June 26, 1934. R. V. COOK 1,964,034

PUMPING SYSTEM

Filed Aug. 20, 1931

Fig. 1.

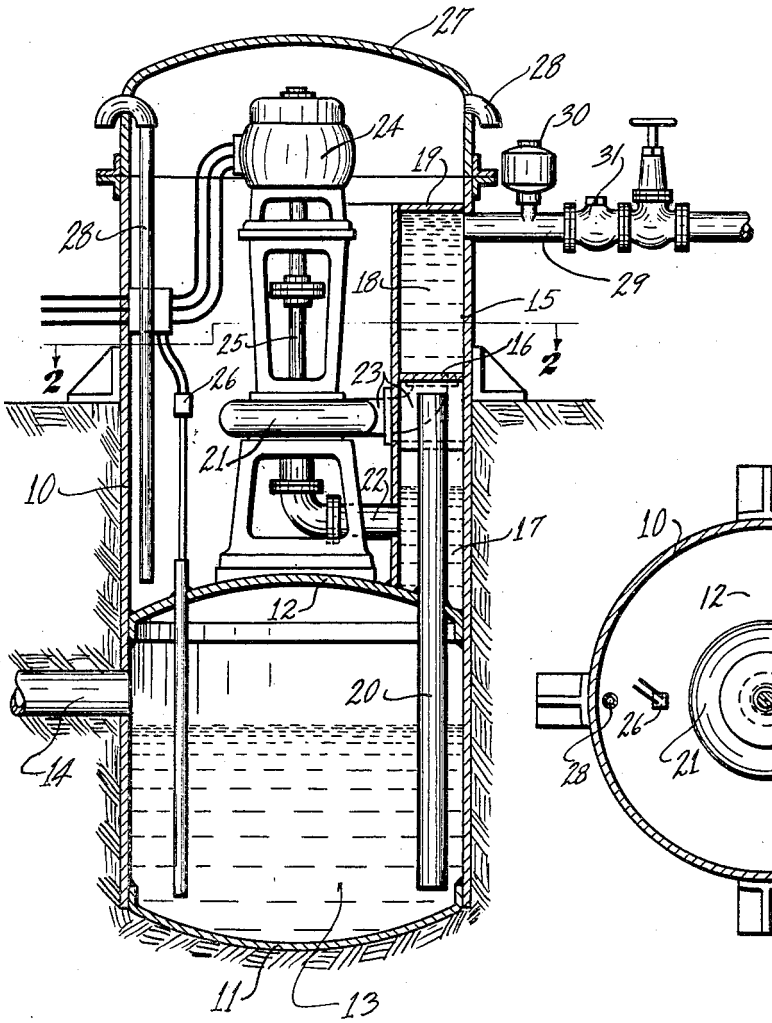
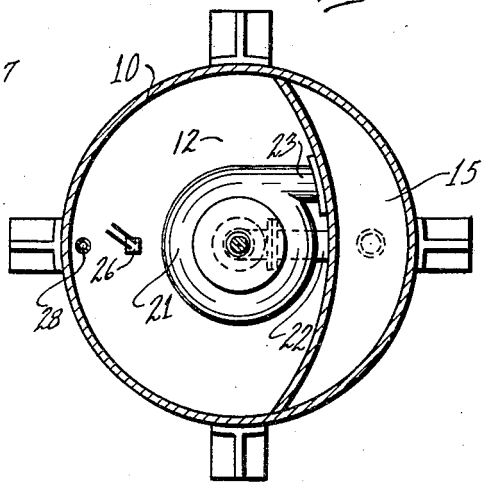


Fig. 2.



Inventor

Robert V. Cook

By

Roy McKiles

Attorney

Patented June 26, 1934 1,964,034

UNITED STATES PATENT OFFICE

1,964,034

PUMPING SYSTEM

Robert V. Cook, Chicago, Ill., assignor to Fairbanks, Morse & Company, Chicago, Ill., a corporation of Illinois

Application August 20, 1931, Serial No. 558,275

2 Claims. (Cl. 103—113)

This invention relates to improvements in pumping systems, and more particularly to improved automatic pumping apparatus in combination with a housing or pumping station.

Where sumps, cisterns, or basins are disposed below the level of the street mains or sewers, it is necessary to provide a sump pump, or the equivalent, to lift the liquid up to the level of the sewer drain. It is desirable to use valveless or centrifugal pumps for this type of service. Heretofore, in certain installations, the centrifugal pump has been submerged directly in the liquid in the sump, and the pump has been driven by a long vertical shaft operatively connected to a motor, or other suitable power source, usually the motor being disposed directly above the pump at the upper end of the shaft. It will, of course, be readily understood that in the use of valveless or centrifugal pumps, for this type of service, some means must be provided to flood or prime the pump for starting purposes. However, with a pump submerged in the liquid, as above noted, no pump priming apparatus is needed, but several disadvantages to this type of installation are apparent, among which may be mentioned the inconvenience of repairing, cleaning, inspection and lubrication of a pump which is submerged at all times. The long vertical pump drive shaft required also introduces further difficulties, such as shaft whipping action which causes rapid bearing wear. The use of a centrifugal pump and motor above the sump, however, has many advantages, especially if some convenient automatic priming or flooding device is incorporated in the installation.

