Dec. 3, 1935. E. C. WELLS ET AL 2,023,039

PUMPING UNIT

Filed July 16, 1931 2 Sheets-Sheet 1

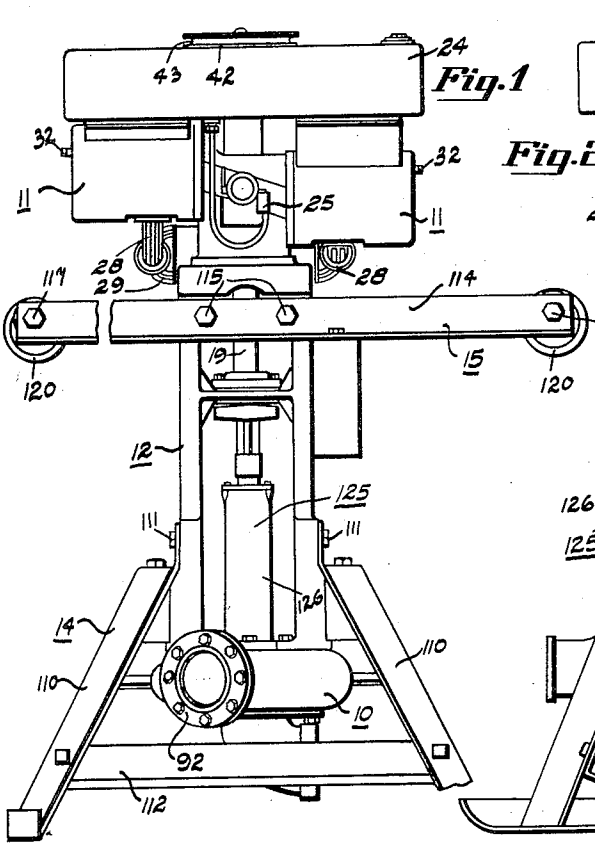


Fig.1

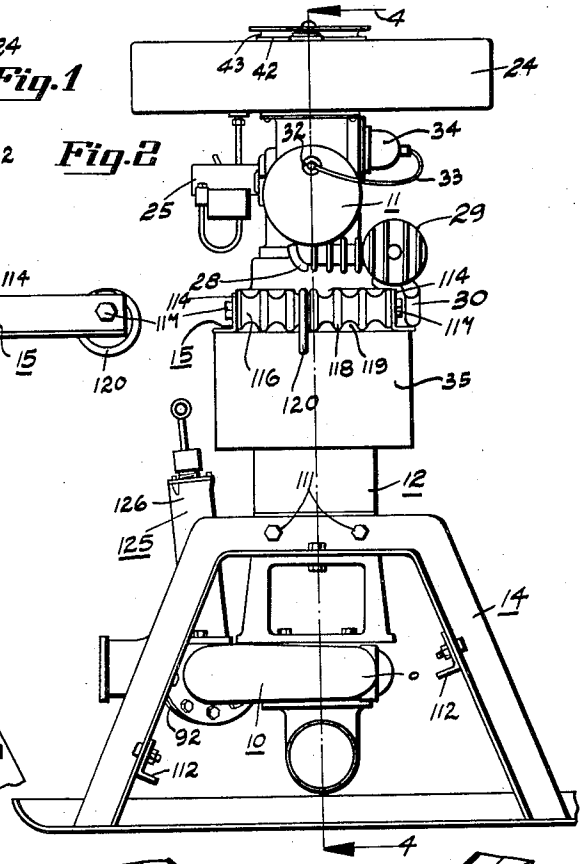


Fig.2

