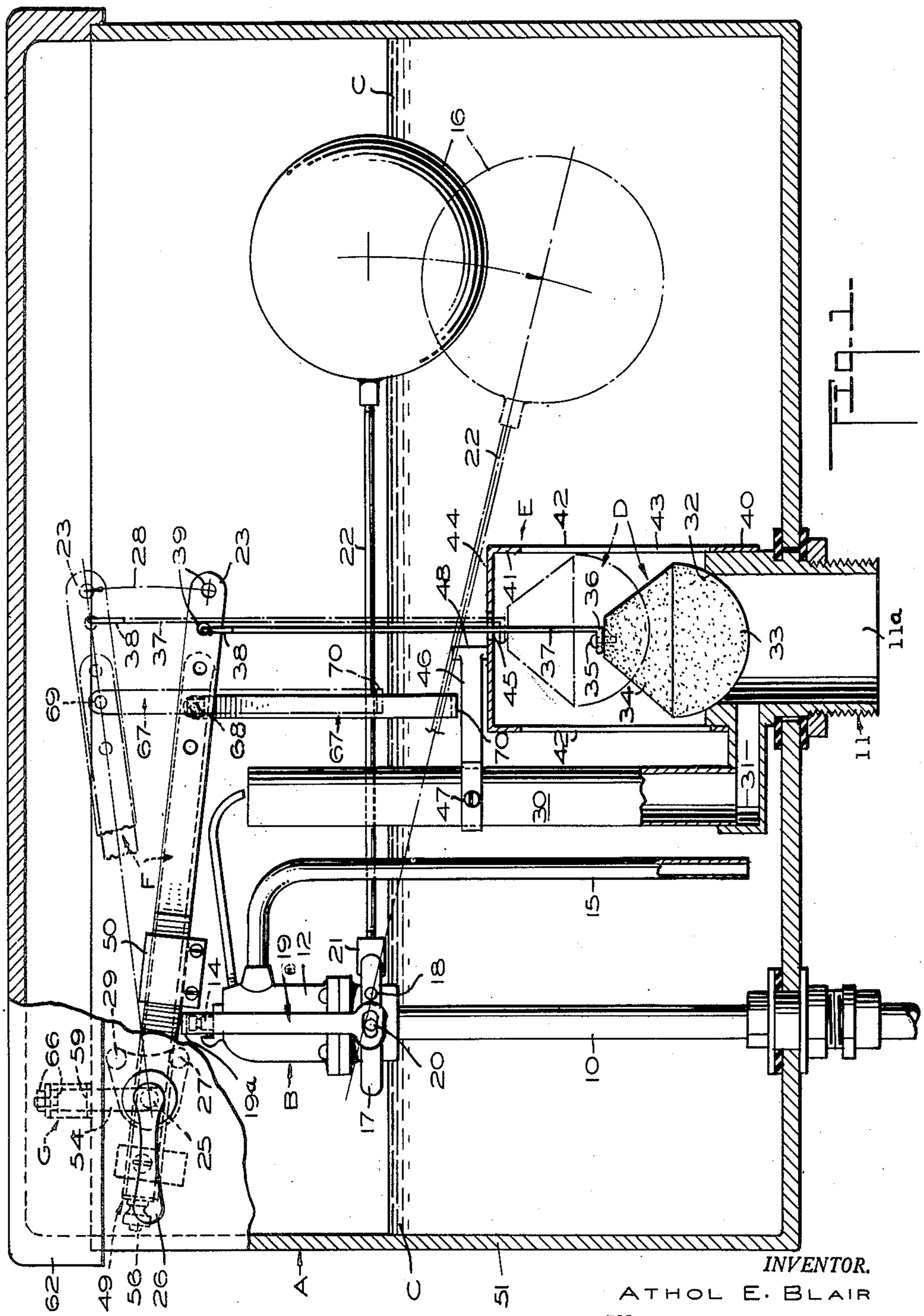
Jan. 27, 1953 A. E. BLAIR 2,626,401

WATER-SAVING DEVICE FOR FLUSH TANKS

Filed April 2, 1951 2 SHEETS—SHEET 1



