No. 821,653. PATENTED MAY 29, 1906.

M. E. LAYNE.

WELL MECHANISM.

APPLICATION FILED APR. 28, 1903.

4 SHEETS—SHEET 1.

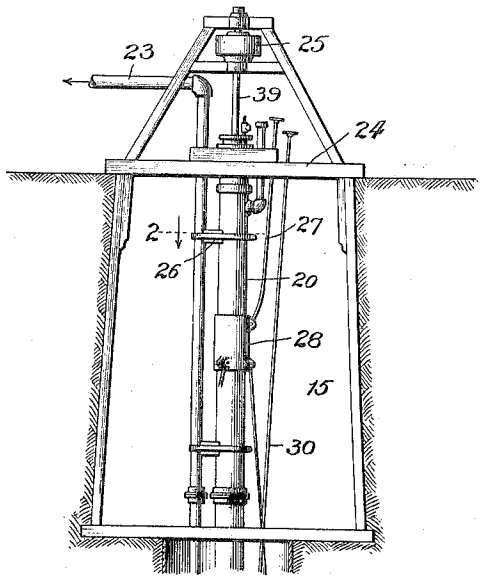


Fig. 2.

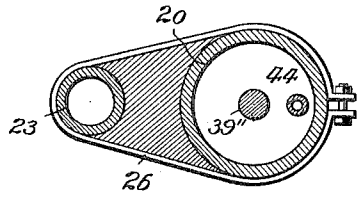


Fig. 3.

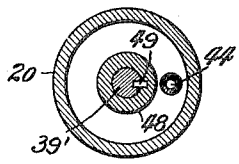


Fig. 4.

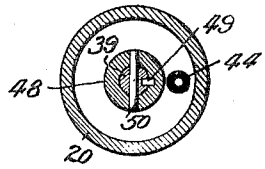
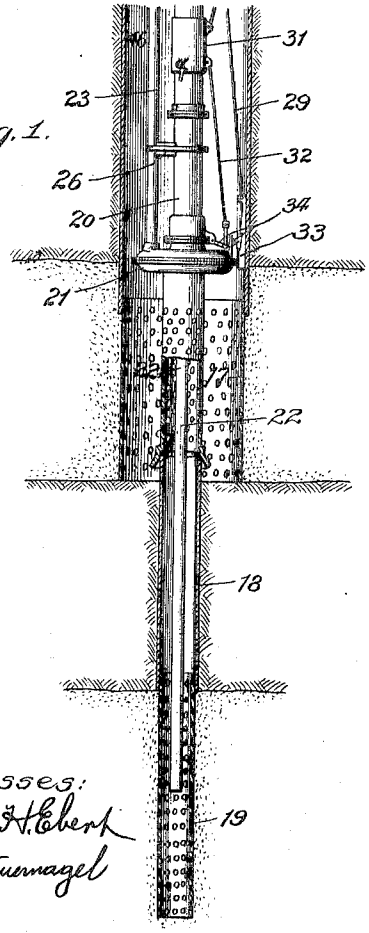


Fig. 1.



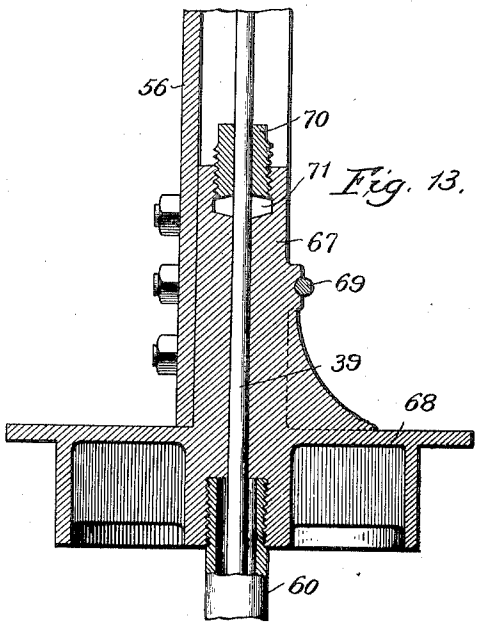


Fig. 13.

