April 6, 1943. A. O. SWEENY 2,315,824

COMBINED PNEUMATIC AND HYDRAULIC WATER CLOSET

Filed Nov. 6, 1941 3 Sheets-Sheet 1

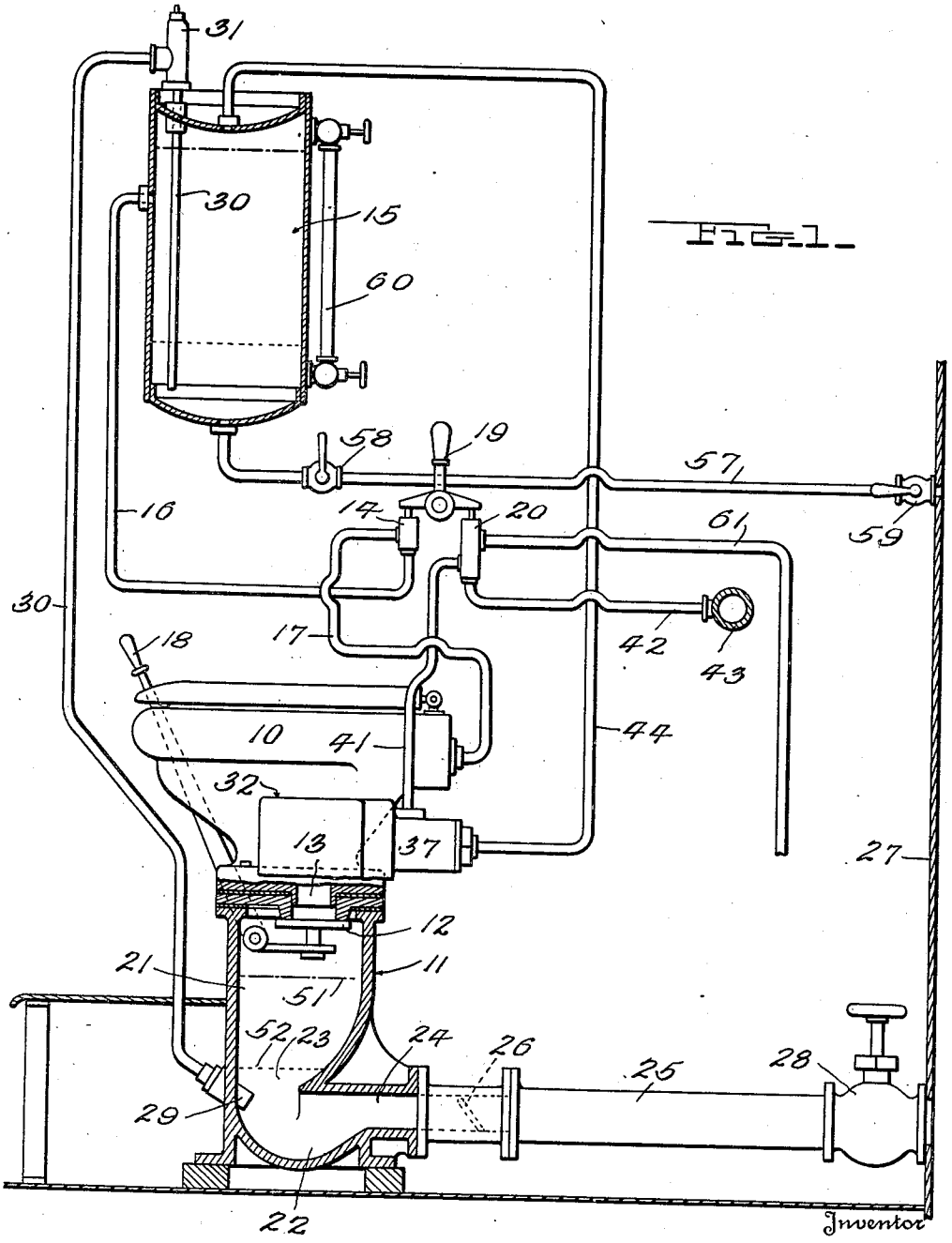

Fig. 1.

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FIG. 2.

