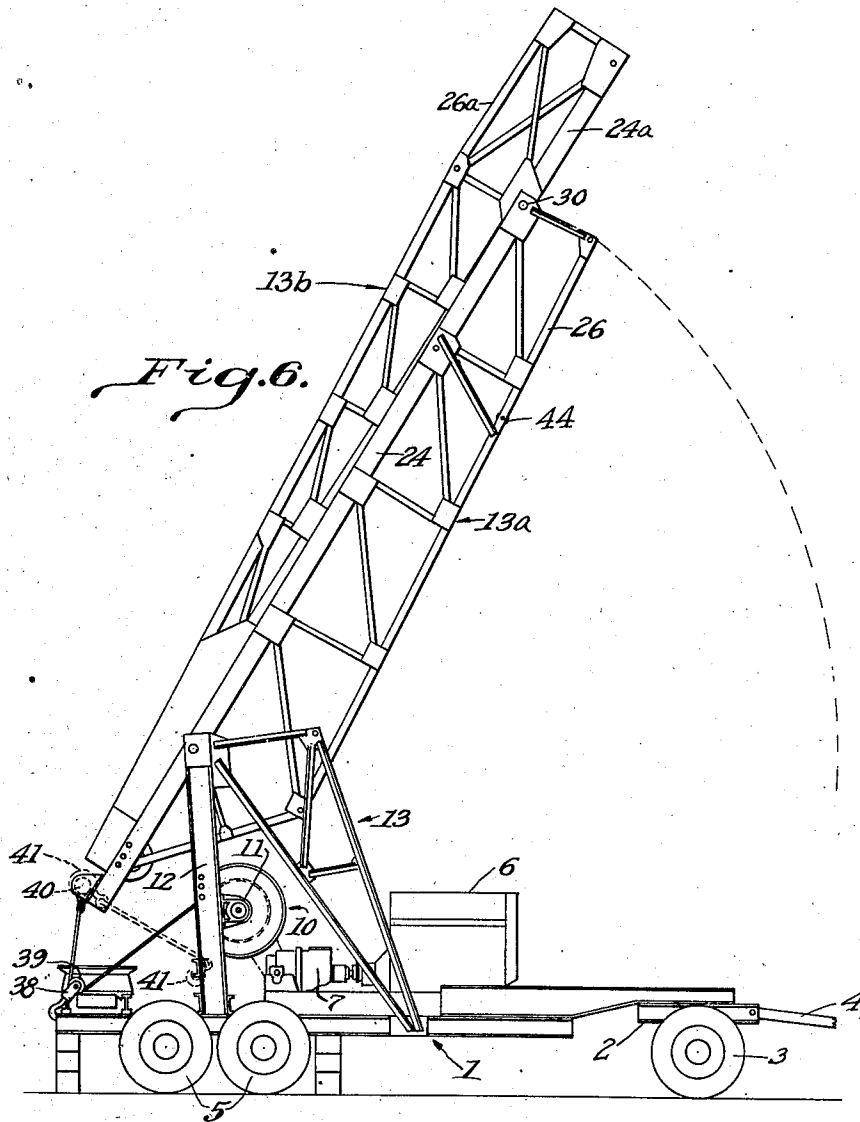
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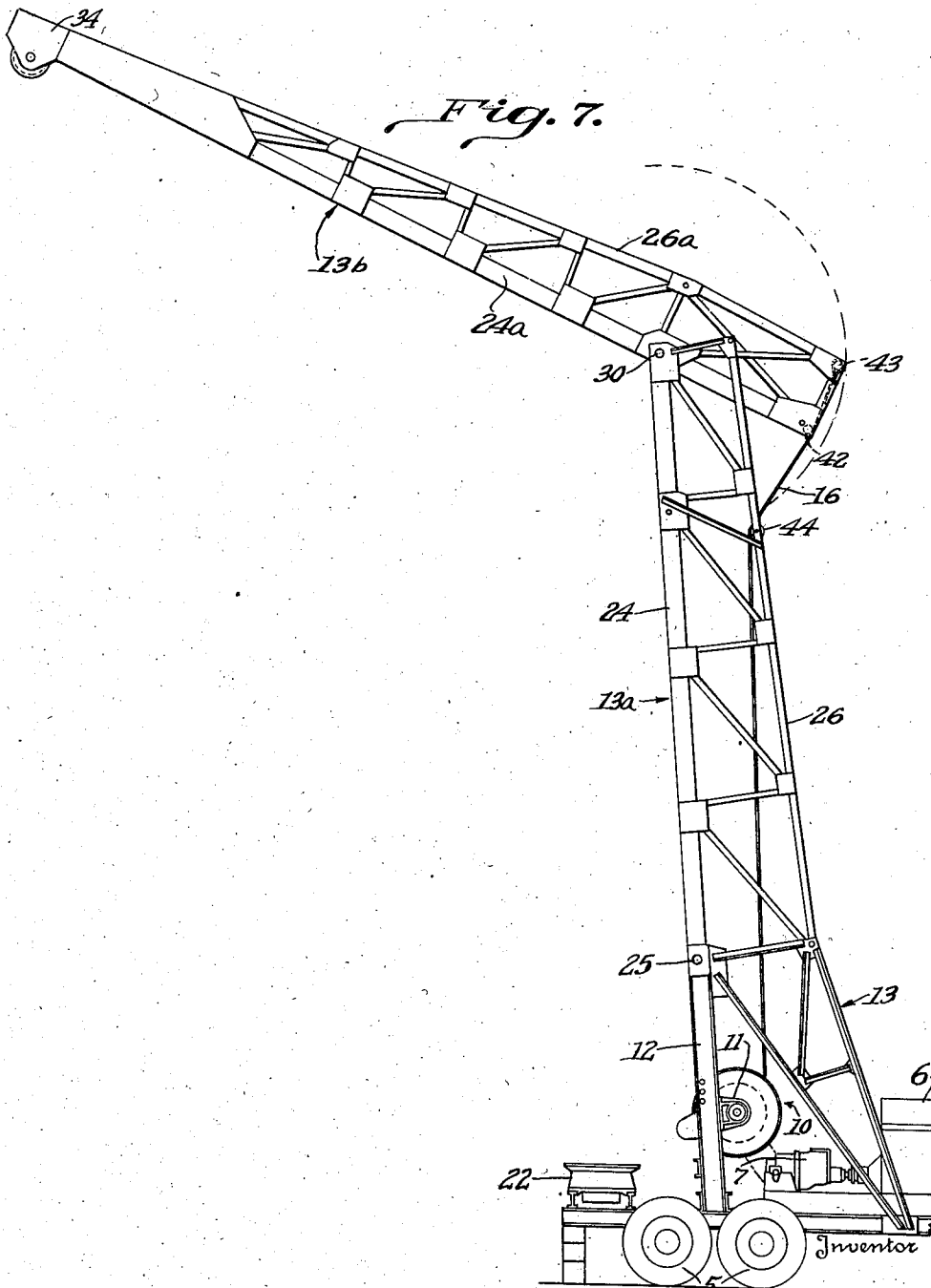
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UNITED STATES PATENT OFFICE

