F. A. DEW.

TRIPLEX PUMP.

APPLICATION FILED MAY 15, 1915.

1,193,244.

Patented Aug. 1, 1916.

5 SHEETS—SHEET 1.

Fig. 1

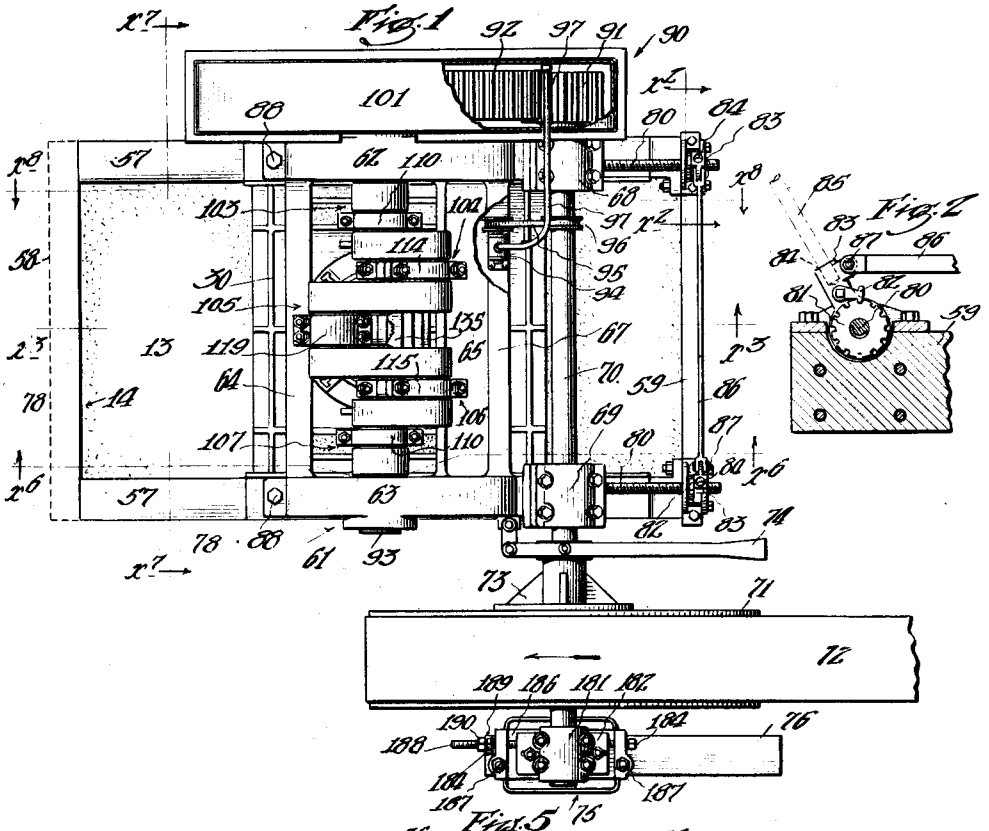
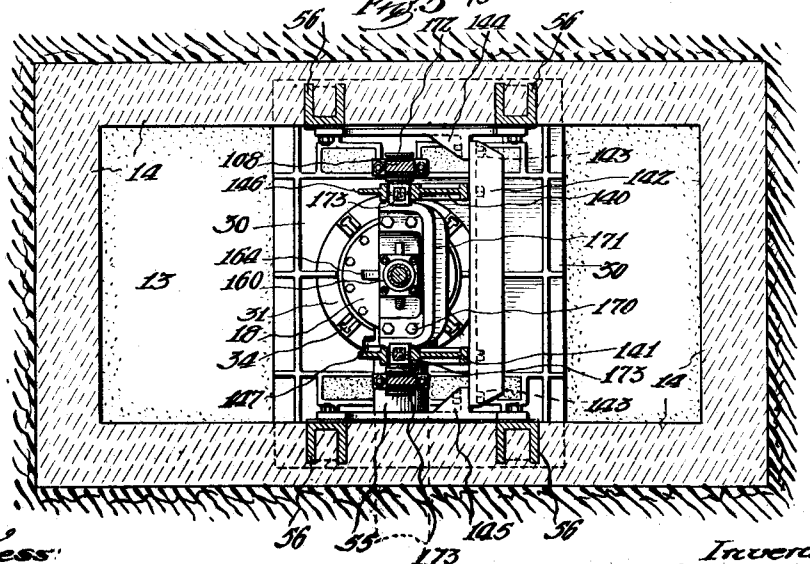


Fig. 2

Fig. 5



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5 SHEETS—SHEET 2.

