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E. K. BAKER

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MULTIPLE PUMP UNIT FOR A WELL INSTALLATION

Filed July 14, 1948

2 Sheets-Sheet 1

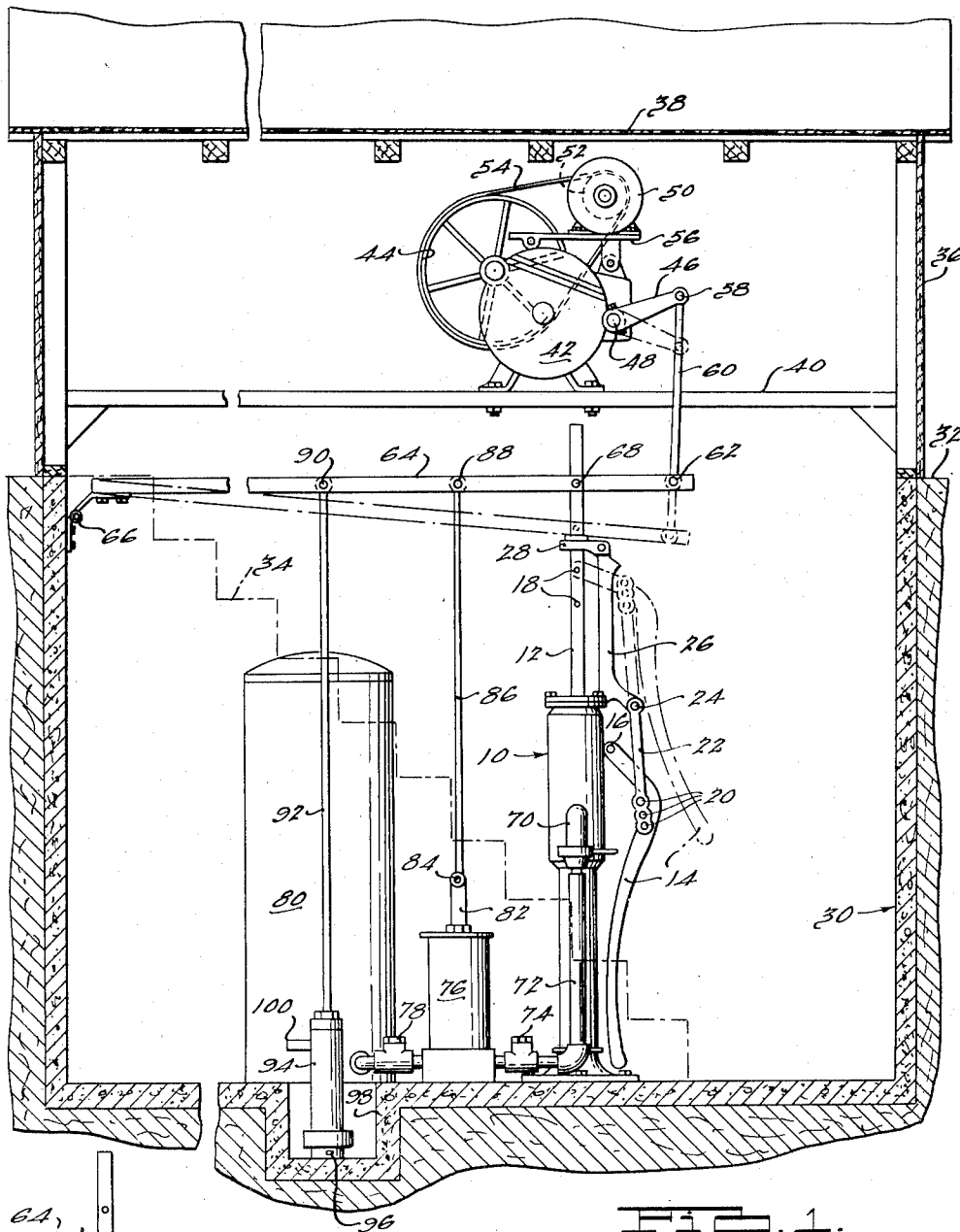


FIG. 1.