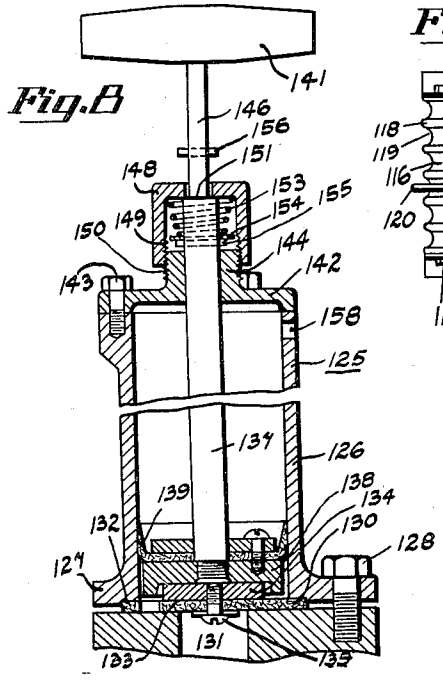


Fig.8

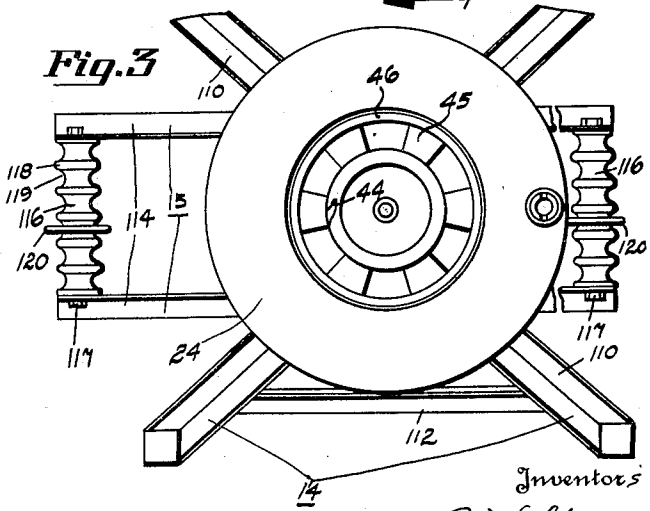


Fig.3

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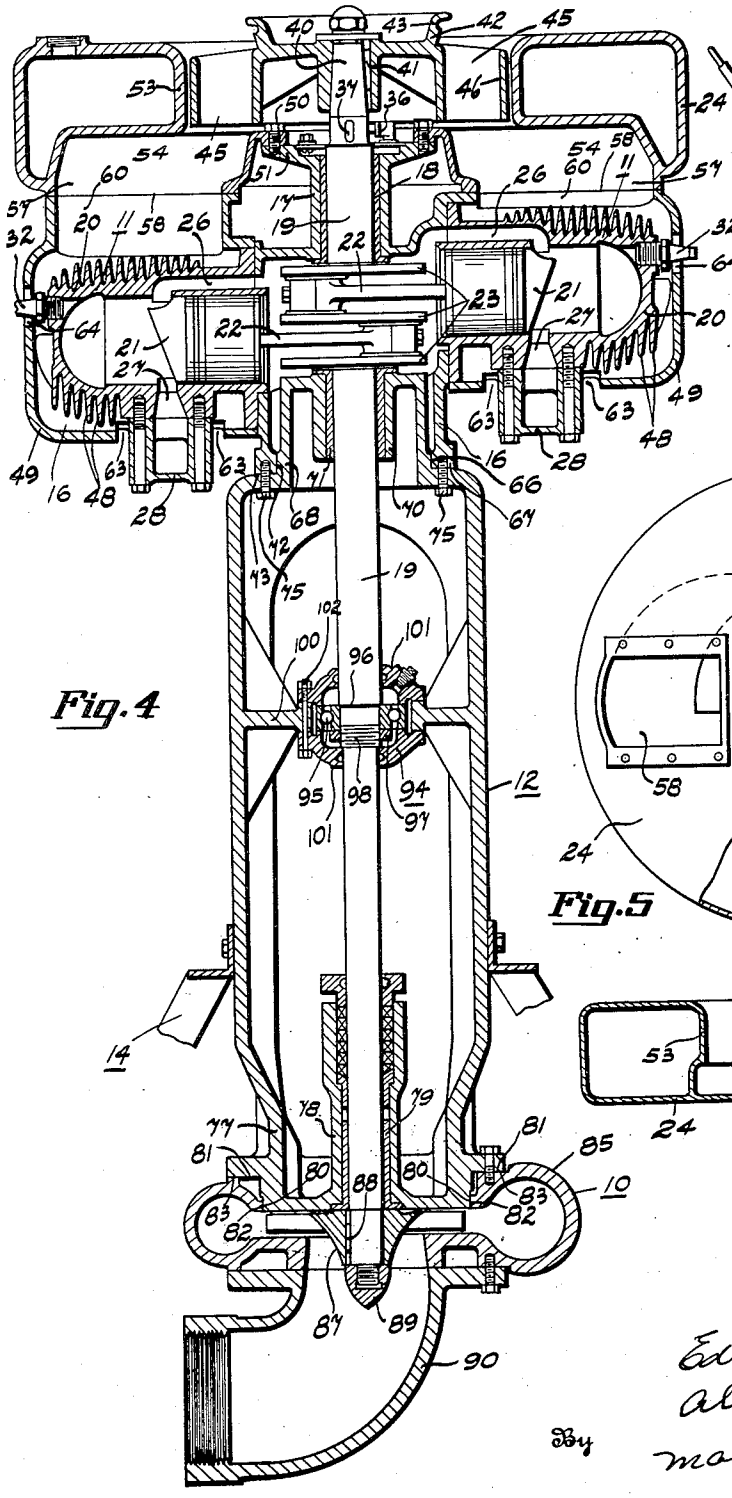


