

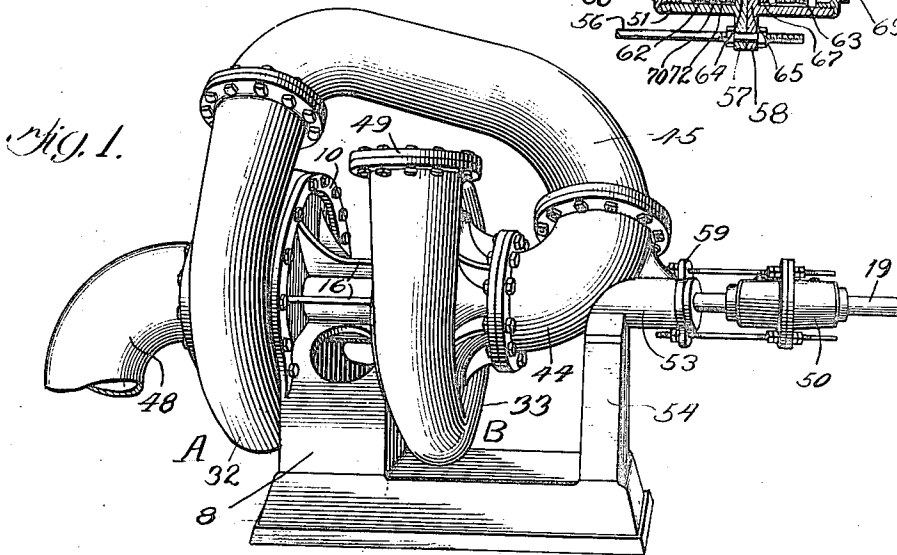
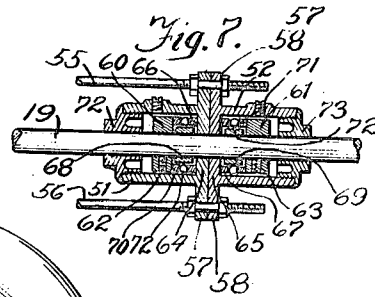
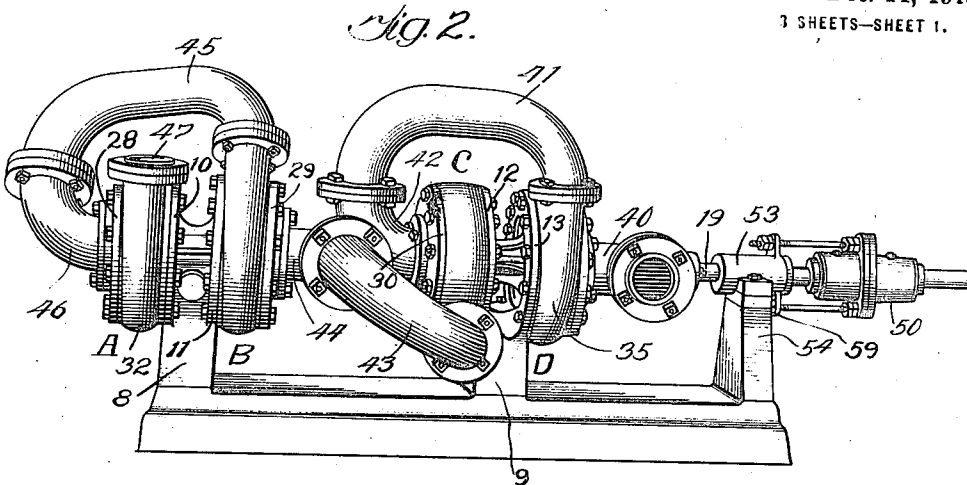
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PUMP.

APPLICATION FILED APR. 3, 1911.

1,163,809.

Patented Dec. 14, 1915.

