Sept. 22, 1942. W. F. BATES ET AL 2,296,659

METHOD AND EQUIPMENT FOR MOVING DRILLING RIGS

Filed Dec. 28, 1940 2 Sheets-Sheet 1

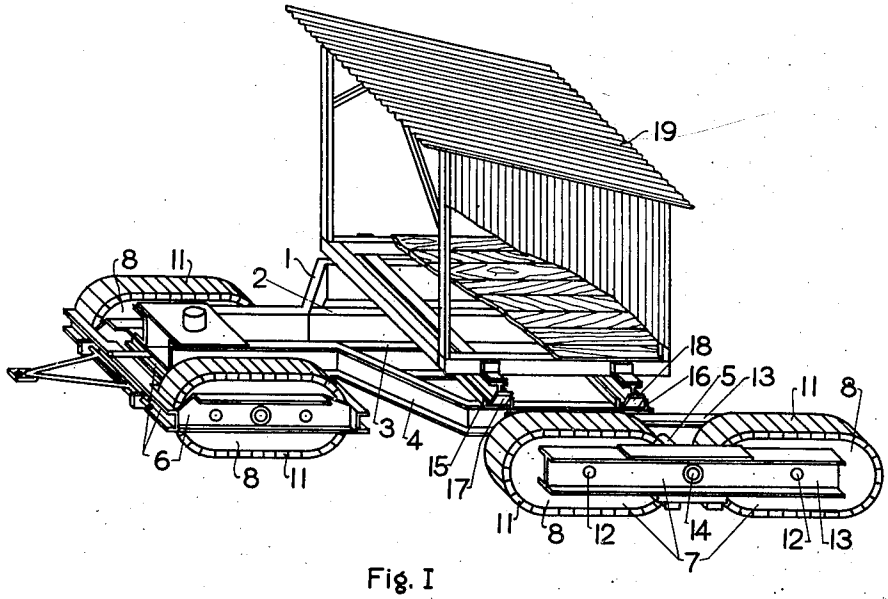

Fig. I

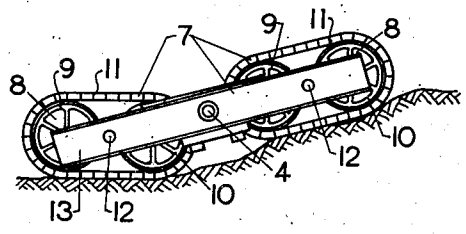

Fig. II

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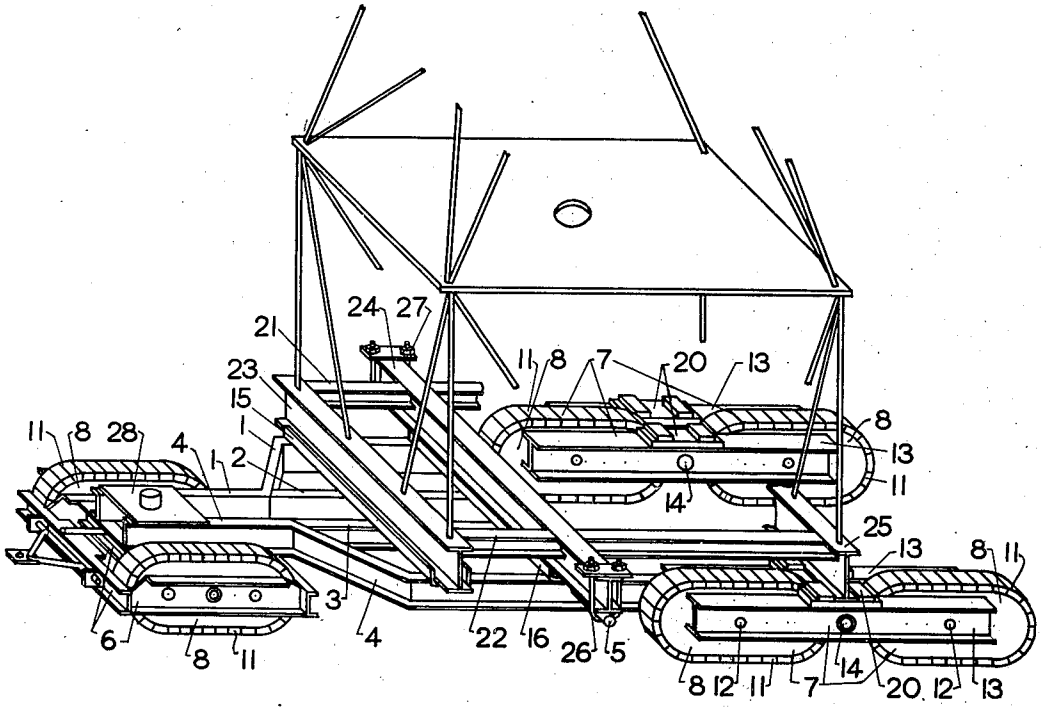