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FOLDING MAST FOR PORTABLE WELL
DRILLING AND OPERATING APPARATUS

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Application January 25, 1937, Serial No. 122,167

2 Claims. (Cl. 189—15)

This invention relates to an improved portable and sectionally collapsible derrick or prospecting rig, and has for a general object the provision of a derrick or rig which is especially adaptable for facilitating the drilling of relatively shallow oil wells, geological test borings, or water wells where a portable and easily erected derrick is desired.

Another object resides in the provision of an improved portable and collapsible derrick and rig structure of economical construction and which comprises a compact self-contained unit mounted on a wheeled truck-drawn base or trailer, the latter also carrying in addition to the derrick the operating engine or prime mover, draw-works and rotary machine units needful in the drilling of wells and in the insertion and removal of associated casing or tubing.

For a further understanding of the invention, reference is to be had to the following description and the accompanying drawings, wherein:

Fig. 1 is a side elevation of the portable derrick and associated apparatus comprising the present invention, the derrick being shown in its extended or active position;

Fig. 2 is a rear elevation of said derrick;

Fig. 3 is a side elevation with the derrick in its lowered or inactive position;

Fig. 4 is a horizontal sectional view on the line IV—IV of Fig. 1;

Fig. 5 is a similar view on the line V—V of Fig. 1.

Figs. 6 and 7 are side elevations showing the portable derrick in different stages of the elevating or collapsing operations.

Referring more particularly to the drawings, wherein has been illustrated a single but preferred form of the derrick apparatus embodying the present invention, the numeral 1 designates a wheeled base or trailer on which said apparatus is mounted. This base or trailer comprises a horizontal bed frame provided at its forward end with a pivoted steering truck 2 having ground engaging wheels 3 and a motor truck coupling tongue 4. The rear end of the bed frame includes preferably a set of four ground engaging and supporting wheels 5, which impart stability to the trailer and enable the same to successfully withstand the loads and strains borne thereby.

