Jan. 19, 1926. 1,570,385

B. M. McFARLAND ET AL

LONG STROKE AMPLIFYING DEVICE

Filed June 13, 1925 2 Sheets-Sheet 1

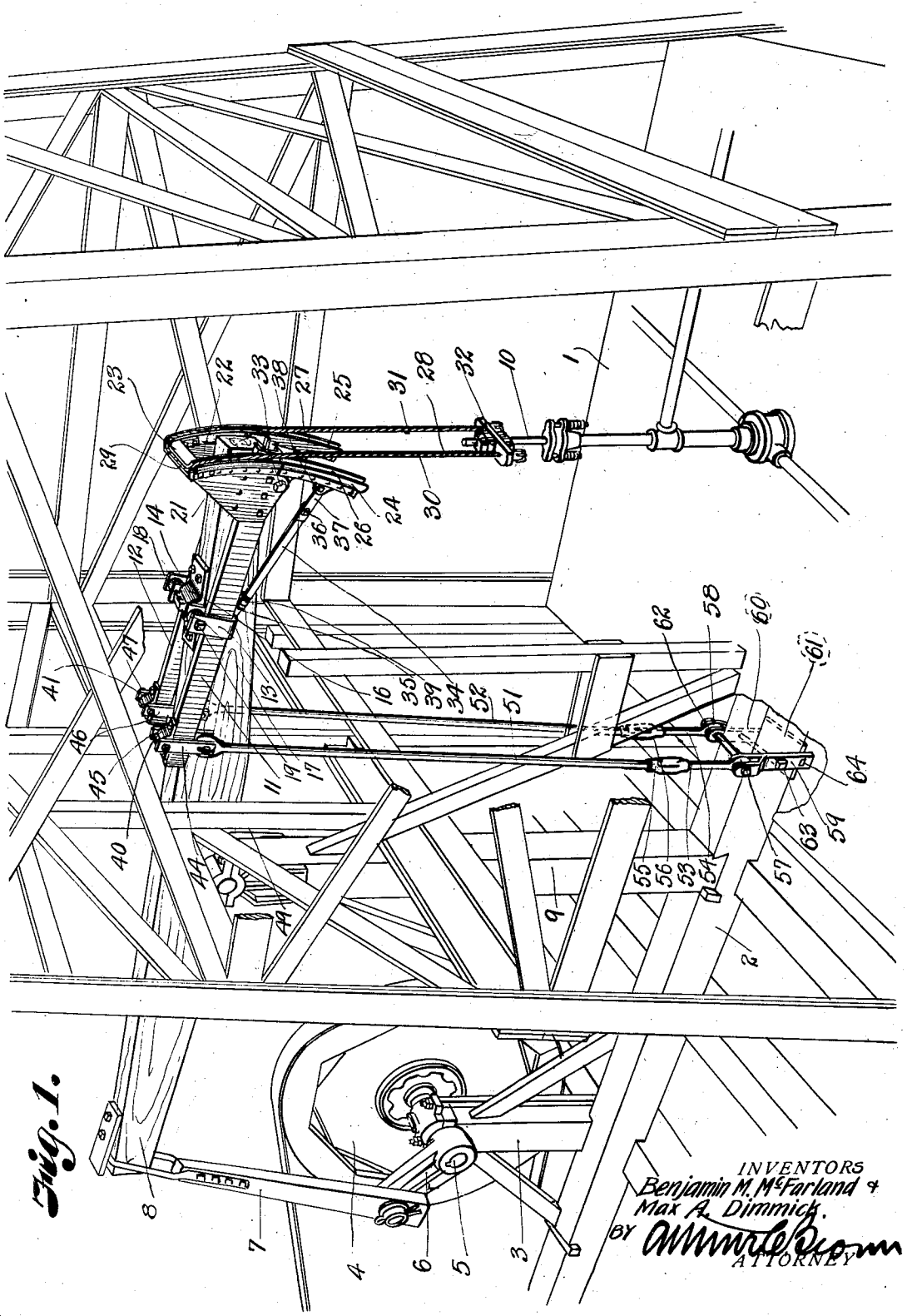


Fig. 1.