3 SHEETS—SHEET 1.



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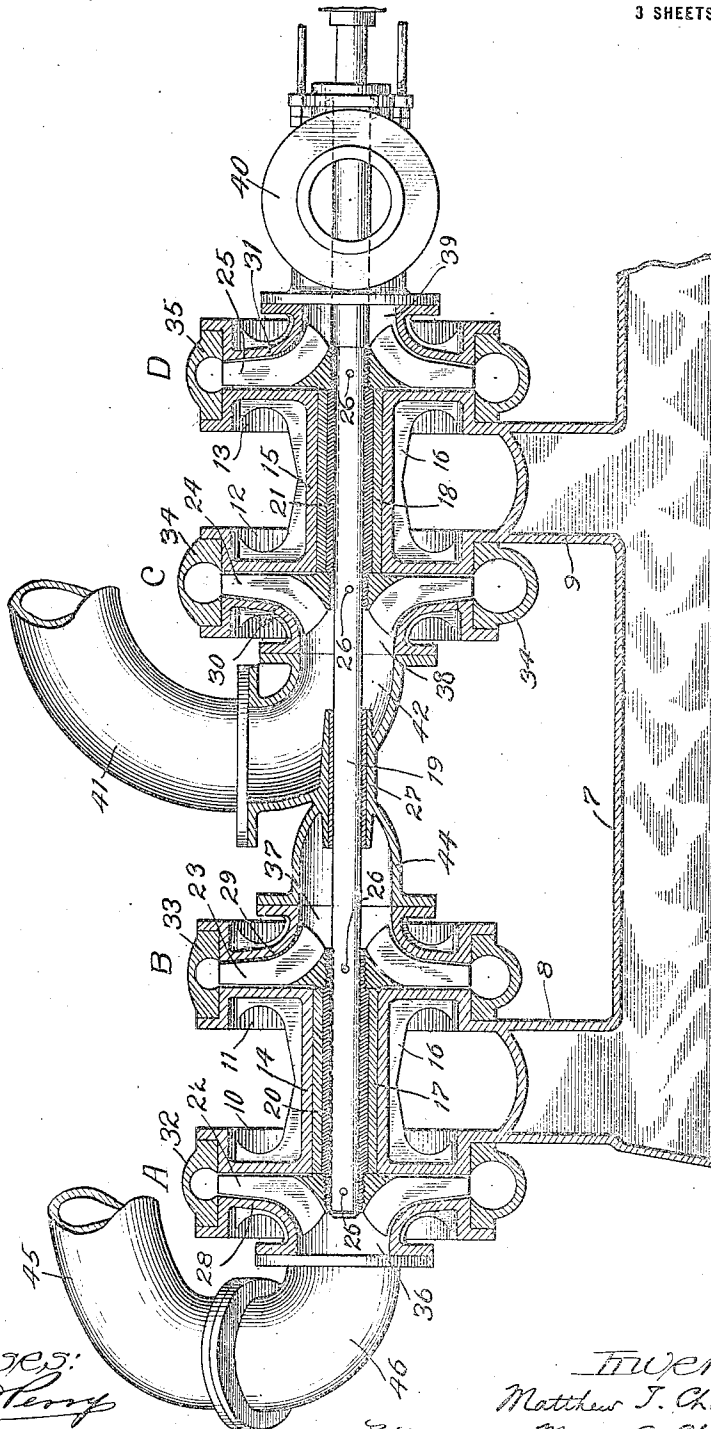
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3 SHEETS—SHEET 2.

Fig. 3.



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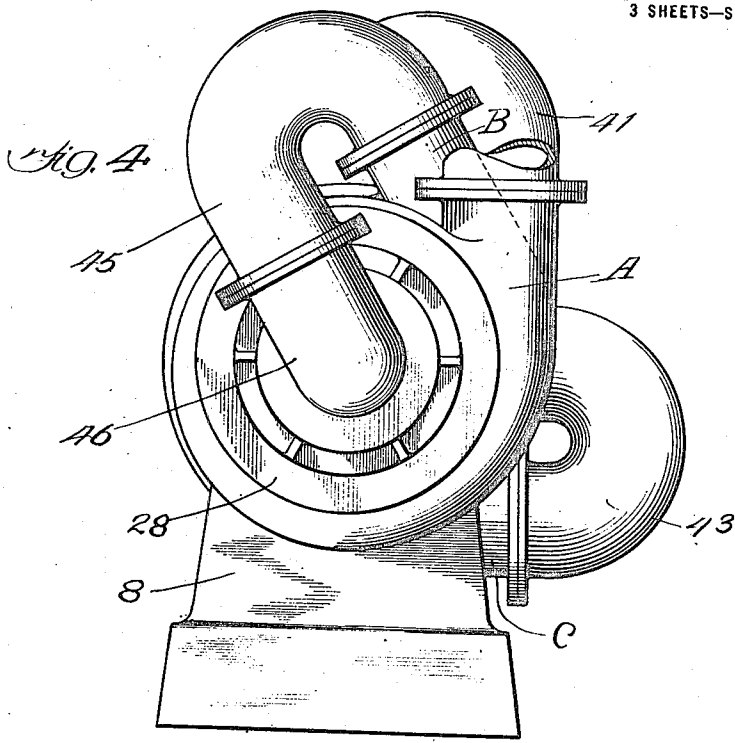


Fig. 6.