Fig. III

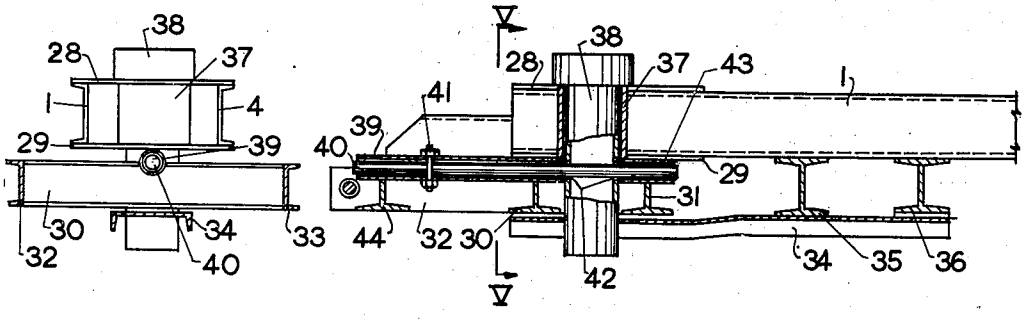

Fig. V

Fig. IV

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METHOD AND EQUIPMENT FOR MOVING DRILLING RIGS

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2 Claims. (Cl. 214—152)

This invention relates to equipment suitable for the movement of drilling rigs such as are used in the drillig of oil, gas and artesian wells.

It has long been established practice in the well drilling art to consider a period of days, usually not less than a week, as the time necessary to move drilling rigs from one location to another. The major portion of this time is taken up in dismantling operations on the derrick and auxiliary equipment at the finished well and reassembling the same at a new location, i. e., the actual transportation time is but a relatively small portion of the time taken for disassembling and reassembling operations. This is particularly true in the case of rotary oil well drilling, which requires the use of heavy steel derricks and a considerable amount of heavy auxiliary equipment of a type that is especially time-taking to dismantle.

It is an object of the present invention to provide a method and equipment whereby a major proportion of the disassembling and dismantling operations may be obviated. More specifically, it is an object of the instant invention to provide heavy duty mobile equipment by means of which drilling rigs may be transported from one location to another with a minimum of disassembling operations. It is a further object of the invention to provide equipment especially adapted to negotiate the various types of terrain commonly encountered where drilling operations are carried out. Other objects, together with the numerous advantages to be derived when operating according to the present invention, will appear in the following detailed description of the invention.

Broadly, the present invention embodies a heavy-duty trailer including features which adapt it particularly to transporting a steel derrick, for example, without dismantling the derrick structure in any way other than freeing it from its foundation and removing any equipment which is not firmly attached to the derrick structure proper. By means of certain adjustments and changes in procedure, as will be hereinafter described, the same trailer unit may be used for the transportation of other heavy equipment, such as the draw works, engines, boilers, etc., that are necessary in deep well drilling.

Referring to the drawings, Figure I is a perspective view showing the trailer unit as assembled when moving equipment other than the derrick structure. Figure II is a side elevation of one of the double track wheel members utilized as part of the trailer unit. Figure III is a perspective view sheowing the trailer unit as assembled when moving a derrick structure. Figure IV is a sectional side elevation showing the construction of the king pin assembly of the front track wheel member. Figure V is a sectional front elevation through V—V of Figure IV.

The trailer unit, as shown in Figures I, II and III, comprises a series of heavy steel bed members 1, 2, 3, 4; an axle 5, rigidly attached to and passing through bed members 1, 2, 3, 4; a front track wheel steering assembly 6, which is attached to the extension of bed members 2, 3 by means of the king pin assembly shown in Figures IV and V, and a pair of double track wheel assemblies 7. Cross members 15, 16, which are rigidly attached to bed members 1, 2, 3, 4, serve as loading channels.

