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VALVE CLOSING MECHANISM FOR WATER CLOSETS

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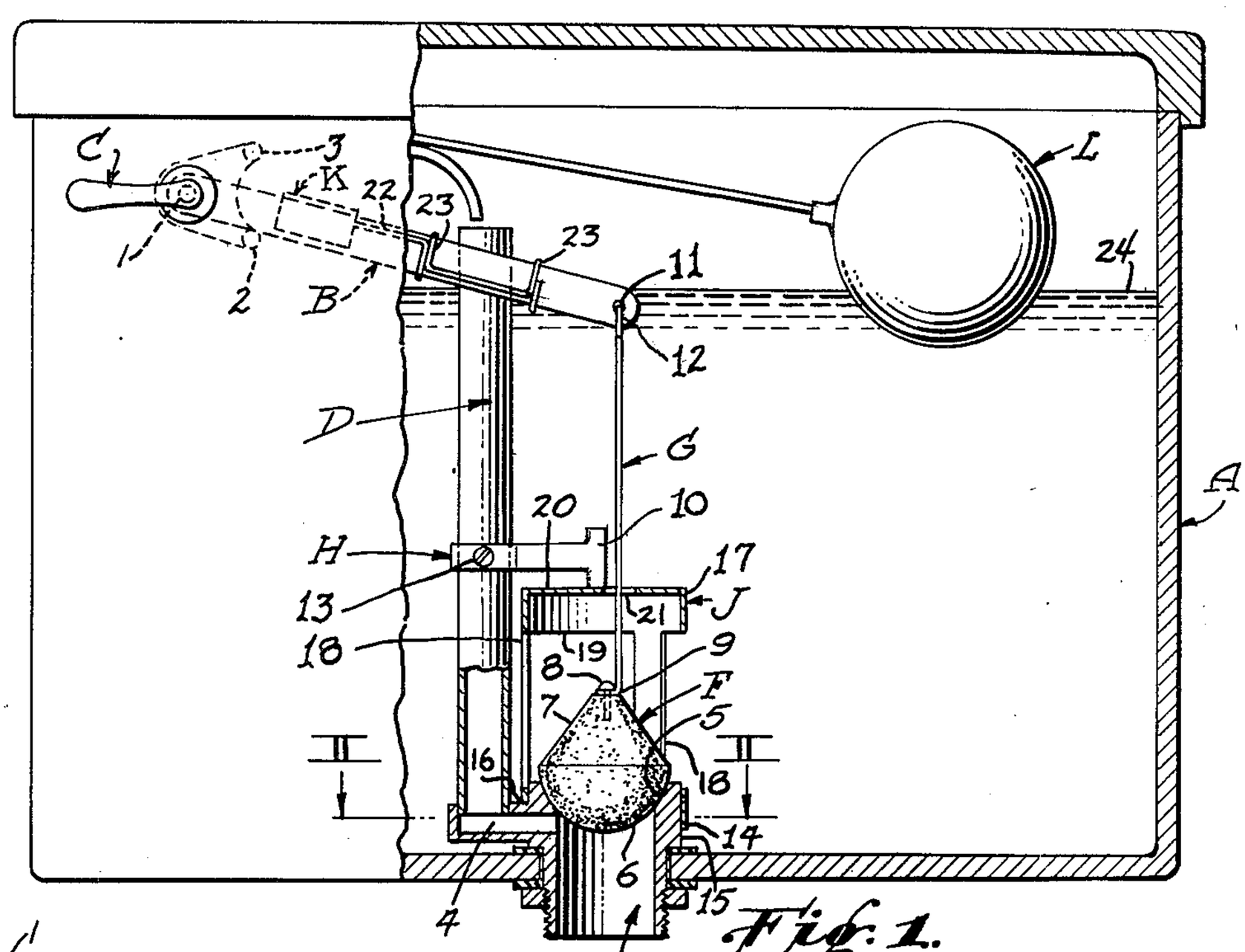

Fig. 1.

