Aug. 15, 1967 H. J. WOOLSLAYER ETAL 3,335,987

ADJUSTABLE OIL WELL MAST SUPPORT

Filed Aug. 1, 1966 4 Sheets-Sheet 1

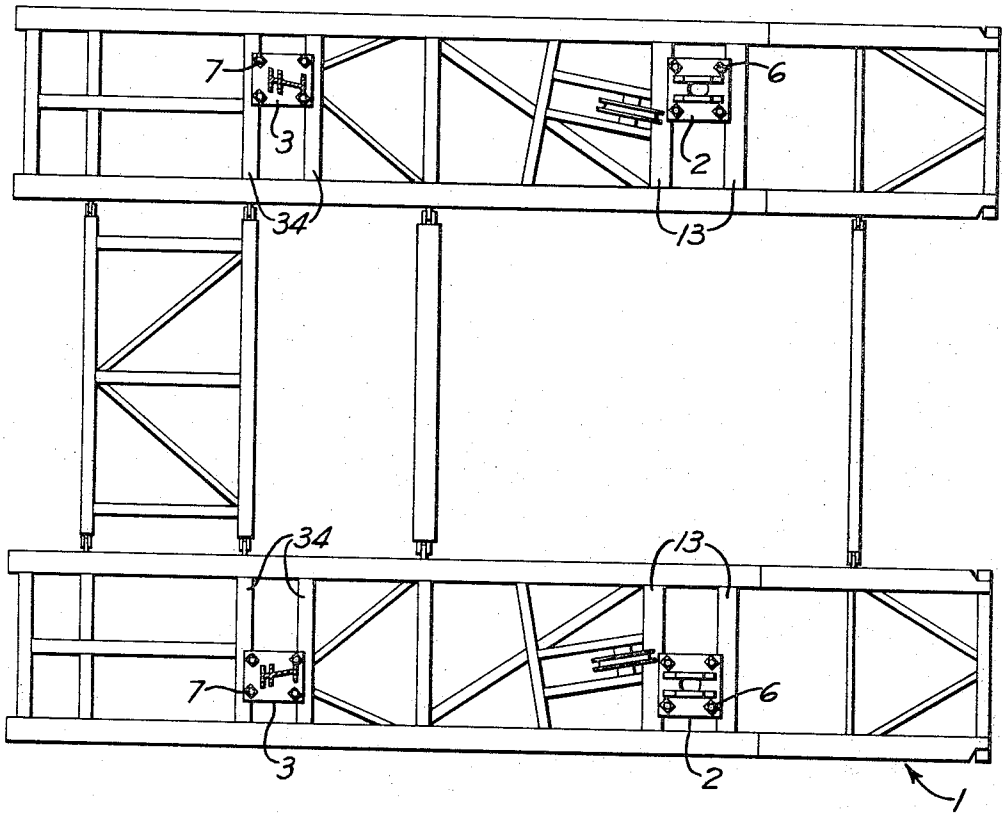


Fig. 1

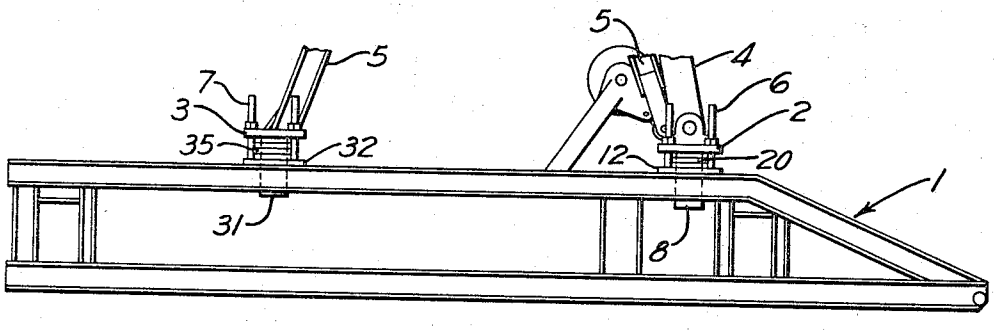


Fig. 2

INVENTORS.
HOMER J. WOOLSLAYER
CECIL JENKINS

Brown, Critchlow, Flick & Peckham
ATTORNEYS.