Jan. 27, 1953 A. E. BLAIR 2,626,401

WATER-SAVING DEVICE FOR FLUSH TANKS

Filed April 2, 1951 2 SHEETS—SHEET 2

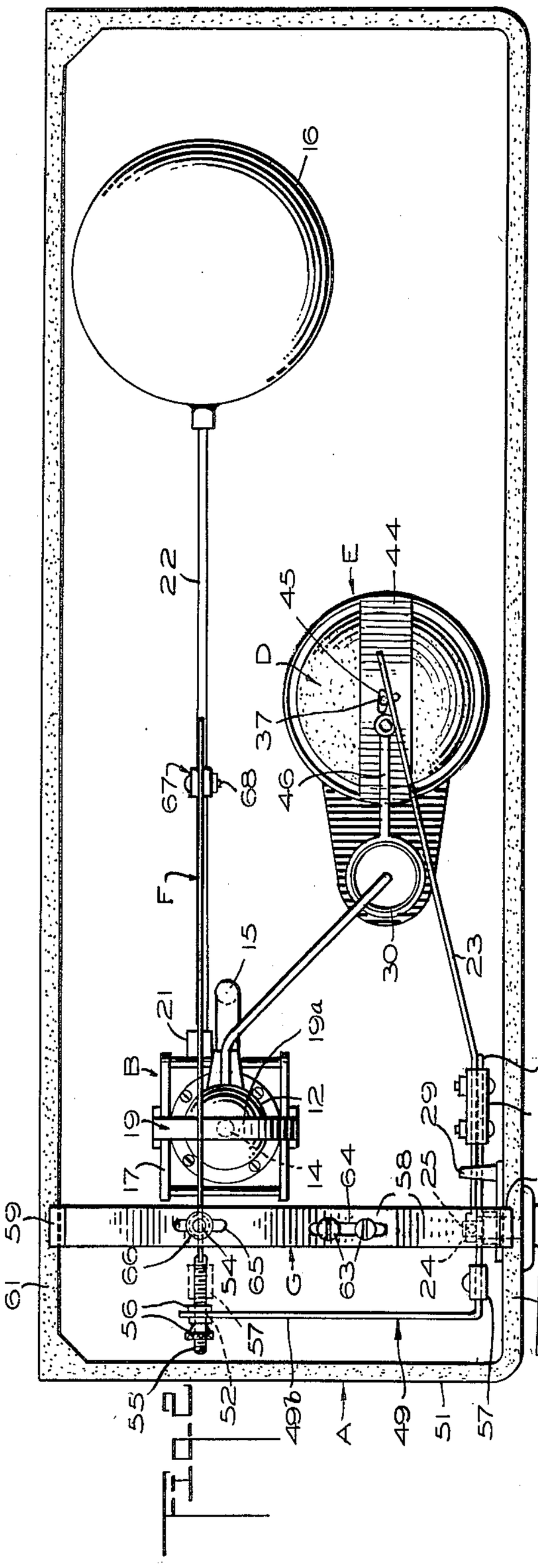


FIG. 2.

