

Nov. 6, 1951

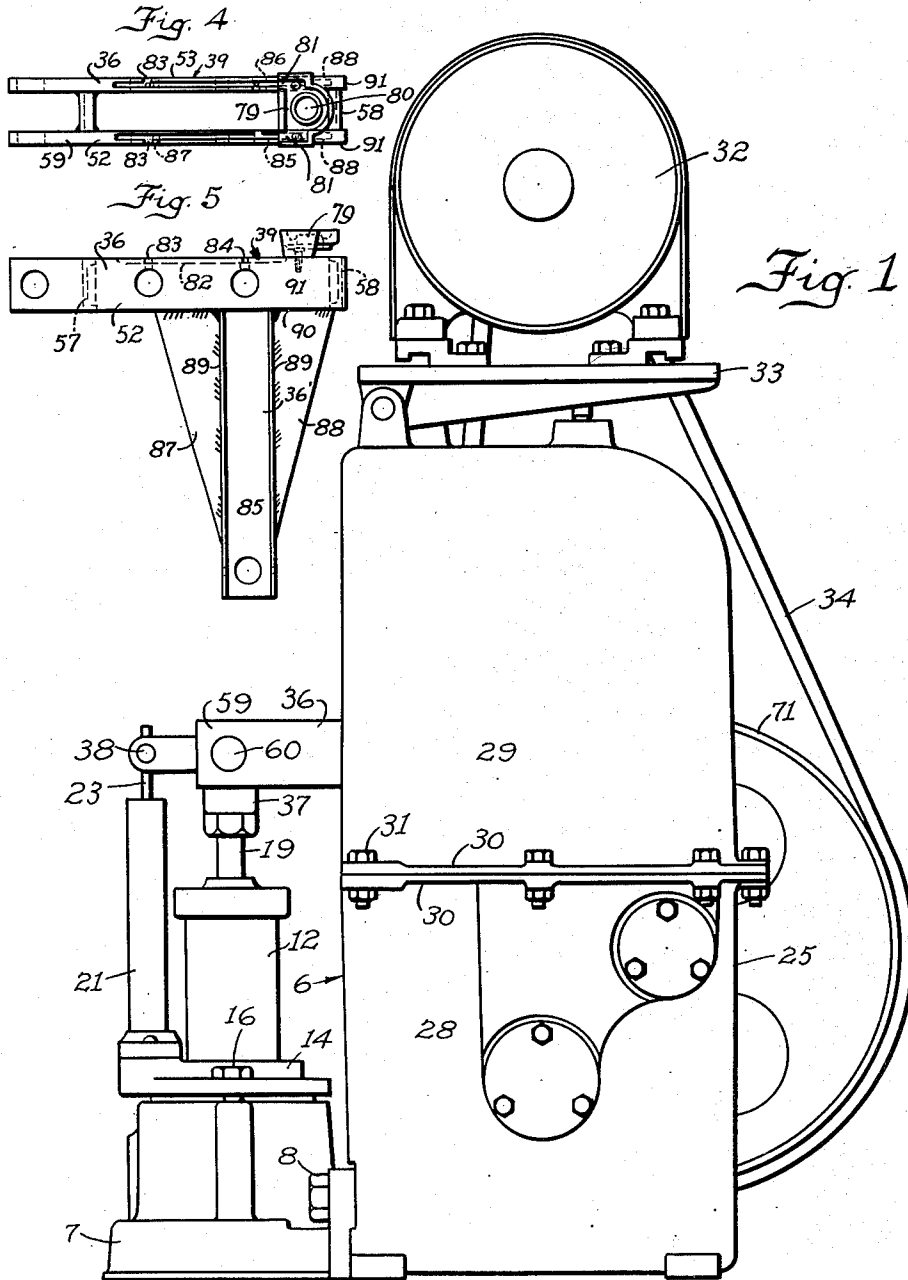
LE ROY R. YOUNG ET AL

2,573,753

DEEP WELL WORKING HEAD

Filed Nov. 7, 1946

3 Sheets-Sheet 1



Inventors
LeRoy R. Young
& Mills E. Spangberg
Andrew F. (Attorney)