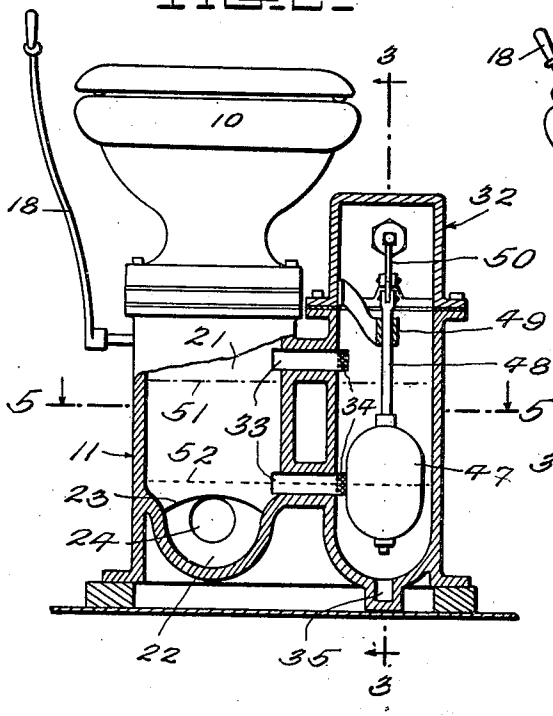
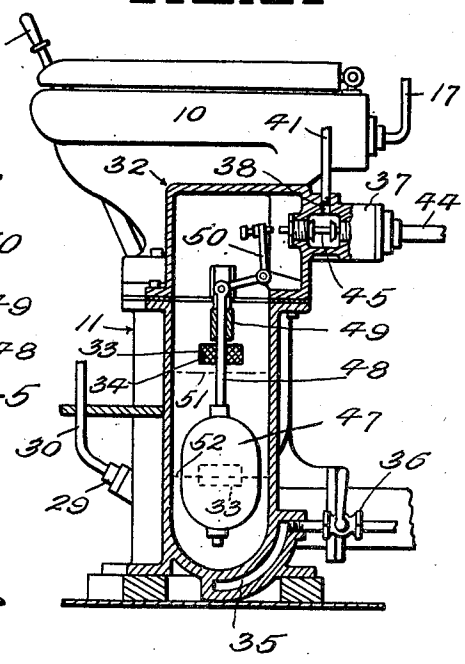


FIG. 3.



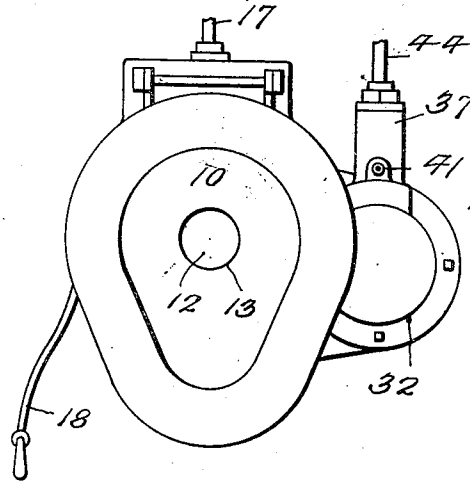


FIG. 4.

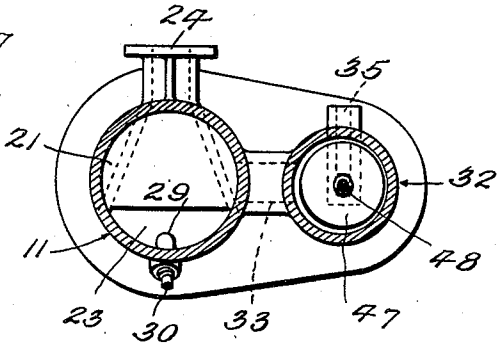


FIG. 5.

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FIG. 6.

