Nov. 7, 1950 C. C. WILLIAMS 2,529,062

WELL PUMP INSTALLATION

Filed April 14, 1947 5 Sheets-Sheet 1

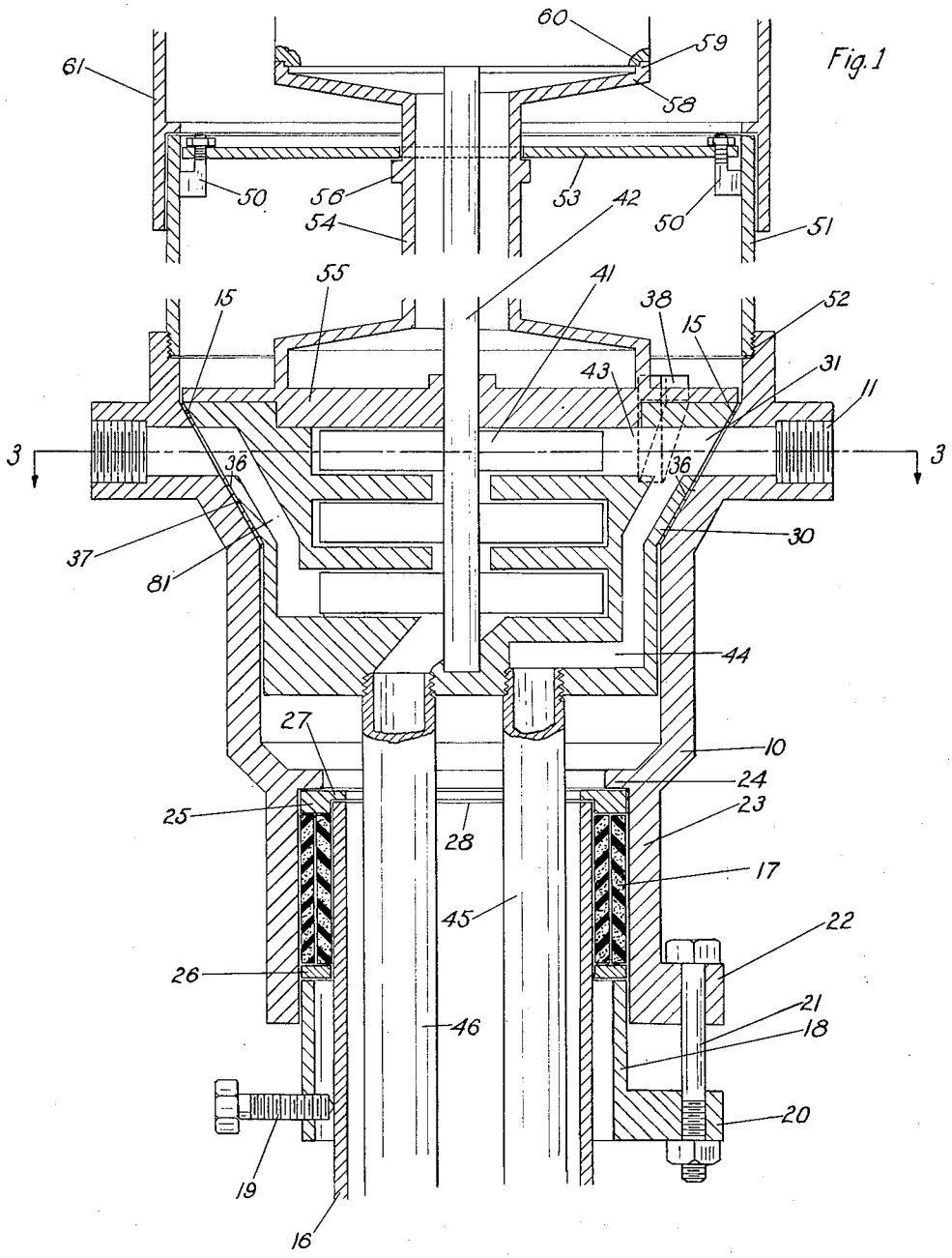

Fig. 1

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WELL PUMP INSTALLATION

