Feb. 7, 1933. W. A. TROUT 1,896,530

DERRICK CONSTRUCTION

Filed Jan. 12, 1929 2 Sheets-Sheet 1

Fig. 1.

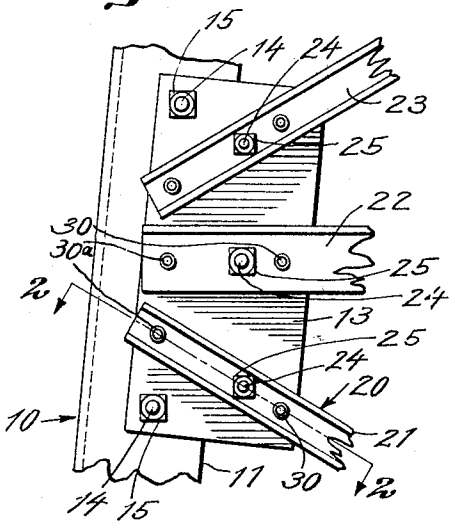


Fig. 3.

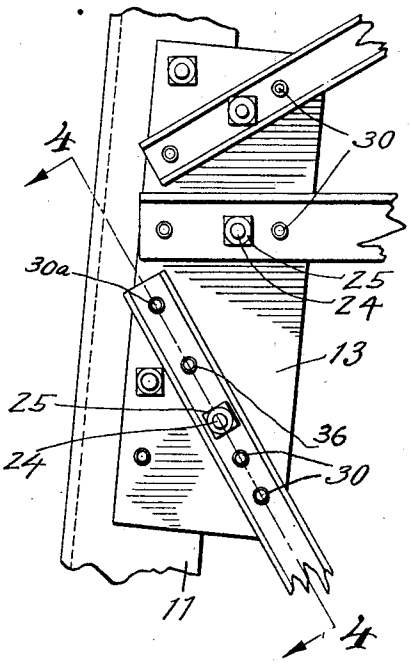


Fig. 2.

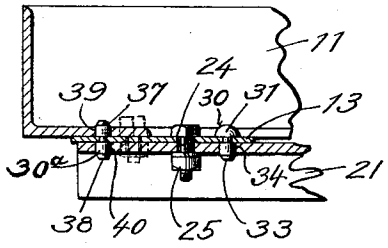


Fig. 4

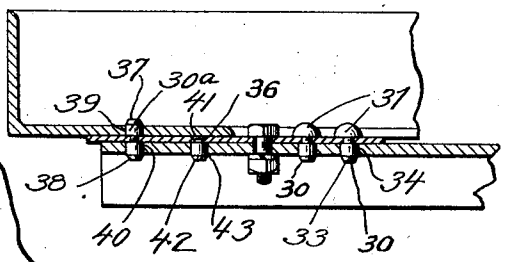
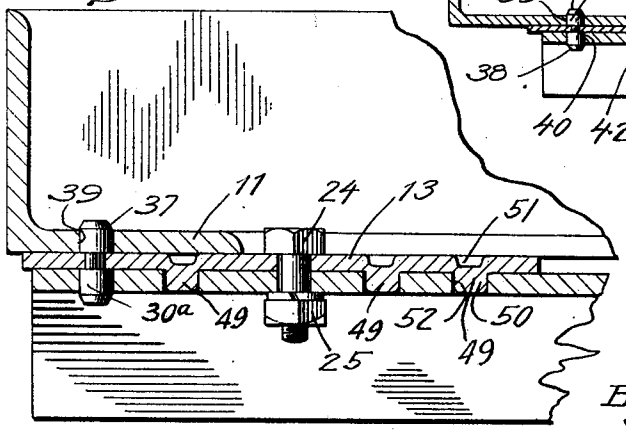


Fig. 5.



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DERRICK CONSTRUCTION

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Fig. 6.

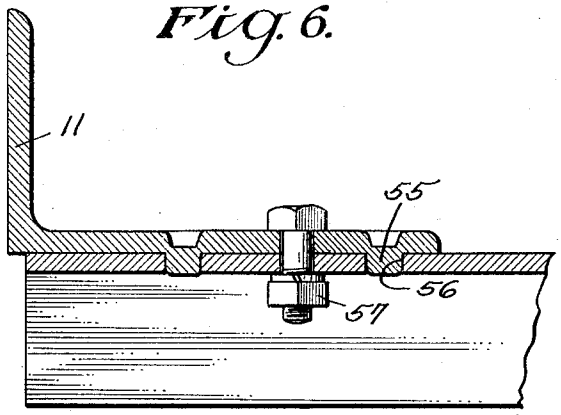
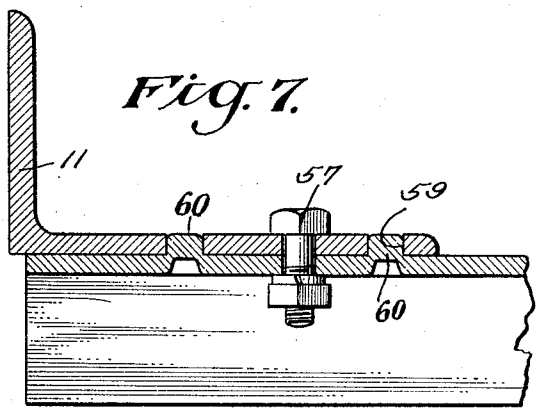


Fig. 7.



