

Feb. 7, 1956

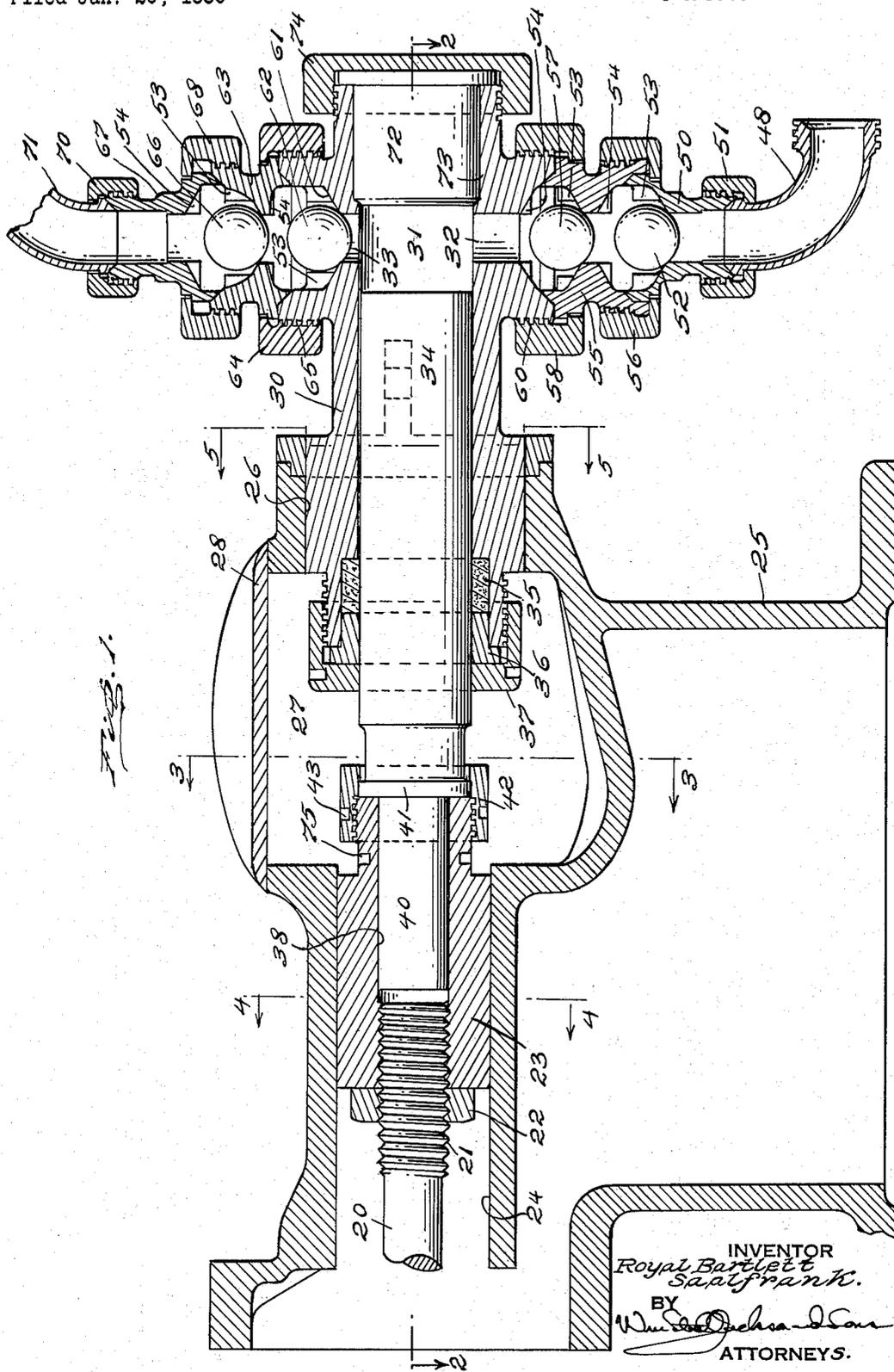
R. B. SAALFRANK

2,733,664

PUMP WITH FACILITIES FOR CLEANING

Filed Jan. 20, 1950

