

June 18, 1940.

C. WHITE, JR  
PORTABLE DERRICK  
Filed May 20, 1939

2,204,713

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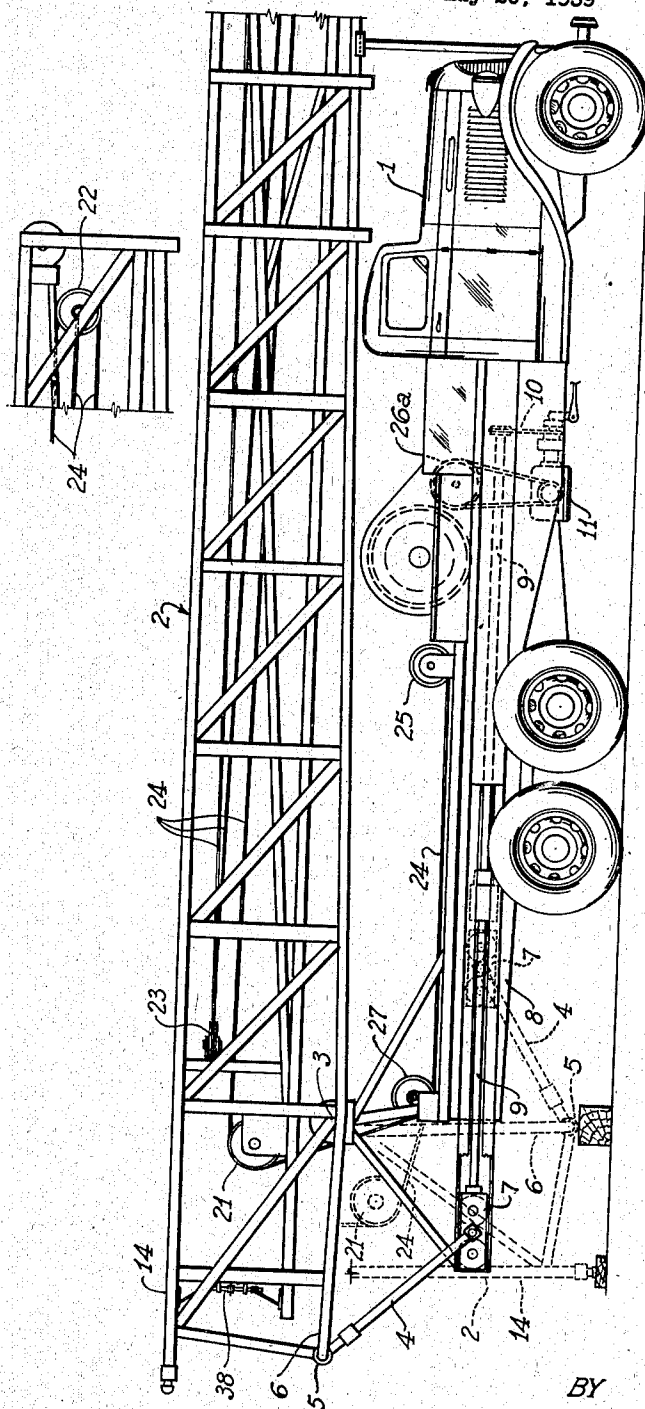