Fig. 4

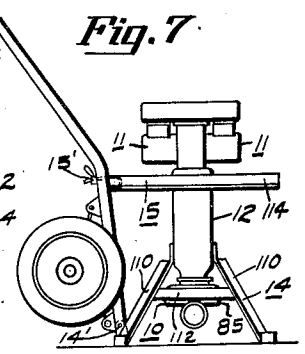


Fig. 7

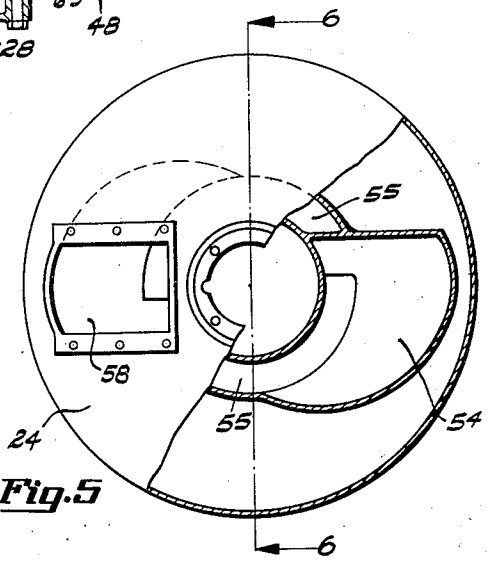


Fig. 5

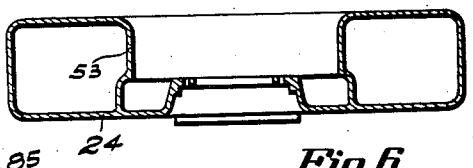


Fig. 6

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UNITED STATES PATENT OFFICE

2,023,039

PUMPING UNIT

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Application July 16, 1931, Serial No. 551,177

4 Claims. (Cl. 103—87)

This invention relates to self-contained pump and power units, and more particularly to such a unit comprising a pump and a prime mover therefor, which unit is portable.

One of the principal objects of the invention is the provision of a compact self-contained engine driven unit of simple and rugged construction, having high operating efficiency, and which is capable of withstanding the deteriorating effects of rough and continued service.

Another object of the invention is the provision of a pumping unit which is readily portable, and which may be satisfactorily operated either when standing on its base or when suspended, as from the hook of the lifting crane.

A further object of the invention is the provision of a pumping unit in which the various parts are coordinated as to design so as to readily fit together into a rigid assembly for effective operation; the major parts of the unit being arranged so as to overlie and protect from damage the operating mechanism attached to and forming part of the pumping unit.

