Dec. 7, 1943. J. P. SELBERG ET AL 2,336,305

PORTABLE DERRICK

Filed Jan. 27, 1941 3 Sheets-Sheet 1

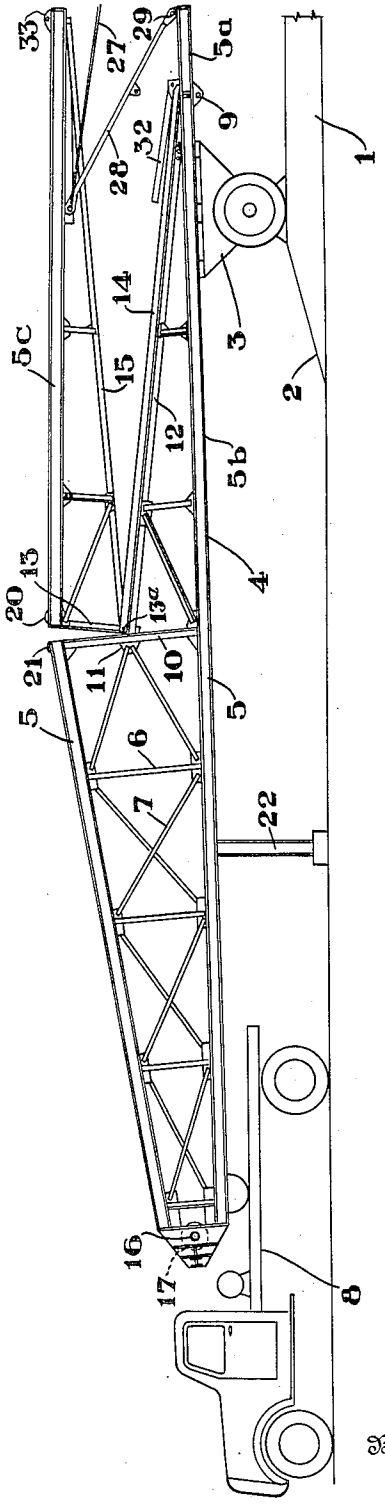


FIG. 1.

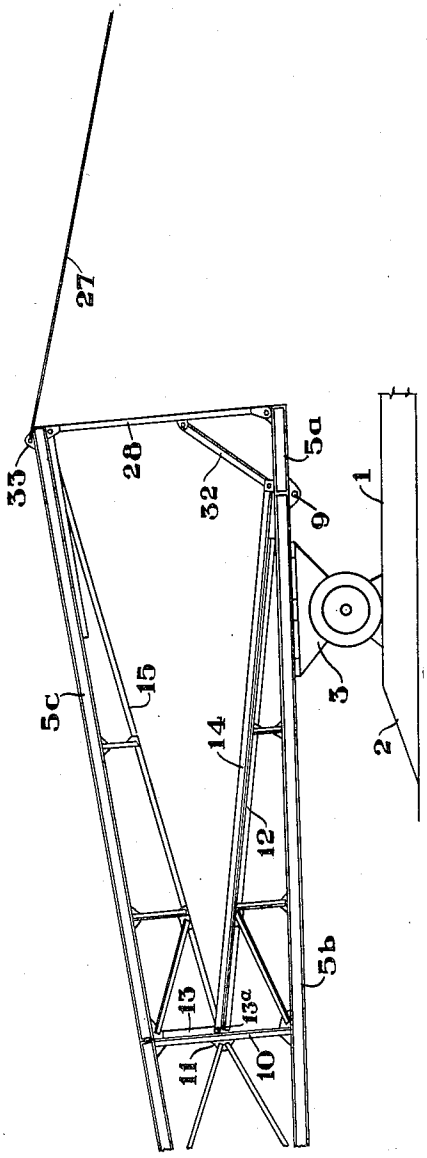


FIG. 3.

