Oct. 27, 1942. C. YEOMANS ET AL 2,300,039

PACKAGE TYPE SEWAGE EJECTOR

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Fig. 1.

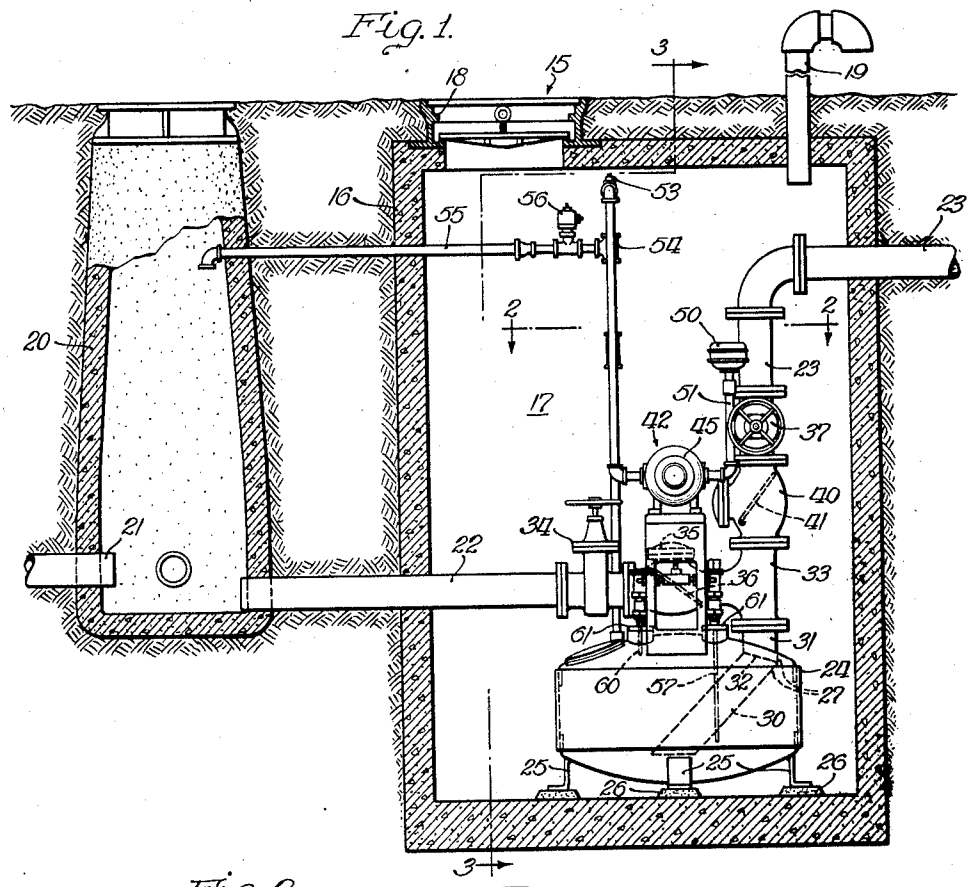
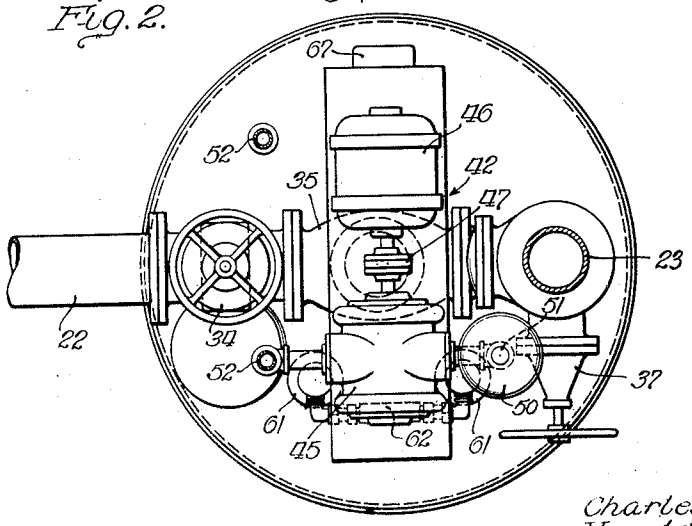


Fig. 2.



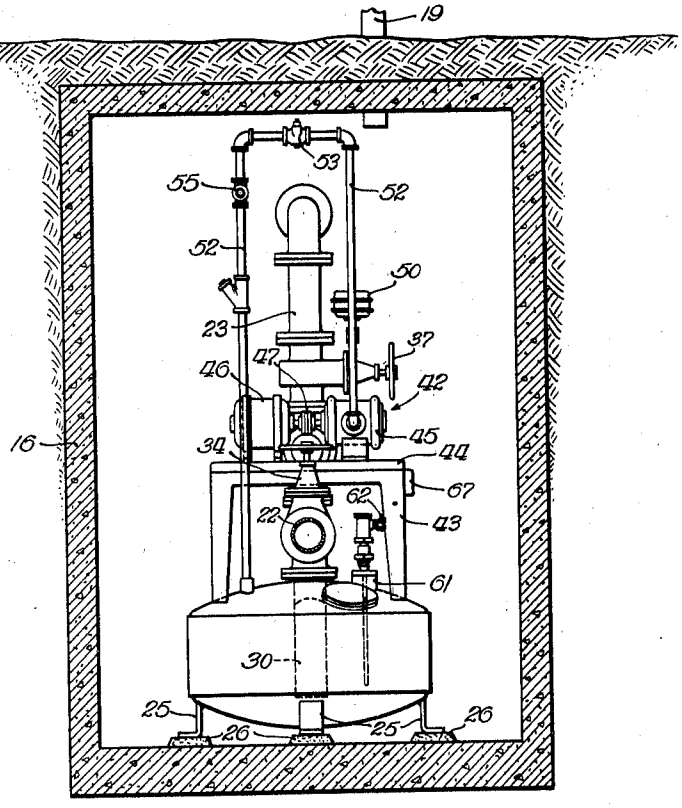
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Fig. 3.



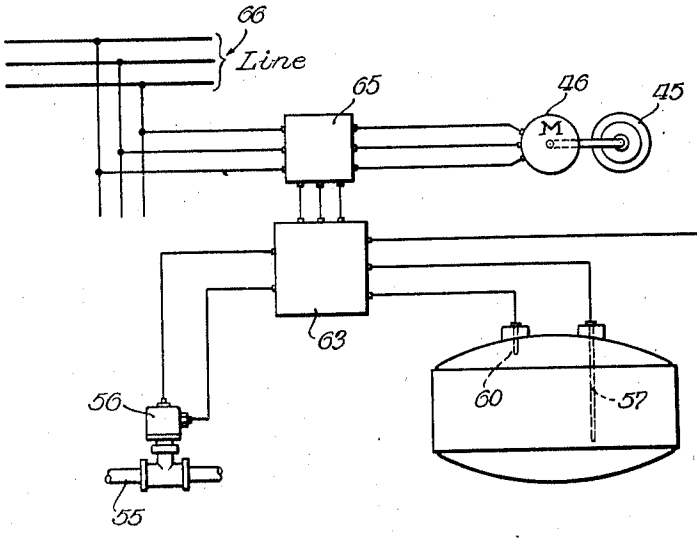


Fig. 4.