Fig. 3

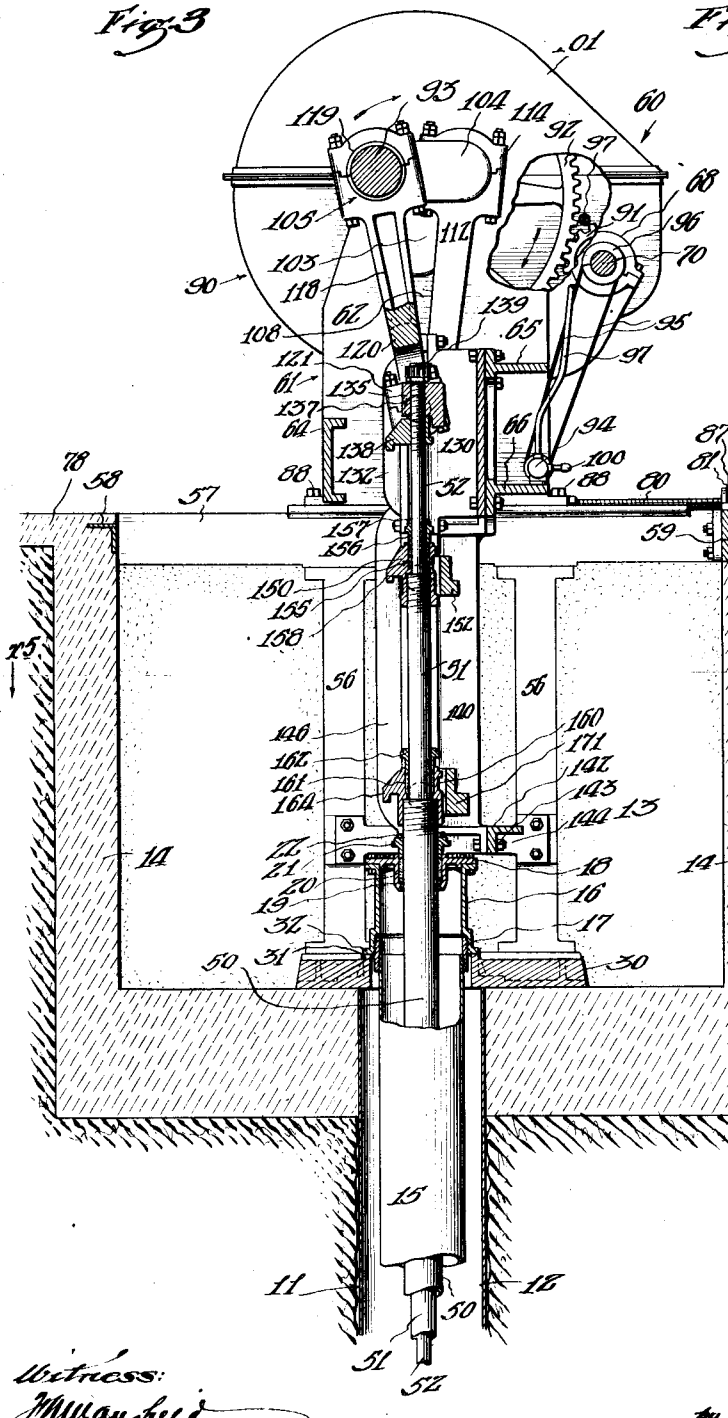
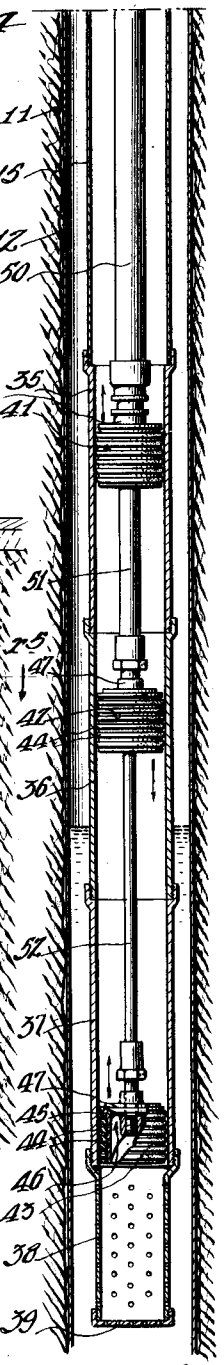


Fig. 4



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5 SHEETS—SHEET 3.

Fig. 6

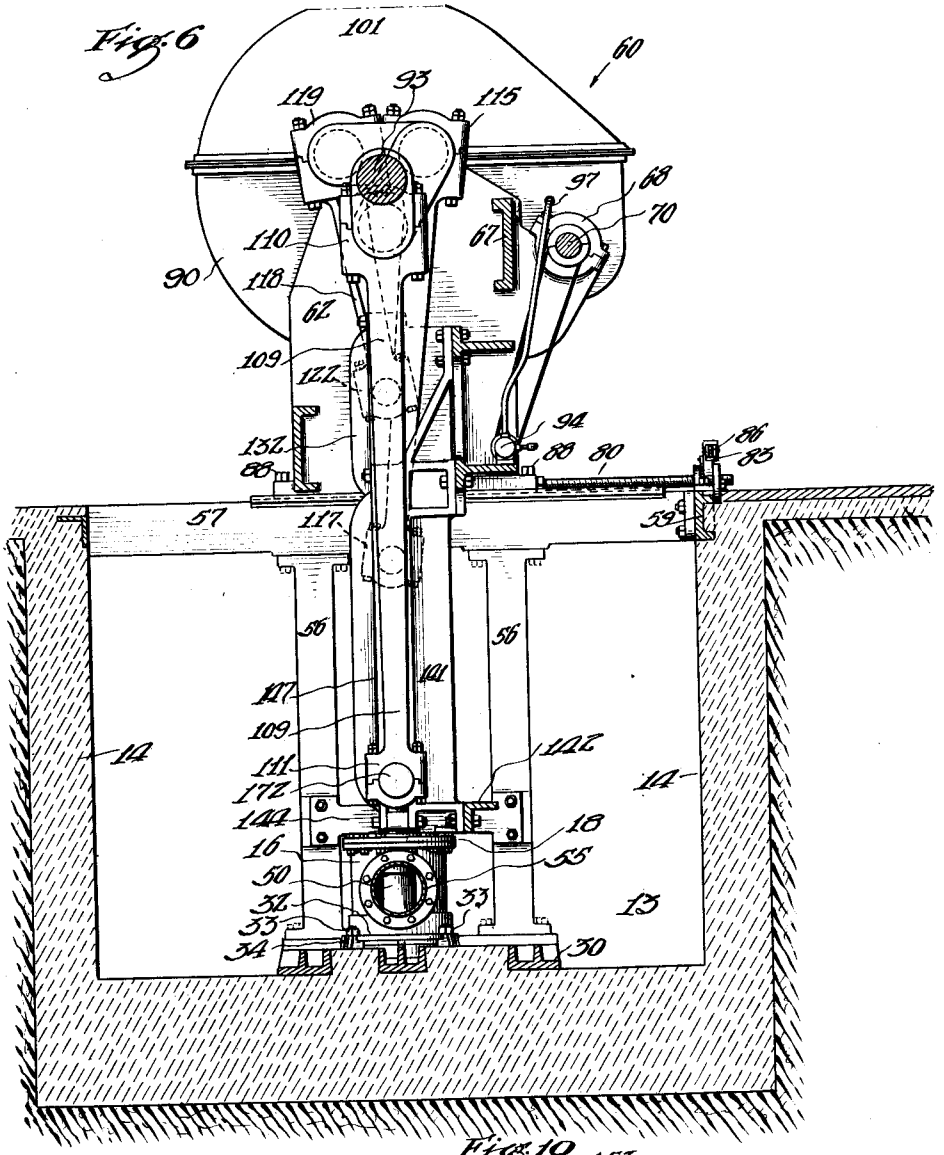
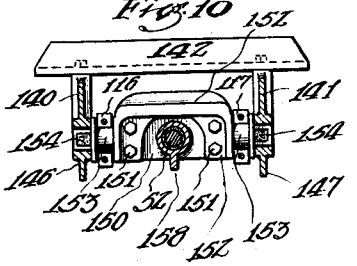