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4 SHEETS—SHEET 2.

Fig. 5.

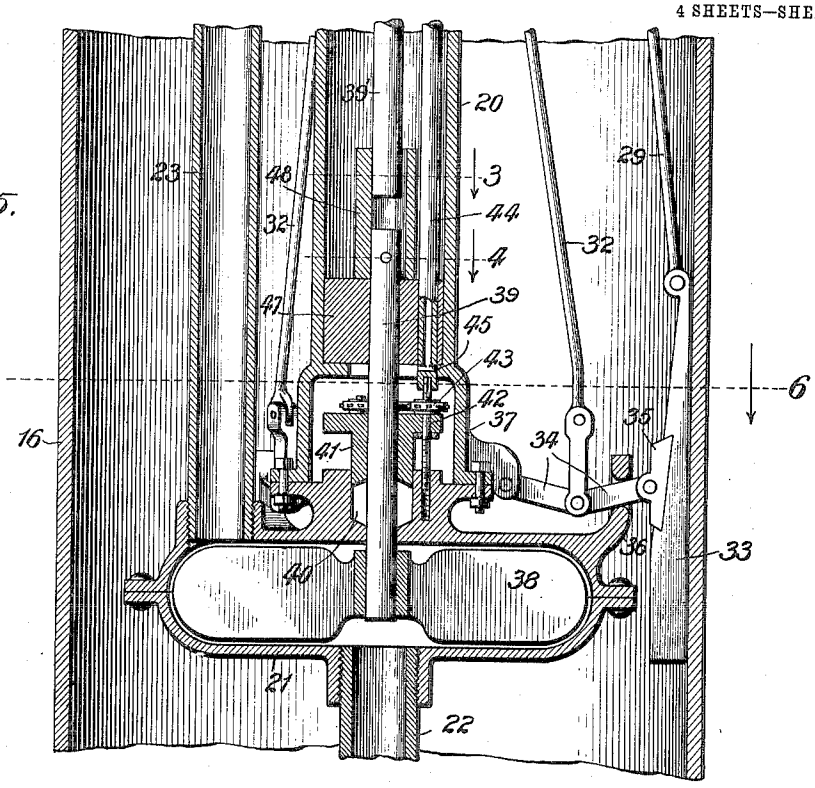
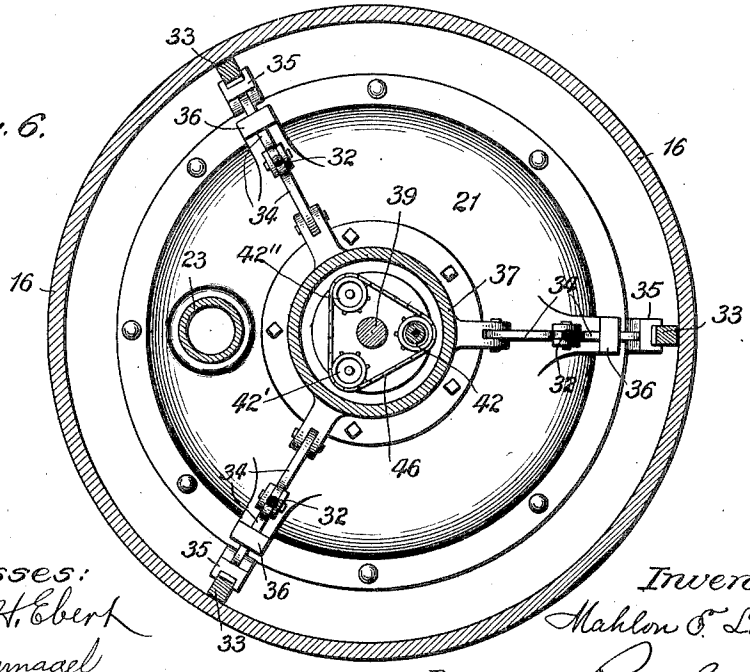


Fig. 6.



