

May 27, 1947.

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2,421,066

FLOOD CONTROL SYSTEM

Filed Sept. 29, 1944

3 Sheets-Sheet 1

Fig. 1.

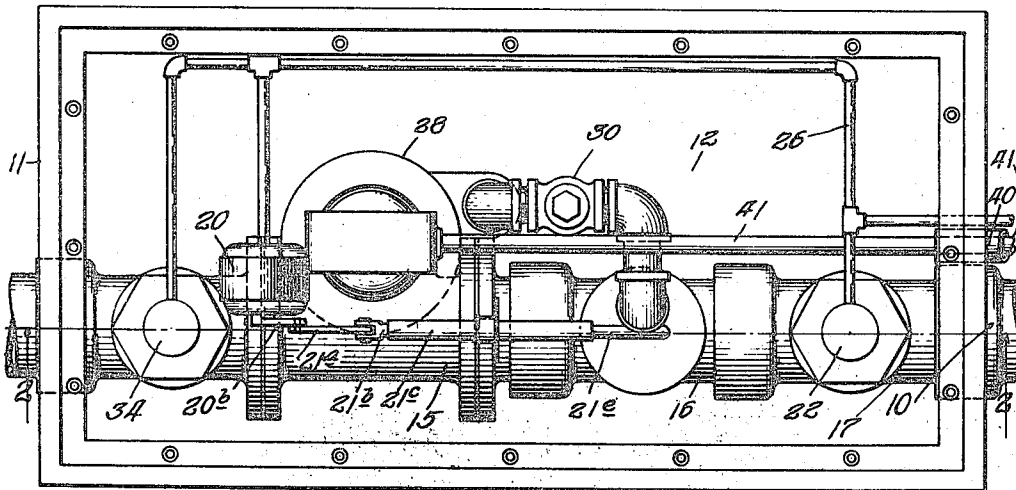
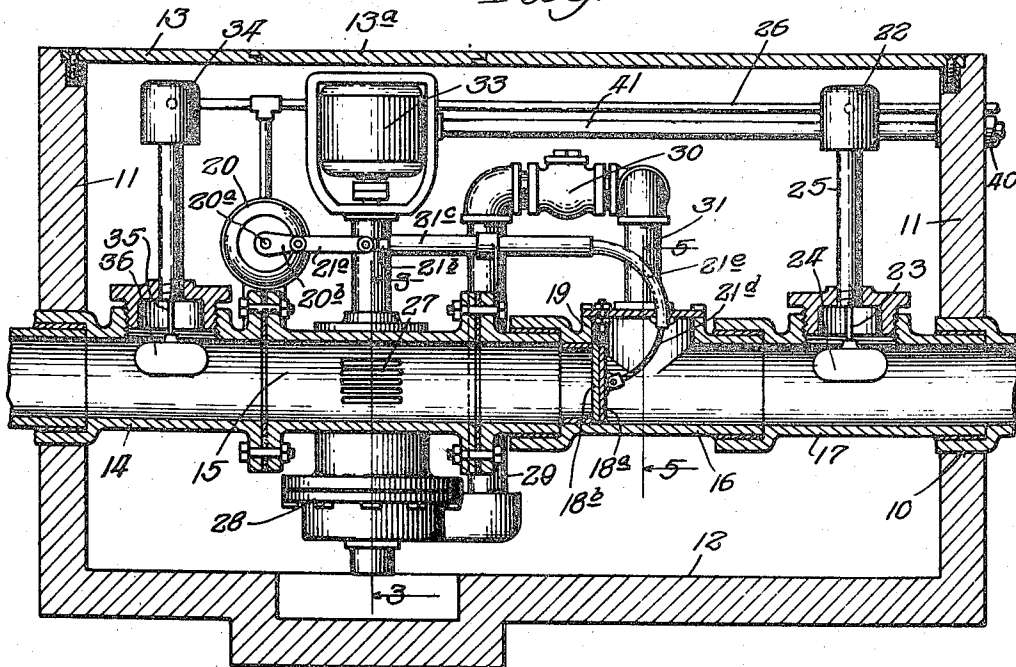


Fig. 2.



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Fig. 3.

