April 17, 1945. W. G. WINTER 2,373,935

PNEUMATIC SEWAGE EJECTING APPARATUS

Filed Aug. 12, 1943

Fig. 1

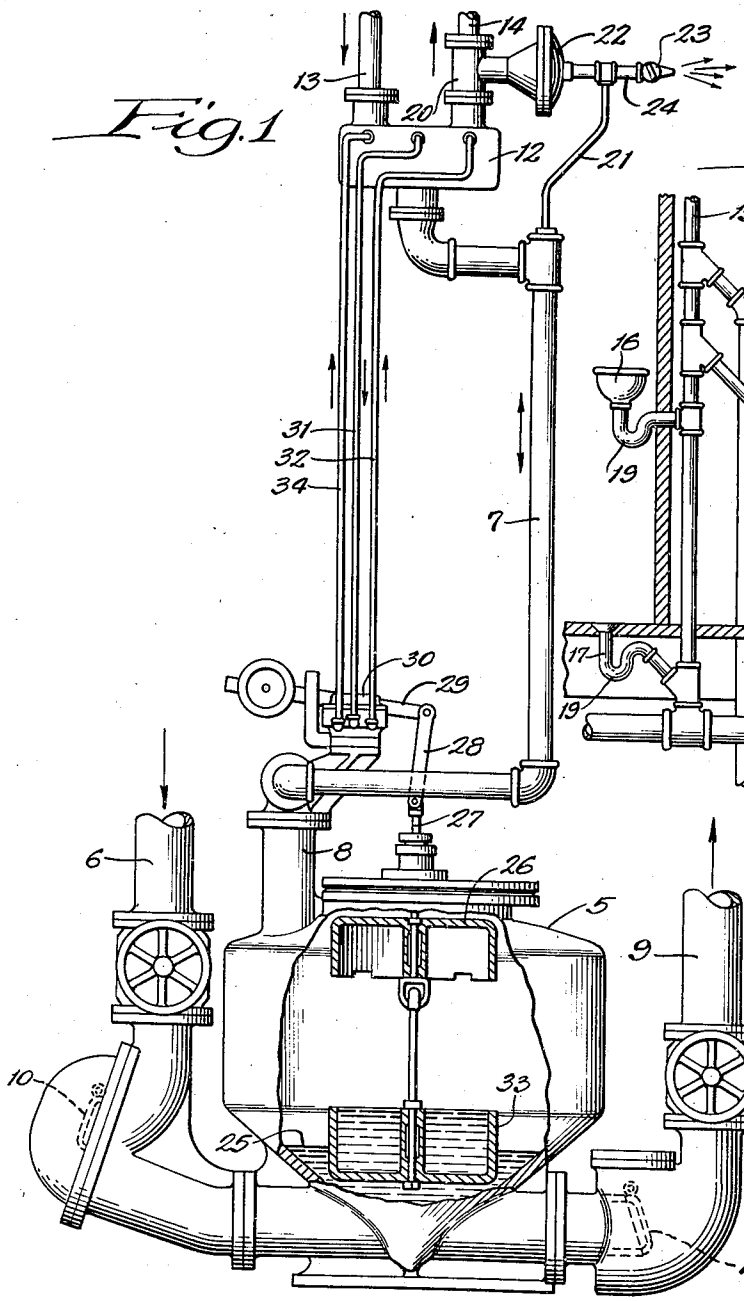
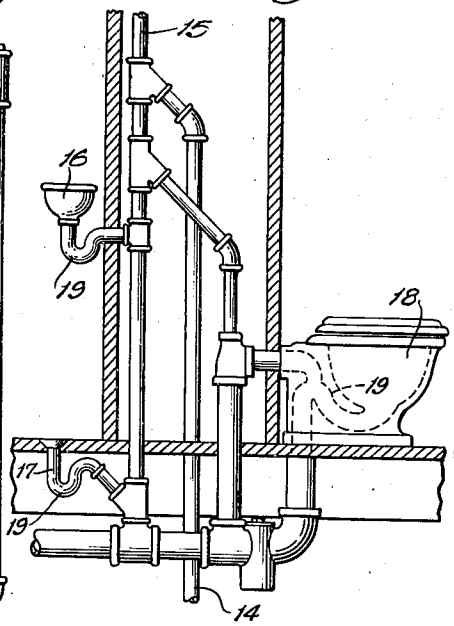


Fig. 2



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PNEUMATIC SEWAGE EJECTING APPARATUS

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4 Claims. (Cl. 182—1)

This invention relates to improvements in pneumatic sewage ejecting apparatus, and it is particularly concerned with the control of the relief of compressed air delivered to the apparatus for effecting a sewage ejecting operation.