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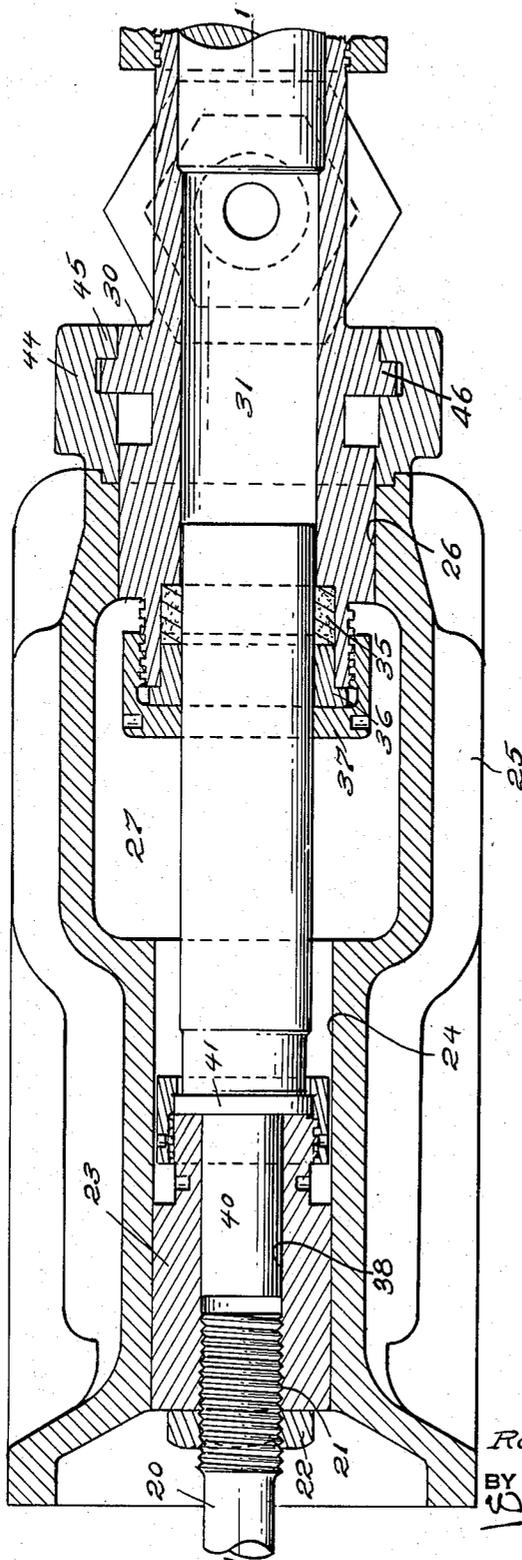
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FIG. 2.