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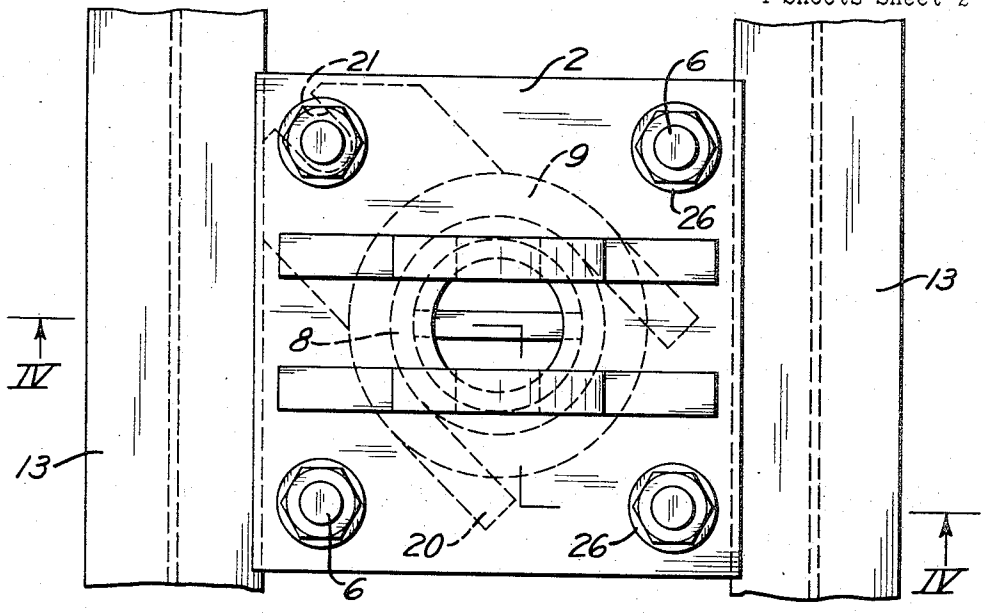