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PORTABLE DERRICK

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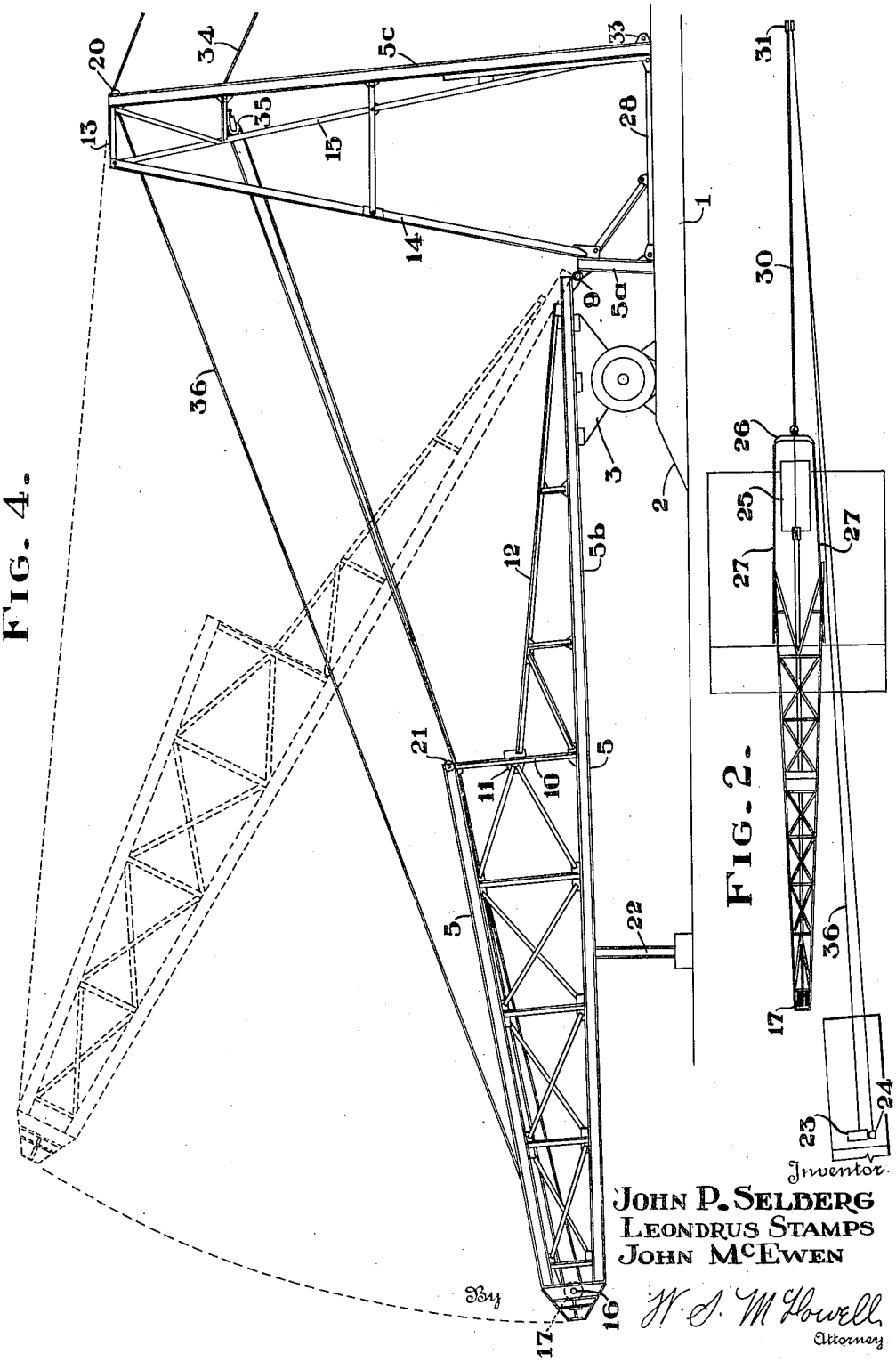


FIG. 4.

FIG. 2.

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FIG. 5.