Fig. 10



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5 SHEETS—SHEET 4.

Fig. 7

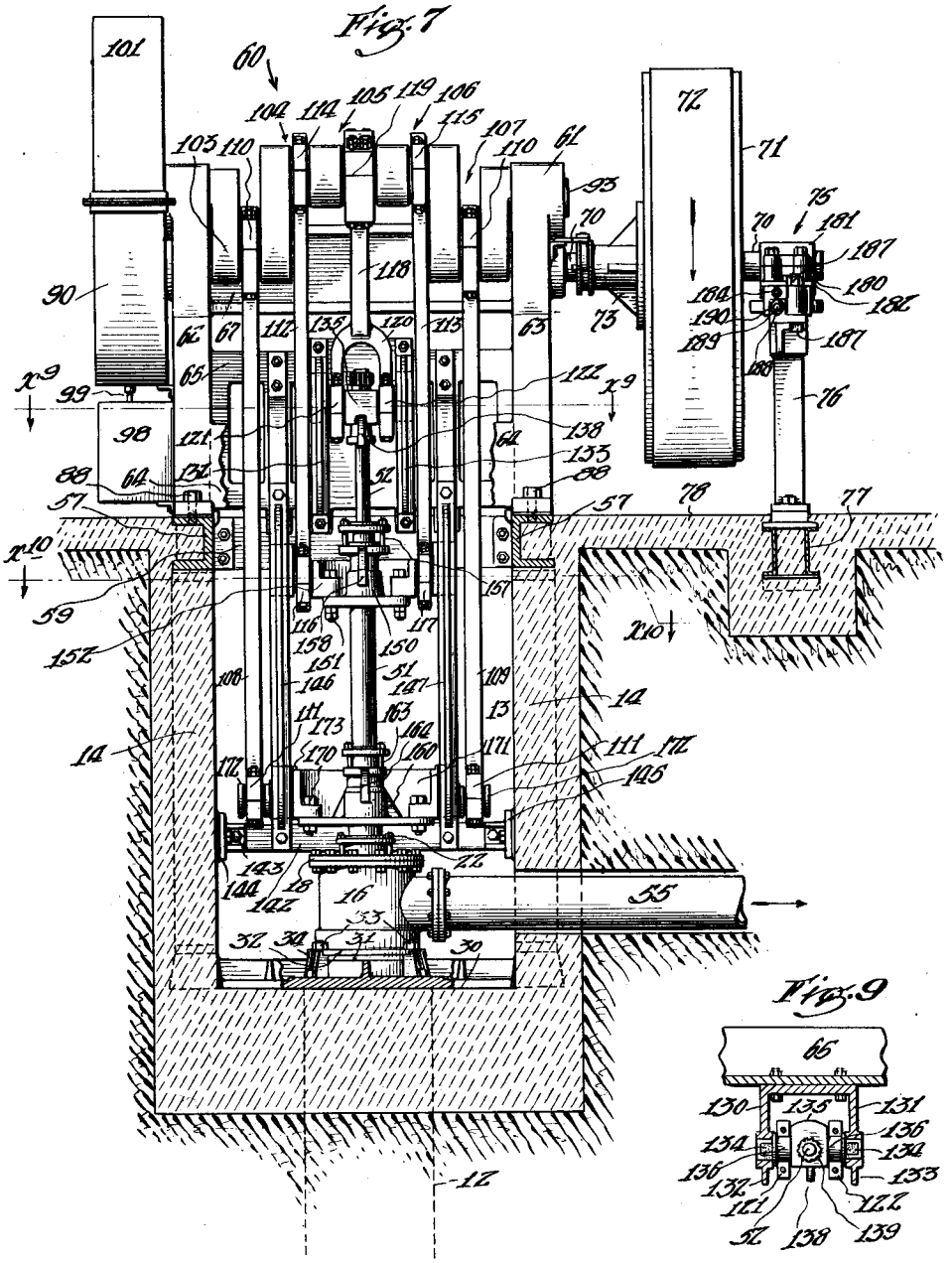


Fig. 9

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5 SHEETS—SHEET 5.