Nov. 6, 1951

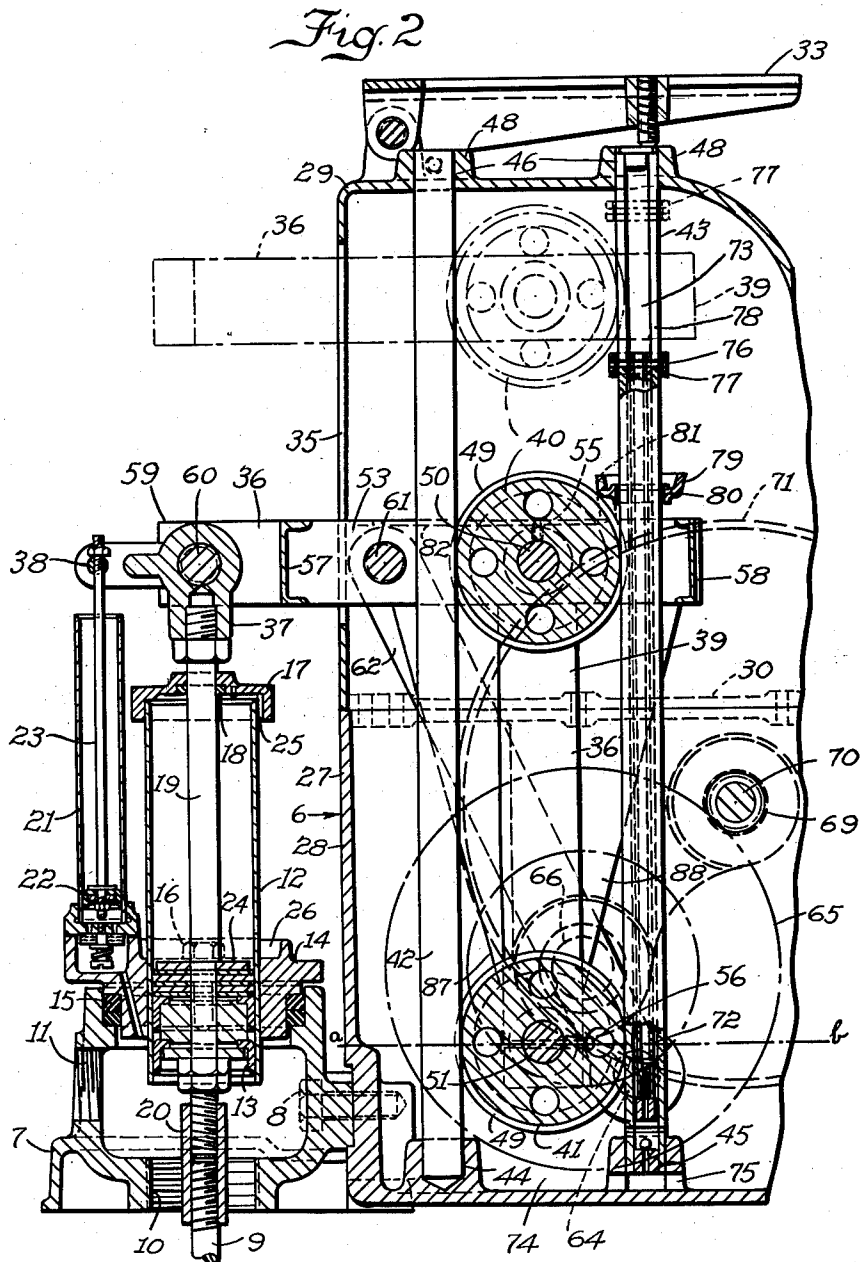
LE ROY R. YOUNG ET AL

2,573,753

DEEP WELL WORKING HEAD

Filed Nov. 7, 1946

3 Sheets-Sheet 2



Inventors
LeRoy R. Young
& Mills E. Spangberg
Andrew F. Winterborn
Atty

Nov. 6, 1951

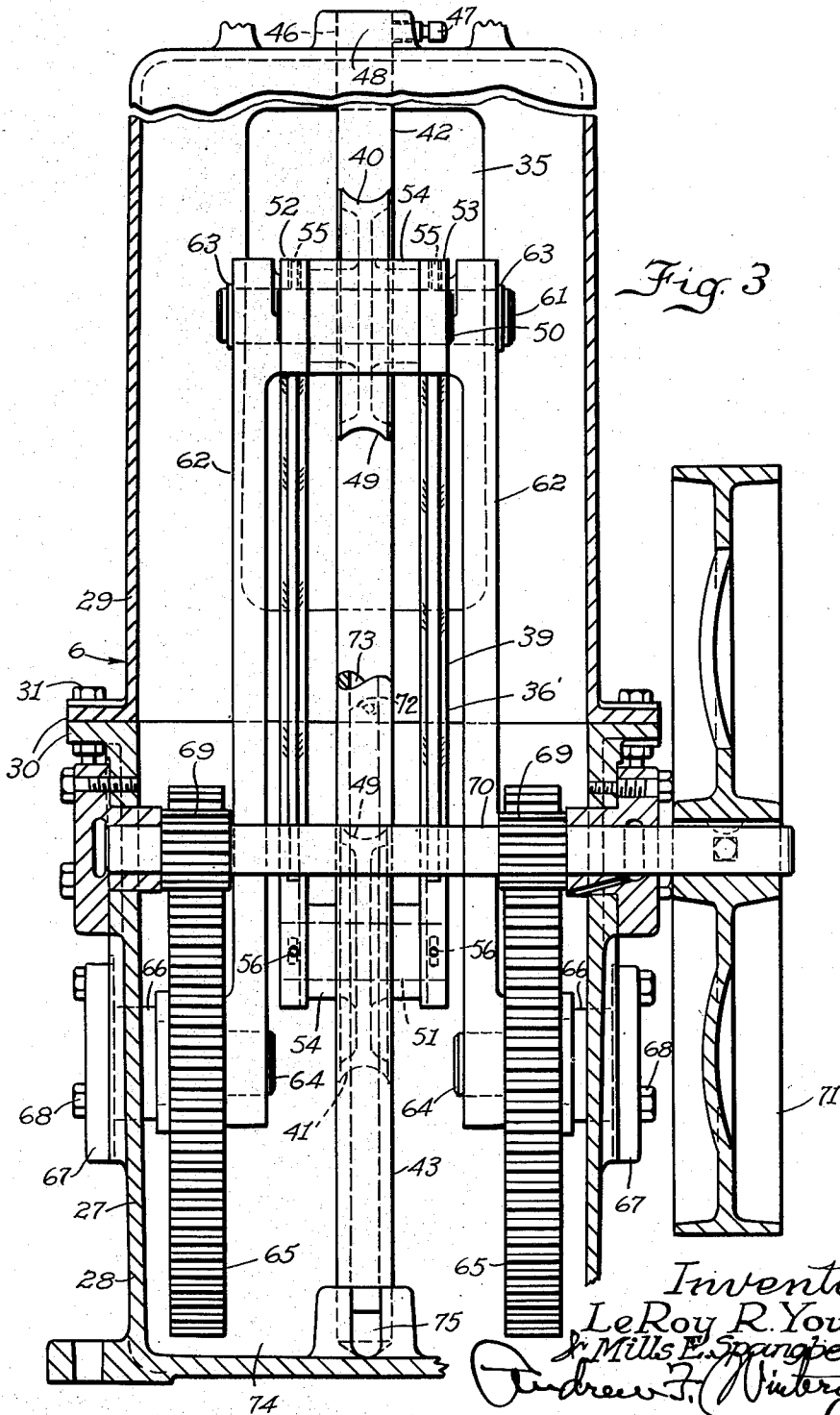
LE ROY R. YOUNG ET AL

2,573,753

DEEP WELL WORKING HEAD

Filed Nov. 7, 1946

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,573,753

DEEP-WELL WORKING HEAD

Le Roy R. Young and Mills E. Spangberg, Freeport, Ill., assignors to Woodmanse Mfg. Co., Freeport, Ill., a corporation of Illinois

Application November 7, 1946, Serial No. 708,356

12 Claims. (Cl. 74-44)

1

This invention relates to gear driven working heads for deep-well pumps.