In the drawings, which disclose a preferred embodiment of the invention—

Figs. 1 and 2 are elevational views of a pumping unit constructed in accordance with this invention;

Fig. 3 is a plan view of the pumping unit;

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

Fig. 5 is a plan view of the bottom side of the fuel tank; a portion being broken away for clearness of illustration;

Fig. 6 is a sectional view on the line 6—6 of Fig. 5;

Fig. 7 is an elevational view of the pumping unit with carrying truck attached; and

Fig. 8 is a sectional view of the priming pump.

The drawings, in which like characters of reference designate like parts throughout the several views thereof, illustrate a self-contained engine driven operating unit. The engine driven work device is shown and described as a pump for lifting or pumping water or the like, although obviously the work device may be of a different character. The unit comprises generally a work device or pump 10, pump driving means 11 in the form of an internal combustion engine, and a connecting member 12 which is attached to the pump and engine to hold these parts in fixed spaced relationship. A base structure 14 serves to support the pumping unit from the floor with the pump and engine standing vertically related to one another. Additional supporting means are provided in the form of a suspension frame 15 by which the complete pumping unit may be lifted bodily for moving it around, as from a crane hook, or for suspension of the unit while pumping. The unit may be readily attached to a carrying truck, such as is shown in Fig. 7, in which a truck has been backed up to the pump and has the draw bar tilted upwardly to permit insertion of lower attaching bolts 14' between the truck frame and the pump base 14. Upon attachment of hook bolts 15' to the suspension frame 15 the pump may be raised from the ground by lowering the draw bar of the truck.

The engine 11 comprises a crank case 16 which has formed as an integral part thereof a bearing sleeve 17 for the reception of a bearing bushing 18 within which the vertically extending crank shaft 19 is journaled. The crank case 16 also has attached to it oppositely positioned horizontally extending cylinders 20 within which are fitted pistons 21 having connecting rods 22 which are attached to the crank throws 23 of the crank shaft 19. The engine is preferably of the two cylinder two cycle type and is arranged so that the cylinders fire simultaneously.

A fuel tank 24 is mounted above the engine. This tank is preferably formed as a casting and is of substantial proportion. It is shown of ring-like shape and is mounted coaxially with the crank shaft. A tube is provided for the passage of fuel from the fuel tank 24 to the carbureter 25. The carburetor is bolted to the engine crank case in communication with ducts leading to the interior of the crank case and terminating in openings positioned at the inner ends of the cylinders so as to be uncovered upon outward movement of the pistons 21. Gaseous fuel from the carbureter is drawn into the crank case as the pistons move outwardly and is then compressed therein upon reverse movement of the pistons. As the pistons reach the end of the inward stroke they uncover the openings of passages 26 leading from the crank case to the cylinder interiors to permit the compressed charge of fuel to flow thereinto. At this same time the exhaust ports 27 are open by being uncovered by the pistons so that the burned gases of a previous power impulse may pass from the cylinders through the exhaust stacks 28 into the muffler 29 and be discharged through the exhaust pipe 30. A spark plug 32 is provided in each cylinder for ignition of the gaseous charge; each plug being connected by a cable 33 to a coil 34 which is electrically connected to an energizing circuit. A battery supplies the necessary current and is car-

ried in a container 35 which is shown suspended from the frame 15.

The battery circuit is interrupted by a circuit breaking mechanism comprising a contact arm 36 which is pivotally mounted on an axis parallel to the crank shaft axis and is spring tensioned to bear against the crank shaft surface. On the crank shaft is a flat portion providing a cam face 37 so that upon each rotation thereof the contact arm 36 will be moved by its spring to interrupt the circuit in proper timed relation to the positioning of the pistons. The contact arm is of conventional form and has a fiber block which bears against the crank shaft surface by being tensioned thereagainst. In order to prevent undue wear between the contacting surfaces of the fiber block and the crank shaft a hard smooth surface is provided on the crank shaft by electroplating a surface layer of chromium thereon. The crank shaft is of such size that it presents a difficult problem of handling to properly harden the camming surface by heat treatment and to subsequently grind this surface to provide the desired smoothness. The surface layer of chromium applied thereto by electro-plating presents a simple and effective means of acquiring a hard surface of sufficient depth to withstand the rubbing contact of the tensioned circuit breaker.