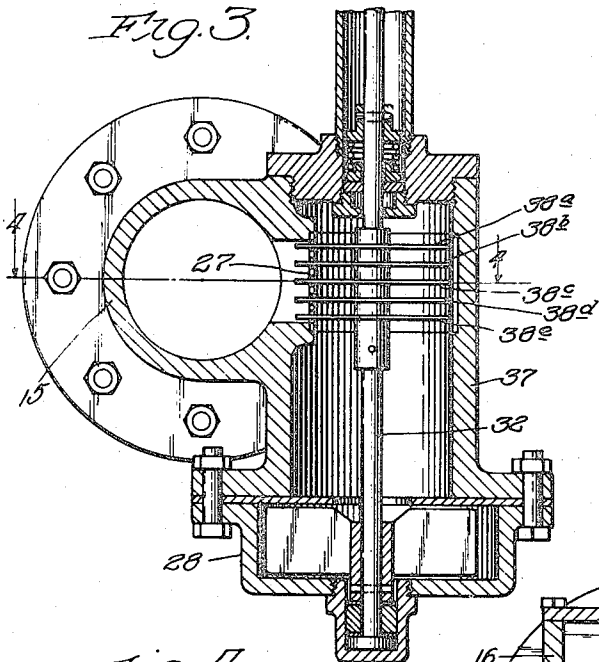


Fig. 4.

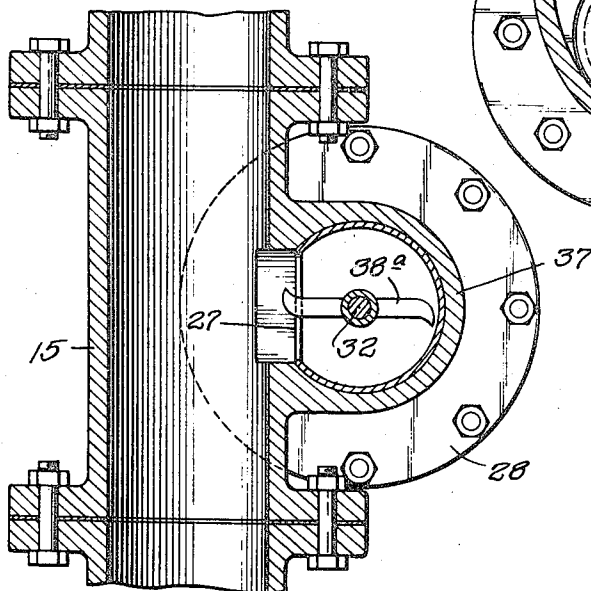
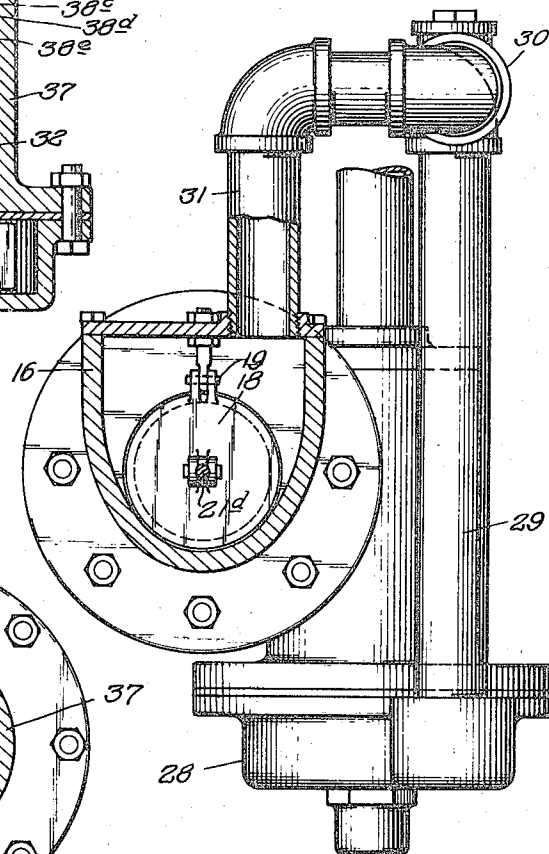


Fig. 5.



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Fig. 6.