Fig. 3

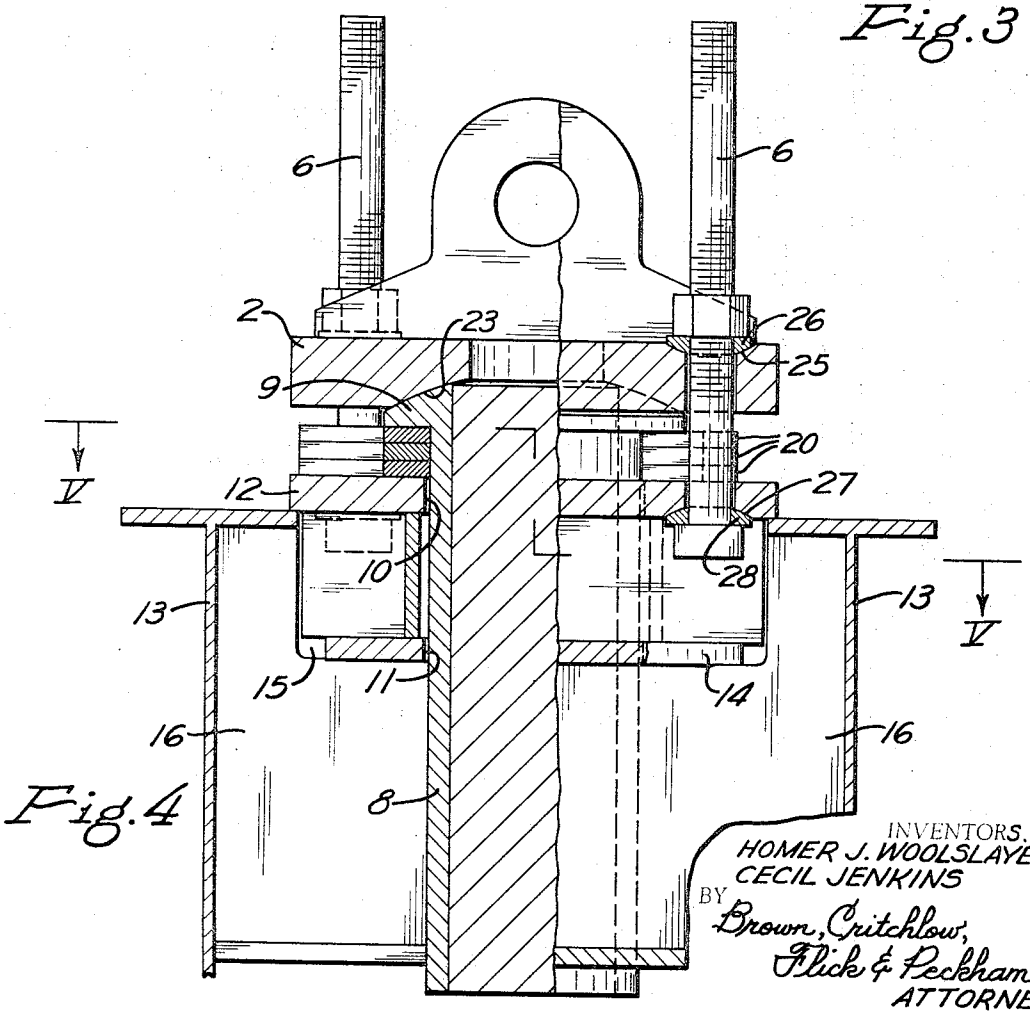


Fig. 4

INVENTORS.
HOMER J. WOOLSLAYER
CECIL JENKINS
BY
Brown, Critchlow, Flick & Peckham
ATTORNEYS

Aug. 15, 1967 H. J. WOOLSLAYER ETAL 3,335,987

ADJUSTABLE OIL WELL MAST SUPPORT

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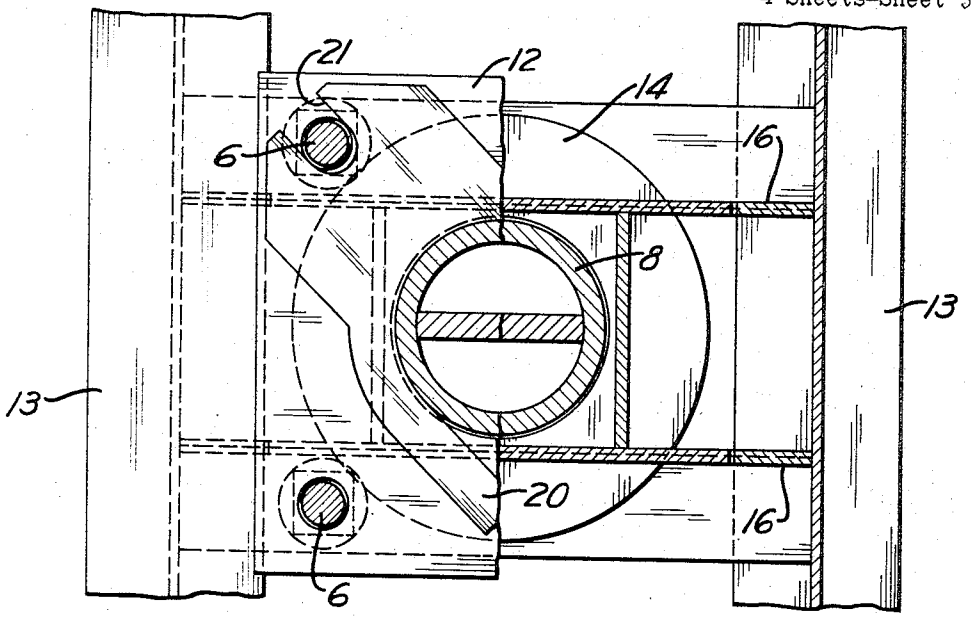


