

April 28, 1942.

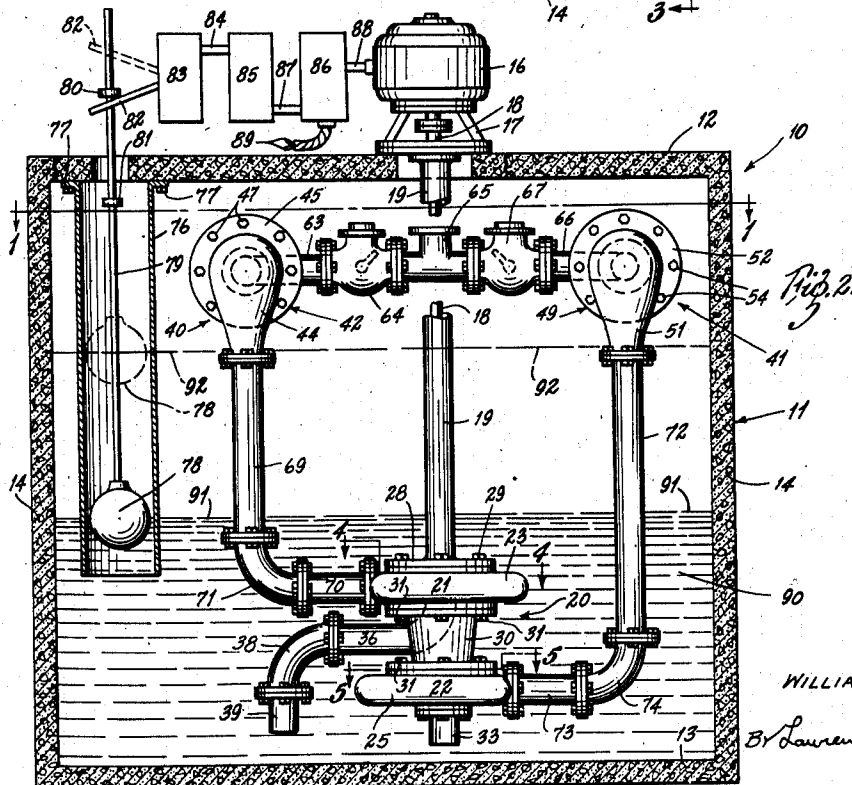
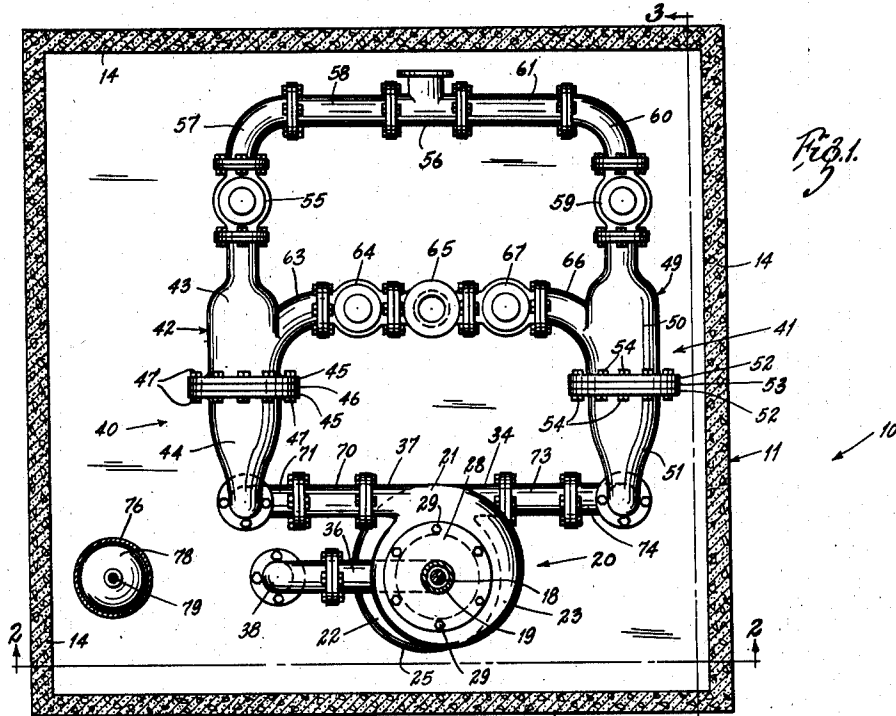
W. H. REEVES

2,280,930

PUMPING EQUIPMENT

Filed March 22, 1940

2 Sheets-Sheet 1



INVENTOR:
WILLIAM H. REEVES,

By Lawrence C. Kingland
ATTORNEY.