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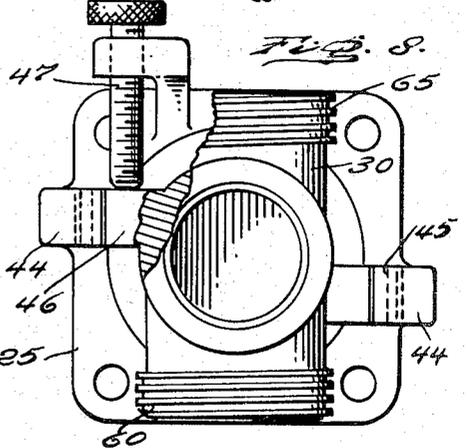
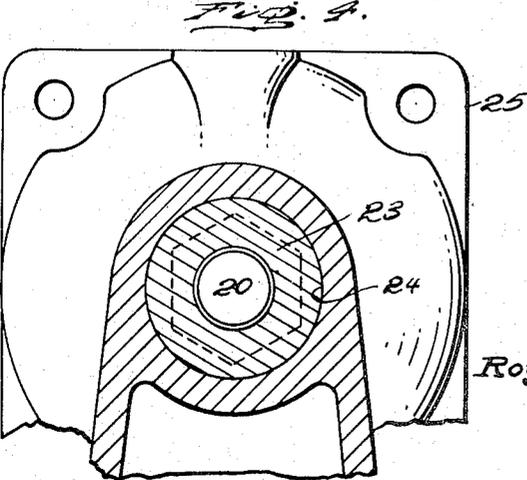
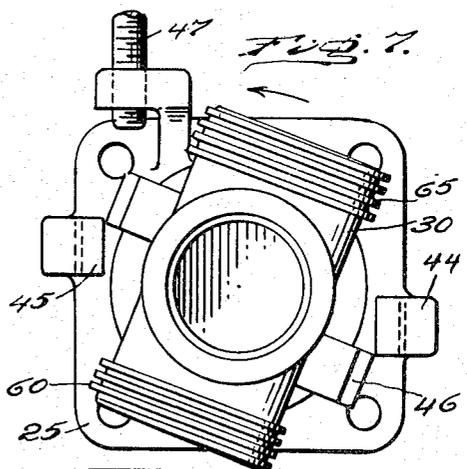
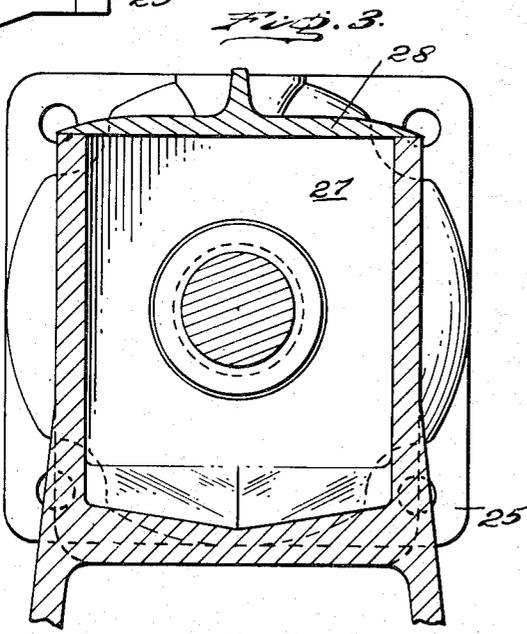
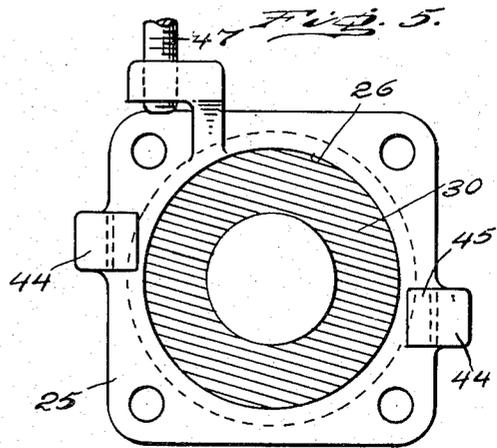
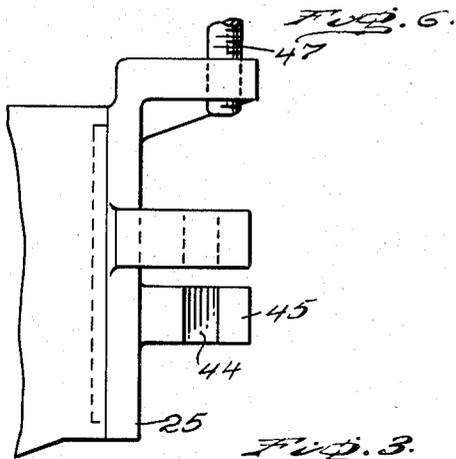
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PUMP WITH FACILITIES FOR CLEANING

