Jan. 3, 1933. C. GROEN 1,893,282

POWER HEAD

Filed Dec. 14, 1931 3 Sheets-Sheet 1

Fig. 1.

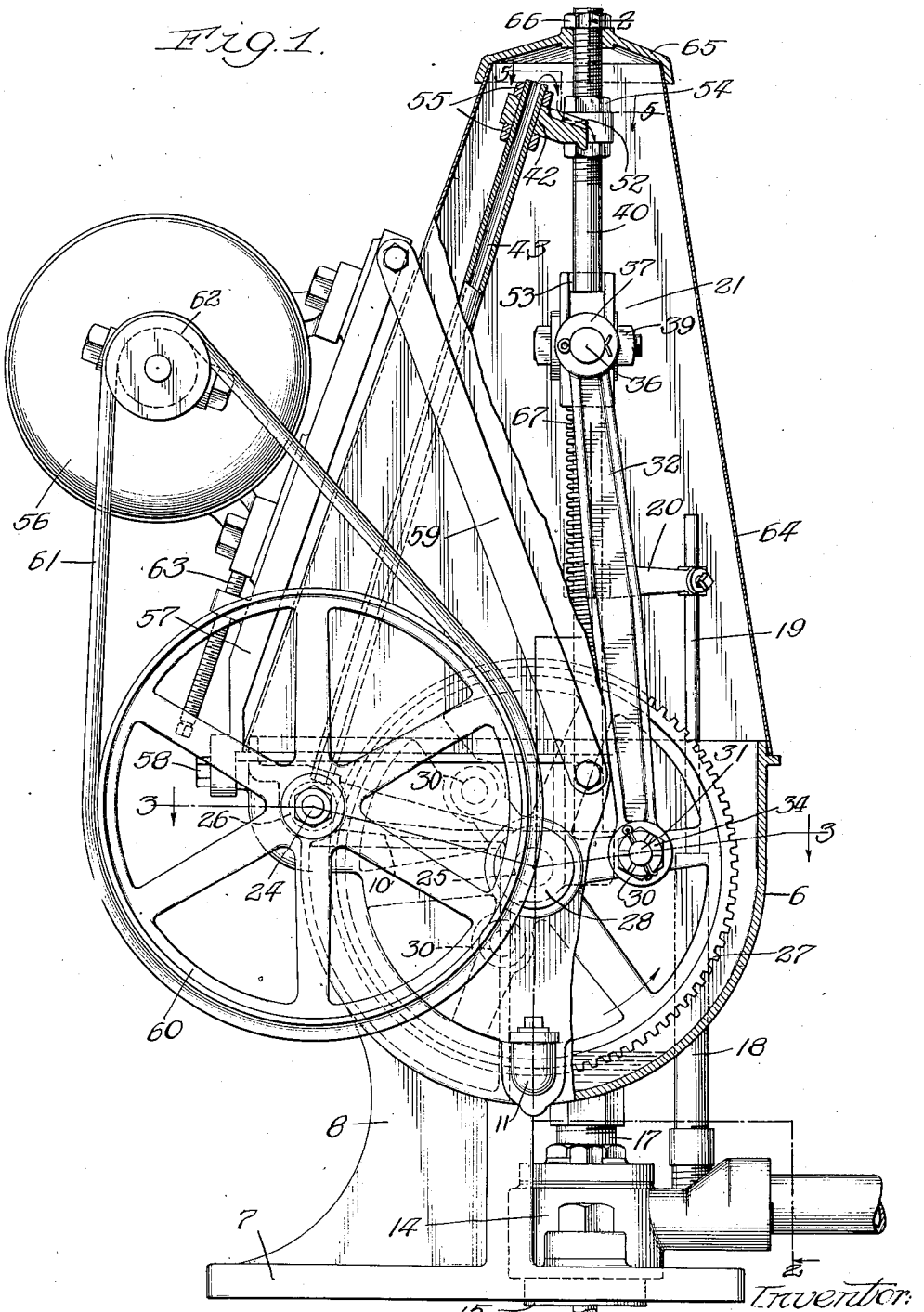

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Fig. 2.