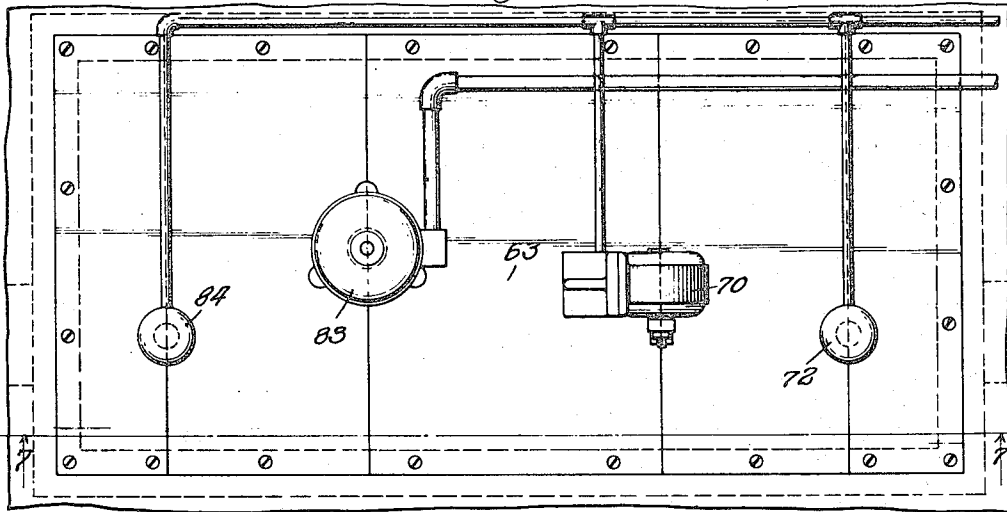
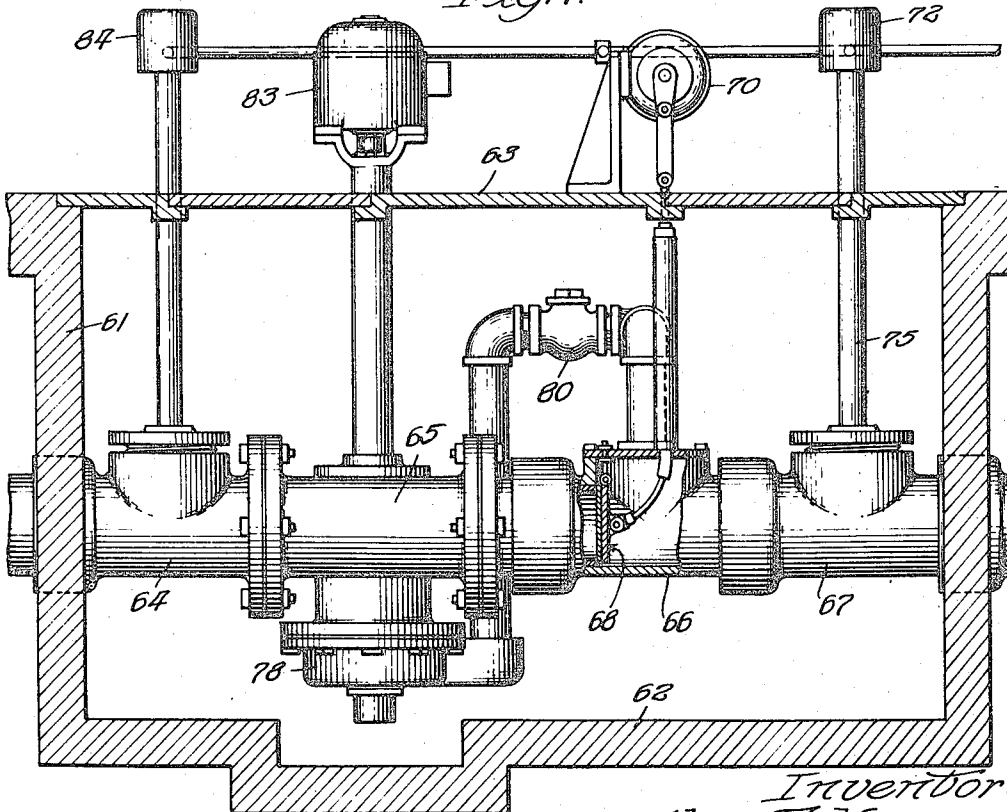


Fig. 7.



