Nov. 24, 1953 J. P. SELBERG 2,660,268

HINGED BASE FRAME FOR PORTABLE DERRICK MASTS

Filed Jan. 26, 1949 3 Sheets-Sheet 1

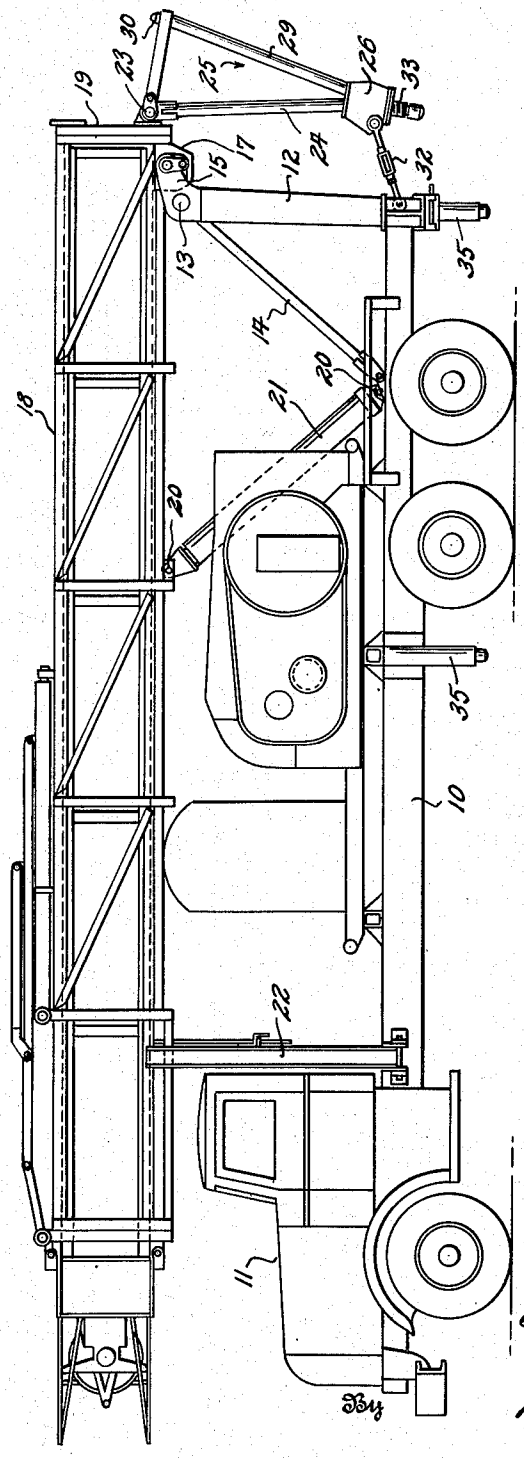


FIG. 1.

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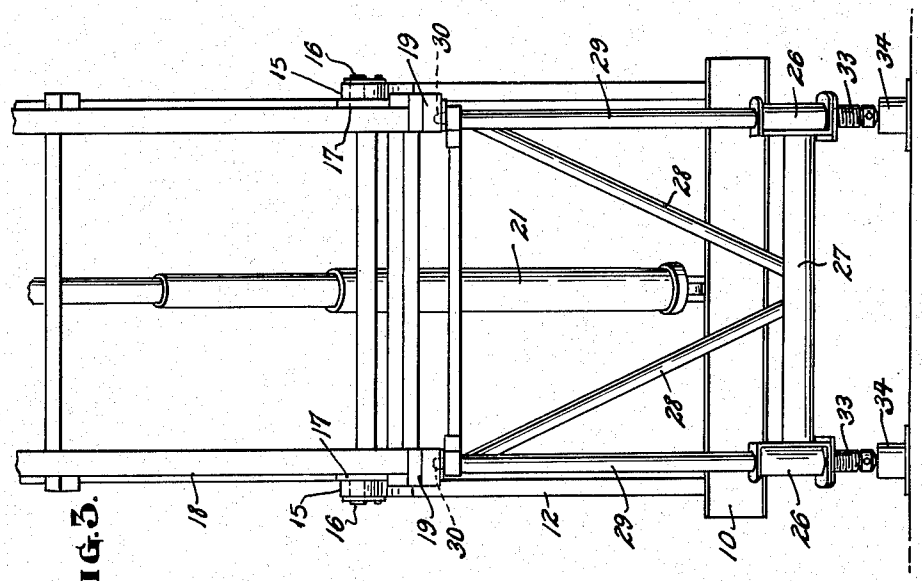


FIG. 3.