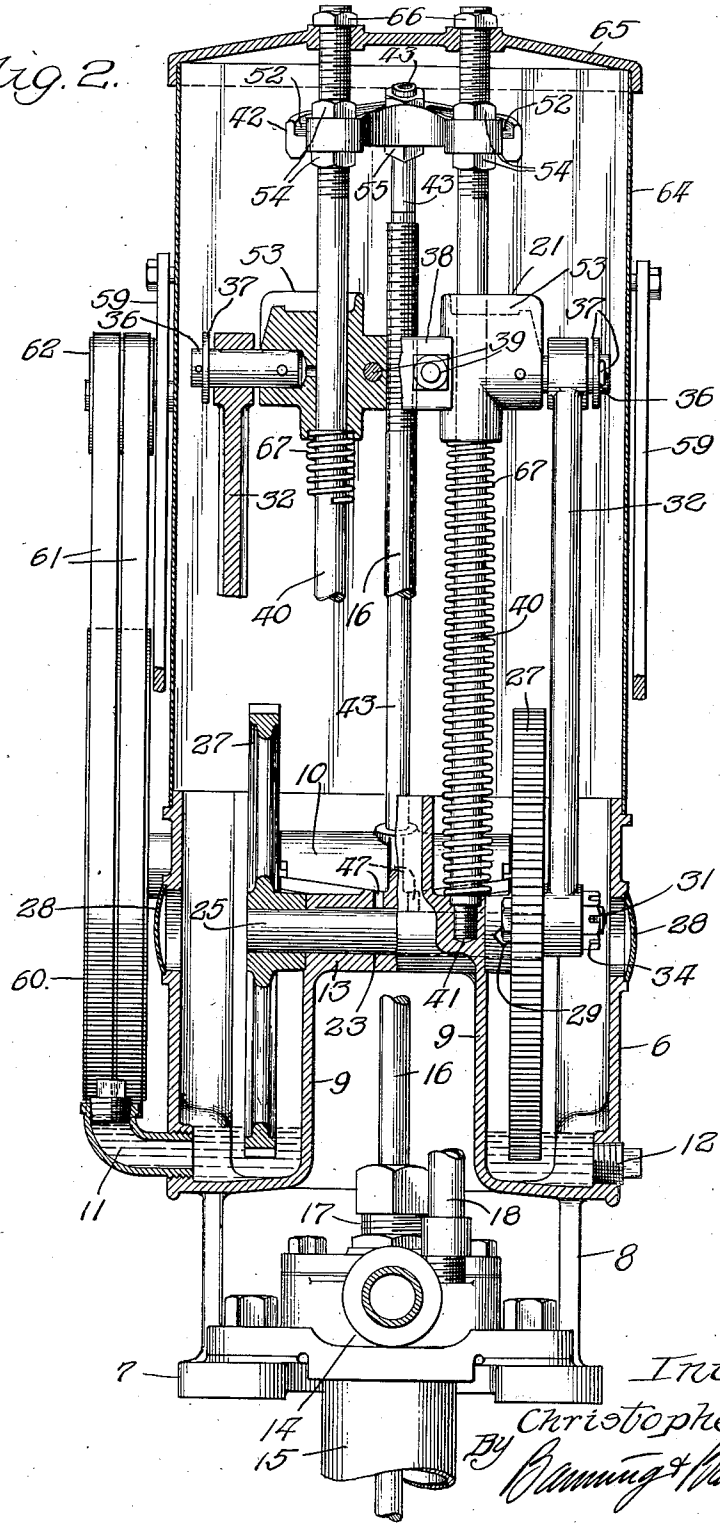

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Fig. 3.