Fig. 5

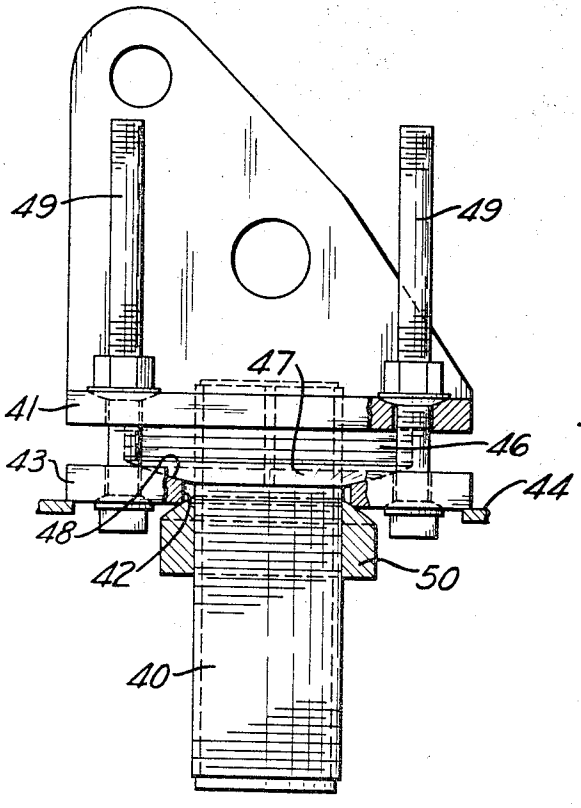


Fig. 9

INVENTORS.
HOMER J. WOOLSLAYER
CECIL JENKINS

Brown, Critchlow, Flick & Peckham
ATTORNEYS.

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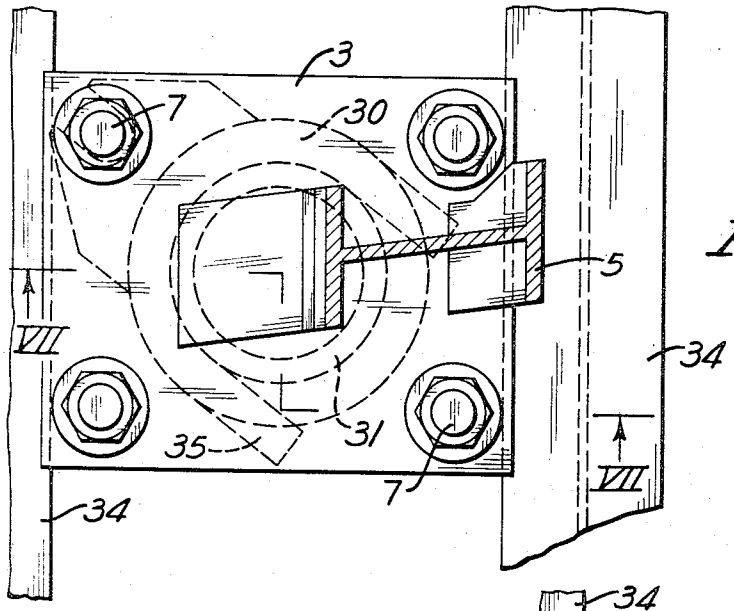


Fig. 6

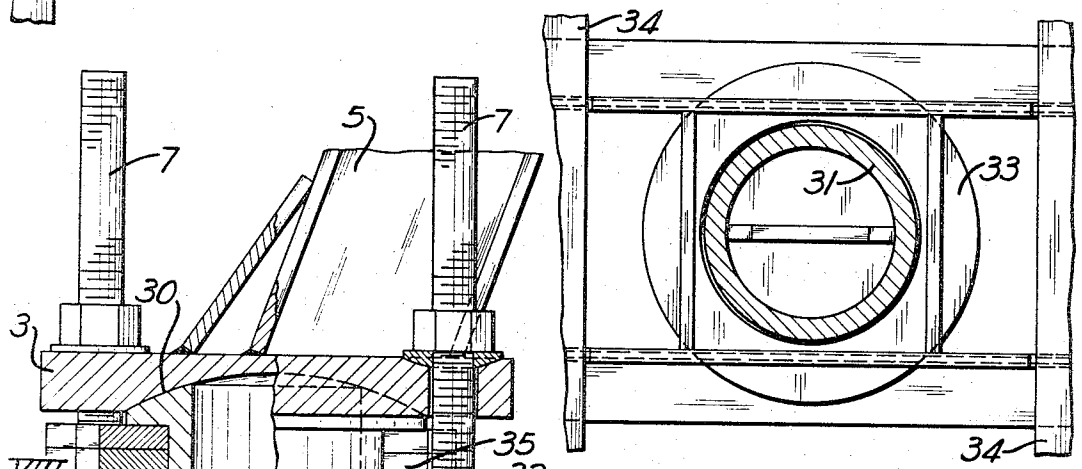


Fig. 8

Fig. 7

INVENTORS.
HOMER J. WOOLSLAYER
CECIL JENKINS

Brown, Critchlow, Flick & Peckham
ATTORNEYS.

