Jan. 28, 1941. J. F. EATON 2,230,029

LOAD STABILIZER FOR WELL PUMPING EQUIPMENT

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Fig. 1.

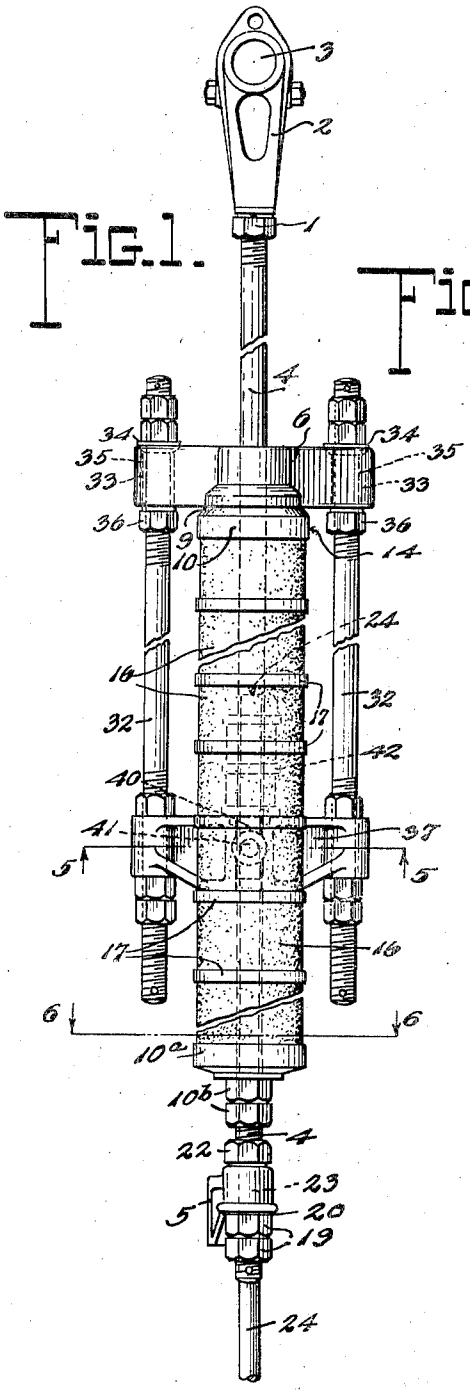
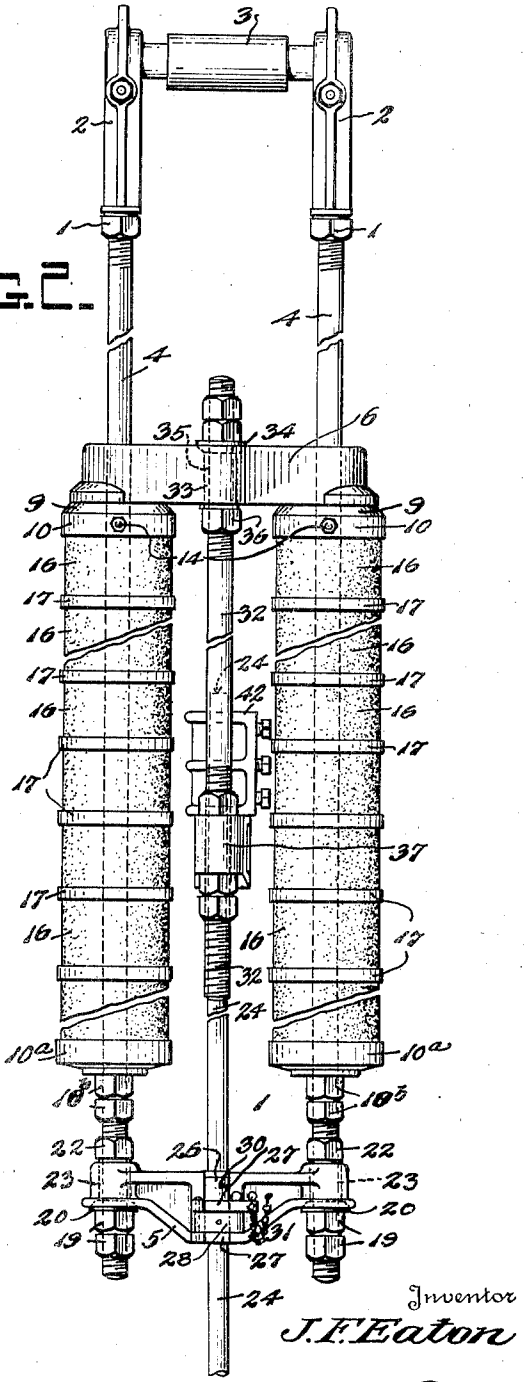


Fig. 2.