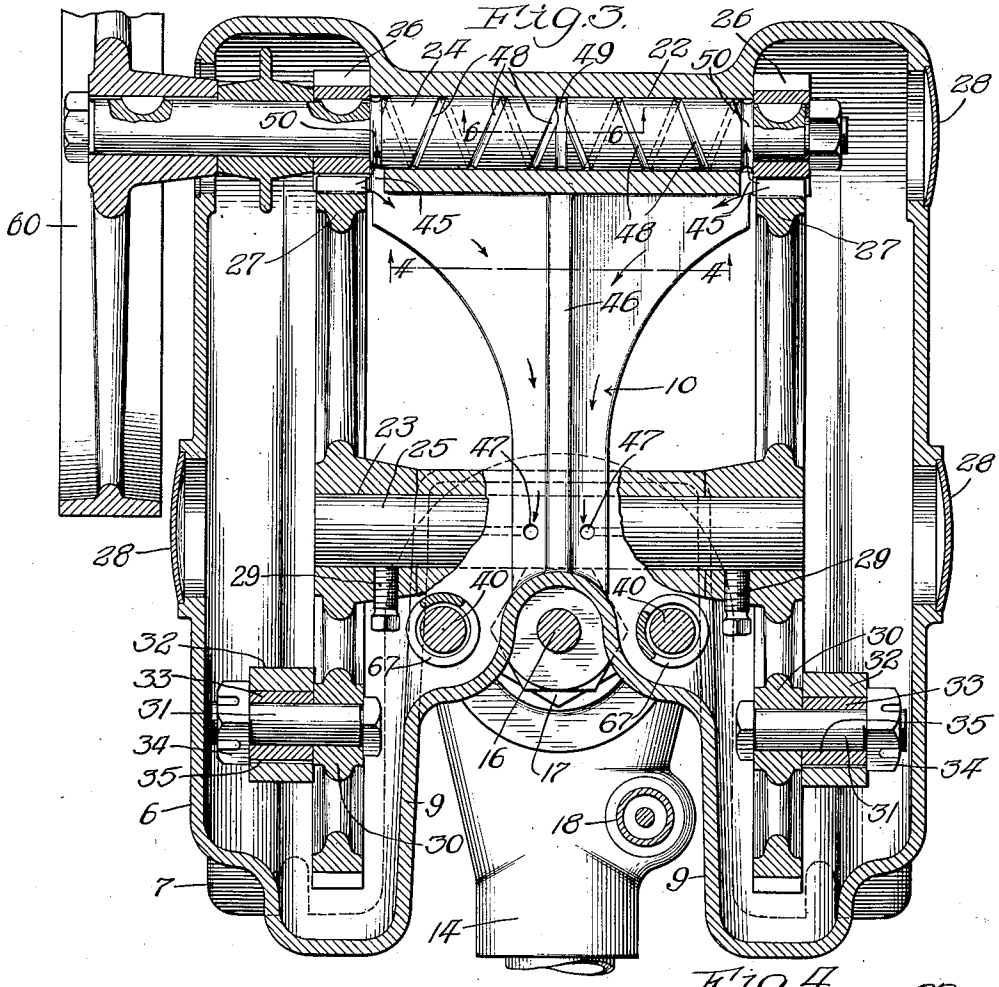


Fig. 4.

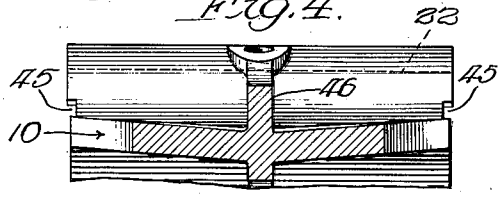
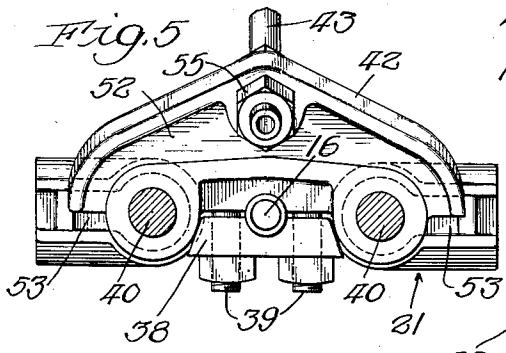


Fig. 5



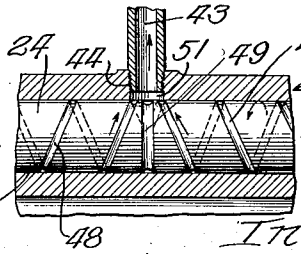


Fig. 6.

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UNITED STATES PATENT OFFICE

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POWER HEAD

Application filed December 14, 1931. Serial No. 580,929.

This invention relates to a power head adapted in particular to operate a deep well pump.

Among its objects is the provision of means whereby the piston rod and attached sucker rod of an open or tubular type of pump cylinder may be withdrawn without disturbing the power head setting. This novel arrangement also allows, when the diameter of the well permits, the removal of any drop pipe and cylinder assembly without disturbing the power head setting.