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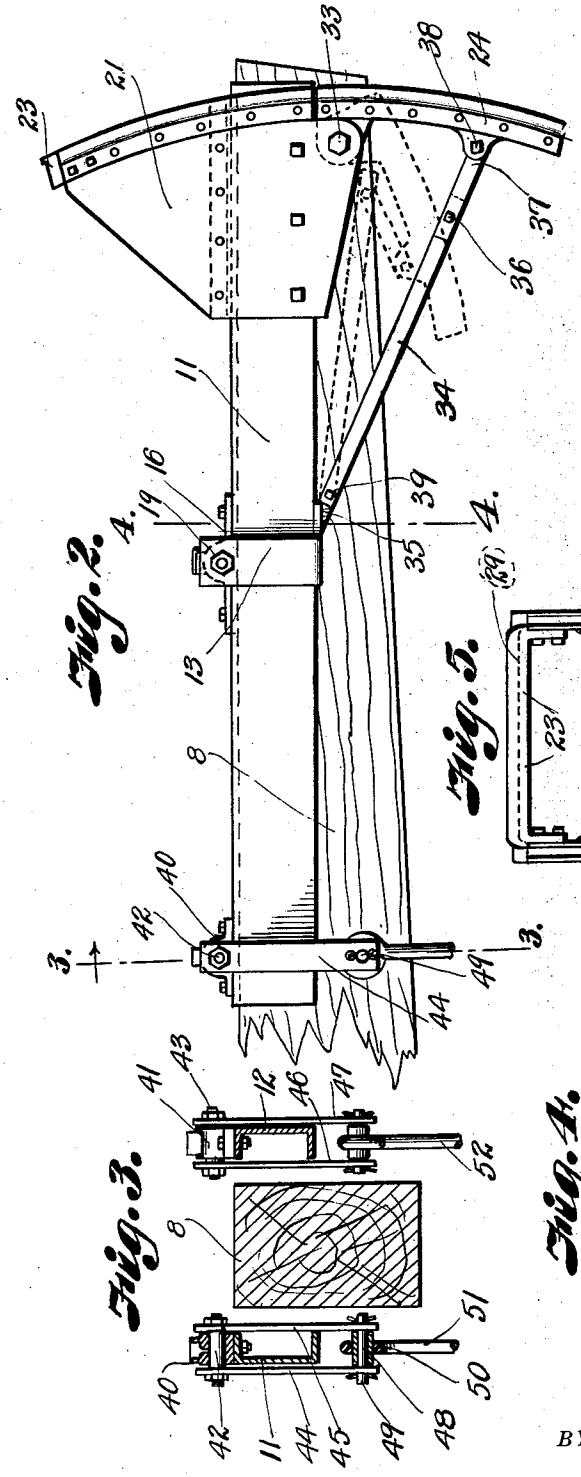


Fig. 2.

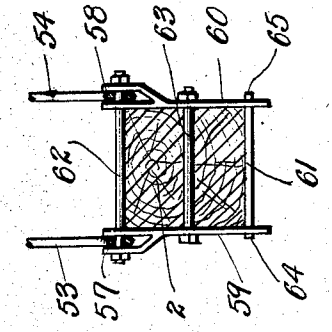


Fig. 6.

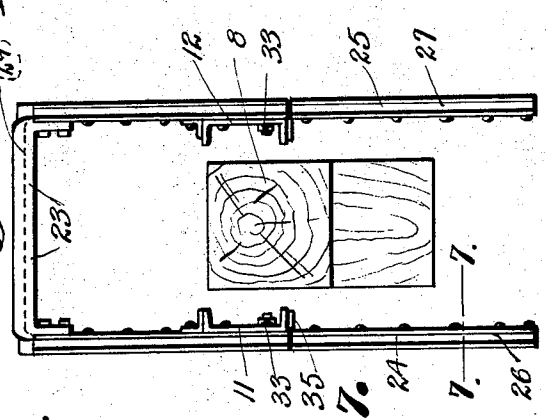


Fig. 5.