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4 SHEETS—SHEET 3.

Fig. 7.

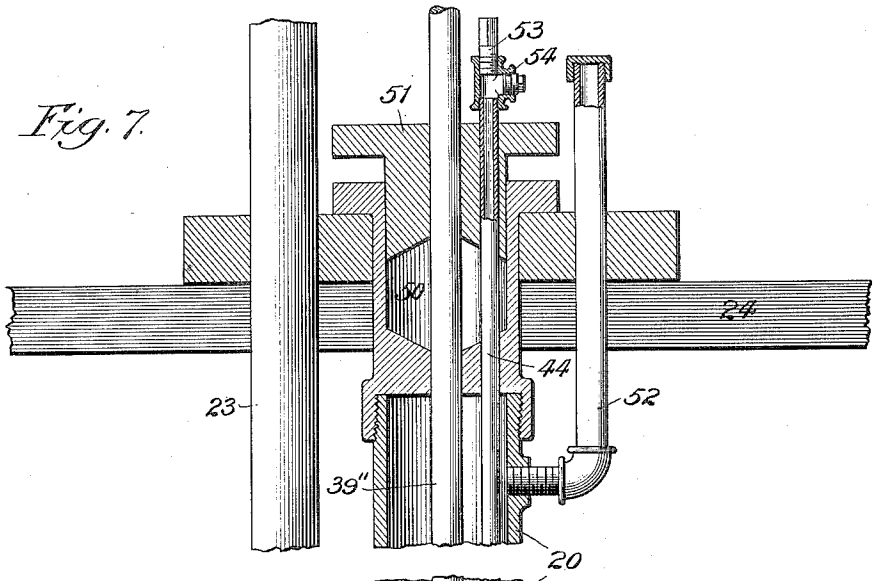


Fig. 8.

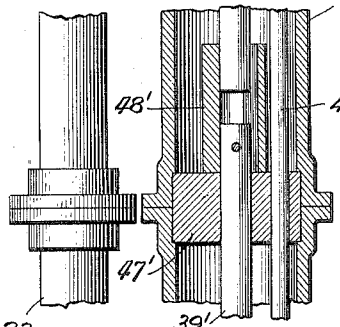
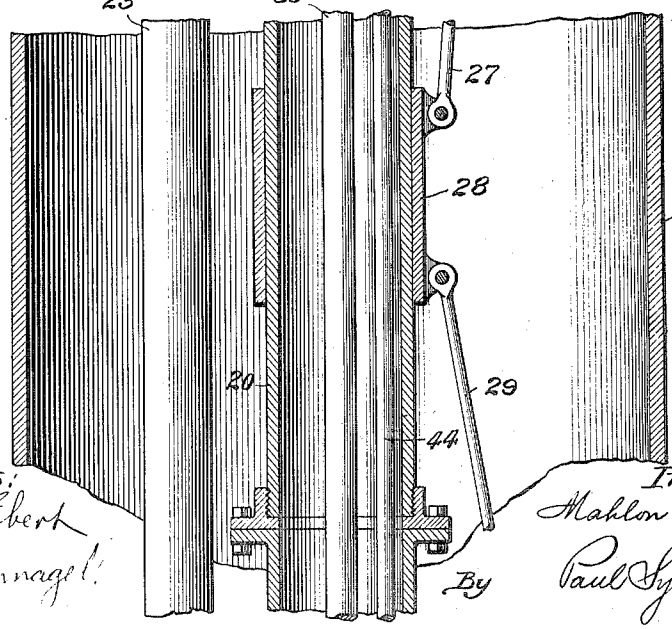


Fig. 9.



