June 26, 1951 W. T. YOUNG 2,558,119

SPUDDING TOWER HEAD FRAME

Filed Dec. 22, 1948 3 Sheets-Sheet 1

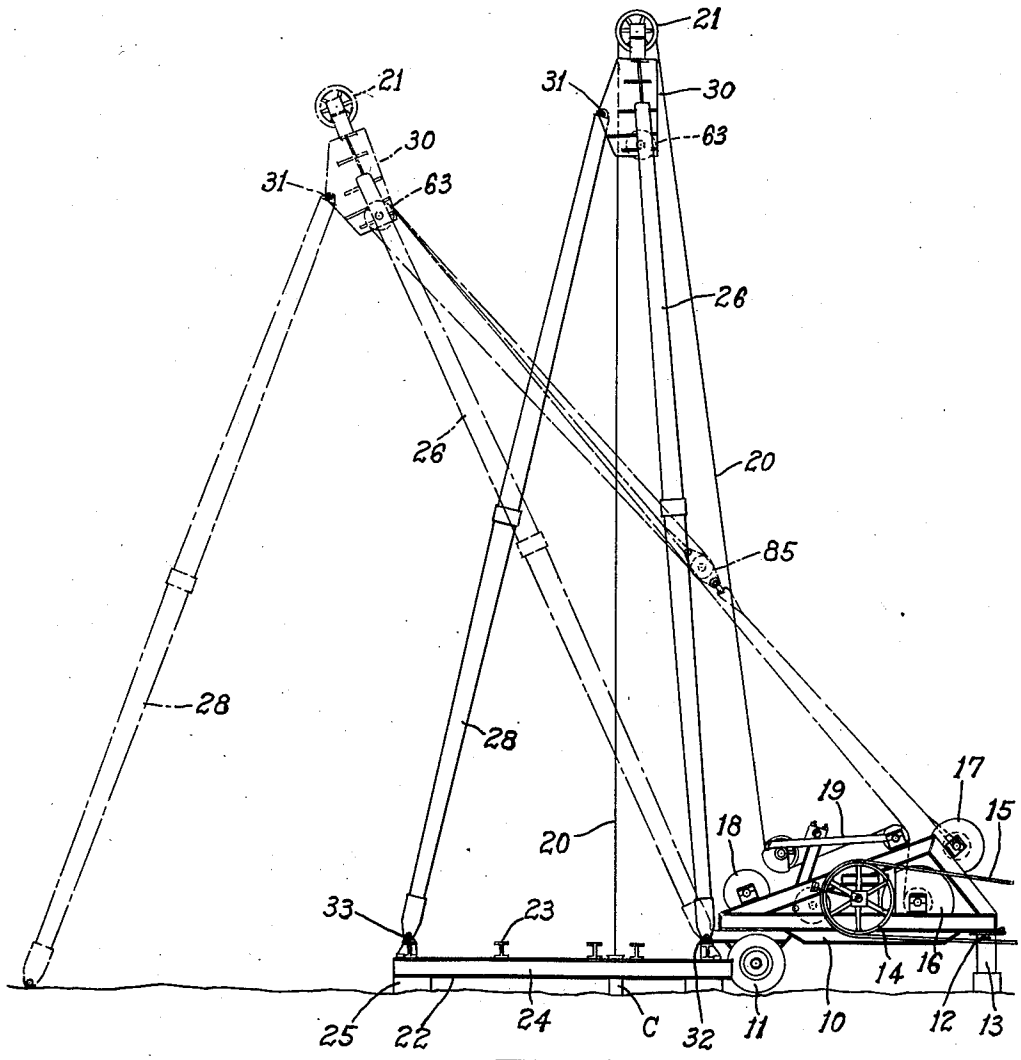


Fig. 1

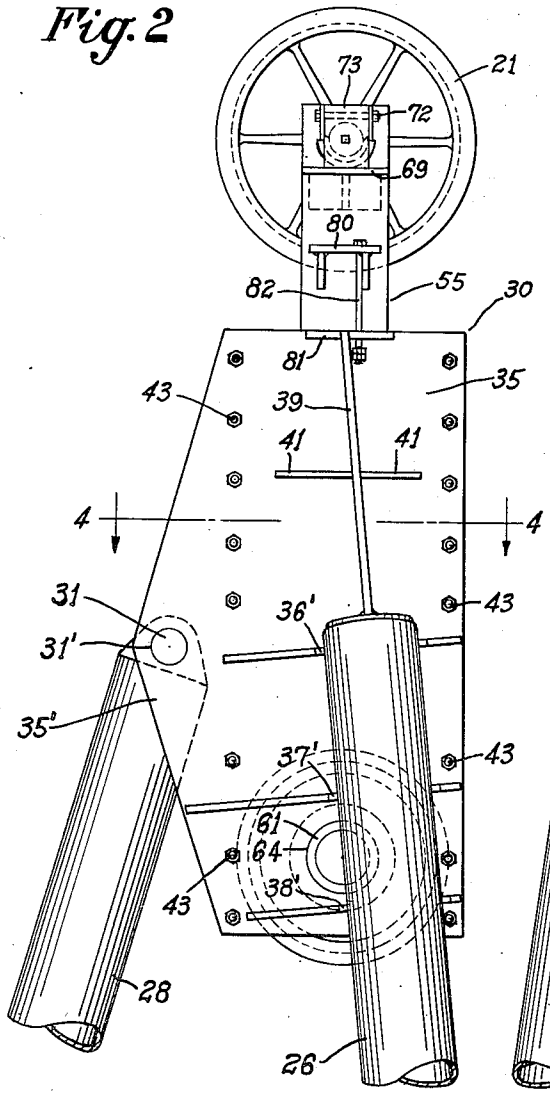
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Fig. 2