Another object is the provision of power mechanism for applying force to the piston rod in a line which approximates movement of the piston rod, thus minimizing side thrust and friction and utilizing the power to the best advantage.

Another object is to provide means to build up on the downward stroke energy which is available on the upward or lifting stroke of the piston.

Another object is the provision of a positive oiling system for lubricating all the moving parts of the power mechanism without requiring any separate pump mechanism or additional associated parts.

Another object is the provision of a casing closed at the bottom and open at the top furnishing a mounting for the power mechanism which is accessible from all sides, the casing having a covering hood which may be applied in place or be removed free of interference with the remaining structure.

Another object is the utilization of a minimum number of parts combined together to produce a simple mechanism which is strong, durable, well balanced throughout, and substantially free in operation of stresses and strains which consume added power or occasion needless wear.

With these and other objects and advantages in view, this invention consists in the several novel features of construction, arrangement and combination of parts hereinafter fully set forth and claimed.

An exemplification of the invention is clearly illustrated in the accompanying drawings in which—

Figure 1 is a side elevation of a power head, partly broken out, to illustrate parts that would be otherwise hidden from view;

Fig. 2 is a view partly in rear elevation and partly in vertical longitudinal section, with certain parts broken away, the line of section being indicated at 2—2 in Fig. 1;

Fig. 3 is a view partly in plan and partly in horizontal section taken on line 3—3 of Fig. 1;

Fig. 4 is a detail vertical section through the trans-bearing bracket, taken on line 4—4 of Fig. 3;

Fig. 5 is a view partly in plan and partly in horizontal section of the oil distributor and trans-bearing bracket taken on line 5—5 of Fig. 1; and

Fig. 6 is a fragmental vertical longitudinal section of the pump mechanism, taken on line 6—6 of Fig. 3.

Referring to the drawings which illustrate one embodiment of the invention, I have shown an open-topped casing 6 rounded in its bottom and supported upon feet 7 which may be bolted or otherwise secured to the platform of a well in the usual manner. The feet are connected substantially to the casing as by flanges or webs 8.

The rear of the casing has a reentrant wall 9 the contour of which conforms generally to two spaced gears which are mounted within the casing. Extending centrally between the front and rear walls of the casing is a bracket 10. At one side of the casing is shown a filler pipe 11, closed by a screw plug through which fluid lubricant may be introduced, a drain opening, closed by a plug 12, being located desirably at the opposite side of the casing.

Bolted or otherwise secured to the feet of the casing is a discharge head 14 from which may depend a drop pipe 15 for connection with a pump cylinder (not shown). The piston rod 16 which operates the pump extends through a stuffing box 17 in the top of the discharge head, upon which I may also mount an air pump 18 having its plunger stem 19 connected to the piston rod by a bracket arm 20.

The upper end of the piston rod is detachably connected to a cross head 21 which is reciprocated by suitable power mechanism.

By disconnecting the piston rod from the cross head and the discharge head from the feet of the casing, the piston rod and connected parts may be shifted rearwardly of the casing permitting withdrawal from the well of the pump cylinder assembly. This may be accomplished without disturbing the power head setting in any degree due to disposition of the piston rod within the space defined by the reentrant walls of the casing, but exteriorly thereof.

The trans-bearing bracket is bored to provide bearings 22 and 23 in which are journaled, respectively, a drive shaft 24 and a driven shaft 25 having intermeshing pinions 26 and gears 27. The side walls of the casing may be provided with openings in line with the bearing apertures to facilitate preparation of the bearings and insertion of the shafts therein, plug 28 being thereafter applied to the openings by friction to close the same.

The driven gears 27 which are made fast to the shaft 25, as by set screws 29, also function as crank wheels. They are provided with several oppositely disposed bosses 30 adapted to receive wrist pins 31 to provide connections with pitmen 32 which are pivotally joined to the cross head 21. The several pairs of bosses 30 are spaced at different radial distances from the axis of the crank wheels to provide for variation in the stroke of the pitmen.

Inasmuch as the crank wheels are confined in restricted spaces in the casing, I have devised a novel wrist pin assembly for each pitman. As shown, each wrist pin is formed with a head which bears against the boss 30. The shank of the pin extends through a bushing 33 which is fitted within the bearing aperture in the pitman, a castellated nut 34 being threaded upon the pin end, as shown.