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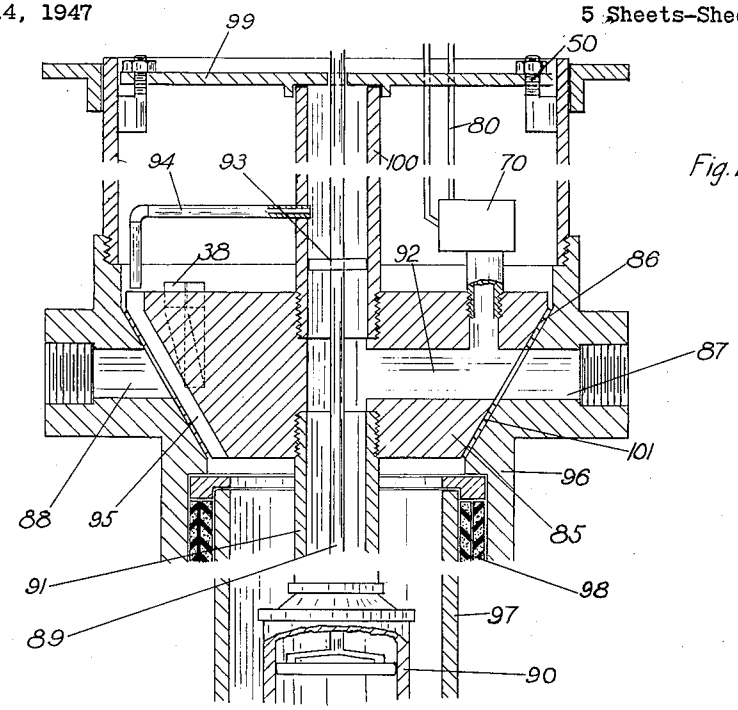

Fig. 2

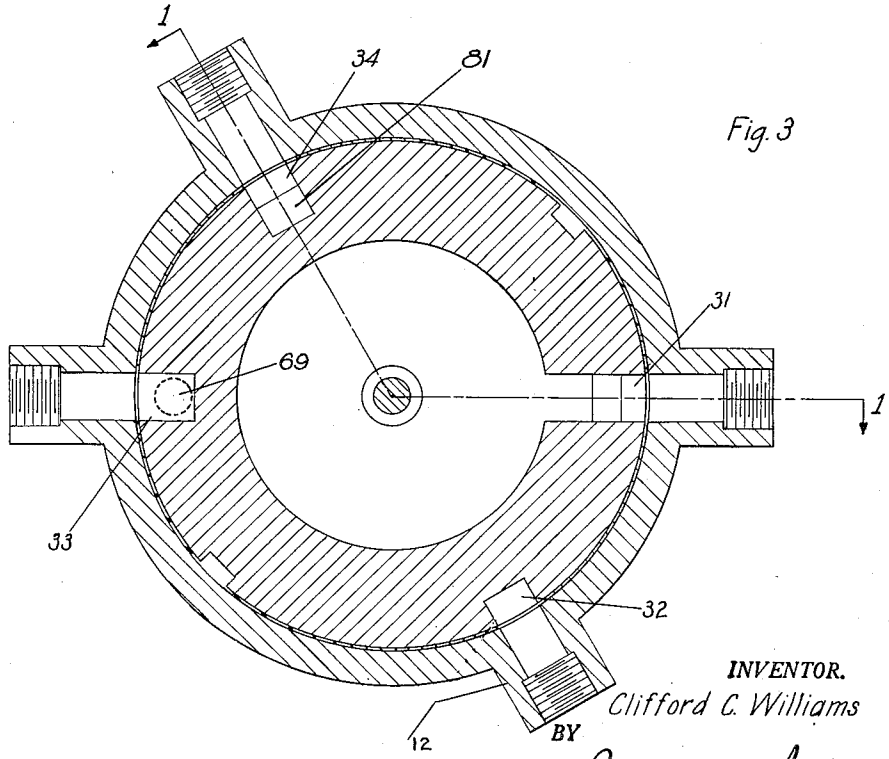

Fig. 3

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Fig. 4

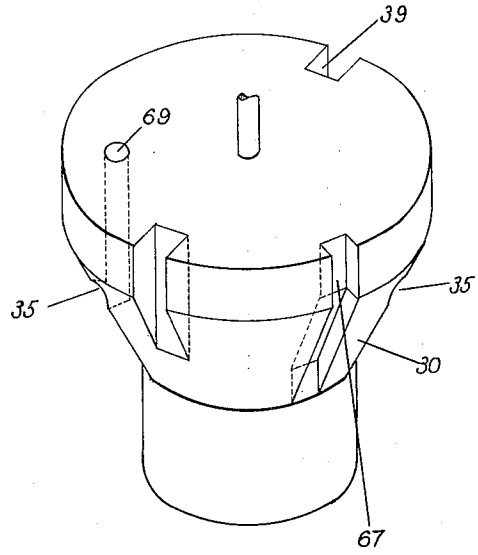
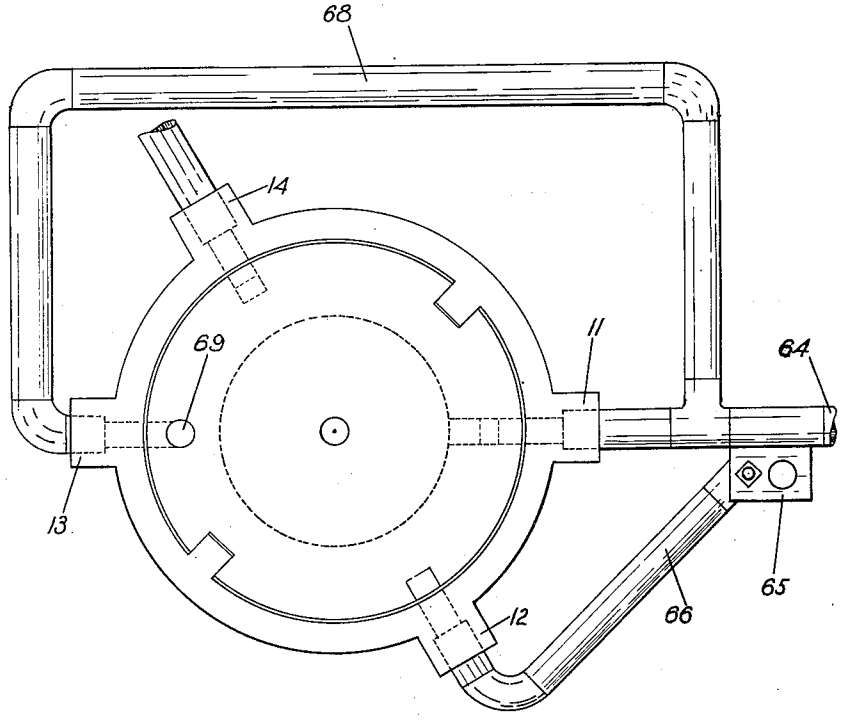