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4 SHEETS—SHEET 4.

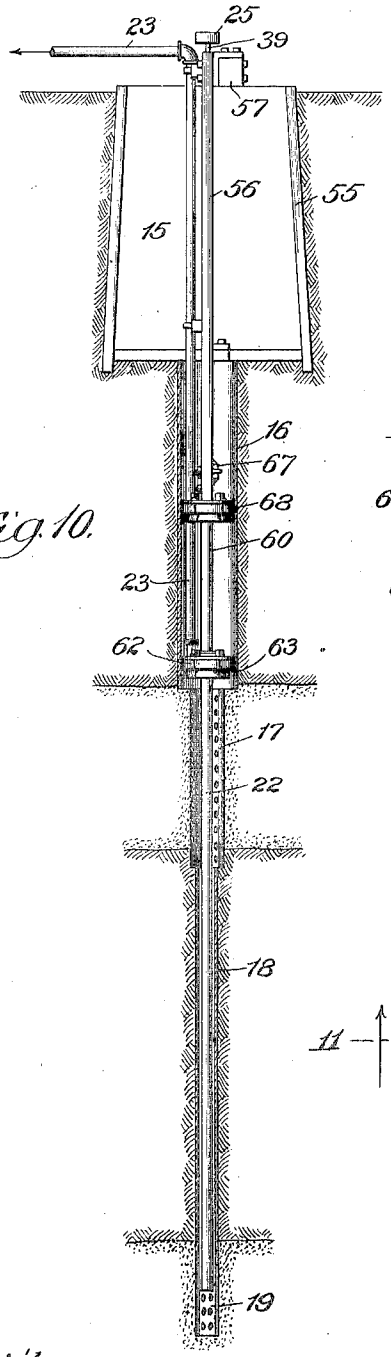


Fig. 10.

Fig. 11.

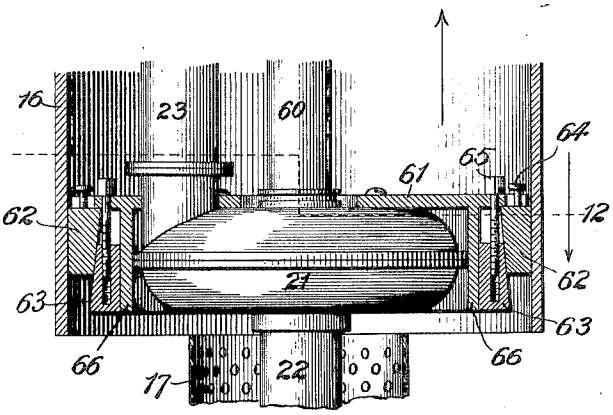
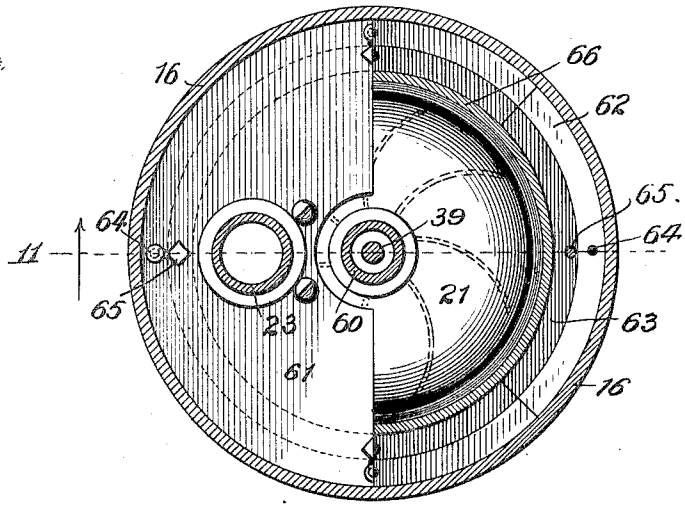


Fig. 12.