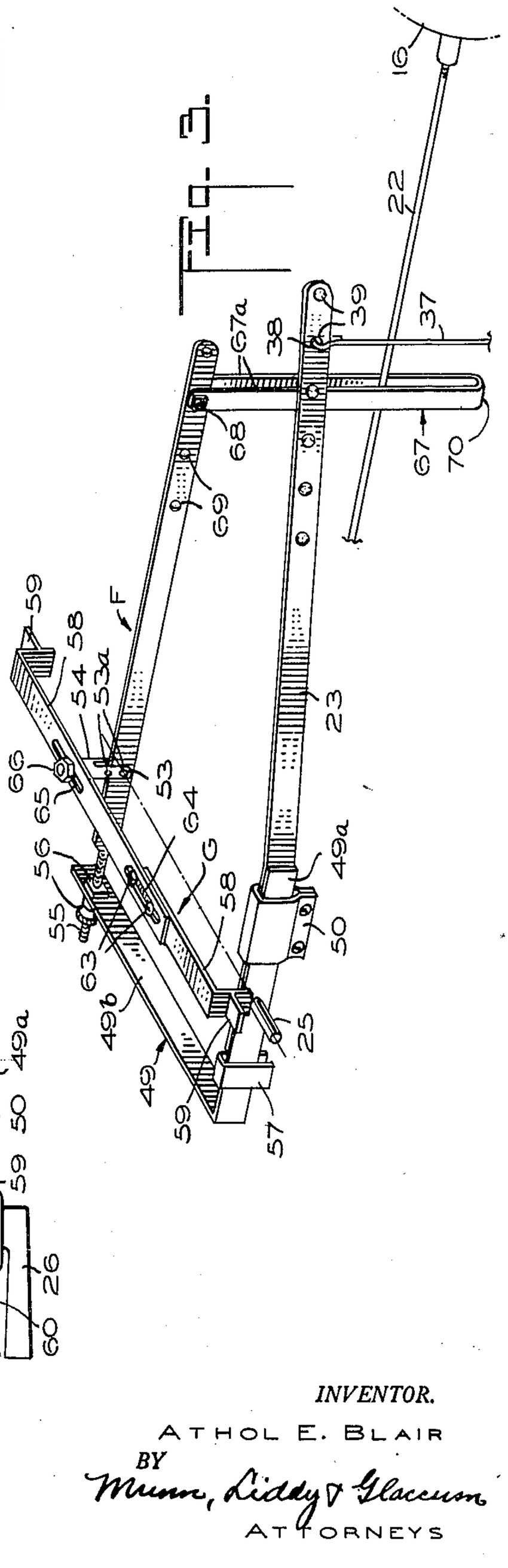


FIG. 3.

INVENTOR.

ATHOL E. BLAIR

BY

Munn, Liddy & Glascock

ATTORNEYS

Patented Jan. 27, 1953 2,626,401

UNITED STATES PATENT OFFICE

2,626,401

WATER-SAVING DEVICE FOR FLUSH TANKS

Athol E. Blair, Santa Cruz, Calif.

Application April 2, 1951, Serial No. 218,750

4 Claims. (Cl. 4—67)

1

The present invention relates to improvements in a water-saving device for flush tanks, and more particularly to tanks employed for flushing toilet bowls. It relates to extension of improvements over my copending application, entitled "Valve Closing Mechanism for Water Closets." which was filed in the United States Patent Office on January 30, 1951, Serial No. 208,526.

In the conventional flushing tank, a predetermined amount of water is delivered thereto through a float-controlled inlet valve. The volume of this stored water is regarded as sufficient for the proper flushing of a toilet bowl. However, when the outlet valve is raised to allow discharge of the water from the tank to the bowl, the float descends with the water level, thereby permitting considerable additional water to enter the tank during the flushing operation. Inasmuch as the outlet valve is opened at this time, the additional water will be discharged into the bowl. since the outlet valve remains unseated until the flushing is completed. Consequently, this results in a considerable waste of water.

Accordingly, the cardinal object of this invention is to provide a water-saving device, which is adapted to retain the incoming float-actuated valve in closed position until substantially the time that the flushing of the bowl has been completed. Thus, no additional water is allowed to enter the tank and became discharged therefrom, along with the water previously stored in the tank.

Moreover, I propose to provide a device of the character described. which may be readily installed in a conventional flush tank, without requiring any alterations in the mechanism of the latter.

Other objects and advantages will appear as the specification continues. The novel features of my invention will be set forth in the claims hereunto appended.

Drawings

For a better understanding of this invention, reference should be had to the accompanying drawings, forming part of this application, in which:

Figure 1 is a longitudinal vertical sectional view taken through a flush tank, incorporating my water-saving device therein, parts being shown in elevation;

Figure 2 is a top plan view thereof, with the cover of the tank removed; and

Figure 3 is an isometric view of my water-saving device.