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ADJUSTABLE OIL WELL MAST SUPPORT

Homer J. Woolslayer and Cecil Jenkins, Tulsa, Okla., assignors to Lee C. Moore Corporation, a corporation of Pennsylvania

Filed Aug. 1, 1966, Ser. No. 569,339
8 Claims. (Cl. 248—23)

This invention relates to supports for oil well masts, and more particularly to supports that can be adjusted to keep the masts level.

Although only masts will be referred to herein, it is to be understood that this term is used in a broad sense to cover standard derricks as well. During the drilling of oil wells, the foundation, base or substructure on which the mast rests sometimes settles unevenly so that the mast no longer is plumb over the well. Due to the great weight of the entire rig, which may be as much as 400,000 pounds, it is very difficult to correct the situation by jacking up the low corner or side. It therefore has been the practice to adjust the mast only, because of course it weighs only a fraction of the complete rig. When the low side of the mast is raised to level it, shims are placed under the raised mast shoes and then the shoe anchor bolts are tightened again.

In order to provide satisfactory stability, large shims have been required, which weigh several thousand pounds. Another objection to them is that they have made it difficult to maintain proper alignment of the mast foot, due to the extended length of the shoe anchor bolts.

It is among the objects of this invention to provide an adjustable oil well mast support which requires only small and relatively light-weight shims when a shoe is raised to level the mast, which maintains proper alignment of the raised mast foot, and on which the mast remains stable.

The invention is illustrated in the accompanying drawings, in which:

FIG. 1 is a plan view of a substructure;

FIG. 2 is a side view thereof;

FIG. 3 is an enlarged plan view of a front shoe;

FIG. 4 is a vertical section taken on the line IV—IV of FIG. 3;

FIG. 5 is a horizontal section taken on the line V—V of FIG. 4;

FIG. 6 is an enlarged plan view of a rear shoe;

FIG. 7 is a vertical section taken on the line VII—VII of FIG. 6;

FIG. 8 is a horizontal section taken on the line VIII—VIII of FIG. 7; and

FIG. 9 is a side view, partly in section, of a modification.

Referring to FIGS. 1 and 2 of the drawings, a typical substructure **1** is shown, on which there are shoes **2** and **3** for the front feet of the mast stem **4** and the front and back feet of the mast gin pole **5**. Originally, all of the shoes are firmly anchored to the substructure by means of anchor bolts **6** and **7**. However, provision is made for raising any one or more of the shoes in case the substructure settles and throws the mast out of line with the well. To permit the front shoes to be raised and shimmed up, the base of each shoe rests on top of a vertical stem **8** in the form of a heavy reinforced short length of pipe. As shown in FIG. 4, the stem extends down into a vertical passage in the substructure and is supported therein by its upper end, which extends radially outward like a flange to form a head **9**. To prevent the stem from tilting in the substructure, the passage that receives it may be formed by a piar of vertically spaced aligned openings **10** and **11** in parallel plates. The upper plate **12** rests on top of a pair of horizontal beams **13**

forming part of the top of the substructure and is welded to them. The lower plate **14** is seated in recesses **15** in a pair of parallel vertical cross plates **16**, the ends of which are welded to the adjoining beams.

If it becomes desirable to raise one of the front shoes as indicated in FIG. 2, the nuts on its long anchor bolts **6** are loosened the necessary amount or, in case the bolts are short they are removed and replaced by longer bolts. Then a jack (not shown) is placed beneath the stem and operated to jack up the stem and shoe and the mast and gin pole legs attached to it. When the shoe reaches the desired height where it is level with the other shoes, shims **20** are placed between the shoe and the substructure and then the nuts on the anchor bolts are tightened to hold the shoe firmly in place.

The shims may take various forms, but they should be bifurcated so that they can be inserted beneath the shoe astraddle of the stem as shown in FIGS. 3 and 5. As it is desirable to lock the shims in place by means of one of the anchor bolts, the side of each shim opposite its open side preferably is provided with a projection having a notch **21** in it for receiving one of the anchor bolts that generally is removed before the shims are inserted beneath the shoes. However, that bolt can be left in place until after all of the shims have been installed, whereupon it can be removed, the shims all rotated to align their notches with the empty bolt holes, and then the missing bolt replaced. This locks the shims in place so that they cannot move away from the stem.

Another feature of this invention is that a raised shoe will be free to remain in alignment with the mast leg as the shoe is raised so that no strain will be put on the connection between the mast and shoe. This is accomplished by making the head **9** of the stem spherical as shown in FIG. 4 and providing the bottom of the shoe with a spherical recess **23** that receives the head. This ball and socket type connection therefore allows the shoe to tilt in any direction on the stem as required in order to maintain alignment.