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Fig. 6.

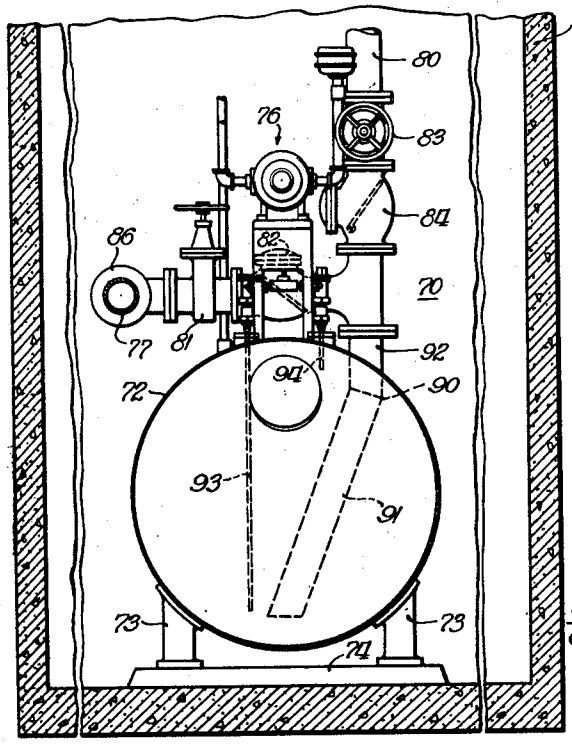


Fig. 5.

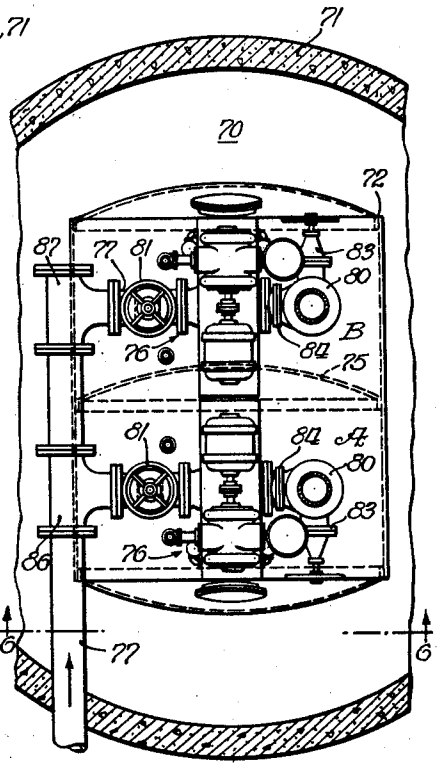
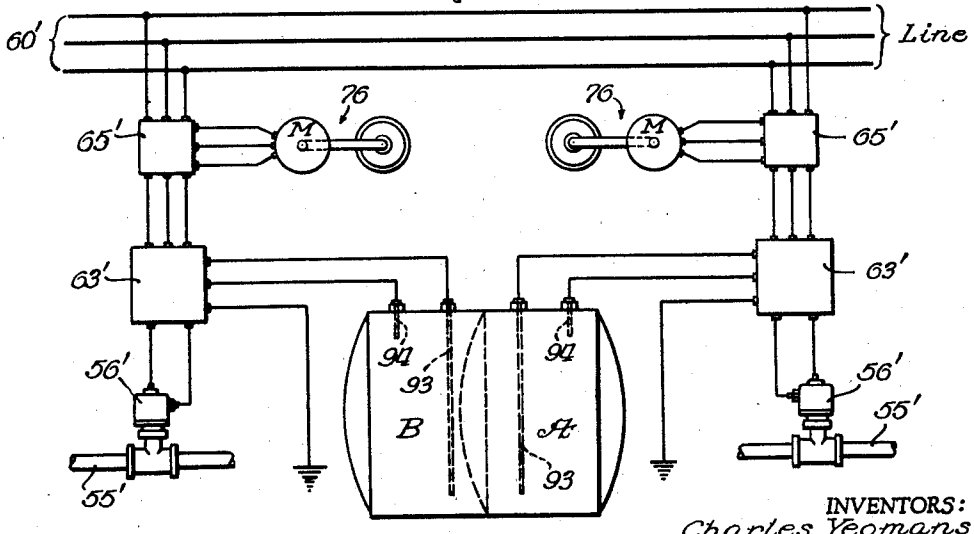


Fig. 7.



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Fig. 8.

