Sept. 28, 1926. 1,601,254

J. D. McEWEN

DERRICK CLAMP

Filed March 29, 1924

Fig. 1.

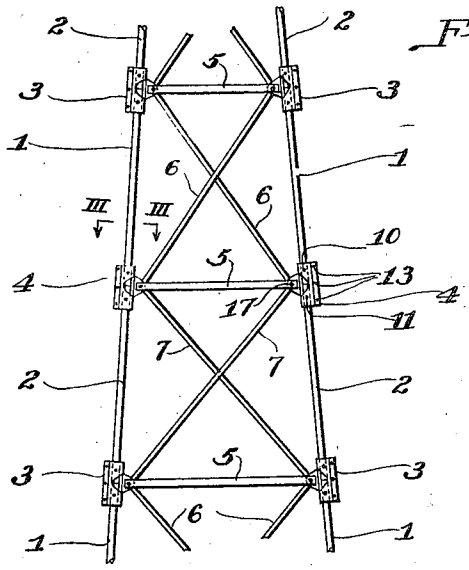


Fig. 2.

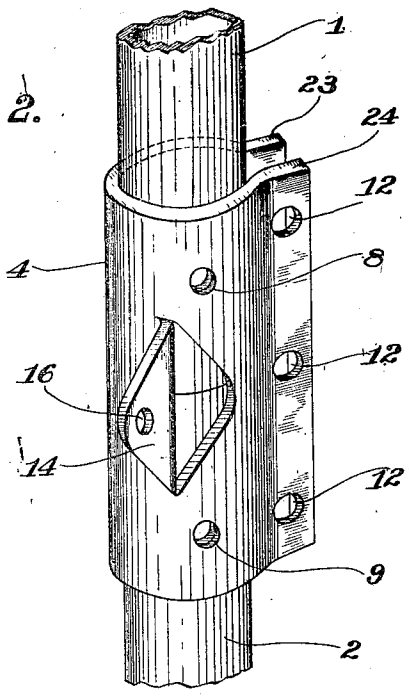


Fig. 3.

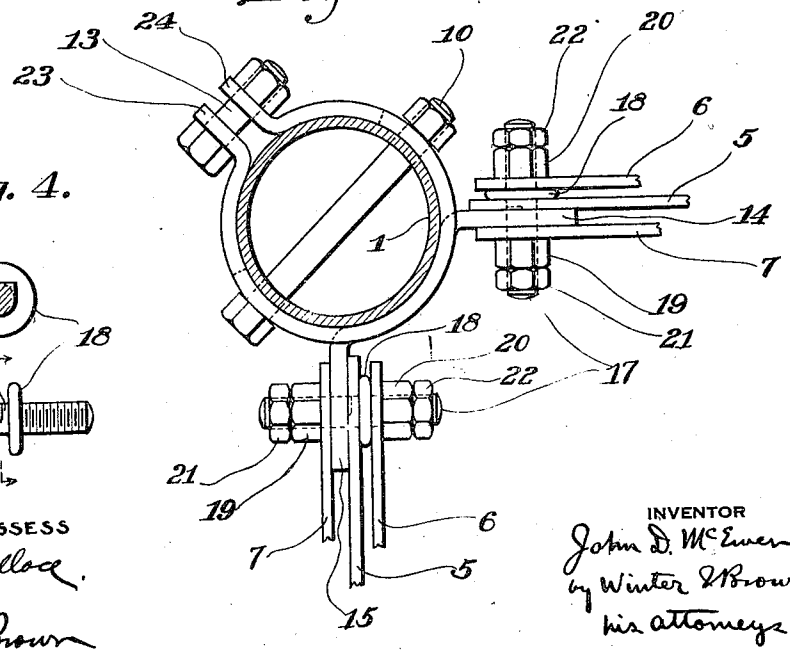
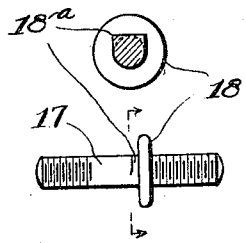


Fig. 4.



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UNITED STATES PATENT OFFICE.

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DERRICK CLAMP.

Application filed March 29, 1924. Serial No. 702,817.

This invention relates to all-metal towers, and particularly to such structures, known as "derricks", for use in connection with oil wells. Specifically, the invention relates to new and improved means for connecting sections of the upright members of such structures together, and for connecting the cross braces and girts positioned between the uprights to each other and to the uprights.

An object of the invention is to provide a clamp for engaging adjacent sections of upright leg members of metal derricks, the said clamp to be constructed of a single piece of pressed, forged, or cast metal, having portions thereof forming engaging tongues for attachment thereto of the girts and braces, means to attach two braces and a girt at a single point to a single tongue, and means to positively connect the adjacent leg sections to a single clamp.

Other objects and advantages will be apparent to those familiar with the art from the following specification.

