Aug. 13, 1940. N. C. STOREY 2,211,526

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Fig. 1

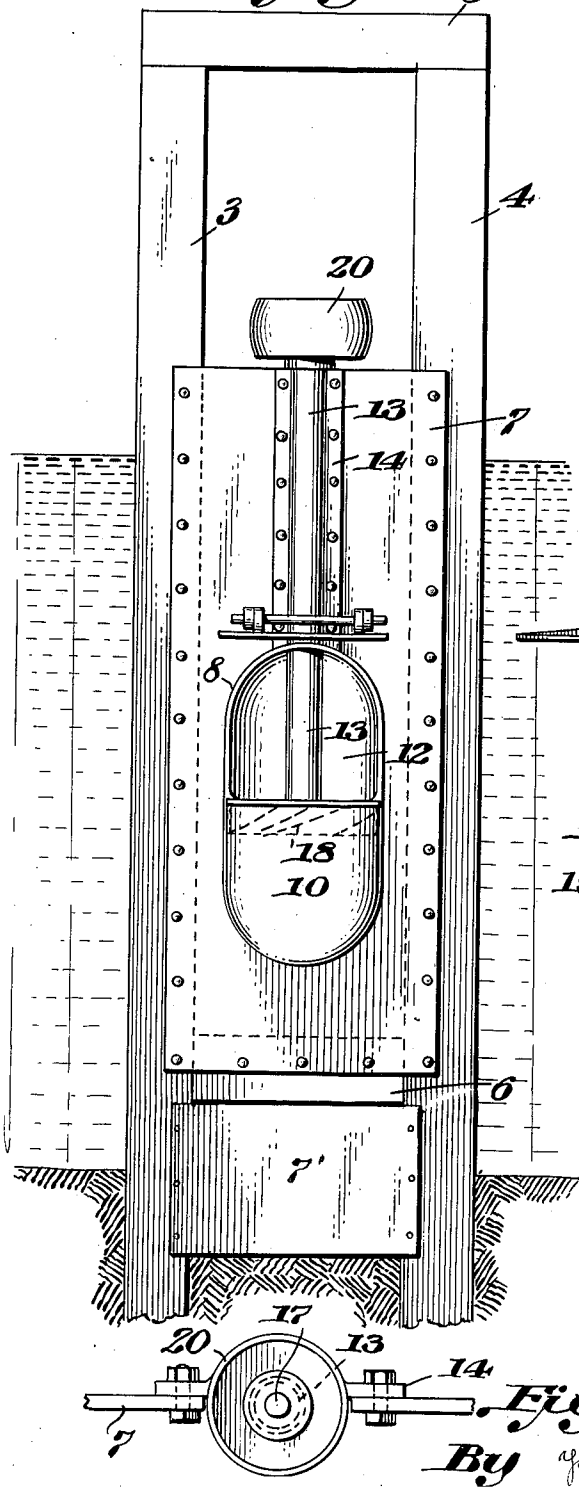


Fig. 2.