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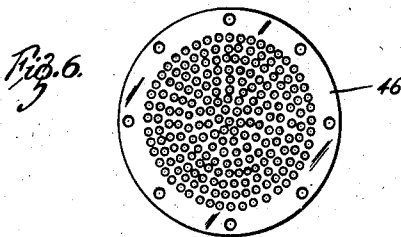
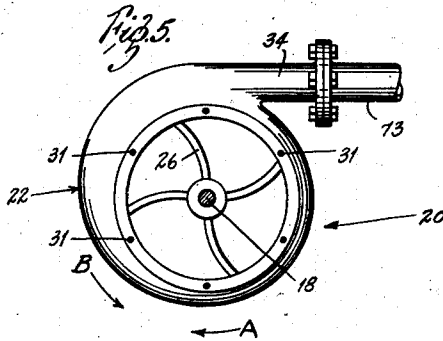
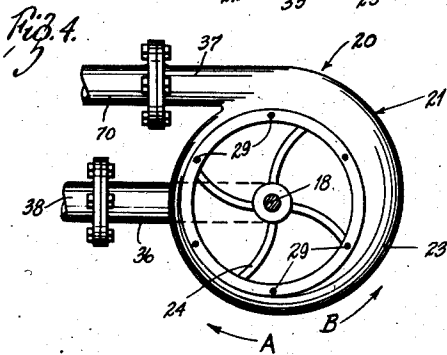
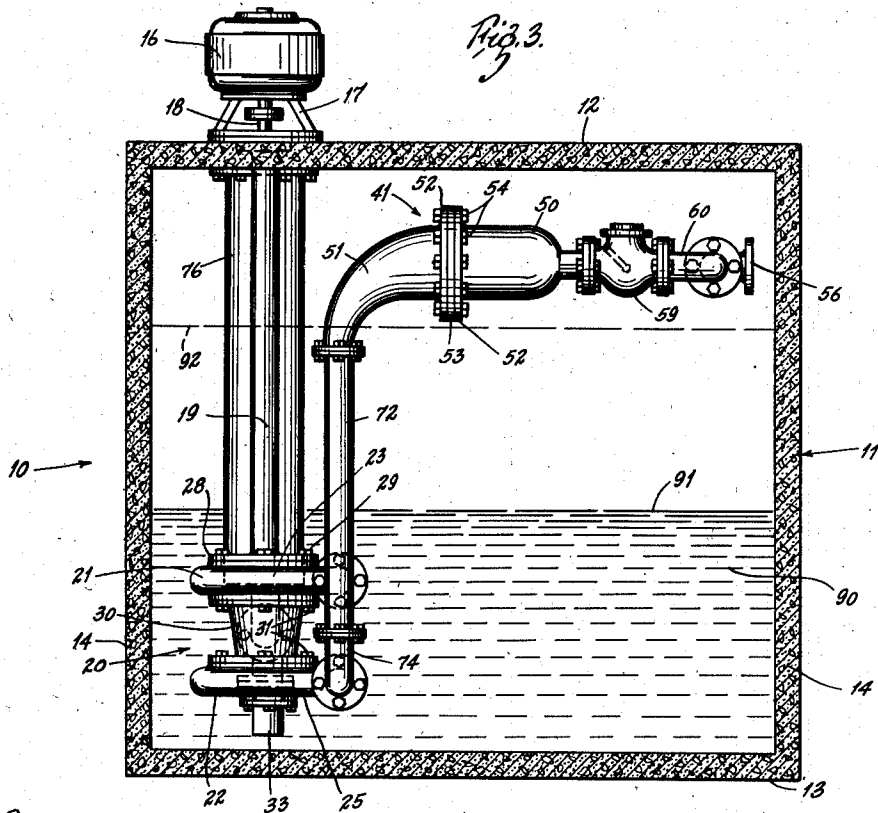
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2 Sheets-Sheet 2



INVENTOR:
WILLIAM H. REEVES,

By Lawrence C. Kingland
ATTORNEY.