Geared working heads have usually employed sliding journals working up and down on one or more guide rods with considerable friction and proportionately heavy power consumption and short life. Usually the only effort made in the direction of compensating for the extent of overhang of the arm connected to the plunger rod for transmitting reciprocation to the pump rod was to elongate the journal or journals, with the result that the structure was more massive and expensive than would otherwise be expected and a still heavier drag was imposed upon the operation of the working head, meaning another sizable increase in the cost of operation. It is, therefore, the principal object of our invention to provide a working head in which an L-shaped frame of relatively light but strong channel iron construction is provided carrying two widely spaced rollers on the vertical leg of the frame working between parallel guide rods for easy, quiet operation and minimum wear, the horizontal leg of the frame forming the overhanging arm and having the pitman rods connected thereto at an intermediate point between the vertical leg of the frame and the outer end of the overhanging arm with respect to which point the mass of the frame on the one hand and the mass of the pump and plunger rods on the other hand are substantially balanced, whereby to make for still easier operation and still further reduced wear.

The gearing, in accordance with our invention, is enclosed in a housing that is divided horizontally through the middle, which makes it possible to cast the two sections separately more easily and economically, the two sections being bolted together, the separable upper section being applied after the greater part of the assembling operations have been completed, which, of course, makes it much easier to assemble the working head and facilitates inspection and repair of the unit.

The invention is illustrated in the accompanying drawings, in which

Fig. 1 is a side view of a working head made in accordance with our invention;

Fig. 2 is a vertical section through the working head on a larger scale, the drive motor being omitted to conserve space and permit showing the construction on the larger scale;

Fig. 3 is a still further enlarged vertical section through the working head in a transverse plane, and

Figs. 4 and 5 are two views of the L-shaped frame removed from the working head and shown on a smaller scale.

2

The same reference numerals are applied to corresponding parts throughout the views.

The working head 6 of our invention is bolted to a base 7, as shown at 8. This base may be set on a suitable foundation over the well casing directly over the usual drop pipe, which, as is well known, is disposed centrally in the well casing and has a pump rod 9 extending downwardly therein. The drop pipe is threaded at 10 into the base 7, and a discharge pipe may be threaded into the base at 11, the discharge pipe being extended in the usual way to a storage tank forming a part of the water supply system, on a farm, for example. The cylinder 12, in which a cup-leather piston 13 operates, is mounted in a plug 14 set in the top of the base 7 and fastened down onto the gaskets 15 with a water-tight fit by bolts 16. A cap 17 is threaded or otherwise suitably secured on the upper end of the cylinder and has an opening with a packing 18 therein through which the plunger rod 19 extends for reciprocation, this rod being attached to the piston 13 and coupled as at 20 to the pump rod 9. A small air pump cylinder 21 is mounted on the plug 14 alongside the cylinder 12 and has a cup-leather piston 22 operated therein by a plunger rod 23 to pump air into the storage tank with the water to maintain an air cushion in the tank in the usual way. What little water finds its way past the double piston 13 will cover the wiper 24 and thus improve the sealing action of the wiper and piston, and if there is any excess, it will be discharged through a vent 25 provided in the cap 17 and collect in a well 26 provided in the plug 14 around the base of the cylinder 12 and either evaporate if in sufficiently small amount or overflow harmlessly onto the outside of base 7.

The working head 6 of our invention comprises a housing 27 which is split horizontally through the middle, being made in two cast sections 28 and 29. This enables much more economical casting, and the sections, which are flanged, as at 30, on their abutting edge portions and bolted together, as at 31, will not be bolted together until the greater part of the assembling operations have been completed, and, obviously, it is much easier to assemble the working head with the top section 29 off. The top sections 29 supports the electric drive motor 32 on a pivoted bracket 33 which permits tightening of the drive belt 34 in a well-known manner. A vertically elongated opening 35 is provided in one side wall of the top section 29 through which the pump working arm 36 extends in overhanging relation to the well casing for operative connection, as at 37, with the plunger rod 19 and with the air pump plunger rod 23, as at 38. This arm 36 is

formed by the horizontal leg of an L or T-shaped frame 39 which works up and down in the housing 27, the same being guided by two widely spaced rollers 40 and 41 that run between a pair of parallel cylindrical guide rods 42 and 43 which are mounted at their lower ends in sockets 44 and 45 provided in the bottom of the lower housing section 28 and supported at their upper ends in holes 46 provided in the top wall of the top section 29. Set screws 47 in the bosses 48 serve to prevent endwise displacement of the guide rods.