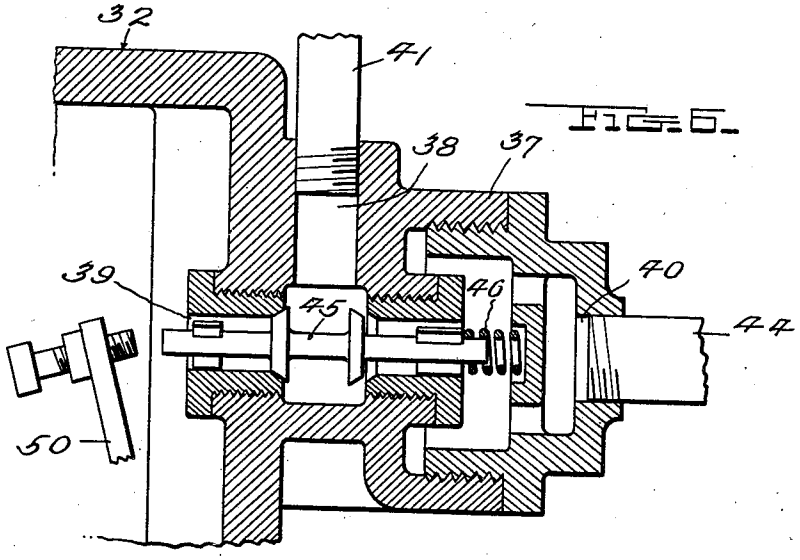

FIG. 7.

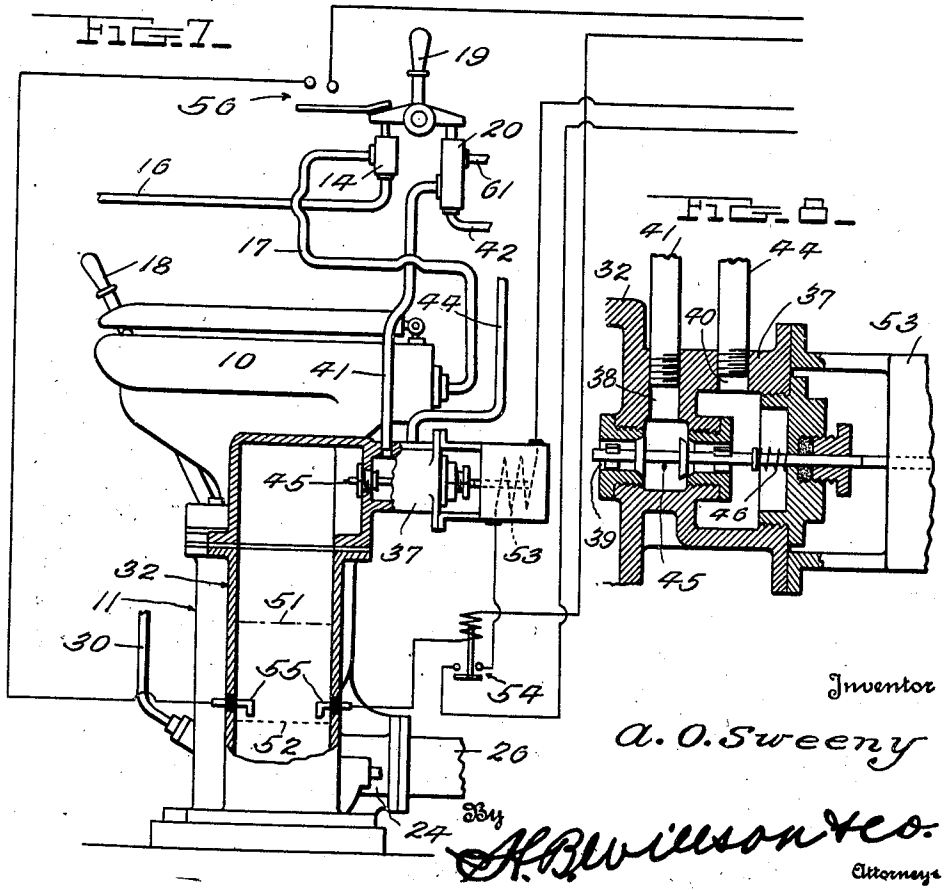

FIG. 8.

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Patented Apr. 6, 1943

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UNITED STATES PATENT OFFICE

2,315,824

COMBINED PNEUMATIC AND HYDRAULIC WATER CLOSET

Arthur O. Sweeny, Kittery, Maine

Application November 6, 1941, Serial No. 418,070

7 Claims. (Cl. 4—77)

The invention aims to provide a new and improved water closet of the general type used in submarines, subway stations and the like, in which the discharge from the closet must be forced out against resisting pressure, and the construction of the invention is such that compressed air is used to position the waste in readiness for discharge, and water under pressure is then used to effect the discharge, insuring that there shall be no escape of compressed air with the waste, which is particularly desirable when the closet is used on submarines, as it precludes air bubbling to the surface and possibly giving the location of the vessel to the enemy.

With the foregoing in view, the invention resides in the novel subject matter hereinafter described and claimed, description being accomplished by reference to the accompanying drawings.