Since a tilted shoe will not be parallel to the top of the substructure, it is desirable to provide the top of the shoe plate around each bolt hole with a spherical recess **25**, in which a spherical washer **26** on the anchor bolt is seated. Likewise, the bottom of the supporting plate **12** is provided with a spherical recess **27** around each bolt hole for receiving a spherical washer **28** supported by the head of the bolt beneath it. With this arrangement, there is no tendency to bend the bolts when the shoe is not parallel to the substructure.

The arrangement of the rear shoes **3** is similar to the front shoes, except the rear shoes are fastened rigidly to the lower ends of the gin pole rear legs **5**. As shown in FIG. 7, each shoe **3** is seated on the spherical head **30** of a vertical stem **31** that is adjustable vertically in plates **32** and **33** supported by a pair of horizontal beams **34** forming part of the top of the substructure. The shoes can be shimmed up, as indicated in FIG. 2, by shims **35** like front shims **20**.

The construction just described permits a shoe to be raised to a desired level and then be supported there by small light-weight shims in a manner that does not reduce the stability of the mast. At the same time, misalignment of the shoes and mast is prevented and undue strain is not put on the connection between them.

In the modification shown in FIG. 9, the upper end of the stem **40** is rigidly secured to the shoe **41**. In view of this, the substructure passage formed by the opening **42** through plate **43** must be oversize to permit the stem that it receives to tilt in it when it is necessary for the shoe to be tilted relative to the substructure **44** in order to stay in line with the derrick leg connected to it. Plate

43 is welded to the substructure. The shims **46** that are placed between the shoe and the substructure to hold the shoe in a raised position remain parallel to the bottom of the shoe plate because they rest on a washer **47** that encircles the stem and has a spherical bottom seated in a spherical recess **48** around the opening through the substructure plate **43**. It will be seen that this washer will tilt with the shoe and therefore remain parallel to it.

With this construction, the anchor bolts **49** can be supplemented or even dispensed with by providing the stem **40** with a screw thread and screwing a large retaining nut **50** onto it up against the bottom of plate **43**. In such a case, the top of the nut should be spherical in order to engage the plate around the stem even though the stem is tilted. It is not always necessary that the stem be capable of tilting, because a self-aligning connection between the foot of the derrick and the shoe can be employed to allow a change in alignment of the shoe and derrick.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. An adjustable oil well mast support comprising a substructure, shoes on the substructure for the feet of a mast, a central stem extending down from the bottom of each shoe, the substructure being provided with vertical passages slidably receiving the stems, means holding the shoes in place, said stems being elevatable in said passages to raise the shoes above the substructure after said means have been loosened, whereby shims can be placed between the shoes and the substructure to support the raised shoes.

2. An adjustable oil well mast support according to claim **1**, in which said stems are rigidly connected to the shoes and are threaded, and said holding means are nuts screwed onto the stems.

3. An adjustable oil well mast support according to claim **1**, in which said stems are rigidly connected to the shoes, said passages are large enough to permit said stems to be tilted therein, the substructure around the upper end of each passage is provided with a concave recess, and a spherical washer is slidably mounted on each stem and seats in the underlying recess.

4. An adjustable oil well mast support according to claim **1**, including bifurcated shims straddling at least one of said stems between the shoe thereon and the substructure.

5. An adjustable oil well mast support according to claim **4**, in which said holding means are bolts anchoring the shoes to the substructure, and the shims on a stem are provided with notches receiving at least one of said bolts to help hold the shims in place.

6. An adjustable oil well mast support according to claim **1**, in which the upper end of each of said stems has a spherical head, the bottom of each shoe is provided with a spherical recess receiving the underlying stem head to permit the shoe to be tilted on the stem, and said holding means are bolts anchoring the shoes to the sub structure.

7. An adjustable oil well mast support according to claim **6**, in which each of said passages is formed from a plurality of vertically spaced members provided with aligned openings therethrough receiving a stem to keep it from tilting.

8. An adjustable oil well mast support according to claim **6**, including washers mounted on each bolt and having spherical inner surfaces seated in corresponding recesses in the shoes and substructure.

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JOHN PETO, *Primary Examiner.*