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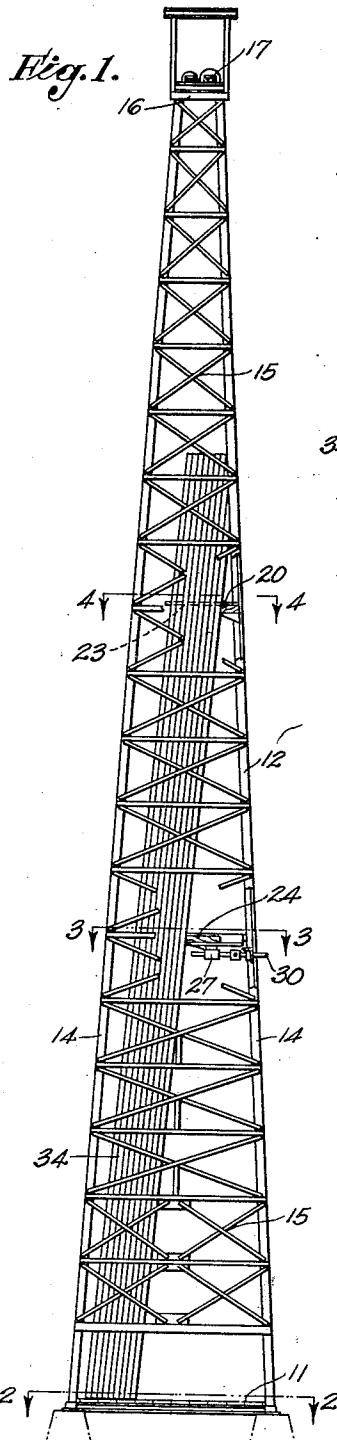
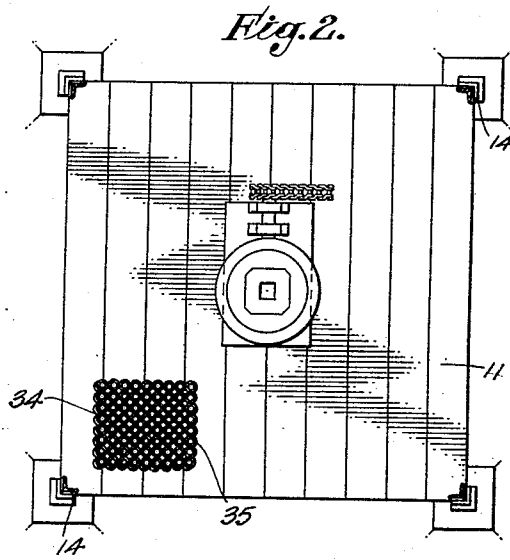
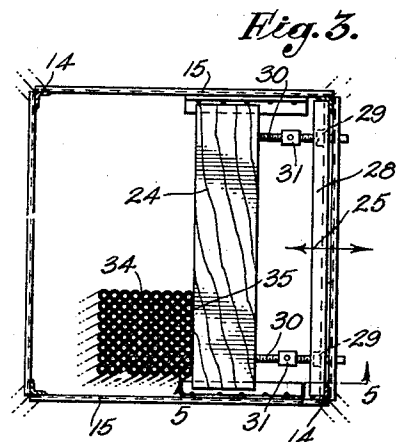
L. A. RAWSON