The air pressure relief control feature of the present invention is a highly important improvement, particularly in connection with installations of pneumatic sewage ejecting apparatus, wherein the relief of the compressed air from the apparatus is required to be made through the same piping which is employed for venting various plumbing fixtures. It has usually been considered preferable to provide independent venting or exhaust piping for pneumatic sewage ejecting apparatus, and where such independent exhaust means is employed, there is no important necessity for regulating the rate at which the compressed air is discharged from the apparatus upon completion of a sewage ejecting operation. It will, of course, be understood that the compressed air must be relieved from the sewage collector after each ejecting operation, so as to permit the resumption of flow of sewage into the collector, or pot. In cases where the provision of separate exhaust piping for the sewage ejecting apparatus is not possible, or desirable, and wherein it is desired to effect relieving of the air pressure of the apparatus through piping provided for venting plumbing fixtures, provision must be made to prevent a blow-back in the venting system. If the usual more or less explosive rush of compressed air from the sewage ejecting apparatus were permitted to enter plumbing venting, it is likely that blow-backs would occur in the venting, with the result that the usual traps provided for floor drains, drinking fountains, wash stands, water closets, and other plumbing fixtures, would be blown out. Obviously, such a condition could not be tolerated.

The main objects of the present invention are to provide a means for controlling and for retarding the exhaust of compressed air from the sewage ejecting apparatus; to provide such control or retarding means which will be automatically actuated and controlled by air pressure conditions existing in the sewage ejecting apparatus; to provide such control means of a simple and inexpensive, but nevertheless efficient and durable character; and, in general, it is the object of the invention to provide an arrangement whereby the air pressure developed in a sewage ejecting system may be relieved through piping which is also employed for venting plumbing fixtures.

Other objects and advantages of the invention will be understood by reference to the following specification, and accompanying drawing, wherein there is disclosed a typical arrangement of the invention for facilitating the relief of compressed air from the sewage ejecting apparatus through the venting of plumbing fixtures.

In the drawing, Fig. 1 is a side elevation illustrating a typical arrangement of the sewage ejecting apparatus, a portion of the same being shown in cross section to reveal certain details of construction; and Fig. 2 is a more or less diagrammatic illustration showing the connection of the sewage ejector exhaust to the plumbing vent pipe.

The sewage ejecting system herein disclosed, comprises a sewage collector, or pot 5, into which sewage is conducted through a pipe line 6. The sewage is ejected from the collector 5 by compressed air delivered to the upper part of the collector, through a pipe line 7 connected at its lower end to an upwardly projecting part 8 of the collector 5. The sewage is discharged through a pipe line 9, which conducts the discharged sewage to a main sewer, or other desired receiver. A check valve indicated at 10 prevents the flow of sewage from the collector 5 back into the delivery pipe 6, and a similar check valve 11 prevents the flow of sewage from the discharge pipe 9 back into the collector 5.

The pipe line 7 is connected at its upper end to a three-way valve 12, which is preferably a so-called piston valve. The piston valve is of more or less conventional construction, and is preferably a pneumatically-operated valve so arranged that when the movable piston contained in the structure is at one end of its travel, the pipe line 7 will be connected to a conduit 13, which is connected to a suitable source of compressed air. When the movable piston of the valve 12 is in its other position, the conduit 7 will be connected to an exhaust pipe 14. The exhaust pipe 14 in more common installations, is a pipe provided especially for the purpose of relieving air pressure from the sewage collector 5, and in such installations, the air pressure may be permitted to rush into the exhaust pipe 14 with unrestricted force.

In some instances, it has been considered necessary, or desirable, to connect the exhaust pipe 14 to the vent piping 15 (Fig. 2) which is provided for venting various plumbing fixtures such as typified by a drinking fountain 16, a floor drain 17, and a water closet 18. It will be readily appreciated that with a sudden rush of air from the exhaust pipe 14 into the vent pipe 15, which i-

often somewhat smaller in capacity than is desirable for exhausting a sewage collector, there is a substantial possibility that a back pressure would be created in the vent piping which might easily blow out the traps such as represented at 19, of the various plumbing fixtures.

To control the relief of air pressure from the sewage collector 5, there is provided in the exhaust line 14, a pneumatic or diaphragm valve 20, which is controlled by air conducted from the pipe line 7, through a bleeder pipe 21, to the diaphragm chamber 22 of the valve structure. A petcock 23 is connected to the pipe 24, which also connects the bleeder pipe 21 to the diaphragm chamber 22. The operation of the apparatus described is substantially as follows:

When the level 25 of sewage in the collector 5 reaches and closes the open bottom of the inverted bell 26, the air entrapped in the bell 26 will cause the latter to float, and thereby to rise with the level of the sewage. Such upward movement of the bell 26 is transmitted through a rod 27 and a link 28 to an arm 29 which controls a rotary three-way valve 30. When the valve 30 is rocked incident to the rise of the sewage level in the collector 5, compressed air will be permitted to flow through the bleeder conduit 31, and through the valve 30, and upwardly through the conduit 32 to one end of the piston chamber of the valve 12. The piston of the valve 12 will thereby be moved to the opposite end of the valve structure to establish communication between the compressed air conduit 13 and the pipe line 7. Compressed air then delivered to the upper portion of the sewage collector, or pot 5, will effect discharge of the sewage through the outlet pipe 9.