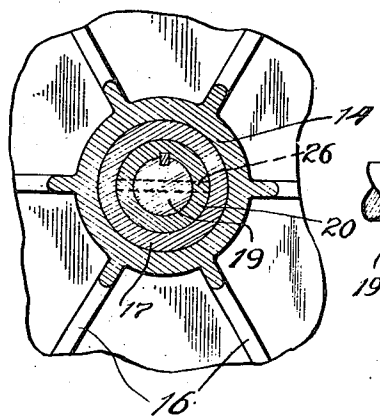
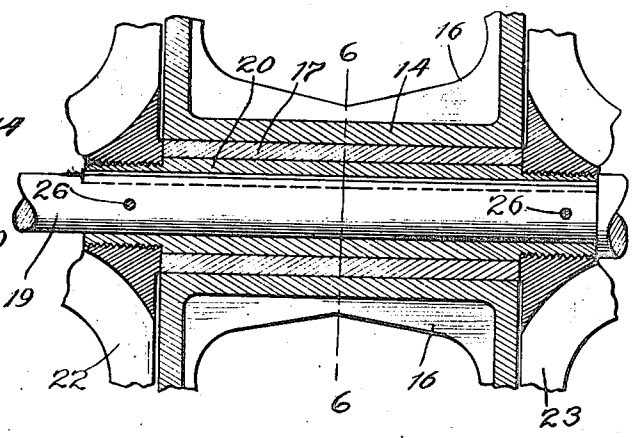


Fig. 5.



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UNITED STATES PATENT OFFICE.

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PUMP.

1,163,809.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, MATTHEW T. CHAPMAN and MARK C. CHAPMAN, citizens of the United States, residing at Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Pumps, of which the following is a specification, reference being had to the accompanying drawings.

10 Our invention relates to pumps of the centrifugal type, and has particularly to do with rotary pumps made up of a plurality of pumping units.

15 It has for its object to provide an improved construction by which the lateral pressure upon the runners or pistons is equalized so that the runners are balanced and lateral friction is practically eliminated. We accomplish this object as illustrated in the drawings and as hereinafter described.

20 What we regard as new is set forth in the claims.

25 In the drawings,—Figure 1 is a perspective view showing our improvements embodied in a pump composed of two pumping units; Fig. 2 is a front elevation illustrating our invention embodied in a pump composed of four pumping units; Fig. 3 is a longitudinal vertical section of the arrangement shown in Fig. 2; Fig. 4 is an end view thereof; Fig. 5 is an enlarged detail, being a longitudinal vertical section through the axis of the pump cylinder shown in Fig. 1; Fig. 6 is a vertical cross-section on line 6—6 of Fig. 5; and Fig. 7 is a sectional view illustrating the bearing for the outer end portion of the pump shaft.

35 Our improved pump comprises a plurality of pumping members or units, each of which includes a rotary runner or piston mounted in a suitable casing, the several pumping units being arranged in one or more pairs, the units of each pair being concentrically mounted and axially connected, with water supply pipes so that water is admitted to the two units of a given pair in opposite directions, and consequently the lateral pressure sustained by the units of a given pair is neutralized. When more than one pair of pumping units is employed, they are connected in series in a similar manner, and consequently, no matter how many pairs of pumping units are employed, the

lateral pressure is always neutralized, and 55 as the balance of the pistons or runners is constantly maintained there is no objectionable lateral friction. In Fig. 1 we have illustrated a pump composed of a single pair of pumping units, and Figs. 2 and 3 illustrate the arrangement employed when two pairs are used.