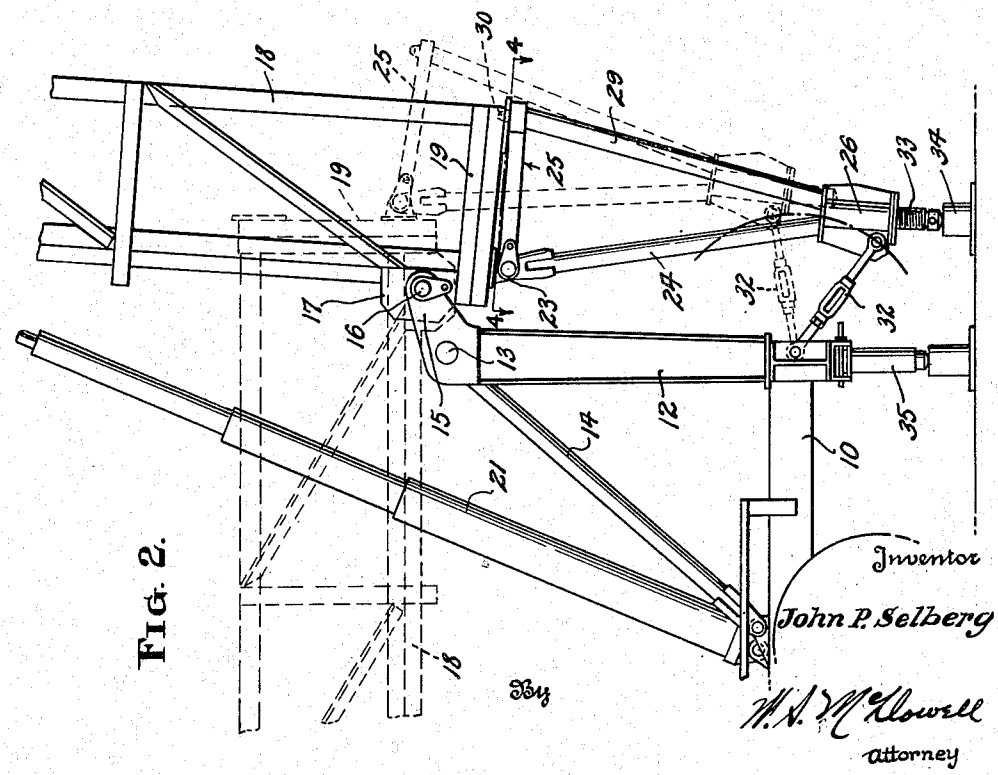


FIG. 2.

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HINGED BASE FRAME FOR PORTABLE DERRICK MASTS

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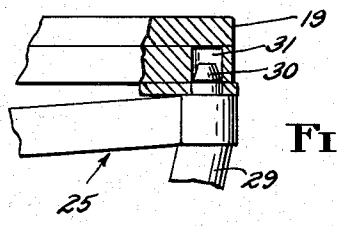


FIG. 7.

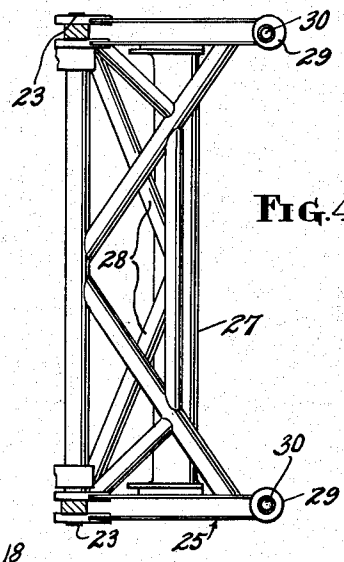


FIG. 4.