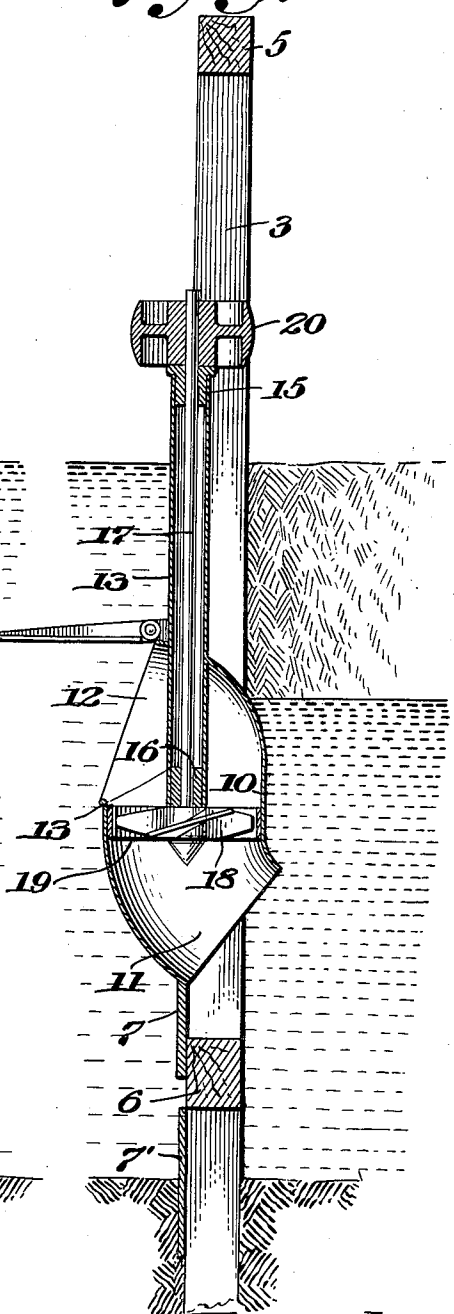


Fig. 13.

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Fig. 3.

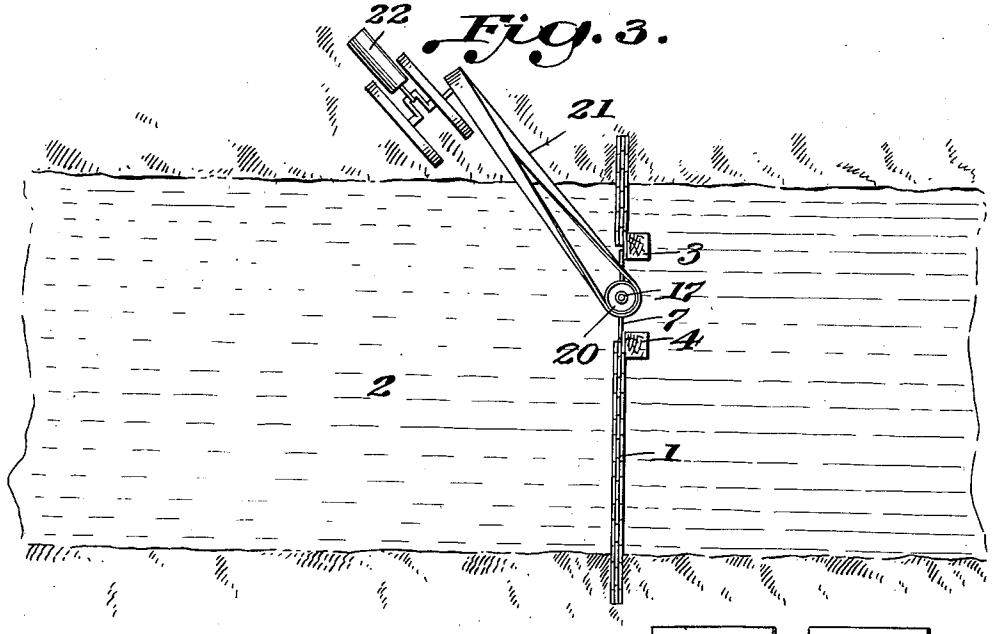


Fig. 5.

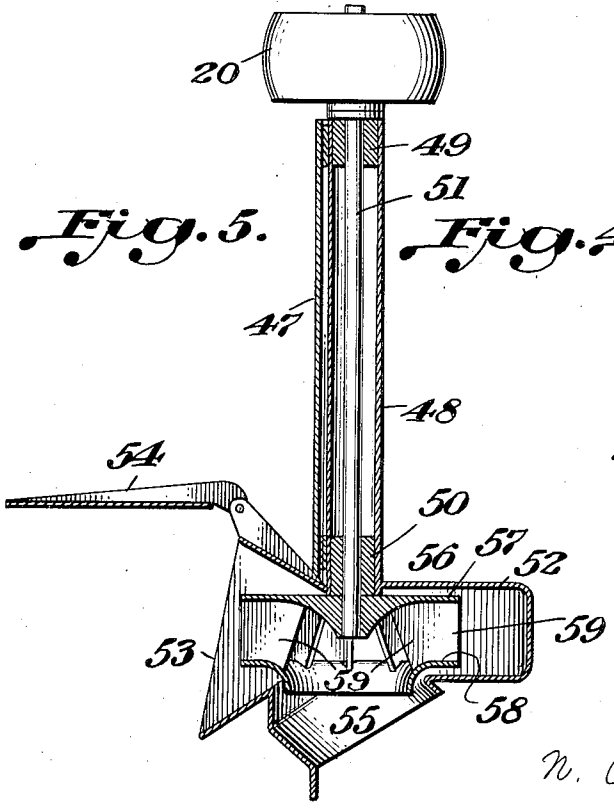
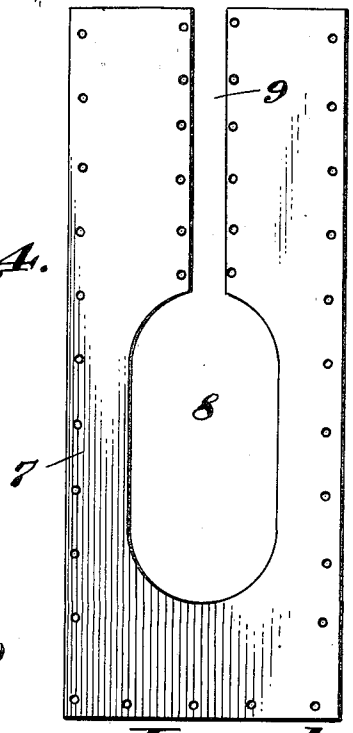