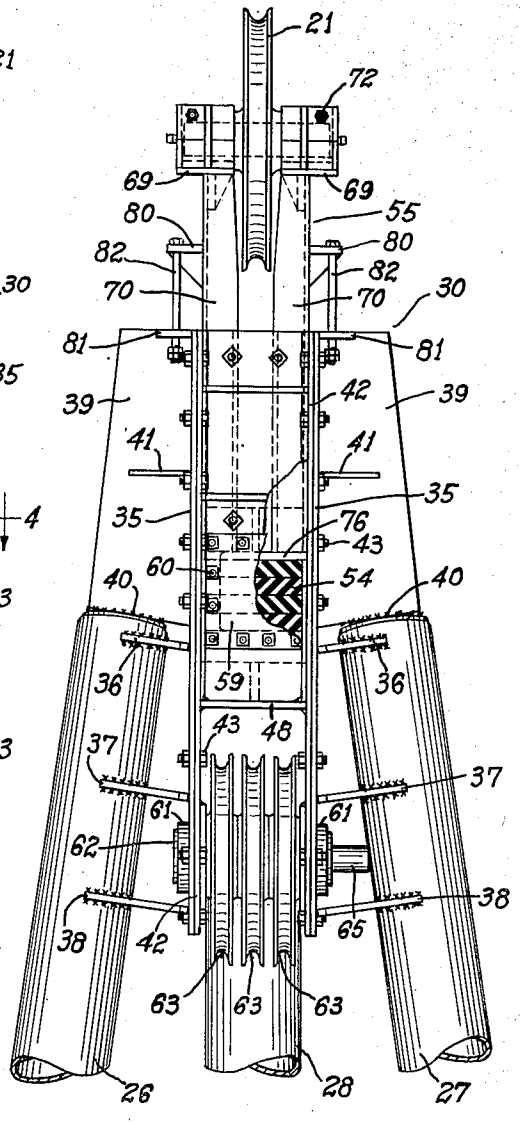


Fig. 3

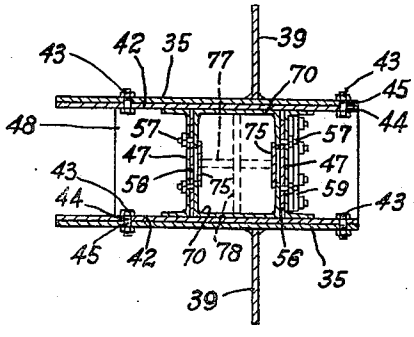


Fig. 4

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SPUDDING TOWER HEAD FRAME

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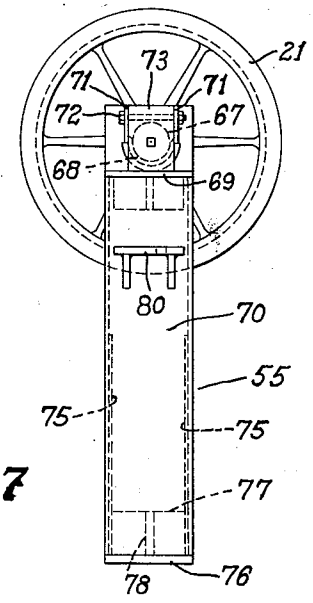


Fig. 7

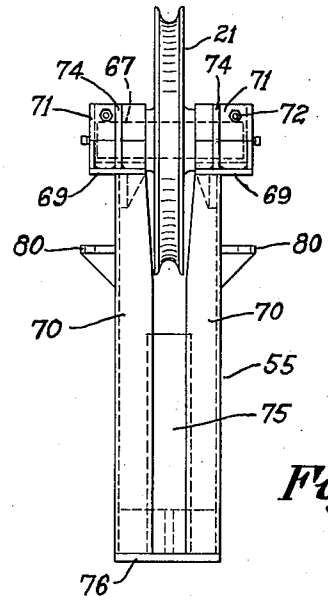


Fig. 8

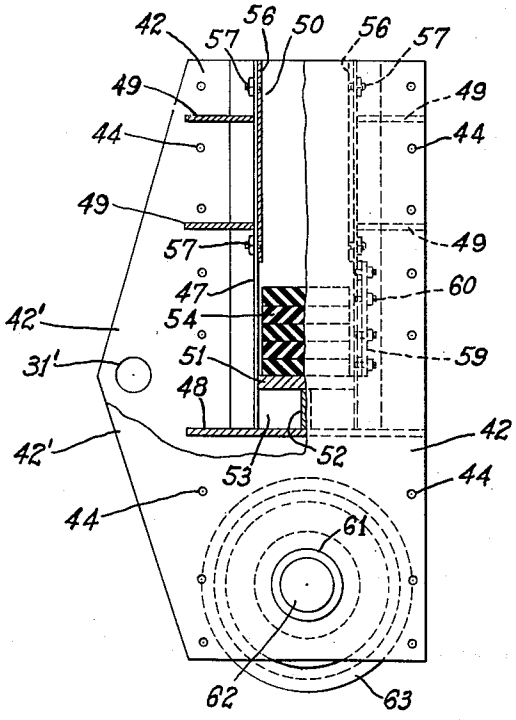


Fig. 5

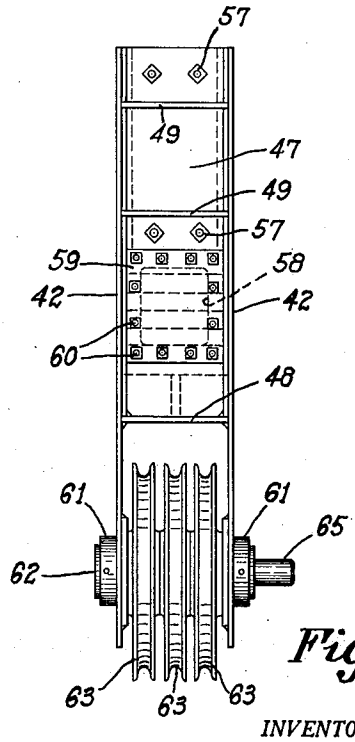


Fig. 6

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Patented June 26, 1951 2,558,119

UNITED STATES PATENT OFFICE

2,558,119

SPUDDING TOWER HEAD FRAME

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Application December 22, 1948, Serial No. 66,797

5 Claims. (Cl. 254—139.1)

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The invention relates generally to well drilling apparatus, and more particularly to a novel head frame for the top of the mast or tower of a spudding apparatus.