Fig. 8

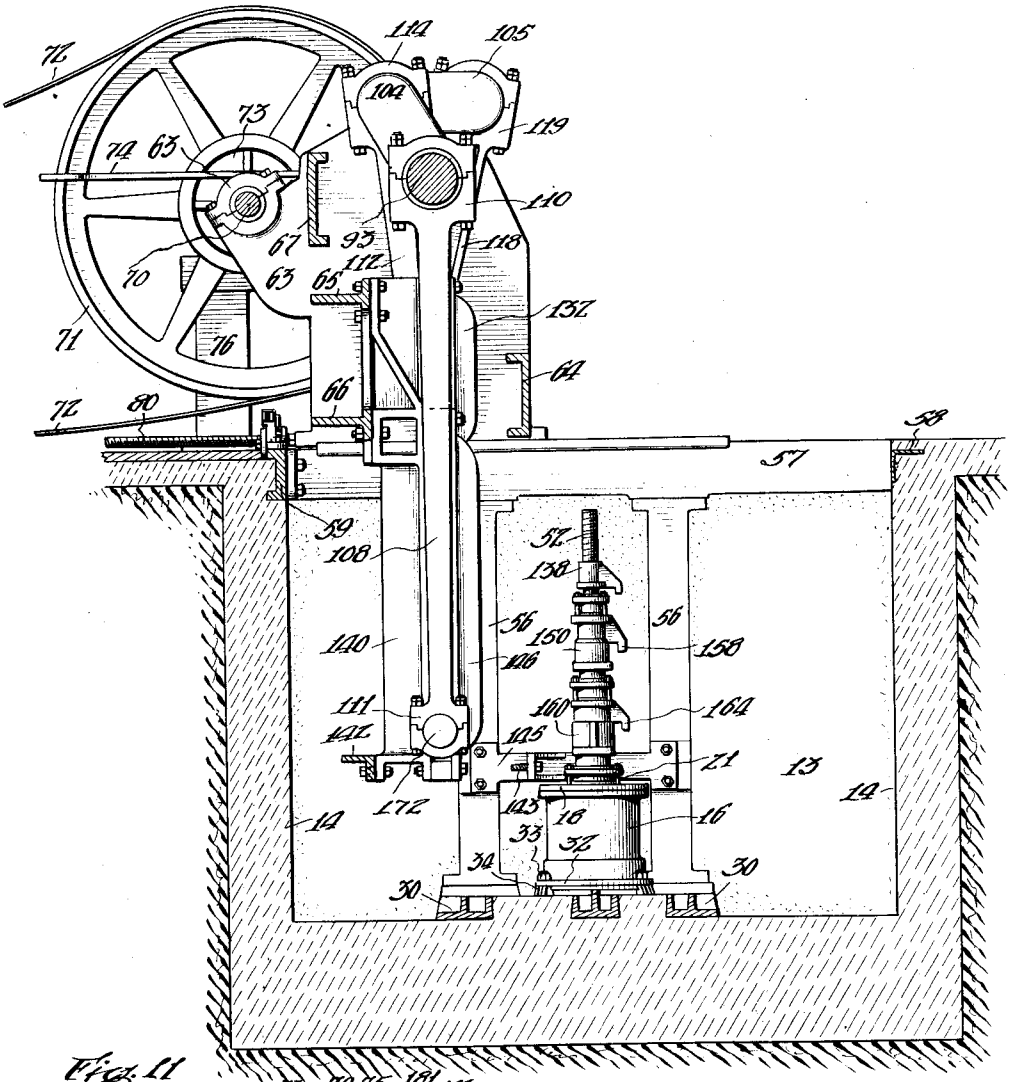
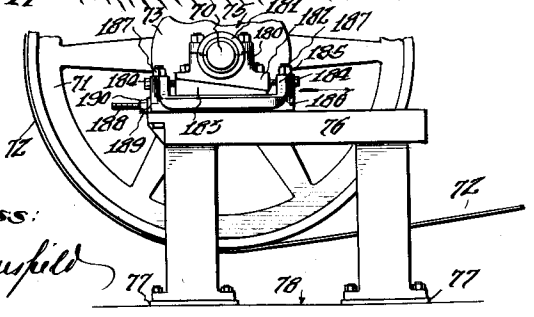


Fig. 11



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UNITED STATES PATENT OFFICE.

FRED A. DEW, OF POMONA, CALIFORNIA.

TRIPLEX PUMP.

1,193,244. Specification of Letters Patent. Patented Aug. 1, 1916.

Application filed May 15, 1915. Serial No. 28,480.

To all whom it may concern:

Be it known that I, FRED A. DEW, a citizen of the United States, residing at Pomona, in the county of Los Angeles and State of California, have invented a new and useful Triplex Pump, of which the following is a specification.

My invention relates to pumps, such as are used in deep water wells, and more particularly to triplex pumps in which three buckets are arranged in line, these buckets being located below the surface of the water in the well and being actuated from a single crank shaft through concentric pump rods, the cranks being spaced 120° apart so that there is an even motion imparted to the water in the pump column. The removal of the pump rods and buckets from such a well is often necessary and where the ordinary forms of pump are used such removal is a difficult matter.

The principal object of my invention is to provide a pump so arranged that removal of the rods and buckets will be a comparatively simple and easy matter. This is very important as the shutting down of large pumps, especially when used for pumping water for municipal purposes, is often a very serious matter, and it is very desirable that the change should be made quickly, surely, and at a small expense.

In the drilling of deep water wells the bore of the well is rarely exactly perpendicular, and it is good practice to erect the pumping head in the proper relation to the bore of the well rather than to level it up regardless of the bore.

A further object of my invention is to provide means for erecting the pump head in the proper relation to the bore of the well so that the pump rods will move along the axis of the well, thereby greatly reducing the wear on these rods and the liability of shut-downs for repairs.

The erection of large pumps is an expensive and difficult matter, and a further object of the invention is to provide a pump which can be quickly erected at small cost and which when erected will be securely and permanently anchored so that there will be no vibration of the pump head and no tendency for wear or breakage due to such vibration.

In my invention I provide a pump head mounted on cross rails so that it can be slid away from the mouth of the well, thereby giving free access to the mouth of the well.

A further object of the invention is to provide novel means for connecting the pump rods to the mechanism of the pump head, this mechanism being so arranged that the pump rods can be dropped away from the pump head and supported on the top of the well, the pump head being then free to slide away so that the rods can be pulled directly upward, sufficient space being given around them so that they can be easily handled.

