

No. 879,560.

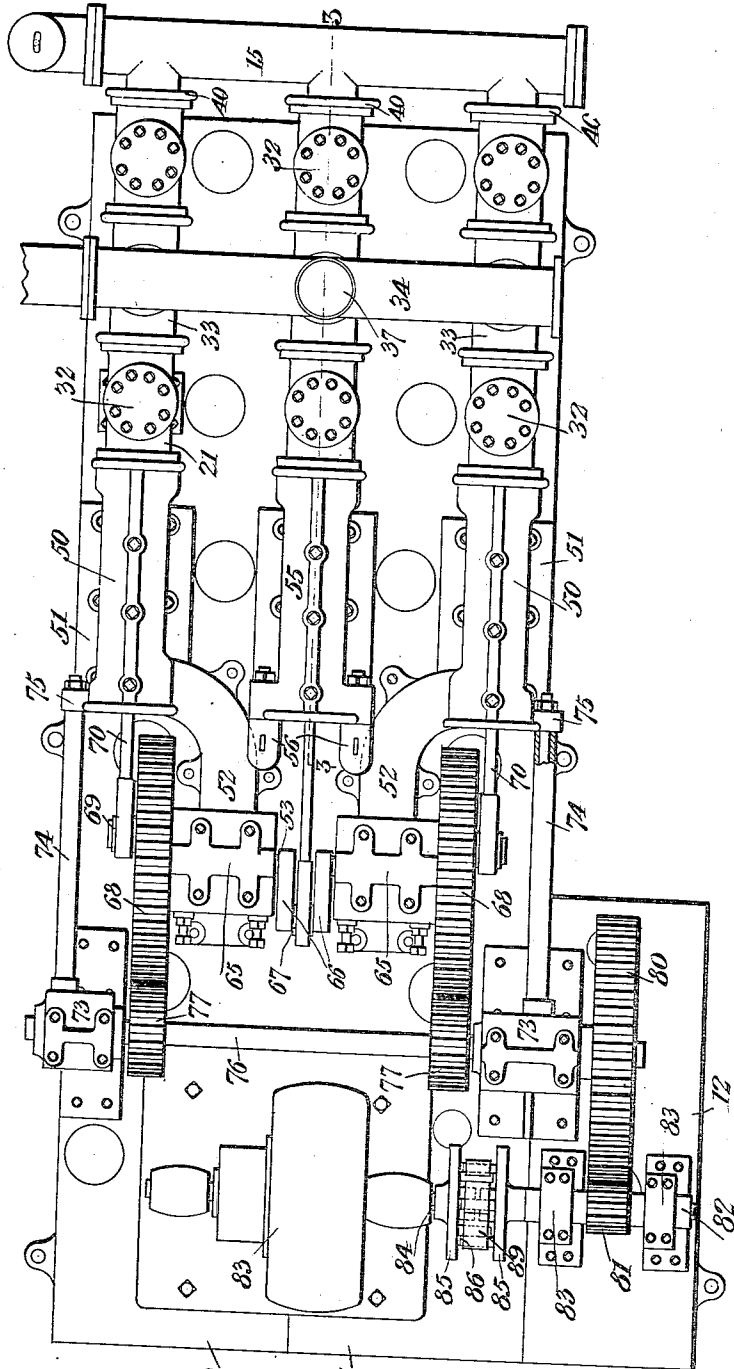
D. F. LEPLEY.
TRIPLEX PUMP.

PATENTED FEB. 18, 1908.