UNITED STATES PATENT OFFICE

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PUMPING EQUIPMENT

William H. Reeves, St. Louis, Mo.

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6 Claims. (Cl. 103-3)

The present invention relates generally to pumping apparatus, and more particularly to pumping apparatus for handling sewage and other liquids carrying solids.

Therefore, an object of the present invention is to provide a novel pumping apparatus constructed to transfer solid-laden liquids, such as sewage, and the like, from a source of supply to a place of disposal.

Another object is to provide a novel pumping apparatus constructed to prevent passage of the larger solids of solid-laden liquid to the pumping elements, yet which ultimately forces such larger solids to the general ultimate point of disposal.

Another object is to provide a novel pumping apparatus which successively reverses the flow path of material being forced from one point to another upon the occurrence of predetermined circumstances.

Another object is to provide a novel pumping apparatus constructed to simultaneously transfer sewage from source of supply to storage box and transfer sewage from storage box to place of disposal, thereby permitting continuous runs of long duration.

Another object is to provide a novel pumping apparatus for conveying solid-laden liquids from one point to another, which is constructed to bypass larger solids through automatically reversing the flow upon the occurrence of predetermined circumstances.

Another object is to provide a novel pumping apparatus which is automatic and efficient in operation, and which is adapted to fulfill its functions throughout a long period of service.

Other objects and advantages will be apparent from the following description, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a section on the line 1-1 of Fig. 2, showing a top plan view of the major portion of a preferred embodiment of the present invention;

Fig. 2 is a section on the line 2-2 of Fig. 1;

Fig. 3 is a section on the line 3-3 of Fig. 1;

Fig. 4 is a section on the line 4-4 of Fig. 2;

Fig. 5 is a section on the line 5-5 of Fig. 2; and,

Fig. 6 is a plan view of a strainer screen which is one of the elements of the present construction.

Referring to the drawings more particularly by reference numerals, 10 indicates generally a pumping apparatus constructed in accordance with the concepts of the present invention. The pumping apparatus 10 is shown located within a concrete box or basin 11, which serves a func-

tion described below. The box 11 includes a top wall 12, a bottom wall 13, and side walls 14.

A reversible motor 16 is mounted exteriorly of the box 11 on the top wall 12 (Fig. 2) through a suitable support 17. An elongated rotor shaft 18 extends downwardly into the box 11 through a housing pipe 19 which is secured at its upper end to the support 17. Within the box 11 is a pump 20 which comprises in superposed relation a first pump section 21 (Fig. 4) and a second pump section 22 (Fig. 5). The pump section 21 includes a housing 23 and a blade assembly 24, and the pump section 22 includes a housing 25 and a blade assembly 26. The housing 19 terminates at its lower end in an enlarged flange 28 which is secured to the housing 23 of the pump section 21 by bolts 29, or the like. The upper side of the housing 25 is secured to the lower side of the housing 23 by a connecting element 30 by suitable bolts 31, or the like.

A pipe section 33 leads into the pump section 22 at the lower central part of the housing 25. A nozzle 34 leads off from one side of the housing 25. Leading off from the lower side of the housing 23 of the pump section 21 is a nozzle 36, and leading off from the side of the housing 23 is a nozzle 37. To the nozzle 36 is connected a pipe bend 38 and a pipe section 39 which leads into the box 11.

Above the pump 20 are spaced strainers 40 and 41. The strainer 40 comprises a housing 42 which includes sections 43 and 44, each of which terminates at one end in a flange 45. Between the flanges 45 is a screen 46 (Figs. 1 and 6), the sections 43 and 44 through the flanges 45 and the screen 46 being secured together as a unit by bolts 47, or the like. Similarly, the strainer 41 includes a housing 49 comprising sections 50 and 51, each of which terminates at one end in a flange 52. A screen 53 is disposed between the flanges 52 and is secured thereto by bolts 54, or the like.

The free end of the strainer section 43 is secured to a check valve 55, which is in turn connected to a T-member 56 by a pipe bend 57 and a pipe section 58. Similarly, the free end of the strainer section 50 is connected to a check valve 59, which is in turn connected to the T-member 56 by a pipe bend 60 and a pipe section 61. The stem of the T-member 56 is connected to a place of sewage disposal (not shown).