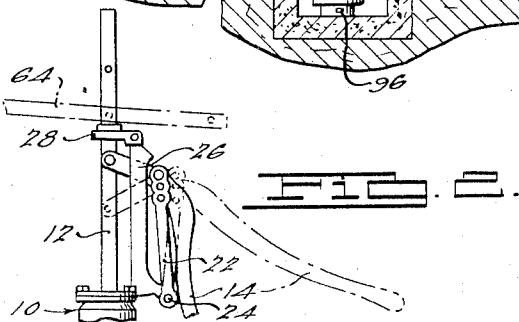


FIG. 2.

INVENTOR.

Erle K. Baker

BY

Elmer Jamison Gray
ATTORNEY.

May 15, 1951

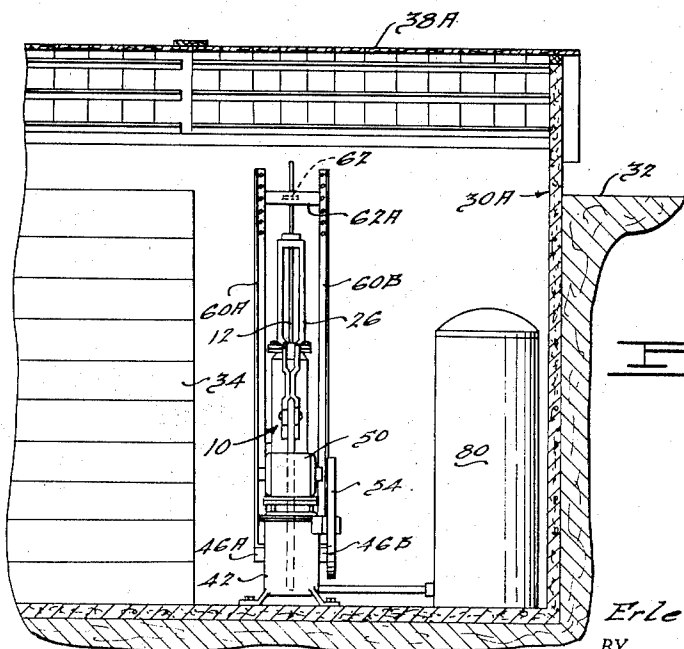
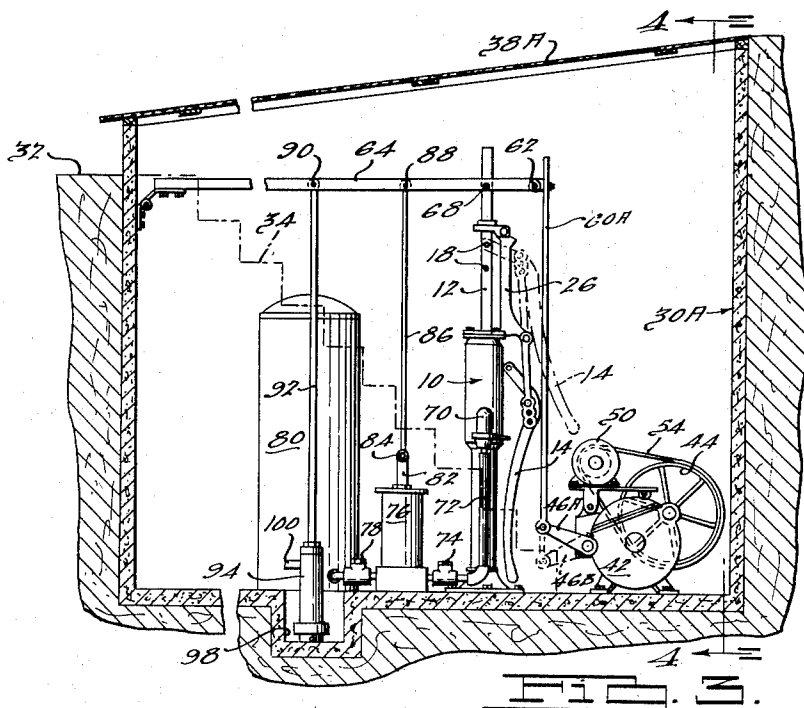
E. K. BAKER

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2 Sheets-Sheet 2



INVENTOR.
Erle K. Baker.
BY

Elmer Jamison Gray
ATTORNEY.