2

While I have shown only the preferred form of my invention, it should be understood that various changes, or modifications may be made within the scope of the annexed claims without departing from the spirit thereof.

Detailed description

Referring now to the drawings, I disclose a flush tank designated generally at A. This tank is provided with a conventional float-operated valve B, which allows a predetermined volume of water C to enter the tank through an inlet pipe 10. Moreover, this tank includes an outlet fitting 11, which delivers the supply of water to a toilet bowl (not shown) when an outlet valve D is unseated.

In its structural features, the inlet valve B includes a casing 12 surmounting the pipe 10, which is provided with a reciprocable plunger 14. Upon allowing this plunger to rise. water will flow through a discharge pipe 15 into the tank A. As the level of this incoming water rises in the tank, a float 16 operates to close the valve B when the water reaches the height shown in Figure 1 of the drawing. However, when the water level descends due to a flushing operation, and the float occupies its dot-dash line position in this view, the plunger 14 will be projected upwardly and the tank will be refilled again.

It will be noted that a rectangular-shaped frame 17 is swingably attached by trunnions 18 to the valve body 12 (see Figure 1). An inverted U-shaped yoke 19 has its lower ends pivotally mounted by pins 20 to opposing sides of the frame 17. The closed end 19*a* of this yoke overlies and bears against the top of the plunger 14. As further shown in Figure 1, the frame 17 has a boss 21 fixed thereto. An operating rod 22 has one end thereof attached to this boss, while its opposite end is connected to the float 16 in the usual way.

Therefore, when the yoke 19 is pulled downwardly, due to the water C rising to the level shown in Figure 1, the plunger 14 is depressed to cut off further inflow of water. This arrangement is conventional in flush tanks for toilet bowls.

The flushing mechanism includes a lever 23, which has one end thereof clamped by a nut 24 to a stub shaft 25, the latter being fastened to a swingably-mounted handle 26 disposed exteriorly of the tank. The lever 23 normally occupies a slight downwardly-inclined position, as shown in full lines in Figure 1, and rests against a lower stop 27. When the handle 26 is depressed for a flushing operation, this lever is swung in the di-

rection of the arrow **28** until it contacts with an upper stop **29** (see Figure 1).

As a part of the usual flushing mechanism, an overflow pipe **30** is provided, which communicates through a horizontal passageway **31** with the bore **11***a* of the outlet fitting **11**. The upper end of this fitting is fashioned with a seat **32** disposed above the passageway **31** (see Figure 1). The seat **32** is designed to receive the lower spherical portion **33** of the outlet valve D. The upper part **34** of this valve is conical-shaped, and is loosely connected by a screw **35** to an eyelet **36** of a valve-lifting stem **37**. The construction is such that the outlet valve D will have a limited universal movement relative to its stem.

It will be noted that a loop **38** is formed at the upper end of the stem **37**, which is adapted to be engaged through any one of a series of openings **39** provided in the forward section of the lever **23**. The loop is large enough to permit a loose pivoted connection between the stem and the lever.

After the valve D has been unseated, it will float on the surface of the water as the latter is discharged from the tank through the outlet bore **11***a*. During the flushing operation, the valve D and its stem **37** will retain the lever **23** in the raised dot-dash line position in Figure 1. When the water level in the tank drops substantially to the top of the fitting **11**, the valve D will descend again to the seat **32**, closing off further discharge of water from the tank.

In the ordinary flushing mechanism, the stem **37** is slidably guided relative to the lever **23**. However, in my arrangement, the buoyancy of the valve D is sufficient to hold the lever **23** in raised position while the flushing continues.

My copending application, Serial No. 208,526, discloses the details of a valve cage guide designated generally at E. It has a lower ring **40**, which is designed to be telescoped over the outlet fitting **11**. Moreover, an upper ring **41** is provided at the top of this cage. The rings **40**—**41** are interconnected by upstanding bars **42** that are spaced laterally from one another to define water passageways **43** in the cage. The purpose of these passageways is to permit water to flow from the tank A into the outlet fitting **11** when the valve D is raised. These bars serve as guides to preclude undue lateral swinging of the valve D on the stem **37** during the lifting of this valve and the subsequent seating thereof.