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Fig. 3.

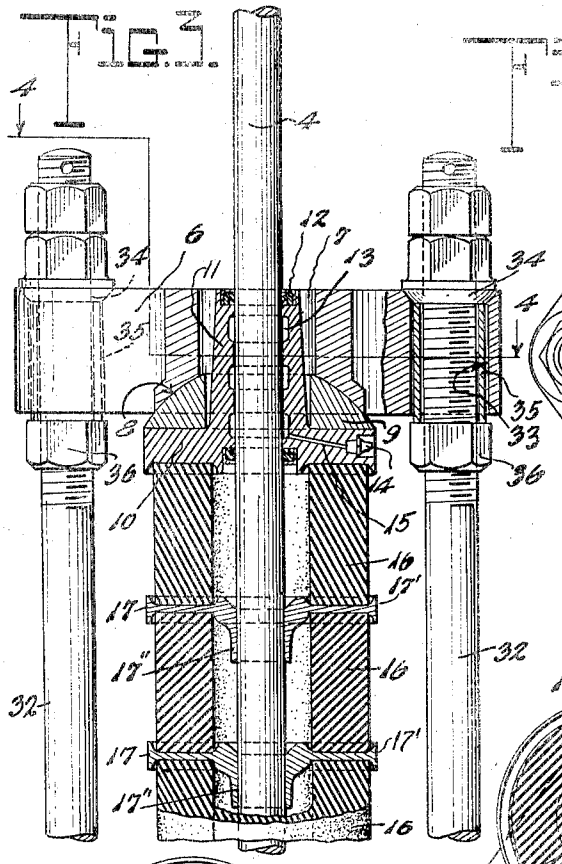


Fig. 4.

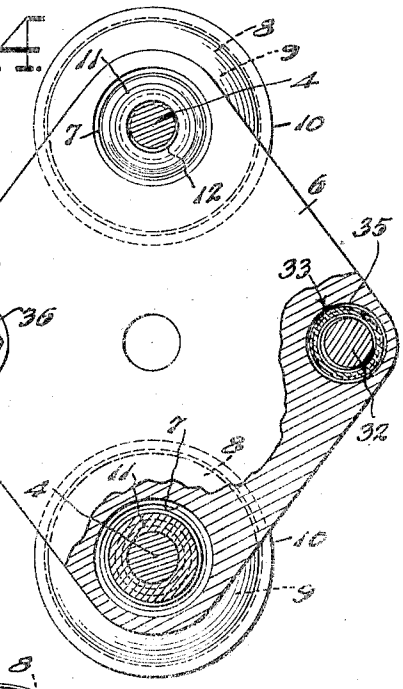


Fig. 5.

