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DERRICK

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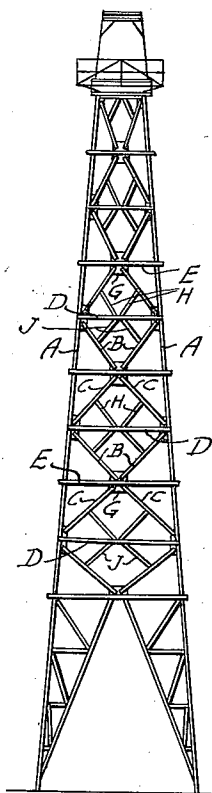


Fig. 1.

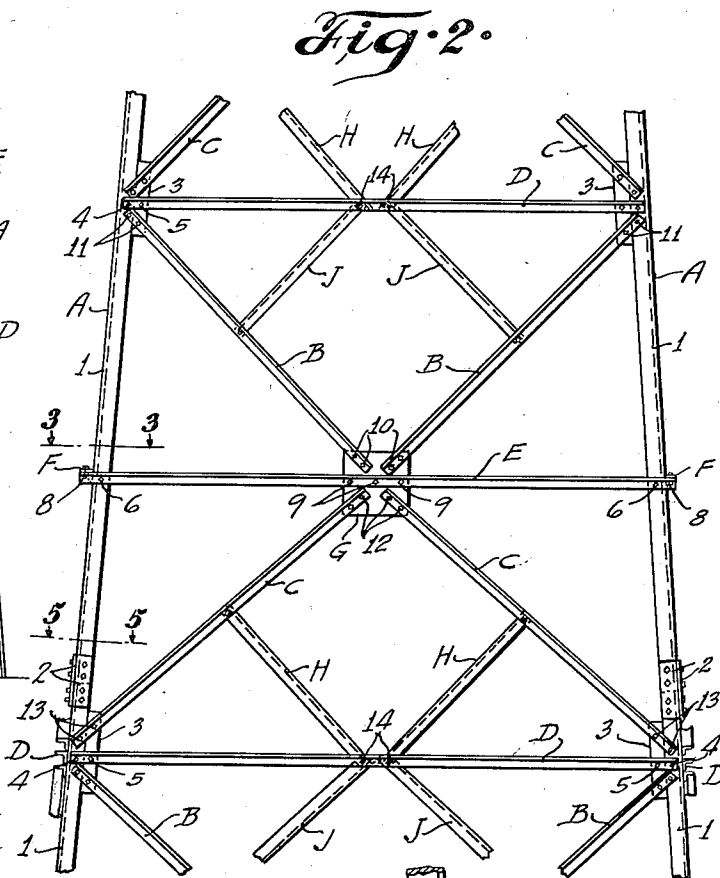


Fig. 2.

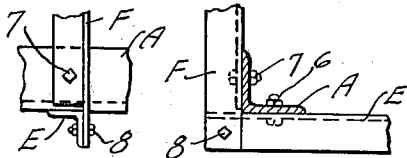


Fig. 4. Fig. 3.

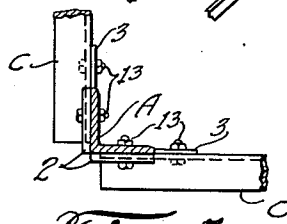


Fig. 5.

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7 Claims. (Cl. 189—13)

This invention relates generally to derricks. More particularly, my invention relates to a certain new and useful improvement in the construction of fabricated structural steel derricks especially, though not exclusively, adapted for use in connection with oil-wells and the like.

My invention has for its chief object the provision of a derrick of the type and for the purpose stated embodying in its structure horizontal girts and oblique struts and diagonals so formed and interrelated and connected together and to the derrick-legs as to not only economically minimize the number of parts and permit the employment of relatively light weight structural members, thereby enabling low production and installation costs, but also characteristically give to the derrick substantially maximum strength, durability, rigidity, and efficiency.