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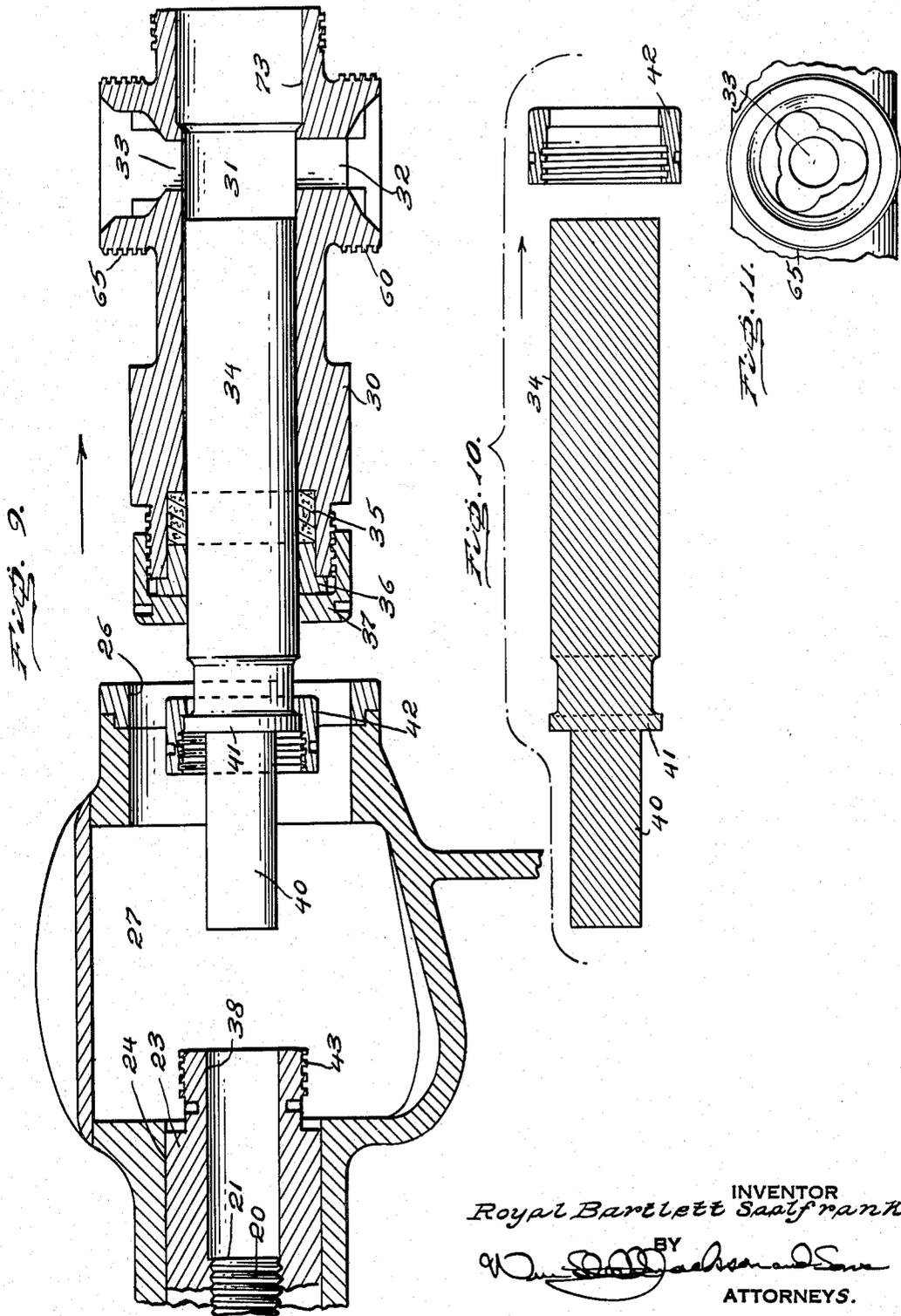
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Filed Jan. 20, 1950

4 Sheets-Sheet 4



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2,733,664

**PUMP WITH FACILITIES FOR CLEANING**

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Application January 20, 1950, Serial No. 139,625

4 Claims. (Cl. 103—153)

The present invention relates to a pump of the character which is suitable for proportional feeding or other pumping of foods and sludges and slurries.

The present application has been divided and the pump valve assembly combination is embodied in my divisional application, Serial No. 251,660, filed October 17, 1951, for Pump with Facilities for Cleaning.

A purpose of the invention is to facilitate disassembly of the pump and its valves for the purpose of cleaning and sterilizing.

A further purpose is to permit removal of the cylinder and piston bodily from the frame in the direction axially of the cross head and away from the motor.

A further purpose is to provide quick removable connections between the cylinder and the frame and between the piston and the crosshead.

A further purpose is to insert a removable filler in the cylinder at the end opposite the piston for inspection and cleaning.