APPLICATION FILED OCT. 5, 1906.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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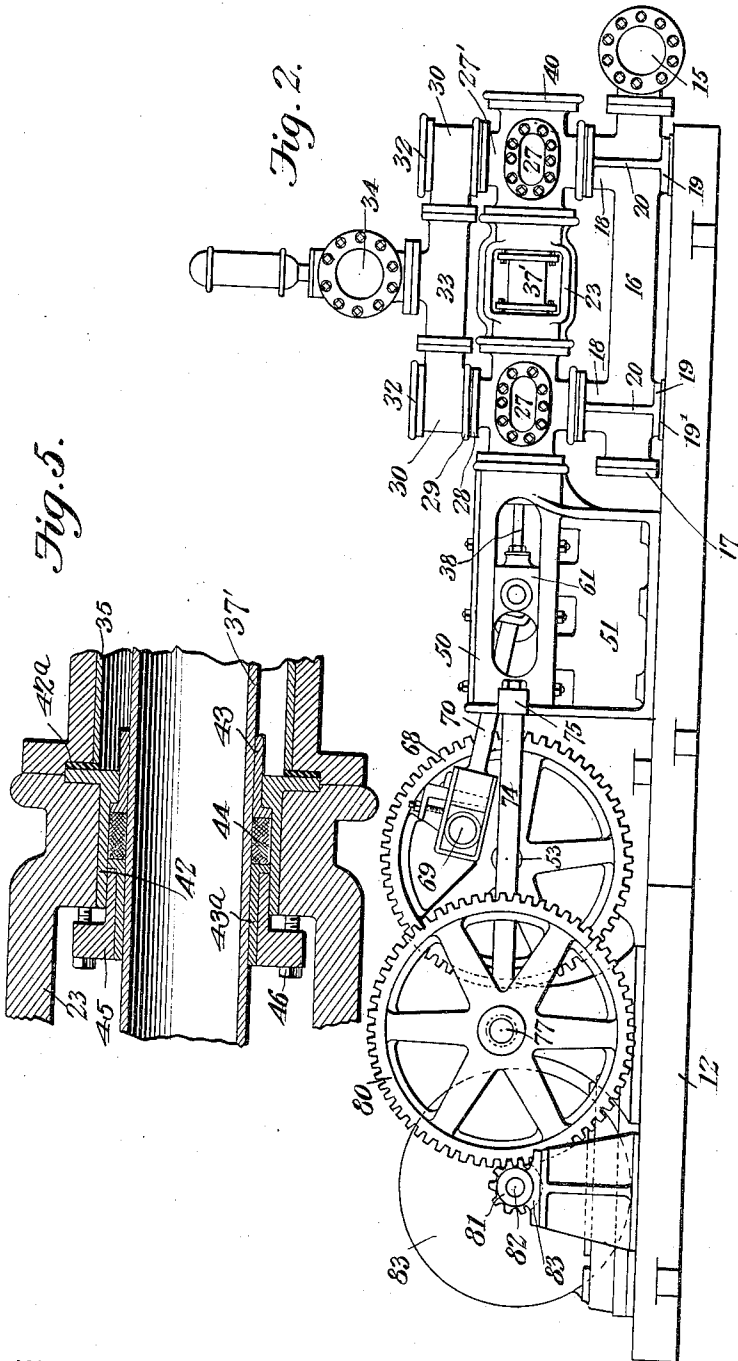
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4 SHEETS—SHEET 2.



