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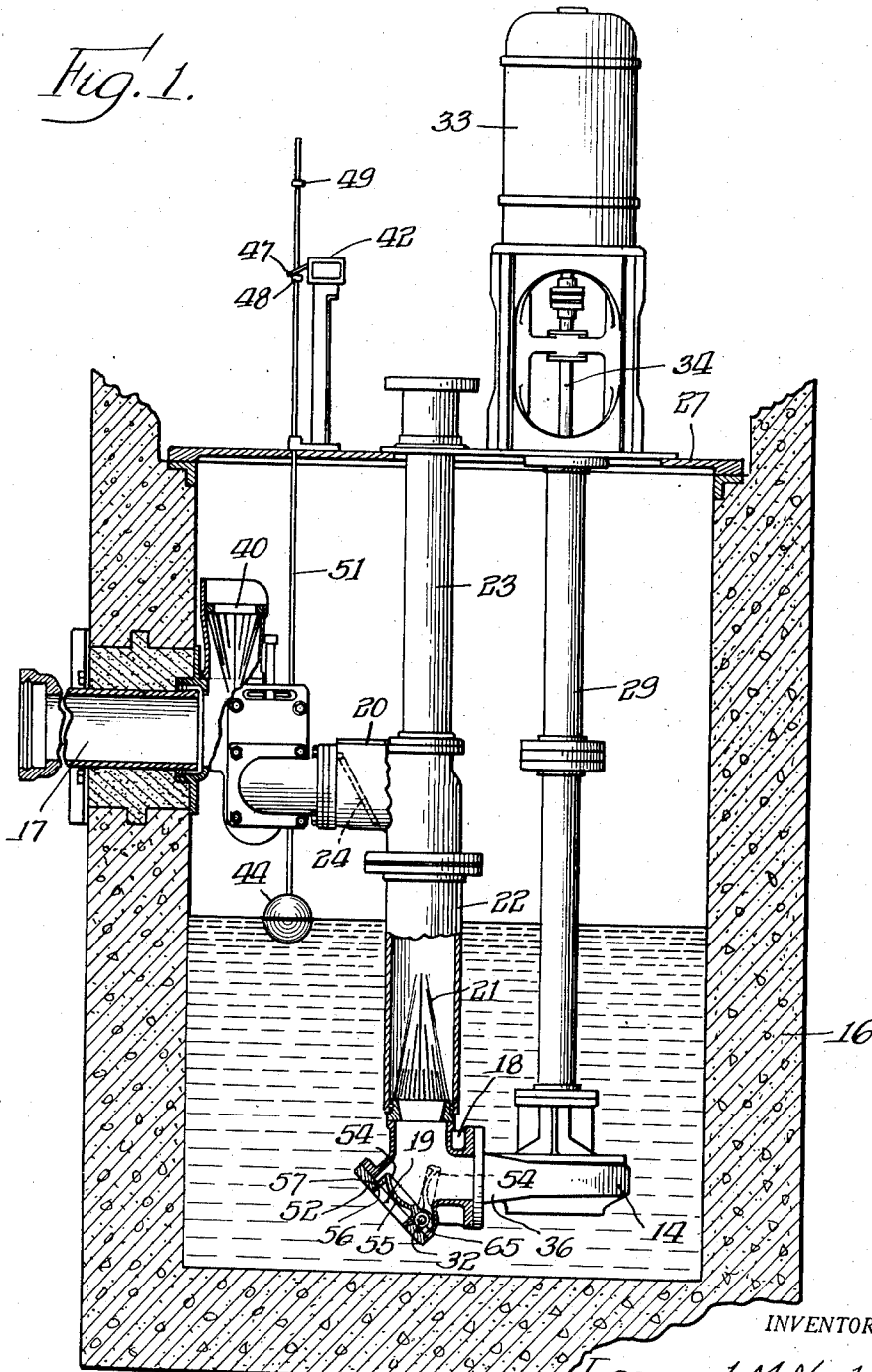
L. M. NECHINE