Referring to the drawings, Fig. 1 is a partial side elevation of a portion of a derrick structure such as that with which my particular invention is designed to be used; Fig. 2 is a perspective view of a one-piece clamp in position as used to connect adjacent ends of tubular upright members of a derrick; Fig. 3 is an enlarged horizontal section through one of the uprights as for example the line III—III of Fig. 1, showing a plan of my clamp and attaching means as applied to the derrick; and Fig. 4 shows a special bolt for attaching the girts and braces of the derrick construction to one of the special clamps hereinafter described.

In drilling oil wells and the like, towers of a considerable height are necessary for lifting the drilling apparatus, the casing, etc., out of the well. These towers, or derricks are ordinarily left in place after the well is completed, to be used in later pulling the casing, or cleaning out the well. They are of considerable height, and consequently when exposed to strong winds are put under strain. In later years the so-called tubular steel derricks have come into quite general use. These ordinarily comprise four leg members, each of which is made up of sections of tubing placed end to end one on top of the other the adjacent ends being connected together by clamps extending around the tubes and held thereon by frictional engagement therewith. Horizontal cross braces extending from corner to corner of the derrick and girts extending diagonally between adjacent legs, connect the legs and hold the whole structure together. In case of very high winds there is a tendency to separate the leg sections at the joints and it has been found in some cases where mere frictional engagement is relied on, that the leg sections may be pulled completely apart and out of the clamp. I have therefore found it advisable to positively connect the leg sections through an overlapping clamp to which the meeting ends of adjacent sections are bolted.

These derricks are built up upon themselves as a scaffold, the workmen placing successive sections, and connecting them with clamps, girts and braces, as the structure goes up. Requisites of construction of the clamps and connecting members are that they shall be simple in form so as to be capable of economical manufacture, of sufficient strength to withstand the tearing and bending strains to which they are exposed, and of such a nature that the parts may be readily assembled and disassembled by the workmen.

All of these objectives have been attained in the structure herein illustrated and described, with a very simple and strong structure, having decided advantages, as will more fully appear throughout the specification.

Referring to Fig. 1, derrick structures such as those herein dealt with comprise corner leg members made up of tubular sections as for example 1 and 2, abutting end to end as illustrated. The meeting ends of the sections 1 and 2 are surrounded and retained in position by means of clamps 3 and 4, each of the clamps 3 and 4 being connected to a corresponding one at the same level on an adjacent leg by a horizontal girt member 5, and to the two clamps in the adjacent leg at the joints next above and next below its position in the structure by diagonal braces 6 and 7, all as clearly illustrated in Fig. 1.

In Fig. 2 there is an enlarged perspective view of one of the clamps 4 as applied to the sections 1 and 2 of one leg of the derrick. This clamp may be forged or cast but is preferably and ordinarily made as here

illustrated of a pressed steel plate in which holes 8 and 9 are provided for receiving bolts 10 and 11, adapted to extend through the oppositely positioned holes 8, 8 and 9, 9 respectively, in the finished clamp, and through the ends of the leg sections, as illustrated in Fig. 1. Holes 12 are provided at each edge of the blank for receiving bolts 13, adapted to compress the finished clamp and cause it to grip the ends of the leg sections, as illustrated in Fig. 3. From the body of the blank ears or tongues 14 and 15 are struck up, and each of these has therethrough a single hole 16. These ears are formed to lie in the planes of the sides of the derrick. In a four leg derrick the ears are perpendicular to each other, as illustrated in Fig. 3, or they may be turned at 120° for three-cornered derricks, or to any other desired angle. While illustrated as arranged in axial planes the ears may be disposed tangentially relative to the clamp or tube, or in an intermediate position. The holes 16 in the ears 14 and 15 are adapted to receive a special bolt 17, having an intermediate head or collar 18 as shown in Fig. 4. The body of the bolt adjacent to the said collar is non-circular in cross section in the portion 18^a adapted to engage a hole of corresponding shape in a girt, to prevent turning of the bolt when nuts are being applied to it.

These bolts are adapted to engage the ears 14, 15, and to pass through non-circular perforations in the ends of the girts 5 and circular holes in braces 6 and 7, the girts and braces being retained in position by nuts 19 and 20, which may be secured by locking nuts 21 and 22, as illustrated in Fig. 3.

The clamps may be cast but are ordinarily made from a blank of steel plate, the holes being punched at one operation, the ears struck up at another, and then the clamp bent into circular form, with the edges turned out to form parallel terminal edge flanges 23 and 24. When the clamps are cast the thickness of metal is somewhat varied at different points but the clamps are essentially the same. The diameter of the inside of the clamp is slightly larger than the external diameter of the leg sections 1 and 2 so that the clamp may be slipped over the ends of the sections, in assembling and disassembling.

The derrick is built up by positioning the first sections of the leg sections in upright position, and attaching them to the foundation or base in any suitable manner, then slipping over the upper ends of the leg sections 1, the clamps 3, and attaching them by bolts 11, then attaching girts and braces and adding the next leg sections, etc., in well known manner not necessary to describe here.

The special bolts 17 permit attachment of one brace or girt at a time, and yet one bolt holds all three cross members, and applies their various stresses to the ear through the single bolt, and at points thereon so close together that bending moments are very small.