1,841,671

OIL WELL DERRICK

Filed Jan. 23, 1931

2 Sheets-Sheet 1



INVENTOR:
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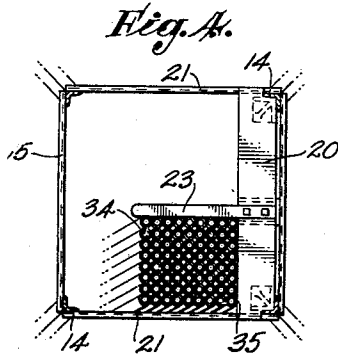
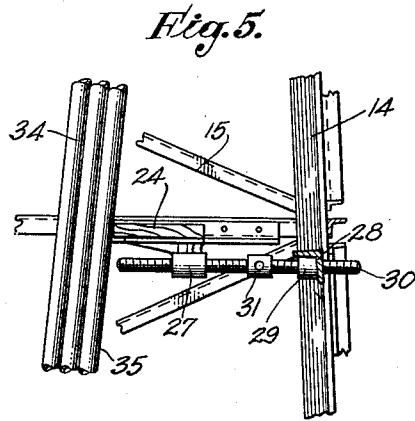
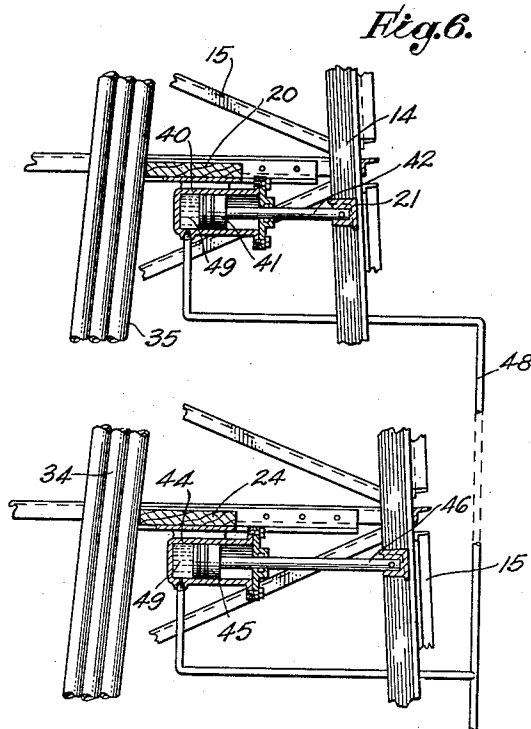
L. A. RAWSON

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OIL WELL DERRICK

Filed Jan. 23, 1931

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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OIL WELL DERRICK

Application filed January 23, 1931. Serial No. 510,700.

The invention which constitutes the subject-matter of this application is a derrick, intended for use in oil wells, having a novel drill-pipe supporting means incorporated therein.

My invention has particular utility in the oil-producing industry in which derricks are used for the handling of the various apparatus in the well. According to usual well drilling practice, a derrick is constructed above the well and is provided with a crown block at the upper end thereof. Extended around the crown block is a cable which supports a travelling block, the travelling block in turn being adapted to handle the various pipes and casings which are used in the well. The hole is drilled by means of the drill-pipe having a bit, which drill-pipe is rotated by a rotary machine. The drill-pipe at the present time consist of stands of pipe of approximately 80 ft. in length. When the drill-pipe is removed, which removal is necessary at intervals during the drilling of the well, the stands of pipe are usually placed in a substantially erect position in the derrick. At the present time wells are being drilled quite deep, and it is anticipated by large oil operators that a great many wells will be drilled as deep as 10,000 ft. This necessitates taller derricks and longer stands of pipe for reasons of economical drilling. Applicant has constructed a derrick which is over 160 ft. in height and which is designed to accommodate a stand of drill-pipe approximately 120 ft. in length. When the stand of pipe is placed in the derrick it engages the derrick at a distance of 100 ft. from the ground. Since the pipe is very heavy, the force exerted against the derrick at this point is considerable and it necessitates making the derrick structure sufficiently heavy up to this level to withstand the forces applied to it by the stands of pipe. It should be understood that ordinarily all of the stands of pipe constituting the drill-pipe are placed in the derrick and there may be seventy-five or one hundred of these stands of pipe, all of which exert a force against the derrick.

My invention provides a tall derrick of the character just mentioned, adapted to accom-

modate long stands of pipe, which is designed so that the upper structure of the derrick may be lighter than required if the ordinary method of supporting the pipe were used. In the derrick of my invention I provide an upper pipe support which is placed near the upper end of the stand of pipe and a lower pipe support which is placed substantially at the central part thereof. These pipe supports are designed so that the stands of pipe engage them, and so that both of them transfer force to the derrick. The result of this combination is that all of the load of the stands of pipe is not transferred to the upper part of the derrick, but a portion of it is transferred directly to the central part of it. By reason of this arrangement, the derrick is made relatively heavy up to the central part and may then be made lighter from there to the top or the crown of the derrick. A further advantage accruing from this arrangement is that the central support prevents an undue curving of the stands of pipe when they are resting in the derrick. The advantage of this will be quite evident when it is remembered that many stands of drill-pipe are placed one leaning against the other, and that the pipes against which the others lean must support those pipes. By using the intermediate pipe support the stands of pipe against which the other stands of pipe rest may be prevented from curving a great amount.

If desired, one of the pipe supports may be adjustable to take care of the different positions of the pipe. For example, if the first row of the stands of pipe set in the derrick is not properly placed, either the upper pipe support or the lower pipe support will not engage these first stands of pipe. If both of the pipe supports are immovable, much care must be exercised in properly placing the first row of stands of pipe. If either one of the pipe-supports is adjustable, then after the first row of stands of pipe is set the adjustable pipe support may be adjusted into proper engaging position.