Fig. 4.



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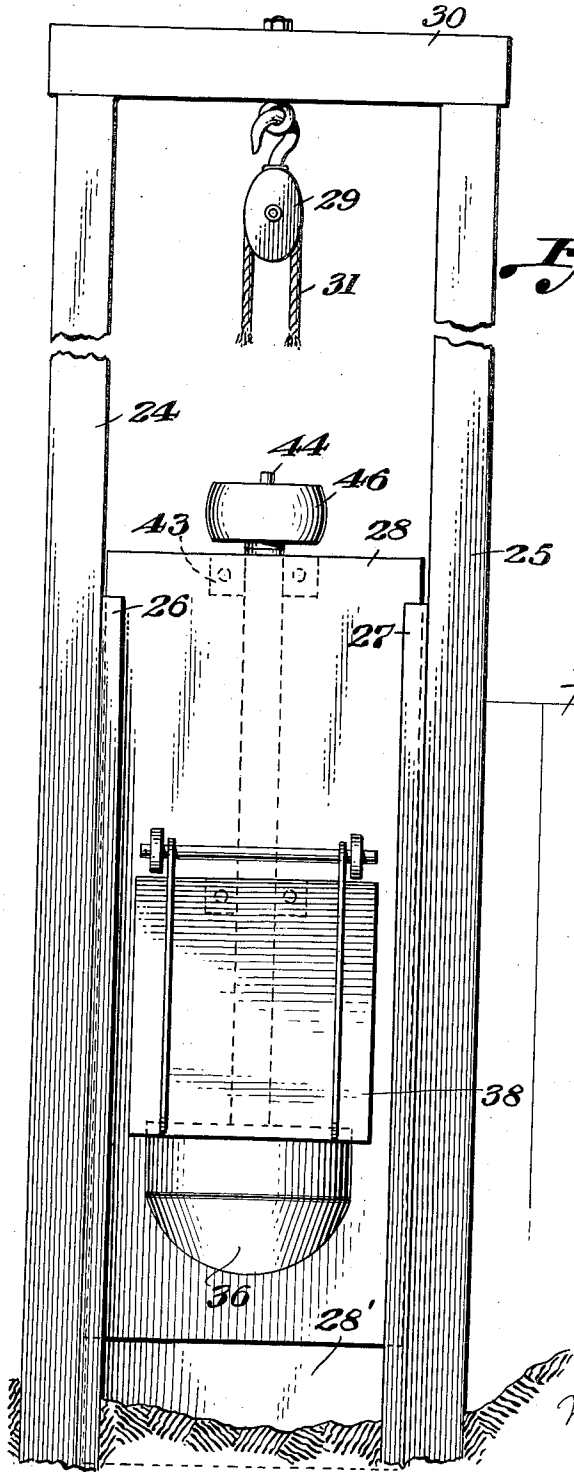


Fig. 6.