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BY-PASS ARRANGEMENT FOR PUMPING APPARATUS

Filed Dec. 16, 1944

2 Sheets-Sheet 1



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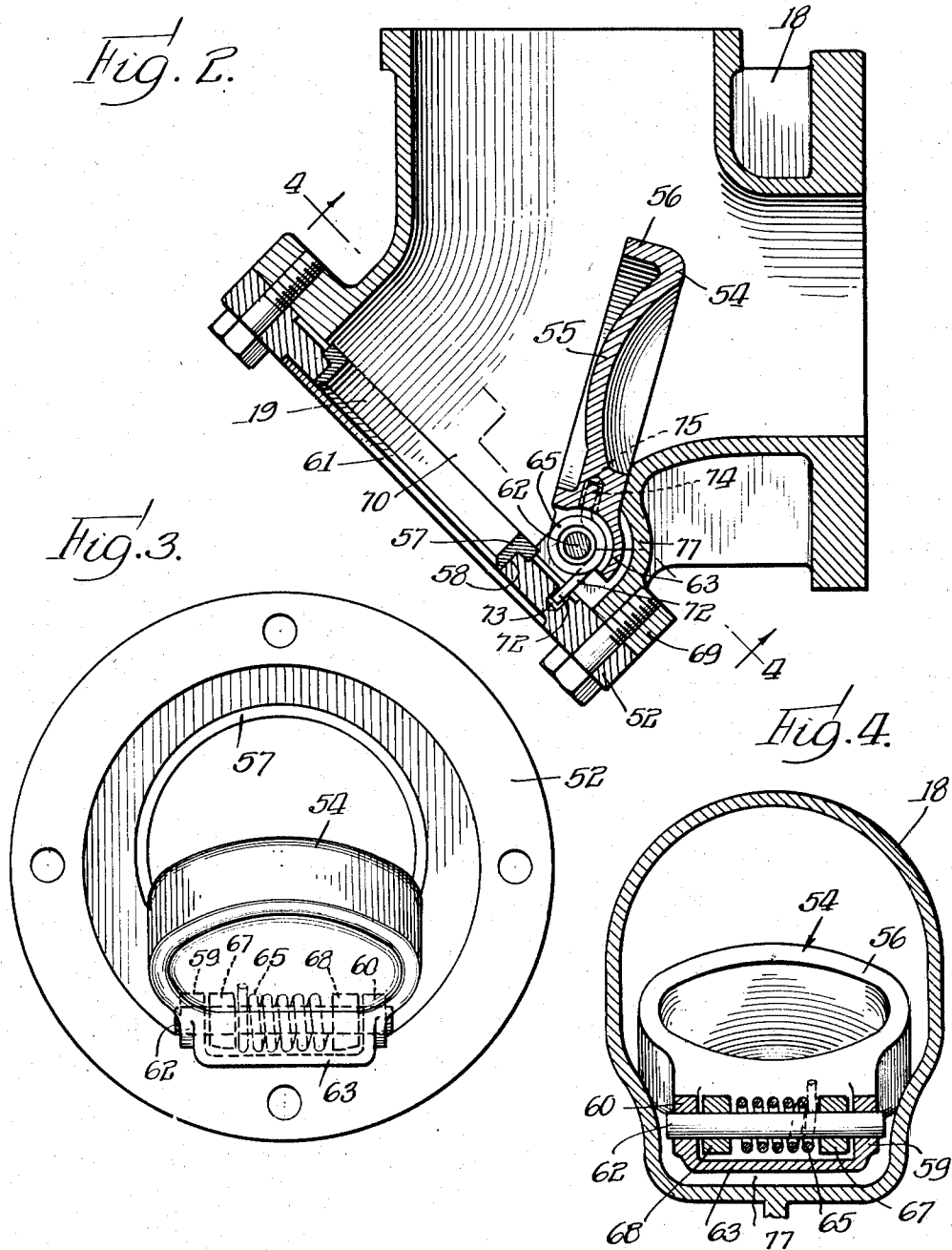
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## UNITED STATES PATENT OFFICE

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## BY-PASS ARRANGEMENT FOR PUMPING APPARATUS

Leonard M. Nechine, Chicago, Ill., assignor to Chicago Pump Company, a corporation of Delaware.

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3 Claims. (Cl. 103-11)

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This invention relates to pumping apparatus and more particularly to apparatus for pumping sewage. In apparatus of this kind, sewage or other liquid containing solids flows into a basin containing, or associated with, a pump in a direction reversed to the direction of flow when the pump is operating.

It is an established procedure at the present time to provide a straining device or screen which is interposed between the inlet to the apparatus and the pump, so that solids in the incoming material are screened out before entering the pump. In the past the screened or strained fluid was introduced into the basin through the pump, while it was idle, and then the pump was operated to discharge the fluid from the basin.