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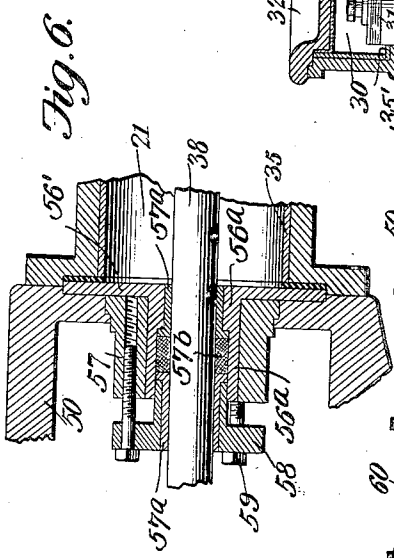
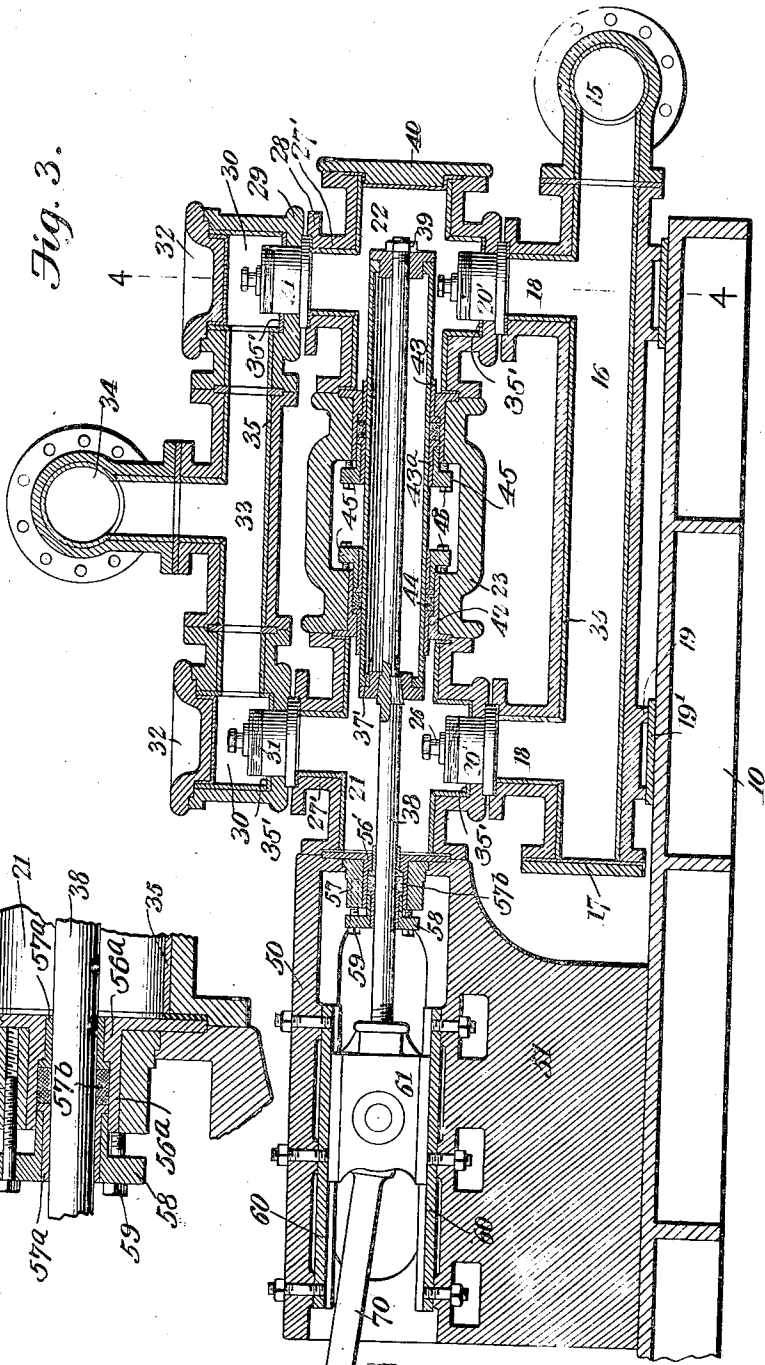
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4 SHEETS—SHEET 3.



Witnesses
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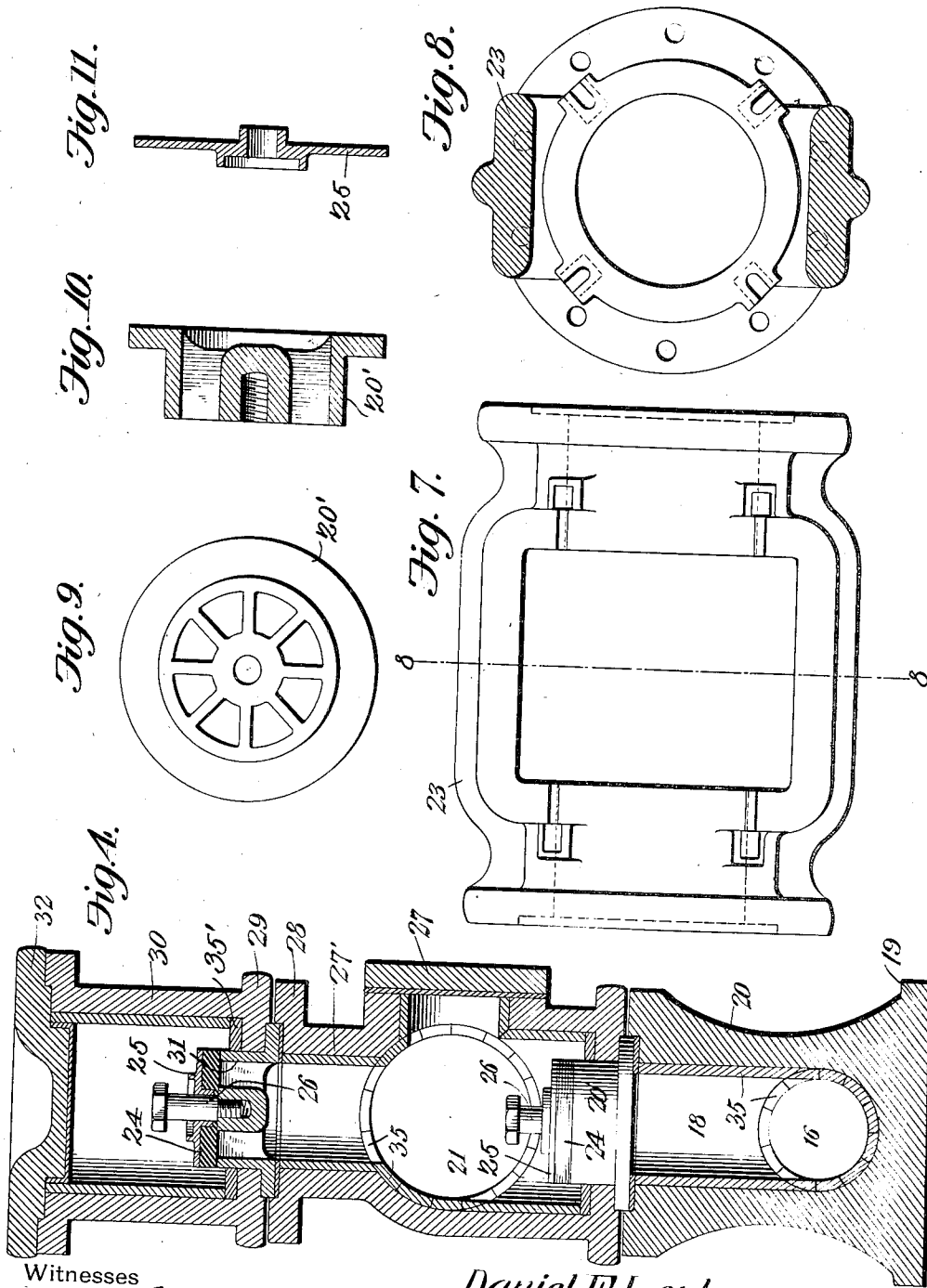
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PATENTED FEB. 18, 1908.