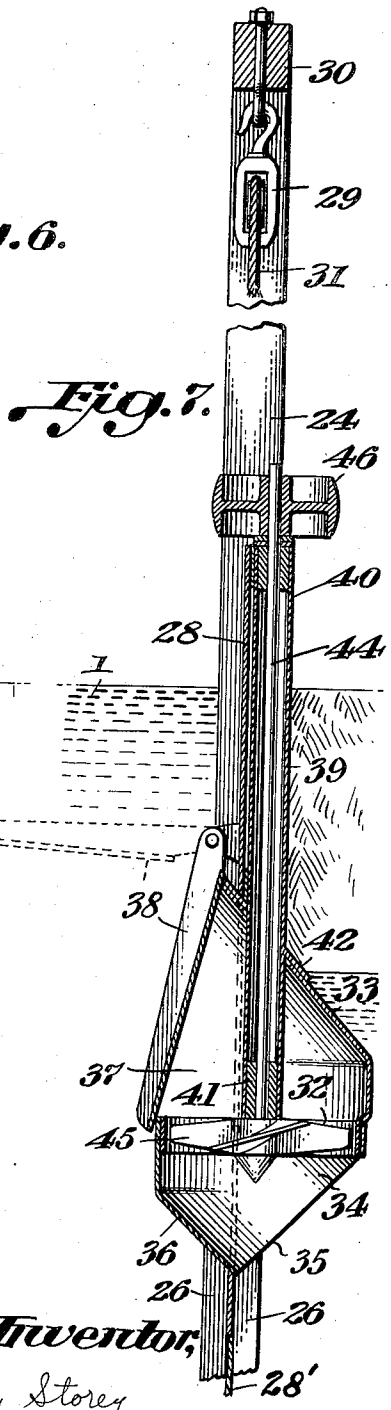


Fig. 7.

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Fig. 8.

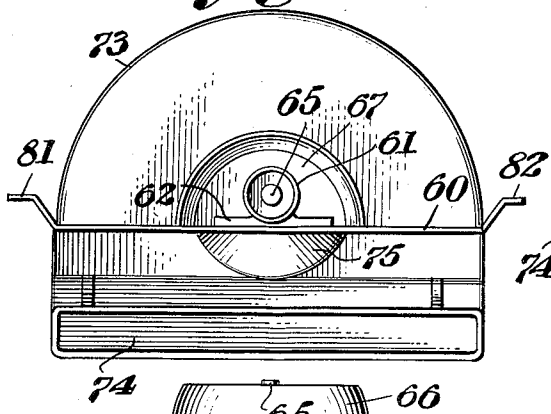
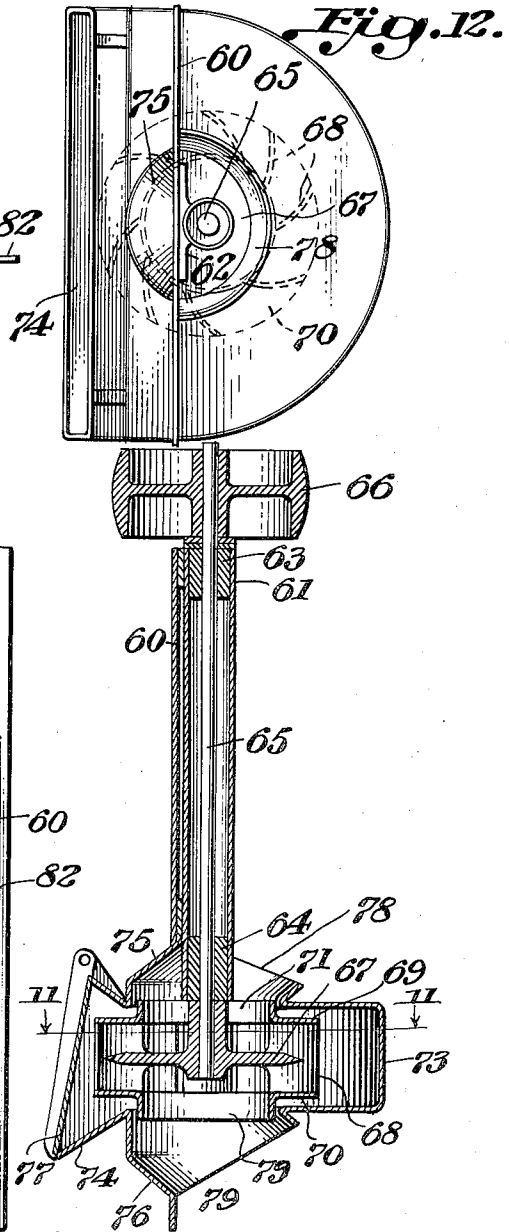


Fig. 12.