UNITED STATES PATENT OFFICE

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MULTIPLE PUMP UNIT FOR A WELL
INSTALLATIONErle K. Baker, Detroit, Mich., assignor to Baker
Axle Company, Cleveland, Ohio, a corporation
of Ohio

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3 Claims. (Cl. 103-4)

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The present invention relates to improvements in a pump operating means, and particularly but not exclusively to an improved pump operating means whereby a conventional hand operated water pump and pressure pump in series therewith may be operated in conjunction with a sump pump with optimum efficiency and economy from a single power actuated mechanism.

It is common preferred practice in the installation of conventional water pumps, as for example of the type of the hand operated lift pump ordinarily employed on farms and in rural dwellings, to shelter the pump within a pump house excavated below the frost line, particularly if suitable heating facilities are not available. Frequently in such installations, water which collects by condensation on the comparatively cool walls of the underground pump house in warm weather, or seeps through the walls, or which is accidentally spilled from the pump, becomes objectionable and must be pumped from the pump house.

It is also often desirable in such installations, particularly with the hand operated lift pump, to employ a power driven pumping mechanism co-operable with the hand pump for delivering water under pressure. The problem immediately arises regarding the provision of a mechanism for operating the several pumps involved with optimum economy and efficiency and with a minimum of maintenance expenses and unnecessary operation and wear.

Inasmuch as the reciprocating plunger type of pump commonly available for small installations only delivers during half of each pumping cycle and is under no load during each non-pumping half cycle, the conventional practice of providing a separate pumping mechanism for each pump involved is obviously uneconomical. Likewise, the high initial cost and maintenance of a single over-size pumping mechanism adapted to deliver sufficient power to operate the several pumps under load simultaneously is also uneconomical.

Accordingly, an important object of the present invention is to provide an improved simplified and highly efficient pump operating means which is particularly but not exclusively adapted for operating an existing hand operated lift pump installed in an underground pump house and for simultaneously operating a sump pump.

Another object is to provide an efficient, economical pumping mechanism which is adapted for operating a sump pump and a conventional hand operated lift pump, and which is co-operable

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with the latter for effecting delivery under pressure.

Other objects of the present invention are to provide an improved simple and efficient pumping mechanism which may be readily detachably connected with a hand operated lift pump for operation thereof, or readily disconnected therefrom to permit hand operation of the pump, and which is operatively connected with a sump pump and a pressure pump, the latter being in series with the lift pump for effecting delivery under pressure; and to provide such a pumping mechanism which is readily adapted for power operation.

Another object is to provide a pumping mechanism of the character described employing a pivotal pump operating lever pivotally connected to a fixed support and operatively connected with a sump pump, a pressure pump, and a lift pump at corresponding points spaced at progressively larger distances from said fixed pivot support in the foregoing order, the sump and lift pumps being operated upon pivotal movement of the pump operating lever in one direction and the pressure pump being operated upon pivotal movement of the pump operating lever in the other direction, thereby achieving optimum utility and operating efficiency from the pumping mechanism and the several pumps and avoiding the necessity of multiple pumping mechanisms or an over-size pumping mechanism to operate the several pumps simultaneously.

Another object is to provide such a pumping mechanism which is particularly but not exclusively adapted for use with the reciprocating plunger type of pump.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

The above and other objects are accomplished in a preferred embodiment of the present invention comprising a conventional hand operated reciprocating plunger type lift pump mounted within an underground pump house below the frost line. The plunger of the lift pump is operatively connected with a pivotally oscillating power driven pump operating lever which is pivotally secured to a fixed pivot support. In order to supply water from the lift pump under pressure, a comparatively high pressure reciprocating plunger type pressure pump is employed in series between the lift pump and a pressure storage tank and is operatively connected with the aforesaid

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pivotal lever. Adequate leverage to operate the pressure pump is assured by operatively connecting the latter with the pivotal lever at a point intermediate the fixed pivot support and the aforesaid operative connection between the pivotal lever and the lift pump plunger.