Fig. 1 is a side elevation partly broken away and in section, showing not only the hopper and the chambers associated therewith but illustrating the water tank, the flush valve, the blow valve and all necessary piping.

Fig. 2 is a front elevation partly broken away and in section showing the hopper, the chambers associated therewith and the valve-actuating mechanism in one of these chambers.

Fig. 3 is a vertical sectional view on line 3—3 of Fig. 2.

Fig. 4 is a top plan view of the hopper and chambers.

Fig. 5 is a horizontal sectional view on line 5—5 of Fig. 2.

Fig. 6 is an enlarged vertical sectional view through the compressed air valve casing and the portion of the chamber with which it is associated, illustrating the compressed air valve in elevation in said casing and showing a fragment of the operating lever of said valve.

Fig. 7 is an elevation partly in section showing a modification in which a solenoid is employed in operating the compressed air valve.

Fig. 8 is a vertical sectional view through the compressed air valve shown in Fig. 7.

Preferred features of construction have been illustrated and will be rather specifically described, with the understanding, however, that within the scope of the invention as claimed, variations may be made.

The conventional hopper 10 is suitably mounted upon a vertically elongated casing 11, and a suitable dump valve 12 is provided for the hopper outlet 13. At 14, I have illustrated a suitable flush valve for directing water from a water tank 15 through pipes 16 and 17 to flush the contents of the hopper 10 into the casing 11 when the dump valve 12 is opened, a suitable operating lever 18 being employed for this valve. An appropriate rocker 19 is illustrated for operating the flush valve 14 when moved in one direction and for operating a suitable blow valve 20 when moved in the other direction.

The casing 11 includes an upper receiving chamber 21 and a lower discharge chamber 22, the lower end of 21 being in restricted communication with the upper end of 22, as indicated at 23. The discharge chamber 22 is provided with a horizontally directed waste outlet 24 communicating with a waste discharge line 25 having a check valve 26. When the closet is used in a submarine, the line discharges through the hull 27 of the ship and is of course provided with an appropriate sea valve 28. A water nozzle 29 extends through the side wall of the casing 11 substantially in alinement with the outlet 24 for hydraulically scavenging the waste from the chamber 22, and a water conducting line 30 leads to said nozzle from the lower end of the water tank 15, said line 30 being provided with an appropriate spring-seated valve 31 to prevent syphonic action.

An additional vertical casing 32 is provided abreast of the casing 11, and said casing 32 is placed in communication with the upper and lower portions of said casing 11, by means of appropriate passages 33 which insure the same liquid level in both casings 11 and 32. Both passages 33 are suitably screened at 34 to prevent any appreciable amount of solid matter from flowing through them into the casing 32, but as it will be advisable from time to time to clean any collecting sediment from said casing 32, it is provided with a suitable clean-out passage 35 for which a valve 36 is employed.

Projecting outwardly from the upper portion of the casing 32, is a compressed air valve casing 37 having (see Figs. 6 and 8) a compressed air inlet 38 and two compressed air outlets 39 and 40. A compressed air conducting line 41 leads to the inlet 38 from the blow valve 20, which valve is operatively connected by a line 42 with a compressed air main 43. The compressed air outlet 39 communicates directly with the upper end of the casing 32, and an air line 44 extends from the outlet 40 to the top of the water tank 15.

Slidable within the compressed air valve casing 37 is a dual compressed air valve 45. When this valve is shifted to the right from the position shown in Figs. 6 and 8, it places the compressed

air inlet line 41 in communication only with the outlet 39 for conducting compressed air into the chamber within the casing 32 and (thru uppermost passage 33) into the chamber 21 of the casing 11. When the valve 45, however, is shifted to the left as seen in Figs. 6 and 8, it places the compressed air inlet 38 in communication only with the compressed air line 44 extending to the top of the water tank 15. Provision is made, controlled by the liquid level in the chamber 21, for effecting proper operation of the valve 45. In the present disclosure, this valve is urged to the left by a suitable coil spring 46 but this spring is overcome by the operating means which is controlled by the liquid level, when the valve should be moved to the right, and said spring is permitted to act by said operating means, when the valve should be shifted to the left.