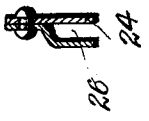


Fig. 7.

Fig. 3.

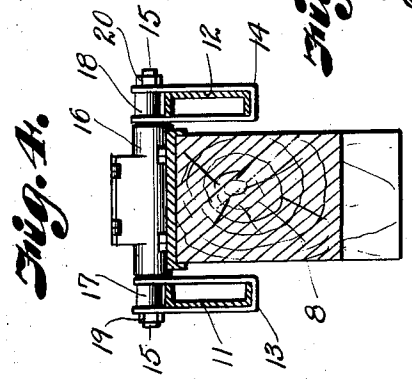


Fig. 4.

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UNITED STATES PATENT OFFICE.

BENJAMIN M. McFARLAND AND MAX A. DIMMICK, OF ELDORADO, KANSAS.

LONG-STROKE AMPLIFYING DEVICE.

Application filed June 13, 1925. Serial No. 36,835.

To all whom it may concern:

Be it known that we, BENJAMIN M. McFARLAND and MAX A. DIMMICK, citizens of the United States, residing at Eldorado, in the county of Butler and State of Kansas, have invented certain new and useful Improvements in Long-Stroke Amplifying Devices; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this application.

This invention relates to pumping apparatus for wells and particularly to a long stroke pumping mechanism especially designed for pumping oil wells, and the primary object of the invention is to provide mechanism adapted to be associated with the walking beam of an oil well rig to increase the stroke of the pump rods beyond what would be their normal amplitude of movement with the conventional pumping elements ordinarily consisting of the walking beam, the power driven band wheel and the pitman and crank connections between the walking beam and the band wheel shaft.

The advantages of a long stroke pumping outfit for oil wells are now generally recognized so we will confine ourselves to a description of the novel arrangement of parts and combination of parts, all of which will be specifically described hereinafter, reference being had to the accompanying drawings, in which—

Fig. 1 is a perspective view of the lower part of an oil well drilling rig to which our invention is applied.

Fig. 2 is an enlarged, fragmentary, side elevational view of the front end of a walking beam showing the stroke amplifying lever and certain of its connections.

Fig. 3 is a cross sectional view on the line 3—3 of Fig. 2.

Fig. 4 is a cross sectional view on the line 4—4 of Fig. 2.

Fig. 5 is an end view of the walking beam and "mule-head."

Fig. 6 is a cross sectional view through the main sill showing the clevis anchor for the operating rods of the multiplying lever, and

Fig. 7 is a cross sectional view on the line 7—7 of Fig. 5.

Referring now to the drawings by numerals of reference 1 designates the derrick floor, 2 the main sill, 3 one of the jack posts, (of which there are two, one on each side of the band wheel) 4 the band wheel, 5 the band wheel shaft, 6 the crank, 7 the pitman and 8 the walking beam on the Samson post 9. All of the construction thus far described is standard rig and ordinarily the pump rod 10 is connected direct to the front end of the walking beam 8, sometimes over a "mule-head." When the pump rods were connected direct to the front end of the walking beam the pump stroke, obviously, could not exceed the up and down motion of the front end of the walking beam, but with our invention the use of the amplifying lever imparts a reciprocatory motion to the pump rod equal to the amplitude of motion of the front end of the walking beam plus the motion of the front end of the amplifying lever so that more fluid may be raised for each upstroke of the working barrel of the pump than will be possible when the pump rods are connected direct to the walking beam.