Fig. 5



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WELL PUMP INSTALLATION

Filed April 14, 1947 5 Sheets-Sheet 4

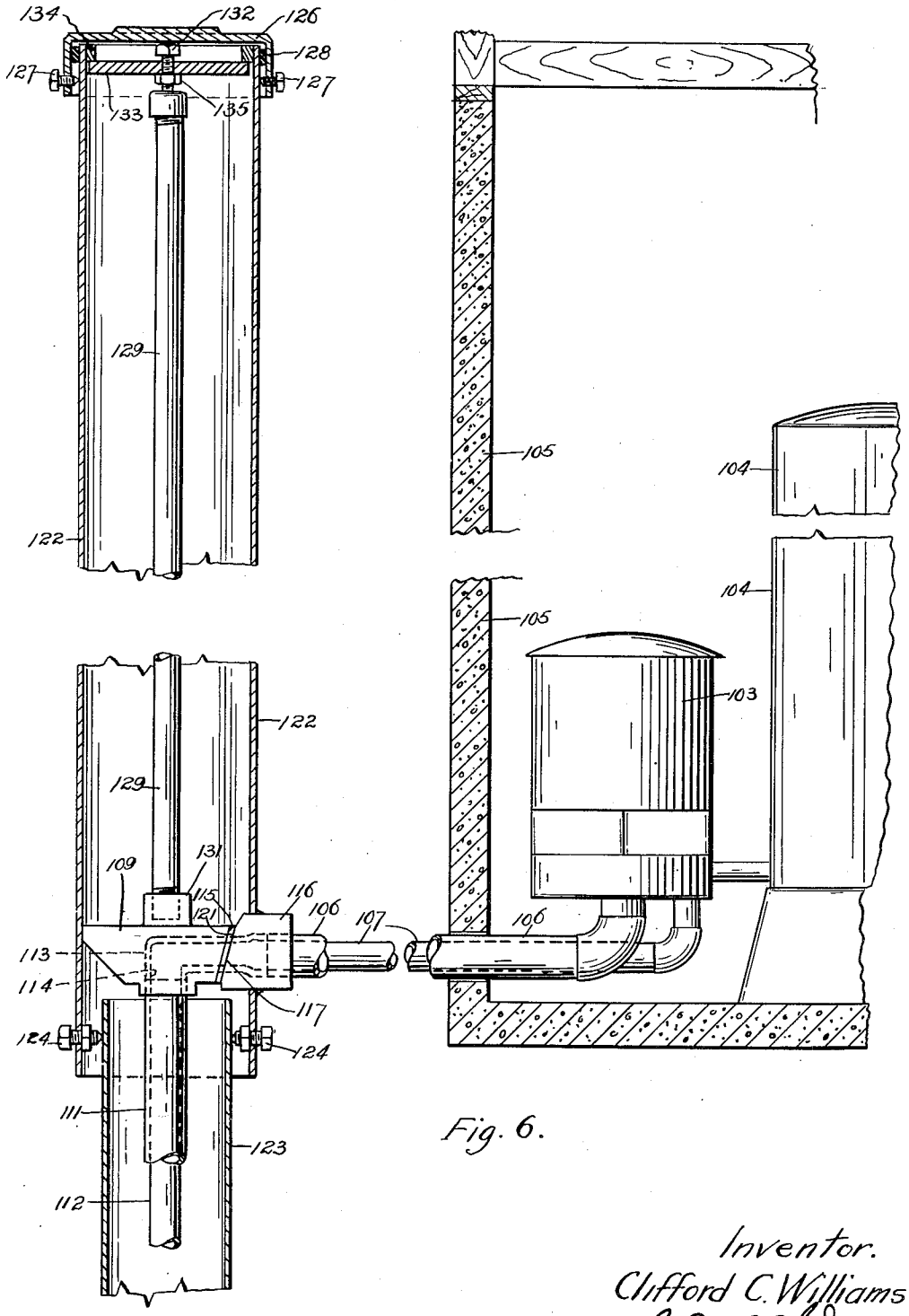

Fig. 6.