In most views of the drawings, a mechanical means is shown for operating the valve 45, but in Figs. 7 and 8, electrical means is shown for obtaining the same result. Referring more particularly to Figs. 2 and 3, it will be seen that a float 47 is provided in the casing 32, said float having an appropriate stem 48 passing slidably through a suitable guide 49 and operatively connected with a bell crank 50. When the float 47 rises, the bell crank 50 pushes the valve 45 to the right against the action of the spring 46, and when said float again lowers, said spring 46 again shifts said valve 45 to the left. The rise and fall of liquid in the casing 32 which causes operation of the float 47, occurs between more or less fixed limits, and the high and low levels are indicated by the broken lines 51 and 52 respectively.

In Figs. 7 and 8, a solenoid 53 is employed for shifting the valve 45 to the right. Current for operating this solenoid is supplied through an appropriate relay 54, and two contacts 55 to be bridged by the liquid in casing 32 are instrumental in aiding to complete the circuit of said solenoid. A switch 56, however, is controlled by the rocker 19 to completely close the circuit only when this rocker is operated to actuate the blow valve 20. Whenever this blow valve is operated, the liquid is substantially at the high level 51 and consequently the circuit of the relay 44 will be completed through the switch 56 and the liquid bridging the contacts 55. Whenever the liquid is driven down to the low level 52, it clears the contacts 55, breaking the circuit of the relay 55 which in turn breaks the circuit of the solenoid 53, allowing valve 45 to return to the left.

A filling line 57 is provided for the water tank 15, and in the present showing, said line 57 is equipped with a control valve 58 and with a sea valve 59. Also associated with the tank 15 is an appropriate gauge glass 60.

The element 61 extending from the blow valve 20 is simply a vent line through which the compressed air escapes from the chambers of the closet after it has performed its duty.

In explaining the operation of the invention, reference will first be made to the form of construction shown in Figs. 1 to 6. After use of the closet, the rocker 19 is moved to actuate the flush valve 14, and either before or simultaneously with the movement of said rocker, the dump valve 12 is opened by means of the lever 18. Thus the hopper contents are received in the receiving chamber 21 with the result that the liquid in this chamber and in the casing 32, rises to the high level 51. This causes the float 47 to rise and shift the compressed air valve 45 to the right from its Fig. 6 position. The rocker 19 is now tilted in the opposite direction to operate the blow valve 20, which valve conducts aid to the compressed air valve casing 37 through the pipe 41. This air leaves the casing through the outlet 39 and enters the upper end of casing 32, flowing also through the uppermost of the passages 33 into the chamber 21, above the liquid level, it being of course understood that the dump valve lever 18 is released to permit valve 12 to close before the blow valve 20 is operated. The admission of compressed air above the contents of the chamber 21, drives these contents down to the low level 52 and discharges most of them into the discharge chamber 22. When the liquid level reaches the low lever 52, however, the float 47 drops and the spring 46 returns the valve 45 to the position of Fig. 6, thus discontinuing the supply of compressed air above the liquid level. This shifting of the valve also directs the compressed air through the line 44 into the upper end of the water tank 15, with the result that the air pressure discharges the water from this tank through the line 30 and nozzle 29 to hydraulically scavenge the discharge chamber 22 with no danger of any air escaping with the waste. When the water level in the tank 15 lowers to the lower end of the gauge glass 60, the rocker 19 should be released to allow return of the blow valve 20 to its normal position, in which position it vents the compressed air from the chambers into which it was previously admitted. The water tank 15 is refilled by opening the valve 58.

With reference to Figs. 7 and 8, the operation is the same as above described, except that instead of any float shifting the valve 45 to the right, the solenoid 53 accomplishes this when its circuit is completed by closing the switch 56. It will be recalled that this switch is operated by the rocker 19 when the latter is moved to actuate the blow valve 20. At this time, the liquid is at the high level 51 and consequently the contacts 55 are submerged to aid in completing the circuit of the relay 54, which relay in turn completes the circuit of the solenoid 53. When the liquid reaches the low level 52, it automatically breaks the circuit of the relay 54 and this relay breaks the circuit of the solenoid 53, allowing valve 45 to shift again to the left to direct compressed air through the line 44 to the water tank 15 to effect hydraulic scavenging of the discharge chamber 22.

From the foregoing taken in connection with the accompanying drawings, the preferred construction will be fully understood but attention is again invited to the possibility of making variations within the scope of the invention as claimed.