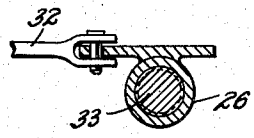


FIG. 8.

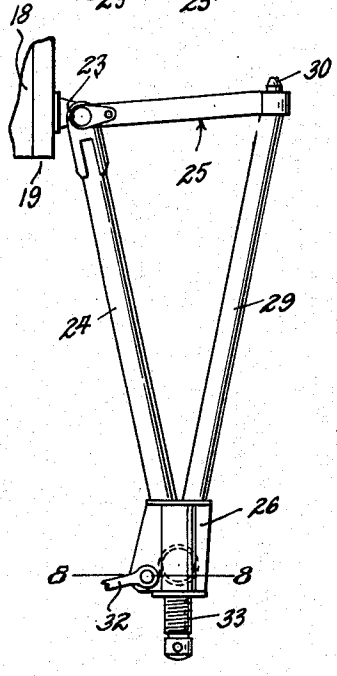


FIG. 5.

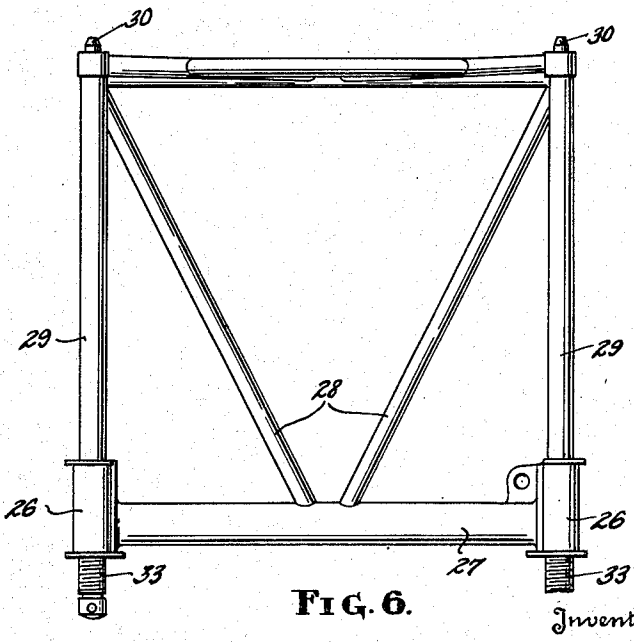


FIG. 6.

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UNITED STATES PATENT OFFICE

2,660,268

HINGED BASE FRAME FOR PORTABLE DERRICK MASTS

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Application January 26, 1949, Serial No. 72,796

6 Claims. (Cl. 189—11)

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The present invention relates generally to portable mast or derrick structures of the type utilized in well-servicing operations. More specifically, the present invention deals with an improved ground-engageable base frame which functions to support the mast structure of a portable well-servicing rig, when such mast structure occupies a substantially vertical erected position.

In the past, numerous types of portable and mobile well-servicing or derrick rigs have been used in connection with oil well operations in replacement of the usual stationary semi-permanent mast or derrick structures. Generally, such portable or mobile well-servicing rigs embody a mobile base, such as an automotive truck or trailer, a mast structure pivotally mounted upon such base for swinging movement between prone and erect positions with respect to the base, and means interposed between the mobile base and the mast structure to move the latter between its prone and erected positions. In the usual case, the mast structure of such rigs is pivotally connected with the associated base a relatively short distance from the lower end thereof, in order that the lower or base end of the mast, when the same is moved to an erect position, may be maintained in relatively closely spaced relation to the ground surface, or even in abutting engagement therewith.

It will be understood, that in erecting the mast structure of the portable rig, it is necessary to back the vehicular base or truck into position with respect to a given well site, and afterwards swing the mast structure to its erected position. In so doing, it is oftentimes necessary, due to the overhang of the lower end of the mast from its pivotal connection with the base, to partially erect or elevate the mast prior to finally ascertaining the proper position of the mobile base, for the reason that the exact desired location of the lower or base end of the mast with respect to a well site cannot always be determined until the mast structure occupies a substantially vertical or erected position, at which time the desired position of the mast with respect to a given well site may be determined.