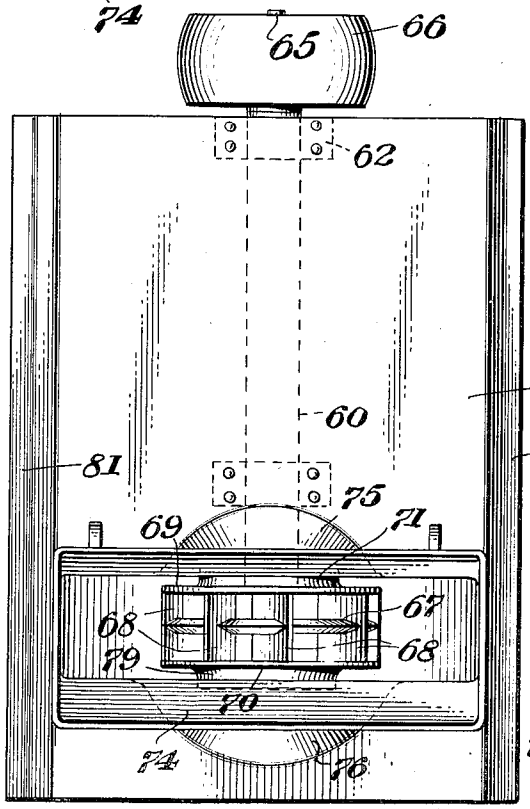


Fig. 9.

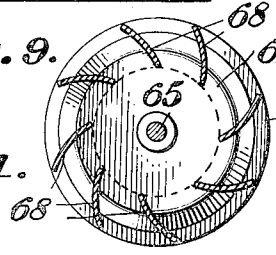


Fig. 10

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Fig. 11.

By Young Emery & Thompson Attys.

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UNITED STATES PATENT OFFICE

2,211,526

PUMP

Norman Choate Storey, Miami, Fla.

Application February 21, 1938, Serial No. 191,752

5 Claims. (Cl. 103—104)

This invention relates to pumps and more particularly has reference to pumps associated with a dam or bulkhead to cause water to flow from one side of the dam or bulkhead to the other side thereof.

An object of this invention is to provide a pump for moving water in a ditch to effect a supply for irrigation or a condition of drainage.

Another object of this invention is to provide a pump in a dam, bulkhead or similar means separating two parts of a body of water for effecting a flow from one part to the other.

A further object of this invention is to provide a pump mounted in a plate adapted to serve as a gate in a dam or bulkhead or as a stationary part of said dam or bulkhead.

Still another object of this invention is to provide a pump mounted in a plate adapted to serve as a gate in a dam or bulkhead or as a stationary part of said dam or bulkhead in which the plate is constructed so that it may be reversed to reverse the flow effected by the pump.

With these and other important objects in view, which may be incident to my improvements, the invention resides in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in construction, proportions and arrangement, without departing from the spirit and scope of the appended claims.

In the drawings:

Figure 1 is an elevational view of an apparatus constructed according to the present invention.

Fig. 2 is a vertical sectional view of the device of Fig. 1.

Fig. 3 is a plan view of an installation embodying the present invention.

Fig. 4 is an elevational view of the pump mounting plate.

Fig. 5 is a vertical sectional view of a modified form of pump.

Fig. 6 is a view similar to Fig. 1 of a modified form of the invention.

Fig. 7 is a vertical sectional view of the structure shown in Fig. 6.

Fig. 8 is a plan view of a further modified form of pump and its supporting plate.

Fig. 9 is an elevational view of the structure shown in Fig. 8.

Fig. 10 is a vertical sectional view of the structure shown in Fig. 9.

Fig. 11 is a sectional view taken on line 11—11 of Fig. 10.

Fig. 12 is a plan view similar to Fig. 8 in which the supporting plate is plane.

Fig. 13 is a horizontal sectional view of Fig. 1.