And with the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawing,—

Figure 1 is a reduced elevational view of the so-called pumping front of an oil-well derrick constructed in accordance with and embodying my invention;

Figure 2 is an enlarged fragmentary elevational view of the derrick;

Figure 3 is a detail sectional view of the derrick taken approximately on the line 3—3, Figure 2;

Figure 4 is a side elevational view of the parts shown in Figure 3; and

Figure 5 is a detail sectional view of the derrick taken approximately along the line 5—5, Figure 2.

Referring now more in detail and by reference characters to the drawing, which illustrates a preferred embodiment of my invention, the derrick is rectangular in contour in horizontal section and, as is customary, regularly tapers in horizontal area from its base to its upper end.

The four sides of the derrick, which are approximately of equal dimensions, are commonly known or designated as the bull-wheel side, shop and ladder sides, and pumping front. Such sides structurally differ somewhat at their base for accommodating associate equipment, as will be understood, the pumping front of the present derrick being specifically illustrated in Figure 1. Otherwise such sides are generally or for the most part of like structure, and hence the following description of the girts, diagonals, and struts of the illustrated derrick pumping side will be

equally applicable to the other or remaining sides of the derrick.

Economy in production and installation costs dictate that the derrick be built up to the desired height with a minimum of light weight structural members, yet the derrick must possess sufficient strength and rigidity to durably and efficiently not only carry and support the usual drilling and well operating and producing equipment, but also the cross and lateral wind and other strains and stresses generally experienced in actual practice.

To such end, the present derrick includes four upstanding leg-members A disposed in suitably spaced rectangular relation, each fabricated to the desired height of angle-sections I rigidly end-to-end secured together by connecting-plates 2, as shown, and disposed in the respective vertical planes of, and butt-welded or otherwise permanently fixed to, the right-angularly related flanges of each leg-angle or section I, at suitable predetermined spaced intervals throughout their length, are reduced flat plate-sections 3.

The plates 3 thus widen, as it may be said, the respective flanges of the angular leg-sections I and with the leg-sections I at spaced locations vertically of the derrick provide correspondingly enlarged areas of steel, thus permitting the use of two or more bolts or rivets, and thus saving weight, as otherwise large gusset plates would have to be employed, not only for the ends of respective diagonals B and C, presently described, but also for the ends of respective sets of girts D, the girts D of each set being horizontally disposed in end-to-end relation about the derrick, each girt D being also preferably of angular section, and each, as shown, being bolted, riveted, or otherwise rigidly fixed at its opposite ends, as at 4, 5, respectively, both to a particular flange of a leg-section I and to a particular plate 3.

The sets of girts D are so disposed and fixed in a spaced series vertically throughout substantially the height of the derrick, and the two-point connection of each girt D with a leg A insures against relative deflection or torsional twisting of the parts.

And further tying the legs A together and, as shown, disposed horizontally, and on opposite sides, of the derrick intermediate the girts D, are additional also angular girts E, co-operating with which on the remaining opposite sides of the derrick, are horizontal angular girts F, a pair of the girts E and a pair of the girts F constituting a set.

Each of the girts E extends outwardly at its op-

posite ends somewhat beyond the legs A and adjacent its opposite ends is bolted, riveted, or otherwise fixed, as at 6, to opposite legs A. Each of the girts F is also bolted, riveted, or otherwise fixed at its opposite ends, as at 7, to opposite legs A. At its opposite ends, however, each girt F has one of its flanges cut away, as shown, for flat-wise engagement at its remaining flange to and upon the projecting ends of the girts E of the set, and to which it is bolted, riveted, or otherwise fixed, as at 8.

Thus the girts E and F of each set function as a band, as it may be said, in securing the legs A together and further increase the strength and rigidity of the structure, since it means that the connection has a value of a two bolt or rivet connection without the wasteful use or employment of a gusset plate. It is engineering practice that any member having calculated stresses should have a two bolt connection as a minimum.

Midway its ends, each girt E has bolted to a flange thereof, as at 9, a vertically disposed gusset-plate G, and to the upper portion of such plate a pair of the opposed diagonals B is fixed at their respective inner ends, as at 10. From the plate G, the diagonals B, which are also preferably of angular section, extend divergently outwardly and upwardly to opposite legs A, each of the diagonals B being fixed at its upper or outer end to a plate 3 and leg-section 1 adjacent the end of the next adjacent girt D by also a plurality of fastening members 11, as shown.