In previous designs of pumps it has been necessary to remove the cross head guides and in some cases the crossheads themselves before the rods could be pulled. This requires the services of a skilled mechanic and where such a mechanic is not available such pumps are often incorrectly put together.

A further object of the invention is to connect the crossheads and crosshead guides permanently to the pump head so that they can be disconnected from the rods and moved to one side with the pump head without being in any way disconnected from the pump head, the original fitting and alinement, which may be done in the shop, being thereby preserved, so that there is no danger of the parts being reassembled out of line after the pump rods have been pulled and replaced.

A further object of the invention is to provide means on the pump rods by which they can be readily lifted and lowered.

Further objects and advantages will be evident hereinafter.

Referring to the drawings, which are for illustrative purposes only: Figure 1 is a plan view of the pump head and the pit about the mouth of the well, a portion of the mechanism being broken away to better illustrate the internal structure. Fig. 2 is a partial section on the plane x^2—x^2 of Fig. 1 looking in the direction of the arrows, showing the pawl and ratchet mechanism on the sliding screws. Fig. 3 is a partial section on the plane x^3—x^3 of Fig. 1, looking in the direction of the arrows. Fig. 4 is a prolongation of the section shown in Fig. 3 showing a central section through the lower portion of the well and the pump column, a portion of the lower bucket being broken away to better show the valve structure. Fig. 5 is a section on the plane x^5—x^5 of Fig. 3, looking in the direction of the arrows. Fig. 6 is a section on the plane

x^6—x^6 of Fig. 1, looking in the direction of the arrows. Fig. 7 is a section on the plane x^7—x^7 of Fig. 1, looking in the direction of the arrows. Fig. 8 is a section on the plane x^8—x^8 of Fig. 1, looking in the direction of the arrows, the pump rods resting on the top of the water column and the pump head being slid over to give access to the pump rods and well, the bolts being removed from the cover of the discharge T so that the parts are ready for the operation of pulling rods. Fig. 9 is a partial section on the plane x^9—x^9 of Fig 7 showing the construction of the upper crosshead. Fig. 10 is a section on the plane x^{10}—x^{10} of Fig. 7, showing the construction of the intermediate crosshead and its attached parts. Fig. 11 is an end view of outboard bearing.

In the form of my invention illustrated in the drawings, a well 11 has a casing 12 secured therein, a pit 13 being formed at the mouth of the well and lined with a body of concrete 14. A water column 15 through which the water is raised extends into the well inside the casing 12 and is secured to a discharge T 16 by means of a coupling nipple 17 best shown in Fig. 3. The discharge T 16 has a cover 18 bolted thereon in which a stuffing box 19 is formed, packing 20 being placed in the stuffing box and compressed by a gland 21 which is forced downwardly by suitable bolts 22. The discharge T 16 rests on a horizontal turned surface on the lower base 30 and is kept from moving by four bored vertical lugs 31 in which the turned outside of the flange 32 on base of discharge T fits. This centers the T with relation to base and always brings it back to original position when discharge T is lifted up pulling pump column. Bolts 33 fitting in slots 34 secure the flange 32 to the base 30. Secured to the lower end of the water column 15 is the pump barrel 35 to which is secured the barrel 36, the barrel 37 being secured to the lower end of the barrel 36. A perforated strainer 38 is secured to the bottom of the lower barrel 37, the lower end of the strainer 38 being closed by a perforated bottom member 39. Buckets 41, 42, and 43 fit in the barrels 35, 36, and 37, these buckets preferably having the form shown in application Serial No. 857,602, filed August 19, 1914. Each of the buckets is provided with cup leathers 44 which are clamped in place on a body 45, this body having an opening 46 therethrough. The openings 46 are closed by clappers 47 which are free to raise and allow water to pass through the openings 46 but which seat firmly on the top of the body 45 when lowered, thereby making a tight closure of the opening 46 and causing water to be lifted by the bucket in the water column 15. An outer pump rod 50 is rigidly secured to the bucket 41, an intermediate pump rod 51 is rigidly secured to the bucket 42, and an inner pump rod 52 is rigidly secured to the bucket 43, the pump rod 52 fitting inside the pump rod 51, and the pump rod 51 fitting inside of the pump rod 50, the rods 50, 51 and 52 being concentric, and the rod 52 being preferably made solid. The rods 50 and 51 are in the form of pipe, each size of rod consisting of a number of lengths joined together into continuous string by couplings not shown. The packing 20 fits around the outer pump rod 50 and is compressed by the gland 21 to form a tight closure therearound, so that the water flowing upwardly through the water column 15 enters the discharge T 16 and is discharged through a water outlet pipe 55 which is secured by suitable flanges to the discharge T 16, as shown in Fig. 7. The water outlet pipe 55 may pass through the concrete 14 which lines the pit 13, or it may be brought upwardly through the pit above the surface of the ground if desired, according to standard practice in water wells.

