Sept. 7, 1937. W. N. RIEGER 2,092,022

DERRICK

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Fig 1

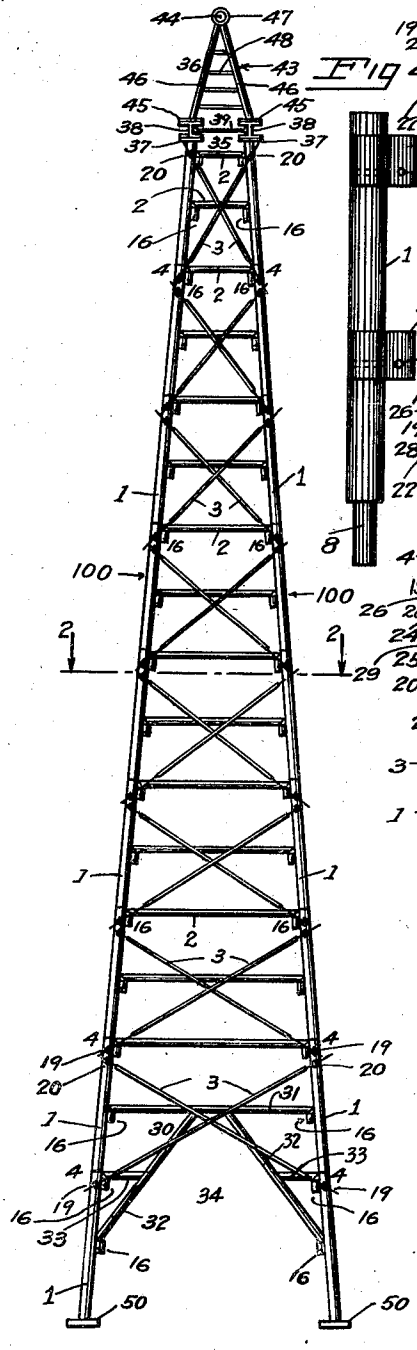


Fig 2

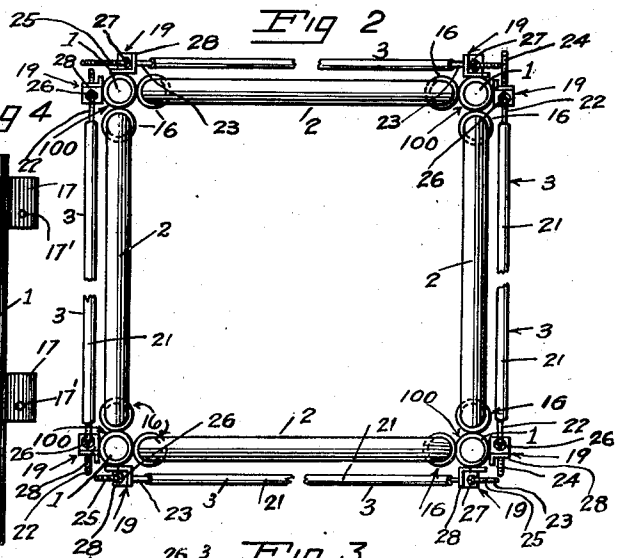


Fig 4

Fig 3

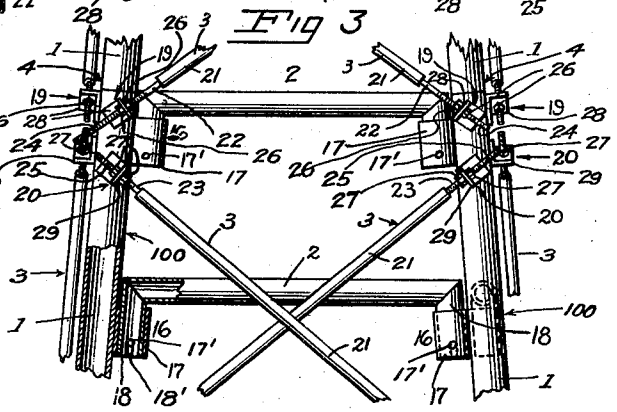


Fig 6

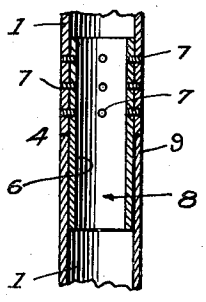


Fig 7

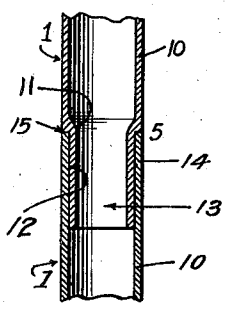
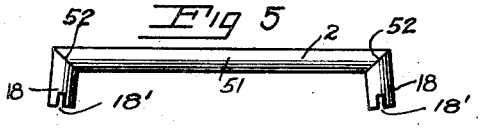