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UNITED STATES PATENT OFFICE.

MAHLON E. LAYNE, OF HOUSTON, TEXAS.

WELL MECHANISM.

No. 821,653. Specification of Letters Patent. Patented May 29, 1906.

Application filed April 28, 1903. Serial No. 154,704.

To all whom it may concern:

Be it known that I, MAHLON E. LAYNE, a citizen of the United States, residing at Houston, county of Harris, and State of Texas, have invented certain new and useful Improvements in Well Mechanism, of which the following is a specification.

My invention relates to the apparatus used for drawing water from driven or Artesian wells, and particularly to the means for adjusting a pump therein. The objects of the invention are, to provide means by which the piping and the pump may be all assembled in proper shape before inserting it into the well; to provide means by which a pump may be placed in any desired position in a well, centered, raised or lowered and fixed in position by manipulating from the outside entirely; to provide means for adjusting the length of the piping leading from the pump to the surface at will and to lower the pump from time to time without taking it out of the well; to provide improved means for centering and fixing the pump in proper position in the well casing; to provide improved means for manipulating the packing of the pump shaft, and proper adjustment of the pump in place by means at the surface of the ground; to provide for the proper action of a pump without stopping up the well, so that water may be either flowed into or pumped out of the same at pleasure; to provide a superior mounting for a centrifugal pump in the well, manipulated from the surface of the ground; to provide an extensible pump shaft separately supported at intervals along its length; to provide an automatic centering device for the pump in the well; to provide for mounting the pump and the shaft in a closed casing which is open to operate from the top; to obviate the necessity of making large wells for descending into them in order to arrange the pump, and to generally improve and cheapen the apparatus used for the above purposes.

The above objects, as well as other advantages which will hereinafter appear, I attain by means of the construction and assemblage of parts as illustrated in preferred forms in the accompanying drawings, wherein—

Figure 1 represents a section of a well showing the preferred form of my apparatus in place therein.

Figures 2, 3 and 4 are horizontal sections of the shaft casing respectively taken on line 2 of Figure 1, and lines 3 and 4 in Figure 5.

Figure 5 is an enlarged central vertical section taken through the pump and the casing of the well.

Figure 6 is a horizontal section of Figure 5 taken along the line 6.

Figure 7 is a section of a top of the well casing containing the pump shaft and its mounting; Figure 8 is a similar section taken at one of the joints of the pump shaft casing.

Figure 9 is a section taken through the casing containing the pump shaft at the collar 28 in Figure 1.

Figure 10 is a vertical section of a well having a modified form of the apparatus therein.

Figure 11 is a side view and partial section of a centrifugal pump mounted by a modified method.

Figure 12 is a half plan and half section of the pump shown in Figure 11, taken along the line 12 therein.

Figure 13 is a partial vertical section taken through the shafting and its mounting shown in Figure 10 at the point marked 68.

For convenience of illustration the apparatus is shown as applied to a well which passes through two water bearing strata separated by an impervious stratum, the top surface of the ground being also an impervious layer of earth. The upper chamber 15 of the well may be protected by wooden framing as customary, or it may be but a continuation of the chamber inclosed by the casing 16, which may be carried to the surface if desired, and the chamber 15 dispensed with. Below this is a screen 17 in the sand layer, and still below the sceen 17 is another casing 18, into which extends the suction pipe 22, from the pump 21, and below this another screen 19.