The bearing face of the pitman is provided with an oil groove 35 through which lubricant may be distributed over its entire surface in engagement with the bushing. Pins 36 rigidly secured in co-axial alignment with each other in the cross head 21 project from the ends thereof to enter apertures in the upper ends of the pitmen. The pitmen are held in place on the pins 36 as by washers and cotter pins 37.

As by bolts and nuts 39 I connect to the cross head a clamp block 38, the piston rod 16 being received within seats between these parts, and there held by the friction resulting from tightening of the clamp block. Above the cross head the piston rod may be screw threaded for connection with a windmill rod or other device, as desired.

For the cross head I provide an upstanding guide which may take the form of a pair of rods 40 having their lower ends 41 anchored within sockets in the casing (see Fig. 2). At their upper ends the guide rods are connected by a block 42 to a hollow brace rod 43, the lower end of which is anchored to the trans-bearing bracket 13 as at 44 (see Fig. 6), the upper ends of the guide rods being thereby rigidly supported. The guide and brace rods extend through the block 42 and are threaded to receive nuts 54 and 55 by which the block is clamped fixedly in place between the guide rods and brace rods.

A positive and simple oiling system has been provided for supplying lubricant to all of the moving parts of the present mechanism. This includes a pump which is incorporated with and made a part of the transmission. A quantity of fluid lubricant is contained in the bottom of the casing to a level which contacts with the crank gears. In operation, the teeth of the gears carry some of the oil to the pinions 26. At this point, some of the oil is expressed from between the teeth for travel to other places which require lubrication.

As shown, oil inlet ports 45 are formed at the ends of the drive shaft bearing, these inlet ports being located adjacent the sides of the pinions 26 which receive oil from the crank gears (see Fig. 3). Some of the gear-lifted oil flows along the trans-bearing bracket on opposite sides of a central web 46 to oil holes 47 located above the driven shaft 25. The trans-bearing bracket is sloped inwardly towards its central web and also longitudinally toward the bearing for the crank gears, as shown in Figs. 2 and 4, thereby providing shallow troughs through which the oil flows in a pre-arranged manner.

The oil pump mechanism is incorporated with the drive shaft 24 by forming therein oppositely pitched spiral grooves 48 which join with an annular groove 49 intermediately of the shaft ends. Other annular grooves 50 also joining with opposite ends of the spiral grooves are provided in the drive shaft at points in register with the ports 45. A discharge port 51 (see Fig. 6) is arranged in the bearing at a point which registers with the intermediate groove 49, and at this same point the hollow brace rod 43 is anchored to form a conduit leading therefrom to the block 42 which serve as an oil distributor. Oil entering the ports 45 is fed through spiral grooves to the discharge port 51 to be forced upwardly therefrom through the hollow brace rod and out upon the overhead oil distributing block.

Formed in the upper surface of the block is an oil channel 52 having two branches that lead to points adjacent the sides of the guide rods for discharge of oil into shallow cups 53 formed in the upper face of the cross head. Each cross head cup surrounds one guide rod to assure adequate lubrication thereof. The excess of oil discharges over low dams and through channels at the ends of the cross head to flow to the pins 36 in which are oil grooves

for distributing the oil lengthwise thereof. Additional oil will either drip down or flow along the pitmen to lubricate the wrist pins on the crank gears. The flow of the oil which is governed to some extent by the pitch of the spiral grooves in the drive shaft should be sufficient for continuous delivery to the overhead distributor and points therebelow to lubricate the cross head and all associated parts.

Power is applied to the drive shaft 24 from any convenient power source, such as an electric motor 56. Desirably a motor base 57 is provided which, in the form shown, is a rectangular plate secured slantingly above the front wall of the casing by bolts 58. Brace bars 59 may connect the upper end of the motor base fixedly to the casing side walls in the manner shown. The drive shaft 24 which extends out through an opening in a side wall of the casing is equipped at its end with a pulley 60 around which is trained a belt (or belts) 61 that passes over a belt pulley 62 mounted on the motor shaft. The motor is adjustably carried upon its base and by means of an adjusting screw 63 may be shifted to tighten the belt as required.