Secured to the base 30 are four column members 56, and secured on the top of the column members 56 are two slide rails 57, these slide rails being connected at one end by an angle iron 58 and at the other end by a casting 59, the parts 57, 58 and 59 being bolted together to form a square upper frame surrounding the mouth of the pit 13 and the members 56, 57, 58 and 59 being embedded in the concrete 14 which is cast therearound after the pump is erected. Mounted on the slide rails 57 is a pump head 60, this pump head being built into a frame 61, preferably cast in one piece, and consisting of side frames 62 and 63 connected by cross members 64, 65, 66 and 67. Mounted in bearings 68 and 69, formed on the frame 61 is the driving shaft 70, this shaft having a loose pulley 71 mounted thereon, the pulley being driven from a suitable source of power by means of a belt 72. A clutch 73 of any one of the various well known forms is operated by a lever 74 and connects the pulley 71 rigidly to the driving shaft 70, when it is desired to operate the pump. An outboard bearing 75 supports the shaft 70 outside the pulley 71. This outboard bearing 75 is mounted on an outboard bearing support 76 which is rigidly secured to an outboard bearing base 77 which is embedded in concrete 78 which is cast about the mouth of the pit 13 integral with the concrete 14. The frame 61 has sliding screws 80 rigidly fixed therein, each of these sliding screws 80 extending out through bearings formed on the casting 59 and having a notched nut 61 mounted in a slot in these bearings, each of these nuts being actuated by a pawl 8 pivoted on a casting 83 which has a hole 84 into which an operating bar 85 may

inserted. The two castings 83 are connected by a bar 86 pivoted on bolts 87 on the castings 83 so that the two nuts 81 may be actuated together by the bar 85. The pawls 82 are reversible so that by throwing them to one side or the other the direction of rotation of the nuts 81 may be varied. Hold-down bolts 88 are provided for fastening the frame 61 to the slide rails 57 when it is in the proper position.

A gear case 90 is secured to the frame 61 and incloses a pinion 91 carried on the driving shaft 70 and a gear 92 which is rigidly connected to a crank shaft 93. An oil pump 94 driven by means of a belt 95, from a pulley 96 carried on the driving shaft 70, forces oil upwardly through a pipe 97 onto the pinion 91 and the gear 92, as shown in Figs. 1 and 3, the object of the oil pump 94 being to continuously lubricate the gears. A storage tank 98 is provided into which the oil from the gear case 90 is drained through a pipe 99 and from which oil is taken by the pump 94 through a pipe 100. The gear case 90 is provided with a cover 101, the pinion 91 and the gear 92 being entirely inclosed thereby.

The crank shaft 93 has five crank pins 103, 104, 105, 106, and 107 formed thereon, the crank pins 103 and 107 having the same axis, the crank pins 104 and 106 having the same axis, the crank pins 103, 104, and 105 being 120° apart. Journaled on the crank pins 103 and 107 are the outer pitmen 108 and 109, these pitmen having crank pin boxes 110 formed at the upper end thereof surrounding the crank pins 103 and 107, the lower end of the pitmen 108 and 109 having cross head pin boxes 111 formed at the lower end thereof. Intermediate pitmen 112 and 113 have crank pin boxes 114 and 115 formed at the upper end thereof surrounding the crank pins 104 and 106 respectively, the lower end of the pitmen 112 and 113 having crosshead pin boxes 116 and 117 formed thereon. An inner pitman 118 has a crank pin box 119 formed at the upper end thereof, this crank pin box surrounding the crank pin 105, the lower end of the pitman 118 having a forked end 120 on which are formed crosshead pin boxes 121 and 122.

Secured to members 65 and 66 are the inner crosshead guides 130 and 131, these guides being provided with suitable guide bars 132 and 133, the guide bars 132 and 133 being bolted to the guides 130 and 131. An upper crosshead 135 has crosshead blocks 134 sliding freely between the guides 130 and 131 and the guide bars 132 and 133 as shown in Fig. 9. The upper crosshead 135 is provided with crosshead pins 136 formed inside the blocks 134, the crosshead pin boxes 121 and 122 engaging the pins 136 and providing the driving means for raising and lowering the upper crosshead 135. The upper crosshead 135 is provided with a hole 137 through which the upper end of the inner pump rod 52 passes, an upper hook casting 138 having a hook formed thereon and being threaded on the rod 52 below the crosshead 135, a nut 139 being threaded on the pump rod 52 above the crosshead 135, thereby clamping the crosshead 135 on the rod 52 between the nut 139 and casting 138, as best shown in Fig. 3. Crosshead guides 140 and 141 are secured at their upper end to the cross members 65 and 66 and are secured at their lower ends to a cross member 142 which is secured by means of bolts 143 to side members 144 and 145 secured to lugs formed on the columns 56. Guide bars 146 and 147 are secured to the crosshead guides 140 and 141. An intermediate hook casting 150 is bolted by means of bolts 151 to the lower side of an intermediate crosshead 152, this intermediate cross head having intermediate crank pins 153 and intermediate crank pin blocks 154 formed thereon, these blocks 154 sliding between the guides 140 and 141 and their caps 146 and 147. The intermediate crosshead pin boxes 116 and 117 are journaled on the pins 153. The intermediate hook casting 150 is threaded on the intermediate pump rod 51, as shown in Fig. 3, and has a cavity formed therein in which packing material 155 is placed, this material being compressed about the inner pump rod 52 by means of a gland 156 which is forced downwardly by bolts 157. A lifting hook 158 is formed on the casting 150 for the purpose of attaching a rope sling or other supporting means thereto.

Threaded on the upper end of the outer pump rod 50 is a lower hook casting 160, this casting having an opening formed therein which is filled with packing 161 compressed by means of a gland 162 forced downwardly by means of bolts 163, the packing forming a tight closure around the intermediate pump rod 51. A lower hook 164 is formed on the casting 160 for the purpose of attaching a rope sling thereto. The casting 160 is secured by means of bolts 170 to the underside of a lower crosshead 171, this crosshead 171 having crosshead pins 172 and crosshead blocks 173 formed thereon. The blocks 173 slide between the guides 140 and 141 and the guide bars 146 and 147. The lower crosshead pin boxes 111 surround the pins 172, turning freely thereon.

The outboard bearings 75 consist of a bearing 180 having a cap 181. The lower edge of the bearing 180 has an inclined surface 182 and a wedge 183 is fitted under the bearing 180, being moved in and out by screws 184 passing through flanges 185 formed on a sub-base 186. The sub-base 186 slides on the outboard bearing support 76

whenever hold-down bolts 187 which are normally secured to the outboard bearing support 76 are removed. A tension screw 188 is rigidly secured in the sub-base 186 projecting through a lug 189 formed on the outboard bearing support 76. A nut 190 is threaded on the screw 188 and serves to draw the sub-base 186 into position.