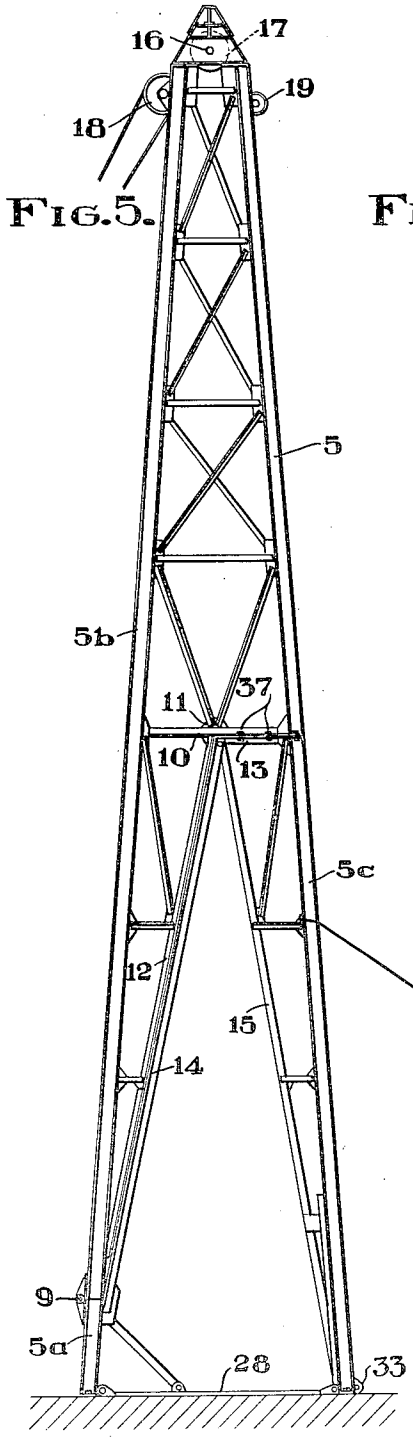


FIG. 6.

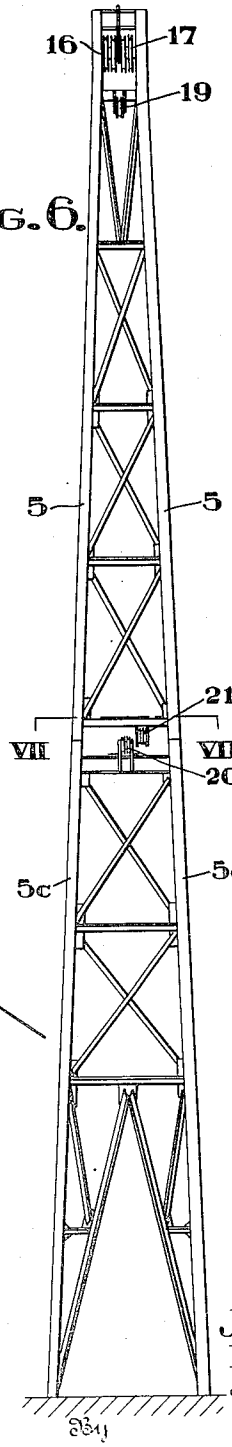
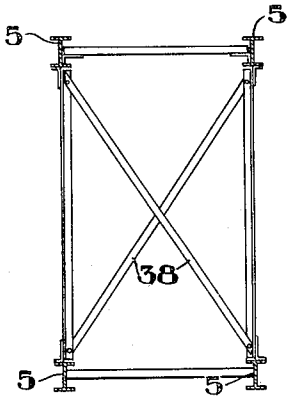


FIG. 7.



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2,336,305

PORTABLE DERRICK

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Application January 27, 1941, Serial No. 376,126

5 Claims. (Cl. 189—15)

This invention relates to oil well drilling and pumping equipment and is particularly directed to derrick means of the type employed in drilling test wells and shallow wells and for pulling tubing, casing and rods from previously drilled wells. In derricks of this type, it is desirable to employ a structure which may be substantially completely assembled while in a prone or horizontal state and then moved to an erect or upright position adjacent to a well bore or the site of a prospective bore. It is also desirable to so form the derricks that they may be quickly and easily transported from place to place with a minimum expenditure of time and effort and without use of excessive special or extraneous equipment.

One of the main objects of the present invention resides in the provision of a derrick which will possess all the desirable features above mentioned and in addition will be rigid and strong when set up for active operation.