In order to enclose the power mechanism, a hood 64, preferably formed of sheet metal, is rested upon a ledge surrounding the upper edge of the casing. The hood extends upwardly inside of the motor base to a point slightly above the oil distributor block. A clamped cap 65 rests upon the upper open end of the hood and may be clamped thereon by a pair of nuts 66 threaded upon the upper ends of the guide rods and bearing against the cap. By removing the cap, the hood may be lifted from the casing without disturbing the motor base or any other parts, thus making the entire operating mechanism accessible from all sides.

I provide also means which store up energy during the down stroke of the cross head and utilize the stored up energy during its upward or lifting stroke. For this purpose I employ a pair of coiled compression springs 67 encircling the guide rods and confined under tension between the cross head and the bearing adjacent the lower ends of the guide rods. The springs, the same as the associated working parts, are enclosed entirely within the casing and hood.

The guide rods are disposed equi-distant from the piston and are arranged in line therewith in order that the springs may exert a balanced pressure against the cross head. It will be noted that the driven shaft is located close to the guide rods and piston rod, so that on the upward stroke the pitmen's thrust will be nearly in line with the pitmen's guides. These springs are lubricated constantly by the oil fed from above, and so will operate with a minimum of friction.

I claim:

1. A power head combining a pair of spaced gears mounted to rotate about a common horizontal axis, a pair of vertical guides upstanding from points equi-distantly from one side of the shaft and adjacent thereto, a cross head slidable upon the guides having operative connections with the gears, a piston rod between the guides aligned therewith and connected to reciprocate with the cross head, and a casing wherein the gears and guides are mounted having a reentrant wall passing in and out between the guides and piston rod to exclude the latter from the confines of the casing.

2. A power head combining a gear mounted upon a horizontal shaft, a vertical guide upstanding from a point closely adjacent one side of the shaft, a slide upon the guide having an operative connection with the gear, a vertical piston rod adjacent the guide distant from the shaft equally with the guide and connected to reciprocate with the slide, and a casing wherein the gear and guide are mounted having a reentrant wall passing in and out between the guide and piston rod to exclude the latter from the confines of the casing.

3. A power head combining a pair of spaced gears mounted to rotate about a common horizontal axis, a piston rod vertically disposed between the gears to one side of the axis thereof and closely adjacent thereto, means connecting the gears to the piston rod to transform rotary movement of the one into reciprocation of the other, and a casing wherein the gears and connecting means are mounted having a reentrant wall passing in and out between the gears and piston rod to exclude the latter from the confines of the casing.

4. A power head combining a pair of spaced gears rigidly mounted on a common shaft, a pair of vertical guides extending up from points equi-distant from one side of the shaft and adjacent thereto, a cross head slidably mounted upon the guides, a pair of pitmen connecting said cross head with the gears, a piston rod between the guides aligned therewith and detachably connected to the cross head, and a casing wherein the gears, shaft and guides are mounted having a reentrant wall passing in and out between the guides and piston rod to exclude the latter from the confines of the casing.

5. A power head combining a pair of spaced gears rigidly mounted on a common shaft, a pair of driving pinions mounted on a common shaft and intermeshing with said gears, a pair of vertical guides upstanding from points equi-distant from one side of the gear shaft and adjacent thereto, a cross head slidable upon the guides, a pair of pitmen connecting the cross head with the gears, a piston rod between the guides and

aligned therewith and detachably connected with the cross head, and a casing wherein said shafts and the guides are mounted having a reentrant wall passing in and out between the guides and piston rod to exclude the latter from the confines of the casing.

6. A power head comprising a pair of vertical upstanding guides, a cross head slidably mounted upon the guide, gearing including a crank wheel connected to the cross head by a pitman, a piston rod between the guides aligned therewith and detachably connected to the cross head, and a casing wherein the gearing and guides are mounted having a reentrant wall passing in and out between the guides and piston rod to exclude the latter from the confines of the casing.

7. A power head combining driving and driven shafts having meshing gears, a casing wherein the shafts are mounted adapted to contain a fluid lubricant through which one of the gears is moved to lift a quantity of the lubricant on to the other gear, and shaft and bearing mechanism for the gear last named constructed to force some of the lifted lubricant to a point of higher elevation.