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WELL PUMP INSTALLATION

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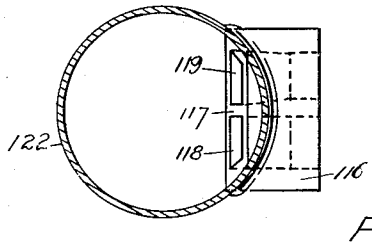

Fig. 7.

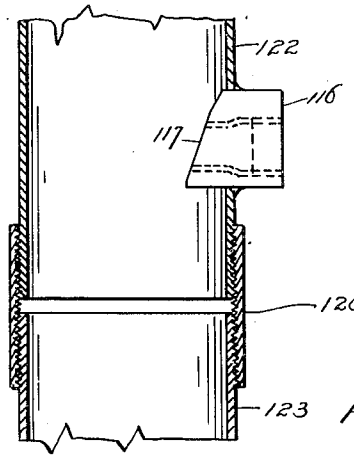

Fig. 8.

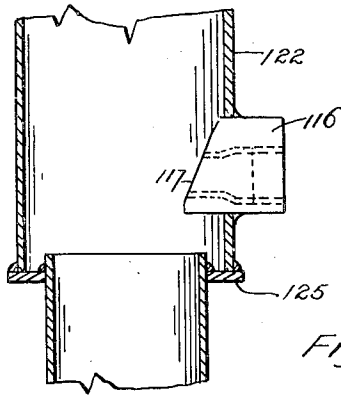

Fig. 9.

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2,529,062

UNITED STATES PATENT OFFICE

2,529,062

WELL PUMP INSTALLATION

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Application April 14, 1947, Serial No. 741,383

8 Claims. (Cl. 103—1)

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This invention relates to well pump installations and among other objects aims to provide an improved and simplified construction which eliminates expensive pump pits and water pollution incident thereto.

The nature of the invention may be readily understood by reference to illustrative apparatus embodying the invention and shown in the accompanying drawings.

In said drawings:

Fig. 1 is a vertical section of the apparatus embodying a multiple stage centrifugal pump, the section being taken on the broken plane 1—1 of Fig. 3.

Fig. 2 is a similar vertical section of a conventional plunger type pump.

Fig. 3 is a horizontal section through the pump and housing taken on the plane 3—3 of Fig. 1.

Fig. 4 is a perspective view showing the tapered surface of the connector element by which external connections with the well piping are sealed;

Fig. 5 is a plan view showing one arrangement of external connections with the well.

Fig. 6 is an elevation partly in section, of a simplified connector and discharge construction, and illustrating also an offset arrangement wherein the pump is offset from the well.

Fig. 7 is a plan view partly in section of the discharge element and casing, the connector having been removed to facilitate illustration.

Figs. 8 and 9 illustrate methods of connecting the well casing to the housing, Fig. 8 illustrating one method of connecting the housing to a well casing of the same diameter and Fig. 9 illustrating a method of connecting to a well casing of smaller diameter.

Heretofore well pits and above ground insulated housings have been employed to conceal the pump or associated apparatus and protect against freezing. It has been found that pits can not be made leakproof except at prohibitive expense, and therefore permit pollution by entry into the well of ground or surface water (since the well casing was cut or terminated below ground); and this was generally aggravated by location of the pit (for convenience in piping, etc.) too close to the house, barn or septic tank and absorption drains, etc., connected therewith. The same considerations make it dangerous to locate the well under the house with the pump, etc. in the basement. Moreover, these pits were just as costly as above ground housing, and it seldom happened that they could be located on high ground (as a protection against surface drainage) at a

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safe distance from the house, since the house itself is usually located on this higher ground.

According to the present invention, the apparatus provides a simple sealed connection (below ground) with the well casing which not only prevents entry of pollution into the well casing but eliminates the construction of a concrete or similar pit, as well as an insulated housing above ground. It is adapted to be used with both plunger and rotary pumps. The latter as applied to wells are of more recent origin. One form operates by dividing the discharge from the pump and piping a portion of it down into the well through an injector (at about water level) which draws in water and forces it to the surface. Often these pumps are multi-stage pumps. They have the advantage of compactness, fewer parts, and steady discharge, over plunger pumps.