The track wheels 8 used are of the type commonly employed in heavy hauling work and consist basically of a pair of internal wheels 9, 10 in tandem, with a continuous tread or track 11 which revolves with wheels 9, 10 and accordingly distributes the load over a greater ground area. In Figures I, II, III, a pair of track wheels 8, 8 have been assembled to form a double track wheel 7 by connecting the axles 12, 12 of track wheels 8, 8 by means of beams 13, 13. An axle hole including bearing surface is provided in beams 13, 13 as at 14 to receive axle 5 when carrying equipment other than the derrick structure.

Referring particularly to Figure I, the trailer unit is shown as assembled when equipment other than the derrick structure is being moved. For purposes of illustration a representation of an engine house 19 is shown loaded on the trailer unit. In actual practice the entire engine house assembly including the draw works complete with drilling line spooled on the drum, drilling engine with chain and guards and all steam piping, sand reel with line, draw works and engine substructure and numerous other miscellaneous pieces of equipment are all moved as a unit. This load in the case of the modern rotary drilling rig, weighs 50 to 75 tons or more. On the bottom of the engine house frame a pair of heavy steel skids 17, 18 are provided which are spaced apart the same distance as loading channels 15, 16 on the trailer unit. The engine house assembly is loaded onto the trailer unit either by building a pair of sloping ramps leading to loading channels 15, 16 up which it may be skidded, or preferably, and more easily in the case of extremely heavy equipment, a bulldozer or other earth moving equipment is utilized to

dig a wide trench beside the engine house assembly and at a right angle to the skids 17, 18 on the bottom of the engine house assembly. A sloping runway into the trench is provided, the depth of the trench being such that when the trailer unit is backed into it the loading channels 15, 16 are on the same level as the skids 17, 18 of the engine house assembly. The engine house assembly may then be skidded from its foundations onto the trailer unit and thence carried on the trailer unit to any desired new location, where, by reversing the above procedure, it may be skidded onto a new foundation prepared beforehand.

Similarly, other auxiliary equipment such as boilers, pipe racks loaded with pipe, etc., is provided with steel skids on the bottom thereof, also spaced apart the same distance as loading channels 15, 16 of the trailer unit. Thus, a single trailer unit is adapted to facilitate rapid loading and unloading of several sizes, weights and types of equipment.

Somewhat different procedure is followed when moving the derrick structure, as shown in Figure III. In this instance the double track wheels 7 are removed from axle 5, inverted and placed under the two rear corners of the derrick base. A pair of loading blocks 20, 20 are provided on each of the double-track wheels 7, mounted on beams 13, 13 and situated between the individual track wheels 8. The derrick is provided with a special steel grillage base comprising members 21, 22, 23, 24 and 25. The loading slots on loading blocks 20, 20 are of a width adapted to receive grillage member 25. The front end of the derrick is then raised sufficiently to permit placing of the trailer unit (without the rear double track wheels) thereunder. Grillage members 23 and 24, are so spaced as to fit into loading channels 15, 16 when the rear of the trailer unit is raised into traveling position. U-bolt clamps 26, 27 are passed around axle 5, over the protruding portion of grillage member 24 and secured by a plate on top thereof as shown. Further U-bolt clamps may be used on the section of grillage member 24 between grillage members 21 and 22, as needed, depending upon the weight of the derrick.

It will be seen that by the arrangement above described, the steel grillage base of the derrick becomes an integral part of the trailer unit. The derrick is then moved to a desired new location and placed upon a previously prepared foundation. The preferred method of unloading the derrick is to raise the rear corners sufficiently to permit removal of the double track wheels 7, 7. The rear of the derrick is then lowered upon its foundation, U-bolt clamps 26, 27 are removed, the front end of the derrick base is raised sufficiently to permit removal of the trailer unit and the front end of the derrick base finally lowered to its position upon the derrick foundations.