Another difficulty with portable rigs of this type embodying mast structures which are pivotally connected with the base a distance from the base end thereof, occurs when the portable rig must be placed closely adjacent to a permanent structure, such as, a pumping station or stationary derrick which closely abuts or lies adjacent to a given well site. In attempting to erect the mast of such rigs, it is necessary to allow sufficient clearance between the base portion of the mast and such closely adjacent structures, and in so doing, the vehicle must be sequentially backed up and the mast elevated in successive stages until the foot of the mast is positioned in desired relation to the well site.

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It will be manifest, that considerable time and effort is expended in the manner prior to the actual erection of the mast and the conditioning of the same for the ultimate well-servicing operations.

Accordingly, it is the primary object of the present invention to provide a portable well-servicing or derrick rig which may be easily and quickly backed into position with respect to a given well site, the body of such rig being jacked up for ground support, and the associated mast swung to an erected position without necessitating sequential shifting of the portable base and the partial and sequential elevation of the associated mast before complete erection.

It is another object of this invention to provide a portable derrick rig having a main mast structure which is hingedly or pivotally connected with the mobile base of the rig substantially at the base or lower end thereof, and a separate base frame member hingedly mounted at the lower or base end of the mast and carried in substantially perpendicular depending relation to the mast when the latter occupies its prone position, whereby to eliminate rearward overhanging of the mast structure during the time the rig is being backed into the desired position with respect to a well site; such base frame being movable relative to the main mast structure into longitudinal supporting alignment therewith as the mast is moved into its erected position.

It is a further object of the present invention to provide a hinged base frame for portable masts which is formed at one end so as to receive and firmly support the base or lower end of the mast, when the same occupies an erected position, and which is formed or provided at its lower end with but a single pair of ground-engaging screw jacks which may be extended upon erection of the mast into engagement with the surface of the ground whereby to support the weight of such mast, and equipment carried thereby independently of the associated vehicular base.

The above and additional objects of the invention will become more readily apparent as a further understanding of the invention is obtained, hence, reference is made to the following description and the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a portable well-servicing rig embodying the aspects of the present invention;

Fig. 2 is an enlarged fragmentary side elevational view showing the relationship between the mast and hinged base support therefor when the mast occupies an erected position, with the prone or rest positions of the mast and base frame being indicated by broken lines;

Fig. 3 is a rear end elevational view disclosing the relationship between the mast and hinged base structure when the former occupies its erected position;

Fig. 4 is a detailed horizontal sectional view taken along the line 4—4 of Fig. 2;

Fig. 5 is a detailed side elevational view of the base frame;

Fig. 6 is a rear end elevational view thereof;

Fig. 7 is an enlarged fragmentary vertical sectional view disclosing the connection between the abutting portions of the base end of the mast and the upper end of the hinged base frame;

Fig. 8 is a detailed horizontal sectional view taken along the line 8—8 of Fig. 5;

Referring now to the drawings, the numeral 10 designates the bed-frame of an automotive truck 11. Carried at the extreme rearward end of the bed 10 are a pair of transversely spaced upright supports 12 which are joined substantially at their upper ends by a transverse crossbar 13. The supports 12 are additionally rigidly secured to the bed of the truck by means of diagonal brace members 14 extending upwardly from the bed for connection with the crossbar 13. The upper end portions of the supports 12 are formed with a pair of rearwardly projecting ears 15, the outer ends of which slightly overhang the rear of the bed 10. The ears 15 of each of the supports 12 are formed with axially aligned bearing openings which receive separate pivot pins provided at their outer ends with relatively enlarged and laterally offset head plates for connection with the ears 15. Pivotally carried by the pins 16 are a pair of laterally projecting bearing plates 17 extending outwardly from the base end portion of a mast structure 18. The mast structure 18 is generally rectangular in cross-sectional configuration, and is formed with a substantially flat rectangular base or lower end 19.

Pivotally connected at its respective ends between the bed 10 of the truck and an intermediate portion of the mast 18, as at 20, is a fluid-actuated multiple stage double acting telescopic ram 21 which functions upon operation to elevate or lower the mast 18 between a substantially horizontal prone position, as indicated in Fig. 1, and a substantially vertical erected position, as partially indicated in Fig. 2. In its prone position, the forward portion of the mast 18 rests within a cradle structure 22 carried by the bed of the truck directly behind the cab portion thereof.