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UNITED STATES PATENT OFFICE

2,421,066

FLOOD CONTROL SYSTEM

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Application September 29, 1944, Serial No. 556,421

13 Claims. (Cl. 182-1)

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This invention relates to a flood control system, and more particularly to a system adapted to be associated with a drainage disposal pipe leading from a building to a sewer connection.

One feature of this invention is that it provides an improved system for ensuring prevention of back flow through a disposal pipe; another feature of this invention is that blocking of the disposal pipe against back flow is effected by a motor so that closing of the main valve means is positive and certain; still another feature of this invention is that the system provides for disposal of drainage material from the building even when the main valve means is closed; yet another feature of this invention is that disposal, when the main valve means is closed, is through a by-pass passageway including a pump; a further feature of this invention is that the by-pass passageway includes means for disintegrating solid material which might otherwise clog the pump; still a further feature of this invention is that operation of the main valve means and of the by-pass pump is effected by control means including float-actuated switch means, control of the main valve means being in accordance with the level of liquid in the pipe in front of said main valve means, and operation of the by-pass pump being in accordance with the level of liquid behind the main valve means; yet a further feature of this invention is that all or at least part of the elements of the system may be housed within a dry pit; and another feature is the provision of ventilating means for the pit, and particularly the pump motor. Other features and advantages of this invention will be apparent from the following specification and the drawings, in which:

Figure 1 is a top plan view of one system embodying my invention, the cover being removed from the pit; Figure 2 is a vertical sectional view along the line 2-2 of Figure 1; Figure 3 is a partial vertical sectional view, transverse to that of Figure 2, along the line 3-3 of Figure 2; Figure 4 is a partial horizontal sectional view along the line 4-4 of Figure 3; Figure 5 is a partial vertical sectional view transverse to that of Figure 2, along the line 5-5 of Figure 2; Figure 6 is a top plan view of another system embodying my invention; and Figure 7 is a vertical sectional view along the line 7-7 of Figure 6.

A building usually has all of its material intended for disposal, including sewage, drainage water, and the like, delivered to a disposal pipe which might be six or eight inches in diameter in the case of the ordinary home, this disposal pipe then extending to the main sewer, usually under

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the street. New sewers now being constructed are usually located at sufficient depth to prevent trouble with backing up of water, but this was not always true in connection with older sewers. Moreover, even where an older sewer is at sufficient depth, overloading it beyond its capacity can create a pressure in it which drives water back up the disposal pipes of each home. Under these conditions, as many a householder has found in heavy rainstorms, water backs up from the main sewer through the disposal pipe and up into the basement through the floor drain, the basement toilet, the wash tub outlet, and the like, resulting in serious flooding of the basement. It has for sometime been considered good practice to include a gravity operated valve arrangement in the disposal pipe (termed a Coleman valve) which tends to swing closed in the event water starts to back up from the main sewer. Such a valve arrangement is not positive in action, however, and is frequently defeated by solid matter lying in the bottom of the pipe, as a piece of orange peel, an apple core, or even so little as a match stick. Moreover, such an arrangement provides no means for disposing of material within the house during the time when the valve is closed, so that the householder must be careful not to empty a bathtub or wash tub, or the like, if flooding of his basement is to be prevented. Certain workers in the prior art have endeavored to provide means for enabling disposal of material within the house during the time when the valve of the disposal pipe was closed, but all such previous arrangements have had serious objections and difficulties and have not been commercially acceptable. The problem is accentuated, of course, in any basement flat, since many systems heretofore used for flood prevention are such that they failed in situations where the basement included a toilet. Moreover, in a basement flat it is impracticable to use standpipes rising from the floor drain; and yet even so little as a quarter or a half inch of water on the floor can cause serious damage to the tenant's rugs and other furnishings and result in a very unsanitary condition from saturating everything with bacteria-contaminated water.