Figs. 1 and 2 illustrate the invention as applied to a construction wherein the pump is in alignment with the well casing; and Fig. 6 illustrates the invention as applied to an offset construction wherein the pump and associated apparatus may be located in a basement, etc. In both instances a permanent well pit and contamination by ground seepage are eliminated.

As here shown, all external piping (one example of which is shown in Fig. 5) is connected to a single connection casing 10. At each pipe connection 11, 12, 13, 14, etc., the casing is provided with a seat 15 (tapered in this case) forming one element of the sealed connection between the exterior and the various passages associated with the pump, presently described in greater detail. The casing 10 has a simple and efficient leakproof connection below ground with the well casing or pipe 16. This leakproof connection may be of any appropriate design. One simple connection of advantageous design is illustrated in Fig. 1.

As there shown, the packing 17 which forms the seal between the casing 10 and pipe 16 is compressed by a sleeve or gland 18 connected to the well casing 16 preferably by some means which does not require threading of the well casing. Generally the well casing is set in position by the well driller before it is cut off at the desired level below ground, and since the point at which it is cut off cannot easily be determined in advance, it is troublesome, though not impossible, to thread the upper end of the severed casing. As here shown, the follower or gland 18 is connected to the well casing by a series of set screws 19. The follower 18 preferably is provided

with a series of lugs 20 (three or more) for bolts 21, which also pass through corresponding lugs 22 on the lower end of the casing 10. The latter is preferably reduced in diameter at its lower end, but preferably this reduction should be sufficient to accommodate well casings of various diameters. The difference in diameter being made up by varying the thickness of the packing 17 between the well casing and the lower end 23 of casing 10. In the present case, the casing 10 is provided with an internal flange 24 which may seat on the upper end of the well casing or as shown here, on an adapter ring 25 bearing against the top of the casing. By using rings of different internal diameters, the apparatus is adapted to well casings of varying diameters. A similar ring 26 is located below the packing. The latter is thus compressed between flange 24 and the follower 18 upon tightening of bolts 21, thereby sealing the connection between the casing 10 and the well casing 16. The upper ring 25 may advantageously be provided with an inwardly projecting flange 27 engaging the upper edge of 28 of the well casing to carry the weight of the apparatus. In this case, the set screws 19 are not tightened until the packing is fully compressed. It may be that the packing itself will form a sufficiently tight connection between casing 10 and well casing 16 as not to require the additional connecting surface of set screws 19; but as a matter of precaution, the set screws 19 are desirable to prevent separation between casing 10 and well casing 16 by the action of frost heaving or other forces.

The pump discharge and other connections with the exterior are sealed by means of a single connector element 30 having therein passages 31, 32, 33 and 34, corresponding to the several pipe connections (see Figs. 3 and 5). These passages terminate in orifices 35 on the outer face of the connector element 30 in register with the aforesaid external connection. Surrounding the orifices 35 of each of these passages the surface of the connector element is a seat corresponding to (and therefore, in this case tapered as at 36) the seats 15 at each of the external connections 11, 12, etc. Preferably a compressible gasket 37 is interposed between the inner and outer tapered surfaces to insure a perfect seal at each of the connections. If desired, the tapered surfaces 15 and 36 of the casing 10 and connector 30 respectively, may be formed by machining the interior and exterior of the casing 10 and connector 30 with identical internal and external circular conical surfaces. However, the tapered surfaces are, of course, absorbed by the gasket.

For units of circular section registry between the passages and the connector 30 and the external connections 11, 12, etc., is insured by providing one or more keys 38 and keyways 39 in the casing 10 and connector 30. Seating of the connector provides a sealed connection with all exterior passages.

As shown in Fig. 1 the connector 30 may advantageously carry a single or multiple stage rotary pump 14 in this case housed in the connector and having its shaft 42 extending longitudinally of the casing. The details of such pump are conventional and need not be described. In Fig. 1 a multiple stage pump is shown wherein a portion of the discharge from the discharge orifice 43 is returned to the well through passage 44 and pipe 45, to an appropriate injector located below water level. The return water is elevated through pipe 46. Generally, the passage 43 is provided with an adjusting valve (not shown) for regulating the proportion of the water returned to the well for operation of an injector. The details of pumps of this character are well known and need not be described here.

By arranging the seats 15 and 36 on an inclination instead of horizontally, the wedging action of the seating surfaces advantageously increases the sealing pressure at the connections. While the weight of the connector 30 and its associated element is considerable and doubtless would insure a perfect seal at each of the connections through its weight alone, it is preferable as an additional precaution to provide positive means for tightly seating the connector 30 and maintaining a seal against any external forces. In the present case (see Fig. 1) the connector is pressed downwardly through the action of bolts 50 carried at the upper end of the cylindrical casing 51. The latter is connected to (threaded in this case) the upper end of 52 of casing 10, and the force of the bolts is transmitted through the element 53 (which may be a bar or a covering plate) and sleeve 54 around the pump shaft 42 to the pump cover plate 55. The connection between the element 53 and sleeve 54 is provided by a shoulder 56. Obviously other means for forcing the connector element 30 tightly against the seat 37 may be employed if desired.