Hingedly connected with the heel side of the base or lower end 19 of the mast 18, as by means of headed pivot pins 23, are the inner legs 24 of a mast-supporting base frame 25. The frame 25 possesses a general V-shaped configuration in side elevation, with the upper end thereof being generally rectangular for complemental engagement with the rectangular lower end of the mast 18. The side legs of the base frame converge toward the lower end thereof, and are suitably joined, as by welding, with a pair of internally screw-threaded socket members 26. The socket members 26 are joined by a transverse tubular brace 27 which, in turn, is connected with suitable diagonal brace members 28 extending upwardly for engagement with the upper end portion of the frame. The outer legs 29 of the frame are formed at their upper ends with a pair of positioning pins or cleats 30 which are arranged for registration with and insertion in a pair of sockets 31 formed in the toe side of the end 19 of the mast 18.

Pivotally linked at their respective ends to the bed 10 of the truck and the socket members 26 of the frame 25, are a pair of turn-buckle links 32 which function to permit limited vertical displacement of the frame 25 during swinging movement of the mast 18, and to prevent the base frame from pivotal swinging movement in conjunction with the mast 18.

Threadedly carried within each of the socket members 26 of the base frame 25 are a pair of extensible screw jacks 33 which are engageable upon extension with the ground surface, or with a number of flat jack stands 34.

As is common to rigs of this general character, the bed 10 of the truck is provided at spaced intervals with a plurality of hydraulic or screw jacks 35 which, when extended, rigidly support the bed of the truck and the load carried thereby to relieve the spring and wheel systems of the vehicle.

In operation, the mast 18 and base frame 25 are normally carried in the positions disclosed in Fig. 1 of the drawings during highway transportation, that is, with the mast occupying its prone position, and the base frame occupying a substantially perpendicular depending position with respect to the mast at the rearward end of the truck. In this condition, the entire rig may be backed into position adjacent a well site or pumping station with the mast in its prone position, and the screw jacks 33 disposed in vertical alignment with the desired ground-engaging point. At this time, the mast 10 may be swung to an erected position, as indicated in Fig. 2, by actuation of the ram 21. During swinging movement of the mast 18 from its prone to its erected positions, the base frame 25 will be displaced downwardly in a substantially vertical plane due to the offset relation of the pivotal connection between the base frame and the mast with respect to the pivotal connection between the supports 12 and the mast, and the linkage provided by the turn-buckle links 32. As the mast 18 reaches its extreme erected position, that is, slightly past a vertical or dead center position, the base frame 25 and the mast 18 will be in substantial longitudinal alignment with the cleats 30 occupying the openings 31 formed in the toe end of the base 19 of the mast. At this time, the base frame 25 will have moved downwardly to a point where the ends of the screw jacks 33 are disposed in closely spaced relation to the ground surface. The jack stands 34 are then aligned with the screw jacks 33, and the latter extended outwardly to transfer the load of the mast from the bed of the truck to the ground. The additional jacks 33 carried by the bed of the truck have been previously extended into engagement with the ground surface so as to balance the system and prevent the spring and wheel systems of the vehicle from absorbing the subsequent loads placed upon the derrick assembly. The entire rig is then in condition for well-servicing operations.

After the completion of well-servicing operations, and the use of the rig is no longer required at the particular well site, the mast 18 is once again moved from its erected position to its prone position by retraction of the ram 21, at which time the base frame 25 is simultaneously lifted out of engagement with the surface of the grounds to its dotted line position, as shown in Fig. 2. At this time the bed-carried jacks 35 may be retracted, and the rig is once again in condition for highway transportation.

In view of the foregoing, it will be seen that the present invention provides an improved portable

derrick rig which is characterized by its mechanical efficiency, its ease of operation and its time-saving qualities in speedy mast erection, and the elimination of sequential shifting of the mobile base and the partial and sequential erection of the associated mast when initially positioning the rig with respect to a given well site.