In the approved form as illustrated in Figure 1, I use a centrifugal pump 21, single or in a series, as may be desired, and having a top discharge. It is attached to a casing 20, which runs to the top of the well and incloses the driving shaft 39 of the pump, which may be driven by a pulley 25, mounted in the framework 24, in any approved manner. An outlet pipe 23 leads from the pump to the surface to carry off the water. As shown in Figure 2, the shaft casing 20, and the outlet pipe 23, are bound together by means of the block-and-strap arrangement 26. These connecting devices are distributed at intervals

along the length of the shaft casing. In order to previously assemble all the parts and then put the pump into the well and fix it in position therein, I provide a system of wedges 33, which serve to fix the pump in place and hold it in the proper vertical position, designed to be operated by means from the top of the well, avoiding the necessity of a man's going into the well in order to fix the pump in place. Pivoted to an extension on the head of the centrifugal pump casing 37, I provide a series of toggle links 34, which are carried in slots in the extension 36 of the casing, and at their outer ends bear wedge blocks 35, which embrace and coöperate with the vertically movable wedges 33, placed against the casing 16. The wedges 33 may be attached to links 29, which are carried by a sliding collar 28 on the casing 20, the collar 28 being operated by a rod 27, which runs to the top of the well, so that from the top the wedges 33 may be raised and lowered into place and can be tightened therein. The toggle links may be also connected by links 32, to a collar 31, and the collar 31 to a rod 30, which extends to the top of the well as before, in order to manipulate it without going into the well. Thus in order to obtain greater power and fix the wedges more securely in place, it will be observed that by pulling up on the rod 32, the toggle links 34 will cause the wedge blocks 35 to press with great power against the wedges 33, and thus fix the pump casing in place wherever desired.

The pump shaft 39 is inclosed in a shaft casing 20, which latter is made in joints and may be of any desired length. The pump shaft also is made in sections, 39, 39′, 39″, which are attached together by means of sliding keys so as to allow of some vertical play with relation to each other. From Figure 5 it will be seen that the shaft 39 passes through a block 47, and at its top is fixed in the bearing block 48 by means of the pin 50, as shown in Figure 4. The next section of the shaft, 39′, is inserted into the block 48, and prevented from rotating by means of the key 49, which is splined therein. The weight of the shaft and pump below the block 47 is carried by the block 48; and from Figure 8 it will be seen that a similar arrangement is made at the top of the next section of the shaft casing, where the block 47′ supports the weight of the section of shaft 39′ by means of the collar 48′, connected by a pin and key as before.

At the top, the casing 20 is closed and is provided with a stuffing box 50, closed by the cap 51, at the top of the shaft 39″. The shaft 39 is fixedly keyed to the vanes 38 of the centrifugal pump, and below the pump casing 21 is a pipe 22, which extends down below the water level and is extended any desired depth in the well.

The casing 20 also contains a tubular rod 44, which has a bearing in the block 47 on top of the pump casing 37, as shown in Figure 5, and is provided with a square opening which coöperates with the head of the screw 42, used for adjusting the cap 41 of the packing box 40 for the pump, and compressing the packing in place. In order that this cap 41 may be raised and lowered evenly, the screw 42 is provided with a sprocket wheel, and two other screws of a similar kind are distributed about the cap, as shown in Figure 6, and connected by means of the sprocket chain 46, so that by means of the tubular shaft 44, all three of said screws 42 may be turned at once to compress the packing in box 40.

This pipe or tubular shaft 44 also serves the purpose of providing convenient means for forcing the liquid out of the pump shaft casing. By forcing air in at the top of the casing 20, by means of the pipe 52, the liquid can be forced down to the bottom of said casing 20, and by means of the small opening 45, in the bottom of the tubular shaft 44, the fluid can be forced out at the top 54, and keep the casing clear in order to leave the bearings clean therein and not interfere with the working of the pump, or by forcing fluid in at the top 54, the operation will be reversed, and the fluid ejected from pipe 52.

It will be noticed that the weight of the pump and its shaft is supported at each end of the sections of the casing by the blocks 47, 47′, etc. By reason of this arrangement the pump shaft and the shaft casing can be made in separable sections, and consequently the pump may be inserted at any desired depth and the parts assembled before putting them into the well. The wedge system illustrated for tightening the pump casing in place may also, if desired, be used to center it with respect to the casing. The outlet pipe 23 is also preferably made in sections to correspond with the sections of the pump shaft casing.