When the screened fluid passed into the basin in the above described manner, a resistance to the flow was developed due to the fact that the inflow, reversed to the ordinary pumped flow, caused the impeller of the pump to spin backwards and create a whirling vortex within the pump chamber. The centrifugal force generated by this vortex and the frictional resistance to flow through the passages in the pump impeller were largely responsible for the undesirable resistance to inflow. This resistance to inflow impaired the capacity of the unit to handle the desired inflow and, consequently, costly modifications of the pump to compensate for the low inflow rate were required.

The present invention is directed to a novel pump by-pass arrangement which permits the incoming liquid to enter the basin at a point in advance of the pump, preferably at a point intermediate the strainer and the pump, thereby eliminating the pump as an element which impedes inflow. From the basin the liquid is pumped back through the strainer in the usual manner, thereby freeing the strainer from the accumulated solid substances, and the liquid, together with the solids, are discharged into a sewer or other suitable place.

The pump by-pass valves of the prior art used to effect this by-passing of inflowing liquid have not been satisfactory because the valves do not operate sufficiently positively in opening and closing and, consequently, develop excessive noise and water hammer when opening and closing. In accordance with the present invention, I have made an improvement in such by-pass valve mechanisms, including therein a valve which is normally open and held open by a spring arrangement when the pump is idle, which is responsive to the flow of water when the pump

operates to close without chattering; and which opens when the pump is stopped. Because of the spring arrangement, the valve of my invention opens and closes positively and, consequently, does not develop objectionable noise or water hammer in doing so.

The foregoing advantages as well as others will be readily apparent from a consideration of the illustrative embodiment of my invention shown in the drawings, taken with the detailed description thereof. It is to be understood that my invention is not to be considered as limited to the specific form shown and described, except as included in the accompanying claims which form a part of my specifications.

Referring to the drawings:

Figure 1 is a vertical, transverse section, partly in elevation, of sewage pumping apparatus embodying my invention, showing the valve in closed position in full lines, and in open position in dotted lines.

Fig. 2 is an enlarged fragmentary vertical sectional view of a portion of the apparatus shown in Fig. 1;

Fig. 3 is a front elevation of the valve and associated plate embodying my invention; and

Fig. 4 is an enlarged detailed section taken along the line 4-4 of Fig. 2.

In the drawings, there is shown a pump 14, preferably of the centrifugal type, located within a sump or basin 16 into which the sewage, for example, to be pumped is delivered. The sewage enters the inlet pipe 17 which passes through a wall of the basin, and flows into basin 16 through a valve-controlled, pump by-pass opening 19 in one leg of a fitting 18, forming a part of the inlet passageway interposed between the pump and a strainer 21. Strainer 21 is located in the lower portion of a pipe 22 which is in communication with the inlet pipe 17, through pipe 20, and is also in communication with discharge pipe 23. The strainer serves to intercept sewage solids or solids contained in the liquid introduced through inlet 17 and thus prevents these solids from entering the basin and, ultimately, the pump. A one-way check valve 24 in pipe 20 allows the sewage to pass to strainer 21. This valve is forced shut when the pump discharges liquid and thus insures that the pumped liquid will enter discharge pipe 23 and be discharged therethrough.

Pump 14 is supported adjacent the bottom of basin 16 by a hanger pipe 29 which is carried by cover 27 of the basin. Electric motor 33, supported on the basin cover 27, and its shaft are connected to the impeller shaft 34 of the pump

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in a conventional manner. As shown, impeller shaft 34 extends through hanger pipe 29. The suction inlet of the pump is through the bottom of the pump casing and the discharge is through a volute 36 which is connected to and communicates with fitting 18, and in turn with pipe 22 and discharge pipe 23. The discharge pipe extends upwardly in basin 16 and through cover 27, and is connected by suitable fittings, discharge gate and check valves to a carry-off pipe (not shown) through which the ejected sewage or other liquid and accumulated screened solids are carried to a sewer or other place of disposal. When the pumping apparatus is located in a dry pit the suction inlet of the pump is connected by a suitable conduit with an associated basin, and opening 19 is in communication with this conduit or with the wet well, as is well understood.