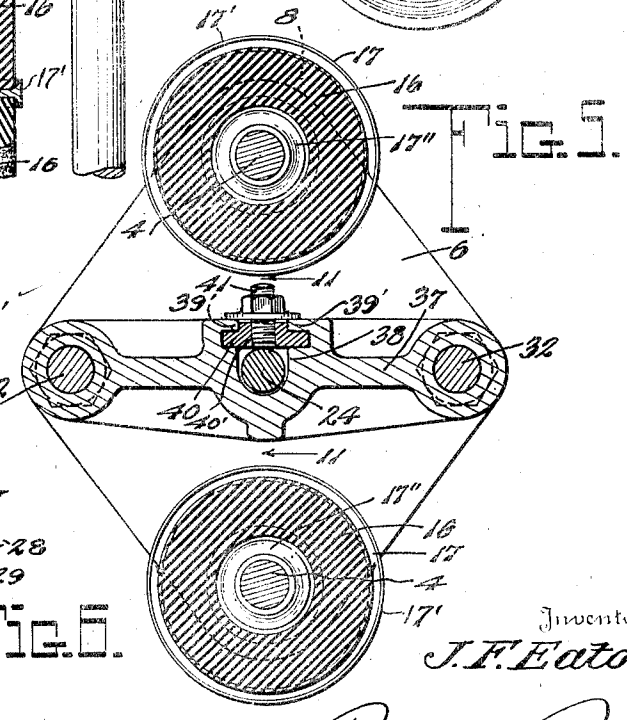
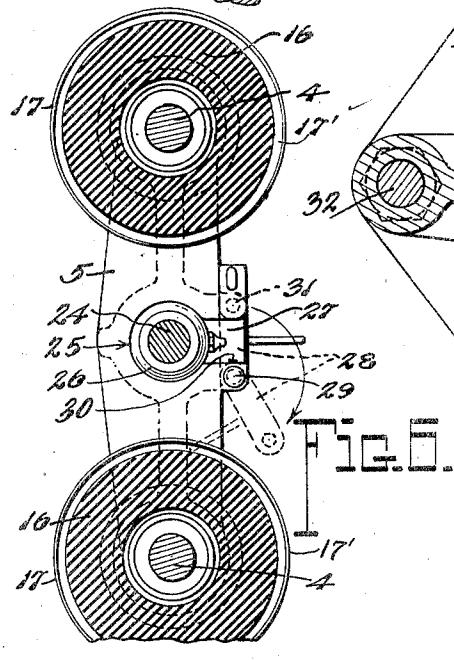


Fig. 6.



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Fig. 7.

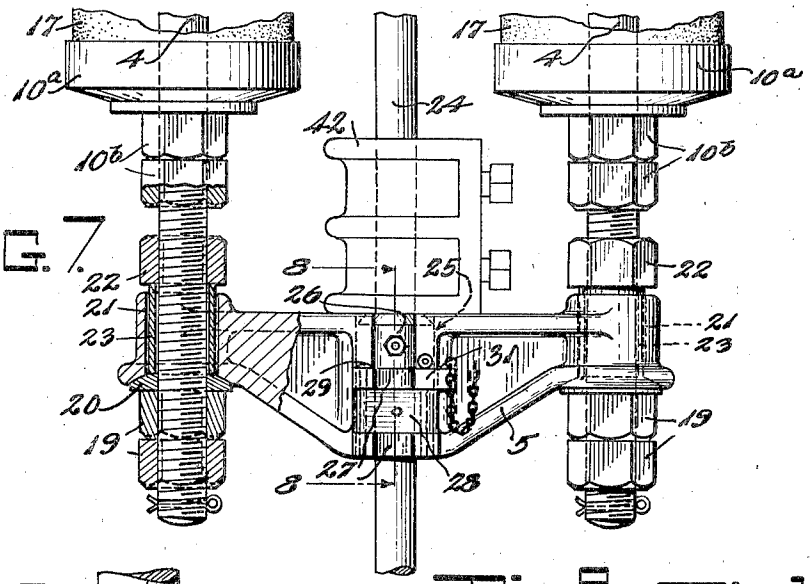


Fig. 8.

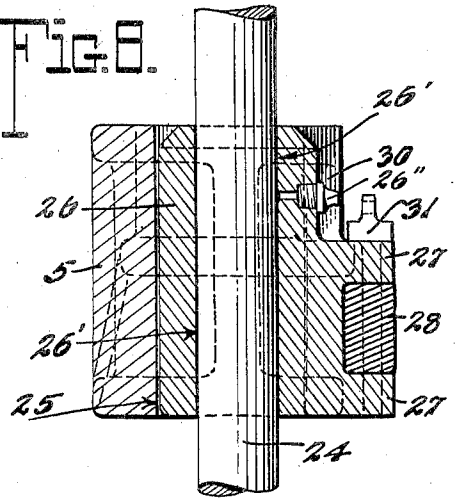


Fig. 9.

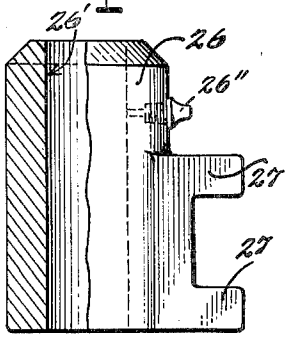


Fig. 10.