I have devised and am here disclosing and claiming a flood control system which is very positive and effective in its action, and which overcomes the objections and difficulties of prior systems seeking the same end. Moreover, in my system all drainage is retained within closed conduits, the parts of my system being all or partly housed within a dry pit. In the case of a build-

ing having a basement flat my entire system can be contained within a dry pit sunk in the basement floor and entirely below floor level. The fact that the pit is dry eliminates any possibility of odor or dampness. In my system I provide positive motor drive means for closing and opening the main valve in the disposal pipe; float-actuated switch means for controlling this valve movement in accordance with the level of liquid in the pipe in front of the main valve; a by-pass conduit leading from in back of the main valve to a point in the disposal pipe in front of the main valve, this passageway including disintegrating means for breaking up solid material, a pump, and a spring pressed check valve; and control means including float-actuated switch means for controlling the operation of the pump and disintegrating means in accordance with the level of liquid in the pipe behind the main valve means. The terms "behind" and "ahead" of the main valve means are used in the sense of normal flow movement through the disposal pipe, portions of the disposal pipe between the main valve means and of the connection to the main sewer in the street being spoken of as "ahead" of the main valve, points on the other side of the main valve being spoken of as "behind" it.

In the particular embodiment of my invention illustrated in Figures 1-5, the disposal pipe is indicated in general by the reference numeral 10, the right-hand end of this pipe (speaking with respect to the position of the parts as shown in Figures 1 and 2) leading to the main sewer and the left-hand end being connected through various risers and other pipes to the various points in the building from which disposal is to be made. In the particular system disclosed here a portion of the pipe 10 extends through a dry pit provided by an enclosure comprising wall members 11, a bottom member 12, and a cover 13. The cover is preferably of metal and arranged level with the basement floor, while the walls and bottom of the pit may be of any appropriate material, as concrete or cast iron. If the pit is to be of concrete forms must be made and the concrete poured on the job, while if the pit is previously made of cast iron it is only necessary to sink it in place and then pour sealing concrete around it to make a watertight connection with the surrounding floor of the basement, almost invariably of concrete. The cover 13 is bolted and sealed to the walls of the pit, and may include a smaller removable portion 13a adapted to be removed if access is desired only to the motors. If the disposal pipe is of the sectional type one or more sections are removed to permit a portion of the pipe to be composed of sections adapted to and forming part of my system. If the pipe, or the portion of it exposed by the pit, is integral, a section must be cut out to permit the introduction of other specially formed parts to be hereafter more fully described.

I have divided the intermediate or special sections of the pipe into four portions for convenience, these being here identified as 14, 15, 16 and 17, but it will be understood that a number of special sections is not of importance. In the particular system illustrated, sections 14 and 17 may be termed control sections, section 15 the pumping section, and section 16 the main valve section.

As may be best seen in Figure 2, the main valve section includes main valve means comprising a

metal disk or plate 18a pivotally mounted about a horizontal axis comprising the pin 19 and carrying on its left-hand face a sealing member 18b, this latter comprising a piece of sponge or other highly resilient rubber preferably about an inch thick. This permits the main valve means to close on to its seat and provide a good seal despite the presence of a match stick or other small piece of solid matter on the seat at the time of closing. The main valve is adapted to be positively moved between open and closed positions by a motor 20 operating through connecting linkage to effect the desired movement. In the particular embodiment of the system shown here the motor 20 is of the type including a reduction gear and limit switch arrangement within its motor housing, the arrangement being such that the shaft 20a and crank arm 20b rotate through 180° upon each energization of the motor circuit. The connection between the crank arm 20b and the valve member 18 comprises a link 21a, a slide 21b slidable in a guide tube 21c, and a piece of flexible steel cable 21d in a guide sheath 21e.

Control of the valve motor 20 is effected by control means including a switch in the housing 22 wired into the valve motor circuit, this switch being moved between open and closed positions by an actuating rod 23 adapted to be raised or lowered by a float 24. The actuating rod 23 is enclosed by a housing pipe 25 appropriately mounted on the pipe section 17 at its lower end carrying the switch housing 22 at its upper end. Wiring connections to the switch and to the motor are completed through a wiring conduit 26. The control parts are so proportioned and arranged that when the float is in the position shown in Figure 2 the main valve means is closed, as illustrated, it being assumed that the level of liquid in the pipe in front of the valve means is high enough to lift the float to this position. On the other hand, if the level of liquid in front of the valve means drops by reason of the material therein draining into the sewer, the float 24 drops a fraction of an inch and the switch is thrown to a position causing the valve motor 20 to operate through 180° and move the main valve member to open position. It will thus be apparent that as long as liquid in the pipe 10 keeps draining off without the liquid level in such pipe rising to much more than half the height thereof, the valve 18 will remain open and all drainage disposal from the house will be in the normal manner, by gravity. Any abnormal rise of liquid level in the pipe in front of the main valve means, as would be caused by the sewer being filled and starting to back up, actuates the main valve motor and moves the valve to closed position, preventing any back flow up the drainage openings or the like in the house.