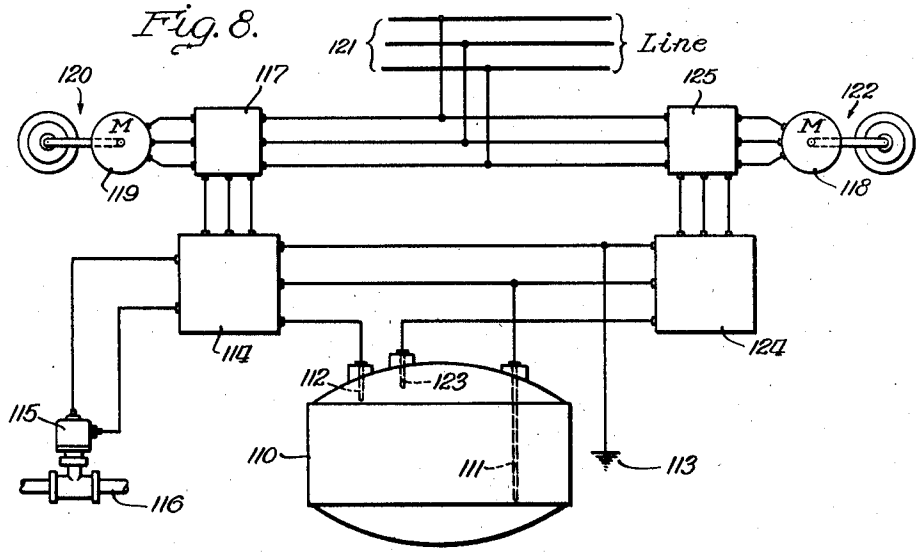
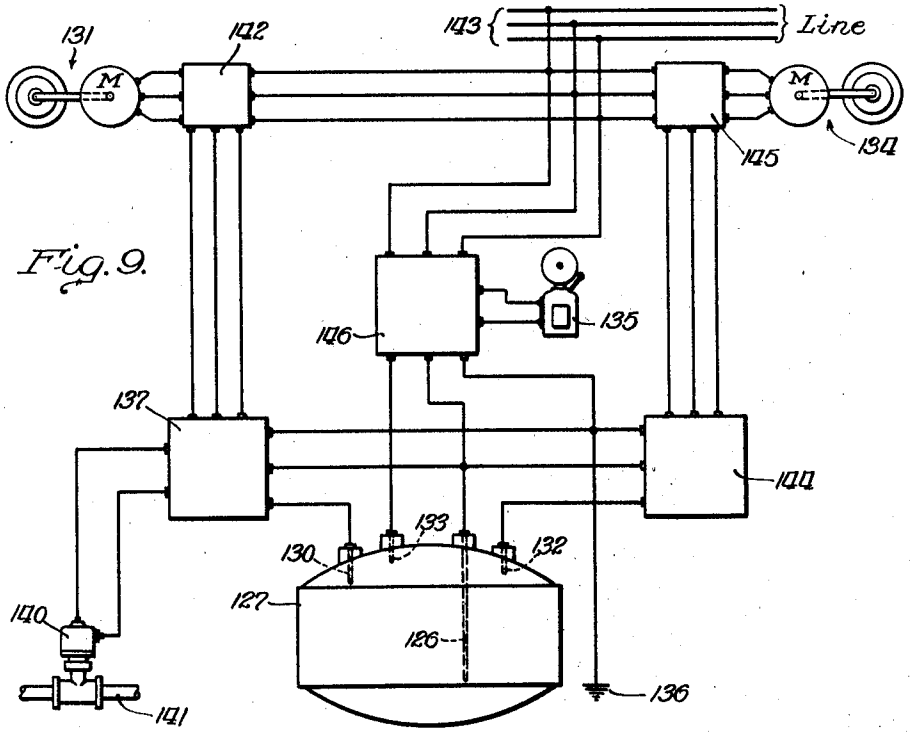


Fig. 9.



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PACKAGE TYPE SEWAGE EJECTOR

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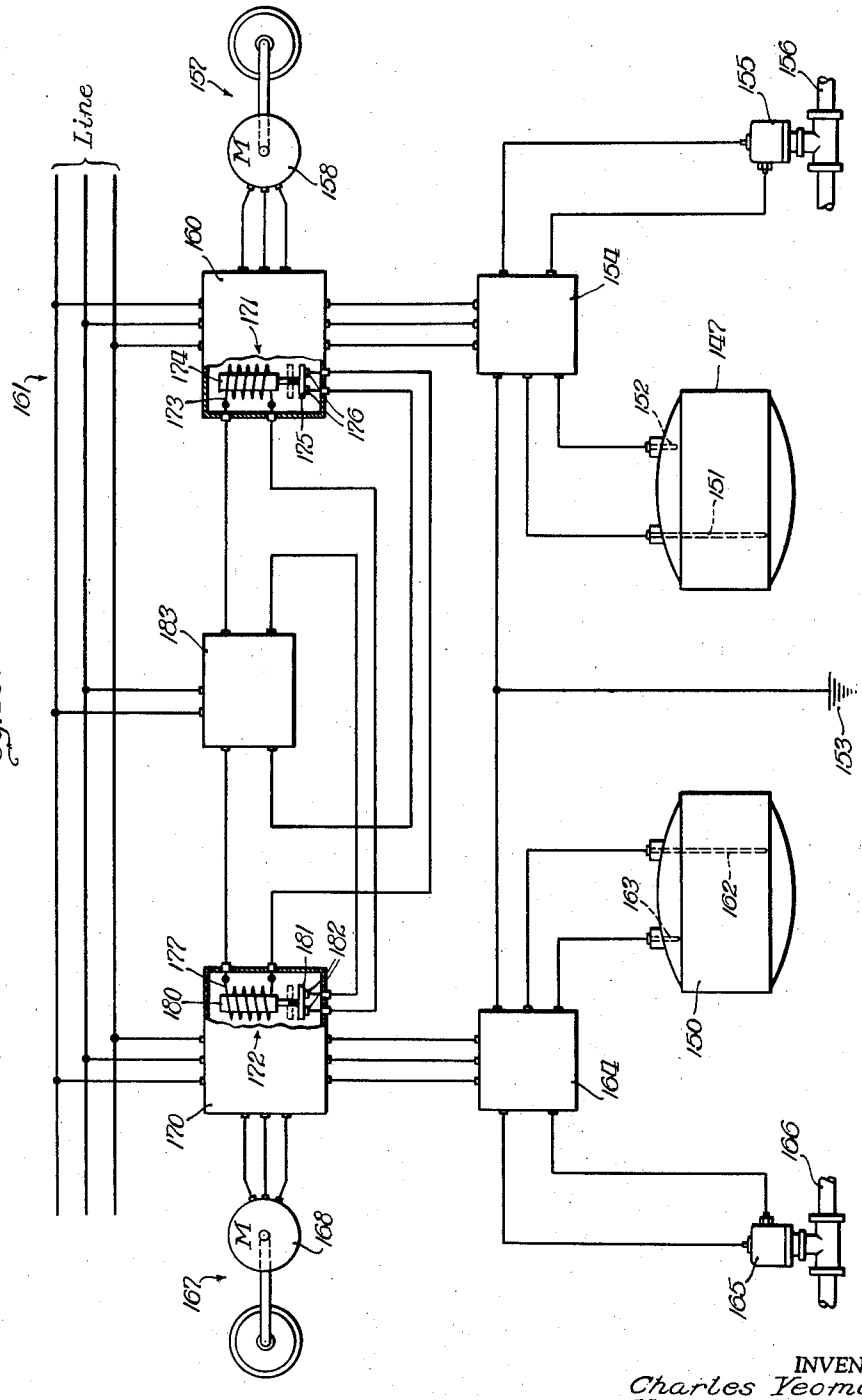


Fig. 10.

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UNITED STATES PATENT OFFICE

2,300,039

PACKAGE TYPE SEWAGE EJECTOR

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Application August 3, 1940, Serial No. 350,442

6 Claims. (Cl. 103—241)

Our invention relates generally to pneumatic sewage ejectors and it has particular relation to certain novel and important improvements therein.