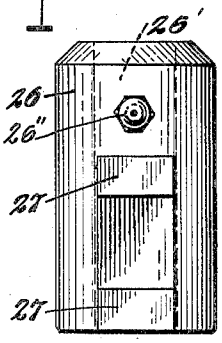


Fig. 11.

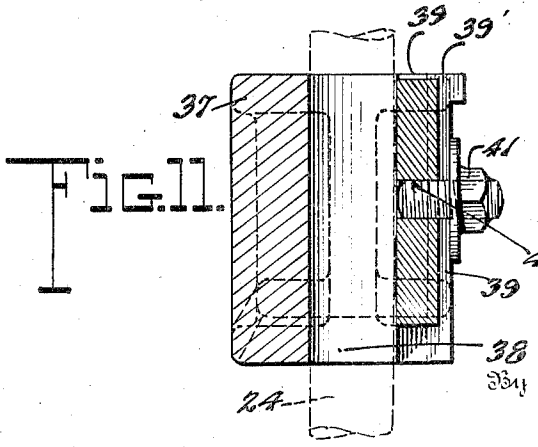
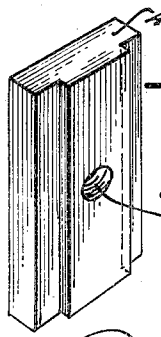


Fig. 12.



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Patented Jan. 28, 1941 2,230,029

UNITED STATES PATENT OFFICE

2,230,029

LOAD STABILIZER FOR WELL PUMPING EQUIPMENT

John F. Eaton, Tulsa, Okla., assignor to The Engineering Company, Tulsa, Okla.

Application December 27, 1938, Serial No. 247,847

9 Claims. (Cl. 255—16)

The present invention relates to what I term, for the purpose of this description, load stabilizers or beam hanger shock absorbers for oil well pumping equipment, and represents improvements in the construction of my prior Patent No. 2,038,527, dated April 28, 1936.

The object of these improvements is to provide a shock absorbing unit in connection with the beam hanger which will more effectively distribute the load stresses over a plurality of cushioning elements to prevent undue distortion of any of the said elements, and further to provide for self-equalization of the parts constituting the mountings of the cushioning members.

In my prior patent referred to above, the load stresses are imposed directly upon the cushioning means by virtue of the mounting of said means on the polished rod, whereas this invention arranges the cushioning means as a separate unit, transmitting the stresses through spaced carrier bars to independent cushioning or absorbing columns.

By my present arrangement also the polished rod may be removed from the hanger without disassembling the cushioning means, and, in the event of disablement of any of the elements of said means during the operation of the pump, I am thus able to cut out the action of the shock absorber unit by merely shifting the position of the polished rod grip so that actuation of the rod is directly effected by the beam hanger.

In carrying out the invention, the shock absorbing means is incorporated in the beam hanger units in such a manner that the sucker rods of the pumping apparatus float, so to speak, on live rubber.

In the operation of a well pump by the well known walking beam construction, it is noticeable that at the beginning of the down strokes the beam hanger drops ahead of the rods but near the end of said strokes the rods overtake the beam hanger with a resultant impact between the polished rod grip and the carrier bar. It is the primary object of these improvements to cushion this impact and thus eliminate shock and vibration, as well as reduce sucker rod wear and rod breaks.

As regards the effect on sucker rod loads, I have found that the installation of the shock absorbers as above premised, to reduce peak polished rod loads five to fifteen per cent. by cushioning, and reduce acceleration loads at start of the upstroke.

A further advantage of the arrangement lies in the reduction of the range of load fluctuation between maximum and minimum, thereby reducing fatigue of sucker rods.

It may be further noted that by the use of my invention I am able to reduce polished rod horsepower without affecting production of the well and to insulate sucker rods from vibrations originating in surface pumping equipment.

One of the important features of my device is the provision of a novel type of carrier bar. Carrier bars, as now employed in oil field equipment, are generally made of cast or fabricated steel with a hole in the center through which the polished rod is inserted and clamped. Now, as will be later pointed out, with the introduction of the shock absorber unit the polished rod moves through the carrier bar as a result of the compression on the unit. This movement causes friction and wears the polished rod and body of the carrier bar, causing the polished rod to break or the carrier bar to fail, and necessitating expensive replacement. To prevent this difficulty, I have embodied a removable bushing in the carrier bar which is made of less abrasive material through which bushing the polished rod moves, thus reducing the friction and wear. This reduction makes for more efficient operation of the shock absorber.