A further purpose is to make up the inlet and outlet valves of units having successively larger outside diameters as the cylinder is approached, joining each unit to the next by a nut which is large enough in inside diameter to pass around all units beyond it when the nut beyond it is removed.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate one only of the numerous embodiments in which my invention may appear, selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a fragmentary vertical section of the pump in accordance with the invention, the section being taken on the line 1—1 of Figure 2. A portion of the outlet fitting is broken away and the motor is eliminated.

Figure 2 is a horizontal section of Figure 1 on the line 2—2, breaking away the closure cap at the end of the cylinder.

Figure 3 is a transverse section of Figure 1 on the line 3—3.

Figure 4 is a transverse section of Figure 1 on the line 4—4.

Figure 5 is a transverse section of Figure 1 on the line 5—5.

Figure 6 is a fragmentary elevation of the pump of Figure 1 showing the locking lugs and fastening screw.

Figures 7 and 8 are right end elevations of the frame and cylinder, omitting the valve fittings and showing the steps of interlocking the pump cylinder to the frame, Figure 8 being broken away to illustrate the fastening more completely.

Figure 9 is a fragmentary vertical section corresponding to Figure 1 and showing the partial disassembly of the parts.

Figure 10 is a detail axial section of the piston and its crosshead locking nut showing the disassembly of the same.

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Figure 11 is a detail top plan of one of the valve seats, being typical of the various seats.

Describing in illustration but not in limitation and referring to the drawings:

For many applications, especially in the food industries, as for example for pumping and metering milk, custard, ice cream mix, pie filling and beverages, and also in the case of chemical and industrial sludges, slurries and viscous fluids, it is necessary to be able to disassemble a pump readily and in some cases sterilize and inspect the surfaces of the parts.

The present invention is concerned particularly with a positive displacement pump suitable for the above purposes and unusually convenient from the standpoint of disassembly, cleaning, sterilizing and reassembly. In the pump of the present invention, the cylinder and piston are readily disconnected from the crosshead and, with the supporting valve, are bodily removable from the frame, motor and crosshead.

The construction is entirely free from recesses and pockets where food could accumulate or where air bubbles could collect.

The end of the cylinder remote from the piston is readily opened for examination or partial cleaning.

The various inlet and outlet valves are made from separable units interconnected by nuts and the successive nuts toward the cylinder are each larger than the preceding by an amount sufficient to permit removal over the outsides of the parts located beyond (away from the cylinder).

The pump is driven in any suitable manner as by an electric motor, an air motor or a thruster, which in any case produces reciprocation of driving rod which is adjustably interconnected by threads and lock nut with crosshead reciprocating in crosshead guides of frame.

In line with the axis of the crosshead is an opening which is beyond a well closed by a removable cover.

The opening is desirably circular and receives a cooperating circular flange of pump cylinder having a pump chamber provided with an inlet port at the bottom and an outlet port at the top preferably in line near one end of the cylinder. The chamber is desirably cylindrical as shown.

Piston or plunger is positioned in the cylinder in line with the axis of the crosshead and desirably occupies substantially the entire cylindrical cross section of the cylinder. At the end of the cylinder toward the crosshead, packing is provided around the piston, compressed by gland through packing nut.

The crosshead has an axial internal bore directed toward the cylinder which receives a cylindrical extension on the piston. The piston, at the point where the extension joins the enlarged cross section, has an annular shoulder slightly larger than the portion of the piston which extends into the cylinder, which is engaged by spanner nut which screws on threads at the end of the crosshead toward the cylinder.

At the mouth of opening the frame carries locking lugs which have jaw portions and are located off-center respectively one above and one below the axis (Figures 5 to 8). The cylinder immediately beyond the mouth of the opening carries locking abutments best seen in Figures 7 and 8, which engage against lugs and behind jaw projections. The abutments are offset from the axis in the same way as the lugs. The lugs and abutments together form a quick locking connection. To hold the quick locking connection in place, a thumb screw mounted tangentially on the frame engages one of the abutments and urges it in the locking direction.

The liquid end of the pump is completely free from any

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recesses or pockets where food or where bubbles could collect.