The use of pneumatic sewage ejectors to collect sewage from large buildings or the like and discharge or eject such sewage into city sewers is well known, and while various types of pneumatic sewage ejectors have been designed and used in the past certain difficulties or objections are encountered in the use of all of this apparatus. For example, the so-called Shone ejector while a most satisfactory device is quite expensive. Other less expensive ejectors are not reliable in operation, and none of the prior art devices provide for automatic ventilation of the ejector pit. The principal object of the present invention is to provide an improved pneumatic ejector which can be manufactured at low cost and which will be free from the objections of the prior art devices.

More specifically an important object of our invention is to provide for improved ventilation of sewage ejector installations and the elimination of the dangerous gases and the objectionable odors sometimes associated therewith. This object is accomplished by providing combination ejector and compressor units which may be completely installed in ejector pits, whereby the compressor units will draw their air supply from within the pits and thereby accomplish automatic or self ventilation of the pits as an incident to the operation of the apparatus. The unit construction of the apparatus also reduces installation costs and makes possible material reduction in the size of the pit.

In addition to the removal of dangerous gases and objectionable odors, the self-ventilation of the ejector pits accomplishes the very important added function of preventing condensation and sweating therein. Since these ejector pits are ordinarily installed below sub-basement floors of large buildings or in closed underground chambers in connection with sewage systems, a considerable amount of condensation and sweating normally takes place therein. Such condensation and sweating causes rusting and corrosion of metal parts of the sewage ejectors in the pits and unless prevented will eventually cause serious damage to the mechanical and electrical apparatus. Heretofore, it has been customary to provide separate ventilating blower units for the purpose of preventing such condensation and sweating within the ejector pits.

With a suitable fresh air inlet to the pits, the amount of self-ventilation incidental to the operation of our ejector units, which are completely housed within the ejector pits, is sufficient to prevent condensation and sweating therein, and thus, the necessity of providing separate blowers for ventilation of the pits is eliminated.

This prevention of condensation and sweating is aided by the heat given off within the ejector pits from the compressor units housed therein. A substantial amount of heat is dissipated and radiated from the air compressor cylinders which, especially in the summer months, tends to equalize the temperature in the pits with that of the external atmosphere so as to thereby reduce condensation and sweating.

As will hereinafter appear, the combination ejector and compressor of our invention embodies certain other important mechanical features included among which are the use of an off-center common inlet and outlet pipe and an improved control system. The invention also makes possible an improved duplex type unit which is much simpler in construction, much easier to install and service, and much cheaper to manufacture than the known prior art types.

Further objects and advantages of our invention will be made more apparent in the accompanying drawings and the following description of certain preferred embodiments thereof.

In the drawings:

Fig. 1 is a sectional view showing a sewage ejector installation forming one embodiment of our invention;

Fig. 2 is a plan view taken on line 2—2 of Fig. 1;

Fig. 3 is a view taken on line 3—3 of Fig. 1;

Fig. 4 is a diagrammatic view of an electrical control system for the sewage ejector installation shown in Figs. 1, 2, and 3;

Fig. 5 is a fragmentary plan view of a duplex sewage ejector forming another embodiment of our invention;

Fig. 6 is an end elevational view taken on line 6—6 of Fig. 5;

Fig. 7 is a diagrammatic view of an electrical circuit control system for the duplex sewage ejector shown in Figs. 5 and 6;

Fig. 8 shows diagrammatically a control system for a sewage ejector having a standby auxiliary compressor unit;

Fig. 9 shows diagrammatically a control system for a sewage ejector including a normal operating compressor, an auxiliary standby compressor, and a high-water alarm which operates in the event of failure of the two compressors; and,

Fig. 10 shows diagrammatically an electrical control system for a two-unit sewage ejector installation wherein it is necessary that the two sewage ejector units shall not empty or discharge at the same time.

Referring now to Figures 1, 2, and 3 of the drawings, a combination compressor and sewage ejector unit in accordance with the present invention and the usual associated equipment is indicated in its entirety at 15. The ejector pit is illustrated generally at 16, and the sewage ejector housed therein at 17. The top of the pit 16 is provided with a man hole cover 18 which may be of any satisfactory type, and an air intake 19.

The sewage supply enters into a man hole pit 20 through a conduit 21 and is conducted from the man hole pit 20 to the sewage ejector 17 through a relatively large sewage inlet pipe 22. A pipe 23 through the wall of the ejector pit 16 connects the discharge side of the ejector 17 with the sewer or other sewage disposal line. The pit 16 and the man hole pit 20 are preferably of masonry construction and are below ground level, as shown. The man hole cover 18 and the cover for the man hole pit 20 are flush or even with the ground or floor level, as shown.

The sewage ejector proper 17 includes a sewage receiver or pot 24 which will ordinarily be of fabricated steel construction. The sewage receiver pot 24 is provided with support legs or members 25 which are anchored to risers 26 in the bottom of the pit 16, as shown.

Sewage is both introduced into and discharged from the sewage receiver 24 through an off-center elbow pipe fitting 27. The pipe fitting 27 is made up of an inner pipe section 30, the lower end of which is disposed above the center of the bottom of the sewage receiver 24 while the upper end thereof terminates in one side of the top of the receiver 24. A vertical flange section 31 may be welded to the section 30 at its upper end where it fits into the top of the sewage receiver 24. The preformed fitting 27 may be welded into the top of the sewage receiver 24 along the joint 32 in order to provide an air-tight connection therewith.

It has been found that by having the inside section 30 of the pipe fitting 27 terminate just above the center of the bottom of the sewage receiver 24, a very desirable result is accomplished. The sewage discharging from the bottom end of the section 30 is directed against the bottom of the receiver 24 and serves to stir up and prevent collection of solid material thereon. This is an important feature in insuring continuous operation of the installation by preventing the plugging or closing of the lower end of the pipe section 30. That is, this particular arrangement for introducing sewage keeps the solid material therein circulating and swirling through the liquid during the operation of the ejector and insures clearing of the pot 24 of substantially all solids each time it is emptied. In this manner the solids do not remain and decay in the sewage receiver 24 and cause the sewage to become septic and in addition cause formation of objectionable and dangerous gases. A septic condition of the ejected sewage would seriously interfere with the subsequent biological purification thereof in the sewage treatment plant.

In order to provide for the connection of the sewage inlet line 22 and the sewage discharge line 23 to the fitting 27, a T fitting 33 is turned on its side and connected to the flange on the fitting 31, as shown. The side opening in the T fitting 33 is connected to a sewage inlet line 22 through a check valve 34 and a one-way inlet valve 35. The one-way inlet valve 35 is of the type having a swinging gate 36 which opens on pressure from the inlet side, and which will be forced to its closed position by pressure from its discharge end connected to the side of the T fitting 33.

The top opening in the T fitting 33 is connected to the sewage discharge line 23 through a check valve 37 and a one-way outlet valve 40. The outlet valve 40 is of the same type as the inlet valve 35 but is reversely arranged so that its hinged gate 41 will open by pressure from the sewage receiver side, and will be closed by pressure from the sewage discharge line 23.