In some installations it may be desirable to have automatic means for proportioning the load of the stands of pipe on the pipe

supports. If this is desired, my invention provides it. One manner of accomplishing this result is to make both of the pipe supports adjustable and to have them associated with hydraulic pressure means. By connecting the hydraulic pressure means together each pipe support may be made to take a certain proportion of the load of the stands of pipe.

In the drawings I have shown three forms in which my invention may be incorporated. These three forms are typical of three different types of constructions and each type may of course be changed in detail without departing from the essence of the invention.

Referring to the drawings,—

Fig. 1 is an elevational diagrammatic view showing a derrick constructed in accordance with my invention and having stands of pipe supported therein.

Fig. 2 is a section taken on the line 2—2 of Fig. 1.

Fig. 3 is a section taken on the line 3—3 of Fig. 1.

Fig. 4 is a section taken on the line 4—4 of Fig. 1.

Fig. 5 is a section taken on the line 5—5 of Fig. 3.

Fig. 6 is a diagrammatic view which illustrates the form of my invention in which the pipe supports are automatically controlled.

Referring to the drawings in detail, particularly Figs. 1 to 5, the derrick of my invention has a base 11 which is supported on the ground by suitable foundations. Extending upward from the base is a tower structure 12. This tower structure 12 may be of usual design including legs 14 which are braced by bracings 15. Supported at the upper end of the tower structure is a crown 16 which, according to usual practice, carries a crown block 17. The various apparatus which are ordinarily employed in the derrick do not constitute a part of the combination of my invention, and for this reason they are not shown in the drawings. It should be understood, however, that the parts which constitute my invention are ordinarily employed in combination with the usual derrick apparatus and do not in any way interfere with the usual position or usual operation of such derrick apparatus.

Secured in a horizontal position across one side of the tower structure is an upper pipe support 20 which consists of a plank which may be secured to cross-pieces 21 which constitute a part of the derrick bracings 15. Extending outward from the upper pipe support 20 at right angles thereto, and substantially on a line which intersects the vertical axis of the well, is a finger 23. Materially below the upper pipe support 20 and at a level near the middle of the stands of drill-pipe adapted to be supported in the derrick is a secondary or lower pipe support 24.

This lower pipe support 24 consists of a plank which extends across the tower structure in the same direction as the upper pipe support 20. In this form of my invention the lower pipe support 24 is made adjustable and may be moved in the directions indicated by the arrow 25 by an adjustment means shown best in Fig. 5. Secured to the plank which forms the lower support 24 is a threaded nut 27, and secured to a cross member 28 which forms a part of the bracing 15 is a nut 29. Extended through each of these nuts 27 and 29 is a lead screw 30 having an enlarged portion 31 in which openings are provided for the application of a bar whereby the lead screw may be rotated. By operating the lead screws 30, one of which is placed near each end of the lower pipe support 24, the lower pipe support 24 may be moved in opposite directions, as indicated by the arrow 25.

Adapted to be supported by the upper and lower pipe supports 20 and 24 are stands of pipe 34 which constitute sections of the drill-pipe used in the drilling of the well. These stands of pipe are approximately 4" in diameter and in this particular derrick are about 120 ft. in length. They are therefore quite flexible and if not properly supported will bend considerably. The lower ends of the stands of pipe rest on the derrick floor in one rectangular corner area, as shown in Fig. 2. They extend upward, as shown in Fig. 1, leaning to the right towards the pipe supports and leaning slightly towards the center, as shown in Fig. 4, so that the upper ends of the pipe are supported on the right side by the upper pipe support 20, and on the other side, as viewed in Fig. 4, are supported by the finger 23. Since most of the inclination is towards the upper pipe support 20, practically all of the load is applied to the upper pipe support and but a very small load is applied to the finger 23. The first row of stands of pipe placed in the derrick, which row is indicated by the numeral 35, is positioned so that this row engages the upper pipe support 20, and, preferably, so that it engages the lower pipe support 24, as shown in Fig. 1, which prevents the stands of pipe from bending any great amount. If the first row, however, is not properly set, workman in the derrick may adjust the lower pipe support 24 by operating the lead screws 30 and bring this lower pipe support 24 into a proper position relative to the upper pipe support 20 and the row 35.