Fig 5



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Fig 8

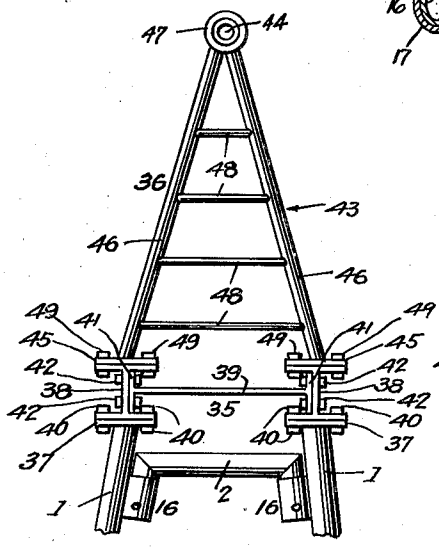


Fig 13

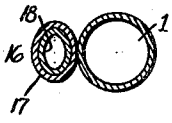


Fig 9

Fig 14

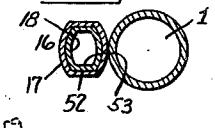


Fig 10

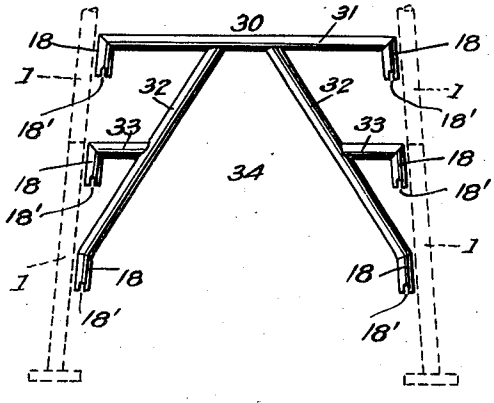


Fig 11

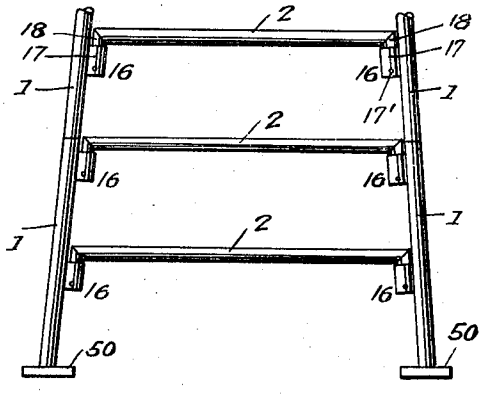
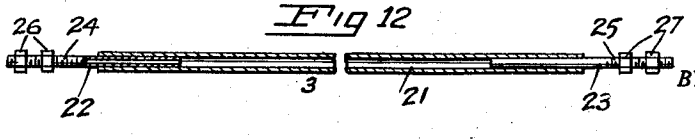


Fig 12



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2,092,022

DERRICK

Walter N. Rieger, Taft, Calif.

Application January 14, 1935, Serial No. 1,669

7 Claims. (Cl. 189—19)

This invention relates to metal structures, such as oil well derricks, towers of various types, building structures, bridge piers, etc.

The general object of the invention is to provide an improved metal structure of the character stated, which may be quickly erected or taken down.

Another object is to provide a sectional metal structure composed of tubular members detachably fitted and held together by slip joints, which permit a rapid drop-in assembly and a fast dismantling of the structure.

Another object is to provide a sectional metal structure composed of tubular members fitted and held together by slip joints, one member of certain joints being welded to certain of said tubular members.

Another object is to provide a metal structure which is considerably stronger and more rigid than an angle-iron oil well derrick, and which offers less resistance to wind, thus enabling the structure to withstand the heaviest wind storm.

Another object is to provide a structure of the character stated which may be constructed of new or used pipe, such as oil well drill pipe.

A further object is to provide a metal structure which will effectively resist fire, so that its members, after being bent and twisted out of shape by the action of heat, may be readily bent back into shape and used over again in reassembling the structure, thus effecting complete salvage of the structure from fire.

Other objects and advantages will appear hereinafter.

The invention is illustrated in the annexed drawings which form a part of this specification and in which:

Fig. 1 is a side elevation of a metal structure such as an oil well derrick embodying my invention.

Fig. 2 is a horizontal section on an enlarged scale of my structure as shown in Fig. 1, taken on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary side elevation, on an enlarged scale, of my structure, as shown in Fig. 1, showing one complete section and portions respectively of the adjoining lower and upper sections.