One of the primary objects of the new carrier bar herein discussed is the provision for ready replacement of this bushing, and, to this end, the carrier bar is formed with a gate from which the bushing and the polished rod may be removed. This arrangement makes it much easier and more convenient to remove the polished rod from the beam hanger when servicing the well.

A further embodiment in the present invention is designed to improve the construction and operation of the device, this residing in the provision of a self-equalizing supporting member arranged to cooperate with the cushioning means on the one hand, and constituting the support for connection with the polished rod of the pump on the other hand.

Other and further objects and advantages of the invention will be hereinafter set forth and the novel features thereof defined by the appended claims.

In the accompanying drawings:

Figure 1 is a side elevation of a beam hanger embodying my invention;

Figure 2 is a front elevation thereof;

Figure 3 is a fragmentary view in elevation of the upper portion of the shock absorber unit somewhat enlarged, portions being broken away and shown in section, to depict more clearly the details of construction;

Figure 4 is a horizontal sectional view taken about on the plane indicated by the line 4—4 of Figure 3;

Figure 5 is a horizontal sectional view taken on the line 5—5 of Figure 1 through the upper carrier bar;

Figure 6 is a horizontal sectional view taken about on the plane indicated by line 6—6 of Fig-

ure 1 and showing the lower carrier bar in top plan;

Figure 7 is a front elevation, partly in section, of the lower portion of the shock absorber unit, showing the lower carrier bar in elevation;

Figure 8 is a vertical sectional view through the lower carrier bar on the line 8—8 of Figure 7;

Figure 9 is a side elevation of the polished rod bushing used in the lower carrier bar, a portion being broken away and shown in section;

Figure 10 is a front elevation of the bushing of Figure 9;

Figure 11 is a vertical sectional view through the center of the upper carrier bar; and

Figure 12 is a detailed perspective view of the removable gate for said upper carrier bar.

Like reference characters designate corresponding parts in the several figures of the drawings.

Referring to the drawings and specifically describing my invention, the beam hanger, generally designated by the reference numeral 1, comprises the hanger arm 2 formed with the trunnion 3 by means of which it is suspended from the usual walking beam (not shown), and a pair of spaced guide rods 4, the lower extremities of which are connected together by the lower carrier bar 5, hereinafter more specifically described. This construction constitutes the mounting for the shock absorber unit forming one of the primary features of this invention and now to be more particularly set forth.

The shock absorber unit includes the yoke or yoke plate 6, functioning as an equalizer, said plate, as shown in Figure 3, being provided with spaced passages 7 through which the guide rods 4 extend. The lower end of each of the passages 7 opens into a socket 8 into which is seated a self-aligning bearing plate 9, in turn resting upon the upper end plate 10 for the cushioning means or compressible column hereinafter referred to. The end plate 10, as best seen in Figure 3, is formed with an upwardly tapering extension 11 in the bore of which is slidingly received one of the guide rods 4, said bore having at its ends oil seals 12, sealing off the annular oil chamber 13 for holding a lubricant adapted to be introduced thereinto through the Alemite fitting 14 and the oil passage 15.

The cushioning means above referred to comprises a column of rubber, there being preferably two such columns, each of which, for obvious reasons, I prefer to split up into a plurality of ring sections 16 of a length dimension in practice of about six inches, these sections being separated by separator plates or rings 17, each having an outer double flange 17' and an inner sleeve extension 17'' snugly and slidingly receiving the cooperating guide rod 4. At the lower ends, the sections 16 are clamped by the end plates 10*a* and the nuts 10*b* coacting therewith.

I desire it to be particularly understood that I do not wish to be restricted as regards the number of the sections or units 16 which may be used, but it is proper to state that the purpose of this sectional arrangement is to limit the stress in the rubber elements and control the distortion thereof. Obviously, a single rubber cushion of the height of the column, as illustrated, would buckle and soon fail. By utilizing the sectional form of cushion or absorber, the columns may be shortened or lengthened according to the load which may be encountered in the use of the apparatus. The function of the equalizer yoke will be later explained, but it is desired to note here that the formation of the bearing plate 9 and its seat 8 maintains the proper alignment of the parts regardless of the load imposed upon the respective columns.