In a spudding apparatus, a crown pulley carrying the drilling cable is supported at the top of the mast or tower, and it is necessary to mount several casing sheaves somewhere near the top of the mast for handling the well casing. Also provision is made for hanging a sand line sheave at or near the top of the mast.

Where the mast has been a single structural member of the latticed type, these various sheaves sometimes have been separately mounted at convenient locations at or near the top of the mast, but a tower of two or more legs has required the building of top frame members spanning the legs, and this often results in a top-heavy construction which also may be unduly complicated and expensive.

A spudding tower made up of several legs or poles angularly inclined toward an apex at the top has many advantages from the standpoint of saving time and expense during erection and operation, because there are no guy lines to erect and no guy lines or braces to interfere with drilling operations such as pulling in the stem, casing or tubing. However, the support of the numerous sheaves at the top of such a tower is difficult to accomplish without building a heavy and somewhat complicated top or head frame. The requirements for such a frame are further increased by the desirability of mounting thereon a cushioning device for absorbing the shocks transmitted to the crown pulley by the drilling cable during the spudding operation.

It is an object of the present invention to provide a spudding tower having a novel head frame which will support all of the various sheaves and cushioning mechanism required.

Another object is to provide a novel head frame which is especially adapted to be used with towers having two or more angularly inclined legs.

A further object is to provide a novel spudding tower head frame which is adapted to be rigidly mounted on two angular legs and pivotally connected to one or more other legs before erection, so that a cable attached to the crown pulley carried on the frame can be pulled by the power mechanism of the spudder to raise the two rigidly connected legs and simultaneously pull the pivoted leg or legs into erected position.

A still further object is to provide a simple, compact and lightweight head frame for a spudding tower, which frame is inexpensive to build and to erect.

These and other objects are accomplished by the parts, improvements, constructions and arrangements comprising the present invention, the nature of which is set forth in the following

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general statement, and a preferred embodiment of which is described in detail in the following description and illustrated in the accompanying drawings, and which is particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

In general terms, the novel head frame construction comprising the present invention may be stated as including vertically disposed laterally spaced plates secured together to form a box construction with a vertically extending socket at the upper end thereof, said plates having laterally outward extending connecting means rigidly secured to the top ends of two tower leg members, a vertically disposed crown pulley support slidable in said socket, and cushioning means at the bottom of said socket for taking the shock of said support, there being a shaft mounted at the bottom end of said frame for carrying a plurality of casing sheaves and the like, and one or more tower legs pivotally connected to a lateral edge of said frame.

Referring to the drawings in which a preferred embodiment of the invention is shown by way of example;

Figure 1 is a general elevational view showing a spudding apparatus including a tripod tower and embodying the novel head frame at the top of the tower, the manner of erecting the tower being indicated in dot-dash lines;

Fig. 2 is an enlarged fragmentary elevation showing the improved head frame at the top of the tower;

Fig. 3 is a fragmentary elevational view taken at 90 degrees to Fig. 2, parts being broken away and in section;

Fig. 4 is a transverse sectional view, as on line 4—4, with distant parts omitted;

Fig. 5 is a detached side elevation of the main part of the box frame, partly broken away to show the cushioning means within the vertical socket;

Fig. 6 is a detached elevational view at 90 degrees to Fig. 5;

Fig. 7 is a detached elevational view of the crown pulley supporting frame which is slidably received in the socket of the main frame; and

Fig. 8 is an elevational view at 90 degrees to Fig. 7.

Similar numerals refer to similar parts throughout the drawings.

Referring first to Fig. 1, a well-drilling apparatus embodying the present invention is shown in elevation, and includes mechanism carried on a suitable structural frame 10 which is supported at one end on wheels 11 and has a fifth wheel tractor connection 12 at the other end for being transported from place to place. As shown, the fifth wheel end of the frame may be supported

on the ground by suitable pier 13 when the apparatus is in position for drilling.