Fig. 4 is a side view of one of the upright members or legs of the structure.

Fig. 5 is a side view of one of the horizontal connecting members or girts of the structure.

Fig. 6 is a longitudinal section, on an enlarged scale, of one form of slip joint for connecting the upright members or legs of the structure together.

Fig. 7 is a view like Fig. 6 of another form of slip joint.

Fig. 8 is an enlarged side elevation of the upper end of the derrick shown in Fig. 1, illustrating the top structure and gin pole.

Fig. 9 is a perspective of the parts shown in Fig. 8.

Fig. 10 is an enlarged elevation scale of the derrick window shown in Fig. 1.

Fig. 11 is an enlarged elevation of the lower portion of one side of my structure.

Fig. 12 is a longitudinal section of one of the tie rods.

Figs. 13 and 14 are horizontal sections of modified forms of slip joints.

Corresponding parts are designated by the same reference characters in all the figures of the drawings.

My structure primarily comprises metal legs 1, girts 2 and tie rods 3 of tubular form, which may be constructed of pipe, such as new or used oil well drill pipe.

The legs 1 are detachably connected together end-to-end by slip joints 4, as illustrated in Fig. 6, or by slip joints 5, as illustrated in Fig. 7 of the drawings, to form the corner posts 100 of my structure.

Each of the slip joints 4 comprises a short piece of pipe 6 of such diameter as to fit closely within the legs 1, and the upper portion of said piece of pipe 6 is fitted within and welded to the lower end portion of a leg 1, there being holes 7 drilled through the lower portion of said leg and the upper portion of said smaller piece of pipe 6 to facilitate welding thereof together, the welding material filling said holes and pinning said piece of pipe to said leg. The lower portion of the piece of pipe which projects below the lower end of each leg 1 forms the male member 8 of a slip joint 4, while the upper end of each leg 1 forms the female member 9 of said joint, and the lower end of one leg 1 is detachably connected to the upper end of another leg by inserting the male member 8 within the female member 9 of the joint 4, until the lower end of the upper leg rests upon the upper end of the lower leg as illustrated in Fig. 6 of the drawings.

Each of the joints 5 is formed by taking a section of oil well drill pipe 10, which has its wall thickened at its end as at 11, for cutting a thread therein, and reducing the external diameter of said thickened end, as indicated at 12, to form the male member 13 of said slip joint 5, the female member 14 of said joint being formed by the other end of a leg formed of a section of drill

pipe. The reduced end portion 12 of the pipe 10 provides an annular external shoulder 15 on the leg 1, which is formed by said pipe at the upper end of said reduced end portion. The lower end of one leg 1 is detachably connected, by means of slip joint 5 to the upper end of another leg 1, by inserting the male member 13 at the lower end of an upper leg into the female member 14 at the upper end of a lower leg until the shoulder 15 of the upper leg rests upon the upper end of the lower leg.

The girts 2 extend horizontally across the sides of the structure and are each detachably connected at their ends to a pair of legs 1 at one side of the structure by slip joints 16, which joints comprise sleeves 17, and the ends 18 of the girts, which ends are bent downwardly to fit in said sleeves, said sleeves being welded to the inner sides of the legs 1 at the upper ends thereof and about midway between the lower and upper ends of said legs. Pins 17' are secured in the lower ends of the sleeves 17 and the girt ends 18 are provided with slots 18' extending upwardly from their lower ends to receive said pins when said ends are slipped into said sleeves whereby my structure is held rigid against twisting. The sleeves 17 may be formed of short pieces of drill pipe.

The tie rods 3 are arranged in pairs extending diagonally of the sides of the structure across each other, with their lower ends connected to the upper ends of a pair of legs 1 by connections 19, and with their upper ends connected to the next upper pair of legs near their upper ends by connections 20 immediately below the connections 19. Each tie rod 3 may consist of a main member 21 of small pipe, and short end members 22 and 23 of smaller pipe or rods driven respectively partway into the lower and upper ends of said main section and extending beyond said ends, the portions of said end members 22 and 23 within the main member 21 being welded to said main member. The outer end portions of the end members 22 and 23 of the tie rods 3 are provided with threads 24 and 25 respectively to be engaged by nuts 26 and 27 respectively. Each connection 19 comprises an angle iron 28, a threaded lower end member 22 of a tie rod 3, and a pair of nuts 26 engaging said threaded end member. One member of each angle iron 28 is welded to the outside of a leg 1 at the upper end of said leg, while the other member of each angle iron 28 is apertured to permit the lower end member 22 of a tie rod 3 to extend therethrough, the nuts 26 on said lower end member engaging the opposite sides of said other angle iron member. Each connection 20 comprises an angle iron 29, a threaded upper end member 23 of a tie rod 3 and a pair of nuts 27 engaging said threaded end member. One member of each angle iron 29 is welded to the outside of a leg 1 near the upper end of said leg immediately below an angle iron 28, while the other member of said angle iron 29 is apertured to permit the upper end member 23 of a tie rod 3 to extend therethrough, the nuts 27 on said upper end member engaging the opposite sides of said other angle iron member. By turning the nuts 26 and 27, on the threaded end members 22 and 23 of a pair of tie rods and causing the inner nuts to disengage and the outer nuts to engage the angle brackets 28 and 29 through which said end members extend, the tie rods may be drawn taut between said angle brackets for tying a pair of legs 1 to the next lower pair of legs, and bracing the structure. The inner nuts may then be turned against the inner sides of said angle brackets for locking the tie rods taut between the brackets at the ends of the rods, in position tying together two adjacent pairs of legs, and bracing the structure.