The roller 40 is carried on the inner end of the horizontal leg of the arm 36 of the frame 39, and the roller 41 is carried on the lower end of the vertical leg 36' of said frame. The rollers 40 and 41 have the grooves 49 thereof conformed to the radius of the guide rods 42 and 43 to prevent lateral displacement of the frame 39 in the operation of the working head, and, of course, when the guide rods show evidence of sufficient wear to warrant making an adjustment, the rods may be turned enough to provide new track surfaces for the rollers, so that the unit will have proportionately longer life, it being obvious that a number of such adjustments can be made before the guide rods will have to be replaced. The rollers 40 and 41 operate on cross-pins 50 and 51 in parallel spaced relation to the two sections 52 and 53 of the frame 39, there being spacers 54 mounted on the pins 50 and 51 on opposite sides of the rollers between the rollers and the frame sections, as clearly appears in Fig. 3. Set screws 55 serve to lock the cross-pin 50 to the frame 39 and cotter pins 56 serve to fasten the pin 51 to said frame. The construction of the frame 39 will be discussed further hereinafter, but it will suffice at this point to state that the sections 52 and 53 disposed in parallel planes on opposite sides of the guide rods 42 and 43 are welded together into an integral frame member by means of channel iron cross-pieces 57 and 58, as shown in Figs. 2 and 4. The spaced relationship of the sections 52 and 53 is also of advantage in providing a forked end portion 59 on the working arm 36 in which a cross-pin 60 may be provided to attach the coupling member 37 for connecting the arm 36 with the plunger rod 19. Another cross-pin 61 is mounted on the arm 36 between the pins 50 and 60 for pivotal connection of a pair of pitman rods 62 with the frame 39, these rods being attached to the projecting ends of the pin 61, as illustrated in Fig. 3, and suitably locked in place by means of snap rings 63 engaged in grooves provided therefor in the end portions of the pin 61. The pitman rods 62 are pivotally connected at their lower ends to crank pins 64 extending inwardly from a pair of gears 65 mounted on journals 66 that extend inwardly through holes provided therefor in the opposite side walls of the lower section 28 of the housing 27. The journals 66 have flanged outer end portions 67 and are arranged to be bolted by these flanged portions to bosses provided on the outside of the walls of the housing section 28, as indicated at 68. The gears 65 mesh with pinions 69 provided on a cross-shaft 70 mounted in bearings provided therefor in the opposite side walls of the lower housing section 28. The shaft 70 carries a large pulley 71 on its outer end to which drive is transmitted from the motor 32 by the belt 34.

In operation, it should be evident that when the motor 32 is operated, there is a one-stage reduction in the driving of the shaft 70 and a sec-

ond-stage reduction in the driving of the gears 65, and, as the gears 65 are turned, the pitman rods 62 transmit reciprocatory movement to the frame 39 so as to move the pump working arm 36 up and down. Now, the operation is not accompanied by any tendency toward a binding action, because, to begin with, rolling friction is substituted for sliding friction, the upper roller 40 assuming part of the load by rolling contact on its one side with one of the guide rods 42—43, and the lower roller 41 assuming the rest of the load by rolling contact on the other side with the other of said guide rods, by virtue of the fact that the frame 39 cocks slightly as it is reciprocated. The unit bearing pressure on the rollers 40 and 41 is low, because the rollers are so widely spaced, and the roller 41, being farther removed from the roller 40 than the pin 60, as clearly appears in Fig. 2, has an appreciable mechanical advantage. This arrangement of the rollers taken with the rolling friction already mentioned makes for much easier operation and greatly reduced wear as compared with earlier structure where journals were slidable up and down on one or more guide rods with considerable sliding friction and proportionately heavy wear. Another important factor in the easier operation of the present working head lies in the fact that the pin 61 to which the pitman rods 62 are connected is located almost midway between the pins 50 and 60, so that the mass of the frame 39 on one side of the pin 61 is substantially in balanced relation to the mass of the pump rod 9 and plunger rod 19 on the other side of the pin 61.