The top of the cage E is provided with a diametrically-extending strip **44** thereon, and the latter has a slot **45** that serves to guide the stem **37**. For the purpose of holding the cage in place, an arm **46** is anchored by a set-screw **47** to the overflow pipe **30**. The free end **48** of this arm bears against the strip **44** to removably retain the cage on the outlet fitting.

In Figures 2 and 3, I disclose an L-shaped bar **49**, which has its leg **49***a* extending longitudinally of the tank A. This leg is butted against the lever **23** and is secured thereto by a suitable clamp **50**. Thus the bar **49** and the lever **23** swing as a unit about the stub shaft **25**, while permitting the bar to be adjusted toward or away from the end wall **51** of the tank. The other leg **49***b* is disposed transversely with respect to the tank, and is fashioned with an opening **52** adjacent its free end (see Figure 2).

For the purpose of maintaining the operating rod **22** in its full-line position in Figure 1 during a flushing operation, and thereby preventing additional water from entering the tank A until

the latter has been substantially emptied, I make use of a float-control lever F. This lever is pivotally secured at **53** to a bifurcated stud **54**, this pivot being axially aligned with the stub shaft **25**, as clearly shown in Figure 3. A number of openings **53***a* may be provided in the stud **54** to allow the pivot **53** to be adjusted vertically.

As illustrated, the lever F has a bolt **55** formed integral therewith, which extends through the opening **52** of the leg **49***b*. Suitable locking nuts **56** are provided on this bolt to clamp the latter to the transverse leg **49***b*. It will be quite apparent that the levers **23** and F, together with the bar **49** define a substantially U-shaped frame, which is mounted for swinging about the shaft **25** and the pivot **53**. Appropriate counterweights **57** are adjustably carried by this frame. These weights may be shifted to give proper balance to the frame.

In order to support the stud **54**, I provide a bracket G which is mounted transversely of the tank A. This bracket includes extensible strips **58** having feet **59** at their outer ends. These feet rest on the tops of the front and rear walls **60** and **61**, respectively, of the tank A. When the cover **62** of the tank is applied, it bears against the feet **59** so as to retain the bracket G in place. Screws **63** and a slot **64** permit the strips **58** to be adjusted longitudinally to one another, thus accommodating the bracket G to tanks of various sizes. The stud **54** passes through a slot **65** in the rearmost strip **58**, and is anchored to the latter by nuts **66** arranged above and below this strip (see Figure 1).

At the forward section of the lever F there is mounted a U-shaped bail **67**. This bail has the upper ends of its legs **67***a* swingably secured to the lever F by a bolt **68**, the latter passing through a selected opening **69** in the lever. It is clearly shown in Figures 1 and 3 that this bail depends from the lever F, with its legs straddling and guiding the operating rod **22** of the float.

When the levers **23** and F are inclined downwardly from the stub shaft **25** and pivot **53**, respectively, as shown by full lines in Figure 1, and the tank is filled with water C to the level shown in this view, the transverse bottom position **70** of the bail is spaced below the rod **22**. At this time, the valve D engages with its seat **32**.

However, upon depressing the handle **26**, and thereby unseating the valve D to permit a flushing operation, the bail **67** will be raised into its dot-dash line position shown in Figure 1. This brings the bottom portion **70** of the bail into engagement with the rod **22**, holding the float-operated valve B closed as long as the levers **23** and F occupy their forward and upwardly-inclined dot-dash line positions.

The buoyancy of the valve D causes the latter to remain unseated until the water level drops substantially to the top of the outlet fitting **11**. Accordingly, the stem **37** will retain the levers **23** and F in their raised positions, preventing additional inflow of water to the tank A, until the flushing operation is completed. However, as the valve D approaches its seat, the bail **67** will be lowered, permitting the float **16** to descend and thus will open the valve B.