FIGURE 1

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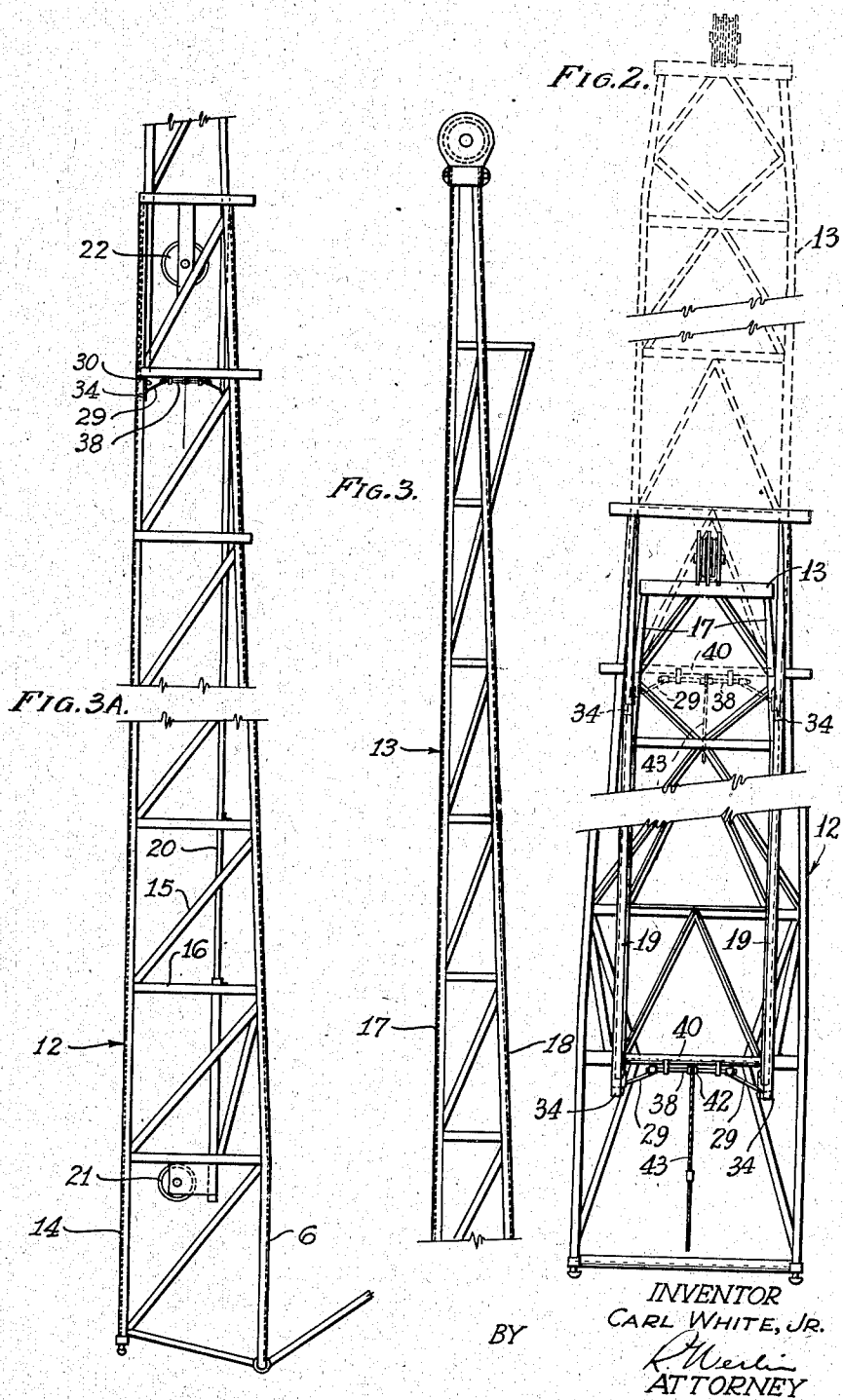
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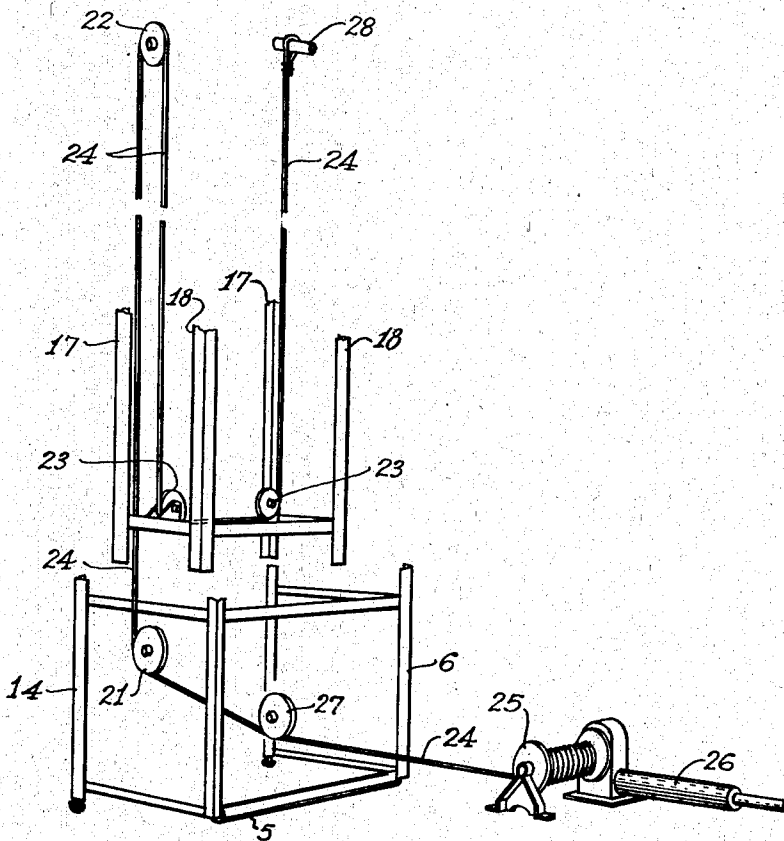