An object of the present invention is to provide an improved pumping installation in which a pump, prime mover, automatic primer, and automatic control means for the prime mover, are all enclosed within a unitary housing construction, the entire assembly being readily and easily installed as a unit.

A further object is to provide an improved pumping station, which includes a pump, motor, automatic primer, and automatic motor control means, all of which are enclosed within a waterproof, self-ventilated, unitary housing construction.

A still further object is to provide an improved sewage disposal system, including a pump housing or station in which provision is made for a built-in sewage sump or basin and automatic primer device, the housing also enclosing a pump, prime mover and prime mover control means, the entire assembly being neat, compact and inexpensive.

Further objects will appear from the following detailed description of parts and the accompanying drawing, in which:

Fig. 1 is a sectional elevation through a preferred form of sewage disposal system to which the present improvements are applied; and Fig. 2 is a section taken along the line 2—2 in Fig. 1.

Referring by numerals to the drawing, a housing or pumping station is indicated at 10, which is, by preference, cylindrical in form for purposes of ease in manufacture, although the housing may be of polygonal form without departing from the objects of the invention. This housing is provided with a bottom or wall portion 11 which is, by preference, welded or otherwise suitably secured to the side walls of the housing. An imperforate partition 12 is suitably secured transversely of the housing 10, and is, by preference, spaced substantially from the bottom portion 11 of the housing to form a sump or catch basin 13, into which is fed sewage or other fluid, from a sewer main or conduit 14, which is suitably attached to the sump. This conduit or main is, by preference, disposed substantially close to the underside of the partition 12, so as to permit the liquid to rise, to a considerable height, within the collecting basin 13. It will be readily understood that the housing including the sump compartment is formed of substantially fluid-tight construction. It will be apparent that the partition 12 divides the housing 10 into a pair of vertical compartments for a purpose hereinafter appearing.

Above the sump 13 there is provided an automatic primer device represented, generally, at 15, which is, by preference, built into and forms a part of the housing 10. This primer assembly is arranged, by preference, on one side of the housing, and is supported partially by the partition 12. The primer device is, by preference, provided with an imperforate transverse partition 16 which is spaced substantially above the partition 12, the partition 16 separating the primer assembly into a pair of vertical compartments 17 and 18. The liquid capacity of the lower or suction chamber 17 is substantially equal to the liquid capacity of the upper or discharge chamber 18. It will be readily understood that the suction chamber 17 and the discharge chamber 18 are, by preference, formed to provide separate fluid-tight containers. The discharge compartment or reservoir is, by preference, closed at the top by a wall portion 19. A suction pipe 20 extends from a point close

to the bottom of the sump, through the partition 12 and into the suction chamber 17, the top end or outlet of the suction pipe 20 reaching to a point just below th > partition 16. It will be apparent that liquid from the sump is fed into the suction chamber through this pipe. A vertical valveless or centrifugal pump 21 is, by preference, supported upon the partition 12 directly above the sump, the inlet side of the pump is connected by a length of conduit or pipe 22 to the suction chamber 16. This connection to the suction chamber is made at a point just above the bottom of the chamber or wall 12. The discharge side of the pump is connected by a length of pipe 23 through the bottom of the partition 16 into the discharge chamber 18. It will, of course, be understood that the top of the suction pipe 20 is disposed an appreciable distance above a horizontal plane through the pump for a purpose hereinafter appearing.

A prime mover, such as a motor 24, is supported above the pump 21, the motor being provided with a vertical driving shaft 25 which is operatively connected to the pump impeller shaft by means of any suitable short coupling member. The energization of the motor 24 is controlled by a suitable switch arrangement, such as a Mercoid switch 26, which is actuated in response to the rise and fall of liquid in the sump. The housing 10 is provided with a suitable closure or lid member 27 which, by preference, supports or carries ventilating conduits 28 extending from the exterior into the interior of the housing. By this arrangement the interior of the housing constituted by the space above the portion 12 is self-ventilated at all times. Near the highest point in the discharge chamber 18 there is suitably attached a discharge conduit 29, which conducts the liquid from this chamber to any desired location. There is provided, by preference, a suitable vent 30 in the discharge line 29, and also a check valve 31 for a purpose hereinafter appearing. It will, of course, be understood that the vent 30 may be suitably installed within the housing 10, and attached directly to the upper portion of the discharge chamber 18. It will, of course, be understood that the vent 30 is constructed, by preference, to permit air to enter or leave the discharge chamber 18, but to prevent liquid from feeding out through the vent. It will also be understood that the check valve 31 is located, by preference, somewhere beyond the vent 30, and is arranged to prevent liquid that has previously passed the valve from returning into the discharge chamber 18.