Inlet occurs through an inlet fitting 48 which engages first inlet valve seat 50 and is secured thereto by a standard sanitary connection nut 51 engaging threads on the seat and pressing together liquid sealing surfaces on the fitting and seat. First inlet check valve 52 rests on first inlet valve seat 50, and is maintained central by centering lugs 53, and limited in upward travel by limiting lugs 54 on the lower portion of second inlet valve seat 55. The first inlet valve seat 50 is connected with the second inlet valve seat 55 by a standard sanitary connection nut 56 engaging threads on the second inlet valve seat and urging together liquid sealing surfaces between the first and second inlet valve seats. The inside diameter of the connection nut 56 is larger than all portions of the first inlet valve seat 50 beyond nut 56, so that nut 56 can be slipped off readily when nut 51 has been removed.

Second inlet valve seat 55 carries a second inlet check valve 57 thereon which is centered by centering lugs 53 and limited by limiting lugs 54 on the bottom of the cylinder. The second inlet valve seat 55 interconnects with the cylinder around inlet port 32 by liquid sealing surfaces and is secured thereto by standard sanitary connection nut 58 engaging threads 60 and larger in inside diameter than the outside diameter of all portions of the second inlet valve seat beyond it and larger than the outside diameter of the first inlet valve seat so that when nut 56 is removed nut 58 can readily be slipped off after fitting 48 is detached.

The outlet port 33 of the pump connects with seat 61 of first outlet check valve 62, the seat being desirably integral with the cylinder. The check valve 62 is centered by lugs 53 and limited by limiting lugs 54 on second outlet valve seat 63 which interconnects with the cylinder by liquid sealing surfaces and is attached thereto by standard sanitary connection nut 64 engaging threads 65 on the top of the cylinder.

Second outlet check valve 66 in seat 63 is centered and limited respectively by the lugs 53 and 54 and its seat 63 interconnects to outlet adaptor 67 by liquid sealing surfaces and is held in interconnecting relationship by standard sanitary nut 68 engaging threads on seat 63. Outlet adaptor 67 interconnects by liquid sealing surfaces and standard sanitary connection nut 70 with outlet fitting 71, the nut engaging threads on the outlet adaptor. Second outlet valve seat 63 beyond nut 64 and outlet adaptor 67 are smaller than the inside of nut 64 so that when nut 68 is removed nut 65 can be slipped off. Likewise outlet adaptor 67 beyond nut 68 is externally smaller than the internal diameter of nut 68 so that when nut 70 is unscrewed nut 68 can be slipped off.

It is thus possible to assemble the inlet and outlet valves from their components by starting first with the components closest to the cylinder and to disassemble in reverse order.

It will be evident that all valves and connecting passages are preferably vertical in straight line relation.

The end of cylinder 30 remote from the piston is closed by filler 72 which enters in an enlarged bore 73 of the cylinder to a position close to the inlet and outlet ports. Filler 72 is held in place by nut 73 engaging threads at the end.

In operation, the crosshead normally is permanently secured to the reciprocating rod 20, but can be adjusted by applying a spanner wrench to openings 75 in the crosshead when in the position of Figure 1 near the right hand limit of the stroke, having first released lock nut 22 when the parts are in the position of Figure 2 near the left hand end of the stroke.

The valve components may be preassembled on the cylinder or assembled after the cylinder and piston are connected to the frame and crosshead respectively.

The piston attaching nut 42 is slipped on the piston and against the shoulder and the piston is inserted through

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the packing into the cylinder. The cylinder and the piston are then brought in through the opening 26 in the direction opposite to the arrow of Figure 9 and the extension 40 of the piston is brought into the recess 38 of the crosshead until the shoulder 41 engages the end of the crosshead. With the crosshead at the right hand end of its stroke as in Figure 1, the nut 42 is then tightened by a spanner wrench in the well 27, access being gained by removing the cover 28.