FIGURE 4

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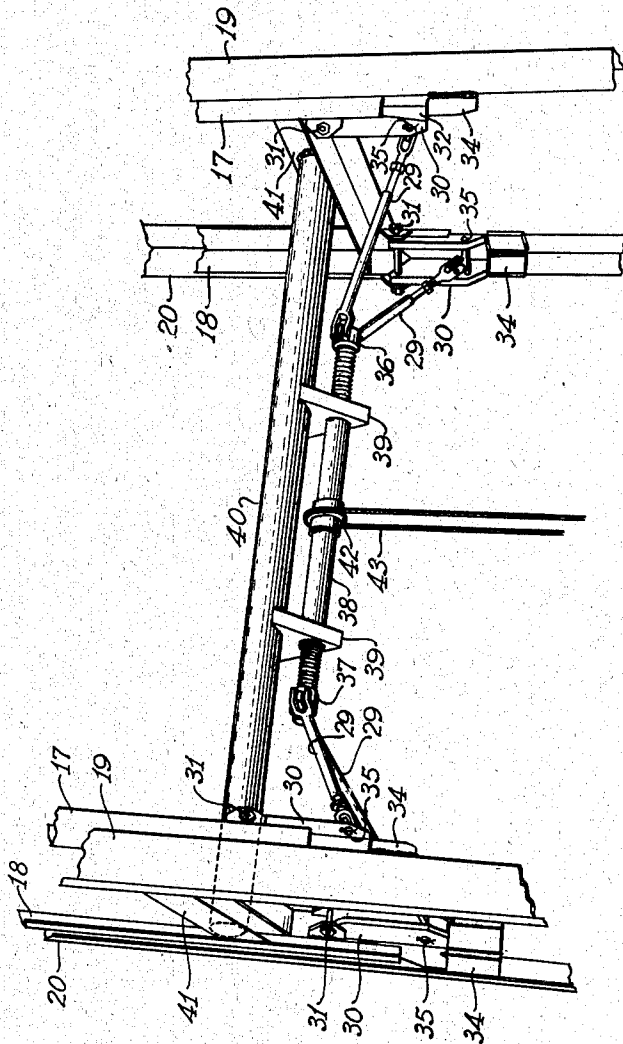