The structure of the present invention is particularly adaptable for use in pumping water from one level to a higher level in ditches and canals. As shown in Fig. 3, the invention may be incorporated in a dam or bulkhead 1 separating two reaches of a body of water 2 usually at different levels. For purposes of illustration, the body of water 2 may be considered to be a ditch or canal, but it should be clearly understood that the invention is equally applicable to other bodies of water. In applying the present invention, the bulkhead is constructed with an opening into which the pump unit of the present invention is inserted.

As more clearly shown in Figs. 1, 2 and 4, the pump unit comprises a frame formed of two spaced upright timbers 3 and 4 secured together by upper and lower cross-members. Secured to the frame is a pump supporting plate 7. In this form of the invention plate 7, as shown in Fig. 4, is provided with an oval-shaped opening 8 in the center thereof and a slot-like opening 9 extending upwardly to the top of said plate.

Positioned in opening 8 is an S-like fitting 10, one end 11 of which opens on one side of plate 7 and the other end 12 of which opens on the other side of said plate. This fitting 10 may be secured to plate 7 in the opening 8 in any desired manner, such as by welding, brazing, soldering or by bolts or rivets.

A tube 13 extends upwardly through the top of fitting 10 and is positioned in the slot 9 of plate 7. The upper part of tube 13 is provided with flanges 14, which are bolted or riveted to plate 7. Of course, tube 13 may be welded or otherwise secured to plate 7.

Bearings 15 and 16 are mounted in the upper and lower ends of tube 13 for rotatably supporting a shaft 17. An impeller 18 is mounted on the lower end of shaft 17 and is rotated thereby. In this form of the invention the impeller is of the screw type and is constructed and rotated to cause the water to be drawn in through opening or port 11 and discharged through opening or port 12. A ring 19 surrounds the periphery of impeller 18 and is mounted in fitting 10.

As an alternative construction, ring 19 may be secured in position in opening 8. In this instance, the lower portion of fitting 10 is formed of two parts, one secured to one side of plate 7 and the other to the other side of the plate. Similarly, the upper portion of fitting 10 is

formed of two parts on opposite sides of plate 7. Both the upper and lower parts of fitting 10 are secured to ring 19.

In both forms of construction, water-tight connections are effected between the parts and plate 7.

The pump unit is positioned in the bulkhead or dam, as shown in Fig. 3 by driving the posts or timbers 3 and 4 into the bottom of the ditch or other body of water. In Figs. 1 and 2, the cross-member 6 is shown spaced from the bottom of the body of water, but in an actual installation the unit is driven down until the member 6 engages the bottom. If desired, however, a plate 7' may be provided beneath cross-member 6 to close the space between member 6 and the bottom when member 6 is not driven to the bottom.

For rotating the impeller 18, the shaft 17 is provided with a pulley 20 which is driven by a belt 21 driven by a motor 22. Of course, it is obvious that the source of power, such as an electric motor, may drive shaft 17 directly or through suitable gearing.

To prevent the back flow of water from the high level side of the dam to the low level side thereof when the pump is not operating, a check valve in the form of a swinging gate 33 is hinged at its upper end to the discharge port 12 of the pump housing 10. When the pump is stopped, the gate will close by gravity, and as there is a higher water pressure on the higher level side of the dam, this pressure will tend to close the gate. Of course, when the pump is again started, the discharge pressure of the pump will open the gate.

A slightly modified form of the invention is shown in Figs. 6 and 7. In these figures, the pump is mounted on a plate slidably supported in guides. In this instance, vertical posts 24 and 25 are sunk into the bottom of the body of water and are provided with guides 26 and 27 in which plate 28 slides. Plate 28, which carries the pump, is intended to be driven down into the bottom of the body of water, or a separate plate 28' is sunk into the ground.

It will be realized that by having the plate 28 mounted for vertical sliding movement, it will serve as a gate to permit the flow of water through the dam or bulkhead. The plate or gate 28 may be raised by any suitable means. For purposes of illustration, a block 29 is shown supported by a cross-beam 30. Rope or cable 31 may be passed through the block and secured to the plate 28 to raise the same. Of course, any type of hoisting mechanism can be used for this purpose.