My structure, when adapted for use as an oil well derrick, is constructed with a window 34 at one side, at the lower portion thereof, to accommodate the walking beam of an oil well rig. Said window comprises a horizontal upper girt member 31, a pair of upwardly converging girt members 32, and a pair of horizontal girt members 33, all of which being constructed of tubular metal such as pipe. The upper ends of the converging girt members 32 are welded to the under side of the girt member 31 intermediate the ends thereof. The horizontal girt members 33 are welded at their inner ends to the converging girt members 32 intermediate the ends thereof. The window 30 is detachably connected, at the ends of the girt 31, and girt members 32 and 33, to legs 1, by slip joints 16. The girt member 31 is constructed like the girts 2 with depending male joint members 18 at its ends which slip into the female joint members or sleeves 17 welded to the next lowermost legs 1, intermediate the ends of said legs. The converging girt members 32 are formed at their lower ends with depending male joint members 18 which slip into the female joint members or sleeves 17 which are welded to the lowermost legs 1 intermediate the ends thereof. The short horizontal girt members 33 are formed at their outer ends with depending male joint members 18 which slip into the female joint members 17 which are welded to the upper ends of the lowermost legs 1. The upwardly converging girt members 32 provide a space 34 in the lower part of one side of the derrick, through which space extends the walking beam of an oil well rig.

When adapted for use as an oil well derrick, my structure is provided with a special form of top structure 35 and gin pole 36 mounted on said top structure. Said top structure comprises plates 37, welded respectively upon the upper ends of the uppermost legs 1, a pair of I-beams 38 resting respectively at opposite sides of the derrick upon the plates 37 at said sides and connecting members 39 connecting the ends of said I-beams. The lower flanges of the I-beams 38 are bolted to the plates 37 by bolts 40. The connecting members 39 are formed with end flanges 41 which are bolted to the intermediate members of the I-beams 38 by bolts 42. The gin pole 36 comprises a pair of stanchions 43 and a horizontal bar 44 supported at its ends respectively by the upper ends of said stanchions. Each of said stanchions comprises a base plate 45, a pair of upwardly converging legs 46 welded at their lower ends to said plate, a horizontal sleeve 47 welded to the upper ends of said legs, and a plurality of vertically spaced horizontal braces 48 welded at their ends to said legs respectively. The ends of the bar 44 are fitted in the sleeves 47 of the stanchions 43. The legs 46, sleeves 47 and braces 48 of the stanchions 43, and the bar 44, are of tubular form and may consist of sections of pipe. The base plates 45 of the stanchions 43 rest upon the upper flanges of the I-beams 38 respectively and are bolted to said flanges by bolts 49.

In assembling and erecting my structure, the lowermost legs 1 are first placed upright with their lower ends resting upon a suitable foundation 50. Girts 2 are placed between opposite legs

at the sides of the structure and the ends of said girts connected to said legs by slip joints **16**. The remaining legs are assembled, together with said lowermost legs end-to-end, and each leg is connected to the next leg by a slip joint **4**, and as each pair of legs at each side of the structure are assembled, girts **2** are connected at their ends to said legs by slip joints **16**, the pins **17'** engaging the slots **18'** of said joints and preventing twisting of the structure. As each pair of oppositely disposed legs at each side of the structure are joined to the next lower pair of legs, a pair of tie rods **3** are extended diagonally across each other and said tie rods are connected at their lower ends by nuts **26**, to the brackets **28**, at the upper ends of said next lower legs, while the upper ends of said rods are connected to the brackets **29** near the upper ends of said upper pair of legs **1**, whereby each pair of legs is tied and braced to the next lower pair of legs. The top structure **35** is placed with the lower members of its I-beams **38** resting upon the top plates **37** on the upper ends of the uppermost legs **1** and said I-beams are secured to said top plates by the bolts **40**. The gin pole **36** is then placed with its base plates **45** resting upon the upper members of the I-beams **38**, and said base plates are secured to said I-beam members by the bolts **49**.