FIGURE 5

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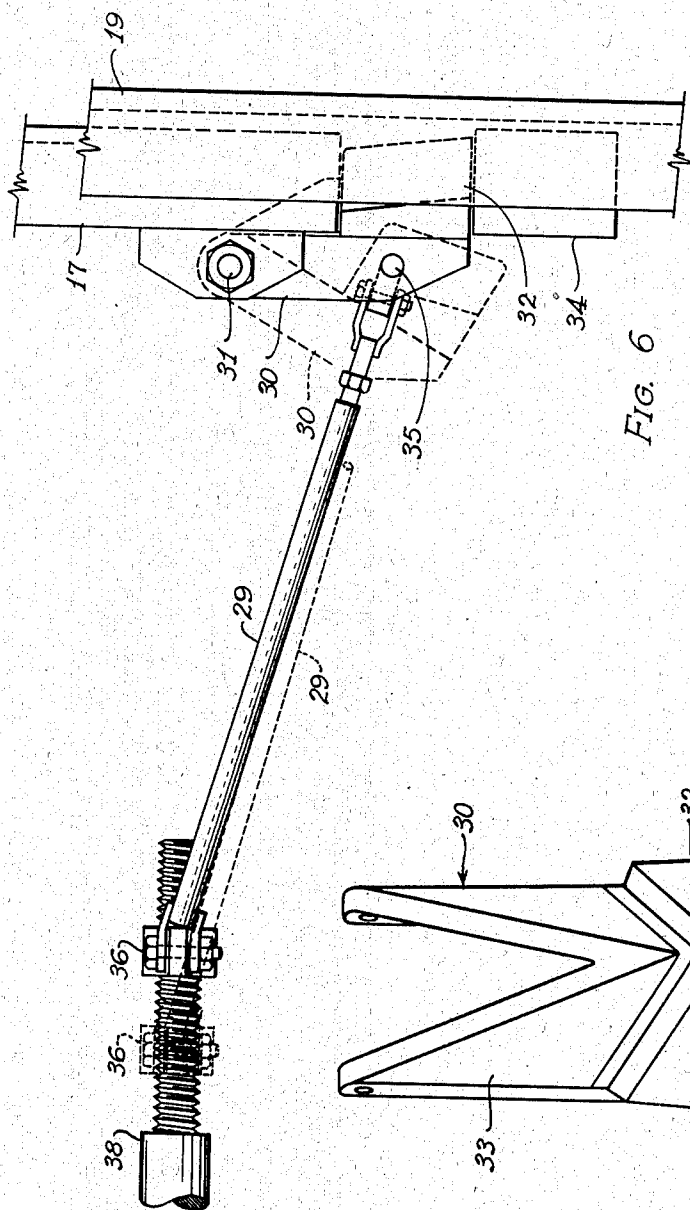
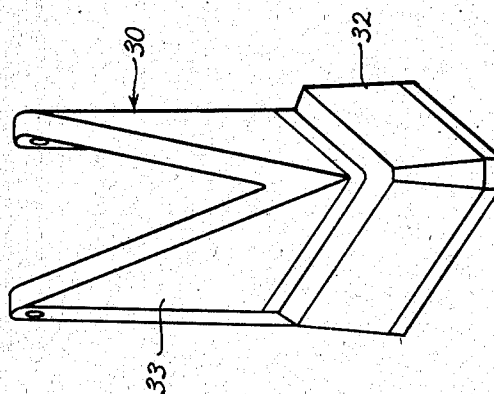
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## UNITED STATES PATENT OFFICE

2,204,713

## PORTABLE DERRICK

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Application May 20, 1939, Serial No. 274,745

3 Claims. (Cl. 189—11)

This invention relates to a portable derrick mast, for use, particularly, with a portable drilling apparatus.

The principal object of this invention is to provide a portable derrick structure comprised of telescoping sections, adapted particularly for use with portable drilling rigs.

Another object is the provision of a portable derrick structure comprising a base section pivotally mounted on a mobile base, an upper section telescopically arranged in said base section, and having a novel form of latching means for locking the upper section in extended position on said base section.