The operation of motor 33 in driving pump 14 is controlled by a switch 42 which is operated by a float 44 within basin 16. In the form of switch operating mechanism shown, switch lever 47 is operated by buttons 48 and 49 mounted upon a switch actuating rod 51 which has the float 44 secured to its lower end. The arrangement is such that when the liquid in basin 16 is at a low level, switch 42 is open and the motor and pump are at rest. When, however, the level of the liquid in the basin reaches a predetermined high level, switch 42 is closed by button 48, thereby closing the electric circuit through the motor to operate it, and, in turn, the pump.

Fitting 18, as shown, is joined with fluid-tight connections to the lower portion of pipe 22 and to the exit end of volute 36. A plate 52, to which by-pass valve 54 is attached as hereinafter described, is bolted or otherwise secured to the lowermost portion of fitting 18.

By-pass valve 54 is in the form of a disc having a top wall 55 which bridges pump by-pass opening 19, and an annular skirt portion 56 which seats on a valve seat, formed by an annular member 57 which is positioned within an opening 58 in an annular plate 52, as by a drive fit. Top wall 55 preferably has a cup shape and the concave side thereof is in the direct line of flow from the pump when the valve is in open position. On one side of the top portion of valve 54 there are spaced apart lugs 59 and 60 which are provided with aligned openings for receiving a bolt or pivot pin 62, about which valve 54 pivots in opening and closing. A curved skirt or shroud portion 63 extends between lugs 59 and 60 and is designed to protect a helical spring 65, which surrounds pivot pin 62, as hereinafter described.

On one side of plate 52 there are spaced apart lugs 67 and 68 which are provided with aligned openings for receiving pivot pin 62. The distance between the outer extremities of lugs 67 and 68 is less than the distance between the inner extremities of lugs 59 and 60, thereby allowing the latter to be positioned about the former with the pivot pin openings aligned. Plate 52, valve disc 54, pivot pin 62, spring 65, and lugs 59 and 60 and 67 and 68 when fitted together form an assembly which is bolted to flange 69 which surrounds the opening 70 in the lower leg portion of fitting 18. This assembly is so designed that if spring 65 fails in its operation, it is easily accessible and replaced with a minimum amount of labor. Spring 65 is dimensioned to extend over a part or all of the space between lugs 67 and 68.

The assembly of plate 52 and valve 54 is as follows. One end 72 of spring 65 is inserted in an opening 73 in plate 52 adjacent one of the lugs

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thereon, say the lug 68. Valve 54 is now positioned over the spring with shroud 63 directly above the spring, and the other end 74 of the spring is then inserted in an opening 75 in the pivot end of valve 54. The opening through the spring is aligned with the pivot pin openings in the lugs and pivot pin 62 is then inserted through the aligned openings from either end. The pin extends successively through lug 59, lug 67, spring 65, lug 68 and lug 60, and holds plate 52 and valve 54 as a unitary structure. Valve 54 is now inserted through opening 70 and plate 52 is positioned against flange 69 and bolted thereto. The hinge portion of the valve and plate assembly, including spring shroud 63 are received in a recess 77 formed in the bottom of fitting 18 adjacent flange 69. The wall defining this recess is so shaped as to extend about the ends of the pivot pin 62 (Fig. 4) and in relatively close proximity thereto, thereby providing a retaining wall which prevents the pin from falling out of the aligned openings. It is manifest from the drawings that shroud 63 covers spring 65 and prevents entrance and accumulation of any small solids or strings which might pass strainer 21 and thus prevent successful operation of the valve.

Spring 65 is a helical torsion spring, suitably made of rust-proof material, and is designed with a fatigue safety factor such that the fatigue limits are far beyond the life of the associated equipment. While the main purpose of this spring arrangement is to maintain the valve 54 in a normally open position, it serves the dual purpose of a dampening or anti-slam device when the flow is sharply reversed as the pump starts up. Spring 65 thus functions to exert torque to open the valve and to resist closing thereof, thereby insuring that the valve will operate with a minimum of noise.

Strained sewage entering fitting 18 when pump 14 is not in operation, flows through opening 19 in the lower portion of fitting 18 into the basin. Valve 54, which is urged onto the valve seat by the liquid discharged from the pump, prevents the flow of liquid into the basin when the pump is in operation. As explained heretofore, the valve, hinged at one end and arranged with the spring attachment, is kept in a normally open position when the pump is at rest, as indicated by the dotted line position in Fig. 1. With the by-pass valve mechanism in the full line position the pump is operating and the liquid is being pumped from the basin and discharged through discharge pipes 22 and 23.