The stroke amplifying lever is illustrated as comprising two bars 11 and 12 which, for the sake of strength, may consist of channels. These are hung in U-shaped slings 13 and 14 comprising straps which hang from a fulcrum shaft 15 mounted in a bearing 16 bolted, or otherwise secured, to the walking beam 8 in rear of the toe or front end portion thereof. The ends of the slings are spaced apart by spacers 17 and 18 sleeved upon the shaft 15 and by referring to Fig. 4 it will be seen that either, or both, of the slings may be removed from the shaft 15 by taking off the nuts 19 and 20. The bars or channels 11 and 12 are mounted in the slings intermediate their ends and they are located on the respective sides of the walking beam so that the lever may straddle the walking beam. At the forward ends of the bars or channels 11 and 12 are two segmental plates 21 and 22 connected at their upper ends by a yoke bar 23, and pivoted to the plates 21 and 22 are segmental bars 24 and 25 curved on the panel arcs as the plates 21 and 22. The plates and the bars 24 and 25 constitute a "mule-head" with grooves 26 and 27 in the

front edges of the plates 21 and 22 and the bars 24 and 25 to receive a flexible connection 28 which is looped intermediate its ends to be received in the groove 29 in the cross bar or yoke 23 so that the two end strands or portions 30 and 31 may be received in the grooves 26 and 27, the ends of the flexible connection or cable being fastened to the polish rod 32 in any well known manner.

The bars 24 and 25 may be pivoted to the plates in any appropriate manner, but in Fig. 2 we have shown a simple form of pivot consisting of a bolt 33 for connecting the bar 24 to the plate 21. Obviously, the bar 25 may be connected to the plate 22 in a like manner. Each bar 24 and 25 is held in extended position, or full line position illustrated in Fig. 2, by braces. One brace is illustrated in Fig. 2 as comprising a bar 34 pivoted to a bracket 35 on the channel 11 and having a pivot connection 36 with a link 37 in turn pivoted at 38 to the bar 24.

When the parts are in the position shown in Fig. 2 the line of compression against the bar 24 will be through the bolt 38, the bolt 36 and the pivot 39 on bracket 35 so the brace will hold the bar 24 in extended position. This will be the position occupied during the pumping operation. When, however, it is desired to pull the rods for inspection or repairs the lower part of the "mule-head", consisting of the bars 24 and 25, should be swung inwardly out of the way then it is only necessary to break the joint at 36 so that the parts can be caused to assume the dotted line position shown in Fig. 2.

We have only described the connections between the bar 24 and the bracket 35 on channel 11, but attention is called to the fact that the bar 25 is connected to its channel 12 in substantially the same way that the bar 24 is connected to the channel 11. The rear ends of the two bars 11 and 12 of the amplifying lever carry bearings 40 and 41 in which are shafts 42 and 43 from which hang links 44 and 45 straddling the channel 11, and links 46 and 47 straddling the channel 12. The links 44 and 45 carry at their lower ends a pin 48 with a spacer 49 thereon extending through the eye 50 of a pull rod, or operating rod 51 while a similar rod 52 is connected to the links 46 and 47 in the same manner as the rod 51. The rods 51 and 52 have at their lower ends separate parts 53 and 54 connected by turnbuckles 55 and 56. The eyes 57 and 58, at the lower ends of the rods 51 and 52, are connected to a clevis, consisting of the side bars 59 and 60 and the bottom plate 61, by a bolt 62 which passes through the side bars 59 and 60 and through the eyes 57 and 58. The side bars 59 and 60 are bolted to the sides of the main sill 2 by a bolt 63 and at the lower ends of the side bars 59 and 60 are openings through which the tongues 64 and 65 of the bottom plate 61 project so that the clevis, formed by the side bars 59 and 60 and the plate 61, is fastened to the main sill.

When the walking beam is rocked on the Samson post 9, receiving its motion from the band wheel 4 and its connections, the amplifying lever will be swung in a vertical arc but as the fulcrum 15 is moved upwardly the pull of the rods 51 and 52 will impart a swinging movement to the amplifying lever so that it will have a movement independent of the movement of the walking beam, therefore the lift on the pump rod 10 will exceed that which would be imparted to the pump rod if it was connected to the end of the walking beam and inversely when the front end of the walking beam is swung downwardly the rods 51 and 52 will impart a corresponding reverse movement to the stroke amplifying lever so that the stroke of the pump rod will be increased above normal and thereby pump a greater amount of fluid from the well at each stroke than can be pumped with the same working barrel under normal conditions. By the pump rod, of course, we mean the entire string of pump rod members normally used in a well.