In Figures 10 to 13 I have shown a modified form of the apparatus which uses a simple series of wedges for fixing the pump in place, as illustrated best in Figure 11. The pump casing has a platform 61, and a depending ring flange 66, and a series of wedges 63 are placed around the depending flange 66, and are connected to the top platform by means of a series of screws 65. A series of coöperating wedges 62 may also be provided, suspended from the platform 61 by means of the screws 64, and the two series of wedges surround the whole casing. It will sometimes be convenient to dispense with the outlet pipe 23, and extend the casing 16 to the top, to act itself as the conveying channel for the liquid. In each case, of course, the pump casing 21 and platform 61 will be made water-tight within the casing 16, and for this

purpose the wedges 62 will be made in overlapping sections, in order to break the joints seen in Figure 12. The pumps will then deliver directly into the upper casing. It will be plain that by turning the screws 65, the bottom wedges are drawn upward against the wedges 62, by which the casing of the pump is fixed in any desired place and tightened in the well casing 16. The screws 65 may be operated by means of a socket wrench placed upon a long rod and reached from the surface of the ground, or may be extended to the surface of the ground, as desired.

In the case illustrated, the top of the pump shaft may be provided with a pulley 25, as before, and a bearing fixed on some part of the framework, as on the cross beam 57. Extending downward from the beam 57 may be provided a timber 56, and part way down a bearing and support provided for the casing of the pump shaft 60, by means of the block 67, which is carried upon a cross frame 68; and a packing box therein, 71, is closed by a screw 70, the whole being attached to the timber 56 as shown in Figure 13. Below this point the shaft 39 may be inclosed in a casing 60, which is screwed in the block 67, as shown in said Figure. For additional security the block 67 may be attached to the timber 56, by means of the strap 69, which surrounds the same. The casing 60 may be in sections and of any desired length.

I prefer, generally, to allow for free flow of water down the well outside of the pump casing and the pump, in order that water may be drained into the well when desired, rather than pumping the water out; which I attain by dropping the wedges 63 and thereby loosening the wedges 62 from the casing 16, permitting water above pump to pass into the strata supplying the well.

I generally prefer to extend the piping 22 entirely through the first water bearing stratum and into the second, as shown in the screen 19; it being understood that the water from the first stratum will flow down the casing 18 to the second when the water level falls sufficiently therefor.

In general I prefer the form of apparatus as shown in Figure 1, both because the means for fixing the pump in place is more easily adjusted, and because of the superior mounting of the pump shaft inside its sectional casing as therein shown, and making the pump shaft in sections. But in cases where the pump will not be moved for a long time, the device of Figure 11 may be used for wedging it in place.

It will be seen that by fastening the pump within the casing in such position as to leave an unobstructed passage around it, I provide for draining water into the well in cases where this is desired, as often happens when fields are flooded, and when it is desired to drain the fields. The whole apparatus being self-contained, can be put together in proper form and lowered into the well at once. It will be seen also that the toggle levers used for actuating the wedges may be used or not, as desired, since the wedges alone will be amply sufficient in the apparatus of Figure 1, as well as in that of Figure 10. I consider it of great advantage also to arrange the pump shaft in a closed casing with stuffing box at surface of ground at top of pump, so that by the use of the packing boxes an air-tight chamber can be maintained, and water kept out of the casing 20, or kept filled with clean liquid, if desired, thereby providing an efficient lubricating system for all bearings of the pump.

The many advantages of this apparatus will be apparent to those familiar with the use of such devices, from inspection of the drawings.

Having thus described my invention and illustrated its use, what I claim and desire to secure by Letters Patent, is the following:

1. A pump provided with a closed driving shaft casing extending to the top of the well from the pump, a pipe extending downward from the pump casing and means for fixing the pump at any desired point in the well casing, substantially as described.