8. A power head combining a casing adapted to contain a quantity of lubricant, gearing movable through the lubricant and including drive and driven shafts, bearings for said shafts, a reciprocatory cross head and a guide therefor, connections between the cross head and gearing for translating the rotary movement of the gearing into reciprocatory movements of the cross head, one of the shafts being so formed as to provide with its bearing pump means for circulating lubricant, and a conduit for conveying the lubricant from the pump means to the cross head.

9. A power head combining a casing open upon its upper side above which extends a vertical guide whose lower end is supported in the casing wherein is also mounted actuating mechanism in driving connection with parts reciprocable upon the guide, means independent of the casing for supporting the upper end of the guide, a motor base carried by the casing above its open upper side, a motor mounted on the base in connection with the actuating mechanism, and a hood positioned over the open upper side of the casing enclosing the actuating mechanism, guide and associated parts, and movable to and from position free of interference with the remaining structure.

10. A power head combining a casing having a reentrant wall and open upon its upper side above which extends a reciprocatory device in connection with an actuating mechanism having a mounting in the casing, a piston rod operable by the reciprocatory device and depending vertically therefrom to pass exteriorly of the casing within the space defined by the reentry of its walls, and a hood applicable over the open upper side of the casing to enclose the actuating mechanism, reciprocatory device and proximate end of the piston rod.

11. A power head combining a casing open at the top, a pair of upstanding guide rods mounted therein, a cross head sliding on the guide rods, a piston rod secured to the cross head in line with the guide rods and equi-distant therefrom, gearing mounted in the casing and including a pair of crank wheels mounted on a common shaft located in close proximity to the guide rods and piston rod and having a driving connection with the cross head which connection is also in line with said guide rods, coiled compression springs encircling said guide rods and exerting an upward pressure on the cross head, and pump means within the casing and operated by the gearing to deliver oil to the gearing, the crank head, and the springs.

12. A power head combining a casing, a pair of upstanding guide rods mounted therein, a cross head reciprocating on said guide rods, a piston rod secured to said cross head and disposed equi-distant from and in line with said guide rods, a shaft mounted in close proximity to said guide rods and piston rod and extending crosswise thereof, a pair of power driven crank wheels rigidly mounted on said shaft, and a pair of pitmen connected at one end to said cross head on a common axis extending through the axes of the guide rods and piston rod, said pitmen being connected at the other end to the crank wheels.

13. A power head having a casing adapted to contain a quantity of lubricant, a gear mechanism in the casing movable through the lubricant and operatively connected to a reciprocating device, a gear shaft rotatably mounted in a bearing in said casing, means to supply lubricant from said casing to said gear shaft and bearing, and said shaft and bearing cooperating to expel lubricant therefrom under pressure to the reciprocating device.

14. A power head having a casing adapted to contain a quantity of lubricant, a gear mechanism in the casing movable through the lubricant and operatively connected to a reciprocating device, a gear shaft rotatably mounted in a bearing in said casing, a conduit communicating with the interior of said bearing and leading to the reciprocating device, and said shaft and bearing cooperating to expel lubricant therefrom through said conduit.

15. A device of the class described comprising a casing adapted to contain a quantity of lubricant, a gear shaft rotatably mounted in a bearing in said casing, gear mechanism geared to said shaft in said casing and movable through the lubricant to operate a driven element, means disposed adjacent one end of said bearing for conveying

lubricant from said gear mechanism to said shaft and bearing, and said shaft and bearing cooperating to continuously expel lubricant therefrom to the driven element.

16. A device of the class described comprising a casing adapted to contain a quantity of lubricant, a gear shaft rotatably mounted in a bearing in said casing, gear mechanism geared to said shaft in said casing and movable through the lubricant to operate a driven element, means disposed adjacent opposite ends of said bearing for conveying lubricant from said gear mechanism to said shaft and bearing, a conduit communicating with the interior of said bearing between the ends thereof and leading to the driven element, and said shaft and bearing cooperating to expel lubricant therefrom through said conduit.

17. A device of the class described comprising a casing adapted to contain a quantity of lubricant, a gear mechanism in the casing movable through the lubricant to operate a driven element, said gear mechanism including a gear shaft rotatably supported in a bearing in said casing, and means on said shaft cooperating with the supporting surface of said bearing to propel a continuous flow of lubricant from said casing to the driven element.

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