The upper end of the crank shaft 19 is tapered as shown at 40 and is provided with a key 41 to receive the hub of a fly wheel 42. To permit starting of the engine the fly wheel is provided with the annular rope receiving groove 43 wherein a length of rope may be wrapped to rotate the engine by a pull on the rope. The groove has a notch 44 for engagement of the rope end. The spokes 45 which extend to the fly wheel rim 46 are positioned in the form of an fan blades to direct a flow of cooling air over the cylinders which are provided with cooling ribs 48. The cylinders are enclosed in jackets 49 by which the cooling air from the fan is directed over the cylinders.

The fly wheel 42 is shown mounted within the confines of the ring shaped fuel tank 24 which is bolted at 50 to a flange 51 extending from the bearing sleeve 17 of the crank case. The fuel tank is provided with passages for directing the flow of cooling air from the fan into the cylinder enclosing jackets 49. As shown, the inner cylindrical wall 53 of the fuel tank closely encircles the rim 46 of the fly wheel. Oppositely positioned air conducting passages 54 of volute shape are formed in the fuel tank and have semi-circular openings 55 which communicate with the space adjacent the fly wheel. At the lower wall 57 of the fuel tank the passages 54 communicate with the cylinder jackets 49 through openings 58. Each jacket has an upstanding flange 60 similar in outline to the corresponding opening 58 and is proportioned to contact with and be attached to the frames 61 which define the openings 58. Outlets for the cooling air from the jackets are provided by openings 63 which are positioned at the point of attachment of the exhaust stacks 28 with the cylinders. Also, each jacket is provided with an opening 64 for the spark plug.

The end of the crank case opposite to that upon which the bearing sleeve 17 is formed is open and is provided with a cylindrical machined surface 66 and an adjacent disk like machined face 67 for reception of the upper end 68 of the connecting member 12 which forms a closure for the open crank case end. The connecting member end 68 is provided with a bearing sleeve 70 within which is fitted a bearing bushing 71 for further support of the crank shaft 19. The end portion 68 is provided with machined surfaces 72 and 73 which match with the surfaces 66 and 67 of the crank case. As the bearing sleeve 17 is machined relatively to the crank case surfaces 66 and 67 and the bearing sleeve 70 is machined relatively to the surfaces 72 and 73 the two bearing sleeves 18 and 71 will stand perfectly aligned for proper support of the crank shaft. Bolts 75 attach the connecting member 12 and the crank case 16 rigidly together.

The opposite end 77 of the connecting member 12 is provided with a bearing sleeve 78 for the reception of a bearing bushing 79 for further support of the crank shaft 19. This end of the connecting member, like the end 68, is also provided with a cylindrical machined surface 80 and an adjacent disk like machined surface 81 which match respectively with machined surfaces 82 and 83 of the casing 85 of the pump 10 so that the pump casing, like the crank case, is also properly aligned with respect to the crank shaft carried in the bearings of the connecting member. The crank shaft extends beyond the end of the connecting member and into the confines of the pump casing 85 for attachment of a pump impeller 87 which is shown held thereon by provision of a key 88 and a nut 89. A suction fitting 90 is shown bolted to the inlet side of the pump, while a suitable bolting ring 92 is formed at the discharge end of the pump for the attachment of pipes.

A bearing for sustaining the thrust loads of both the engine and the pump, as well as additional support for the crank shaft, is provided by the single thrust bearing 94 which is supported from the connecting member 12. As shown, an antifriction bearing 95 is mounted on the shaft 19 and is clamped against a shaft shoulder 96 by means of a nut 97 which engages a threaded portion 98 of the shaft. The antifriction bearing 95 is supported from an annular ring 100, forming part of the connecting member 12, by provision of cup shaped housing plates 101 which are clamped to the ring 100 by bolts 102. The housing plates 101 stand facing opposite to one another and are provided with machined surfaces which engage the outer race of the bearing 95. Accurate positioning of the thrust bearing, which serves to locate the crank shaft with respect to the engine and pump, is secured by machining the engine and pump engaging surfaces of the connecting member ends 68 and 77 relatively to the surfaces of the ring 100 to which the thrust bearing housing plates 101 are attached. The single shaft which extends throughout the length of the unit and has the fly wheel attached at one end, and the pump impeller attached at the other end, and which includes also the crank throws as well as the cam face for energizing the ignition system, is rigidly and accurately supported for free rotational movement by the interfitting machined parts carrying the bearings 18, 71, 95 and 79.