The cylinder is pushed toward the crosshead and, with its abutments 46 angularly offset respectively above and below the lugs 44 in the position of Figure 7, is pushed on until the abutments engage on the end of the frame around the opening 26. The cylinder is then rotated counterclockwise in the position of Figure 7 (as shown by the arrow) until the ends of the abutments 46 engage under the clamping jaws 45 of the lugs 44 and the ends of the abutments cannot move any farther counterclockwise because of their contact with the lugs as shown in Figure 8. The thumb screw 47 is then turned down to the position of Figure 8, locking the abutments in engagement with the lugs and holding the cylinder against withdrawal.

Assuming the liquid end of the pump has not been assembled previously this is now assembled. The filler 72 is inserted in the bore 73 and nut 74 is screwed on the crossheads at the end of the cylinder.

The inlet valves are assembled in the following order. Second inlet valve 57 is placed in its seat 55 and the sealing surfaces are brought in contact with the sealing surfaces adjoining inlet port 32. Connection nut 58 is then screwed home and tightened on threads 60. First inlet valve 52 is then inserted in first inlet valve seat 50 and the liquid sealing edges brought into contact, and connection nut 56 screwed home on the threads on the second inlet valve seat. Then nut 51 is tightened to secure inlet fitting 48, which is in turn connected to the inlet piping.

On the outlet side, first outlet valve 62 is placed in first outlet valve seat 61 and second outlet valve seat 63 is placed on top, bringing the liquid sealing surfaces into contact. Connection nut 64 is then screwed home on threads 65. Second outlet valve 66 is then inserted in second outlet valve seat 63, and outlet adaptor 67 is placed on top with the liquid sealing surfaces in contact and connection nut 68 screwed home, after which outlet fitting 71 is brought into contact at the top of the adaptor and locking nut 70 is screwed down on the thread on the adaptor.

In order to inspect or partially clean the pump it is not necessary to disassemble the valves, nut 74 merely being removed and filler 72 taken out.

In order to completely clean the pump, the reverse process of assembly can be carried out, removing first the smaller and then the larger connection nuts on the inlet and outlet side to disassemble the valve components, releasing piston crosshead locking nut 42, and loosening thumb screw 47 and swinging the cylinder to the position of Figure 7 and pulling the cylinder and piston out longitudinally through opening 26.

The piston can then be pulled out through the packing and when the piston is removed the piston crosshead locking nut 42 is slipped off the piston by motion toward the end of the piston remote from the crosshead.

The separate components can individually be cleaned, including brushing, wiping, sterilizing and the like, followed by any desired inspection before reassembly.

In the form shown, the check valves are of ball formation, and while this construction is preferred, it will be understood that any other suitable form may be used.

In the embodiment shown, the check valves have gravity return, and for ordinary purposes it is considered that spring return is not necessary.

It will be evident that the construction of the liquid end throughout is such that all passages progressively provide upward streamline flow, without recesses or pockets in which food could be trapped or bubbles might collect.

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In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they may fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A pump having a frame, crosshead guides in the frame and a crosshead, reciprocal back and forth in the crosshead guides, the frame having a clear opening in one direction in line with the crosshead, in combination with a cylinder in line with the crosshead extending through the clear opening, a quick removable connection between the cylinder and the frame, a piston in the cylinder in line with the crosshead, a quick removable connection between the piston and the crosshead, the piston and cylinder being removable bodily as a unit in the direction away from the frame and the crosshead when the quick removable connection between the cylinder and the frame and the quick removable connection between the piston and the crosshead are separated.

2. A pump according to claim 1 in which the quick removable connection between the cylinder and the frame comprises lugs off center with respect to the axis of the clear opening in the frame, abutments on the cylinder which cooperate in engaging the lugs when the cylinder is rotating into locking relation with the lugs, and a lock-

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ing screw on the frame for holding the cylinder in angular locking relation with the abutments locking in the lugs.

3. A pump according to claim 2 in combination with inlet and outlet valves on the end of the cylinder remote from the crosshead, supported by the cylinder and removable bodily with the cylinder and piston.

4. A pump according to claim 2 in combination with a stuffing box, packing gland and packing nut on the end of the cylinder toward the crosshead and removable through the clear opening in the frame along with the cylinder, the piston extending through the packing gland and having a shoulder at the end toward the crosshead and a nut surrounding the shouldered end of the piston and engaging the shoulder and making threaded connection with the crosshead.

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