APPLICATION FILED OCT. 5, 1905.

4 SHEETS—SHEET 4.



Witnesses
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UNITED STATES PATENT OFFICE.

DANIEL F. LEPLEY, OF CONNELLSVILLE, PENNSYLVANIA.

TRIPLEX PUMP.

No. 879,560.

Specification of Letters Patent.

Patented Feb. 18, 1908.

Application filed October 5, 1905. Serial No. 281,516.

To all whom it may concern:

Be it known that I, DANIEL F. LEPLEY, a citizen of the United States, residing at Conneltsville, in the county of Fayette and State of Pennsylvania, have invented a new and useful Triplex Pump, of which the following is a specification.

This invention relates to the construction of pumps, and has for its principal object to provide an improved mine pump of the triplex type.

One of the principal objects of the invention is to provide a triplex pump in which all of the working parts are conveniently accessible, so that all necessary adjustment of the plungers, stuffing boxes, glands, valves, cross heads, connecting rods, and bearings may be made with perfect safety while the pump is in motion, and any worn or broken part may be readily renewed in the shortest possible time, and without the necessity of removal to a repair shop.

A further object of the invention is to provide a pump which may be installed at moderate expense and in which the space occupied is comparatively small, thus obviating the necessity of extensive and costly excavations and foundations within the mine, while still reserving all the space necessary between the pumps and around the various parts to admit of the free and unobstructed use of any tools or other appliances necessary for the installation of the pump in the mine, or the hurried removal and replacement of any part of the pump when necessary, and further to so construct and arrange the parts that those requiring the greatest amount of care and attention are the most accessible, and so that any part may be replaced by dismantling of the least number of its connecting members.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1

is a plan view of a triplex mine pump constructed in accordance with the invention. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical section of a portion of the pump on the line 3—3 of Fig. 1, the view being on an enlarged scale. Fig. 4 is a vertical section through one of the pumps on the line 4—4 of Fig. 3. Fig. 5 is a detail sectional view through the end portion of one of the cylinders, showing the bushings and stuffing box. Fig. 6 is a similar view showing the arrangement of the bushings and stuffing box around the plunger rod. Fig. 7 is a detail view of a center piece which is employed between the pumping cylinders of each pair and carries the bushings and stuffing boxes of both cylinders. Fig. 8 is a transverse sectional view of the same on the line 8—8 of Fig. 7. Fig. 9 is a plan view of one of the valve seats detached. Fig. 10 is a sectional view of one of the valve seats. Fig. 11 is a detail sectional view of one of the packing ring carrying disks detached.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

Mine pumps are in a class distinct from pumps employed for other purposes. Situated usually in the lower level of the mine, and working continuously, they are exposed to the action of corrosive elements in the mine water, and cannot be shut down for adjustment or repairs with any degree of safety, owing to the danger of flooding the mine. It is of the first importance, therefore, that all of the parts of the pump be readily accessible for adjustment while the pump is running, and that the parts exposed to the greatest wear be so arranged as to permit ready renewal in case of breakage or excessive wear. All of these features have been carefully considered in the construction of the pump forming the subject of the present invention.