I claim:

1. A combined pneumatic and hydraulic water closet comprising a hopper and a dump valve normally closing the outlet of said hopper, a receiving chamber under said hopper and into which said hopper discharges when said dump valve is opened, a discharge chamber communicating with the lower portion of said receiving chamber and into which the contents of said receiving chamber may be downwardly forced, said discharge chamber having an outlet provided with a check valve, means for conducting water to said hopper to flush same when said dump valve is opened, whereby the hopper contents will enter said receiving chamber, valved means for conducting compressed air into the upper end of said receiving chamber after again closing said dump valve, to force the contents of said

receiving chamber to a low level and cause most of same to enter said discharge chamber, means controlled by said low level and operatively connected with said valved means for actuating the latter to discontinue the supply of compressed air to said receiving chamber when the liquid reaches said low level, thus preventing any of said compressed air from entering said discharge chamber, a water nozzle operatively related with said outlet of said discharge chamber for scavenging the latter of waste, and valve controlled means for supplying water under pressure to said water nozzle.

2. A combined pneumatic and hydraulic water closet comprising a hopper and a dump valve normally closing the outlet of said hopper, a receiving chamber under said hopper and into which said hopper discharges when said dump valve is opened, a discharge chamber communicating with the lower portion of said receiving chamber and into which the contents of said receiving chamber may be downwardly forced, said discharge chamber having an outlet provided with a check valve, means for conducting water to said hopper to flush same when said dump valve is opened, whereby the hopper contents will enter said receiving chamber, a third chamber abreast of said receiving chamber and communicating with the upper and lower ends thereof to insure the same liquid level in both said receiving chamber and said third chamber, valved means for conducting compressed air into the upper end of said third chamber to force the contents of said receiving chamber and said third chamber to a low level and cause most of same to enter said discharge chamber, means controlled by the low level in said third chamber and operatively connected with said valved means for actuating the latter to discontinue the supply of compressed air to said third chamber when the liquid reaches said low level, thus preventing any of said compressed air from entering said discharge chamber, a water nozzle operatively related with said outlet of said discharge chamber for scavenging the latter of waste, and valve-controlled means for supplying water under pressure to said water nozzle.

3. A combined pneumatic and hydraulic water closet comprising a hopper and a dump valve normally closing the outlet of said hopper, a receiving chamber under said hopper and into which said hopper discharges when said dump valve is opened, a discharge chamber communicating with the lower portion of said receiving chamber and into which the contents of said receiving chamber may be downwardly forced, said discharge chamber having an outlet provided with a check valve, means for conducting water to said hopper to flush same when said flush valve is opened, whereby the hopper contents will enter said receiving chamber, an air valve casing having a compressed air inlet and two compressed air outlets, one of these outlets being in communication with the upper end of said receiving chamber to admit compressed air to said receiving chamber to force the contents of said receiving chamber to a low level and cause most of said contents to enter said discharge chamber, a water nozzle operatively related with said outlet of said discharge chamber for scavenging the latter of waste, a closed water tank and a water conducting pipe from the lower end of said tank to said nozzle, a compressed air pipe from the other of said compressed air outlets of said valve casing to said tank to supply compressed air to forcibly discharge water from said tank and force same through said nozzle, a compressed air valve in said valve casing, said compressed air valve being shiftable from one position in which it places said compressed air inlet in communication only with said one of said compressed air outlets, to a second position in which it places said compressed air inlet in communication only with said other of said compressed air outlets, means operatively associated with said compressed air valve and controlled by the liquid level in said receiving chamber for setting said compressed air valve in said one position when said liquid level is high and for setting said compressed air valve in said second position when said liquid level is low, and compressed air supply means leading to said compressed air inlet and including a control valve.

4. A structure as specified in claim 3; said means for conducting water to said hopper to flush the same comprising a valved pipe extending from said water tank to said hopper and connected with said tank between the high and low water levels thereof.