2. A pump provided with a closed driving shaft casing extending to the top of the well from the pump, a pipe extending downward from the pump casing and means for fixing the pump at any desired point in the center of the well casing and sealing said shaft off from water in the well, substantially as described.

3. The combination with a pump of an extensible pump shaft therefor means for supporting the pump at any desired point in the well, and independent supports for the shaft.

4. The combination of a rotary pump, and extensible pump shaft and protecting casing for the shaft, and means for supporting the pump and shaft and casing at any desired point within the well.

5. The combination with a rotary pump, of a sectional pump shaft casing surrounding the pump shaft and extending to the top of the well and means for fixing the pump in position at any desired point of the well casing.

6. In well mechanism in combination with a pump, a series of wedges operated from the top of the well by means of links, a series of wedges carried by the pump casing and operated by toggle links attached to a rod extended to the top of the well, for the purposes specified.

7. In combination with a well casing and a pump, a series of wedges suspended by rods from the top of the well for operating the same to wedge the pump casing against the well casing, substantially as described.

8. In well mechanism a pump casing provided with a series of wedges mounted upon toggle links therein to wedge the said casing against the side walls of the well casing, substantially as described.

9. In well mechanism the combination with a pump casing, of a rotary pump of a jointed pump shaft and a closed casing surrounding the pump shaft from the pump to the top of the well.

10. In well mechanism in combination with a pump and a closed shaft casing, a pump shaft supported at intervals by blocks pinned thereto and having splined joints in said blocks whereby the different sections of the pump shaft may have vertical play with relation to each other.

11. A pump casing provided with a stuffing box and stuffing box plug, a closed shaft casing protecting the bearings from the water screws for raising and lowering said plug and means for moving all of said screws at once and means for operating the screws from the top of the well, substantilly as described.

12. In pump mechanism the combination with wedges for fixing the pump in the well casing, of a casing for the pump shaft, a collar thereon and links extending from said collar to the top of the well and to the said wedges.

13. The combination with a pump and its actuating shaft of a sectional casing therefor provided at each end of each section with a fixed block with bearings for the shaft, the casing being closed at the top and provided with an air vent.

14. The combination with a pump of a pump shaft casing closed at the top and bottom and provided with an interiorly disposed hollow rod for the escape of liquid from the shaft casing and an air inlet at the top of the casing.

15. In well mechanism the combination with a rotary pump of a pump shaft made in sections independently supported and joined by blocks and keys in the blocks and ends of the shaft sections, and a closed casing around the shaft.

16. A pump shaft made in sections, each section being suspended on a bearing by means of a block pinned to the shaft section and the next section being splined into said block to rotate therewith.

17. The combination with a rotary pump, of a pump shaft and shaft casing surrounding the shaft, the shaft and casing being in sections and connected by bearings at each end, and the shaft section being separately supported in each section of the casing, as described.

18. In well apparatus the combination with a pump and means for suspending it from the top of the well, of a casing separating the pump and bearings from the well, and devices for fixing it at any desired point in the well casing, and means for operating the fixing devices from the top of the well.

19. A pump shaft made in independently supported sections and suspended in a closed pipe and provided with bearings and means for lubricating the same.

20. The combination of a well casing, a rotary pump therein, and a line shaft for the pump entirely closed off from the water in the well.

21. The combination of a well casing, a rotary pump therein, means for fixing it at any desired point in the well, an extensible line shaft for the pump and a shaft casing entirely inclosing the shaft and bearings.

22. The combination of a well casing, a rotary pump therein, means for fixing it at any desired point, a shaft casing, and a discharge outlet from the pump independent of the shaft casing and communicating with the pump casing only at the bottom of the well.

In testimony whereof I have hereunto set my hand, this 3d day of April, A. D. 1903, at Chicago, Illinois.

MAHLON E. LAYNE.

Witnesses:

PAUL CARPENTER,

ALBERT C. HOWARD.