Having the elbow fitting 27 open in one side of the top of the receiver pot 24 instead of in the center of the top is an important feature. By this particular arrangement the inlet valve 35 and check valve 34 may both be mounted directly over the top of the receiver 24 instead of to one side thereof, thereby permitting the pit 16 to be several feet smaller in size.

To accomplish the pneumatic ejection of the contents of the sewage receiver 24 when it becomes filled with sewage, a compressor unit indicated generally at 42 is mounted on the top of the receiver 24. The support for the compressor unit 32 comprises a four-legged support frame 43 provided with a flat base 44 resting on the top thereof. The compressor unit 42 includes an air compressor 45 mounted on the base 44 which is driven by an electric motor 46, likewise mounted on the base 44. The drive shafts of the compressor 45 and motor 46 are coupled at the connection 47 as shown in Figure 2. The air intake side of the compressor 45 is connected to a muffler and air cleaner 50 through a short pipe line 51, while the discharge or high pressure side of the compressor 45 is connected to the sewage receiver 24 through a U-shaped pipe line 52.

A safety valve 53, of the pressure relief type, is provided in the horizontal arm of the U-shaped pipe 52 which will prevent excessive pressure from being built up in the sewage receiver 24. A T fitting 54 is provided in one side of the compressed air line 52, as shown in Figure 1, into which a vent line 55 may be connected. The vent line 55 is provided with a solenoid valve 56 for opening and closing the same. The vent line 55 opens into the man hole 20.

In order to accomplish automatic discharge of the contents from the sewage receiver pot 24 when it becomes filled to the high liquid level, the apparatus includes a motor control system which is responsive to the liquid level in the pot 24. This control system includes a long control electrode 57 which reaches close to the bottom of the receiver 24, and a short control electrode 60 which extends down to the predetermined high-water level.

The short and long control electrodes 57 and 60, respectively, enter through the top of the sewage receiver pot 24 through adapter fitting 61. The terminals of the electrodes 57 and 60 may be taken out from the center of a multi-section conduit box 62 mounted on the adapters 61.

As shown in Figure 4 of the drawings, the control electrodes 57 and 60 are connected to the terminals of a grounded control relay 63 which is connected to an electrically operated solenoid valve 56 in the vent line 55. The relay 63 is connected in circuit relationship to an electrically operated motor starter 65. The relay 63, the

solenoid valve 56, and the starter 65 may be of any suitable standard type. The terminals of the motor 46 are connected to three terminals of the starter 65 through three conductors as shown. Power is supplied to a supply line 66 through suitable conductors.

The control equipment is preferably enclosed in a suitable box 67 mounted on one side of the support frame 43, as shown in Figures 2 and 3, or it may be mounted on the wall of the pit.

In operation the solenoid valve 56 is normally energized and open, thereby venting the sewage receiver pot 24 and allowing it to fill up with sewage from the sewage supply line 22. It will be understood that a solenoid valve may be used which is normally de-energized and opened, and which closes on being energized. When the sewage level reaches the lower end of the short electrode 60, an electrical circuit will be established between the electrodes 57 and 60 which serves to trip the relay 63. This tripping of the relay 63 in turn de-energizes the solenoid valve 56 so as to close the same, and energizes the starter 65, thereby effecting the starting of the compressor motor 46 which drives the compressor 45. The vent line 55 being closed, the compressor 45 will build up pressure within the top of the sewage receiver 24 sufficiently to blow the contents out through the pipe section 30 and up through the T fitting 33, one-way outlet valve 40, check valve 37, discharge line 23, and into the sewer or other disposal line.

As the sewage is discharged from the receiver 24 the circuit between the electrodes 57 and 60 will be broken thereby resetting the relay 63. This resetting of the relay 63 cuts out the starter 65 and de-energizes the motor 46, thereby stopping the compressor 45. At the same time, the solenoid valve 56 is energized and opens, thereby opening the vent line 55 and allowing the pressure within the receiver 24 to be released.

Having the sewage ejector 17 housed as a unit within the pit 16 is a very important feature of the invention for the reason that it accomplishes automatic ventilation of the pit wherein the sewage ejector is installed. Heretofore, in sewage ejector installations the air compressor units have been positioned outside of the pits in which the sewage ejectors were housed. In spite of the fact that the sewage receivers were hermetically sealed, and the piping joints carefully tightened, it was impractical to prevent a certain amount of sewer gas from escaping into the pits. Such sewer gas seeping or leaking into the building wherein the ejectors are installed is both dangerous and obnoxious. In addition, as stated above, it has heretofore been necessary to provide separate blower units to ventilate ejector pits and prevent objectionable condensation and sweating therein. In the present invention the air supply for the compressor 45 is drawn in directly from the pit 16 through the air cleaner and muffler 50, while the sewage receiver 24 is vented through the pipe line 55 opening outside the pit 16. This intake of pit air through the muffler 50 and discharge without the pit 16 serves to ventilate the same. Condensation and sweating is thus prevented, and dangerous gases and objectionable odors removed as an incident to the operation of our improved sewage ejector installations and the requirement of separate ventilating apparatus is eliminated.

Besides this important ventilation feature, having the sewage ejector 17 housed as a unit in the pit 16 reduces the installation space from that normally required heretofore where the compressor units were not mounted on the sewage receiver bodies.

In certain instances it is desirable to couple two sewage ejectors in one installation. This may be desirable where, although ordinarily one sewage ejector provides sufficient sewage ejection capacity, there may be certain peak or overload periods in which additional capacity is required. Furthermore, in such a duplex unit, one of the sewage ejectors may serve as an auxiliary or standby ejector in case of breakage or failure of the other.

In Figures 5 and 6 of the drawings a duplex or double sewage ejector unit is designated generally at 70 incorporating the novel features of the single sewage ejector unit 17 shown in Figures 1, 2, 3, and 4 of the drawings. The sewage ejector 70 is housed within a masonry pit 71 and includes a barrel-shaped tank body 72 carried by legs 73 secured on a riser 74 in the floor of the pit 71 as shown.

The tank 72 is divided into two separate sewage receiver compartments A and B by a header partition 75 welded within the tank 72. Each of the compartments A and B is provided with a super-structure arrangement, similar to the super-structure of the sewage ejector 17 of Figures 1, 2, and 3, including a compressor unit 76, sewage inlet line 77, sewage discharge line 80 and suitable valves. In fact, super-structure units substantially identical with the super-structure unit used on the sewage ejector 17 may be mounted on each of the compartments A and B. Certain minor modifications such as the lengths of the electrodes, and the pipe discharging the sewage into the compartments A and B may be necessary.