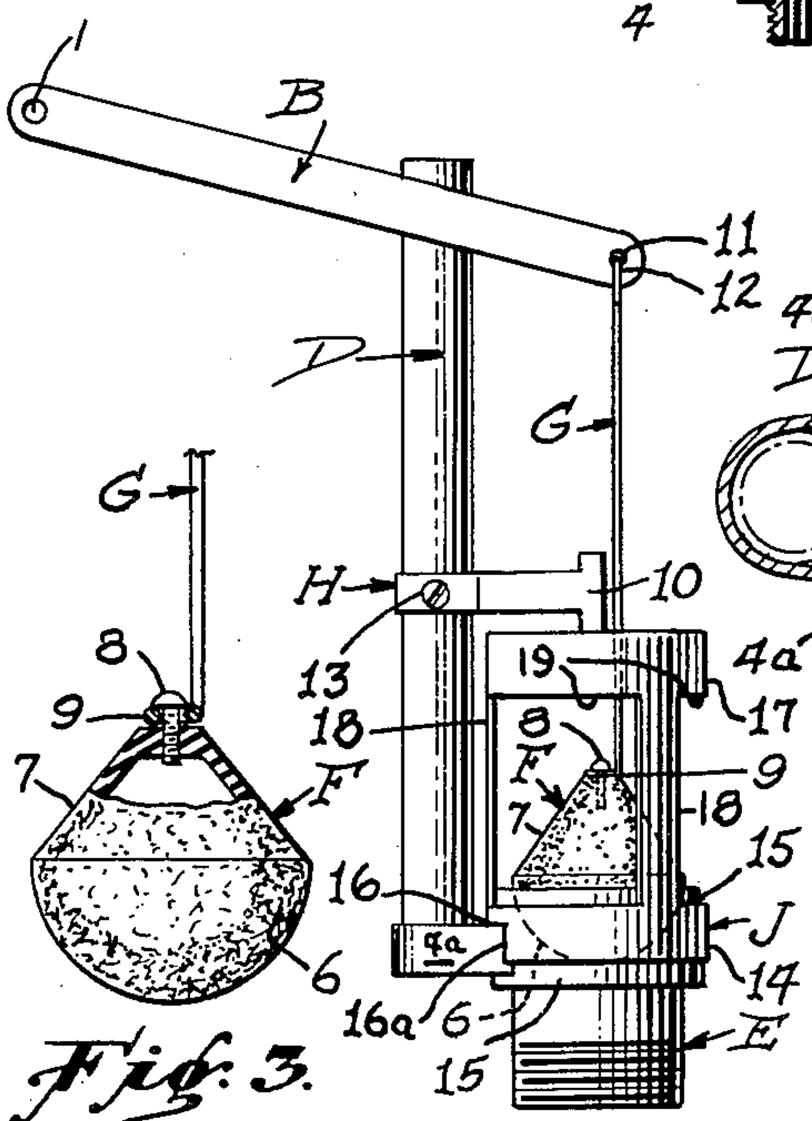

Fig. 3.

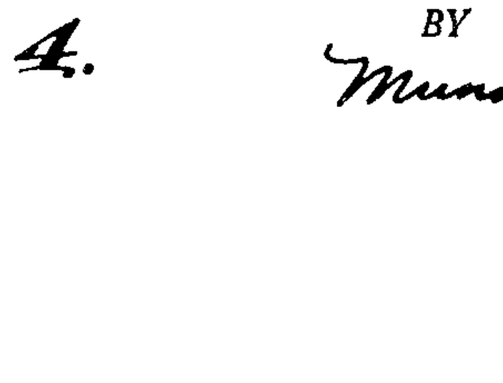

Fig. 2.

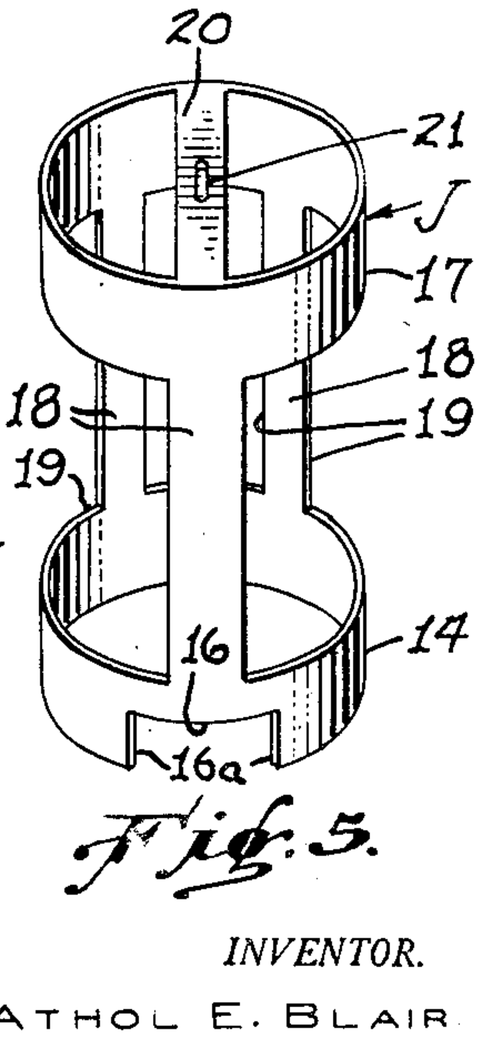

Fig. 5.

Fig 4.

