M. E. LAYNE AND S. N. HALL.

WELL MECHANISM.

APPLICATION FILED NOV. 16, 1920.

1,415,587.

Patented May 9, 1922.

2 SHEETS—SHEET 1.

FIG. 1.

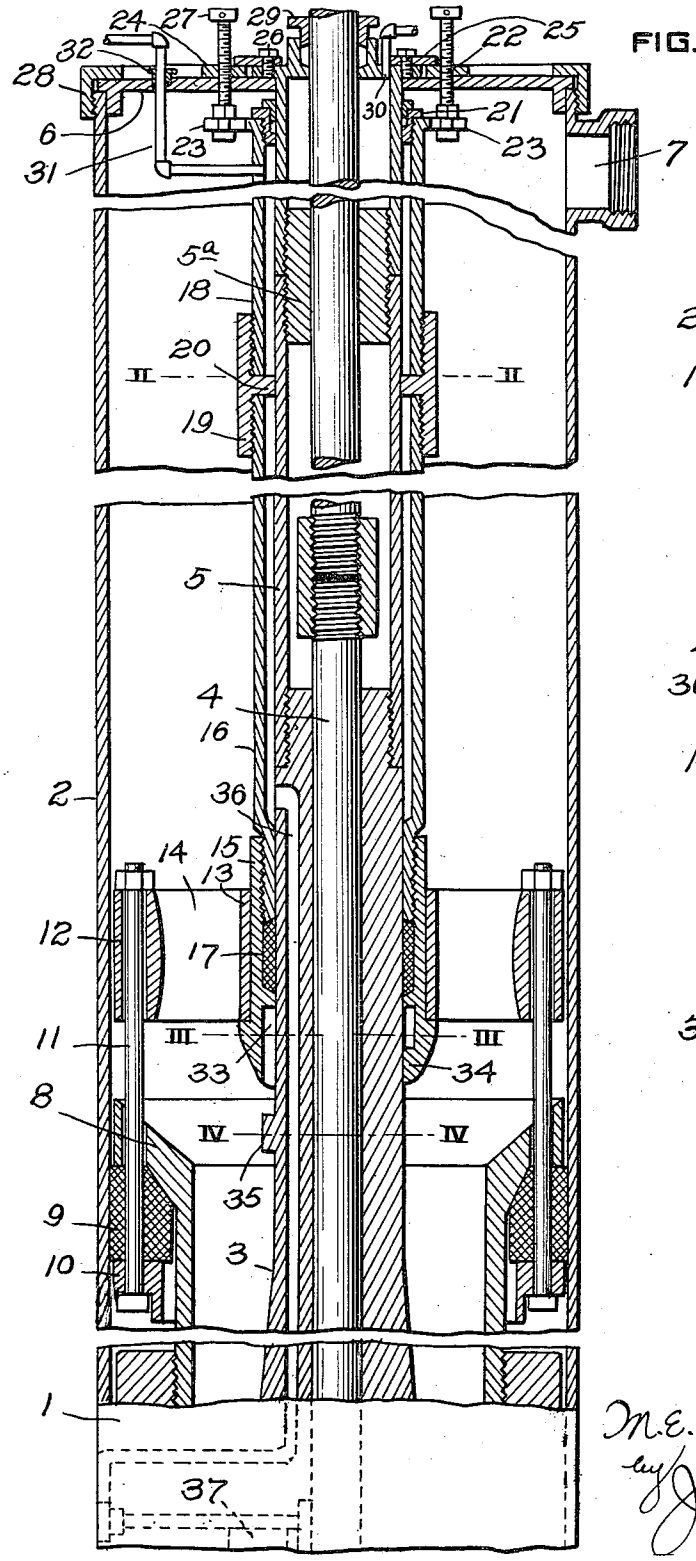


FIG. 2.

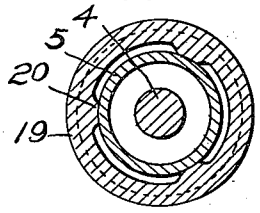


FIG. 3.

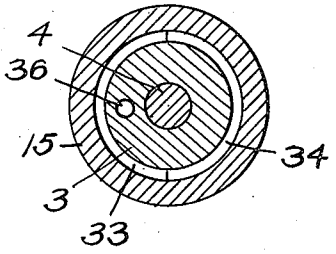
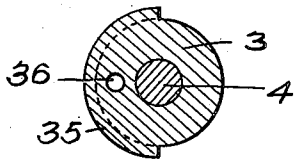


FIG. 4.