In the derrick in which my invention is intended for use, the stands of pipe 34 are approximately 120 ft. in length. The crown of the derrick is substantially 169 ft. from the ground, the upper pipe support substantially 100 ft. from the ground, and the lower pipe support is substantially 60 ft. from the ground. The upper pipe support 20 supports a part of the load of the stands of pipe 34,

and the lower pipe support 24 supports the remaining part of the load. Therefore, the upper pipe support transfers part of the load to the derrick and the lower pipe support transfers the other part of the load to the derrick. By reason of this arrangement the upper structure of the derrick may be made lighter than would ordinarily be required and a fairly large saving in material will be effected. Furthermore, by placing less strain in the upper part of the derrick a safer structure is provided, and the stands of pipe 34 are not permitted to curve. Consequently, they are much easier to handle in placing them in the derrick and in removing them from the derrick, and no strains are placed on the stands of pipe during the time that they are positioned in the derrick.

It is not necessary that either of the pipe supports be made adjustable, but the adjustable feature may be of some value, since if the first row of the stands of pipe 35 is not properly positioned, the adjustable pipe support may be adjusted to bring it into a proper relation with the other of the pipe supports and the row of stands of pipe 35. This adjustment could be accomplished much easier than by changing the position of the row of stands of pipe 35. Either the lower pipe support 24 may be adjustable, as shown, or the upper pipe support 20 may be adjustable.

In Fig. 6 I diagrammatically show the form of my invention which is automatic in operation. In this form of the invention the parts corresponding to the parts shown in Figs. 1 to 5 will have numerals which correspond. In this form of my invention now under discussion, a cylinder 40 is secured to the upper pipe support 20, in which cylinder a piston 41 is operable. Extending from the piston 41 is a piston rod 42 which is rigidly secured to the tower structure of the derrick. For example, it may be secured to the cross member 21. Secured to the lower pipe support 24 is a cylinder 44 in which a piston 45 is operable. Extending from the piston 45 is a piston rod 46 which is secured to the derrick and may be attached directly to a cross member 28. Connected to the cylinder 40 and to the cylinder 44 is a fluid conduit 48. Contained in the fluid conduit 48 and in the cylinders 40 and 44 is a fluid 49 which is preferably an incompressible fluid, such as oil. When the stands of pipe 34 are placed in the derrick, they engage the upper and lower pipe supports and force them to the right, as viewed in Fig. 6, thus placing the fluid 49 under pressure. Since the two cylinders 40 and 44 are connected together, the pressure in each of the cylinders is the same, and the fluid means will therefore cause the pipe supports to automatically adjust themselves to take a certain proportion of the load. The proportion of the load supported by the pipe supports are determined

by the relative areas of cross-section of the two cylinders and pistons. It will be understood that in Fig. 6 I have illustrated but one type of equalizing means which is hydraulic. It is obvious that it is within the scope of my invention to provide a mechanical means, such as a lever system, for proportioning the load.

The two forms of the invention illustrated include the essential features of my invention. Basically, my invention consists of a derrick having an upper pipe support and a lower pipe support which support a stand or a plurality of stands of pipe, with the result that the upper derrick structure may be very light and a safer structure provided by reason of less strains being exerted on the upper part of the derrick, and the stands of pipe are better supported in the derrick and are prevented from undue curving or bending.

I claim as my invention:

1. In a derrick of the class described, the combination of: a base; a tower structure on said base; an upper pipe support secured to said tower structure for supporting the upper part of a drill-pipe which leans thereagainst, the lower end of said drill-pipe resting on said base; a lower pipe support secured to said tower structure below said upper pipe support against which said drill-pipe leans, for supporting a portion of the weight of said drill-pipe; and means for proportioning the load carried by said pipe supports.

2. In a derrick of the class described, the combination of: a base; a tower structure on said base; an upper pipe support secured to said tower structure for supporting the upper part of a drill-pipe which leans thereagainst, the lower end of said drill-pipe resting on said base; and a lower pipe support secured to said tower structure below said upper pipe support against which said drill-pipe leans, for supporting a portion of the weight of said drill-pipe.

3. In a derrick of the class described, the combination of: a base; a tower structure on said base; an upper pipe support secured to said tower structure for supporting the upper part of a drill-pipe which leans thereagainst, the lower end of said drill-pipe resting on said base; and a lower pipe support secured to said tower structure below said upper pipe support against which said drill-pipe leans, for supporting a portion of the weight of said drill-pipe, one of said pipe supports being adjustable.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 30 day of December, 1930.

LESLIE A. RAWSON.