The base or sole plate of the pump is formed of three sections, 10, 11 and 12 which are planed, and securely bolted together lengthwise, to secure and retain alinement, the sectional character of the plate permitting its convenient handling and transportation into the mine. All of the parts of the pump, together with the electric motor which operates the same, are rigidly secured to this plate in order to obtain rigid

and permanent alinement with the various operating parts. At the water end of the pump is arranged a main suction inlet pipe 15, from which lead three individual suction pipes 16 arranged in parallel relation, and at equal distances apart. These pipes are formed of cast metal, and each pipe is provided at one end with a closing cap 17, and at points near each end are vertically arranged elbows 18, leading to the pumping cylinders. At points immediately below and in vertical alinement with the elbows are bolting flanges 19 that are secured in the sole plate, the structure being reinforced by suitable strengthening ribs 20. Between the bolting flanges 19 and the sole plate are arranged liners 19', so that when necessary either end of the suction pipe may be unbolted, and by knocking out the liner the end of the pipe can be dropped a sufficient distance to clear it, and then swung laterally to one side or the other for the purpose of removing the suction inlet valves and their seats.

Each pair of water cylinders 21 and 22 is connected by a center piece 23, and the cylinders are duplicates of each other, and are interchangeable, so that a damaged cylinder may be readily removed, if necessary. These cylinders are mere unfinished castings, planed at the ends, but without any expensive stuffing box, valve, or other fittings, so that in case of breakage from water hammer or other cause they may be quickly and cheaply replaced. All of the bushings, stuffing box members, and like portions of the pump which must be finished at considerable expense are carried by the center piece, and as the latter is not subjected to shock or jar, and is not likely to be broken, it is found much more convenient and economical to arrange the parts in this manner, and employ cylinders that may be replaced at very small cost.

Between the lower bolting flange of each cylinder and the flange of the adjacent elbow is arranged a suction inlet valve seat 20', the valve seat having a projecting flange which fits in recesses formed in both of the bolting flanges in order to secure rigid and permanent alinement, and a packing gasket is, also, introduced on one or on both sides of the flange to prevent leakage between the castings and the seat: It will be noted that the recess formed in the flange of the elbow 18 is of less depth than the thickness of the liner 19', so that when the latter is removed, the suction inlet pipe may be dropped down clear of the valve seat, and then swung around, so that the valve seat can be taken out for examination or repair. The valve proper is in the form of a disk of vulcanized rubber 24 on which is a bronze valve plate 25, the latter being guided by a vertically disposed bronze valve stem 26.

In one side of each cylinder is a small man-hole, normally closed by a cover 27 that may be readily removed in order to gain access to the valve in case it is not necessary to remove or detach the suction inlet pipe.

The top of each water cylinder has a discharge neck 27', provided with a bolting flange 28 that is secured to the bolting flange 29 of a valve chamber 30, the latter being arranged to contain a valve seat 31 of a construction similar to the suction valve, and the adjacent bolting flanges being both recessed in order to receive the valve seat flange. The tops of the chambers 30 are provided with detachable covers 32 that are bolted in place and may be readily removed when it is necessary to gain access to the discharge valves, or the chambers as a whole may be unbolted in case it is necessary to remove the valve seat and valve. The two valve chambers 30 are connected by a T 33 to a discharge pipe 34, and the latter is provided with a compressed air chamber 37 that is common to all three sets of cylinders.

The main suction pipe, the individual suction pipes, the water cylinders, the upper valve chambers, the discharge section, and the main delivery pipe connected thereto are all lined throughout with wood, the wooden linings 35 being formed of strips, the edges of which are planed to a bevel corresponding to the radius of the inside diameter of the various castings in which they are fitted, and securely keyed within said castings so as to make them practically water tight. The ends of the strips are trimmed off flush with the planed surfaces of the sections, so that the sheet gum gaskets used between the various bolting flanges will, also, be pinched between the abutting edges of the wood where exposed, so as to prevent water passing through the joints and gaining access to the surface of the casings back of the wood linings.