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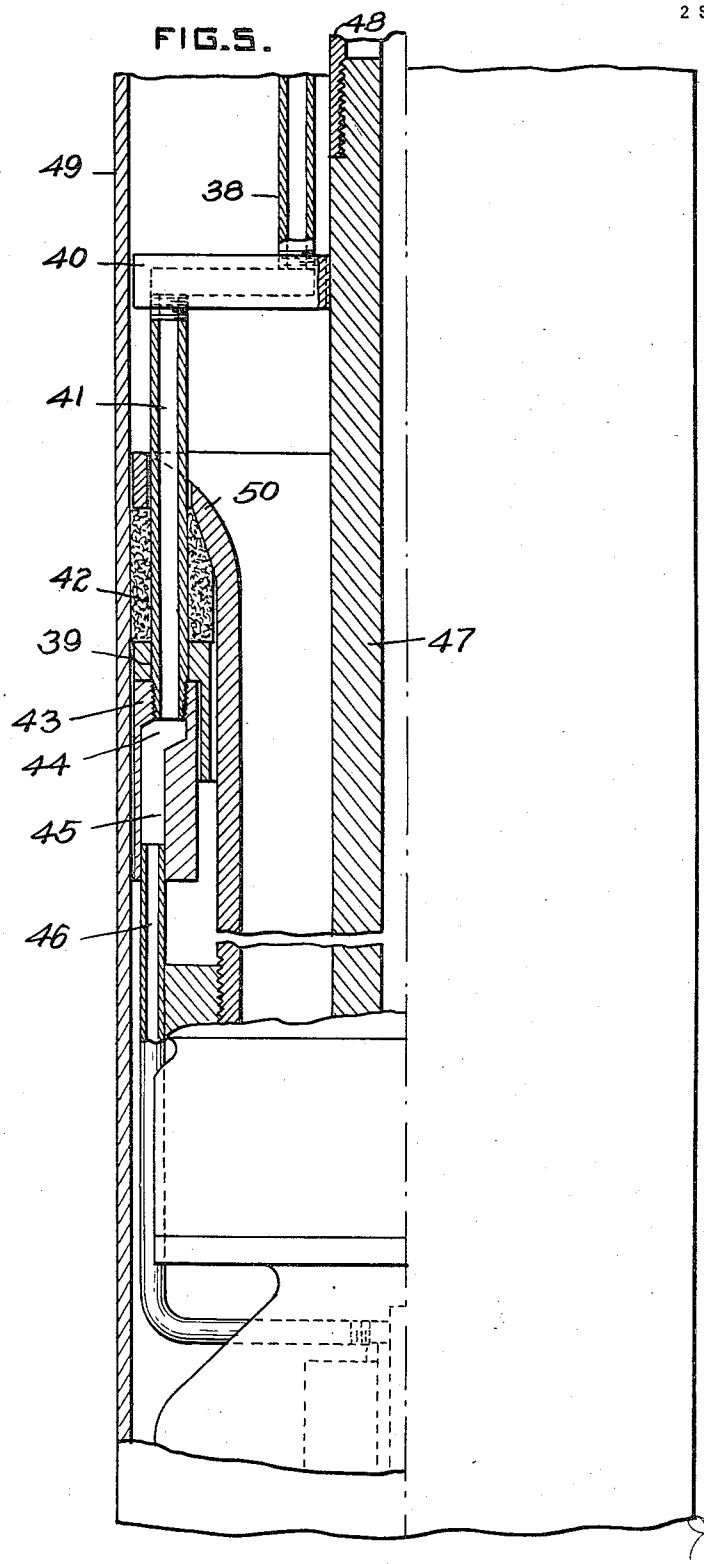
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2 SHEETS—SHEET 2.

FIG.5.



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UNITED STATES PATENT OFFICE.

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WELL MECHANISM.

1,415,587. Specification of Letters Patent. Patented May 9, 1922.

Application filed November 16, 1920. Serial No. 424,568.

To all whom it may concern:

Be it known that we, MAHLON E. LAYNE and SAMUEL N. HALL, both citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Well Mechanism, of which the following is a specification.