Another object resides in the formation of a portable derrick which will be composed of a pair of sections hingedly connected whereby each of the sections may be employed to facilitate the operation of raising and lowering the other section.

A further object resides in the provision of a transportable derrick which is rockable between a prone transporting position and an upright working position, and wherein the lower part of the frame is inwardly recessed for the reception and coaction of an independently movable supplemental leg extension, and wherein provision is made for pivotally uniting contiguous portions of the derrick frame and supplemental leg extension for the purpose of providing a common fulcrum point about which both the derrick frame and the supplemental leg extension may be rocked bodily.

A still further object resides in forming the supplemental leg extension to include inner and outer rail members which are pivotally united with each other contiguous to their upper ends, spreader means being provided in conjunction with the lower ends of the inner and outer rail members to maintain the latter in an expanded state while the supplemental leg extension occupies its upright position, and in a partially collapsed state when said supplemental leg extension is lowered to a prone position, whereby to permit the overall height of the base of the supplemental leg extension to be reduced for convenience in transportation.

Other objects will be made apparent by the following description and the accompanying drawings in which the invention has been illustrated in one desirable form.

In the drawings:

Fig. 1 is a side elevational view of a portable derrick formed in accordance with the present invention, showing the same located adjacent to a well bore prior to being moved from the prone position shown to an upright working position;

Fig. 2 is a plan view of the derrick shown in Fig. 1;

Fig. 3 is a partial side elevational view showing the supplemental leg extension of the derrick in its fully expanded position prior to the raising of the supplemental leg extension to its upright position;

Fig. 4 is a similar view showing the derrick with the supplemental leg extension in an upright position, the main frame of the derrick being shown in a prone position in full lines and in a partially elevated position in dotted lines;

Fig. 5 is a side elevational view showing the derrick assembled in an upright position;

Fig. 6 is a front elevational view of the derrick in the position shown in Fig. 5;

Fig. 7 is a detail horizontal sectional view taken on the plane indicated by the line VII—VII of Fig. 6.

Referring more particularly to the drawings, the numeral 1 designates a foundation which is adjacent to the location of a well bore. This foundation may be formed of concrete, timbers, prefabricated structural steel members or any other suitable material. At one side, the foundation has an inclined ramp 2, by means of which a wheeled dolly 3 may be moved onto the foundation. The dolly supports one end of the derrick 4 when the latter is in its prone position. This dolly may be suitably secured to the derrick to prevent displacement of the latter when it is being transported from one well to another. The derrick 4 is formed from structural members and includes corner legs 5 and girt and truss braces 6 and 7 welded or otherwise connected to produce a pyramidal structure. When the structure is disposed in a prone position, as illustrated in Fig. 1, the smaller upper end of the structure may be supported on the bed of a truck 8 which cooperates with the dolly to transport the derrick between well locations.

In the present instance, the pyramidal frame structure of the derrick has four sides and the corner legs are divided intermediate of their ends to produce upper and lower derrick sections having leg portions of unequal length on opposite

sides. The legs at one side are divided substantially midway of their length while the legs at the opposite side are divided in relatively close proximity to the lower end of the structure. This arrangement provides the upper derrick section with long leg portions which are disposed on the lower side of the derrick when it is in a prone position. It will be noted from Fig. 1 that the dolly 3 is disposed under the longer leg portions of the upper derrick sections and adjacent to the lower or rear ends when the derrick is adjusted for transportation. By dividing the legs as set forth, the lower derrick section has long and short leg portions at opposite sides. The shorter leg portions are on the under side when the derrick is in the position shown in Fig. 1.

These shorter leg portions, designated by the numeral 5*a*, are connected with the longer leg portions 5*b* of the upper derrick section by hinge means 9 which permits pivotal movement between the derrick sections. The girt braces 10 on the upper derrick section in registration with the lower ends of the shorter legs are provided at their central portions with gusset plates 11 for the reception of the upper ends of inner angular brace rails 12, the opposite ends of these members being connected with the lower ends of the leg portions 5*b*. Short braces extend between the angular rails and the leg portions 5*b* to hold the rails in proper position. The lower derrick section, which forms a supplemental leg extension, has top bar means 13 connected at one end with the upper ends of the longer leg portions 5*c*. These bars extend transversely relative to the derrick and their outer ends are pivotally secured as at 13*a* to the upper ends of diagonal braces 14, the lower ends of which are rigidly secured to the upper ends of the leg portions 5*a*. Inclined braces 15 are rigidly secured to the outer ends of the top bars 13 and are connected at their opposite ends with the lower portions of the legs 5*c*. Additional braces extend between the members 5*c* and 15 to form a wedge-shaped brace which is inverted when the lower derrick section is in an upright position.