There is still the problem of moving liquid from the house side of the main valve to the street side, when such valve is closed, to enable continued functioning of all house drains in normal manner. I accomplish this by providing a by-pass which connects with the disposal pipe in back of the main valve means at one end and in front of it at the other end; by providing a pump and a check valve in this by-pass passageway; and by providing control means for the pump actuated in accordance with the level of liquid in the pipe behind the main valve means. The point of communication between the disposal pipe and one end of the by-pass passageway is covered by the grate 27, comprising a plurality of

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spaced parallel grate bars arranged horizontally. From this point the passageway extends down to the pump 28, which may be of the centrifugal type, located below the disposal pipe. The outlet of the pump 28 communicates with a relatively small vertical riser pipe 29, passes through a check valve housing portion 30 including a spring pressed ball check valve, and then the passageway is completed through a downwardly extending pipe 31 opening into the pipe section 16 in front of the main valve. The impeller portion of the pump 28 is mounted on and adapted to be rotated by the drive shaft 32, this shaft extending vertically up to a connection with the rotating shaft of the pump motor 33.

Control means for the pump motor 33 is provided, this means including a switch in the housing 34 wired into the pump motor control circuit. The switch is actuated in accordance with the level of liquid in the pipe in back of the main valve, this being effected through an actuating rod 35 and a float 36. These float-actuated control devices are not being described with more particularity since they are of a common and well known type commercially available. When the float 36 is in the position shown in Figure 2, the motor 33 and pump 28 are inoperative. Should any drainage take place in the house and run down into the pipe, this would tend to raise the level back of the valve 18 and as soon as the float 36 were lifted a quarter of an inch, the motor 33 and pump 28 would be started and would pump material out of this portion of the pipe and through the by-pass passageway into the portion of the disposal pipe in front of the main valve 18. This disposal action would take place, by virtue of the forcing power of the pump 28, even if the portion of the pipe in front of the main valve were full; and, when the pump is eventually stopped through lowering of the float 36, the ball check valve in the housing 30 prevents any backward movement of liquid through the passageway. I have found that it is highly important that no pieces of solid matter of any appreciable size be permitted to reach the pump 28, as these tend to clog and jam the pump and render the system inoperative. This is particularly true of pieces of paper, which have a very bad effect upon the operation of the pump. The provision of the grate 27 is operative to prevent larger pieces of solid material from getting into the pump, allowing these to merely accumulate behind the main valve means until the flood conditions are over and the main valve again opens and allows gravity disposal. In order to prevent the solid material, and particularly leaves and paper, from clogging the grate, and to prevent small pieces of solid material which get through the grate from interfering with the operation of the pump, I provide disintegrating means best seen in Figures 3 and 4. A cylindrical disintegrator housing 37 forms part of the passageway leading to the inlet of the pump 28, this housing being coaxial with the drive shaft 32. Near the upper part of this housing are a plurality of disintegrating members or chopper blades here identified as 38a-e. The grate bars 27 are straight and are so arranged that they comprise chords across what would otherwise be one section of the cylindrical disintegrating housing 27. The disintegrating members or chopper blades 38 are of such a length that their ends project through between the grate bars during a part of each rotation, as may be best seen in Figure 4, and move very close

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to the inner wall of the disintegrating housing 27 during the remainder of each rotation. If pieces of paper, leaves or other solid matter tend to clog the grate they are beaten or knocked away upon each revolution of the chopper blades by the end portions which project through the grate; and any small pieces which get through the grate bars are chopped up into very small pieces between the ends of the chopper blades and the inner wall of the housing before they drop down into the motor inlet, the disintegration being sufficiently complete that any particles of solid material reaching the pump are very small in size and are forced through the pump and the rest of the passageway without difficulty.