By making the clamp in the form illustrated, with a single ear upon each side for attachment of it to two braces and girts at the same point a number of advantages are obtained. When such derricks are exposed to various strains, the braces may be under tension while the girt may be simultaneously exerting pressure on the clamp at the point where the two braces are exerting a pulling force, etc. When the girts and braces are attached to separate ears or tongues, as has been frequently done heretofore, there results a tendency to tear out the metal around the ears, or to pull it away from the ends of the tubes. Furthermore, where three separate ears are used they are necessarily of a comparatively small size, and consequently have sometimes failed under undue strains. Furthermore, the punching out of three ears in the plate form of clamp tends to unduly weaken the body of the clamp by cutting out the metal throughout so great a part of the length of the clamp.

In cases where a single wing or flange has been struck up or cast, it has been customary to make three separate connections of the two braces and girts thereto, usually as far separated as possible, and this again has resulted in strains on the metal, as well as requiring an undue amount of the plate to be struck up from the body of the clamp, making the clamp unduly long and expensive to preserve the necessary strength.

In the present construction I am able to make a single ear on each side support the two braces and a girt on that side, and by having only one ear, the ear can be made of comparatively large size, positioned in the middle of the clamp and yet leave ample metal above and below the ear to secure maximum strength, as well as leaving ample space for the holes 8 and 9 through which retaining bolts are passed for connecting the adjacent ends of the leg sections. And by having but a single hole in each ear its size may be reduced enough to not weaken the body of the clamp. With all of this the clamp itself is very simple, in one piece, and one which can be economically manufactured, without expensive machine operation. The three cross members being connected to a single ear by a single bolt tend to neutralize their respective opposing strains and to applying their bending, pulling and compression moment at substantially that same point, that point being positioned to secure maximum strength. At the same time the clamp is one that permit positively connecting the adjacent ends of the tubular leg

sections, so positively providing against the disengagement of the leg sections by wind strains and lifting movements.

When the clamp is placed upon the top of one of the tubular leg sections, it may be positively positioned and retained by the use of a single bolt 11. Ordinarily for convenience the bolts 13 are put in the clamp loosely before it is raised to position in the derrick, so that all that is necessary is that they be tightened up by the constructor. When the three leg sections of the same level are in position with clamps on their tops, girts 5 are attached to each by means of bolts 17, and these hold the legs in proper josition, and provide a working scaffold. The girts are attached by inserting the bolts 17, and the non-circular portion 18a through the hole in the end of the girt 5, and through the ear 15. A nut may be turned partially on the free end of the holt, to hold the girt temporarily, or the brace 7 may be positioned upon the other side of the ear 15, and the nut 20 may be turned down thereon. The other brace 6 may be positioned later, according to the convenience of the man making the construction.

This particular bolt makes possible the use of a one-eared clamp, because it permits the attaching of the three cross members at a single point, and by means of a single perforation in the clamp. Furthermore, this bolt has the great advantage that one man can erect the entire derrick, with a monkey wrench. The single bolt 17 is prevented from rotation.

This one-eared clamp, made practicable by the particular attaching means shown, has the advantage that girts and braces of a standard length may be carried in stock to be used with derrick sections and clamps of different diameters. Since the three cross members are all attached to the clamp at a single point, these cross members may be made of standard length, for even if the leg sections and clamps vary in diameter, standard bracing members will work with all sizes of derricks, the legs being merely moved slightly closer or farther apart according to variation in diameter. But where clamps of different length are used with three points of attachment on each side, special girts and braces have to be used with each size of clamp and leg section. This is a valuable feature, since as the matter now is, for each size of derrick or clamp used there must be carried in stock a complete set of braces and girts and these are not interchangeable with corresponding braces and girts in derricks of different sizes.

I claim:

1. In a derrick structure comprising a plurality of upright tubular leg members formed by sections of tubing placed end to end with transverse bracing members, the combination with a clamp for connecting the ends of adjacent leg sections, said clamp having ears extending toward the adjacent legs of the derrick, a single ear in each direction and with a single perforation in each ear, of a bolt adapted to extend through the perforations in said ear, said bolt having an intermediate collar or head, a non-circular portion adjacent to the collar, and being threaded at each end, whereby to attach to each ear a plurality of bracing members.

2. In a derrick construction comprising a plurality of legs made up of tubular sections with clamps for connecting the adjacent leg sections and cross braces between adjacent legs, a bolt adapted to attach to the clamp a plurality of said cross braces, said bolt having an intermediate collar or head and an adjacent non-circular body portion.

3. In a derrick clamp for connecting adjacent sections of tubing to form derrick legs and cross braces for holding the legs together, the combination of a single ear extending from the clamp toward an adjacent leg and having a single perforation therein with a single bolt having an intermediate head and adjacent non-circular portion and threaded ends, whereby a plurality of cross braces are attached to a single ear by a single bolt.

In testimony whereof, I sign my name.

JOHN D. McEWEN.