The casing 51 may, if desired, be large enough to house a motor as well as various pump controlling elements, and in the case of a reciprocating pump it may house the reduction gearing, etc. Generally, however, it is preferable to locate the motor somewhat higher or even above ground so that access to it for oiling and servicing is simplified. It should be understood in this connection that the connector 30 and its associated elements are depressed sufficiently below the ground surface to be safely below the frost line and out of danger of freezing.

The pump cover 55 and the associated tubular sleeve 54 may advantageously be used to center the driving motor relative to the centrifugal pump and its shaft. As here shown, the upper end of the sleeve is provided with a wide flange 58, which is rabbeted at 59 concentrically to the pump shaft 42 and the pump to provide means for centering the motor casing 60 accurately. In this case the motor which is preferably located above ground is protected and concealed by the casing 61. It should be understood that the motor casing is relatively inconspicuous and small as compared to the usual pump housing. It is not unsightly and therefore is not objectionable above ground.

As shown in Figs. 1, 3, and 5, various connections from the exterior may be made with the pump. In the present case, in addition to the pump discharge connection 11 (which connects through pipe 64 with a storage tank), the casing is provided with a drain passage 12 adapted to return to the well (through passages 32, Fig. 3) water drained from a hydrant or the like. Such hydrant drains are necessary to prevent freezing. As shown in Fig. 5, the lower portion of the hydrant is below frost level, and when the hydrant is closed the water located in the pipes above frost level drains into the well through pipe 66 and the drain connection 12. The drain passage 32 in connector 30 registers with connection 12 for returning the drain water to the well casing. Leakage from packings, etc. inside the apparatus also may drain to the well through passage 32. Another connection transmits pump pressure to means by which operation of the pump is con-

trolled. In the present case, such connection 68 is located externally of the pump so as to reflect true pump pressure. Thus pump pressure is transmitted from discharge 11 to the connection 13 by which it is conducted to the passage 69 in the connector 30. The passage 69 is connected to a pressure control switch 70 (Fig. 2) for controlling the operation of the motor through electric lines 60.

Another connection which may be employed with multiple stage pumps is a so-called low pressure connection 14 which registers with the passage 81 in the connnector 39 leading to a lower stage of the pump. Where low pressure supply is sufficient, such a connection may be desirable.

The foregoing will be sufficient to illustrate how other connections may be made, should they be desired. For an offset construction wherein the pump is in a basement or other remote place, the connector and the casing 10 against which it seats function to provide sealed connections with the exterior pipes running to the pump, etc. Other features incident to the directly connected pump (in Figs. 1 and 2) may be eliminated from the connector.

In Fig. 2 is illustrated the application of the invention to a direct connected plunger type pump. As there shown, the connector element 85 is provided like connector 30 with tapered surfaces 86 for sealing the connection with the various external connections 87, 88, etc. Details of the pump and its operating mechanism need not be described since they are conventional. It is sufficient to point out that the pump plunger or rod 89 extends downwardly into the well to the pump cylinder 90. Water is elevated thereby through the drop pipe 91 connected to the connector element 85 from whence it passes through a discharge passage 92 to the discharge outlet 87. A suitable packing or differential piston 93 is provided to seal the pump rod against escape of water at the top. Any slight leakage is returned to the well through drain pipe 94 connected to the well by the drain passage 95 formed in the connector casing 85. The external casing 96 is connected with the well casing 97 through packing 98 in a manner similar to that disclosed in Fig. 1. The connector 85 is held on its seat in a manner similar to that disclosed in Fig. 1 by bolts 50 acting through the cover plate 99 and the sleeve or pipe 100 threaded into the upper end of connector 85 to force the latter and the intervening gasket 101 tightly against the tapered seats at the various connections 87, 88, etc. The tapered seats may, if desired, be formed as explained in connection with the construction shown in Fig. 1 by forming internal and external conical or flat tapered surfaces of identical pitch on the casing 96 and connector 85. In the present case the operating motor and its associated mechanism is located above the plate 99 and protected by an appropriate cover removable for easy access for servicing.

Figs. 6 and 7 illustrate a simplified construction for the connector and associated parts. Fig. 6 also illustrates a so-called offset construction wherein the pump 103, pressure or storage tank 104 are remotely located (as in a basement 105) and connected to the well by a laterally extending line or lines 106 and 107, passing through the ground below frost level, or otherwise protected. A rotary pump requires a return passage 107 as explained in connection with the construction of Fig. 1. A plunger pump requires only a single pipe. The latter type of pump can

of course, be used only for shallow wells when thus offset. It will be understood that the above described offset construction can be used with the type of connector construction illustrated in Figs. 1 and 2.