Referring now to the construction at the lower end of the guide rods, as illustrated in Figure 7, said rods are connected together by the carrier bar 5, as hereinbefore referred to, said bar being of a special construction. The nuts 19 are formed with a beveled face or seat 20 and the ends of the rod openings 21 are correspondingly formed, thus providing for self-adjustment of the parts. The nuts 19 and 22 clamp against sleeves 23. The construction of the carrier bar 5 is important in this hanger, for I have designed it so as to enable the displacement of the polished rod 24 without disturbing the shock absorber, as when it is desired to service the pump or handle the sucker rods. To this end, the center of the bar is formed with a vertical passage 25 sufficiently large to receive a bushing 26, best seen in Figures 6 and 8 to 10. This bushing is made of suitable bearing metal and of a size to slip vertically into the passage 25 after it has been applied to the polished rod, which, in the operation of the shock absorber, slides in the bore 26' of the bushing. It will be observed that the bar 5 is slotted through its front into the passage 25 so as to receive the forwardly extending spaced lugs 27, thus holding the bushing from turning in the passage. The bar is further provided with a gate 28 pivotally connected to the bar on the pin 29 so as to swing across the front slot 30 referred to and between the upper and lower lugs 27, thereby locking the bushing against vertical movement. The gate is held in closed position by the locking pin 31.

Suspended from the yoke plate 6 and arranged in a plane at right angles to the guide rods 4 is a pair of reins 32, the mounting of which is best seen in Figure 3 of the drawings. The upper ends of the openings 33 are formed with seats to conform to the beveled end faces of the nuts 34, and said openings are large enough to receive sleeves 35, against the lower ends of which the clamping nuts 36 seat. Thus it will be seen that the reins may be adjusted to maintain vertical positions when the equalizer yoke 6 shifts relative to the absorber columns, as also described with reference to the mounting at the lower end of the guide rods 4.

At the lower ends, the reins 32 are connected to the upper carrier bar 37 which also has a vertical passage 38 opening forwardly through the slot 39. The sides of the slots are formed with guides 39' to provide a seat to receive a vertically slidable gate 40, shown clearly in Figure 12 of the drawings, and adapted to be locked in closed position by a clamping member 41 threaded into the opening 40'. The polished rod 24 passes upwardly through the passage 38 and is held, for the lifting action, by the grip 42 mounted on the rod and seated on the top of the upper carrier bar 37, as clearly shown in Figure 1 of the drawings.

In operation, the beam hanger support or load stabilizer herein disclosed is suspended from the end of the usual operating beam and the polished rod of the pump is connected to the hanger by the grip member 42 mounted upon the upper carrier bar 37. As the upstroke of the pump is effected by the beam, the equalizer yoke 6 compresses the rubber cushions interposed between said yoke and the lower carrier bar 5. In the down stroke, the pressure is released from the cushioning columns, and as the lower extreme

of the stroke is reached any impacts upon the upper carrier bar 37 by the polished rod grip 42 are absorbed by the cushioning means.

Should any defect in the cushioning means occur during the operation of the pumping apparatus, the function of the shock absorbing means may be eliminated by displacing the polished rod grip 42 from its cooperative position with respect to the upper carrier bar 37, by arranging said grip 42 in a position upon the top of the lower carrier bar 5. Under such arrangement, the hanger functions in the usual manner of the non-cushioned type of beam hanger.

The foregoing rearrangement of the polished rod grip is facilitated by the provision of gates 40 and 28 in the respective carrier bars 37 and 5, it being necessary only to open said gates and move the polished rod laterally from out of the passages of said carrier bar, whereupon the grip 42 may be dropped down on the polished rod to the position above the lower carrier bar, as above stated.

In the operation of pumping, the stresses applied to the respective columns are equalized by the self-aligning bearing plates 9 received in the sockets or seats 8 of the equalizer yoke. The sliding action of the end plates 10 on the guide rods 4 is lubricated at all times by the lubricant within the chambers 13 of these plates, and said sliding action as regards the bushing 26 in the carrier bar 5 is also facilitated by lubricating the bore of the bushing through the lubricant fitting 26''.