While the use of a dry pit in connection with my system does not require ventilation in accordance with the building codes, I find it desirable under some circumstances to provide ventilation for cooling of the motors, and particularly the pump motor, which may run for long periods. In the arrangement shown here a pair of concentric pipes 40 and 41 are used for ventilation, these pipes terminating in a vented or louvered ventilation outlet at some point not shown, as on one wall of the basement. In the particular arrangement here illustrated blower means mounted within the casing of the motor 33, in a conventional manner frequently used commercially, forces air out through the pipe 41 and draws air into the pit through the pipe 40 when the motor 33 is operating. The motor 20 operates so seldom that no special cooling of this unit is necessary. Flood conditions rendering this system operative might only occur 3 or 4 times a year and at each occurrence the motor would operate once to close the main valve and then again some hours later to open the main valve. During the period this main valve was closed however, the motor 33 might have to operate a great many times, depending upon the amount of drainage taking place from the house during this period. Taking a shower bath, for example, would impose a continuous load on the motor 33 for the entire time the shower was operating.

The embodiment of my invention illustrated in Figures 6 and 7 is similar to that embodiment just described in general principles and in operation, differing primarily in that the control means and motors lie above the level of the basement floor rather than in the pit. In view of the similarity of these two systems in most respects, the description of this latter form of my flood control system will be shortened and reference numerals 50 higher than those used in Figures 1-5 will be applied to similar parts. The pit comprising the walls 61 and bottom 62 again houses special pipe sections here identified as 64, 65, 66 and 67. Again a main valve member 68 is adapted to be opened under normal conditions, but to be positively forced closed by a motor 70 and operating linkage (in this case the motion being achieved again by a flexible cable and a crank arm) when the liquid level in the pipe in front of the valve 68 rises to a point actuating the valve motor control means. When the main valve is closed any drainage into the pipe behind this valve sufficient to actuate the float control means in the portion 64 and switch housing 84 renders the pump motor 83 operative and the pump 78 forces liquid through the by-pass passageway into the pipe section 66. Where the basement does not contain a flat and the floor space is not desired for a recreation room or the like, the ar-

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range-ment illustrated in these figures, with the control means and motor located above the cover 63, has certain advantages. One of these advantages is that no special cooling and ventilating arrangement is needed for the pump motor 83. Another advantage is that the motors may be oiled at appropriate intervals, brushes changed and all other service work done more conveniently than where they are located in the pit.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. A flood control system associated with a disposal pipe, including: main valve means in said pipe; motor means for positively opening and closing said main valve means; a by-pass passageway communicating with said pipe on opposite sides of the main valve means; a check valve in said passageway permitting flow only in the disposal direction; and a pump in said passageway for forcing material in the pipe behind the main valve means through said passageway.

2. A flood control system associated with a disposal pipe, including: main valve means in said pipe; motor means for positively opening and closing said main valve means; control means for operating said motor means in accordance with the level of liquid in the pipe in front of the main valve means; a by-pass passageway communicating with said pipe on opposite sides of the main valve means; a check valve in said passageway permitting flow only in the disposal direction; a pump in said passageway for forcing material in the pipe behind the main valve means through said passageway; and control means for operating said pump in accordance with the level of liquid in the pipe behind the main valve means.

3. A flood control system associated with a disposal pipe, including: main valve means in said pipe; motor means for positively opening and closing said main valve means; control means comprising float-actuated switch means for operating said motor means in accordance with the level of liquid in the pipe in front of the main valve means; a by-pass passageway communicating with said pipe on opposite sides of the main valve means; a check valve in said passageway permitting flow only in the disposal direction; a pump in said passageway for forcing material in the pipe behind the main valve means through said passageway; and control means comprising float-actuated switch means for operating said pump in accordance with the level of liquid in the pipe behind the main valve means.

4. A flood control system associated with a disposal pipe, including: main valve means in said pipe; motor means for positively opening and closing said main valve means; control means for operating said motor means in accordance with the level of liquid in the pipe in front of the main valve means; a by-pass passageway communicating with said pipe on opposite sides of the main valve means; a check valve in said passageway permitting flow only in the disposal direction; a pump in said passageway for forcing material in the pipe behind the main valve means through said passageway; means in said passageway between said pipe and said pump for effecting the disintegration of any solid material which would

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reach the pump; and control means for operating said pump in accordance with the level of liquid in the pipe behind the main valve means.