The base structure 14 comprises a framework fabricated from structural iron and consists generally of two U-shaped frames 110 of angle iron which are bolted at 111 to the connecting member 12. The legs of the oppositely positioned frames are connected by cross members 112. The legs are of sufficient length to permit the suction fitting 90 attached to the bottom of the pump to stand clear of the floor level.

The suspension frame 15 by which the unit may be lifted bodily from the floor comprises

parallel horizontally extending members 114 of angle iron which are bolted at 115 to the connecting member 12. The members 114 are spaced apart a distance equal to the thickness of the connecting member 12 and are joined at their outer ends by cross members 116 which are held to the members 114 by provision of through bolts 117. The members 116 are formed each as a series of annular ridges 118 and grooves 119, and each has loosely mounted upon it a ring 120 of sufficient diameter that it may be moved along its member 116 over the ridges 118. These rings serve as a means of attachment for lifting hooks which, for example, may be attached to an overhead crane or some other suitable means of suspending the pumping unit. The provision of the series of spaced grooves permits a selective positioning of the rings 120 so that the pumping unit may be lifted in balance irrespective of the weight of the pump piping which may be attached to it and tending to cause the unit to be tilted. As the unit of itself is substantially balanced, when lifting the unit alone the rings 120 will be positioned diametrically opposite one another so that the pump unit will then hang in suspension with the shaft axis standing vertically. With a length of hose attached to the suction and discharge fittings of the pump any tendency to cause the unit to tilt when suspended may be counteracted by moving the rings 120 to the proper groove to provide a balancing of the weight suspended.

The arrangement of the major parts of the pumping unit is such that the operating mechanism attached to the pumping unit, such as the carbureter, the ignition coil, the muffler, and the battery box, are protected from damage. The major parts overlie these portions of the operating mechanism and so provide a protecting guard whereby these parts may not be damaged by being struck or bumped during use of the pump. The fuel tank 24, as mentioned above, is circular in form and, as shown particularly in Fig. 3, extends out well beyond the positioning of the parts named above. The fuel tank by being bolted directly to the crank case and by being formed as a casting of substantial strength, is able to withstand very rough usage while serving as an overlying guard for these parts. Also, the suspension frame 15 serves as an additional protection in that its lateral extent is such as to serve as a guard against damage to the cylinder jackets and parts projecting therefrom.

A priming pump 125 is attached to the casing 85 of the centrifugal pump to provide the initial suction when it is desired to start the pump in operation. The priming pump comprises a cylinder 126 having an open bottom end upon which is formed a flange 127 which serves also as a bolting ring for the reception of screws 128 by which the priming pump is held to the discharge or pressure side of the pump casing 85. The flange 127 and screws 128 serve also as a means for clamping the suction valve 130 in position so that this valve may provide a closure for the passage 131 communicating with the interior of the casing 85 and the priming pump cylinder. The valve 130 is in the form of a flexible disk having a rim portion 132 which is held between the flange 127 and the casing 85, and a central portion 133 which is attached to the rim portion by a narrow neck so as to be readily removable upon creating suction within the priming pump. The valve portion 133 is stiffened by provision of a disk 134 held thereto by means of a screw 135.