The operation of the present improved unitary pumping station is simple, automatic and positive, and requires no attendant. When the liquid in the sump 13 reaches a predetermined high level, the Mercoid switch 26 is actuated to close the power circuit to energize the motor 24 which operates the pump 21. Prior to the pump starting operation, or when the pump is not operating, it will be apparent that the suction pipe 20, pressure chamber 18, and the discharge line 29 between the check valve 31 and the pressure chamber 18, are empty, but the suction chamber 17 is filled with liquid approximately level with the top end of the suction pipe 20 and, therefore, the pump is completely flooded or primed. Therefore, when the pump starts operating, the liquid is drawn by the pump from the suction chamber 17, and forced into the discharge or pressure chamber 18. As the liquid is drawn from the suction chamber 17, the pressure in this chamber is reduced sufficiently to draw liquid from the sump up through the suction pipe 20, and into the suction chamber 17 to replace the liquid that has previously been removed, thereby maintaining a constant level of liquid in this chamber. It will, of course, be understood that as the liquid is drawn from the suction chamber, the liquid level is reduced to a point just sufficient to cover the suction inlet of the pump, before liquid from the sump is drawn into the chamber. The pump, thereafter, will continue to force liquid into the discharge chamber, the overflow from this chamber being conducted out through the discharge conduit 29.

When the liquid in the sump reaches a predetermined low level, the Mercoid switch arrangement will be actuated to open the power circuit to stop the motor and pump. At this time, the pressure chamber 18, pump 21, suction pipe 20, and connections from pump to primer device are completely filled with liquid. It will, also, be readily understood that the suction chamber 17 is partially filled with liquid, as noted above. The air vent 30 in the discharge side of the apparatus, permits the liquid in the pressure chamber 18 to return, by gravity, through the pump and into the suction chamber, while the liquid in the suction line 20 drops back into the sump. As the liquid fills the suction chamber 17, a pressure is built up therein, and the liquid rises to a height, approximately, level with the open top end of the suction pipe. It will be apparent that the pump and connections therefrom are all flooded or primed with liquid, and the pump is therefore in a condition to be again started. It will be apparent that the above described primer arrangement is entirely automatic in operation.

It will be apparent that the present arrangement of pumping apparatus, with the pump, motor, primer, and automatic control, all contained within a unitary assembly, provides an installation that is easily installed, readily accessible for inspection, repair and lubrication. The present improved station housing which includes a sump compartment, facilitates mounting the pump, motor, automatic control means, and primer, directly over the sump, insures a decided saving in construction costs, since the motor control is simplified and the piping connections are short and, therefore, inexpensive. The use of short suction pipe connections makes it possible to employ a smaller primer. It will, of course, be understood that the top or partition 12 of the sump may be disposed above, below, or at the ground level as conditions require. This partition separates the housing 10 into a sump and a pump compartment. Further, the pump or pumps employed in this installation may be vertical trash or fresh-water pumps, or they may be replaced by one or more horizontal trash or fresh-water pumps as desired. It will be apparent that the present improved sewage ejector arrangement forms a unitary assembly, which provides many decided advantages over older prevailing types of installations.

It will, of course, be understood that the present detailed description of parts and the accompanying drawing relates to only a single executional embodiment of the invention, and that substantial changes may be made in the described construction and arrangement of parts without departing from the spirit and full intended scope of the invention.

I claim as my invention:

1. In an automatic sewage disposal system, in combination as a completely enclosed structural unit, a housing, a transverse partition supported from the walls of the housing, and forming there-

with a sump compartment in the lower portion of the housing and a pumping compartment in the upper portion of the housing, a pump and pump operating means supported by said partition within said pump compartment, vertical and horizontal housing partitions constituting a divided priming reservoir built in said pump compartment above the sump, said reservoir embodying a suction chamber and a discharge chamber, vertically disposed one above the other, a conduit from the inlet side of said pump to the suction chamber, a conduit from the discharge side of said pump to substantially the lowermost portion of said discharge chamber, a suction conduit from said sump to said suction chamber, said suction conduit being supported by said transverse partition and extended a substantial distance within the suction chamber to prevent return of the priming liquid therein to the sump, all of said conduits being contained within said housing.

2. In an automatic sewage disposal system, the combination of a tank constituting a unitary enclosure or housing, a transverse partition in said housing forming a sump compartment and a pump compartment, pumping and priming apparatus within the pump compartment including a centrifugal pump, a prime mover operatively connected to the pump, said pumping and priming apparatus being supported by said partition, above the sump compartment, vertical and horizontal partitions in said pump compartment, forming with the walls of the housing, and said transverse partition, a pair of vertically superposed priming reservoirs in said pump compartment, a supply connection from the lower portion of said sump to the upper portion of the lower reservoir, said connection being supported by said transverse partition and including a portion projecting through a part of the lower reservoir and arranged to prevent return of liquid to the sump, a supply pipe connecting the lower reservoir to the inlet of said pump, a connection from the discharge side of said pump to substantially the lowermost portion of the upper reservoir, a connection from the upper portion of the upper reservoir to a place of discharge, the lower reservoir extending to a height at least equal to that of the pump casing, to insure delivery of priming fluid thereto, and the upper reservoir being of a minimum capacity equal to the volume of that portion of the lower reservoir above the pump inlet connection, the upper reservoir being disposed above the pump casing, and an automatic pump control in said sump.

ROBERT V. COOK.