The sewage inlet line to each of the compartments A and B includes a check valve 81 and a one-way inlet valve 82, while each of the discharge lines 80 includes a check valve 83 and a one-way outlet valve 84. The sewage inlet line 77 leads from the sewage source into the pit 71. Two T fittings 86 and 87 are provided in the sewage supply line 77 having the side openings thereof connected with the inlet side of each of the check valves 81.

Sewage is both introduced into and discharged from the compartments A and B through pipe fittings 90, as shown in Figure 6. The fittings 90 are angle-shaped and include pipe sections 91 terminating close to the center of the bottom of each of the compartments A and B, with upper fittings 92 welded thereto. The fittings 82 fit in holes in the top of the tank 72 and are welded therearound both for support and to provide an air-tight seal. The same cleaning and swirling action is obtained when sewage is discharged from the lower ends of the pipe sections 91 into the compartments A and B as described heretofore in connection with introduction of sewage into the receiver 24 of the sewage ejector 17.

Each of the compartments A and B is provided with a long electrode 93 reaching close to the bottom of the compartments, and a short electrode 94 reaching to the high water level. The mounting structure for these electrodes 93 and 94 is similar to that for the electrodes 57 and 60 of the sewage ejector 17 and will not be described in detail.

In Figure 7 of the drawings the electrical control system for the sewage ejector 70 is shown. Essentially, this electrical control system comprises the combination of two control systems

similar to the one for the sewage ejector 17 shown in Figure 4 of the drawings. That is, a control system is provided for each compartment A and B which may be substantially a duplicate of the control system of Figure 4. It will be seen that only one current source is required. The vent lines for the compartments A and B, the solenoid valves, the relays, motor starters, and current source, have been given prime reference numerals to correspond with like elements in Figure 4. A detailed description of this electrical control system is not necessary.

In the operation of the sewage ejectors 70, the sewage normally flows through the inlet line 77 and into the sewage compartment A. When this compartment A is filled to the high liquid level, an electric circuit will be completed between the two electrodes 93 and 94 therein, and the contents will be discharged by the compressor unit 76 in a manner analogous to that described in connection with sewage ejection from the sewage ejector 17. After the discharge of the compartment A the air vent line 55' therefor will be opened by the energization of the solenoid valve 56' therein, and the compressor unit 76 will be shut down. It will be seen that the cycle of operation is the same as that of the cycle of operation of the sewage ejector 17 in Figures 1, 2, 3, and 4.

Any sewage flowing through the sewage supply line 77 while sewage is being ejected from compartment A will flow into the compartment B until the compartment A is vented. When the compartment B becomes filled to its high water level, the sewage will be likewise discharged therefrom in the same manner as sewage is ejected from the compartment A.

In one installation it was found that the compartment B became filled with sewage about once while the compartment A was filled and discharged 6 times. This ratio will vary depending upon the installation. However, it will be seen that in case a great deal of sewage is being emptied through the sewage inlet line 77 the compartment B will be filled more often.

The sewage ejector unit 70 has the same advantages in respect to pit ventilation and compactness as the sewage ejector 17 described in connection with Figures 1, 2 and 3. In addition it is much more compact than duplex units known heretofore.

In certain sewage ejector installations it is desirable to provide positive action for sewage ejection by using a standby compressor unit. The control system for such an installation is shown in Figure 8 of the drawings. A sewage receiver 110 is provided with a long electrode 111 reaching close to the bottom of the receiver 110 and a short electrode 112 reaching to the normal high water operating level. The electrodes 111 and 112, together with a ground 113, are connected to a relay 114 through suitable conductors. The relay 114 is also connected in circuit relationship with a solenoid valve 115 of a vent line 116 for the sewage receiver 110, and with an electrically operated motor starter 117 serving to control a driving motor 119 for the compressor unit 120.

The motor starter 117 is electrically connected through suitable conductors to a power source 121, which may be a three-wire, 220 volt, 60 cycle line. When the sewage reaches the normal high water level and covers the end of the short electrode 112, an electrical circuit will be completed between the electrodes 111 and 112 thereby causing the operation of the relay 114. This serves to close the solenoid valve 115 and start the compressor unit 120. When the contents of the receiver 110 have been emptied, the relay 114 will be reset thereby de-energizing the motor of the compressor unit 120 and energizing and opening the solenoid valve 115.

In order to insure positive ejection of the contents of the sewage receiver 110, a standby compressor unit 122 is provided. A relatively short electrode 123 is provided in the top of the sewage receiver, which does not reach to the normal predetermined high water level. A relay 124 is provided which is connected in circuit relationship with the ground 113, the long electrode 111, and the short electrode 123, as shown. The relay 124 is also connected in circuit relationship with a motor starter 125 serving to control a driving motor 118 for the compressor unit 122. The motor starter 125 is also connected to the current source of line 121.

In the event of failure of the compressor unit 120 to operate, the sewage will continue to rise in the receiver 110 until the end of the short electrode 123 is covered. On this occurrence, an electrical circuit is established between the electrode 123 and the long electrode 111 which acts to operate the relay 124. This operation of the relay 124 cuts in the motor starter 125 and starts out with the auxiliary compressor unit 122. This unit will then serve to discharge the contents from the sewage receiver 110.

Referring to Figure 9, a pneumatic sewage ejector control system is shown incorporating a high water alarm or safety device in combination with an auxiliary type air compressor arrangement. The liquid level responsive system includes a long control electrode 126 reaching adjacent to the bottom of sewage receiver 127, and a short control electrode 130 which reaches to the normal high water level to which the sewage rises in the receiver 127. The short control electrode 130 is adapted to control the normally operating compressor unit indicated generally, at 131 of the storage ejector installation.

A second short control electrode 132 is provided in the top of the receiver 127 which reaches to a depth somewhat above that to which the electrode 130 reaches, and a third short electrode 133 is provided in the top of the receiver 127 which reaches to a depth some what above that to which the short electrode 132 reaches. The electrode 132 is adapted to control a standby compressor unit, indicated generally, at 134, and the short electrode 133 is adapted to control a high water alarm 135, as will appear hereinafter.

The long control electrode 126, the electrode 130, and a ground 136 are connected in circuit relationship with a grounded relay 137 through suitable conductors, as shown. The terminals of a solenoid valve 140 which controls the vent line 141 for the sewage ejector 127 are also connected to the relay 137. The relay 137 is further connected in circuit relationship with a motor starter 142 which serves to start the motor of the compressor unit 131 and is electrically connected therewith. In order to energize this part of the system, the motor starter 142 is connected in circuit relationship with a suitable power source, such as the line 143. The line 143 may be the ordinary three-wire, 220 volt, 60 cycle current source.