When the level of sewage reaches a predetermined lowered level, the rod 27 and link 28 will move downwardly, incident to the weight of the upper bell structure 26 and lower bell 33, and its content of sewage. Thereupon, the valve 30 will be rocked to establish a flow of compressed air through the bleeder line 31, through the valve 30, and upwardly through the conduit 34, into the other end of the piston chamber of the valve 12. The piston will then be returned to its initial position to stop the flow of compressed air from conduit 13 to the pipe 7, and to establish communication between the said pipe line 7 and the exhaust pipe 14.

The diaphragm valve 20 will, however, have been closed incident to the air pressure developed in the diaphragm chamber 22 during the sewage ejecting operation. The valve 20 will not open until the pressure is relieved in the chamber 22. To effect controlled relief of said pressure, the petcock 23 is adjusted to permit escape of compressed air from said diaphragm chamber, at whatever rate appears to satisfactorily control the opening of the valve 20. It will be apparent that by properly adjusting the petcock 23, the valve 20 may be caused to open slowly and gradually, thereby preventing a rush of compressed air into the exhaust line 14.

By the relatively simple, but nevertheless efficient and durable means described, the relief of air pressure in the sewage ejecting apparatus is effectively and adjustably controlled. The described arrangement permits the employment of the plumbing venting system for relieving the air pressure developed in the sewage ejecting system, with its attendant economies and other advantages incident to the use of the plumbing venting system for the additional purpose indicated. The flow of compressed air through the open petcock 23 during the sewage ejecting operation is so slight in relation to the volume of air employed, that it is negligible, both in respect to its effect on the sewage ejecting operation, and on the cost of providing the required compressed air.

Changes in the described arrangement may be made without departing from the principles of the invention as set forth in the following claims.

I claim:

1. In pneumatic sewage ejecting apparatus, the combination of a sewage collector, a pipe line connected to said collector for the delivery of compressed air to said collector for effecting ejection of sewage therefrom, and for the escape of compressed air from said collector upon completion of an ejecting operation, a three-way valve connected to said pipe, to a conduit from a source of compressed air, and to an exhaust conduit, means controlled by the sewage accumulated in said collector for actuating said valve to establish a flow of compressed air from said source to said collector, to thereby eject sewage therefrom, said means being also operable upon lowering of the level of sewage in said collector to a predetermined extent, to actuate said valve to stop said flow of compressed air, and to connect said pipe line to said exhaust conduit to thereby relieve the air pressure in said collector, and means controlled by the air pressure in said collector, for retarding the relief of said air pressure to prevent a rush of air into said exhaust conduit.

2. In pneumatic sewage ejecting apparatus, the combination of a sewage collector, a pipe line connected to said collector for the delivery of compressed air to said collector for effecting ejection of sewage therefrom, and for the escape of compressed air from said collector upon completion of an ejecting operation, a three-way valve connected to said pipe, to a conduit from a source of compressed air, and to an exhaust conduit, means controlled by the sewage accumulated in said collector for actuating said valve to establish a flow of compressed air from said source to said collector, to thereby eject sewage therefrom, said means being also operable upon lowering of the level of sewage in said collector to a predetermined extent, to actuate said valve to stop said flow of compressed air, and to connect said pipe line to said exhaust conduit to thereby relieve the air pressure in said collector, and a pneumatic valve in said exhaust conduit and connected to said pipe line so as to be closed when the air pressure in said pipe line is raised, and means for effecting slow opening of said pneumatic valve upon lowering of the air pressure in said pipe line, to thereby prevent a rush of air into said exhaust conduit.

3. In combination with pneumatic sewage ejecting apparatus, having an air exhaust line connected to the vent of one or more plumbing fixtures a pneumatic valve in said exhaust line intermediate the sewage ejecting apparatus, and the connection of said exhaust line with said vent, said valve being pneumatically closed during the sewage ejecting operation by compressed air diverted from said sewage ejecting apparatus, and opened upon completion of said operation to permit the escape of compressed air from said apparatus, and means for slowly relieving the valve closing pressure, thereby to effect slow opening of said valve so as to prevent a rush of compressed air into said vent.

4. In pneumatic sewage ejecting apparatus, the combination of a sewage collector, a pipe line con-

nected to said collector for the delivery of compressed air to said collector for effecting ejection of sewage therefrom, and for the escape of compressed air from said collector upon completion of an ejecting operation, a three-way valve connecting said pipe to a source of compressed air and to an exhaust conduit, means for actuating said valve to establish a flow of compressed air from said source to said collector, and from said collector to said exhaust conduit respectively at predetermined high and low sewage levels in said collector, and means for retarding and effecting gradual acceleration of the initial portion of the flow of exhaust air.

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