Through the provision of the hinged base frame, the portable derrick system may be easily and quickly erected at a desired location, without necessitating relatively tedious and time-consuming calculations in establishing a predetermined desired position of engagement between the base of the previous type mast structure and the ground surface. The base frame further provides a sturdy and rugged support for the mast structure when the same occupies its erected position, and eliminates the use of a relatively large number of screw jack supports, heretofore necessary with previous types of portable derrick rigs which were constructed to provide an overhang of the base section of the mast a distance beyond the pivotal connection thereof with the portable base.

While a single preferred form of the present invention has been disclosed in detail, it will be manifest that various modifications in design and constructional details are possible without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a portable derrick rig including a mobile base, a mast pivotally carried by said base for swinging movement between prone and upright positions, said mast terminating in a base end portion located substantially in the vertical plane of one end of said base, and means to swing said mast between said prone and upright positions; a substantially vertically arranged ground-engaging base frame for supporting the base portion of said mast when the latter occupies an upright position, said base frame being hingedly connected with the base end portion of said mast and pivotally linked to said mobile base frame for limited movement in a substantially vertical plane only upon swinging movement of said mast.

2. In a portable well-servicing rig, a mobile base, a pivot support carried by said base in elevated relation to the rear end thereof, a mast having a base end terminating substantially in the plane of the rear end of said base and pivotally connected with said pivot support for swinging movement between prone and erected positions, means to swing said mast between said prone and erected positions, and ground-engageable means hingedly connected to the base end of said mast for movement into a position in longitudinal alignment with said mast when the latter occupies an erected position and a position in depending substantially perpendicular relation thereto when said mast occupies a prone position.

3. A portable well-servicing rig comprising a mobile base, an elevated support carried by said base substantially at the rearward end thereof, a mast structure having a base end pivotally connected with said support for swinging movement between prone and erected positions with respect to said base, fluid-pressure-responsive means connected respectively with said base and said mast structure and operable to swing the latter between said prone and erected positions, a ground-engageable base frame hingedly connected with the base end of said mast for relative movement between a position in longitudinal alignment therewith and a position in substantially depending perpendicular relation thereto, and means connecting said base frame with said base to prevent longitudinal alignment of said base frame with said mast except when the latter occupies an erected position.

4. A portable derrick rig comprising a portable base, a support carried in elevated relation to one end of said base, a mast pivotally carried by said support for swinging movement between prone and erected positions with respect to said base, said mast being formed with a substantially rectangular base end, arranged substantially in vertical alignment with the said one end of said base fluid-operable means connected respectively with said base and said mast to swing the latter between said prone and erected positions, a base frame hingedly connected with the base end of said mast, said frame being formed with a rectangular upper end portion for complemental engagement with the base end of said mast and a lower end portion terminating in a pair of ground-engageable screw jacks, said frame being hingedly movable relative to said mast between positions in longitudinal alignment therewith and in perpendicular relation thereto, and means linking said frame to said base to prevent longitudinal alignment of said frame with said mast when said mast occupies other than an erected position.

5. In a portable derrick rig, a base, a mast structure having a base end portion terminating a distance outwardly from one end of said base and pivotally connected with said base for swinging movement about its point of pivotal connection with said base between a substantially horizontal prone position and a substantially vertical upright position, means to swing said structure between said prone and upright positions, a ground-engaging base frame hingedly carried on the base end portion of said mast structure a distance outwardly from the point of pivotal connection of said mast and said base for supporting said mast independently of said base when said structure occupies its erected position, and means pivotally connected between said base frame and said base for holding said base frame in a substantially vertical plane during swinging movement of said mast.

6. In a portable well-servicing rig, a mobile base, a pivot member carried in elevated relation to one end of said base, a mast having a base end portion terminating substantially at the said one end of said base and pivotally connected with said pivot member for swinging movement between substantially horizontal prone and substantially vertical erected positions, means to swing said mast between said prone and erected positions, a substantially vertically arranged ground-engageable base frame hingedly connected to said mast at the base end portion thereof for supporting said mast when the latter occupies an erected position, and a link pivotally connected between said base frame and said mobile base for controlling swinging movement of said base frame in association with said mast.

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