Still another object is the provision of a telescoping derrick structure mounted on a mobile base, carrying power operated means for raising and lowering the structure and for extending and retracting the telescoping sections thereof.

A further object is to provide a portable derrick structure for use with portable drilling rigs, said derrick structure being of sufficiently large dimensions required for drilling of deep wells but adapted to be telescoped into a structure of reduced dimensions suitable for transporting on a truck.

An additional object is the provision of a portable derrick structure for portable drilling rigs which is mounted on a truck and adapted to be easily and quickly raised and lowered as required for operating or transport.

Other important objects and advantages of this invention will be readily apparent from the following detailed description when read in conjunction with the accompanying drawings which show a preferred embodiment thereof.

In the drawings:

Fig. 1 is a side view of a truck on which is mounted the derrick structure of this invention, showing in dotted lines the lowermost portion of the derrick structure in vertical position and in full lines the power mechanism for raising and lowering the structure, and the derrick structure in transport position with the sections thereof telescoped together.

Fig. 2 is a front view of the derrick structure in vertical position showing in full lines the sections telescoped together, and in dotted lines the extended position of the upper section.

Fig. 3 is a side view of a portion of the upper section of the derrick structure.

Fig. 3a is a side view of the lower section of the derrick structure.

Fig. 4 is a schematic view showing the mechanism for extending and retracting the upper section of the derrick structure.

Fig. 5 is a perspective view of the latch mechanism for locking the telescoping derrick section together.

Fig. 6 is a detail of the latch mechanism showing in full lines one of the locking pawls in locking position and in dotted lines the position of the pawl when the derrick sections are released from each other to permit telescoping thereof, and

Fig. 7 is a view in perspective showing the outer face of one of the locking pawls.

Referring to the drawings, particularly Fig. 1, a motor truck 1 is shown in side view on which is mounted the derrick structure of this invention, designated generally by the numeral 2.

The lowermost portion of the derrick in vertical operating position is shown in dotted lines, while the entire structure is shown in horizontal transport position in full lines. The derrick structure is pivotally movable between transport and vertical operating position about shaft 3, rotatably supported from the truck frame, and is movable thereon by means of a pitman 4, one end of which is rotatively attached to a horizontal pivot bar 5, extending between the lowermost extremities of the rear legs 6 of the derrick and the other end journaled in a cross head 7, which is longitudinally movable in the channels of the side member 8 of the truck frame. The cross head 7, is driven by means of a power operated screw 9, also mounted in the channel of the side member 8 and connected by means of a chain drive 10 to a power take-off 11 operated from the truck transmission, not shown. By driving the cross-head 7 toward the rear of the truck frame, thrust is applied by means of pitman 4 to the pivot bar 5 and rotates the derrick 1 about shaft 3, thereby lowering the derrick to the transport position shown in full lines in Fig. 1.

The described mechanism for pivotally moving a truck-mounted derrick between transport and vertical operating positions is described in greater detail in the co-pending application of W. B. Woody, Serial No. 194,155, filed March 5, 1938.

The derrick structure of this invention consists of a base section, designated generally by the numeral 12 and an upper section, designated generally 13, which is adapted to telescope with the base section.

The base section is composed of rear legs 14 and front legs 15 forming the corner posts of the derrick and constructed of angle-iron, the included angles of which face inwardly toward the

center of the derrick structure.

The upper section 13 is composed of rear legs 16 and front legs 17 forming the corner posts of the upper section and constructed of angle-iron, the included angles of which face inwardly toward the center of the derrick structure.

The upper section 13 is adapted to telescope with the base section 12 by means of a latch mechanism 18 for locking the sections together.

The latch mechanism 18 is shown in perspective view in Fig. 5 and in detail in Fig. 6. It comprises a locking pawl 19 which is adapted to engage a notch 20 in the upper section 13 when the sections are to be locked together.

The pawl 19 is shown in full lines in Fig. 6 in locking position and in dotted lines in Fig. 6 in the position of the pawl when the derrick sections are released from each other to permit telescoping thereof.