In the operation of this device, assuming that the by-pass valve is in the dotted line position shown and the pump is at rest, sewage or other liquid enters inlet 17 and passes through strainer 21. The solid matter contained in the liquid is intercepted by the strainer and begins to accumulate around it. The liquid which is thus strained passes through the top opening in fitting 18 and then flows through opening 19 into basin 16. As soon as the liquid in the basin reaches the predetermined high level, switch 42 is closed, and the pump motor is started, thereby operating the pump. The water discharged by the pump exerts a pressure against valve 54 forcing it from the dotted line position to the full line position shown without chatter. The liquid discharged from the pump passes through fitting 18 up through strainer 21, carrying with it the solid matter accumulated there around, and is discharged with the solid matter through discharge pipe 23. When the liquid in basin 16

reaches the predetermined low level, the switch is opened, the pump is stopped and the former operation repeated.

In the operation of a device as described it is manifest that the operation of the pump is intermittent, depending upon the level of the liquid in basin 16. If it is desired to introduce sewage or other liquid continuously into basin 16 and to pump it continuously therefrom, the pumping apparatus, motor and motor control mechanisms herein above described, may be duplicated within the basin as in Durdin, Jr. Patent No. 1,785,480 and Lannert Patent No. 2,265,650, and operated as therein described to accomplish this.

In pumping apparatus of the type herein described, now in commercial use, a valve is provided in a suitable place in inlet line 17, usually in advance of it, whereby the apparatus may be shut off from the source from which the sewage or other liquid is delivered. Many times the flow of this fluid is of considerable volume, beyond the capacity of the apparatus to handle it in the manner described above, and to take care of this large fluid flow, a strainer 40 is secured in an opening in the top of the inlet conduit 17, as shown, through which some of the liquid passing through inlet passageway 17 may escape directly into basin 16.

I claim:

1. In apparatus for pumping liquids wherein the liquid flows into a basin containing or associated with a pump in a direction reversed to the direction of flow when the pump is operating, a pump by-pass passageway comprising a fitting having an opening leading into said basin, a valve adjacent said opening for opening and closing said passageway, an annular member secured to said fitting to form a seat for said valve, a pair of spaced lugs extending from said valve, a second pair of spaced lugs extending from said annular member and fitting between said first mentioned lugs, all of said lugs being apertured transversely, a pivot pin extending through said apertured lugs to pivotally mount said valve adjacent said passageway, a spring encircling said pivot pin between the lugs on said annular member for maintaining the valve in open position, said fitting being recessed adjacent said pivotal connection, the wall of said recess being shaped to extend around the ends of said pivot pin in close proximity thereto to prevent said pin from falling out of the aligned openings in said lugs, said valve, while in open position, being in the path of liquid flow from the pump and being so dimensioned as to be directly responsive to said flow to be rotated to the

closed position against the action of said spring.

2. In apparatus for pumping liquids, a basin, an inlet conduit for liquid to the basin and an outlet conduit for liquid from the basin, a pump for pumping liquid from the basin through said outlet conduit, a pump by-pass passageway which is open to permit liquid to flow from said inlet conduit directly into the basin when the pump is idle and which is closed when the pump is operating, a valve for opening and closing said by-pass passageway, resilient means for maintaining said valve in open position, and a curved skirt extending from said valve over said resilient means to protect it from contact with material that might otherwise interfere with its proper functioning, said valve, while in open position, being in the path of liquid flow from the pump and responsive to said flow to be moved to the closed position against the action of said resilient means.

3. In apparatus for pumping liquids, a basin, an inlet conduit for liquid to the basin and an outlet conduit for liquid from the basin, a pump for pumping liquid from the basin through said outlet conduit, a pump by-pass passageway which is open to permit liquid to flow from said inlet conduit directly into the basin when the pump is idle and which is closed when the pump is operating, a valve for opening and closing said by-pass passageway, said valve being pivotally mounted adjacent said passageway, a spring for maintaining the valve in open position, and a curved skirt extending from said valve over said spring to protect it from contact with material that might otherwise interfere with its proper functioning, said valve, while in open position, being in the path of liquid flow from the pump and being so dimensioned as to be directly responsive to said flow to be rotated to the closed position against the action of said spring.

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