In lining the castings around the valve seats, wooden rings 35' are first placed in position around the valve seats before the main lining strips are inserted, and the cap members or covers are provided with facings of lead in order to resist the action of the acidulous water.

Fitting within each pair of water cylinders is a hollow bronze plunger 37' that is rigidly secured to a piston rod 38 extending the entire length of the plunger, the inner end of the latter being secured to the rod by fitting against the tapered enlargement of said rod, while the outer end is secured by a heavy nut 39 which is accessible for examination or renewal by the removal of the blank cylinder head 40 on the outer end of the cylinder 22.

Each plunger fits within the two cylinders and passes through stuffing boxes arranged at the adjacent ends of said cylinders.

The plunger is passed through suitable

bushings 42 that are held in place between the end of the cylinder and the adjacent end of the center piece 23. In order to insure permanent and rigid alinement of this portion of the device the bolting flanges of both the cylinder and the central section 23 are recessed for the reception of the annular flange of the bushing, the diameters of the recesses corresponding approximately to the diameter of the flange, so that the latter will be rigidly held in place. Between the outer face of the cylinder and the recess at the end of the cylinder is arranged a gum gasket 42^a in order to prevent access of the mine water between the flange and the castings.

The outer end of the bushing is counter-bored to form a packing space, and at the base of this packing space is inserted a flanged wear ring 43 which encircles the plunger and may be readily removed when worn. The packing 44 is held in place by a flanged ring 43^a that extends around the plunger, the flanged end of the ring bearing against the packing and being held in place by a suitable gland 45 that may be tightened by bolts 46, the T heads of which are inserted in suitable recesses formed in the outer face of the section 23.

It will be seen that the stuffing boxes, bushings and portions exposed to wear, and especially those portions which, from the necessity of finishing, are expensive, are all carried by the removable central section 23 and are wholly independent from the pumping cylinders, the latter being normally rough castings which are finished only at the bolting flanges. The cylinders are more or less likely to break from water hammer, or other cause, and may be renewed at comparatively small cost, while the center piece which carries the more expensive portions of the fittings is not exposed to shock or jar to any considerable extent, and is not likely to be broken. There is sufficient space between the adjacent ends of the glands to permit the removal of either gland for the renewal of packing, or to permit the renewal of either of the wear rings 43-43^a. The bushings may likewise be renewed, but this will seldom, if ever, be necessary. The cross head guides 50 of the outer sets of pumps are provided with heavy cast iron base members 51 that are bolted to the sole plate, and each is provided with a heavy extension trunk bed 52 on the outer end of which is cast a pillow box for the reception of the crank shaft 53, the pump extension being, also, bolted to the sole plate. The cross head guide 55 of the center pump is provided with a heavy base that is secured to the sole plate, and with extension lugs 56 that are bolted to the trunk bed 52 of the outer guides, all of said guide sections being thus rigidly held in place, and in proper position with respect to the pillow blocks.

The inner ends of the guide sections are bolted to the bolting flanges of the cylinders 21 and both the guide sections and the cylinder flanges are provided with recesses for the reception of the flange 56' of a bushing 56^a. Surrounding the bushing is a bolting ring 57 having a flanged inner end that is arranged in a recess at the end of the guide section 50 and is held in place by the flange 56' when the parts are bolted together. This bolting ring is provided with openings for the reception of the bolts 59 of a gland 58, and in turning these bolts, it frequently happens that one will be broken off within the bolting ring. In such case, the parts may be detached to permit the insertion of a new bolting ring at small expense. The bushing 56^a is counter-bored for the reception of a flanged wear ring 57^a that surrounds the plunger rod 38, and which forms the inner seat for a packing 57^b that is confined in place by a flanged wear ring 57^c, also; surrounding the plunger rod. This ring 57^c is engaged by the gland and forced against the packing for the purpose of compressing the same. It will be seen that these parts of the pump are wholly independent of the water cylinder and may be readily renewed when worn or broken.