It may further be noted that by virtue of the use of the separator plates 17 which are each formed with a bearing sleeve slidingly coacting with the cooperating guide rod 4, the lateral distortion of the component parts or units of the cushioning columns is restricted.

It will be understood that modifications may be made in the details of construction and arrangement of parts of this load stabilizer device without departing from the spirit of the invention and within the scope of the claims appended hereto.

What I claim and desire to secure by Letters Patent is:

1. A load stabilizer of the class described comprising a carrier bar, a plurality of spaced beam hanger rods connected at one of their ends to the carrier bar, a pump sucker rod support slidably mounted on the beam hanger rods having a sucker rod receiving opening intermediate the beam hanger rods, shock absorbing means mounted on and surrounding said beam hanger rods intermediate the carrier bar and said slidably mounted sucker rod support comprising a series of superimposed rubber cushion units arranged in a plurality of columns disposed at opposite sides of said sucker rod receiving opening and constituting cushioning, load equalizing and absorbing means, and means on said pump sucker rod support independent of said cushioning means for retaining the sucker rod in the said sucker rod opening of the support.

2. A load stabilizer of the class described comprising a carrier bar, a beam hanger support comprising spaced guide rods connected to the carrier bar, an equalizer yoke slidably mounted on said guide rods, cushioning members mounted on said rods and supporting said yoke, and means for removably connecting sucker rods to the yoke comprising a pair of reins connected at one end to the yoke and at their other ends to a second carrier bar.

3. A load stabilizer of the class described comprising a carrier bar, a beam hanger support comprising spaced guide rods connected to the carrier bar, a polished rod support slidably connected to the rods, superposed cushioning units mounted on and surrounding said guide rods intermediate the polished rod support and the carrier bar, and means for connecting said polished rod support to a polished rod, said carrier bar having a removable bushing therein to slidingly receive the polished rod.

4. A load stabilizer as claimed in claim 3, wherein the carrier bar opening is provided with a gate to lock the bushing for said polished rod in fixed relation to said carrier bar.

5. A beam hanger for operating sucker rod well pumps comprising a pair of guide rods, a carrier bar connected to said guide rods, a plurality of cushioning members mounted on each of said rods, an equalizer yoke mounted on said rods and cushioning members, a pair of reins depending from said yoke, a second carrier bar connected to said reins, and a polished rod grip adapted to coact with one of said carrier bars.

6. A load stabilizer of the class described comprising a carrier bar, a beam hanger support, comprising spaced guide rods connected to the carrier bar, an equalizer yoke slidably mounted on said guide rods, cushioning members mounted on said rods and supporting said yoke, means for connecting sucker rods to the yoke, and self-aligning bearing plates mounted intermediate the cushioning members and the equalizer yoke.

7. A carrier bar for beam hangers having openings formed therethrough at its end portions for connecting beam hanger guide rods thereto and having a polished rod opening intermediate the aforesaid openings formed with a lateral passage extending through the side of the bar, a vertically removable bushing disposed in said intermediate passage for slidably receiving said polished rod, and retaining means on the carrier bar interlockingly engaging said bushing for locking the same against vertical displacement in said intermediate polished rod passage.

8. A carrier bar as claimed in claim 7 in which the lateral passage is narrower than the intermediate passage to prevent the removal of the bushing through the lateral passage, the said lateral passage in the bar being greater in width than the polished rod to permit removal of the polished rod through the lateral passage upon vertical displacement of the bushing out of the intermediate passage.

9. A carrier bar for beam hangers having openings formed therethrough at its end portions for connecting beam hanger guide rods thereto and a polished rod opening intermediate the aforesaid openings formed with a lateral passage extending through the side of the bar, a vertically removable bushing disposed in said intermediate passage for slidably receiving said polished rod, retaining means on the carrier bar interlockingly engaging said bushing for locking the same against vertical displacement in said intermediate polished rod passage in which the polished rod retaining means comprises a slidable bushing mounted in said intermediate passage and having spaced lugs projecting through the lateral passage, and a locking member connected to the carrier bar and movable into position between the bushing lugs and across the opening of the lateral passage.

JOHN F. EATON.