The frame 10 carries a usual band wheel 14 which is driven from the drilling engine by means of a belt 15, which can be a flat belt or a V belt or a chain as desired. Frame 10 also carries the usual bull wheel 16, sand reel 17, calf reel 18 and spudding beam 19. As shown in full lines in Fig. 1, the drilling cable 20 is led from the spudding beam 19 over a crown pulley 21 at the top of the drilling tower or mast and thence vertically downward to suspend the drilling tools within the casing C of the hole being drilled or spudded.

The parts thus far described are generally well known and per se form no part of the present invention.

The spudding tower which carries the crown pulley 21 at the top is supported adjacent to the drilling apparatus on a suitable base indicated generally at 22 which may be suitably formed of steel I beams 23 supported crosswise on stringer beams 24, which are in turn supported on suitable piers indicated at 25. As shown, the spudding tower is preferably a tripod including three legs or poles 26, 27 and 28 which have their lower ends supported on the base 120 degrees apart circumferentially, and which have their upper ends inclined inwardly toward each other for attachment to the novel head frame indicated generally at 30.

Two of the legs 26 and 27 are rigidly secured to the head frame 30 in a manner to be described, and the other leg 28 is pivotally connected to a lateral edge of the frame as indicated at 31. The legs 26 and 27 are pivotally connected to the base frame 22 as indicated at 32, and the pivots 32 are axially aligned so that the legs 26 and 27 can be swung upwardly as a unit and will pull leg 28 along with them, as indicated in dot-dash lines in Fig. 1. The leg 28 is then connected to the opposite end of the base 22 as indicated at 33.

The legs or poles 26, 27 and 28 are preferably of the double-tapered type, that is, they are tapered from their largest diameter at their center radially inward toward the ends. This type of pole is an efficient compression member, but it will be understood that other types of poles or masts may be used without departing from the scope of the invention. While I have shown and described the invention as applied to a tripod tower, other types of masts or towers may be used without departing from the scope of the invention as defined in the claims.

The novel head frame 30 preferably includes two laterally spaced vertically disposed plates 35 which are rigidly connected to the upper ends of the poles 26 and 27. As shown in Figs. 2 and 3, the plates 35 have laterally outwardly projecting attaching fins 36, 37 and 38 secured as by welding at their inner edges to the plates 35 at vertical intervals, and having curved semi-circular sockets 36', 37' and 38' respectively, in their outer edges for receiving the upper ends of the poles 26 and 27. The poles are welded to the fins around the sockets 36', 37' and 38', as indicated in Fig. 3 to rigidly secure the poles in proper slightly inclined relation to the vertical plates 35.

Preferably, the attaching fins 36, 37 and 38 are located in the lower portions of the plates 35, and the upper portions have laterally projecting gusset plates 39 substantially at right angles to the attaching fins, the lower edges of the gusset plates being secured to the top ends of the respective poles 26 and 27, as by welding indicated at 40. The gusset plates may have stiffening

flanges 41 welded thereto intermediate their ends and welded to the adjacent portions of the plates 35. Thus the upper ends of the poles 26 and 27 are rigidly secured to the plates 35 and suitably braced to form a strong and rigid outer frame for the head frame.

As best shown in Figs. 3 and 4, the inner frame preferably includes two laterally spaced vertically extending plates 42 which match the plates 35 in dimension and shape and are secured in flatwise abutment with the inner surfaces of plates 35 by means of two vertical rows of bolts indicated at 43 which extend through registering holes 44 and 45 in the inner and outer plates 42 and 35 respectively. Both the plates 35 and 42 are provided at one lateral edge with triangular projecting portions 35' and 42' having aligned holes 31' therein, and a suitable pivot pin 31 extends through the holes for pivotally connecting the top end of the pole 28 to the head frame.