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Patented Feb. 7, 1933

1,896,530

UNITED STATES PATENT OFFICE

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DERRICK CONSTRUCTION

Application filed January 12, 1929. Serial No. 332,179.

My invention relates to a novel form of derrick or tower construction, and it is a foremost object of this invention to provide a construction wherein the assembling and dismantling of such a derrick or tower is greatly facilitated.

In the oil industry it is customary to build a derrick structure over the spot at which drilling is to take place. Wooden derricks were formerly extensively used, but of late a steel construction has proved popular because of safety considerations, added strength, non-inflammability, and the possibility of dismantling such a derrick should the well prove to be dry.

It is an object of this invention to provide a steel derrick or tower construction which saves a large percentage of the time previously required in assembling and dismantling such a derrick or tower.

These objects I accomplish by replacing certain bolts in the ordinary construction with rivet members having heads which extend into holes in an adjacent member, there being one or more bolts to hold the members together, the rivet members resisting any tendency to rotate about the bolt. The structure I have developed meets all the regulations adopted by the American Petroleum Institute with respect to wind-load capacities and dead-load capacities.

It is an object of this invention to provide a derrick construction meeting all standard regulations as to wind-load and dead-load capacities, and which is cheaper to assemble and dismantle than the ordinary steel derrick.

Further objects and advantages of my invention will be made evident hereinafter.

Referring to the drawings, I illustrate three forms of my invention,—

Fig. 1 is a fragmentary view illustrating one form of my invention.

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

Fig. 3 is a fragmentary view illustrating another form of my invention.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3.

Fig. 5 is a sectional view illustrating a third form of my invention.

Figs. 6 and 7 are alternative forms of the form illustrated in Fig. 5.

One type of well-known derrick construction comprises a frame structure 10 having four frame members 11 in the form of legs, the lower ends of these members resting on a suitable foundation, while the upper ends are secured together by a suitable crown structure, not shown.

The frame structure 10 of my invention includes a plurality of gusset plates 13 which are bolted to the frame members 11 by bolts 14 having nuts 15 secured thereon. The frame members 11 are usually in the form of angle-irons, and the gusset plates 13 are bolted to the flanges thereof to form a suitable connection for a bracing structure 20 which extends between the adjacent frame members 11 and reinforces the frame structure.

In Fig. 1, I have illustrated the bracing structure 20 as comprising bracing members 21, 22, and 23. The bracing members 21 and 23 are termed "diagonals," while the member 22 is termed a "girt." Each of these members is in surface contact with the outer face of the gusset plate 13, being clamped thereagainst by bolts 24 having nuts 25 threaded thereon to compress the bracing members and gusset plates together. As shown in Figs. 1 and 2, these bolts 24 do not extend through the frame member 11, although such a construction may be applied without departing from the spirit of this invention.

In order to prevent the bracing structure from pivoting about the bolts 24, I provide one or more rivet members 30, 30ª, secured to the gusset plate 13.

Referring particularly to Fig. 2, the inner rivet member 30 has a round head 31 bearing against the gusset plate, a neck portion passing therethrough, and a pin-head 33 formed on the other end of said rivet member to hold this member in fixed relationship with the gusset plate. This pin-head may be formed by deforming the end of the rivet member, after this member is in place, in a manner similar to the ordinary method of clinching rivets.

The bracing structure 20, and more particularly the diagonal 21, has a hole 34 which is only slightly larger in diameter than the pin-head 33 so that when the nuts 25 are tightened, the bracing member is prevented from rotating about the bolt 24 by the pin-head extending in the hole 34. A similar construction clamps the bracing members 22 and 23 to the gusset plate 13.

In addition to the inner rivet member 30, I prefer to provide an outer rivet member 30^a, these rivet members 30 and 30^a being on opposite sides of the bolt 24. The rivet member 30^a is slightly different in form, having a neck portion extending through the gusset plate 13 and clamped thereto by two pin-heads 37 and 38, these heads extending respectively through holes 39 and 40 formed in the frame member 11 and bracing member 21. The rivet member 30^a thus helps to prevent a rotation of the bracing member about the bolt 24, and also to prevent a rotation of the gusset plate 13 about the bolts 14 securing this plate to the frame member 11. Similar rivet members are so placed as to extend in a like manner through the bracing members 22 and 23.

The rivet members 30^a serve a very useful purpose in assembling the structure, inasmuch as the pin-heads 37 may first be passed through the openings 39 of the frame member, thus centralizing the holes in the gusset plate and frame member through which the bolts 14 are subsequently passed. After the nuts on these bolts have been tightened, the pin-heads 38 and 33 of the respective rivet members serve as convenient guides for positioning the bracing members, the holes 40 and 34 of these members being slipped over the heads 38 and 33, thus aligning the holes of the gusset plate and bracing member through which the bolts 24 are subsequently passed.