The pawl 19 is pivoted at its upper end to a bracket 21 which is mounted on the upper section 13. The lower end of the pawl 19 is adapted to engage the notch 20 in the upper section 13.

The pawl 19 is held in locking position by means of a spring 22 which is connected to the bracket 21 and the pawl 19.

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the center of the derrick structure, and suitably braced by means of cross-and-angle-bracing members 15-16 extending between the legs on the same sides of the derrick.

- 5 The horizontal section of base section 12 is generally a rectangle, the side dimensions of which progressively decrease toward the top of the base section.

The upper section 13, the upper end of which carries the usual crown block and pulleys for rigging the lines which support the well pipe and drilling tools, is also generally rectangular in horizontal section, being somewhat smaller in base dimensions than the upper end of base section 12. Upper section 13 is also composed of angle-iron corner legs, the rear legs being numbered 18 and the front legs 17, which are suitably cross- and angle-braced in the same manner as base section 12.

- 20 Rigidly positioned within base section 12, are longitudinally extending front and rear pairs of guide rails 19 and 20, respectively (Figs. 2 and 3), constructed of angle-iron and forming a hollow rectangular structure of uniform side dimensions from top to bottom, which are sufficiently greater than the lower end of upper section 13 to receive the corner legs 17 and 18 thereof in loose fitting sliding engagement within the corresponding rails 19 and 20. Guide rails 19 and 20 extend 25 longitudinally from the upper end of base section 12 to a point therein just short of the lower end of the base section. Thus, when upper section 13 is extended or retracted relative to the base section, it slides inside the guide frame 30 formed by the pairs of guide rails 19 and 20. The clearance between legs 17 and 18 and rails 19 and 20 is sufficient to allow the former to clear lugs 34 attached to the latter for purposes to be described hereinafter.

- 40 Upper section 13 is extended or retracted relative to the base section 12 by means of a pulley and cable arrangement illustrated schematically in Fig. 4, from which guide rails 19 and 20 are removed for purposes of clarity. The arrangement consists of a pulley 21 journaled in one side of base section 12 but near the lower end thereof, a second pulley 22 journaled in the same side of base section 12 but near the top thereof, and a pair of pulleys 23-23 is positioned on opposite sides of the lower end of upper section 13. A cable 24 is wound on a winch 25 which is driven by a shaft 26 connected by means of a chain drive 26a to the power take-off 11, and is threaded first through a guide pulley 27, located outside the derrick structure, then under pulley 21, over pulley 22, under both pulleys 23-23, and the free end thereof is then attached to a dead end connection 28 firmly affixed to the upper end of base section 12 on the side opposite pulley 22. Thus, with upper section 13 in the retracted position within base section 12, by pull applied to cable 24, the upper section is hoisted upwardly within base section 12 along guide rails 19 and 20 until the lower end thereof is at the desired position near the top of base section 12 where it is locked in place on lugs 34 by means of a latch mechanism to be described in detail hereinafter. When it is desired to retract the upper section, the latch 65 mechanism is released and the cable slacked gradually to allow the upper section to retract slowly into the base.

For purposes of locking the sections of the derrick structure together when in the extended position use is made of a novel form of latch mech-

anism shown particularly in Figs. 5, 6, and 7, which may be described as follows:

The lower end of each of the legs 17 and 18 is provided with a pawl 30, hingedly attached thereto by a hinge pin 31, pawl 30 is a hollow generally angular member, preferably of cast steel, provided about its lower edge with a projecting angular shoe 32 which is adapted to be received within the angle of the corresponding guide rail 19 or 20. The shank 33 of each pawl is also angular in shape but has narrower sides than the shoe 32. The side dimensions of shank 33 are such as to allow the shank to fit snugly within the angle of one of the legs 17 or 18. The shank 33 is hingedly attached by means of hinge pin 31 to its corresponding leg 17 or 18 so as to swing inwardly toward the center of section 13. When the pawl is snugly in place in the leg angle the lower end of the corresponding leg will rest upon the upper face of shoe 32 which is, in turn, received upon the upper face of an angular lug 34 which is firmly attached, as by welding, to the inner faces of the sides of the corresponding corner rail 19 or 20 and thus locks the upper section 13 against downward movement in base section 12.