In order to control the standby or auxiliary compressor unit 134, the long electrode 126, the short electrode 132, and the ground 136 are connected to a second grounded relay 144, which is

also connected in circuit relationship with a motor starter 145, which serves to start the motor of the compressor unit 134. For energization, the motor starter 145 is connected to the power line 143.

The short electrode 133, the long electrode 126 and the ground 136 are electrically connected to a third grounded relay 146. The relay 146 is connected with an alarm bell 135 and also with the current source 143, as shown. It will be understood that other forms of high water alarm, such as a light, may be used instead of the bell 135.

In operation, the sewage receiver 127 normally fills to the lower end of the short electrode 130, whereupon an electric circuit is established between the electrode 130 and the long electrode 126 which serves to effect the operation of the relay 137. On operation of the relay 137 the compressor unit 131 is started and the solenoid valve 140 closes, thereby ejecting the contents of the sewage receiver 127. In case the compressor unit, 131 fails to operate, the sewage will continue to rise until it covers the end of the short electrode 132, whereupon the relay 144 will be operated, starting up the compressor unit 134, and discharging the sewage from the receiver 127. In the event that neither of the compressor units 131 or 134 operates in the usual manner, the sewage will rise above the electrode 133 thereby operating the relay 146 and setting off the alarm 135.

There are certain instances in the case of duplex sewage ejector installations in which it is necessary to insure that the two separate sewage receivers are not discharged at the same time. One example of such an instance occurs where both of the sewage receivers discharge into a common sewage discharge line which is abnormally small in cross sectional area or of very long length. The capacity of such a discharge line being relatively small, an abnormally high pressure will be required to overcome the pipe friction and discharge the contents of the two sewage receivers simultaneously therethrough. In Figure 10 of the drawings, an electric control system for a duplex sewage ejector installation is shown wherein the simultaneous discharge of two sewage receivers 147 and 150 is prevented.

The sewage receiver 147 is provided with long and short electrodes 151 and 152, respectively, which, together with a ground 153, are connected to the terminals of a relay 154. The relay 154 is connected with a solenoid valve 155 which controls the vent line 156 for the sewage receiver 147. In order to pneumatically discharge the contents of the receiver 147, a compressor unit indicated generally at 157 is provided, the electric driving motor 158 of which is adapted to be started by a motor starter 160 electrically connected therewith. The motor starter 160 is also connected in circuit relationship with the relay 154 and to a current source 161.

The sewage receiver 150 is likewise provided with long and short electrodes 162 and 163, respectively, which together with the ground 153 are connected to the terminals of a second relay 164. Two terminals of the relay 164 are also connected to a solenoid valve 165 serving to open and close a vent line 166 for the sewage receiver 150. The sewage receiver 150 is discharged by a compressor unit indicated generally at 167 driven by an electric motor 168. The electric motor 168 of the compressor unit 167 is connected with a motor starter 170 which may be of the same type as the motor starter 160. The motor starter 170 is connected in circuit relationship with the relay 164, and to the power source 161 for energization.

In order to prevent dual or simultaneous operation of the two sewage ejectors, each of the motor starters 160 and 170 is provided with a solenoid switch indicated generally at 171 and 172, respectively. The solenoid switch 171 includes a coil 173, an armature 174, and a contact member 175. The contact member 175 depends from the bottom of the armature 174 and is insulated therefrom. When the solenoid or coil 173 is de-energized, and the armature 174 is in its lower position, the contact member 175 rests on two contact points 176 and completes a circuit therebetween, as will appear hereinafter. Likewise, the solenoid switch 172 includes a solenoid or coil 177 and an armature 180 from which a contact member 181 is supported in insulated relationship. When the solenoid 177 is de-energized, and the armature 180 is in its lower position, the contact member 181 completes a circuit between two contact points 182.

As shown in the drawings, both of the contact members 175 and 181 are resting on the contact points 176 and 182, respectively. The broken line outlines of the contact members 176 and 181 indicate their upper positions which they take when the solenoids 173 and 177, respectively, are energized.

One of the terminals of each of the solenoids 173 and 177 is connected to a terminal of a reversing switch unit 183. The second terminal of the solenoid 173 is connected to one of the contact points 182 of the solenoid switch 172, while the second terminal of the solenoid 177 is similarly connected to one of the contact points 176 of the solenoid switch 171. Each of the other contact points 176 and 182 is connected to opposite terminals on the reversible switch unit 183, as shown. In order to energize the alternator switch unit 182 it is connected by two conductors to the line 161.

When the sewage receiver 147 fills up and a circuit is established between the electrodes 151 and 152, the relay 154 is in turn operated, starting up the compressor unit 157 in the usual manner. This operation or tripping of the relay 154 also serves to operate the reversible switch unit 183 and energize the solenoid switch 172 in the motor starter 170, thereby lifting the contact member 181 from the contact point 182 and preventing the motor starter 170 from starting the motor of the compressor unit 167. The solenoid switch 171 in the motor starter 160 remains de-energized and closed, permitting the motor of the compresosr unit 157 to be started. Conversely, when the sewage receiver 150 fills and the relay 164 trips, the reversible switch unit 183 will reverse and the solenoid switch 171 will be energized thereby lifting the contact member 175 from the contact points 176 and preventing the compressor unit 157 from starting, while the switch 172 is deenergized and closed allowing the motor starter 170 to start the compressor unit 167.

Accordingly, it will be seen that when either of the sewage ejectors 147 or 150 fills up, the control system prevents the other sewage ejector from discharging until the first has been emptied. In this way simultaneous discharge of sewage from the two sewage ejectors 147 and 150 of the installation is prevented.

Since certain further changes may be made in the foregoing constructions and arrangements, and different embodiments of our invention may be made without departing from the scope thereof, it is intended that all matter described here-

inbefore or shown in the accompanying drawings shall be interpreted as illustrative and not in a limited sense, and that the accompanying claims shall be accorded the broadest construction consistent with the prior art.

We claim the following as our invention:

1. A sewage ejector installation comprising, in combination; a closed pit; an air inlet into said pit; and a pneumatic sewage ejector completely housed in said pit and comprising an air-tight sewage receiver, a sewage inlet conduit connecting said sewage receiver with the sewage supply outside of said pit, a one-way inlet valve in said sewage inlet conduit, a sewage ejection conduit connected to said sewage receiver and terminating outside of said pit, a one-way outlet valve in said sewage ejection conduit, an air compressor adapted to draw air into said pit through said air inlet therein and connected to said sewage receiver for delivering compressed air thereinto, driving means for said air compressor connected in driving relationship therewith, an air intake in said pit for said air compressor, air vent means connected with said sewage receiver and opening outside of said pit, valve means for said air vent means, and control means responsive to the liquid level of the sewage in said sewage receiver for controlling said air compressor and said air vent valve means.