Mounted on the bed frame of the wheeled base unit or trailer is a suitable type of prime mover 6, which in this instance is shown as an internal combustion engine. The power shaft of the engine drives a change-speed transmission 7 and the

driven shaft of this transmission is provided with spaced sprockets around which pass spaced endless chains 8, the latter being also trained over sprockets carried by the free-running operating shaft 9 of a rotary draw-works 10, the shaft 9 being journaled in anti-friction bearings 11 carried by the uprights 12 of the base section 13 of the folding or collapsible derrick D. The shaft 9 is provided with the usual drum 14 and when hoisting, a sliding jaw clutch 15 on the shaft 9 is engaged with jaws on the drum, as will be readily understood, the associated draw-line 16 of the drum being spooled from the back of the latter. The drum is usually a steel casting, having brake rims cast integrally therewith. A cat-head or small drum 17 is mounted on each end of the drum shaft, which is placed at the proper height for the use of a catline.

A sprocket 18, keyed to the drum shaft 9, drives a corresponding free-running sprocket 19 located on a stationary shaft 20 disposed below the drum shaft. This free-running sprocket has clutch jaws cast integral with the hub thereof which jaws are adapted to engage those of a free running sprocket 21 loose on the shaft 20 to effect the drive of a rotary machine 22, the latter being mounted on the over-hanging rear end of the bed frame of the trailer. The rotary machine as well as the draw-works may be of any well known specific construction since of themselves they do not enter into the present invention. Therefore, a more detailed description of their construction and operation may be omitted.

The derrick D to the construction and mounting of which the present invention is particularly directed, when in its extended or active position, as shown in Fig. 1, possesses a height of approximately sixty feet and a rated capacity of 25 and 30 tons, depending upon the strength of the structural steel members used in its construction. The height and capacity figures above given are, of course, offered to give the reader a clearer understanding of the nature of the invention and are not used in a limiting sense. In its preferred form, the derrick is made up in three sections, the base section 13, an intermediate section 13a and a top section 13b. These sections are each formed from rigidly connected and strongly braced structural steel members of standard cross sections.

The base section 13 includes the heavy uprights 12—12 of channel formation which at their lower ends are firmly bolted or otherwise secured to the bed frame of the trailer. In addition, the uprights are braced and immovably supported to

sustain the loads imposed thereon by the angle braces shown at 22a, the latter being arranged to form substantially triangular internally braced frames which are disposed to occupy the same vertical planes as the uprights 12—12, the lower ends or apices of the bracing frames being secured to the bed frames or trailer sills as at 23.

The intermediate frame section 13a of truncated pyramidal form tapers upwardly from the base section to the top section and when in its erected or active position constitutes a continuation of the base section. The intermediate section is preferably constructed to embody channel uprights 24—24 which align, as shown in Fig. 1, with the uprights 12—12 and are joined with the latter, as shown in Fig. 5, by means of transverse pivot bolts 25. These bolts also serve as fulcrums, since around the axes of which the intermediate frame section turns when being lowered to the inactive position shown in Fig. 3.

In addition to the uprights 24—24, the intermediate section comprises angle members 26—26 which are joined with each other and with the uprights 24—24 by means of the diagonal braces 27 and the substantially horizontal braces 28 at each side of the section 13a, and the cross bracing 29 thereof at the front and rear sides. These structural steel members assembled as disclosed produce a strong, rigid, yet light weight derrick readily capable of sustaining the loads they are designed to receive. As stated, the sections are substantially of truncated pyramidal form and are substantially rectangular in transverse cross section, as indicated in Fig. 4.

The top section 13b is of the same general construction as the intermediate and base section, and forms, when erected, a uniform continuation thereof, the said top section embodying channel-shaped uprights 24a—24a which at their lower ends, as shown in Fig. 4, are united with the upper ends of the uprights 24—24 of the intermediate section by a transverse pivot rod 30, which has its end portions received within registering openings provided in said uprights, the rod being provided with spacers 31 to confine said uprights to spaced vertical planes of operation. Also the top frame includes the angle members 26a—26a complementary to the members 26—26 of the intermediate section and the associated bracing 27a, 28a and 29a. To hold the top section in its erected active position, short cross bolts 32, shown in Fig. 4, pass through registering openings provided in the mating ends of the angle members 26—26 and 26a—26a. These bolts have their threaded ends provided with securing nuts 33.