Referring to Figs. 4 and 5, which illustrate the L or T-shaped frame 39, it will be seen that the frame is of light weight construction without sacrificing strength and rigidity, channel iron members being used for the cross-pieces 57 and 58 and for the vertical leg 36', as indicated at 85 and 86, for the desired strength and rigidity with minimum weight. Triangular sheet metal gusset plates 87 and 88 are welded along the lines 89 to the sides of the vertical leg 36' and along lines 90 to the bottoms of the side plates 91 forming the arm 36. The light weight construction of the frame 39 is also an important contributing factor accounting for the easy operation of the present working head and the low power consumption and generally reduced wear and tear in its operation.

Good lubrication is of great importance in working heads because of the adverse operation conditions in farm installations where they are called upon to take care of the entire pumping service and are very seldom, if ever, inspected to make sure of proper lubrication. Good lubrication for the guide rods 42 and 43 is assured by pumping oil onto the outside of rod 43 from which it will be carried by the rollers 40 and 41 and deposited on rod 42 as the frame 39 works up and down between the rods. A pump plunger 72 works in the bore 73 of the hollow guide rod 43 and has oil delivered therefrom to the sump 74 through openings 75 in the sides of the socket 45, oil being maintained at a level, indicated by the dot and dash line *a—b* in Fig. 2, in the sump 74 for the gears 65 to dip into the oil and be thereby lubricated and in turn lubricate the pinions 69 and the bearings for the shaft 70 as well as the journals 66 and crank pins 64 by drainage from the gears 65 and pinions 69. The lower roller 41 will also dip into the oil in the sump 74 and thus help to lubricate the guide rods 42 and 43 and, of course,

also the pin 51 on which the roller 41 is mounted. The plunger 72 is connected at its upper end by a cross-pin 76 with a ring 77 that surrounds the rod 43, the pin 76 working through vertical slots 78 provided in the diametrically opposite sides of the rod 43. A cup 79 is supported on top of frame 39 over the roller 40 and at a certain point in the up-stroke of the frame 39 engages the ring 77 to raise the plunger 72 to the extent indicated by the dotted line position of the ring 77 appearing in Fig. 2. The plunger 72 returns by gravity to the full line position shown, and it is in this return movement of the plunger that a predetermined amount of oil is discharged through the slots 78 from the upper end of the plunger. Some of the oil discharged is collected in the cup 79, a good portion being allowed to seep freely through the bore 80 to assure good lubrication of the outside of the rod 43 for good lubrication of the rollers 40 and 41 and their pins 50 and 51 and the rod 42. Openings 81 are provided in the opposite side portions of the cup 79 in vertical alignment with grooves 82 provided in the top of the arm 36 in both of the sections 52 and 53 of the frame 39, notches 83 and 84 being provided in the sides of the grooves 82 over the pins 61 and 50, respectively, to insure good lubrication of these pins (see Figs. 4 and 5).

It is believed the foregoing description conveys a good understanding of the objects and advantages of our invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

We claim:

1. In a working head, comprising a housing, a pair of parallel vertical guide rods therein, and power operated gearing in said housing adapted to be operatively connected with a load member to reciprocate the same relative to said guide rods, the improvement comprising a load member adapted to be operatively connected with said gearing and comprising spaced parallel side walls disposed on opposite sides of the plane of said rods carrying vertically spaced guide rollers therebetween confined between and running on said rods, the side walls of said load member having substantially coplanar portions extending laterally from said housing to carry the load on the outer ends thereof, and a pitman rod adapted to be reciprocated by said gearing and pivotally connected to the laterally extending portions of the side walls of said load member at a point between the adjacent guide rod and the point of attachment of the load on the outer end of said portion to reciprocate the load member.