The method of operation of the invention is as follows: The parts being connected for operation as shown in Figs. 1, 2, 3, 4, 5, 6, and 7, the loose pulley 71 is turned by the belt 72 from any suitable source of power such as an engine or a motor. Whenever it is desired to start the pump the lever 74 is moved throwing the clutch 73 into engagement, locking the pulley 71 on the driving shaft 70. The driving shaft 70 then actuates the crank shaft 93 through the pinion 91 and the gear 92, oil being continuously fed to the gear and pinion by means of the pump 94, this oil being collected in the tank 98 and recirculated by the pump 94. The rotation of the crank shaft in the direction of the arrow shown in Fig. 3 turns the crank pins 103, 104, 105, 106, and 107, and actuates the crossheads 135, 152, 171 through pitmen 108, 109, 112, 113, 118. The buckets 41, 42, and 43 are actuated through the pump rods 50, 51, and 52 according to standard practice in triplex pumps. The water rises through the water column 15 into the discharge T 16 and is discharged through the water outlet pipe 55.

Whenever it is desired to remove the rods 50, 51, and 52 and their buckets 41, 42, and 43 the following procedure is followed: The hook castings 138, 150, and 160 are disconnected from the crossheads 135, 152, and 171, and the pump rods 50, 51, and 52 are lowered into the position shown in Fig. 8. The member 142 is then disconnected from the members 144 and 145 and the holding bolts 88 and 187 and the nut 190 are removed. The operator then oscillates the bar 86, the pawls 82 being so placed that they turn the nuts 81 on the screws 80 in the same direction, pulling the pump head 60 across the pit, the frame 61 sliding on the slide rails 57. The sub-base 186 of the outboard bearing 75 slides on the outboard bearing support 76, the parts finally assuming the position shown in Fig. 8. The crosshead and crosshead guides with their connected parts move with the pump head sliding across with the frame 61 so that the alinement of the crossheads and pitmen with the head 60 is not affected by this movement. With the pump head in the position shown in Fig. 8 free access is given to the top of the well and the rods and buckets may be lifted directly upward by means of suitable tackle secured to the hooks on the hook castings 138, 150, and 160, the tackle being supported from the derrick or building which always covers deep wells of this character.

It will be noted that the crossheads 152 and 171 have a U-shape form so that they clear the pump rods passing through the center of the well, and it will be further noted that the hook castings 150 and 160 are secured to the underside of the crossheads 152 and 171 in such a manner that they can be dropped directly away whenever they are disconnected. The intermediate crosshead 152 is of such a size that the hook casting 138 passes freely through the U-shaped opening therein and the lower crosshead 171 is made of such a size that the hook casting 150 can pass freely through the U-shaped central portion thereof so that all the pump rods can be lowered into the position shown in Fig. 8 before the frame 61 is moved from its working position. When so lowered they rest upon and are supported by the discharge T and the head 60 can then be slid over. When the buckets and pump rods are replaced they are allowed to rest in the position shown in Fig. 8 and the pump head is moved into the working position by means of the screws 80 and the nuts 81, the head finally being secured in place by the hold-down bolts 88. When in this position the various rods may be raised by means of the hook castings 138, 150, and 160, and the hook castings may be connected to their crossheads so that the pump is again in operative condition.

As the frame 61 is moved over into the operating position shown in Fig. 6 from the position shown in Fig. 8 the outboard bearing 75 tends to slide along the outboard bearing support 76. This movement is, however, resisted by the tension of the belt 72 and the tension screw 188 is provided for the purpose of overcoming the tension of the belt 72 and pulling the sub-base 186 into such a position that it can be held down by the bolts 187, the nut 190 being turned on the screw 188 until the sub-base 186 is pulled into this position. The wedge 183 is provided for the purpose of raising or lowering the outboard bearing 75 when the pump is first set up. It is not necessary to make an adjustment on the wedge 183 each time that the pump head is moved, this adjustment being made permanent and only changed as the bearing wears or is rebabbitted. When the pump head is moved the bearing 75 slides back and forth without change in the adjustment of the wedge 183.

An important feature of my invention is the arrangement whereby the pump may be erected in proper relation to the bore of the well and whereby the cost of erection will be greatly reduced over that in the case of the present standard forms of pump.

The method of erecting the pump is as

follows: The pump is first accurately machined and erected in the shop on the base 30. The pump is then dismantled and taken to the well. At the well the base 30 is laid on the rough concrete floor of the pit which is somewhat lower than the level at which the final concrete floor is to be formed. The water column 15 is then lowered into the well through the central hole in the base and the discharge T 16 is screwed on the upper end of the column 15, the T and column then being lowered until the lower flange 32 of the T 16 rests in its seat on the base 30. The lower flange 32 is guided and lined up with the base 30 by the bored vertical lugs being secured to the base 30 by the bolts 33 which are then put into place and tightened up, clamping the base and T together.