Referring more particularly to Figs. 2 and 4 which clearly illustrate the construction,—7 indicates a suitable base having 65 standards 8—9 which support the pumping mechanism. As best shown in Fig. 3, each of the standards 8—9 carries a pair of oppositely-disposed heads 10—11 and 12—13, respectively, which form parts of the casing 70 of the several pumping units, which are marked, respectively, A, B, C and D. The heads 10—11 are connected by a sleeve 14 which is preferably cast integral therewith, and in like manner the heads 12—13 are 75 connected by a sleeve 15. 16 indicates strengthening flanges. 17—18 indicate bushings which fit in the sleeves 14—15, respectively. 19 indicates a shaft, which extends through the bushings 17—18 and carries sleeves 20—21 which are journaled in said bushings and have screw-threaded end- 80 portions which project beyond the same as shown in Fig. 3. 22—23 indicate oppositely-disposed runners or pistons, which 85 are mounted upon the screw-threaded end- portions of the sleeve 20 adjacent to the heads 10—11, and 24—25 indicate similar runners mounted on the end- portions of the sleeve 21. The several runners are fixedly 90 secured to their respective sleeves 20—21 and to the shaft 19 by pins 26, or other suitable means, so that said runners rotate with the shaft 19. 27 indicates an intermediate bearing for the shaft 19. 28—29 indicate 95 side-plates, which fit closely over the outer faces of the pistons 22—23, and 30—31 indicate similar plates, which fit over the outer faces of the pistons 24—25. 32 indicates an annular plate, which fits between 100 the head 10 and the plate 28 and is secured thereto, forming with said plates a chamber in which the piston 22 rotates. 33, 34, and 35 indicate similar annular plates forming a part of the units B, C and D. The several side-plates 28—29—30—31 are provided with axial openings 36—37—38—39, respectively, through which water is admit-

ted to the several piston chambers. 40 indicates an elbow connected with the side-plate 31 over the inlet opening 39, said elbow being connected with a suitable suction pipe through which water flows to the pumping unit D. 41 indicates a pipe connected with the piston chamber of pumping unit D through a suitable opening in the plate 35 thereof, as best shown in Fig. 2, said pipe 41 forming the outlet pipe through which water pumped by said unit passes to pumping unit C, said pipe 41 being connected with the inlet side of pumping unit C by an elbow 42, as shown in Figs. 2 and 3. 43 indicates a pipe which connects with the piston chamber of pumping unit C through a suitable opening in the annular plate 34 thereof and connects with the inlet side of pumping unit B through a suitable connection 44, shown in Fig. 3. 45 indicates a pipe connected with the piston chamber of pumping unit B for conducting the water pumped thereby to the inlet side of pumping unit A, said pipe being connected with said pumping unit A by an elbow 46, shown in Figs. 2 and 3. 47 indicates the outlet from pumping unit A.

From the foregoing description it will be seen that the lateral pressure upon the pistons or runners of the several pairs of pumping units is equalized, as whatever the lateral pressure upon the piston 25, for example, may be it is neutralized by the lateral pressure in the opposite direction upon the piston 24; and the same is true of the other pair of pistons.

It will be obvious that the number of pairs of pistons that may be employed may be varied as desired, as, regardless of the number of pairs of pistons, the balancing effect is obtained.

In the arrangement shown in Fig. 1 there is only a single pair of pumping units, the inlet being shown at 48 and the outlet at 49, but in other respects the arrangement is substantially the same as that above described.

A further feature of our invention consists in making the connecting pipes between the units of each pair, of gradually increasing bore from the inlet to the outlet, as illustrated in the drawings. The purpose of this arrangement is to increase the efficiency of the pump by reducing internal friction between the water and the interior surface of the pipe.

In order to overcome any end thrust that may arise owing to unequal operation of the several pumping units, we have provided additional means for maintaining the proper balance of the several pumping units. This feature is best shown in Figs. 1, 2 and 7. As therein shown, the outer end of the shaft 19 is fitted in a bearing 50 constructed to prevent endwise movement of the shaft and having ball bearings for preventing friction