5. A combined pneumatic and hydraulic water closet comprising a hopper and a dump valve normally closing the outlet of said hopper, a receiving chamber under said hopper and into which said hopper discharges when said dump valve is opened, a discharge chamber communicating with the lower portion of said receiving chamber and into which the contents of said receiving chamber may be downwardly forced, said discharge chamber having an outlet provided with a check valve, means for conducting water to said hopper to flush same when said dump valve is opened, whereby the hopper contents will enter said receiving chamber, a third chamber abreast of said receiving chamber and in restricted communication therewith at its upper and lower ends to insure the same liquid level in said third chamber as in said receiving chamber, an air valve casing having a compressed air inlet and two compressed air outlets, one of these outlets being in communication with the upper end of said third chamber to admit compressed air to said receiving chamber to force the contents of said receiving chamber to a low level and cause most of said contents to enter said discharge chamber, a water nozzle operatively related with said outlet of said discharge chamber for scavenging the latter of waste, a closed water tank and a water-conducting pipe from the lower end of said tank to said nozzle, a compressed air pipe from the other of said compressed air outlets of said valve casing to said tank to supply compressed air to forcibly discharge water from said tank through said nozzle, a compressed air valve in said valve casing, said compressed air valve being shiftable from one position in which it places said compressed air inlet in communication only with said one of said compressed air outlets, to a second position in which it places said compressed air inlet in communication only with said other of said compressed air outlets, means operatively associated with said compressed air valve and controlled by the liquid level in said third chamber for setting said compressed air valve in said one position when said liquid level is high and for setting said compressed air valve in said second position when said liquid level is low, and compressed air supply means leading to said compressed air inlet and including a control valve.

6. A combined pneumatic and hydraulic water

closet comprising a hopper and a dump valve normally closing the outlet of said hopper, a receiving chamber under said hopper and into which said hopper discharges when said dump valve is opened, a discharge chamber communicating with the lower portion of said receiving chamber and into which the contents of said receiving chamber may be downwardly forced, said discharge chamber having an outlet provided with a check valve, means for conducting water to said hopper to flush same when said flush valve is opened, whereby the hopper contents will enter said receiving chamber, a third chamber abreast of said receiving chamber and in restricted communication therewith at its upper and lower ends to insure the same liquid level in said third chamber as in said receiving chamber, an air valve casing having a compressed air inlet and two compressed air outlets, one of these outlets being in communication with the upper end of said third chamber to admit compressed air to said receiving chamber to force the contents of said receiving chamber to a low level and cause most of said contents to enter said discharge chamber, a water nozzle operatively related with said outlet of said discharge chamber for scavenging the latter of waste, a closed water tank and a water-conducting pipe from the lower end of said tank to said nozzle, a compressed air pipe from the other of said compressed air outlets of said valve casing to said tank to supply compressed air to forcibly discharge water from said tank through said nozzle, a compressed air valve in said valve casing, said compressed air valve being shiftable from one position in which it places said compressed air inlet in communication only with said one of said compressed air outlets, to a second position in which it places said compressed air inlet in communication only with said other of said compressed air outlets, operating means for said compressed air valve including a float in said third chamber for shifting said valve to said one position when said float rises, and a spring for forcing said valve to said second position when said float lowers, and compressed air supply means leading to said compressed air outlet and having a control valve.

7. A combined pneumatic and hydraulic water closet comprising a hopper and a dump valve normally closing the outlet of said hopper, a receiving chamber under said hopper and into which said hopper discharges when said dump valve is opened, a discharge chamber communicating with the lower portion of said receiving chamber and into which the contents of said receiving chamber may be downwardly forced, said discharge chamber having an outlet provided with a check valve, means for conducting water to said hopper to flush same when said flush valve is opened, whereby the hopper contents will enter said receiving chamber, a third chamber abreast of said receiving chamber and in restricted communication therewith at its upper and lower ends to insure the same liquid level in said third chamber as in said receiving chamber, an air valve casing having a compressed air inlet and two compressed air outlets, one of these outlets being in communication with the upper end of said third chamber to admit compressed air to said receiving chamber to force the contents of said receiving chamber to a low level and cause most of said contents to enter said discharge chamber, a water nozzle operatively related with said outlet of said discharge chamber for scavenging the latter of waste, a closed water tank and a water-conducting pipe from the lower end of said tank to said nozzle, a compressed air pipe from the other of said compressed air outlets of said valve casing to said tank to supply compressed air to forcibly discharge water from said tank through said nozzle, a compressed air valve in said valve casing, said compressed air valve being shiftable from one position in which it places said compressed air inlet in communication only with said one of said compressed air outlets, to a second position in which it places said compressed air inlet in communication only with said other of said compressed air outlets, operating means for said compressed air valve including a solenoid for shifting said valve to said one position when said liquid level rises, a spring for shifting said valve to said other position when said level lowers, and contacts in the lower end of said third chamber to be bridged by the liquid therein for controlling said solenoid; and compressed air supply means leading to said compressed air outlet and including a control valve.

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