Considerable amount of water is saved by my arrangement, since the incoming flow of water from the valve B to the tank A is precluded while the outlet valve D remains unseated.

Summary

Assuming that the various parts of the flushing apparatus and my water saver device have

been installed in the tank A in the manner disclosed in Figures 1 and 2, the operation is summarized as follows:

The volume of water C contained in the tank is regarded as sufficient for flushing a toilet bowl, with no additional water required to effect complete flushing. When the water level reaches that illustrated in Figure 1, the float-operated valve B is closed by the float 16; the outlet valve D rests on its seat 32; the levers 23 and F are inclined downwardly and forwardly in manner shown by full lines in Figure 1; and the bottom portion 70 of the bail 67 is spaced below the rod 22 of the float. This may be regarded as constituting the "normal" positions of the several parts.

When it is desired to discharge the water C through the outlet bore 11*a* for flushing a toilet bowl, the free end of the handle 26 is depressed. This will result in swinging both the levers 23 and F into upwardly and forwardly inclined positions, as suggested by the dot-dash lines in Figure 1.

Raising of the lever 23 will lift the valve D from its seat 32, and the water will commence to discharge through the bore 11*a*. The buoyancy of this elevated valve and the interposed stem 37, will retain the lever 23 in its raised position, until the water level drops substantially to the top of the outlet fitting.

As the lever 23 is swung upwardly, due to depressing the handle 26, the lever F will move upwardly, due to the L-shaped arm 49 connecting these levers together into a unitary frame or structure. This movement of the lever F will elevate the bail 67, with the bottom portion 70 of the latter coming into engagement with the rod 22 of the float 16. Accordingly, the float cannot descend at this time, and the valve B will remain closed.

The water continues to pour through the bore 11*a*, with the valve B remaining closed. However, when the water level drops sufficiently, the valve D will start to descend, which will lower the bail 67. Thereupon, the float 16 will start to swing into its dot-dash line position in Figure 1. About this time, the valve D reaches its seat 32; the valve B will open; and water will commence to issue from the discharge pipe 15 to refill the tank A.

As the water level rises again, the float 16 will be raised, pulling down on the yoke 19 and finally closing the float-operated valve B. This will restore the several parts to their "normal" positions, completing the flushing cycle.

I claim:

1. The combination with a flush tank having an inlet pipe for delivering water thereto, and an outlet fitting for discharge of water therefrom; a float-operated valve connected to the inlet pipe and having an operating rod extending therefrom on which a float is secured for controlling inflow of water to the tank; a discharge valve arranged to seat upon and coacting with the outlet fitting to control outflow of water from the tank; and a pivotally-mounted flushing lever arranged to be moved between lowered and raised positions; of a water-saving device comprising: a stem having a lower end attached to the outlet valve, and an upper end anchored to the lever so that the stem will unseat the outlet valve when the lever is raised; the flushing lever being substantially balanced about its pivot and the outlet valve having sufficient buoyancy to automatically maintain the stem and lever in their raised positions until the water level descends to a predetermined point during a flushing operation; and means actuated by the flushing lever and movable thereby for engaging with the operating rod of the float-operated valve for maintaining this valve in closed position until the flushing operation has been substantially completed and the outlet valve descends.