When the derrick is assembled and the upper and lower sections are in their proper positions, the top brace 13 of the lower section will be side by side with the girt 10 and the diagonal brace 14 will be in the same relation with the angular rail 12. Suitable removable securing means may extend through the portions 10, 12, 13 and 14 to maintain the derrick sections in their assembled relation. As illustrated in Fig. 1, when the derrick is adjusted for transportation, the wedge-shaped section of the lower portion of the derrick may be adjusted to position the lower ends of the legs 5c in closer proximity to the lower ends of the legs 5*a* than when the derrick is set up for operation. Through this provision, the height of the derrick may be decreased to prevent interference with bridges or other underpasses which the device may pass through during transportation.

The upper ends of the corner legs are connected by transversely extending members which form the support for one or more transversely extending pivots 16 upon which suitable sheave wheels 17 are journaled to form the crown block. Other sheaves 18 and 19 may be carried by the upper end of the derrick to receive cables used in elevating equipment when the derrick is operatively positioned and for raising or lowering the derrick during its adjustment. The upper and lower ends of the lower and upper derrick sections respectively may be provided with pulleys 20 and 21 to receive the cables used in elevating and lowering the derrick.

In the operation of the device, the derrick is maneuvered to position the dolly on the foundation 1 as disclosed in Fig. 1. Suitable jacks are inserted between the smaller end of the derrick and the truck bed and these jacks are adjusted to raise the derrick a slight distance relative to the truck. Blocks or extending jacks of screw or telescoping hydraulic type 22 are positioned between the ground and the upper derrick portion so that the truck can be withdrawn from under the derrick and moved to a position at one side thereof as illustrated in Fig. 2. The truck is provided with a power driven winch 23 upon which one or more cables may be wound. This winch also has a cathead 24 to receive another cable. Ordinarily, the derrick forming the subject matter of this invention is employed around wells previously drilled and when the derrick is moved to a well, pumping or other equipment 25 is usually mounted on the foundation adjacent to the well bore. It therefore becomes desirable to employ a bridle bar 26 so that cables 27 connected to the ends thereof will be disposed at the sides of the pumping mechanism 25. The free ends of the cables 27 are connected with the upper ends of brace rods 28 which are pivoted at their lower ends as at 29 to the ends of the legs 5*a*. The upper ends of the rods are disposed in guides carried by the legs 5*c* so that when power is applied to the bridle bar 26 by means of a cable 30 extending around a pulley 31 and to the cathead 24, the bars 28 will move in the guides and swing the wedge-shaped portion of the lower derrick section to the position shown in Fig. 3. At this time, the upper ends of the braces 28 may be bolted to the lower ends of the legs 5*c*. Supplemental braces 32 are then swung from the position shown in Fig. 1 to that shown in Fig. 3 wherein the ends are connected with the upper portion of the legs 5*a* and the intermediate portions of the braces 28.

During the operation of raising the wedge-shaped portion, the members 12 and 14 are secured in their side by side relation. After the braces 28 and 32 have been secured in the position shown in Fig. 3, the bolts or other securing elements extending through members 12 and 14 are removed and the lines 27 are connected with stationary eyes 33 on the members 5*c*. A cable 36 connected with the winch 23 is passed around a second pulley at 31 and trained over the pulley 20 on the lower derrick section, the cable 36 then extending around a sheave of the crown block or a separate pulley block removably secured to the upper end of the upper section near the crown block and through the derrick to a snatch block 35 connected with the lower derrick section. This cable may extend around as many pulleys in the snatch block and the crown or separate pulley block as may be necessary to provide the proper power to elevate the derrick. By providing a separate pulley block, the line 36 may be carried strung up at all times and crown sheaves will be left free to be permanently reeved with the traveling block line. Since this eliminates special reeving operations at each well bore, it saves a great deal of time in erecting the derrick. The free end of the cable 36 is connected with the upper portion of the upper derrick section. Power may

then be applied to the cathead to wind the cable 30 thereon. The movement of the cable will swing the lower derrick section around the axis of the hinge 9 from the position shown in Fig. 3 to the upright position shown in Fig. 4. The lower ends of the legs 5a and 5c will rest on the foundation and may be rigidly secured thereto through any suitable means.