In the form of construction shown in Figs. 6 and 7, the pump is mounted on the plate in a manner somewhat differently from that shown in the preceding figures. As shown, the plate is provided with a central opening, but there is no vertically extending slot.

Ring 32 is mounted in the opening in plate 28 in a horizontal position. The pump housing comprises an upper hood-like member 33 extending upwardly from the ring 32 on the intake side of the plate and secured to plate 28 about the upper portion of the opening. A section 34 extends downwardly from the sides of the ring to form an intake port 35. On the opposite side of the plate, a curved plate 36 extends downwardly from ring 32 and is secured to plate 28 about the lower portion of the opening to complete the intake portion of the pump casing or housing. A collar-like member 37 extends upwardly from ring 32 on the opposite side of the plate from member 33 to cooperate with said member to complete the discharge portion of the pump casing or housing. The member 37 forms the discharge port of the pump housing and is provided with a gravity closed gate 38 which acts as a check valve, as described in connection with Figs. 1 and 2.

A tube 39 provided with upper and lower bearings 40 and 41 extends downwardly into the pump housing and upwardly on one side of the plate 28. This tube is provided with a flange 42 which cooperates with the member 33 of the casing or housing. Tube 39 is secured to the plate 28 by flanges 42 and 43. A shaft 44 is mounted in the bearings 40 and 41 and carries an impeller 45 on the lower end thereof. On the upper end of shaft 44 is mounted a pulley 46 by which the shaft is driven.

In Fig. 5, there is shown a centrifugal type of pump mounted on a plate 47 which may be supported as shown in either Fig. 1 or 6. This form of construction differs from those hereinbefore described in that the impeller is of the centrifugal type, rather than the screw type, and the pump housing or casing is constructed accordingly. As shown, the tube 48, carrying the bearings 49 and 50 which support shaft 51, is secured to plate 47 above the opening formed therein. The casing or housing in this form of construction comprises a semi-circular member 52 secured to plate 47 about the opening therein. On the opposite side of the plate there is mounted an outwardly flared discharge member 53, the mouth of which is provided with a gate 54 similar to those hereinbefore described. The members 52 and 53 cooperate to form a discharge chamber having an axial opening in the bottom thereof, to which is secured the inlet fitting 55.

An impeller 56 is mounted on the lower end of shaft 51 to rotate within the casing, as shown. This impeller comprises upper and lower disc-like elements 57 and 58, between which are positioned a series of annularly arranged curved vanes 59. The lower element 58 has a central opening registering with the inlet opening in the bottom of the housing. When the casing or housing is flooded with water, rotation of the impeller will cause the vanes to centrifugally throw the water into the casing surrounding the impeller and will effect a discharge through the opening controlled by gate 54. Of course, this action will create a suction through fitting 55 and the water will be forced from one side of plate 47 to the other.

In Figs. 8–12, a further modification is shown. This form of construction differs from that shown in Fig. 5 in that two inlet ports are provided in the pump casing or housing. As shown, the plate 60 supports the tube 61 which is secured thereto by flanges 62 or in any other manner. Tube 61 is provided with upper and lower bearings 63 and 64, in which the shaft 65 is rotatably mounted. As in the preceding forms, the shaft 65 carries a pulley 66 at its upper end and an impeller at its lower end. In this instance, the impeller is formed of a disc 67 fixed to the shaft, which disc carries a series of annularly arranged curved vanes 68 extending in an axial direction on each side of the disc. Annular plates 69 and 70 are secured to the upper and lower edges of the vanes to complete the cage-like impeller. At the center of plates 69

and 70, annular flanges 71 and 72 are provided which surround the openings for the intake of water.

The casing or housing comprises a semi-circular portion 73 surrounding the impeller on one side of plate 60 and a flared out discharge portion 74 on the other side of the plate. Curved sections 75 and 76 extend upwardly and downwardly from the discharge section 74 to close the opening in plate 60 and complete the pump casing or housing.

In operation, the casing and impeller cage are flooded with water; then, upon rotation of the impeller, water is thrown radially into the space surrounding the periphery of the impeller and forced out through the discharge port 77. This action causes water to be drawn into the casing through the intake ports 78 and 79. Of course, the discharge port 77 may be provided with a gate 80, as in the hereinbefore described forms.