The priming pump piston rod 137 has attached to its lower end a piston plate 138 which serves as a support for a cup leather 139 having an upturned flange which engages the interior wall of the cylinder 126. The opposite end of the rod 137 is provided with a handle 141 for manual operation of the piston. The upper end of the cylinder 126 is closed by a cover plate 142 which is held in place by the screws 143. The plate 142 has a central sleeve portion 144 which serves as a guide for the piston rod which passes therethrough. Means are provided so that during times that the priming pump is not in use the piston rod may be held in clamped engagement with the suction valve 130 so that this valve is positively maintained closed and no liquid from the pump 10 may then pass therethrough. To provide this clamping action a portion of the piston rod toward the handle 141, and on the exterior side of the piston guide 144, is provided of reduced diameter as shown at 146. A sleeve 148 is loosely mounted upon this rod portion of reduced diameter and is internally threaded at 149 for engagement with threads 150 provided on the exterior of the guide 144. The shoulder 151 formed on the rod at the portion of reduced diameter and the proportioning of the sleeve 148 is such that when the piston is pushed down into contact with the suction valve and the sleeve is then threaded onto the piston guide the piston will be held in clamped engagement with the suction valve. To prevent engagement of the sleeve with the threaded portion of the guide during operation of the priming pump piston, a spring is provided on the piston rod which tends to force the sleeve upwardly into a position which prevents its engagement with the guide. The spring, indicated at 153, is supported at one end upon a washer 154 carried by a cross pin 155 which extends through the rod. The opposite end of the spring bears against the under side of the sleeve and forces it upwardly to a position limited by a second cross pin 156. An air escape opening 158 is provided in the upper end of the priming pump cylinder so that during operation of the pump air compressed thereby may readily escape. Positioning of the engine and pump vertically with respect to one another results in a compact assembly having small lateral dimensions so that the unit occupies but a relatively small amount of floor space when standing on its base, and which may be readily lowered into a pit of quite small diameter. The arrangement of the pump unit is such that it is particularly suited for the use of contractors and in construction work requiring a readily portable unit of high pumping capacity and rugged construction which will continue to operate efficiently even though roughly handled.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A self-contained pumping unit comprising an internal combustion engine, a crank case therefor, said crank case comprising a shaft receiving bearing and having an annular machined surface defining an opening in said crank case axially aligned with and spaced from said bearing, a pump casing having an annular machined surface defining an opening therein, a one piece

member connecting said engine and pump in rigid spaced relationship, said connecting member having annular machined surfaces at each end thereof receivable in close fitting relationship within the annular openings of the crank case and pump assembly for alignment of the pump and engine, a shaft receiving bearing positioned in said connecting member adjacent each of said annular surfaces and concentrically related thereto, and a shaft extending from said engine crank case to said pump casing, said shaft being rotatably mounted in said shaft receiving bearings.

2. A self-contained pumping unit comprising an internal combustion engine and a rotary pump, a connecting member joining said engine and pump in vertically spaced relationship on a common axis, and means for supporting the pumping unit in suspension comprising horizontally related parallel members joined to the connecting member and extending perpendicularly therefrom in both directions, end members extending between and joining adjacent ends of the parallel members, said end members being parallel and on opposite sides of the connecting member, and means on the end members giving selective provisions for suspension of the pumping unit on opposite sides of the plane of symmetry.

3. A self-contained pumping unit comprising an internal combustion engine and a rotary pump, a connecting member joining said engine and pump in vertically spaced relationship on a common axis, and means for supporting the pumping unit in suspension comprising horizontally related parallel members joined to the connecting member and extending perpendicularly therefrom in both directions, end members extending between and joining adjacent ends of the parallel members, said end members being parallel and on opposite sides of the connecting member, a ring loosely carried by each of said end members for attachment to lifting means, each end member comprising a series of alternate ridges and grooves, the ridges being of sufficient height to prevent displacement of the ring from a selected groove upon application of a lifting force.

4. A self-contained pumping unit comprising an internal combustion engine and a rotary pump, a connecting member joining said engine and pump in axially spaced relationship, means comprising horizontally related parallel members extending perpendicularly to the connecting member intermediate the engine and pump for attachment of suspension means, a base structure attached to the connecting member for support of the pumping unit with the engine and pump in vertically spaced relationship, and a wheeled frame detachably connected to the parallel members and to the base for suspension of the pumping unit.

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