A sump is provided within the floor of the pump house to collect water slowly accumulating within the latter and is in communication with the inlet conduit of a reciprocating plunger type sump pump. The discharge conduit of the sump pump leads to the exterior of the pump house. The plunger of the sump pump is operatively connected to the pivotal lever for actuation thereby at a point intermediate the fixed pivot support and the operative connection between the pressure pump and the pivotal lever. By this construction, the operating stroke of the sump pump will be comparatively short with respect to the stroke of the lift pump and will be in accordance with the output normally required from that pump. Thus, needless operation and the pumping of air by the sump pump is largely avoided, maintenance and repairs are minimized, and a longer operating life is assured.

It is apparent that the power required to operate the pressure pump, so as to effect delivery from the lift pump under comparatively high pressure, will be appreciably greater than the power required to operate the lift pump and the sump pump combined in ordinary circumstances. Likewise, it is apparent that upon each non-pumping return stroke of the reciprocating pressure pump plunger, the power means therefor will be running idly under essentially no load. Without a provision to the contrary, expensive power equipment will be effectively utilized only half the time. In order to avoid such waste and to utilize efficiently the available power of the pressure pump driving means on each non-pumping half cycle of the pressure pump, the sump pump and lift pump are adapted for operation upon movement of the pivotal lever in one direction. The pressure pump is adapted for operation upon movement of the pivotal lever in the other direction. Thus, the power means employed to oscillate the pivotal lever is under load regardless of the direction of movement of the latter and is utilized at all times at essentially its most efficient rated capacity.

Details of a preferred embodiment of the present invention are illustrated in the drawings wherein:

Fig. 1 is a fragmentary vertical section through a pump house showing in side elevation a pump operating mechanism embodying the present invention.

Fig. 2 is a fragmentary elevation showing the fulcrumed handle for the hand operated lift pump operatively coupled with the lift pump plunger for hand operation.

Fig. 3 is a fragmentary vertical section through a pump house showing in side elevation another embodiment of a pump operating mechanism of the present invention.

Fig. 4 is a fragmentary vertical section taken in the direction of the arrows along the line 4-4 of Fig. 3.

Before explaining the present invention in detail it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways.

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Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to Figs. 1 and 2, a conventional hand operated lift pump, indicated generally by the numeral 10, is shown with the conventional reciprocating plunger shaft 12 adapted for an adjustable operative connection with the pump handle 14. As indicated in Fig. 2 and in the phantom portion of Fig. 1, one end of the pump handle 14 provides a conventional clevis 16 adapted for selective detachable pivotal connection with one of the adjusting pivot holes 18 in the shaft 12. The handle 14 is also adjustably fulcrumed at one of the adjusting pivot holes 20 within the connecting link 22. The latter is pivotally connected at 24 to the lower end of the supporting bracket 26 of the pump 10 and having the upper guide 28 which encircles and guides the reciprocating plunger shaft 12. By selectively connecting the handle 14 at the pivot holes 18 and 20, the stroke and operative positions of the handle 14 and shaft 12 may be suitably determined. It is apparent from the construction shown that by disconnecting the clevis 16 from its pivot hole 18, the link 22 may be dropped pivotally downward to swing the handle 14 out of the way when the pump 10 is power operated.

As herein shown, the pump 10 is suitably mounted within an underground pump house 30 which is preferably sufficiently below the ground level 32 to minimize the danger of freezing water within the pump mechanism. Access to the pump house 30 is achieved by the stairs 34 leading to the exterior through a door not shown.

The upper portion of the pump house 30 is suitably enclosed within a shelter having side walls 36, a roof 38 and which supports a platform 40 for the pump actuating power mechanism. The latter includes a pump jack 42 secured to the platform 40 and operatively driven by the large pulley 44 for oscillating the lever arm 46 about the pivot 48. The large pulley 44 is operatively coupled with the motor 50 by means of the motor pulleys 52 and drive belt 54 for rotation thereby. The motor 50 is supported on a platform 56 which in turn is mounted on the pump jack 42. Details of the construction and operation of a suitable pump jack mechanism for pivotally oscillating the lever 46 upon rotation of the pulley 44 are well known to the art and are accordingly not described herein.