2. In a working head, comprising a housing, a pair of parallel vertical guide rods therein, and power operated gearing in said housing adapted to be operatively connected with a load carrying frame to reciprocate the same relative to said guide rods, the improvement comprising a generally T-shaped frame adapted to be operatively connected with said gearing and comprising spaced parallel sections on opposite sides of and parallel to the plane of said guide rods, a pair of widely vertically spaced rollers carried on the vertical reach of said frame between the spaced sections and confined between and rollable on said rods, reinforcing gussets secured between the vertical and lateral reaches of said frame, one of said lateral reaches being elongated and extending laterally from the housing for attachment of the load to be lifted in the outer end

thereof, and a pitman rod adapted to be reciprocated by said gearing and pivotally connected to the elongated laterally extending reach of said frame at a point between the adjacent guide rod and the point of attachment of the load on the outer end of said portion to reciprocate the member.

3. In a working head, comprising a housing having a pair of spaced vertical guide rods mounted therein the improvement comprising a reciprocable cross-head member comprising a generally L-shaped frame comprising laterally spaced substantially parallel L-shaped sections interconnected by cross-members in rigid relationship, the spaced sections forming a load carrying fork portion on the outer end of the horizontal leg of said frame, a pair of widely vertically spaced rollers mounted on the vertical leg of said frame between the spaced sections thereof and running on and between said guide rods, and a driving cross pin on said horizontal leg of said frame between the adjacent roller and the outer end of said leg.

4. In a working head, comprising a housing having a pair of spaced vertical guide rods mounted therein the improvement comprising a reciprocable cross-head member comprising an inverted generally L-shaped frame comprising laterally spaced substantially parallel L-shaped sections interconnected by cross-members in rigid relationship, the spaced sections forming a load carrying fork portion on the outer end of the horizontal leg of said frame, a pair of widely vertically spaced rollers mounted on the vertical leg of said frame between the spaced sections thereof and running on and between said guide rods, a driving cross pin on said horizontal leg of said frame between the upper roller and the outer end of said leg the upper roller being carried on a cross-pin in spaced relation to the aforesaid driving cross-pin, the spaced sections of said frame having oil conducting grooves provided in the top thereof extending from one cross-pin to the other adapted to spill oil therefrom onto said pins, and an oil cup carried on the inner end of the horizontal leg of said frame having openings in vertical alignment with one end of said grooves to deliver oil by gravity into said grooves from said cup.

5. In a working head, comprising a housing having a pair of spaced vertical guide rods mounted therein, the improvement comprising a reciprocable cross-head member comprising an inverted generally L-shaped frame comprising laterally spaced substantially parallel L-shaped sections interconnected by cross-members in rigid relationship, the spaced sections forming a load carrying portion on the outer end of the horizontal leg of said frame, a pair of widely vertically spaced rollers mounted on the vertical leg of said frame between the spaced sections thereof and running on and between said guide rods, a driving cross-pin on said horizontal leg of said frame between the upper roller and the outer end of said leg, the horizontal leg of said frame extending at its inner end portion beyond the vertical leg, and reinforcing gusset plates of triangular form disposed on opposite sides of the vertical leg of said frame and secured to the spaced sections thereof on both the horizontal and vertical legs thereof.

6. In a deep-well pumping apparatus, a housing and a pair of vertical guide rods mounted therein, a reciprocable frame carrying rollers

that are spaced appreciably in a vertical direction running on and between said guide rods, a pump driving rod, and means connecting the same to said frame substantially in the plane of said guide rods but at one side thereof, pitman rods pivotally connected with said frame on opposite sides thereof between one of said guide rods and the pump driving rod and movable in planes parallel to the plane of said guide rods, rotatable gears connected to the lower ends of said pitman rods for driving the same and lying in planes parallel to said guide rods, a cross-shaft carrying pinions meshing with said gears, and means for driving said cross-shaft.

7. In a deep-well pumping apparatus, a housing and a pair of vertical guide rods mounted therein, a reciprocable frame comprising vertically disposed sections that are laterally spaced so as to receive the guide rods therebetween, the sections carrying rollers therebetween that are spaced appreciably in a vertical direction running on and between said guide rods, a pump driving rod, and means connecting the same between the spaced sections of said frame substantially in the plane of said guide rods but at one side thereof, pitman rods disposed on opposite sides of and movable in planes parallel to said guide rods and pivotally connected with opposite sides of said frame on an axis between one of the guide rods and the pump driving rod, rotatable gears connected to the lower ends of said pitman rods for driving the same and lying in planes parallel to said guide rods, a cross-shaft carrying pinions meshing with said gears, and means for driving said cross-shaft.