In Figs. 3 and 4 I have shown a modified form of my invention differing from the form shown in Figs. 1 and 2 mainly in the number of rivets used. Thus, this construction shown in Figs. 3 and 4 illustrates two of the round-head type of rivets 30 having the round heads 31, the pin-heads 33 of these rivets extending through openings 34 in the bracing member 21. In addition to the rivet member 30^a previously described, I prefer to provide a single-ended rivet member 36 having a flat head 41 which is countersunk into the gusset plate 13 so as to be flush therewith. This rivet member has the usual neck extending through the gusset member and a pin-head 42 which tightly holds the rivet in place relative to the gusset plate and extends through an opening 43 in the bracing member 21.

Any number or arrangement of the rivet heads may be utilized without departing from the spirit of this invention. Larger structures, of course, necessitate the use of more of the rivet members than do smaller structures and the number utilized depends entirely upon the shearing force which they are required to withstand. Rivet members such as those indicated by the numerals 30 and 36 resist any shearing action between the gusset plate 13 and the bracing member, while the rivet members indicated by the numeral 30^a resist any shearing either between the gusset plate and the frame member or between the gusset plate and the bracing members.

In Fig. 5 I have illustrated still another form of my invention in which the gusset plate 13 is clamped to the frame member 11 by the bolts 24, previously described. Before assembly, however, the gusset plate 13 is placed in a suitable punch press, and rivet members 49 having pin-heads 50 are extruded therefrom by means of a punch bearing downward on one face of the gusset plate and forming a cavity 51, thus extruding the metal downward into a die to form the pin-head 50. This construction is much simpler than that illustrated in the other figures, the forming of the pin-heads by extrusion being quickly and cheaply accomplished. I have illustrated one of the double-ended rivet members 30^a as being utilized in this construction for centralizing purposes, and also for resisting shear between the frame member 11, and the gusset plate 13.

It should be understood that the pin-heads 50 serve the same purpose as the pin-heads 33 and 42, the pin-heads 50 extending through openings 52 formed in the bracing members so as to prevent any rotation which might otherwise tend to take place between the bracing member and the gusset plates around the bolts 24.

Similarly, in Fig. 6 I have shown extruded rivet members 55 as being formed directly in the frame members 11 and extending into holes 56 formed in the bracing member. No gusset plate is used in this embodiment, the frame member and bracing members being held together by a nut and bolt 57, as previously described. The extruded rivet members may also be formed directly on the bracing member as at 60 and extend into holes 59 of the frame member, as indicated in Fig. 7.

I claim as my invention:

1. In a derrick construction, the combina-

tion of: a frame element; a plate member secured to said frame element; a bracing member; securing means for securing together said plate member and said bracing member; and aligning rivets on opposite sides of said securing means for preventing relative rotational movement of said members, said aligning rivets being supported by one of said members and having pin-heads resting in openings in the other one of said members.

2. A combination as defined in claim 1 also including a doubled headed aligned rivet secured to said plate member having a pair of pin-heads resting in openings formed in said frame element and said bracing member.

3. In a derrick construction, the combination of: a frame element; a plate member secured to said frame element; a bracing member; securing means for securing together said plate member and said bracing member; and aligning rivets on opposite sides of said securing means for preventing relative rotational movement of said members, said aligning rivets being supported by said plate member and having pin-heads resting in openings formed in said bracing member.

4. In a derrick construction, the combination of: a frame member; a gusset plate bolted to said frame member and extending a distance to one side thereof; a rivet member carried by said gusset in fixed relationship thereto, said member having a pin-head; a bracing member in surface contact with said gusset plate and having a hole therein only slightly larger than said pin-head and into which said pin-head slides; a bolt passing through said gusset plate and said bracing member; and a nut threaded to said bolt to clamp said bracing member to said gusset, said rivet member having a second pin-head which extends through a hole in said frame member.

5. In a derrick construction, the combination of: a frame member; a gusset member secured to said frame member; a bracing member; a rivet member extending through said gusset member and said bracing member and being retained in one of these members, said rivet member having a pin-head extending through a hole in the other of these members; and means for securing said bracing member and said gusset member together, said rivet member having a second pin-head which extends through a hole in said frame member.

6. In a derrick construction, the combination of: a frame member; a gusset member secured to said frame member; a bracing member; a rivet member extending through said gusset member and said bracing member and being retained in one of these members, said rivet member having a pin-head extending through a hole in the other of these members; and means for securing said bracing member and said gusset member together, said rivet member having a second pin-head which extends through a hole in said frame member, and said gusset member including a second rivet member in fixed relation therewith and extending only through said bracing member, said second rivet member having a pin-head sliding into a hole in said bracing member.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 16th day of December, 1928.

WILLIAM A. TROUT.