Leading from one side of the section 43 of the strainer housing 42 is an arm 63 which is connected to a check valve 64 which is in turn connected to a T-member 65. Similarly, leading

from the section 50 of the strainer housing 49 is an arm 66 which is connected to a check valve 67, which is in turn connected to the T-member 65. The stem of the T-member 65 (Fig. 2) is connected to the source of sewage, or the like, to be pumped (not shown).

Connecting the free end of the section 44 of the strainer housing 42 with the pump nozzle 37 are pipe sections 69 and 70, and a pipe bend 71. Similarly, connecting the free end of the section 51 of the strainer casing 49 with the pump nozzle 34 are pipe sections 72 and 73 and a pipe bend 74.

An automatic control for the pumping apparatus 10 is provided. A casing 76 is connected to the lower face of the top wall 12 by bolts 77, or the like, and extends to a point beneath the determined lowest liquid level. Within the casing 76 is a float 78 from which extends a float shaft 79. The float shaft 79 carries spaced lever throw elements 80 and 81 which are adapted to actuate a lever 82 of a switch 83, diagrammatically shown. The switch 83 is operatively connected by leads 84 to an alternator 85. A reversing motor starter 86 is connected to the alternator 85 by leads 87, to the motor 16 by leads 88, and to a source of power by leads 89. The alternator 85, the reversing starter 86 and the leads 84, 87 and 88 are shown diagrammatically, inasmuch as these elements per se form no part of the present invention.

Sewage 90, or the like, within the box 11 ordinarily falls and rises between the extreme low level 91 and the extreme high level 92.

Operation

Let it be assumed that the level of the sewage 90 within the box 11 is at the maximum level 92, in which case the float 78 will be in the position shown in dotted lines in Fig. 2, and the lever 82 in the dotted line position with the throw element 81 engaging beneath it. The switch 83 is in the "on" position with the lever 82 thus raised. Hence, the motor 16 is rotating in one direction. Rotation of the motor 16 effects rotation of the rotor shaft 18, which in turn rotates the blades 24 of the pump section 21 and the blades 26 of the pump section 22. Let it be further assumed that the blades 24 and 26 are rotating in the direction of the arrows A on Figs. 4 and 5. Sewage 90 will be drawn into the T-member 65 from the source of supply and thence consecutively through the check valve 64 (Fig. 1), the arm 63, the section 43, the screen 46, the section 44, the pipe line 69 (Fig. 2), the pipe bend 71, the pipe section 70, the nozzle 37, the pump section 21, the nozzle 36, the pipe bend 38, and the pipe outlet section 39 into the interior of the box 11.

At the same time sewage 90 is being drawn into the box 11 by the pump section 21, sewage 90 within the box 11 is being forced to the point of sewage disposal by the pump section 22, the sewage 90 entering the pipe section 33 and thereafter consecutively passing through the pump section 22, the nozzle 34, the pipe section 73, the pipe bend 74, the pipe section 72, the strainer section 51, the screen 53, the strainer section 50, the check valve 59, the pipe bend 60, the pipe section 61, and out through the stem of the T-member 56 to the aforesaid point of sewage disposal.

During the foregoing passage of sewage 90 into the box 11 and out of the box 11 to a point of disposal, the check valve 55 prevents the return of any sewage 90 being forced by the pump section 22 from entering the strainer section 43

and thereby being recirculated. A small amount of sewage 90, of course, fills the pipe section 58 and the pipe bend 59, but the remaining portion passes out through the T-member 56. Similarly, the check valve 67 prevents any of the sewage 90 being forced out of the box 11 by the pump section 22 from entering the T-member 65 and being recirculated by the pump section 21.

The screen 46 prevents large solids from passing to the pump section 21. Hence, gradually the screen 46 will become clogged, so that the amount of liquid and small solids passed to the pump section 21 and into the box 11 will become less than the amount of sewage 90 carried by the pump section 22 from the box 11 to the point of disposal. The level of sewage 90 within the box 11 will gradually drop until it reaches the predetermined lowest level 91, in the course of which the throw element 80 throws the switch lever 82 from the dotted line position to the full line position (Fig. 2), breaking the contacts of the switch 83 and stopping the motor 16, since the float 78 falls with the liquid.