In the forms of construction in which the impeller shaft supporting tube is mounted so that the axis of the shaft is spaced from the supporting plate, the plate is formed with offset flanges. As shown in Fig. 8, plate 60 is provided with offset guiding flanges 81 and 82, which lie in a plane passing through the axis of shaft 65. This enables the plate 60 to be rotated through an angle of 180°, so that the flow of water will be reversed without disturbing the position of the axis of shaft 65. In other words, the position of shaft 65 and pulley 66 will be the same, regardless of the position of plate 60.

The advantage of my particular pump is its simplicity, compactness, low manufacturing costs, ease of installation, accessibility for repairs, etc. Another advantage is that the plate supporting the pump may be rotated through an angle of 180°, so that the pump will create a flow in the opposite direction. In operation, the water is simply pushed through the bulkhead and the head against which it must pump is equal only to the difference in water levels on the opposite sides of the bulkhead. If it is desired to permit a normal flow of the ditch in which it is mounted, the pump may be hoisted in its ways, opening up a clear passage.

Although my pump is shown only in a simple form, refinements are contemplated, such as a geared head with different speed ratios and a more satisfactory belt drive, or a direct driving connection to the prime mover may be provided instead of the vertical pulley shown. The impeller housing or casing may be split about a line through the impeller drive shaft, so that the rear or circular half of the housing may be removed and thus expose the impeller for removal.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details herein set forth by way of illustration, as it is apparent that many changes and variations may be made therein by those skilled in the art, without departing from the spirit of the invention or exceeding the scope of the appended claims.

I claim:

1. A pump of the character described, comprising a vertical supporting plate having an opening therein, a pump housing associated with said opening and closing the same, a shaft extending upwardly through said housing and lying parallel to the vertical center of the plate and spaced from said plate, an impeller mounted on said shaft in said housing and extending through the opening in said plate, said housing having an inlet opening on one side of said plate and a discharge opening on the other side of said plate, and means for rotating said shaft to create a flow through said housing, the side edges of said plate being offset to lie in the plane of said shaft so that when the plate is mounted in vertical guides it may be reversed without shifting the position of the axis of the shaft.

2. In a bulkhead, a pair of horizontally spaced vertical guides, a plate vertically slidably mounted in said guides, said plate having an opening therein, a pump housing associated with said opening and closing the same, a shaft extending upwardly through said housing and lying in a plane parallel to and spaced from said plate, an impeller mounted on said shaft in said housing and extending through the opening in said plate, said housing having an inlet opening on one side of said plate and a discharge opening on the other side of said plate, and means for rotating said shaft to create a flow through said housing, the side edges of said plate being offset to lie in the plane of said shaft so that when the plate is mounted in vertical guides it may be reversed without shifting the position of the axis of the shaft.

3. A pump of the character described, comprising a supporting plate having an opening therein, a pump housing associated with said opening and closing the same, a tube extending upwardly through said housing and lying against said plate, a shaft in said tube, and a centrifugal impeller mounted on said shaft in said housing, said housing having a chamber surrounding the periphery of said impeller, a discharge port opening on one side of the plate, and an inlet port opening on the other side of said plate for feeding liquid axially to said impeller.

4. A pump of the character described, comprising a supporting plate having an opening therein, a pump housing associated with said opening and closing the same, a tube extending upwardly through said housing and lying against said plate, a shaft in said tube, and a centrifugal impeller mounted on said shaft in said housing, said housing having a chamber surrounding the periphery of said impeller, a discharge port opening on one side of the plate, and inlet pores above and below said impeller for feeding liquid axially to said impeller both opening on the other side of said plate.

5. A pump of the character described, comprising a vertical supporting plate having its side edges adapted to be mounted in vertical guides, its central portion offset from said side edges and an opening in the lower portion thereof between said side edges, a pump housing associated with said opening and closing the same, a shaft extending upwardly through said housing and mounted with its axis in the plane of and between said side edges whereby the plate may be turned through an angle of 180° without shifting the position of the axis of said shaft, and an impeller mounted on said shaft in the housing and extending through the opening in said plate, said housing having an inlet opening on one side of the plate and an outlet opening on the other side of the plate.

NORMAN CHOATE STOREY.