During the movement of the lower derrick section to the upright position, cable 36 will be drawn from the winch and the rotation of the latter controlled to snub the movement of the derrick section. Guy wires 34 are secured to the upper portions of the legs 5c and anchor means, not shown, inserted into the earth in spaced relation from the derrick and on the same side thereof as the legs 5c. These guy wires assist in holding the lower derrick section in its upright position during the operation of raising the upper or main derrick section. After the lower derrick section has been so secured, power may be introduced to the winch to wind the cable 36 thereon. This movement will shorten the effective length of the cable and result in swinging the upper derrick section from its prone position to an upright position as indicated in Fig. 5. Prior to moving the upper derrick section, the means, if any, employed to secure the dolly to the derrick may be disconnected so that the dolly may be removed after the derrick section has been lifted therefrom.

It will be noted at this point that when the derrick is in a prone position, the upper section thereof supports the lower section for pivotal movement from the prone position to the elevated or upright position, then the latter section serves as a support for the pivotal movement of the upper section from the prone to the upright position. Neither of the derrick sections are pivotally connected with the foundation. This feature is important since it is not necessary to employ any special kind of material for the foundation and it will not have to be transported at the same time or with the derrick.

Prior to swinging the upper derrick section to its upright position, the cable 30 may be disconnected from the bridle and passed around the sheave 18, the free end of the cable being dead ended to the truck. This cable is wound on the cathead and when the upper derrick section is being elevated, the rotation of the cathead may be controlled to snub the movement of the upper derrick section. During part of the upward movement of the upper section, the cables between the crown block and the snatch block 35 will engage the pulley 21 to prevent injury to the cables or the various derrick braces. When the upper derrick section has been completely elevated to the upright position shown in Fig. 6, it may be secured in this position by inserting bolts 37 in registering openings provided in the girts 10 and top bars 13.

As illustrated in Fig. 7, cross bracing 38 is employed in the upper derrick section to reenforce the various elements during transportation and elevation. These cross braces are removed after the elements 37 have been inserted and tightened. The derrick may be lowered to its transporting position by reversing the above process.

In view of the foregoing, it will be seen that the present invention provides a readily transportable derrick structure which may be conveniently moved from one working location to another. The derrick comprises essentially the main frame of pyramidal form which has the lower portion thereof inwardly recessed or open at one side for coaction with the partially collapsible supplemental leg extension. This supplemental leg extension is adapted to be received within the recessed open side of the main derrick frame when the latter is elevated to assume its working position, the supplemental leg extension constituting under such conditions a symmetrical continuation and in effect a structural part of the derrick proper. The longer corner rails 5b of the derrick frame are pivotally united as at 9 with the rails 5a and 14 of the supplemental leg extension so that the pivotal axis 9 serves to permit of bodily independent swinging movement of both the supplemental leg extension and the main derrick frame between prone and upright positions.

Another feature of advantage resides in pivotally uniting the rails 14 as at 13a with the upper portion of the structure constituting the supplemental leg extension, whereby when the latter is undergoing transportation, the same may be partially collapsed, as illustrated in Fig. 1 to diminish the overall height of the base end of the derrick. When the supplemental leg extension is erect or in its working position, the spreader rails 28 function to maintain the rails 5a and 5c of the supplemental leg extension in their fully expanded state, thus maintaining the same against relative movement.