And similarly extending divergently outwardly and downwardly from the lower portion of a gusset-plate G to opposite legs A, are the preferably angle diagonals C, each likewise fixed at its inner end to the plate G preferably by a plurality of suitably spaced fastening-members 12 and at its lower or outer end to a plate 3 and leg-section 1 adjacent the end of the next adjacent lower girt D by also preferably a plurality of spaced fastening-members 13.

As so disposed, the diagonals B, C, take and support the structure against lateral loads induced by the winds, the loads being transferred to the diagonals B and C and resisted by them acting in compression and tension, and re-enforcing the diagonals B, C, against deflection when under compression are so-called sub-struts H and J, each of the former of which at one end is fixed to, and approximately at a point midway the ends of, a diagonal C and at right angles to the diagonal C extends to a point approximately midway the ends of the adjacent lower girt D, to which it is rigidly fixed, as at 14.

In like manner, each of the sub-struts J at one end is fixed to, and approximately at a point midway the ends of, a diagonal B and at right angles to the diagonal B extends to a point approximately midway the ends of the next adjacent upper girt D, to which it, in turn, is also fixed, as at 14.

Thus, through and by its connected legs A, diagonals B, C, girts D, E, F, and struts H, J, the derrick uniquely possesses and is characterized by great strength, rigidity, and efficiency for the performance of its intended functions. The various structural members or parts of the derrick may be fabricated at the mill and the structure, as a whole, built up at the selected location with a minimum of labor and expense, and it is to be understood that changes in the form, construction, arrangement, and combination of the several parts of the derrick may be made and substituted for those herein shown and

described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is,—

1. An oil-well derrick having a side including, in combination, a pair of spaced upstanding legs, a set of three normally parallel horizontal girts disposed in spaced relation vertically of, and each girt being rigidly fixed at its opposite ends to, the legs, pairs of first and second diagonals actuatable in compression and tension for reinforcing the legs and girts when the derrick-side is under lateral loads, each of the diagonals of the first pair having fixed connection at its inner end with the middle girt, the diagonals of the first pair oppositely extending obliquely upwardly and outwardly from the middle girt and being fixed at their respective opposite ends to the legs adjacent the ends of the upper girt, each of the diagonals of the second pair having fixed connection at its inner end with the middle girt, and the diagonals of the second pair oppositely extending obliquely downwardly and outwardly from the middle girt and being fixed at their respective opposite ends to the legs adjacent the ends of the lower girt, and pairs of first and second sub struts for reinforcing the diagonals against deflection when under compression, the sub struts of the first pair having a length extending only between, and being fixed at their opposite ends to, the first diagonals and the upper girt, and the sub struts of the second pair having a length extending only between, and being fixed at their opposite ends to, the second diagonals and the lower girt.

2. An oil-well derrick having a side including, in combination, a pair of spaced upstanding legs, a set of three normally parallel horizontal girts disposed in spaced relation vertically of, and each girt being rigidly fixed at its opposite ends to, the legs, a gusset-plate fixed to the intermediate girt midway the ends thereof and normally disposed in the vertical plane of the legs, pairs of first and second diagonals actuatable in compression and tension for reinforcing the legs and girts when the derrick-side is under lateral loads, each of the diagonals of the first pair being fixed at its inner end to the plate above the middle girt, the diagonals of the first pair oppositely extending obliquely upwardly and outwardly from the plate and being fixed at their respective opposite ends to the legs adjacent the ends of the upper girt, each of the diagonals of the second pair being fixed at its inner end to said plate below the middle girt, and the diagonals of the second pair oppositely extending obliquely downwardly and outwardly from the plate and being fixed at their respective opposite ends to the legs adjacent the ends of the lower girt, and pairs of first and second sub struts for reinforcing the diagonals against deflection when under compression, the sub struts of the first pair having a length extending only between, and being fixed at their opposite ends to, the first diagonals and the upper girt, and the sub struts of the second pair having a length extending only between, and being fixed at their opposite ends to, the second diagonals and the lower girt.