The invention relates to well mechanism and is designed to constitute an improvement upon the construction shown and described in the application of S. N. Hall, Serial No. 408,948, filed September 8, 1920. In the construction of said application provision is made for supporting the packing for the pump from the shaft casing, the said packing taking the weight of the pump and serving to make a tight joint between the pump casing and the well casing which also serves as the discharge casing. The construction of the present invention differs from that of said application in that the packing is supported by a means independent of the shaft casing, such means preferably being in the form of a separate pipe surrounding the shaft casing and serving the additional function of a conduit for supplying oil to the bearings in the pump. The supporting means for the packing may also be in the form of an oil pipe (not surrounding the shaft casing) or conduit for other purposes, or in the form of a support from the upper portion of the well which is not used as a conduit. In its preferred form, as above referred to, the pipe not only functions as a conduit, but gives additional strength and rigidity to the shaft casing, serving to keep such casing straight and preventing any tendency to buckle and thus impose a binding stress upon the drive shaft which runs in bearings supported in the shaft casing. The objects and advantages of the construction will more fully appear from the following specification and drawings, wherein,

Fig. 1 is a longitudinal section through a well mechanism embodying the preferred form of the invention, Figs. 2, 3 and 4 are sections on the lines II—II, III—III and IV—IV of Fig. 1; and Fig. 5 is a partial longitudinal section through a modified structure.

Referring to Fig. 1, the principal parts illustrated may be enumerated as follows: 1 is the casing of a centrifugal or rotary pump; 2 is a well casing which also acts as a discharge casing and extends to the surface of the ground; 3 is the upper end of the inner portion of the pump casing, also referred to as the pump neck; 4 is the drive shaft extending to the surface of the ground and operated by means of a pulley or other suitable means (not shown); 5 is the shaft casing extending upwardly from the pump neck to the platform plate 6 located at or adjacent to the surface of the ground, such casing being provided with bearings 5^a for the shaft; and 7 is the lateral outlet from the upper end of the shaft casing of the well casing, from which the discharge of water from the pump occurs.

The upper portion of the pump casing is turned outwardly to form the flange 8 and beneath this flange is the packing 9 which is designed to make a tight joint between the pump casing and the well casing 2. The packing is supported from beneath by ring 10 provided with a series of perforations to receive the bolts 11, such bolts extending upwardly through the packing and the flange 8 thereabove, and being supported at their upper ends in the collar 12. The collar 12 is secured to another collar 13 by means of a series of arms 14 suitably spaced and constituting a supporting spider to permit the free passage of water upwardly through the discharge casing.

The collar 13 is swivelled upon a sleeve 15 screw-threaded at its upper end to a pipe section 16. A recess is provided opposite the lower end of the pipe section 16 in which suitable packing means 17 are inserted so that a tight joint is made between the pump neck and the lower end of the pipe section 16. The pipe section 16 is coupled at its upper end to another section 18 by means of the coupling 19, which coupling is provided with a plurality of lugs (Fig. 2) 20 extending between the opposite ends of the sections 16 and 18 and engaging the surface of the shaft casing 5. The shaft casing is preferably machined opposite the lugs 20 and for a short distance above and below, so that the casing composed of the sections 16 and 18 may move up and down and circumferentially with relative freedom for the purpose hereinafter set forth.

The pipe sections 18 and couplings 19 are duplicated to form a casing extending to the surface of the ground and serving as a sup-

port for the collar 12 and the packing suspended therefrom. The uppermost section 18 of this casing is provided with a suitable packing sleeve 21 and is supported for vertical and rotary adjustment with respect to the platform member 6.

This support is accomplished by means of a series of bolts 22 having their lower ends swivelled in the slots 23 provided in the flange at the upper end of the pipe section 18. Nuts 24 are threaded upon the bolts and held down against the platform 6 by means of the annular plate 25 secured in position with the bolts 26. Each bolt is provided at its upper end with an integral head 27 so that by the application of wrenches to the heads of the bolts, such bolts may be screwed up and down, thus raising and lowering the casing made up of the sections 16 and 18. The platform plate 6 is held in position upon the casing 2 by means of the angle 28 and upon loosening this angle the platform plate may be given a movement of rotation and this movement of rotation is transmitted to the upper pipe section 18 by means of the bolts 22 so that this casing may be given a movement of rotation for accomplishing the function hereinafter described.

The upper section of the shaft casing 5 is provided with a suitable stuffing box 29 and oil may be supplied to the interior of this casing through the pipe 30. Similarly the upper end of the pipe section 18 is provided with an oil pipe 31, extending through a suitable gland 32 so that the casing 18 may act as a conduit for oil.

The sleeve 15 is provided with an annular recess 33 and a semi-circumferential flange 34 as shown in Fig. 4. The pump neck is provided with a corresponding flange 35. This arrangement constitutes a means for interengaging the sleeve 15 with the pump neck when the sleeve 15 is moved down so that the flange 34 lies below the flange 35, and the sleeve given a partial revolution to bring the flanges into vertical alinement.