A crown block 34 is built in the upper end of the top section 13b of the derrick and carries the usual pulley block 35 and its depending cable line 36. The intermediate and top sections of the derrick are so proportioned that when lowered to their inactive positions, the same fold into jack-knifing relationship with each other and the stationary base section 13. In their collapsed positions, the sections 13a and 13b in addition to the support offered by the uprights 12—12, are also supported by a frame 37 arising from the front end of the trailer. When so folded, the distance from the road level to the highest point of the derrick assembly in a derrick of the height and capacity above given is not over fifteen feet. By connecting the draw-line 16 with the movable derrick sections, provision is made for raising and lowering said movable sections by the power of the draw-works.

The operation of raising the derrick from the folded position shown in Fig. 3 to the extended position shown in Fig. 1 is as follows: A snatch block 38 is detachably connected to the framework of the trailer as shown in Fig. 6 and the draw line 16 passed around a pulley 39 carried thereby. The free end of the draw line is then fastened to a cross brace 40 provided at the lower end of the intermediate section 13a. When power is applied to the draw-works, the upper and intermediate sections will be raised approximately to the position shown in Fig. 6. Hooks 41, illustrated in dotted lines in Fig. 6, are then connected to the section 13a and the frame and enough slack introduced in the line 16 to permit the detachment of the snatch block. Power is then again applied to the drum and the operation of raising the section 13a completed. Securing pins or bolts are positioned in aligned holes in the lower part of the intermediate section and the stationary base section to hold the former in its elevated position.

The draw line 16 is then detached from the brace 40, passed upwardly through the center of the intermediate section, bent around a cross brace 42 carried by the short end of the side angles 24a of the upper section 13b and connected to a similar brace 43 extending between the angle members 26a. Power is again applied to the draw-works and the cable will cause the upper section 13b to swing about the pivot 30 and move upwardly to its elevated position. A roller 44 is provided on the intermediate section, adjacent the position occupied by the lower end of the upper section when it is in a raised position, for the cable 16 to pass over when the upper section moves toward a horizontal position. This provides the necessary leverage to cause the section 13b to continue in its upward movement. This section is secured in its extended position by applying the bolts 32 as previously described. When it is desired to lower or collapse the derrick, the operations above described are reversed.

In view of the foregoing, it will be seen that the present invention provides a portable and foldable derrick and associated well drilling and operating mechanism of a sturdy, economical and easily operated character. In the use of the apparatus, it is preferable to jack or elevate the bed frame of the trailer and set timbers beneath it to relieve the wheels and axles of the loads incident to hoisting drill pipe and casing. Each part of the inset is so designed as to obtain ample strength and minimum wear to impart satisfactory service at low maintenance costs. The derrick sections may be conveniently secured in their assembled or released to their collapsed position by the insertion or removal of the two sets of securing bolts employed in their fastening.

What is claimed is:

1. In a collapsible derrick, a stationary base section, a pair of relatively movable upper sections, each of said sections including a pair of spaced side members, bracing means for said side members comprising light weight structural frames positioned at the rear of said side members and rigidly secured thereto, the spacing between the side members of the upper sections being progressively less than the next lower section, said side members all being disposed in a common plane when the derrick is operatively positioned, portions of the side members of adjoining ends of said sections being in overlapping relationship, pivot means provided between the upper ends of

the side members of each section and the adjacent portions of the side members of the section immediately thereabove, said pivot means providing for the swinging movement of each of the upper sections on its supporting section, the bracing frame at the top of the second and base sections being omitted in order that the top section will swing forwardly on the second section and the latter section will swing rearwardly on the base section, and means detachably connecting the lower ends of said side members, the adjacent portions of the side members of the next lower section and the adjoining portions of said bracing frames.

2. In a collapsible derrick, a stationary section and a plurality of movable sections, each of said sections including a pair of spaced side members and bracing means, said bracing means being composed of relatively light structural members joined together to form side and back skeleton frames, the spacing between the side members of the stationary and first movable sections being greater than that of the first and second movable sections respectively, pivot means car-

ried by the upper ends of the side members of the stationary and first movable sections, the pivot means carried by the stationary section extending through the side members of the first movable section at points spaced from the lower ends thereof and the pivot means carried by the upper end of the first movable section extending through the side members of the second movable section at points spaced from the lower ends thereof, the lower ends of said movable sections being provided with perforations which register when said sections occupy extended positions with similar perforations provided below the pivots on said side members of the stationary and first movable sections, the back skeleton wall of the stationary and first movable sections being open to receive the lower ends of the sections pivoted thereto, the adjoining portions of the bracing means of the sections being formed with openings which register when said sections occupy extended positions, and securing devices removably positioned in the registering openings in the side members and bracing means.

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