The box 11 will again gradually fill with sewage 90 due to gravity flow from the source of supply, the gravity flow being through both channels leading from the T-member 65 into the box 11. When the level of the sewage 90 reaches the maximum level 92, the float 78 will have been returned to the dotted line position (Fig. 2), in the movement of which the throw element 81 will have returned the switch arm 82 to "on" position, which energizes the alternator 85 and the starter 86 to start the motor 16 in the opposite direction.

Upon rotation of the motor 16 and its rotor shaft 18 in the opposite direction, the blades 24 of the pump section 21 and the blades 26 of the pump section 22 are moved in the direction of the arrows B on Figs. 4 and 5. The travel of the sewage 90 will be reverse to that set forth above than when the blades 24 and 26 move in the direction of the arrows A. The pump element 22 draws the sewage 90 into the box 11 through the T-member 65, whereas the pump section 21 forces sewage 90 from the box 11 through the T-member 56. In this operation, the check valves 59 and 64 function to prevent recirculation of sewage 90 being forced from the box 11 by the pump section 21. In this reverse action, the larger solids lodged against the screen 46 are forced from the screen by the liquid being evacuated from the box 11 by the pump section 21 and are carried along with it through the T-member 56 to the point of disposal. Meanwhile, the screen 53 functions to stop the passage of larger solids to the pump section 22. As the pumping action continues, the screen 53 will become more clogged with the larger solids, whereupon the flow into the box 11 will become less than the flow therefrom. The level of the sewage 90 within the box 11 will become less until it again reaches the predetermined lowest level 91. The above-described action again takes place, the motor 16 being stopped until the sewage level reaches the predetermined highest level 92 by gravity action. The rotation of the motor 16 is reversed and the pump section 21 again assumes the task of drawing sewage 90 into the box 11. The clogging of the intake screen or the failure of the source of liquid supply determines the length of time of operation in a given direction.

The foregoing cycle is automatically continued throughout the life of the pumping apparatus

10. Where generous screens are employed, the operation in a given direction will be for a considerable period of time. In pumping relatively clean liquid, the operation in one direction will be continuous unless the source of supply fails. The device is of simple and sturdy construction and, therefore, continues to operate over a long period of time without mechanical difficulties.

The pumping apparatus 10, of course, may be disposed outside of the box 11, it being shown in the present application as located within the box 11 for conservation of space, which would be one reason for locating it within the box 11. The several elements of the pumping apparatus 10 are secured together by suitable fastening means, preferably by the bolt and flange construction disclosed, although other means may be employed. Further, it is appreciated that two separate pump and prime mover units may be employed, and that the pumps may be other than vertically related.

It is apparent that the pumping apparatus 10 fulfills all of the objects and advantages sought therefor. It is to be understood that the foregoing description and accompanying drawings have been given by way of illustration and example, and not for purposes of limitation, the invention being limited only by the claims which follow.

What is claimed is:

1. Pumping apparatus comprising a first pumping means, a second pumping means, each pumping means being designed to pump liquid against a positive head when rotating in one direction and to exhaust liquid to a negative head when rotating in the opposite direction, means for driving said pumping means first in one direction and then in the opposite direction, means connecting the first pumping means with a source of solid-laden liquid supply, means connecting said first pumping means with a point of disposal, means connecting said first pumping means with a receptacle, means connecting the second pumping means with the source of solid-laden liquid supply, means connecting said second pumping means with a point of disposal, means connecting said second pumping means with the receptacle, means to prevent return of liquid from either disposal-connecting means to either source-connecting means, and means in each of said source-connecting means for preventing the passage of larger solids to the pumping means, said last means also being in a portion of the disposal-connecting means, said pumping means being disposed so that one draws liquid from the source into the receptacle while the other forces liquid from the receptacle to the place of disposal, whereby one solid-blocking means is being cleaned while the other is fulfilling its screening function.