When the pump is installed in the discharge casing, the casing made up of the sections 18 is in its lowermost position with respect to the shaft casing 5 and the pump and the flange 34 lying below the flange 35. The weight of the pump is thus supported by the pipe sections 18 and the ring 10 lies spaced below the packing 9. When the pump reaches the level at which it is to be fixed, the platform plate 6 is rotated with respect to the shaft casing 5 thus turning the casing made up of the sections 16 and 18, such rotation being just sufficient to carry the flanges 34 and 35 out of alinement. The bolts 22 are then screwed upward through the nuts 24, thus raising the pipe sections 18 and the parts 10, 11, 12, 13, 14 and 15 carried thereby. This movement is continued until the packing 9 is compressed and the weight of the pump is either partially or entirely shifted from the shaft casing 5 to the casing made up of the pipe sections 18, which casing, as hereafter indicated, may be used as an oil conduit and may properly be designated as an oil conduit. This arrangement provides for a tight seal between the pump casing and the well or discharge casing 2, and one which may be readily disconnected when it is desired to remove the pump or re-position it at a different level.

When it becomes necessary to release the packing this is accomplished by screwing down the bolts 22, thus lowering the oil conduit 18 and the sleeve 15 until the flange 34 lies below the flange 35. This lowers the packing supporting ring 10 releasing the packing and shifting the weight of the pump from the oil conduit 18 to the shaft casing 5. The pump may now be removed by means of proper lifting means applied to the shaft casing or shaft (the platform plate having been released from its connection with the discharge casing 2), or in case of injury to the shaft or shaft casing, the plate 6 may be turned relatively to the shaft casing thus bringing the flange 34 on the sleeve 15 beneath the flange 35 on the pump neck and the weight of the pump thus transferred to the outer casings 16 and 18 or other similar supports which may or may not constitute an oil conduit, and the pump then pulled by lifting such casings.

The pipe sections 16 and 18 may not only serve as a support for the packing, but as an oil conduit for carrying oil to the pump. The lower section 16 overlaps the upper end of the oil passage 36 in the pump neck so that oil which is fed downward through the casing enters such passage and is supplied to one or more bearings in the pump. The manner in which the passage connects with the bearings may be arranged to suit conditions and constitutes no part of the present invention. The oil may be supplied to an oil dome or separator in the pump casing, as shown in the Layne application, Serial No. 408,946, and thence fed upward past the bearings in the shaft casing as described in said application, or it may be supplied to oil cylinders 37 and thence to the bearings in the pump as shown in the Layne and Hall application, Serial No. 408,949, or it may be supplied directly to the bearings.

The outer casing or oil conduit also acts as a stiffener or bracing means for the shaft casing. Since the weight of the pump and the column of water in the discharge casing may be either partially or wholly carried by the oil conduit it is held straight and true, and the shaft casing, engaged by the lugs 20, is held correspondingly true so that no bindings strains are imposed on the bearings engaging the drive shaft. In some cases the

weight of the pump may be largely carried by the shaft casing, the outer casing being pulled up only sufficiently to tighten the packing.

Fig. 5 illustrates a modified construction in which a plurality of oil pipes 38 take the place of the oil conduit of Fig. 1. These conduits serve to carry the bearing supporting ring 39, and extend upward to the surface of the ground, having connection with suitable means for raising and lowering. The lower ends of the pipes 38 are connected to the hollow spider 40 slidably mounted on the pump neck 47, which spider in turn carries the short pipes 41 extending through the packing 42 and are threaded into the ring 43 lying below the ring 39 and provided with the circumferential passage 44 and a downwardly directed opening 45. An oil pipe 46 carried by the pump casing and extending to the bearings of the pump has its upper end extended upward into the opening 45 and freely slidable therein to permit the rings 39 and 43 to be moved up and down in loosening and tightening the packing. The pump neck 47 is connected to the shaft casing 48 as in the other type of construction. In positioning the pump in the well casing 49 the weight of the pump is carried by the shaft casing, the packing and its supporting ring 39 being at such time lowered out of contact with the pump casing flange 50. When the pump reaches its desired position, the pipes 38 are pulled upward so that the packing is made to engage the pump casing flange lying thereabove, and the weight of the pump is transferred from the shaft casing to the packing and the pipes 38 carrying such packing. One of the pipes 38 may be used for other purposes aside from carrying oil such as indicating the vacuum at the lower end of the pump, suitable connection being made for that purpose.

It is obvious that considerable modification in the matter of detail may be made in the constructions shown and described. The conduits of both constructions do not need to be used as oil passages, although this may be desirable. Various other constructions, independent of the shaft casing might be used to support the packing. Various constructions may also be substituted for the one of Fig. 1 for raising and lowering the supporting conduit, this being a matter of detail forming no part of the generic invention which contemplates broadly the supporting of the packing from the upper portion of the well casing by a means independent of the shaft casing.