The pawls 30 are swung in or out of locking position simultaneously by means of toggles 29 each one of which has one end hingedly attached by means of a hinge pin 35 to lower end of the corresponding pawl, the toggle entering in the space between the sides of the pawl and being held there by means of the hinge pin 35. The opposite ends of one pair of toggles 29 are pivotally attached to a winged nut 36 and the opposite ends of the other pair of toggles are attached to a winged nut 37. The winged nuts 36 and 37 are threadedly attached to the opposite ends of an elongated rod 38, the ends being threaded oppositely to each other so that when the rod is turned in one direction, the winged nuts 36 and 37 will move toward the opposite ends of the rod 38 and so actuate the toggles to move toward the legs 17 and 18 and push the attached pawls into the locking position. Turning the rod 38 in the reverse direction will cause the toggles to pull the pawls out of locking position on lugs 34 and so allow the upper section 13 to clear lugs 34 and permit telescoping the upper section within base section 12. Rod 38 is suspended horizontally in the lower end of upper section 13 by means of hangers 39 which are connected to a bar 40 which extends above rod 38 and parallel thereto between cross braces 41 connected at the sides of upper section 13 between the adjacent legs 17 and 18. Turning of rod 38 in either direction to move pawls 30 is accomplished by means of a sprocket 42 fixedly mounted on rod 38, at an intermediate point thereof, to which a chain 43 is connected. Chain 43 is of sufficient length to reach the floor of the derrick when the upper section 13 is in position at the top of base section 12. To pull pawls 30 inwardly of the derrick and out of locking position between the derrick section, the forward segment of chain 43 is pulled downwardly by the operator on the derrick floor. This operation rotates rod 38 in the clockwise direction causing the wing nuts 36 and 37 to be retracted on the threaded ends of the rod. To move the pawls 30 outwardly into locking position between the derrick sections, the rearward portion of chain 43 is pulled downwardly by the operator reversing the previously described movement of rod 38 and nuts 36 and 37 with their attached links and pawls. A sec-

ond set of stop lugs 34 (Fig. 2) is provided at the lower ends of rails 19 and 20 on which the lower end of upper section 13 may be lodged and locked by means of pawls 30 when the upper section is retracted within base section 12.

The above described structure is operated in the following manner: With the derrick structure in the horizontal position shown in full lines in Fig. 1, it is desired to raise the structure in preparation for drilling. Power from the truck power plant is applied through power take-off 11 to screw 9 to draw cross head 7 from its rearward position to the forward position shown in dotted lines in Fig. 1. This movement acts through pitman 4 to pull the lower end of the derrick structure downwardly and forwardly about pivot bar 3 and thus raise the mast structure to the vertical position.

Pawls 30 are then drawn inwardly of upper section 13 to clear lugs 34 by downward pull on the forward segment of chain 32 and power is applied from power take-off 11 through drive 26a, and shaft 26 to winch 25, to apply pull to cable 24 which then acts through the several pulleys 27, 21, 22 and 23—23 to lift the upper section 13 along guide rails 19—20 to the extended position. When the raising of the upper section has brought the lower end thereof above the level of lugs 34, the pawls 30 are moved into locking position between the ends of legs 17 and 18 and lugs 34 by suitable rotation of rod 38 by downward pull on the rear segment of chain 43 and when the pawls are in position above lugs 34, cable 24 is slackened sufficiently to bring the upper section firmly to rest on the lugs 34. The structure is now in position to begin drilling operations, since it is ordinarily maintained fully rigged with drilling lines, this being possible by virtue of the described construction of the derrick structure of this invention, and it is one of the important advantages thereof in saving time, trouble and expense in the moving and setting up of derricks of this class.