2. Pumping apparatus comprising a first pumping means, a second pumping means, each pumping means being designed to pump liquid against a positive head when rotating in one direction and to exhaust liquid to a negative head when rotating in the opposite direction, means for driving said pumping means first in one direction and then in the opposite direction, means connecting the first pumping means with a source of solid-laden liquid supply, means connecting said first pumping means with a point of disposal, means connecting the said first pumping means with a receptacle, means connecting the second pumping means with the source of solid-laden liquid supply, means connecting said second pumping means with a point of disposal, means

connecting said second pumping means with the receptacle, means to prevent return of liquid from either disposal-connecting means to either source-connecting means, means in each of said source-connecting means for preventing the passage of larger solids to the pumping means, said last means also being in a portion of the disposal-connecting means, said pumping means being disposed so that one draws liquid from the source into the receptacle while the other forces liquid from the receptacle to the place of disposal, whereby one solid-blocking means is being cleaned while the other is fulfilling its screening function, and means for automatically reversing the said driving means.

3. A pumping apparatus comprising two reversible pump sections, one of which is adapted to draw liquid into a receptacle while the other simultaneously forces liquid from the receptacle, reversible driving means connected to said pump sections, means connecting one of said pump sections with a source of liquid supply, means connecting said one pump section with a point of disposal, means connecting said one pump section with a receptacle, means connecting the other pump section with the source of liquid supply, means connecting the other said pump section with the point of disposal, means connecting said other pump section with the receptacle, means in each source-connecting means to prevent recirculation of fluid being ejected from the receptacle, means in each of said source-connecting means for preventing the passage of large solids to the respective pump section, and means for reversing the driving means to reverse the rotation of the pump sections upon the occurrence of predetermined conditions.

4. A reversible pumping apparatus for forcing solid-laden liquid from a source of supply to a point of disposal constructed to prevent the passage of large solids to the pumping mechanism comprising a first reversible pump section, a second reversible pump section, a receptacle, means connecting the first pump section with the source of supply, means connecting the first pump section with the receptacle, means connecting the first pump section with a point of disposal, means connecting the second pump section with the source of supply, means connecting the second pump section with the point of disposal, means connecting the second pump section with the receptacle, means in each of said source-connecting means for preventing the passage of large solids to the respective pump section, means for rotating the pump sections simultaneously to draw liquid into the receptacle from the source of supply by one pump section and to force liquid from the receptacle to the point of disposal by the other pump section, means to prevent recirculation of liquid being ejected from the receptacle, and means for sequentially reversing the direction of rotation of the pump sections.

5. A reversible pumping apparatus for forcing solid-laden liquid from a source of supply to a point of disposal constructed to prevent the passage of large solids to the pumping mechanism comprising a first reversible pump section, a second reversible pump section, a receptacle, means connecting the first pump section with the source of supply, means connecting the first pump section with the receptacle, means connecting the first pump section with the point of disposal, means connecting the second pump section with the source of supply, means connecting the second pump section with the receptacle, means

connecting the second pump section with the receptacle, means in each of said source-connecting means for preventing the passage of large solids to the respective pump sections, means for rotating the pump sections simultaneously to draw liquid into the receptacle from the source of supply by one pump section and to force liquid from the receptacle to the point of disposal by the other pump section, means to prevent recirculation of liquid being ejected from the receptacle, means for sequentially reversing the direction of rotation of the pump sections, and means for reversing the direction of rotation of the pump sections upon the occurrence of predetermined conditions.

6. Pumping apparatus comprising a first pumping means, a second pumping means, each pumping means being designed to pump liquid against a positive head when rotating in one direction and to exhaust liquid to a negative head when rotating in the opposite direction, and to also permit flow of liquid through same by gravity when idle, means for driving said pumping means, first in one direction and then in the opposite direction, means connecting the first pumping means with a source of solid-laden liq-

uid supply, means connecting said first pumping means with a point of disposal, means connecting said first pumping means with a receptacle, means connecting the second pumping means with the source of solid-laden liquid supply, means connecting said second pumping means with a point of disposal, means connecting said second pumping means with the receptacle, means to prevent return of liquid from either disposal-connecting means to either source-connecting means, means for filling the receptacle with liquid from the supply source by gravity through both pumping means and both solid-blocking means when the pumping means are idle, and means in each of said source-connecting means for preventing the passage of larger solids to the pumping means, said last means also being in a portion of the disposal-connecting means, said pumping means being disposed so that one draws liquid from the source into the receptacle while the other forces liquid from the receptacle to the place of disposal, whereby one solid-blocking means is being cleaned while the other is fulfilling its screening function.

WILLIAM H. REEVES.