2. A pneumatic sewage ejector comprising, in combination, an air-tight sewage receiver, pipe means having one end opening inside of said sewage receiver adjacent to the bottom thereof, a sewage inlet pipe connected with said pipe means, a one-way inlet valve in said sewage inlet pipe, a sewage discharge pipe connected with said pipe means, a one-way outlet valve in said sewage discharge pipe, a compressed air source connected to said sewage receiver, an air vent for said sewage receiver, a valve for opening and closing said air vent, and control means responsive to the liquid level of the sewage in said receiver for controlling the admission of compressed air from said compressed air source and for controlling said air vent valve, sewage being fed into said sewage receiver through said pipe means when the receiver is vented through said air vent and said compressed air source is shut off, and sewage being ejected from the sewage receiver through said pipe means, when said air vent is closed, by compressed air from said compressed air source which is turned on.

3. A pneumatic sewage ejector comprising, in combination, an air-tight sewage receiver, pipe means having one end opening inside of said sewage receiver near the center of the bottom thereof and the other end opening outside of said sewage receiver at one side thereof, a three-opening fitting with one of its three openings connected with the outside opening of said pipe means, a sewage inlet pipe connected with another one of the three openings of said fitting, a one-way inlet valve in said sewage inlet pipe, a sewage discharge pipe connected with the remaining opening of said fitting, a one-way outlet valve in said sewage discharge pipe, a compressed air source connected to said sewage receiver, an air vent for said sewage receiver, a valve for opening and closing said air vent, and control means responsive to the liquid level of the sewage in said receiver for controlling the admission of compressed air from said compressed air source and for controlling said air vent valve, sewage being fed into said sewage receiver through said pipe means when the receiver is vented through said air vent and when said compressed air source is shut off, and sewage being ejected from the sewage receiver through said pipe means by compressed air from said compressed air source when said air vent is closed.

4. A pneumatic sewage ejector comprising, in combination, an air-tight sewage receiver, pipe means having one end opening inside of said sewage receiver at a point near the center of the bottom thereof and having the other end opening through one side of the top of said sewage receiver, a sewage inlet pipe connected with the top end of said pipe means, a one-way inlet valve in said sewage inlet pipe, a sewage discharge pipe connected with the top end of said pipe means, a one-way outlet valve in said sewage ejection pipe, an air vent pipe connected with said sewage receiver, a solenoid valve in said air vent pipe for opening and closing the same, a support base mounted on the top of said sewage receiver, an air compressor mounted on said support base, an electric motor mounted on said support base and connected in driving relationship with said compressor, a compressed air pipe connecting said air compressor with said sewage receiver, an electrical current source, electrical control means responsive to the liquid level of the sewage in said sewage receiver connected in circuit relationship with said current source, and conductor means connecting said solenoid valve and said electric motor in circuit relationship with said control means whereby when the level of the sewage in the sewage receiver is below a predetermined high level the solenoid valve is open and the electric compressor motor is de-energized permitting said sewage receiver to fill with sewage, and whereby when the level of the sewage reaches said predetermined high level said solenoid valve is closed and said electric compressor motor is energized and drives said air compressor, the pressure built up by said air compressor serving to eject the contents of said sewage receiver through said pipe means and said sewage discharge pipe.

5. A sewage ejector installation comprising, in combination, a closed pit; an air inlet into said pit; and a pneumatic sewage ejector completely housed in said pit and comprising, an air-tight sewage receiver, pipe means having one end opening inside of said sewage receiver at a point near the center of the bottom thereof and having the other end opening through the top of said sewage receiver, a sewage inlet pipe connected at one end to a sewage supply outside of said pit and connected at the other end to the top of said pipe means, a one-way inlet valve in said sewage inlet pipe, a sewage discharge pipe connected at one end to the top end of said pipe means and terminating at its other end outside of said pit, a one-way outlet valve in said sewage discharge pipe, an air vent pipe connected at one end to said sewage receiver and opening outside of said pit at the other end, a solenoid valve in said air vent pipe for opening and closing the same, a support base mounted on the top of said sewage receiver, an air compressor mounted on said support base, an electric motor mounted on said support base and connected in driving relationship with said compressor, an air intake in said pit for said air compressor, a compressed air pipe connecting said air compressor with sewage receiver, an electrical current source, electrical control means responsive to the liquid level of the sewage in said sewage receiver connected in circuit relationship with said current source, and

conductor means connecting said solenoid valve and said electric motor in circuit relationship with said control means whereby when the level of the sewage in the sewage receiver is below a predetermined high level the solenoid valve is open and the electric compressor motor is de-energized permitting said sewage receiver to fill with sewage, and whereby when the level of the sewage reaches said predetermined high level said solenoid valve is closed and said electric compressor motor is energized and drives said air compressor, the pressure built up by said air compressor serving to eject the contents of said sewage receiver through said pipe means and said sewage discharge pipe.

6. A pneumatic sewage ejector comprising, in combination, an air-tight sewage receiver; a partition dividing said sewage receiver into two separate sewage compartments; first pipe means having one end opening inside of one of said sewage compartments near the center of the bottom thereof and having the other end opening through the top of said one sewage compartment; second pipe means having one end opening inside the other of said sewage compartments near the center of the bottom thereof and having the other end opening through the top of said other sewage compartment; a sewage supply line; a pair of sewage inlet pipes connecting the top ends of said first and second pipe means with said sewage supply line; a one-way inlet valve in each of said pair of sewage inlet pipes; a pair of sewage discharge pipes connected with the top ends of said first and second pipe means; a one-way outlet valve in each of said pair of sewage discharge pipes; an air vent pipe connected to each of said sewage compartments; a solenoid valve in each of said air vent pipes for opening and closing the same; a first support base mounted on the top of one of said sewage compartments; a second support base mounted on the top of the other of said sewage compartments; a first air compressor mounted on said first support base; a first electric motor mounted on said first support base and connected in driving relationship with said first compressor; a second air compressor mounted on said second support base; a second electric motor mounted on said second support base and connected in driving relationship with said second compressor; a pair of compressed air pipes for connecting each of said air compressors with one of said sewage compartments; an electrical current source; electrical control means for each of said sewage compartments responsive to the liquid levels of the sewage therein and connected in circuit relationship with said current source; and conductor means connecting each of said solenoids and each of said electric compressor motors in circuit relationship with said control means; whereby when the sewage in either of said compartments reaches the predetermined high liquid level the electrical control means associated therewith closes the air vent valve associated therewith and starts the compressor motor of the air compressor associated therewith, thereby ejecting the sewage from that compartment.

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