As shown in Figures I, III, IV and V, extensions of bed members 1, 4 serve as a tongue for the trailer unit. Gross plates 28, 29 are rigidly attached to bed members 1, 4 near their extreme front ends. Parallel I-beams 30, 31 which serve as cross members of front wheel assembly 6, are spaced apart sufficiently to permit king pin 38 to pass therebetween with scant clearance. A piece of heavy steel tubing or casing 37 passes through and is rigidly attached to cross plates 28, 29. Draw bar 34, rigidly attached to bed members 1, 4 by means of cross members 35, 36 is also provided with a hole through which king pin 38 may pass. Steel tubing 39 is supported by and rigidly attached to front wheel assembly cross members 44 and 30. This tubing is preferably partially countersunk in cross members 44 and 30. A short section of tubing (43) is similarly supported by and mounted on cross member 31 behind king pin 38. A solid steel shaft 40, fits closely in tubing 39, 43 and passes through a hole in king pin 39 provided therefor. A bolt 41 passes through tubing 39 and shaft 40 to hold shaft 40 in place.

As shown in Figures IV and V, the tongue of the trailer unit is entirely supported by tubing 39, 43 (and shaft 40, which serves as a reinforcing member), cross plate 29 forming a line contact therewith. Thus it will be seen that a horizontal tipping action of the front wheel assembly with respect to the trailer bed is permitted, due to the line contact between the flat surface of cross plate 29 and the curved surface of tubing 39, 43. At the same time, it will be apparent that regardless of the respective positions of the trailer bed and front wheel assembly, no forces other than shear are applied to the king pin 38. This is due to the fact that push or pull forces applied to the front wheel assembly are transmitted to the king pin 38 through cross members 30 and 31 and thence through king pin 38 to point both above (casing 37) and below (drawbar 34) cross members 30 and 31. Lateral movement of king pin 38 (and consequently the trailer bed) relative to the front wheel assembly is restrained by shaft 40 which passes king pin 38 and tubing 39, 43 which is in turn rigidly attached to the front wheel assembly. The above described king pin arrangement also obviously permits the front-wheel assembly to be used for steering the trailer unit.

As a specific example of the time saved in utilizing the present invention in moving drilling rigs, it was found in one instance that a complete move from one drilling location to another could be made within 48 hours. The same move, made utilizing common dismantling practice, would have required at least 7 days. The advantage in such a time saving is of course obvious. However, other advantages are to be inherently derived by operating according to the present invention. For example, dismantling operations on derrick structures, always a rather dangerous job for the men engaged, are completely eliminated. Continual dismantling of other equipment, such as the draw works, increases their rate of depreciation; this factor also is eliminated to a major degree by the instant invention. Further the crew required for moving operations according to the present invention is but a fraction of that required when operating according to the present standard methods, thus releasing men for other work.

We claim as our invention:

1. The herein described method of loading a derrick structure upon a trailer unit for transporting purposes, said derrick structure including a steel grillage support therefor, including a rearwardly disposed member, a forwardly disposed member, and an intermediately disposed member, all of said members being disposed in parallel; said trailer unit comprising a pair of double track wheels including grillage receiving elements mounted thereon, a trailer bed, a tongue member formed as an extension of said trailer bed, a track wheel assembly supporting said tongue member, and loading channels mounted on said trailer bed and spaced apart the same distance as said forwardly and intermediately

disposed members of said steel grillage, said loading method comprising disengaging said pair of double track wheels from said trailer unit and disposing said pair of double track wheels under opposite ends of said rearwardly disposed member of said steel grillage support and at right angles thereto, said grillage receiving elements engaging said rearwardly disposed member and disposing said trailer bed beneath said steel grillage support, said loading channels mounted on said trailer bed engaging said forwardly and intermediately disposed members of said steel grillage support and thereafter detachably securing said trailer bed to said steel grillage support.

2. The herein described method of loading a derrick structure upon a trailer unit for transporting purposes, said derrick structure including a steel grillage support therefor, including a rearwardly disposed member, a forwardly disposed member, and an intermediately disposed member, all of said members being disposed in parallel; said trailer unit comprising a pair of double track wheels including grillage receiving elements mounted thereon, a trailer bed, a tongue member formed as an extension of said trailer bed, a track wheel assembly supporting said tongue member, and loading channels mounted on said trailer bed and spaced apart the same distance as said forwardly and intermediately disposed members of said steel grillage, said loading method comprising disengaging said pair of double track wheels from said trailer unit and disposing said pair of double track wheels under opposite ends of said rearwardly disposed member of said steel grillage support and at right angles thereto, said grillage receiving elements engaging said rearwardly disposed member and disposing said trailer bed beneath said steel grillage support, said loading channels mounted on said trailer bed engaging said forwardly and intermediately disposed members of said steel grillage support and thereafter detachably securing said trailer bed to said intermediately disposed member of said steel grillage support.

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