In the simplified construction the connector 109 comprises a simple fitting to which the drop pipe or pipes 111 and 112 may be connected and having corresponding passages 113 and 114 therein leading to ports in an inclined or beveled sealing face 115. For simplicity in machining this face is preferably a plane or flat face downwardly and inwardly inclined relative to the well axis. The discharge connection 116 is similarly simplified, having a mating sealing face 117 provided with ports, 118 and 119 leading to connections with the pipes 106 and 107. A gasket 121 lies between faces 115 and 117 to insure a seal and to compensate for any qualities in the faces.

In the present instance the discharge connection 116 is carried by the housing or casing 122, the latter being provided with an opening to admit and fit the discharge connection which is fastened to the casing by brazing, welding, etc. The opposite side of the casing serves as an abutment for connector 109 to carry the lateral thrust created by the pressure against inclined faces 115 and 117. The casing thus serves multiple functions and contributes to the simplified construction.

Casing 122 may be connected to the well casing 123 in any appropriate manner. In the present instance mechanical connection is effected by a series of set screws 124 and the joint between the two casings is sealed by an appropriate sealing compound such as rubberized asphalt as sealing compound poured into the joints while hot. Such a sealing compound adheres well to the metal and remains soft at all temperatures.

In Figs. 8 and 9 are illustrated other methods of connecting the casing 122 with the well casing. In Fig. 8 wherein the well casing is of the same diameter as casing 122 the meeting ends of the casings are threaded and connected by plain couplings 120. If the diameter of the well casing be smaller than that of casing 122, the coupling may be a reducing coupling.

In Fig. 9 wherein the well casing is of smaller diameter than casing 122, the connection may be effected by an adapter ring 125 welded both to the well casing and casing 122.

Casing 122 preferably extends to the surface of the ground and is covered by a removable cap 126 fastened to the top of the casing 122 by set screws 127 or the like. A gasket 128 provides a seal between the casing and its cap.

If it be desired to exert a positive pressure against the connector to hold on its seat, such pressure may be advantageously exerted by a rod or tube 129 seated or threaded in a recess 131 in the top of the connector and extending into proximity with the top of the casing. Thrust is transmitted to the rod 129 by an adjusting member 132 threaded through a transverse bar 133. The latter is seated against lugs or stops 132 welded or otherwise connected to the inside of the casing. By screwing down the adjusting members 132 a thrust will be exerted through the rod against the connector 109 to hold the latter positively on its seat against displacement. A lock nut 135 holds the member in adjusted position. The adjusting member and bar 132 may be easily removed to permit access to the connector. Preferably rod 129 is threaded into the recess 131 on the connector to provide means

by which the connector and the drop pipe carried thereby may be introduced into and elevated from the well.

It should be understood that the illustrative apparatus may also be employed for dug wells, in which event the apparatus is suspended in the dug well below frost level, from a platform or other structure which covers the well hole.

Obviously the invention is not limited to the details of the illustrative apparatus, since these may be variously modified. For example, the invention is not limited to the specific type of pump used. Within the limits of pump suction a rotary suction pump may be used with a single drop pipe. If the necessary lift exceeds the limit of rotary pump suction, two drop pipes (as here shown) and a jet may be advantageously used. A reciprocating pump may also be used in the place of a rotary pump, with the aforesaid jet arrangement. Moreover it is not indispensable that all features of the invention be used conjointly since various features may be used to advantage in different combinations and subcombinations.

This application is a continuation in part of my copending application Serial 566,284, now abandoned.

Having described my invention, I claim:

1. In a well pump construction the combination comprising a connection casing adapted to be located below frost level, said casing having therein a passage terminating in an orifice on the inner surface of the casing and having means on the exterior for connecting said passage with a conduit or the like, said casing having seating means on its inner face surrounding said orifice, a connector, a rotary pump carried thereby, said connector having an outer surface adapted to rest upon the inner surface of said casing, said outer surface having therein an orifice connected with said pump and having a seating surface surrounding said orifice and adapted to seat against the seating means on said casing, means for registering said orifices, and means for applying pressure at said seats to seal the connection between said orifices.

2. In a well pump construction the combination comprising a connection casing adapted to be located below frost level and carrying all connections with the exterior, said casing having on its inner face orifices for each of said connections and having seating surfaces surrounding each of said orifices, a well casing, said connection casing being open at the bottom and having means associated therewith for making a sealed connection between said connection casing and said well casing, a connector element inside said connection casing and resting against said inner face of said connection casing, said connector element having in its outer surface a plurality of orifices adapted to register with the orifices in said connection casing, and having seating surfaces surrounding said orifices, and means for pressing together the seating surfaces on said connection casing and said connector element to form a sealed connection between the orifices in said connection casing and those in said connector element.