One of the advantages of our invention is that it can be installed on an ordinary walking beam and that one end of the amplifying lever can be fastened, or anchored, to the main sill of the oil well rig in a convenient manner. The cost of production of the long stroke attachment will be comparatively small and will involve small expense and labor in installation.

What we claim and desire to secure by Letters-Patent is:—

1. In combination with the walking beam of an oil well rig, of a stroke amplifying lever pivoted intermediate its ends to the walking beam, a "mule-head" on one end of the lever, means associated with the "mule-head" for connection with the polish rod clamp of an oil well pump, and means for anchoring the rear end of the lever in fixed relation with respect to the floor of the rig.

2. In combination with the walking beam of an oil well rig, of a stroke amplifying lever pivoted intermediate its ends to the walking beam, rigid rods pivotally connecting the rear end of the stroke amplifying lever to a rigid part of the rig, and means on the front end of the lever for connection to the polish rod of an oil well pump.

3. A pumping apparatus comprising a walking beam, an amplifying lever, comprising two spaced bars straddling the walking beam, having a common fulcrum, intermediate their ends mounted upon the

walking beam, rods connecting the rear ends of the bars to a rigid support, and a "mule-head" connecting the forward ends of the bars.

4. A pumping apparatus comprising a walking beam, an amplifying lever straddling the beam and pivoted thereto intermediate its ends, means for holding the rear end of the lever in relatively fixed position, and a "mule-head" on the other end of the lever.

5. A pumping apparatus comprising a walking beam, an amplifying lever straddling the beam and pivoted thereto intermediate its ends, means for holding the rear end of the lever in relatively fixed position, and a "mule-head" on the other end of the lever, the "mule-head" having a flexible loop receiving portion.

6. A pumping apparatus comprising a walking beam, an amplifying lever straddling the beam and pivoted thereto intermediate its ends, means for holding the rear end of the lever in relatively fixed position, a "mule-head" on the other end of the lever, the "mule-head" having a flexible loop receiving portion, and arcuate guiding grooves for a flexible connecting member.

7. A pumping apparatus comprising a fulcrum having means for attachment to a walking beam, a pair of slings hung on the ends of the fulcrum, spaced parallel bars hung in the slings, a "mule-head" connecting the forward ends of said bars, rods loosely connected to the rear ends of said bars, and means on the rods for connecting them to a support.

8. A stroke amplifying apparatus comprising a fulcrum having means for attachment to a walking beam, spaced bars pivotally hung from the ends of the fulcrum, arcuate plates secured to the forward ends of said bars, means connecting the upper ends of said plates, the edges of the plates and the edge of the connecting means having guide grooves, and anchoring means on the rear ends of the bars.

9. A stroke amplifying apparatus comprising a fulcrum having means for attachment to a walking beam, spaced bars pivotally hung from the ends of the fulcrum, arcuate plates secured to the forward ends of said bars, means connecting the upper ends of said plates, the edges of the plates and the edge of the connecting means having guide grooves, and anchoring means on the rear ends of the bars, said means comprising pairs of links connected to said bars and rods connected to the links.

10. A stroke amplifying apparatus comprising a fulcrum having means for attachment to a walking beam, spaced bars pivotally hung from the ends of the fulcrum, arcuate plates secured to the forward ends of said bars, means connecting the upper ends of said plates, the edges of the plates and the edge of the connecting means having guide grooves, anchoring means on the rear ends of the bars, said means comprising pairs of links connected to said bars and rods connected to the links, and anchors engaging the lower ends of the rods.

11. A stroke amplifying apparatus comprising a fulcrum, having means for attachment to a walking beam, spaced bars pivotally hung from the fulcrum, segmental plates vertically supported by the bars, arcuate bars pivotally supported by the plates, collapsible braces between the arcuate bars and the first named bars, and anchoring means on the rear ends of the first named bars.

In testimony whereof we affix our signatures.

BENJAMIN M. McFARLAND.
MAX A. DIMMICK.