What I claim is:

1. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upward therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, and means extending to the surface of the ground and indepednent of the shaft casing for supporting the packing.

2. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upward therefrom, packing means between the well casing and the pump casing, an annular supporting member beneath the packing, a shaft casing extending upwardly from the pump casing, a flange carried by the pump casing and lying above the packing, supporting rods for said annular member extending upwardly through the packing, and means connected to said rods and extending to the upper end of the well casing for supporting said annular member and the packing carried thereby.

3. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upward therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, and means concentric with the shaft casing and extending upwardly to the upper end of the well casing for supporting the packing.

4. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upward therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, and a pipe surrounding the shaft casing and extending upwardly to the upper end of the well casing for supporting the packing.

5. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upward therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, a pipe surrounding the shaft casing and extending upwardly to the upper end of the well casing, supporting means lying beneath the packing and connected to the pipe, and bracing means between the shaft casing and said pipe arranged at intervals along the length thereof.

6. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upward therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, a pipe

surrounding the shaft casing and extending upwardly to the upper end of the well casing, supporting means lying beneath the packing and connected to the pipe, and bracing means carried at intervals along the length of the pipe and engaging the shaft casing.

7. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upward therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, a pipe comprising a series of sections surrounding the shaft casing and extending upwardly, couplings for the sections provided with inwardly projecting portions engaging the shaft casing, and supporting means lying beneath the packing and connected to the pipe.

8. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upward therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, and an oil conduit extending to the surface of the ground for supporting the packing and supplying oil to the pump bearings.

9. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, and an oil conduit surrounding the shaft casing and extending to the surface of the ground for supporting the packing and supplying oil to the pump bearings.

10. In combination in a well mechanism, a well casing, a pump in the casing provided with a bearing and a neck portion provided with a passage leading to the bearing, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump casing, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, an oil conduit surrounding the shaft casing communicating at its lower end with said passage and extending upwardly to the surface of the ground, a support for the packing lying therebeneath, and connecting means between the lower end of the conduit and said support.

11. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upward therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump, means on the pump casing engaging the packing whereby the weight of the pump is applied to the packing, a pipe surrounding the casing and extending upwardly to the surface of the ground, a support beneath the packing, connections between said support and the lower end of said pipe, and interengaging means on the lower end of the pipe and the pump casing adapted to be engaged when the pipe is slid down over the shaft casing and rotated.

12. In combination in a well mechanism, a well casing, a pump in the well casing having a casing provided with an oil passage, a drive shaft extending upwardly from the pump, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump casing, means on the pump casing engaging the packing whereby the weight of the pump is applied thereto, a pipe surrounding the shaft casing from the pump to the surface of the ground and having its lower end extended over the upper end of said oil passage, a support beneath the packing, connections between said packing and the lower end of said pipe, and interengaging means on the lower end of the pipe and the pump casing adapted to be engaged when the pipe is slid downward over the shaft casing and rotated.

13. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upwardly therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump and adapted to support the weight thereof, and means independent of the shaft casing and operable from the surface of the ground for applying pressure to the packing to force it tightly between the pump casing and well casing and to release such pressure.

14. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upwardly therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump and adapted to support the weight thereof, and means independent of the shaft casing and operable from the surface of the ground for applying pressure upwardly from the lower side of the packing to force such packing tightly between the pump casing and the well casing.

15. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upwardly therefrom, packing means between the well casing and pump casing, a shaft casing extending upwardly from the pump and adapted to support the weight thereof, a support for the packing, and means extending upwardly from the support and independent of the shaft casing for moving the support up and down to

tighten or loosen the packing and adapted to take all or a part of the weight of the support from the shaft casing.

16. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upwardly therefrom, a shaft casing extending upwardly from the pump and adapted to support the weight thereof, other supplemental means extending upwardly to the surface of the ground and adapted to support the weight of the pump, and means for shifting the weight of the pump from the shaft casing to said supplemental means and for applying a lifting force to said supplemental means.

17. In combination in a well mechanism, a well casing, a pump in the casing, a drive shaft extending upwardly therefrom, a shaft casing extending upwardly from the pump and adapted to support the weight thereof, other supplemental means extending upwardly to the surface of the ground and adapted to support the weight of the pump, packing means between the well casing and the pump, and means for shifting the weight of the pump from the shaft casing to said supplemental means and causing said weight to tighten said packing.

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