The distal end of the lever 46 is pivotally connected at 58 to the upper end of a connecting shaft or rod 60, which is pivotally secured at 62 at its lower end to the pivotal pump operating lever 64. The latter has one end pivotally secured to a fixed pivot support 66 and is also pivotally connected at 68 with the upper end of the reciprocating pump plunger 12.

Upon pivotal oscillation of the arm 46, the pivotal lever 64 is also pivotally oscillated to reciprocate the plunger 12 and operate the pump 10. The discharge outlet 70 of the latter is detachably connected through a flexible conduit 72 and check valve 74 to the inlet of a pressure pump 76 having an output comparable to the output of the pump 10 for delivering water received therefrom at high pressure through the check valve 74 and into the pressure storage tank 80.

The pump 76 is actuated by a reciprocating plunger 82 pivotally connected at 84 to the lower end of a shaft or rod 86 which in turn is pivotally secured at its upper end at 88 to the pivotal lever

64. Also operatively connected at 90 to the pivotal lever 64 is the upper end of a plunger 92 for a sump pump 94 having its lower inlet port 96 in communication with a sump 98 in the floor of the pump house 30. The discharge outlet 100 of the sump pump 94 is communicated to the exterior of the pump house 30 by conduit means not shown.

The sump pump 94 is preferably of the lift pump type and operates under load with the lift pump 10 upon upward movement of the pivotal lever 64. The pump 76 is preferably of the compression type and operates under load on the downward stroke of the pivotal lever 64. It is thus apparent that the arrangement described herein is adapted for operating the pumps 10 and 94 under load during the half cycle when the pump 76 is not under load, permitting efficient utilization of the pumping mechanism throughout the pumping cycle.

Inasmuch as the sump pump 94 is ordinarily required merely to drain the sump 98 from water slowly accumulating within the pump house 30, as by vapor condensation on its comparatively cool walls or by seepage through the latter, the capacity or output of the pump 94 will be appreciably less than the capacity of the pump 10. The requirements of the pump 94 will be satisfied with a much smaller cylinder diameter and operating stroke than required for the pump 10. The preferred construction shown locates the pivotal connection 90 comparatively close to the fixed pivot support 66 whereat the magnitude of pivotal movement of the lever 64 is relatively small. Thus, the stroke of the plunger 92 is maintained at the desired small value required to keep the sump 98 drained, and excess plunger movements which would result in unnecessary wear and maintenance expenses are avoided.

In operation of the present invention, the motor 50 drives the large pulley 44, which in turn pivotally oscillates the arm 46 through the mechanism of the pump jack 42. The pivotal movement of the arm 46 is imparted to the pump operating lever 64 by the connecting link 60, thereby reciprocating the plungers of the pumps 10, 76 and 94. On the upward stroke of the lever 64, the pumps 10 and 94 are under their operating pumping loads. A charge of water is then delivered under low pressure from the pump 10 via the check valve 74 to the pump 76 during the non-pumping half cycle of the latter. On the downward stroke of the lever 64, the pump 76 is under its operating load and pumps the water therein through the check valve 78 and under high pressure into the pressure storage tank 80. During this stroke, the pumps 10 and 94 are in their non-pumping half cycles.

When the pumps are power driven as above described, the pump handle 14 may be disconnected from the plunger shaft 12 if desired and allowed to hang in the inoperative position shown in solid lines, Fig. 1. In the event of power failure or for other reasons, the link 60 may be disconnected at 62 from the lever 64. The handle clevis 16 is then suitably connected to the shaft 12 at one of the pivot holes 18 to permit manual operation of the pumping apparatus shown. In this connection, it is to be observed that the operative connection 88 between the plunger shaft 86 and the lever 64 is appreciably nearer the pivot support 66 than is the connection 68 between the shaft 12 and lever 64, so as to provide the increased leverage required for manual op-

eration of the pressure pump 76. Accordingly, the preferred arrangement of the pivotal connections shown is important to the versatility of the pumping mechanism and its convenient

5 adaptability for either manual or power operation. However, it is apparent that the location of the pivot support 66 at the end of the lever 64 is not essential to the efficient operation of the present invention. The leverages and advantages of the present invention may be achieved by locating the pivot support 66 intermediate the ends of the lever 64. In such a situation, one or more of the connections 68, 88 or 90 may be located on the other side of the pivot support at distances therefrom corresponding to the distances shown. The pumps 10, 76 and 94 will be adapted accordingly so that the pump 76 will be under pumping load upon pivotal movement of the lever 64 in one direction, and the pumps 10 and 94 will be under pumping load upon pivotal movement of the lever 64 in the other direction.