The structure may be readily taken down by disengaging the bolts **49** and removing the gin pole **36** from the top structure **35**; disengaging the bolts **40** and removing said top structure from the top plates **37**; disconnecting the tie rods **3** and disconnecting the girts from each pair of legs to which said rods and girts are connected; and disconnecting and removing each pair of legs from the next lower pair of legs.

When used as an oil well derrick, the window **30** is connected to the lowermost and next lower legs **1** by means of the slip joints **16**, which connect the lower ends of the girt members **32** and the outer ends of the girt members **33** to the lowermost legs, and the slip joints **16** which connect the girt member **31** to the next lower legs.

Referring to Fig. 5 of the drawings, the girts **2** may consist of three members, an elongated intermediate horizontal member **51** and the depending end members **18**, which intermediate members are joined at their ends to the upper ends of said end members by welded mitered joints **52**. The pins **17'** and slots **18'** of the slip joints **16** are used to prevent twisting of the structure when the girt members **18** and sleeve members **17** of said slip joints are cylindrical.

In the modified form of the slip joints **16** for the girts, shown in Fig. 13 the joint members **17** and **18** are oval in cross section to prevent twisting of the structure.

In the modified form of the slip joint **16** shown in Fig. 14, the joint members **17** and **18** are formed with engaging flat sides **52** and **53** to prevent twisting of the structure.

I claim as my invention:

1. In a structure as disclosed, corner posts comprising a plurality of legs, slip joints for connecting the adjoining ends of said legs together, horizontal girts, slip joints for connecting the ends of said girts to oppositely disposed legs, said slip joints comprising sleeves secured to said oppositely disposed legs, the ends of said girts extending downwardly to fit in said sleeves through the upper ends thereof, pins extending through said sleeves, and the girt ends being provided with slots to receive said pins to prevent turning of said girt ends in said sleeves.

2. In a structure as disclosed, a plurality of legs forming corner posts, means for connecting the adjoining ends of said legs together, and tie rods for tying together adjoining pairs of oppositely disposed legs, each of said tie rods being formed of a main tubular member and end members secured within the ends of said main tubular member and extending beyond the ends of said tubular member, the outer ends of said end members being threaded, angle brackets welded to said legs, one end of each tie rod extending through one of said brackets on one leg of one pair of said legs, and the other end of said tie rod extending through a bracket on the opposite leg of another pair of legs adjoining said first pair, and nuts on the threaded end members of said tie rods for engaging said brackets for drawing each of said tie rods taut between two of said brackets, and girts connecting the legs of each pair of legs.

3. In a structure as disclosed, corner posts comprising a plurality of superimposed legs, means for connecting the adjoining ends of said legs together, girts, slip joints for connecting the ends of said girts to oppositely disposed legs, said slip joints comprising sleeves secured respectively to said oppositely disposed legs and the ends of said girts extending downwardly to fit in said sleeves respectively through the upper ends thereof.

4. In a structure as disclosed, corner posts comprising a plurality of superimposed legs, means for connecting the adjoining ends of said legs together, tubular girts, slip joints for connecting the ends of said girts to oppositely disposed legs, said slip joints comprising tubular female members secured to said legs respectively, and tubular male members secured to the ends of said girts at an angle thereto and fitted in said sleeves through the upper ends thereof.

5. In a structure as disclosed, corner posts comprising tubular legs, slip joints for connecting the adjoining ends of adjoining legs together, tubular girts, slip joints for connecting the ends of said girts to oppositely disposed legs, said slip joints comprising tubular female members secured to said legs respectively, and tubular male members secured to the ends of said girts at an angle thereto and fitted in said sleeves through the upper ends thereof.

6. In a structure as disclosed in claim 4, means for preventing turning of the male members in the female members of the slip joints which connect the ends of the girts to the legs of the corner posts.

7. In a structure as disclosed, corner posts comprising legs arranged in pairs, slip joints for connecting the adjoining legs of adjoining pairs of legs, and a pair of tie rods for tying together two adjoining pairs of legs, the ends of said tie rods being threaded, angle irons secured to the legs of said adjoining pairs of legs, the ends of each tie rod extending through angle irons secured respectively to legs of said adjoining pairs of legs, and nuts on said threaded ends of said tie rods for engaging said angle irons.

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