3. In a well pump construction the combination comprising a connection casing open at both ends, a well casing, the lower end of said connection casing being adapted to be connected with said well casing, said connection casing having adjacent to its upper end a conical surface, passages

in said connection casing terminating in orifices located in said conical surface, said passages having means for connecting the same on the exterior of the connection casing with conduits or the like, a connector carrying a rotary pump inside said casing, having an exterior conical surface adapted to rest against the conical surface in said connection casing, the conical surface of said connector having a plurality of orifices therein adapted to register with the aforesaid orifices in said connection casing, sealing means between said conical surfaces, and means for applying pressure to said conical surfaces to seal the connection between said registering orifices.

4. In a well pump construction the combination comprising a connection casing adapted to be located below frost level, said casing having therein a passage terminating in an orifice on the inner surface of the casing and having means on the exterior for connecting said passage with a conduit or the like, said casing having seating means on its inner face surrounding said orifice, a connector, a rotary pump carried thereby, said connector having an outer surface adapted to rest upon the inner surface of said casing, said outer surface having therein an orifice connected with said pump and having a seating surface surrounding said orifice and adapted to seat against the seating means on said casing, means for registering said orifices, means for applying pressure at said seats to seal the connection between said orifices to prevent entrance of ground leakage, a well casing terminating at said connection casing, the latter having an opening at its lower end to receive said well casing, and means for providing a leak tight joint between said well and connection casings to prevent entrance of ground leakage.

5. In a well construction for use with a well pump, the combination comprising a housing extending to a point below the frost level in the ground, a connection casing incorporated in said housing at a point below frost level and having therein a passage terminating in an orifice on the inner face of said casing and having means on the exterior for connecting said passage with a conduit below frost level leading to the said pump, said inner face being downwardly inclined toward the center of said housing and providing a seat surrounding said orifice, a connector element inside said housing and having an orifice on its exterior surface adapted to register with the orifice in said connection casing and provided with a seat surrounding said orifice complementary in inclination to that of the seat on said connection casing, said connector element being adapted to support a depending well drop pipe and being wedged against the inclined face of said connection casing, a gasket at said face to seal the joint between said connection casing and said connector element and a bar extending from the top of said connector element to a point adjacent the top of said housing.

6. In well construction for use with a well pump, the combination comprising a housing extending to a point below frost level in the ground, a connection casing incorporated in said housing and having therein a passage terminating in an orifice on the inner face of said casing and having means on the exterior for connecting said passage with a conduit or the like, said inner face being downwardly inclined toward the center of said housing and providing a seat surrounding said orifice, a connector element inside said housing and having an orifice on its interior surface

adapted to register with the orifice in said connection casing and provided with a seating surface around said orifice complementary in inclination to that of the seat on said connection casing, said connector element being adapted to support a depending well drop pipe and being wedged against the inclined face of said connection casing to provide a sealed joint connecting said orifice, a rod extending upwardly through said housing and bearing against said connector element, and means at the top of said housing for applying a downward thrust to said rod to hold said connector element tightly seated.

7. In a well construction for use with a well pump construction the combination comprising a housing extending to a point below frost level, a connection casing incorporated in said housing and fastened thereto, said casing having therein a pair of separate passages leading to the exterior of said casing, pipes connected with said passages and adapted to lead to the said pump at a remote point, the face of said casing inside said housing being inclined toward the center of said housing to provide a seat, said passages terminating in orifices in said face, a connector element inside said housing having a seating surface complementary in inclination to that of the inclined face on said connection casing and having therein a pair of orifices adapted to register with the respective orifices in the inclined face of said connection casing, a gasket between said inclined faces, said connector element having passages therein leading from the orifices in said element, said connector element being adapted to support a pair of depending well drop pipes connected with the respective passages in said element, said connector element being wedged against the inclined face of said connection casing to seal the joints connecting said respective orifices.

8. In a well construction for use with a well pump the combination comprising a housing extending to a point below frost level, a well casing connected at its upper end with said housing, a connection casing incorporated in said housing and fastened thereto, said casing having therein a pair of separate passages leading to the exterior of said casing, pipes connected with said passages and adapted to lead to the said pump at a remote point, the face of said casing inside said housing being inclined toward the center of said housing to provide a seat, said passages terminating in orifices in said face, a connector element inside said housing having a seating surface complementary in inclination to that of the inclined face on said connection casing and having therein a pair of orifices adapted to register with the respective orifices in the inclined face of said connection casing, a gasket between said inclined faces, said connector element having passages therein leading from the orifices in said element, said connector element being adapted to support a pair of depending well drop pipes connected with the respective passages in said element, said connector element being wedged against the inclined face of said connection casing to seal the joints connecting said respective orifices.

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