5. A flood control system associated with a disposal pipe, including: main valve means in said pipe; motor means for positively opening and closing said main valve means; control means for operating said motor means in accordance with the level of liquid in the pipe in front of the main valve means; a by-pass passageway communicating with said pipe on opposite sides of the main valve means; a check valve in said passageway permitting flow only in the disposal direction; a pump in said passageway for forcing material in the pipe behind the main valve means through said passageway, this pump being located below the level of said pipe; and control means for operating said pump in accordance with the level of liquid in the pipe behind the main valve means.

6. A flood control system associated with a disposal pipe, including: main valve means in said pipe; motor means for positively opening and closing said main valve means; control means for operating said motor means in accordance with the level of liquid in the pipe in front of the main valve means; a by-pass passageway communicating with said pipe on opposite sides of the main valve means; a check valve in said passageway permitting flow only in the disposal direction; a pump in said passageway for forcing material in the pipe behind the main valve means through said passageway, this pump being located below the level of said pipe; a grate across said passageway where it communicates with said pipe behind the main valve means to prevent some solid material from entering the passageway; means in said passageway between said grate and said pump for effecting the disintegration of any solid material which would reach the pump; and control means for operating said pump in accordance with the level of liquid in the pipe behind the main valve means.

7. A flood control system associated with a disposal pipe, including: main valve means in said pipe; motor means for closing said main valve means; control means for operating said motor means in accordance with the level of liquid in the pipe in front of the main valve means; a by-pass passageway communicating with said pipe on opposite sides of the main valve means; a check valve in said passageway permitting flow only in the disposal direction; a pump in said passageway for forcing material in the pipe behind the main valve means through said passageway, this pump being located below the level of said pipe; a grate across said passageway where it communicates with said pipe behind the main valve means to prevent some solid material from entering the passageway; means in said passageway between said grate and said pump for effecting the disintegration of any solid material which would reach the pump, this means comprising disintegrator members mounted on the drive shaft of said pump; and control means for operating said pump and disintegrating means in accordance with the level of liquid in the pipe behind the main valve means.

8. Apparatus of the character claimed in claim 7, wherein the grate comprises spaced horizontal bars and the disintegrator members are so located and arranged as to project partly through between said bars upon each rotation of said drive shaft.

9. Apparatus of the character claimed in claim

7, wherein the grate comprises spaced parallel bars and the disintegrating means includes a cylindrical casing coaxial with said drive shaft, the disintegrator members being so located and arranged as to project partly through between said bars during part of each rotation of said drive shaft and to move close to the inner wall of said casing during the remainder of each rotation.

10. A flood control system associated with a disposal pipe, including: main valve means in said pipe; a by-pass passageway communicating with said pipe on opposite sides of the main valve means; a check valve in said passageway permitting flow only in the disposal direction; a pump in said passageway for forcing material in the pipe behind the main valve means through said passageway, this pump being located below the level of said pipe and receiving liquid by gravity from the pipe behind the main valve means; and control means for operating said pump in accordance with the level of liquid in the pipe behind the main valve means.

11. A flood control system associated with a disposal pipe, including: main valve means in said pipe; a by-pass passageway communicating with said pipe on opposite sides of the main valve means; a check valve in said passageway permitting flow only in the disposal direction; a pump in said passageway for forcing material in the pipe behind the main valve means through said passageway, this pump being located below the level of said pipe and receiving liquid by gravity from the pipe behind the main valve means; a grate across said passageway where it communicates with said pipe behind the main valve means to prevent some solid material from entering the

passageway; means in said passageway between said grate and said pump for effecting the disintegration of any solid material which would reach the pump; and control means for operating said pump in accordance with the level of liquid in the pipe behind the main valve means.

12. Apparatus of the character claimed in claim 1, in which the said motor means includes a curved tubular guide sheath and a flexible member longitudinally movable in the guide sheath and connected to the main valve means.

13. Apparatus of the character claimed in claim 1, in which the said motor means includes a curved tubular guide sheath and a flexible member longitudinally movable in the guide sheath and connected to the main valve means, said motor means having a rotary member and said flexible member being connected to said rotary member which is operated by the motor.

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