2. The combination with a flush tank having an inlet pipe for delivering water thereto, and an outlet fitting for discharge of water therefrom; an inlet valve connected to this pipe, and having an operating rod extending therefrom on which a float is secured for controlling inflow of water to the tank; a discharge valve arranged to seat upon and coacting with the outlet fitting to control outflow of water from the tank; and a pivotally-mounted flushing lever arranged to be moved between lowered and raised positions; of a water-saving device comprising: a stem having a lower end attached to the outlet valve, and an upper end anchored to the flushing lever so that the stem will unseat the outlet valve when this lever is raised; the flushing lever being substantially balanced about its pivot and the outlet valve having sufficient buoyancy to automatically maintain the stem and flushing lever in their raised positions until the water level descends to a predetermined point during a flushing operation; a pivotally-mounted float-control lever interconnected by a bar with the flushing lever to move up and down therewith and actuated thereby; and a bail fastened to the float-control lever to depend therefrom; the bail having a transverse bottom portion underlying the operating rod of the float valve; this bottom portion of the bail being spaced below the operating rod when both the valves are closed; the transverse bottom portion of the bail being movable into engagement with the operating rod of the float-controlled valve, when the flushing lever is raised to unseat the outlet valve, to retain the float-controlled valve closed until a flushing operation is substantially complete and the outlet valve approaches the outlet fitting.

3. The combination with a flush tank having an inlet pipe for delivering water thereto, and an outlet fitting for discharge of water therefrom; an inlet valve connected to this pipe, and having an operating rod extending therefrom on which a float is secured for controlling inflow of water to the tank; a discharge valve arranged to seat upon and coacting with the outlet fitting to control outflow of water from the tank; and a pivotally-mounted flushing lever arranged to be moved between lowered and raised positions; of a water-saving device comprising: a stem having a lower end attached to the outlet valve, and an upper end anchored to the flushing lever so that the stem will unseat the outlet valve when this lever is raised; the flushing lever being substantially balanced about its pivot and the outlet valve having sufficient buoyancy to automatically maintain the stem and flushing lever in their raised positions until the water level descends to a predetermined point during a flushing operation; a bracket mounted on the tank; a float-control lever swingably attached to this bracket; an L-shaped bar having one leg thereof secured to the flushing lever and its other leg connected to the float-control lever so that these levers will swing together; and a bail fastened to the float-control lever to depend therefrom; the bail having a transverse bottom portion underlying the operating rod of the float valve; this bottom portion

of the bail being spaced below the operating rod when both valves are closed; the transverse bottom portion of the bail being movable into engagement with the operating rod of the float-controlled valve, when the flushing lever is raised to unseat the outlet valve, to retain the float-controlled valve closed until the flushing operation is substantially complete and the outlet valve approaches the outlet fitting.

4. The combination with a flush tank having an outlet pipe for delivering water thereto, and an outlet fitting for discharge of water therefrom; the tank having a cover removably disposed on the top of its walls; an outlet valve connected to this pipe, and having an operating rod extending therefrom on which a float is secured for controlling inflow of water to the tank; a discharge valve arranged to seat upon and coacting with the outlet fitting to control outflow of water from the tank; and a pivotally-mounted flushing lever arranged to be moved between lowered and raised positions; of a water-saving device comprising: a stem having a lower end attached to the outlet valve, and an upper end anchored to the flushing lever so that the stem will unseat the outlet valve when this lever is raised; the flushing lever being substantially balanced about its pivot and the outlet valve having sufficient buoyancy to automatically maintain the stem and the flushing lever in their raised position until the water descends to a predetermined point during a flushing operation; a bracket having feet on

opposite ends thereof, which are removably interposed between tops of the walls of the tank and the cover; these feet being held in place by the cover; a float-control lever swingably attached to this bracket; a bar interconnecting the float-control lever with the flushing lever so that both levers will move up and down together; and a bail fastened to the float-control lever to depend therefrom; the bail having a transverse bottom portion underlying the operating rod of the float valve; this bottom portion of the bail being spaced below the operating rod when both the valves are closed; the transverse bottom portion of the bail being movable into engagement with the operating rod of the float-controlled valve, when the flushing lever is raised to unseat the outlet valve, to retain the float-controlled valve closed until a flushing operation is substantially complete and the outlet valve approaches the outlet fitting.

ATHOL E. BLAIR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
266,216	Sniffen	Oct. 17, 1882
1,134,234	Schonmeyer	Apr. 6, 1915
1,992,381	Lyons	Feb. 26, 1935
2,106,916	Morkisch	Feb. 1, 1938
2,158,750	Flaherty	May 16, 1939