The plates 42 of the inner frame are connected in spaced relation preferably by channels 47 which are laterally spaced apart at right angles to the plates 42 and which have their legs welded to the plates 42 to form a box construction having a rectangular tubular opening extending from the top of the frame downwardly to a horizontal plate 48 extending between and welded at its edges to the plates 42. Additional spacer plates 49 may be provided at intervals along the channels 47 as desired.

The vertically extending socket or rectangular opening formed by the channels 47 and the portions of the plates 42 therebetween is indicated at 50 in Fig. 5, and at the bottom of said opening is a horizontal cushion supporting plate 51 supported on the plate 48 preferably by crossed vertical plates 52 and 53. A plurality of rubber cushioning disks indicated at 54 is supported in a pile on the plate 51 for taking the shock of the crown pulley support stem indicated generally at 55. Preferably a pair of friction or wearing plates 56 is located on opposite sides of the opening 50, and the plates 56 are preferably secured to the insides of the channels 47 by bolts 57.

Opposite the resilient cushioning disks 54, one of the channels 47 is provided with an opening 58 through which the disks may be inspected when the crown pulley support is assembled in the head frame, and the opening 58 is normally covered by a cover plate 59 attached to the web of the channel by studs or bolts 60.

Below the horizontal plate 48, the plates 42 are provided with aligned bosses 61 in which a casing sheave shaft 62 is mounted for journaling a plurality of casing sheaves 63 for carrying the well casing cable in a usual manner. Preferably the bosses 61 extend through suitable registering openings 64 in the outer frame plates 35, and one end of the shaft 62 has a reduced extended portion 65 on which may be supported the usual sand line sheave when required.

The crown pulley support stem 55 has the crown pulley 21 journaled at its upper end, the pulley shaft 67 being journaled in open bearings 68 which are carried on horizontal flanges 69 supported on the upper ends of spaced vertical channels 70. The bearings have laterally spaced vertical plates 71 extending upwardly therefrom with cross bolts 72 connecting their upper ends to prevent the pulley shaft from jumping out of the bearings. End plates 73 are welded between the vertical plates 71 at each end of the shaft, and laterally extending reenforcing ribs 74 are welded to the plates 71 intermediate their ends.

The spaced channels 70 preferably have their legs turned inwardly and are spaced apart to straddle the pulley 21. The channels form a stem of rectangular cross section of such dimension as to fit slidably between the wearing plates 56 within the rectangular opening 50 in the head frame. The inner edges of the channel legs are preferably connected together by inner plates 75 which are welded thereto. The bottom ends of the channel 70 have a flat horizontal abutment plate 76 welded thereto, and the plate is backed up by crossed vertical plates 77 and 78 secured to its upper surface and to the channels 70. When the stem of the crown pulley support 55 is inserted in the opening 50, as shown in Fig. 3, the abutment plate 76 rests on and is supported by the resilient cushioning disk 54 which, as best shown in Fig. 5, have sufficient clearance around their outer edges to allow a certain amount of compression of the disks.

Thus during the spudding operation, the shocks transmitted by the drilling cable with each stroke of the spudding beam are largely absorbed at the top of the tower by the pile of resilient cushioning disks 54. In order to restrain any upward movement of the crown pulley support caused by the rebound action of the disks 54, the upper portion of the pulley support stem 55 is provided with laterally opposite bracket ears 80, and the top end of the head frame is provided with laterally opposite flanges 81, the flanges 80 and 81 being provided with registering holes through which retaining bolts 82 are inserted for limiting upward movement of the crown pulley frame.

In erecting a tower embodying the novel head frame, after the base 22 has been laid and the drilling apparatus 10 positioned alongside, the two legs 26 and 27 of the tripod tower are laid horizontally on the ground and their upper ends are welded to the attaching fins 36, 37 and 38 of the assembled head frame, the side plates 42 of the inner head frame being connected to the outer frame plates 35 by means of the bolts 43. After the poles are welded to the fins, the disks 54 are inserted in opening 50 and the crown pulley support stem 55 is inserted in the socket 50 of the frame. Next, the opposite ends of the legs 26 and 27 are connected to the axially aligned pivots 32. The third leg 28 is then pivoted at its upper end to the frame as at 31, with the leg 28 extended from the head frame horizontally along the ground in the opposite direction, or away from the base 24.