3. An oil-well derrick having a side including, in combination, a pair of spaced upstanding legs, a set of three normally parallel horizontal girts disposed in spaced relation vertically of, and each girt being rigidly fixed at its opposite ends to, the legs, a gusset-plate fixed to the intermediate girt midway the ends thereof and normally

disposed in the vertical plane of the legs, pairs of first and second diagonals actuatable in compression and tension for reinforcing the legs and girts when the derrick-side is under lateral loads, each of the diagonals of the first pair being fixed at its inner end to the plate above the middle girt, the diagonals of the first pair oppositely extending obliquely upwardly and outwardly from the plate and being fixed at their respective opposite ends to the legs adjacent the ends of the upper girt, each of the diagonals of the second pair being fixed at its inner end to said plate below the middle girt, and the diagonals of the second pair oppositely extending obliquely downwardly and outwardly from the plate and being fixed at their respective opposite ends to the legs adjacent the ends of the lower girt, and pairs of first and second sub struts for reinforcing the diagonals against deflection when under compression, the sub struts of the first pair having a length extending only between, and being fixed at their opposite ends to, the first diagonals and the upper girt, and the sub struts of the second pair having a length extending only between, and being fixed at their opposite ends to, the second diagonals and the lower girt, each of the legs, girts, diagonals, and struts being of angle-section.

4. An oil-well derrick having a side including, in combination, a pair of spaced upstanding legs, each of the legs being of angle-section, upper and lower pairs of flat plate-sections disposed in the respective vertical plane of, and permanently fixed to, respective flanges of the legs at spaced intervals vertically thereof, a set of three normally parallel horizontal girts disposed in correspondingly spaced relation vertically of the legs, the middle girt being fixed at its opposite ends to the legs and the upper and lower girts being rigidly fixed at their respective opposite ends to the legs and to particular pairs of said plates, pairs of first and second diagonals actuatable in compression and tension for reinforcing the legs and girts when the derrick-side is under lateral loads, each of the diagonals of the first pair having fixed connection at its inner end with the middle girt, the diagonals of the first pair oppositely extending obliquely upwardly and outwardly from the middle girt and being fixed at their respective opposite ends to the legs and to

the upper pair of said plates, each of the diagonals of the second pair having fixed connection at its inner end with the middle girt, and the diagonals of the second pair oppositely extending obliquely downwardly and outwardly from the plate and being fixed at their respective opposite ends to the legs and to the lower pair of said plates, and pairs of first and second sub struts for reinforcing the diagonals against deflection when under compression, the sub struts of the first pair having a length extending only between, and being fixed at their opposite ends to, the first diagonals and the upper girt, and the sub struts of the second pair having a length extending only between, and being fixed at their opposite ends to, the second diagonals and the lower girt.

5. A structural steel tower having a plurality of wind-bracing panels each comprising two horizontal vertically spaced girts, an intermediate horizontal girt disposed midway between the first girts, a plurality of diagonals each extending from the midpoint of a first girt to an end of the intermediate girt, and a plurality of deflection overcoming sub-struts, each sub-strut extending only from the midpoint of a diagonal to the intermediate girt.

6. A structural steel tower having a plurality of wind-bracing panels each comprising two horizontal vertically spaced girts, an intermediate horizontal girt disposed midway between the first girts, a plurality of diagonals each extending from the midpoint of a first girt to an end of the intermediate girt, and a plurality of deflection overcoming sub-struts, each sub-strut extending only from the midpoint of a diagonal to a point on and adjacent to the center of the intermediate girt.

7. A structural steel tower having a plurality of wind-bracing panels each comprising two horizontal vertically spaced girts, an intermediate horizontal girt disposed midway between the first girts, four diagonals each extending from the midpoint of a first girt to an end of the intermediate girt, and four deflection overcoming sub-struts, each sub-strut extending only from the midpoint of a diagonal to the intermediate girt.

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