When delivery under pressure is not required, the shaft 86 may be disconnected at 88 from the lever 64, and the flexible coupling 72 may be disconnected from the pump 10, permitting delivery directly from the discharge outlet 70 according to conventional practice. Similarly, the shaft 92 may be disconnected at 90 from the lever 64 during dry seasons, for example, when operation of the sump pump 92 is not required.

Figs. 3 and 4 show another embodiment of the present invention which is similar in construction and operation to that described above. The primary modification shown is the mounting of the power mechanism on the floor of the pump house 30a, adapting the present invention to situations wherein the head room provided by the roof 38a, for example, is less than the head room available under the roof 38.

The connecting link 60 and oscillating arm 46 of Fig. 1 are shown as double links 60a and 60b which extend upright from the double arms 46a and 46b respectively in Figs. 3 and 4. The pivotal connection 62 at the end of the pivotal lever 64 is completed with the cross bar 62a joining the upper ends of connecting arms 60a, 60b. In all other respects, the operation and construction of the apparatus disclosed in Figs. 3 and 4 are the same as the corresponding apparatus described in connection with Figs. 1 and 2, and bear the same identifying numerals.

I claim:

1. In a pumping mechanism for a pump house below ground level, a lift pump having a reciprocating plunger, a fixed pivot support, means detachably connected with said plunger for reciprocation thereof and including a swinging lever pivotally connected at one end to said fixed pivot support, mechanism for providing delivery under pressure from said pump and including a motor operatively connected to the other end of said lever for pivotally oscillating the latter and also including a pressure pump having a reciprocating plunger operatively connected with said lever for actuation thereby, the inlet of said pressure pump being detachably coupled with the outlet of said lift pump, and a sump pump having a reciprocating plunger operatively connected with said lever for actuation thereby, the connection of said sump pump plunger with said lever being at a distance intermediate said fixed pivot support and the connections of said lever with said pressure pump and lift pump, said lift and sump pumps being adapted for operation

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under load on the pivotal movement of said lever in one direction and said pressure pump being adapted for operation under load upon pivotal movement of said lever in the other direction.

2. In a pumping mechanism useful within an underground pump house, a lift pump having a reciprocating plunger, a fixed pivot support, means connected to said plunger for reciprocation thereof and including a swinging lever pivotally connected to said fixed pivot support, actuating means for pivotally oscillating said lever, a sump pump having a reciprocating plunger operatively connected to said swinging lever for reciprocation thereby and a pressure pump in series with said lift pump for effecting delivery under pressure and having a reciprocating plunger operatively connected to said lever for reciprocation thereby, the connection of said sump pump plunger with said lever being at a distance from said fixed pivot support less than the distance between said fixed pivot support and the connection of said lever with said lift pump plunger or said pressure pump plunger, said lift and sump pumps being adapted for operation under load on the pivotal movement of said lever in one direction and said pressure pump being adapted for operation under load upon pivotal movement of said lever in the other direction.

3. In a pumping mechanism for a pump house below ground level, a lift pump having a re-

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ciprocating plunger, a pressure pump in series with said lift pump for effecting delivery under pressure and having a reciprocating plunger, a fixed pivot support, a swinging lever pivotally connected to said fixed pivot support and pivotally connected to each of said lift pump and pressure pump plungers, a sump pump having a reciprocating plunger pivotally connected to said lever at a distance from said pivot support less than the distance between said pivot support and the pivotal connection of said lever with said lift pump plunger or said pressure pump plunger, said lift and sump pumps being adapted for operation under load on the pivotal movement of said lever in one direction and said pressure pump being adapted for operation under load upon pivotal movement of said lever in the other direction.

ERLE K. BAKER.

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