To prepare the derrick for transport, upper section 13 is lifted slightly by means of cable 24, the pawls 30 are withdrawn from the locking position and cable 24 slacked to allow the upper section to retract within the base section. When this movement is completed the compacted structure is then returned to the horizontal transport position by reversing the afore-described movement of cross head 7 and pitman 4.

It will be readily understood that numerous alterations and modifications may be made in the size, form and arrangement of the details of the structure of this invention, without departing from the scope of the appended claims.

What I claim and desire to secure by Letters Patent is:

1. A portable derrick structure comprising a mobile base, a derrick mounted on said base, said derrick comprising a lower section pivotally mounted on said base and movable relative thereto between transport and vertical operating positions, spaced parallel guide rails formed from angle iron, extending longitudinally within said lower section, an upper section, formed from angle iron concentrically arranged relative to said rails, retractable within said lower section and slidable therein on said guide rails, releasable latching means carried by said upper section and adapted to cooperate with stop means mounted on said guide rails for locking the upper section in extended position to said lower section, said latching means comprising pawl members hingedly at-

tached to the lower end of said upper section and adapted to be swung into and out of engagement with said stop means, each of said pawls having an angular shank portion and a base in the form of an angular shoe, the shank portion and shoe portion being adapted to seat within the angles of the legs of the upper derrick section and the guide members respectively, when the pawls are swung into engagement with said stops, means for positively moving said pawl members into and out of engagement with said stop members, means for extending and retracting said upper section relative to said lower section, and power operated means carried by said mobile base for actuating said extending and retracting means and for moving said derrick between transport and vertical operating positions relative to said base.

2. A portable derrick structure comprising a mobile base, a derrick mounted on said base comprising a lower section pivotally mounted on said base and movable relative thereto between transport and vertical operating positions, a guide frame extending longitudinally of said lower section and comprising four angle-iron rails arranged at the corners of a rectangle and having their included angles turned inwardly toward the longitudinal axis of said frame, an upper derrick section retractable in said lower section within said guide frame, said upper section being composed of four angle-iron corner legs concentrically arranged relative to said rails, a pair of lugs arranged within the angles of each of said rails, a pawl hingedly attached to the lower end of each of said corner legs, and adapted to be swung into and out of engagement with said lugs, said pawls having an angular shank portion and a base in the form of an angular shoe, the shank portion and the base portion being adapted to seat within the angles of the legs of the upper derrick section and the guide rails respectively, when the pawls are swung into engagement with the lugs, toggle means attached to said pawls, toggle actuating means carried by said upper section to simultaneously swing all of the said pawls into and out of engagement with said lugs, means for extending and retracting said upper section relative to said lower section, and power operated means carried by said mobile base for actuating said extending and retracting means and for moving said derrick between transport and vertical operating positions relative to said base.

3. A portable derrick structure comprising a mobile base, a derrick mounted on said base, said derrick comprising a lower section pivotally mounted on said base and movable relative thereto between transport and vertical operating positions, spaced parallel guide rails, formed from angle iron, extending longitudinally within said lower section, an upper section, formed from angle iron concentrically arranged relative to said rails, retractable within said lower section and slidable therein on the guide rails, releasable latching means carried by said upper section and adapted to cooperate with stop means mounted on said guide rails for locking the upper section in extended position with respect to the lower section, said latching means comprising pawl members hingedly attached to the lower end of said upper section and adapted to be swung into and out of engagement with said stop means, each of said pawls comprising an upper angular shank portion and an enlarged base portion, said base portion being adapted to fit

snugly within the angle of a guide rail between the stop means and the end of one of the legs of the upper derrick section, when the pawls are swung into engagement with the stops, means  
5 for positively moving said pawl members into and out of engagement with the stop members, means for extending and retracting said upper section

relative to said lower section, and power operated means carried by said mobile base for actuating said extending and retracting means and for moving said derrick between transport and vertical operating positions relative to said base.

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