due to end thrust thereof in either direction. In the construction shown this bearing comprises oppositely-disposed cylindrical members 51—52, the inner ends of which abut and are secured together and to a bearing 53 carried by a standard 54, by means of rods 55—56 which pass through flanges 57—58 carried by the members 51—52, respectively, and through flanges 59 carried by the bearing 53, as shown in Figs. 1 and 2. The shaft 19 is provided with collars 60—61 which are secured thereto by set-screws 62—63, or other suitable means, and lie within the members 51—52, as shown in Fig. 7. 64—65 indicate internally-projecting flanges carried by the members 51—52 at their inner ends, said flanges forming bearings for the shaft 19, as shown in Fig. 7. 66—67 indicate annular disks, which are fitted tightly in the cylinders 51—52 adjacent to the flanges 64—65, and 68—69 indicate annular bands which fit tightly within the disks 66—67. The shaft 19 rotates freely within the bands 68—69, which are held non-rotatably by reason of their engagement with the disks 66—67. 70—71 indicate disks similar to the disks 66—67, which are fitted loosely between the bands 68—69 and the inner walls of the cylinders 51—52. 72 indicates anti-friction balls fitted between the disks 66—70 and 67—71, respectively, thus forming anti-friction bearings for supporting the disks 70—71. The collars 60—61 bear against the disks 70—71, which thus form anti-friction end bearings for receiving the end thrust in either direction of the shaft 19. By adjusting the position of the collars 60—61 upon the shaft 19, the position of said shaft and consequently the position of the runners carried thereby may be accurately controlled. These anti-friction bearings act to assist in balancing the runners and prevent lateral friction thereof, and also hold them properly centered in their respective casings. 72—73 indicate caps which screw into the ends of the cylinders 51—52 and tightly close the same so that they may be used to contain a supply of any suitable lubricant.

While our improved pumping apparatus is designed more particularly for pumping water, it may be used for pumping any other suitable liquid.

That which we claim as our invention, and desire to secure by Letters Patent, is,—

1. In a pumping apparatus, the combination of a frame, a shaft revolvably mounted on said frame, balanced rotary pumping means adapted to be operated by said shaft, a bearing held against movement longitudinally of said shaft in either direction, said bearing comprising anti-friction devices adapted to receive the thrust of said shaft in either direction, and a plurality of rods held in fixed position relative to said frame

adjustably connected to said bearing for varying the adjustment of the shaft relative to the frame.

2. A pumping apparatus, comprising a base having a standard, a pair of oppositely-disposed internal heads carried by said standard, a pair of oppositely-disposed external heads, annular plates between each pair of internal and external heads forming runner chambers, a shaft extending into said chambers, runners mounted on and rotating with said shaft, axial openings in said external heads, and a pipe connecting the outlet of one of said chambers with the inlet of the other.

3. A pumping apparatus, comprising a base having a standard, a pair of oppositely-disposed internal heads carried by said standard, a sleeve connecting said heads, a pair of oppositely-disposed external heads, annular plates between each pair of internal and external heads forming runner chambers, a shaft extending into said chambers, runners mounted on and rotating with said shaft, axial openings in said external heads, and a pipe connecting the outlet of one of said chambers with the inlet of the other.

4. A pumping apparatus, comprising a base having a standard, a pair of oppositely-disposed internal heads carried by said standard, a pair of oppositely-disposed external heads, annular plates between each pair of internal and external heads forming runner chambers, a shaft extending into said chambers, runners mounted on and rotating with said shaft, axial openings in said external heads, a pipe connecting the outlet of one of said chambers with the inlet of the other, and anti-friction bearings for preventing endwise movement of the shaft.

5. A pumping apparatus, comprising a base having standards, a pair of oppositely-disposed internal heads carried by each of said standards, pairs of oppositely-disposed external heads, annular plates between each

pair of internal and external heads forming runner chambers, a shaft extending through the several chambers, runners mounted on and rotating with said shaft, axial openings in said external heads, pipes connecting successively the outlet of each of said chambers with the inlet of the next, and an intermediate bearing for said shaft.

6. A pumping apparatus, comprising a base having a standard, a pair of oppositely-disposed internal heads carried by said standard, a pair of oppositely-disposed external heads, annular plates between each pair of internal and external heads forming runner chambers, a shaft extending into said chambers, a sleeve non-rotatably connected with said shaft, runners mounted on and rotating with said shaft, said runners being screwed upon the end portions of said sleeve, axial openings in said external heads, and a pipe connecting the outlet of one of said chambers with the inlet of the other.

7. A pumping apparatus, composed of a pair of pumping units comprising oppositely-disposed rotary runners, oppositely-disposed axial inlets for supplying water to said runners in opposite directions, means for conducting the water discharged by one of said units to the inlet of the other unit, a shaft to which said runners are non-rotatably connected, and an anti-friction bearing for sustaining end thrust of said shaft comprising oppositely-disposed cylindrical members secured together, means securing said cylindrical members against endwise movement, ball-bearings in said cylindrical members, and means carried by said shaft at opposite sides of said ball-bearings and bearing laterally thereagainst.

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