The guide sections are provided with wear plates 60 for the reception of the cross heads 61, and the wear plates are preferably concaved in cross section to receive the correspondingly curved outer face of the cross heads and thereby permit a certain amount of rotation within the guides and relieve the connecting rod and pin of any torsional strain that may be ultimately produced by reason of unequal wear of the pillow box bearings. The main or crank shaft 53 is mounted in the pillow box bearings 65, the latter being spaced for the reception of the crank arm 66 that carries the central crank pin 67, and to the outer ends of the crank shaft are secured gears 68 that carry crank pins 69, the several crank pins being arranged at one hundred and twenty degrees from each other, and being connected to the cross heads by rods 70. The center crank arms 67 are so arranged as to occupy the entire space between the two pillow boxes 65, and thus prevent endwise movement of the shaft.

To the base or sole plate is secured a pair of stand pillow boxes 73 which are further supported by rods 74 extending between the boxes, and lugs 75 that project from the outside cross head guides. These pillow boxes form supports for a counter-shaft 76 that is provided with a pair of pinions 77, intermeshing with the gear 68, and these parts are made of such strength that in the event of breakage of one set of gears, the other set will be sufficient to drive the main crank shaft. To the outer end of the crank shaft is secured a gear 80 that intermeshes with a pinion 81, on

a shaft 82, mounted in pillow boxes 83 secured to the section 12 of the sole plate.

Secured to, but insulated from the sole plate, is a slow speed electric motor 83, the armature shaft 84 of which is in axial alignment with the shaft 82. The adjacent ends of these shafts are provided with disks 85, and each disk carries an annular series of projecting pins 86, one set of pins fitting within the other, and the two sets being connected by a flexible belt 89 which may be formed of leather or other non-conducting material, the drive connection so formed being sufficient to absorb all shock, and at the same time prevent the grounding of the circuit through the frame of the pump.

At the water end of the pump the several sets of cylinders are elevated from the bed plate, and are arranged at such distances from each other that the attendant may freely pass between them and adjust any part of the mechanism while the pump is in motion, and any part of the pump may be readily examined and repairs or renewals of parts may be effected in the shortest possible time, those parts most exposed being readily disconnected and renewed without dismantling any of the other parts of the pump.

Having thus described the invention, what is claimed is:—

1. In a triplex pump, three pairs of pumping cylinders arranged in parallel relation and separated from each other to form clear working spaces between and around the cylinders, a sole plate, and suction inlet pipes supported by the sole plate and extending under and forming supports for the several pumping cylinders.

2. In a triplex pump, three pairs of pumping cylinders arranged side by side in parallel relation, suction inlet pipes extending under the cylinders and forming elevating supports therefor, the inlet pipes being parallel with the longitudinal axes of the cylinders to afford unobstructed working spaces between them.

3. In a triplex pump, three pairs of pumping cylinders arranged side by side and separated to form clear working spaces, a separate base for each pair of cylinders, said base being formed by the suction inlet pipe leading to said cylinders, the inlet pipes being

detachable from the cylinders and movable laterally to release the valve seats.

4. In a triplex pump, a plurality of pumping cylinders arranged in pairs and separated from each other to form clear working spaces around them, a sole plate, suction inlet pipes arranged under the cylinders and forming the sole supports therefor, the suction inlet valves of the pumps being disposed between said suction pipes and the cylinders, and liners disposed between the bottoms of the pipes and the sole plate to permit dropping of the pipes and their lateral movement to free the valve seats.

5. In a pump, a pair of alining cylinders, a center piece connecting them, the center piece and cylinders having bolting flanges, both of which are recessed, bushings having annular flanges confined in said recesses, said bushings being counter-bored to form packing spaces, wear rings and packing members arranged within said packing spaces to permit the ready renewal without detaching the bushing, and glands engaging the outer wear ring and serving to compress the packing.

6. In a pump, the combination with a cylinder having an end bolting flange, of a cross head guide to which the flange is secured, the end of the guide and the flange being recessed, a bushing having a flange confined within said recesses, a bolting ring extending through an opening formed in the guide member and partly held in place by the bushing, said bolting ring being provided with threaded openings for the reception of the gland bolts wear rings, and a packing arranged within the bushing, and a gland bearing against the outermost wear ring and held in place by the bolts.

7. The combination in a pump, of a cylinder, a plunger, a plunger rod, a stuffing box for said plunger rod, a gland for holding the packing under pressure in said box, and a separate detachable ring having threaded openings for the reception of the gland bolts.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

DANIEL F. LEPLEY.

Witnesses:

JNO. E. PARKER,
J. ROSS COLHOUN.