By then attaching a suitable block and tackle indicated at 85 to the sand reel 17 and reeving the cables therefrom over the casing sheaves 63 and thence around the bull wheel 16, the drilling engine will furnish power to swing the head frame upwardly, first using a gin pole as an intermediate support for the cables, and then further raising the legs 26 and 27 without the gin pole as indicated in dot-dash lines in Fig. 1; and as the head frame raises it will pull the leg 28 upwardly with it until the tower reaches the fully erect position shown in full lines, when the bottom end of leg 28 may be connected at 33 to the base.

The novel head frame is a compact and lightweight single structure which supports the crown pulley and the cushioning means therefor, the casing sheaves and the sand reel sheave, and is especially adapted to be used with spudding towers having two or more angularly inclined legs, without requiring additional cross bracing between the legs. Moreover, the novel head frame is adapted to be rigidly connected to two of the legs of a tripod tower for being raised by the power mechanism of a spudder and to simultaneously raise the third leg when pivoted to said frame.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiment of the improved construction illustrated and described herein is by way of example, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention, the construction, the operation and use of a preferred embodiment thereof, and the advantageous new and useful results obtained thereby; the new and useful constructions, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. In a spudding tower having a base and a pair of legs connected to said base by coaxial pivots and angularly inclined toward each other at their top ends, laterally spaced vertical side plates rigidly secured one to the top end of each leg, a third tower leg pivoted at its top end to said side plates and supported on said base, a box-shaped head frame rigidly secured between said side plates and having a vertical opening in its upper end, a transverse casing sheave shaft journaled in the lower end of said frame, resilient cushioning means in said opening, and a crown pulley support slidably mounted in said opening and resting on said cushion.

2. In a spudding tower having three legs forming a tripod, and a base, two of said legs being pivotally connected to the base on coaxial pivots, a vertically extending box head frame rigidly secured to the top ends of said two legs, means pivotally connecting the top end of the third leg to said head frame, said head frame having an open socket at its upper end, a transverse casing sheave shaft journaled in the lower end of said frame, resilient cushioning means in said socket, and a crown pulley support slidably mounted in said socket and resting on said cushion.

3. In a spudding tower having three legs forming a tripod, and a base, two of said legs being pivotally connected to the base on axially aligned pivots, laterally spaced vertical side plates rigidly secured one to the top of each of said two legs, means pivotally connecting the top of the third leg between said side plates at one side of the other legs, a vertically extending box frame rigidly secured between said side plates and having an open socket at its upper end, a transverse casing sheave shaft journaled in the lower end of said frame, resilient cushioning means in the lower end of said socket, and a crown pulley support slidably mounted in said socket and resting on said cushioning means.

4. In a spudding tower having three legs forming a tripod, and a base, two of said legs being pivotally connected to the base on axially aligned pivots, laterally spaced vertical side plates rigidly secured one to the top of each of said two legs, means pivotally connecting the top of the third leg between said side plates at one side of the other legs, a vertically extending box frame rigid-

ly secured between said side plates and having an open socket at its upper end, resilient cushioning means in the lower end of said socket, a crown pulley support slidably mounted in said socket and resting on said cushioning means, and external means connecting said pulley support and said box frame for limiting upward movement of said pulley support.

5. In a spudding tower having three legs forming a tripod, and a base, two of said legs being pivotally connected to the base on coaxial pivots, a vertically extending box head frame rigidly secured to the top ends of said two legs, means pivotally connecting the top end of the third leg to said head frame, said head frame having an

open socket at its upper end, resilient cushioning means in said socket, and a crown pulley support slidably mounted in said socket and resting on said cushion.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,186,720	Edwards	Jan. 9, 1940
2,316,304	Wilson	Apr. 13, 1943
2,482,114	Nixon	Sept. 20, 1949