8. In a deep-well pumping apparatus, a housing and a pair of vertical guide rods mounted therein, a reciprocable frame carrying rollers that are spaced appreciably in a vertical direction running on and between said guide rods, a pump driving rod, and means connecting the same to said frame substantially in the plane of said guide rods but at one side thereof, a pitman rod pivotally connected with said frame between one of said guide rods and the pump driving rod and movable in a plane parallel to the plane of said guide rods, a rotatable gear connected to the lower end of said pitman rod for driving the same and lying in a plane parallel to said guide rods, and means for driving said gear.

9. In a deep-well pumping apparatus, a housing and a pair of vertical guide rods mounted therein, a reciprocable frame comprising vertically disposed sections that are laterally spaced so as to receive the guide rods therebetween, the sections carrying rollers therebetween that are spaced appreciably in a vertical direction running on and between said guide rods, a pump driving rod, and means connecting the same between the spaced sections of said frame substantially in the plane of said guide rods but at one side thereof, a pitman rod disposed in a plane parallel to said guide rods and pivotally connected with said frame on an axis between one of the guide rods and the pump driving rod, a rotatable gear connected to the lower end of said pitman rod for driving the same and lying in a plane parallel to said guide rods, and means for driving said gear.

10. In a working head comprising a housing, a pair of parallel vertical guide rods therein, and power operated gearing in said housing adapted

to be operatively connected with a frame to reciprocate the same relative to said guide rods, the improvement comprising a pair of widely vertically spaced guide rollers confined between and rolling on said rods, an inverted L-shaped frame parallel to the plane of said guide rods on the vertical leg of which said rollers are mounted, said frame having a substantially horizontal load supporting arm portion reaching laterally from said housing and carrying means for attachment of the load to be lifted on the outer end thereof, and a pitman rod adapted to be reciprocated by said gearing and pivotally connected to the laterally extending arm portion of said frame at a point between the adjacent guide rod and the point of attachment of the load on the outer end of said arm portion to reciprocate the frame.

11. In a working head comprising a housing, a pair of parallel vertical guide rods therein, and power operated gearing in said housing adapted to be operatively connected with a frame to reciprocate the same relative to said guide rods, the improvement comprising a pair of widely vertically spaced guide rollers confined between and rolling on said rods, a generally T-shaped frame parallel to the frame of said guide rods on the vertical leg of which said rollers are mounted, said frame having a substantially horizontal load supporting arm portion extending crosswise relative to the upper end of the vertical leg and reaching laterally from said housing and carrying means for attachment of the load to be lifted on the outer end thereof, reinforcing gussets secured between the vertical leg and horizontal arm portion of said frame, and a pitman rod adapted to be reciprocated by said gearing and pivotally connected to the laterally extending arm portion of said frame at a point between the adjacent guide rod and the point of attachment of the load on the outer end of said arm portion to reciprocate the frame.

12. In a working head comprising a housing having a pair of spaced vertical guide rods mounted therein, the improvement comprising a reciprocable cross-head member comprising a generally L-shaped frame in substantially parallel relationship to the plane of said vertical guide rods, a pair of widely vertically spaced rollers mounted on the vertical leg of said frame and confined between and running on said guide rods, the horizontal leg of said frame having a load carrying portion on the outer end thereof, and a driving pin for attachment of power operated gearing for reciprocation of the cross-head member on the horizontal leg of said frame between the adjacent roller and the outer end of the horizontal leg of said frame.

LE ROY R. YOUNG.

MILLS E. SPANGBERG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,661,790	Crawford	Mar. 6, 1928
1,708,577	Hunter	Apr. 9, 1929
1,749,892	Scholes	Mar. 11, 1930
2,038,125	Patterson et al.	Apr. 21, 1936
2,046,059	Chronic et al.	June 30, 1936
2,061,789	Zimmerman et al.	Nov. 24, 1936
2,214,570	Bangasser	Sept. 10, 1940

Certificate of Correction

Patent No. 2,573,753

November 6, 1951

LE ROY R. YOUNG ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 6, line 59, after "carrying" insert *fork*; line 60, for "sair" read *said*; and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of March, A. D. 1952.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.