The T 16 with the base and column attached are now raised off the rough floor of the pit, by suitable tackle, a suitable distance for grouting, this distance varying from one inch to two inches. The water column 15 is now hanging freely in the bore of the well and will assume as nearly a vertical position as the inclination of the well will allow. The turned flange on the bottom of the discharge T 16 in combination with the lugs 31 and bolts 33 holds the base 30 square with the water column 15, the water column being in the position it naturally assumes in the well. Concrete is now grouted in under and around the base 31 forming the permanent floor of the pit. When this concrete has set the base 30 is rigidly secured in place in its proper position in relation to the bore of the well. This method gives accurate results with ordinary labor, whereas with the old methods, even with skilled men, pumps were seldom lined perfectly with the bore of the water column. As wells are rarely exactly perpendicular this lack of alinement between the water column and the pump head resulted in undue wear to the rods, stuffing boxes and their connected parts. After the cement has properly set so that the base 30 is in the proper position the columns 56 are fastened in place, the members 142, 144, and 145 being secured thereto to support them and the slide rails 57 with their connecting members 58 and 59 being secured to the columns 56. At the same time the outboard bearing base 77 is set in place and the concrete 14 and 78 is cast about these members securely anchoring them in their proper position so that when the pump frame 61 is put into position it will be in the proper relation to the base 30 and the bore of the water column 15. The only accuracy that is required in setting up my pump is that required in squaring up the base 30 with the pump column 15, the other parts being accurately machined in the shop so that the whole pump can be erected on the base 30 without danger of the pump head being out of line with the well and the pump rods. After the members 56, 57, 58, and 59 have been secured on the base 30 and after the concrete has been cast therearound there results a practical monolithic pit, the rails 57 being accurately in position so that there is no danger whatever of the parts getting out of line. As the cost of erection of large pumps of this nature is a considerable proportion of the total expense the provision whereby the pumps may be accurately machined in the shop and erected cheaply and accurately is an important one.

My invention comprises the provision of a base 30 which can be easily and quickly squared with the bore of the water column in combination with the frame formed of the members 57, 58, and 59 on which the pump head 60 rests and means for supporting this frame from the base. By machining these members and erecting the pump thereon in the shop it is possible to greatly reduce the cost of erection in the field. The base 30 being squared with and secured in the proper relation to the bore of the water column in the field and the other parts being properly machined the pump can be cheaply and quickly put together by relatively unskilled labor without danger of being erected out of line. Claim 1 is written to cover broadly this conception, and claim 2 is written to cover this conception with the added limitation of the columns 57.

My invention further comprises the conception set forth above with added features of the concrete members 14 and 78 which are cast in place about the columns and the frame. By the use of the columns and frame I am able to quickly and accurately erect my pump and by the use of the concrete members I am able to securely anchor it in place without the use of foundation bolts or other anchorage. This results in cheaper erection and also insures a permanent and rigid construction. I have attempted to claim these features in claim 3.

My invention further comprises the means I employ to make connection and disconnection of the rods and crossheads a simple matter. For example, the U-shaped crosshead and the means for securing the hook castings to the under side so that the rods can be dropped away without disturbing the alinement of the crossheads with the pump head the U-shaped openings being large enough to allow the hook castings to drop through as set forth in claim 4.

My invention further comprises the hooks for supporting the rods and particularly comprises the hooks located as specified in claim 5. This location with relation to the

opening in the crossheads is essential to the result desired.

My invention further comprises a sliding pump head to which the crosshead guides are secured, in combination with pump rods and means for disconnecting the pump rods without disturbing the crosshead alinement as set forth in claim 6.

My invention further comprises the conception embodied in claim 6 with the added feature that the crossheads, guides, and pump head can be slid across the pit as a unit, as set forth in claim 7.

My invention further consists broadly of a sliding head and means for sliding in combination with means for accurately and securely locking the head in place in its operative position as set forth in claim 8.

My invention further comprises the broad conception of a pit, a pump head sliding above said pit and cross head guides fixed to said head and sliding therewith and projecting into the pit as set forth in claim 9. By this construction a very compact and stable structure is produced.

I claim as my invention:

1. In a deep well pump having a water column and a pit formed about the upper end thereof the combination of a base squared with the axis of the water column and located at the bottom of the pit, an upper frame surrounding the mouth of the pit and adapted to support the pump head, a series of columns resting on said base and supporting said frame, and a concrete member forming the wall and floor of the pit, said concrete member being cast about said base, said columns, and frame after said base, said columns, and said frame have been erected in their proper positions.

2. In a deep well pump having a series of concentric pump rods the combination of crossheads having a U-shaped opening therein and hook castings secured to each pump rod and secured to the under side of one of said crossheads, the U-shaped openings in each of said crossheads being of sufficient size to allow hook castings that are normally located above the crosshead to pass freely through the U-shaped openings in the crossheads while the crossheads are in their normal position.

3. In a deep well pump having a series of concentric pump rods the combination of crossheads having a U-shaped opening therein and hook castings secured to each pump rod and secured to the under side of one of said crossheads, the U-shaped openings in each of said crossheads being of sufficient size to allow hook castings that are normally located above the crosshead to pass freely through the U-shaped openings in the crossheads while the crossheads are in their normal position, each of said hook castings having a hook formed thereon, said hook pointing away from the crosshead to which the hook casting is secured.

4. In a deep well pump the combination of a pump head slidably mounted above a pit, crossheads, crosshead guides in which said crossheads slide, said guides being secured to and moving with said head, a water column, buckets in said water column, a series of concentric pump rods each secured to one of said buckets, and means for securing said pump rods to said crossheads so that said pump rods can be disconnected from said crossheads and lowered into a position where they can be supported from said water column without moving the pump head, the crossheads, or the crosshead guides from their operating position.

5. In a deep well pump the combination of a pump head slidably mounted above a pit, crossheads, crosshead guides in which said crossheads slide, said guides being secured to and moving with said head, a water column, buckets in said water column, a series of concentric pump rods each secured to one of said buckets, and means for securing said pump rods to said crossheads so that said pump rods can be disconnected from said crossheads and lowered into a position where they can be supported from said water column without moving the pump head, the crossheads, or the crosshead guides from their operating position, said crossheads having openings therein which normally encircle the pump rods and which are so located that the pump head, the crosshead guides, and the crossheads can be slid as a unit across the mouth of the pit to give access to the pump rods when said pump rods have been disconnected.

In testimony whereof, I have hereunto set my hand at Pomona, California, this 1st day of May, 1915.

FRED A. DEW.