What is claimed is:

1. In a portable derrick, a structure having upper and lower sections with opposite sides of unequal length, hinge means connecting the longer side of the upper section to the shorter side of the lower section for relative swinging movement, means for supporting said structure in a prone position with the hingedly connected side of said sections downward, additional hinge means between the longer and shorter sides of said lower section to permit relative movement therebetween, and means disposed between the longer and shorter sides of said lower section to effect movement of one thereof whereby the distance therebetween may be varied while said structure is in a prone position.

2. A portable derrick comprising a rigid substantially pyramidal frame composed of united structural members, said frame being adapted for bodily swinging movement between a prone transporting position and an upright working position, one side of said frame through a substantial portion of its height being inwardly recessed, the upper part of said recess being disposed in a substantially horizontal plane and extending from one side of said frame to approximately its center, the sides of said recess occupying a plane disposed at an acute angle with respect to the vertical and extending from the inner portion of the horizontal plane of said recess to the lower end of the frame, said recess providing on one side of said frame a rigid leg extension, the sides of which are triangular in elevation with the apices thereof located at the lower end of the frame, a supplemental leg extension adapted for bodily movement between prone and upright positions independently of said frame, said supplemental leg extension being adapted to occupy the recess of said frame, the upper part of said supplemental leg extension terminating in a frustrum upon which the horizontal upper part of the recessed upper portion of said frame seats, the inner sides of said supplemental leg extension being acutely angled

for parallel engagement with the correspondingly angled sides of said rigid leg extension, means providing a single pivoting axis about which both the derrick frame and said supplemental leg extension are rockable bodily between prone and upright positions, and hoist operated cable means cooperative with said frame and supplemental leg extension for first moving the latter from a prone to an upright position about said pivotal axis and thereafter coacting with said supplemental leg extension to swing the derrick frame about said axis from a prone to an upright position.

3. A portable derrick comprising a rigid substantially pyramidal frame composed of united structural members, said frame being bodily movable between a prone transporting position and an upright working position, one side of said frame through a substantial portion of its height being inwardly recessed to produce on the outer side of the frame a rigid leg extension, a supplemental leg extension adapted to occupy the recess of said frame in complemental relationship with said rigid leg extension, said supplemental leg extension being movable independently of said derrick frame between a prone transporting position and an upright working position, and means providing a common axis about which both the derrick frame and the supplemental leg extension are rocked when moving between prone and upright positions.

4. A portable derrick comprising a rigid substantially pyramidal frame composed of united structural members, said frame being bodily movable between a prone transporting position and an upright working position, one side of said frame through a substantial portion of its height being inwardly recessed to provide on the opposite side of the frame a rigid depending leg extension, a supplemental leg extension adapted to occupy said recess in complemental relationship to said rigid leg extension, said supplemental leg extension being movable independently of said derrick frame between a prone transporting position and an upright working position, pivotal means uniting the lower end of the rigid leg extension of said frame with the adjoining lower end of said supplemental leg extension, said means providing a common axis about which both the derrick frame and the supplemental leg extension may be rocked bodily when moving between prone and upright positions, and means for partially collapsing said supplemental leg extension when the same occupies a prone position to diminish the base width thereof.

5. A portable derrick comprising a rigid substantially pyramidal frame composed of united structural members, said frame being bodily movable between a prone transporting position and an upright working position, one side of said frame through a substantial portion of its height being inwardly recessed, the sides of said recess occupying a plane disposed at an acute angle with respect to the vertical and forming on one side of said frame a depending rigid leg extension coextensive with the height of the recess, a supplemental leg extension adapted to occupy the recess of said frame in complemental relationship with said rigid leg extension, said supplemental leg extension being movable between a prone transporting position and an upright working position independently of said derrick frame, said supplemental leg extension being formed with inner and outer relatively movable side-forming rails, the inner of said rails being engageable with the acutely angled inner portions of the rigid leg extension of said frame, adjustable spreader means for maintaining the movable inner and outer rails of said supplemental leg extension in expanded relationship when said supplemental leg extension occupies its upright position and in relatively collapsed relationship when said supplemental leg extension occupies its prone position, and a single pivotal means uniting the lower end of the rigid leg extension of said frame with adjoining lower end portions of said supplemental leg extension, said pivotal means providing an axis about which both the derrick frame and the supplemental leg extension are rockable between prone and upright positions.

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