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VALVE CLOSING MECHANISM FOR WATER CLOSETS

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2 Claims. (Cl. 4—57)

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An object of my invention is to provide a valve closing mechanism for water closets which may be applied to a standard water tank flushing mechanism without altering the construction of the latter. Briefly, the device comprises a cage or guide for the usual water tank flush valve and the cage can be mounted on the present water outlet valve structure and held in place by the standard guide arm which normally is used for guiding the stem that is connected to the actuating lever. The actuating lever for lifting the flush valve in my device is positively and pivotally connected to the upper end of the flush valve stem, and I provide an adjustable weight on the lever to exert the necessary downward force to move the flush valve into seating position with respect to the water outlet valve seat when a predetermined quantity of water has flowed from the tank. The flush valve has a substantially universal connection with the lower end of the flush valve lifting stem and this permits the valve to seat properly after each operation of the flushing mechanism. The cage or guide cooperates with the flush valve to keep the valve in alignment with the tank outlet opening during the movement of the valve so that a proper seating of the flush valve will take place at the end of the flushing operation.

Other objects and advantages will appear in the following specification, and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawing forming a part of this application, in which:

Figure 1 is a sectional view of my device shown operatively applied to a tank that has a standard tank flushing mechanism;

Figure 2 is an enlarged horizontal section taken along the line II—II of Figure 1;

Figure 3 is an enlarged detail of the flush valve and the stem for lifting the valve, the connection between the valve and the stem being such as to permit a substantially universal movement between the two parts;

Figure 4 is a side elevation of the case or guide for the flush valve and illustrates how the cage is secured in position to the valve seat; and

Figure 5 is an isometric view of the cage or flush valve guide when looking from the left hand side of Figures 1, 2 and 4.

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 appended claims without departing from the spirit and scope of the invention.

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In carrying out my invention, I make use of a toilet flush tank indicated generally at A in Figure 1. This tank is provided with the usual flushing mechanism, only a portion of which is illustrated. The flushing mechanism includes a flush valve lifting lever B which is connected to an operating handle C. The lever B when in normal position is inclined downwardly at an angle from its pivotal support 1 as illustrated in Figure 1 and the lever rests against a lower stop member 2 as shown. When the handle C is depressed for flushing the tank, the lever B is swung from its lowermost position into one where it will contact with a limiting upper stop 3. These parts are of standard construction and form no part of my invention, except in so far as they cooperate with the parts presently to be described.

A part of the standard tank-flushing mechanism includes an overflow pipe D which communicates by means of a passage 4 with the outlet pipe E for the tank. The outlet pipe has its entrance opening provided with a valve seat 5 that is designed to receive the lower spherical portion 6 of a flush valve F. The upper portion of the flush valve F is made conical and a screw 8 or other suitable fastening means is used for loosely connecting the flush valve to the valve lifting stem G. Figure 3 shows the lower end of the stem G provided with an eyelet 9 whose plane is horizontal and the opening in the eyelet is larger than the diameter of the screw shank 8. Figure 3 also shows a space between the top of the flush valve F and the under side of the eyelet. This construction provides a loose connection between the flush valve and the stem so that the flush valve will have a substantial universal connection with the stem.

The stem G is set to one side of the free end 10 of a standard guide arm H provided as a part of the flushing mechanism. The upper end of the stem is looped and extends through an enlarged opening 11 in the lever B. The loop 12 is large enough so as to provide a loose pivotal connection between the stem and the lever B. The guide arm H is secured in adjusted position on the overflow pipe D by a set screw 13, see Figure 1.

My invention not only comprises the novel manner of connecting the stem G to the flush valve F and to the lever B, but in addition I provide a valve cage or guide J clearly shown in Figures 1, 4 and 5 for guiding the flush valve F. Referring to Figure 5, it will be noted that the case J has a lower ring portion 14 that is designed to fit over the outer cylindrical surface 15 of the outlet pipe E. Figure 5 further shows

a portion of the ring 14 recessed at 16 so as to straddle the outer surface of the passage portion 4. Figure 2 illustrates the ring portion 14 being received on the cylindrical surface 15 of the outlet pipe E and further shows the sides 16*a* of the recess 16 engaging with the adjacent outer surfaces 4*a* of the passage 4. This construction prevents lateral movement of the ring 14 with respect to the pipe E and also prevents rotative movement between the cage J and the outlet pipe.

The cage is provided with an upper ring 17 and this ring is connected to the lower ring 14 by upstanding bars 18 that are spaced laterally from each other to provide windows or openings 19 in the cage. The purpose of the openings is to permit water to flow from the tank A through the openings 19 and into the outlet pipe E when the flush valve F is raised. The bars or guides 18 which define the windows will act as a guide for the flush valve to prevent undue lateral swinging of the valve on the stem G during the lifting of the valve and the subsequent seating thereof.

Again referring to Figure 5, it will be seen that the top of the cage J is provided with a diametrically extending strip 20 and this strip extends radially from the overflow pipe D when the case is placed in position on the outlet pipe E. The strip 20 has a slot 21 that extends from the center of the guide to the left in Figure 1 so as to permit ready lateral movement of the stem G as the stem is lifted and then moved downwardly during the flushing operation of the tank. The end 10 of the guide arm H is set to one side of the slot 21 as clearly shown in Figure 1. The guide arm H is moved down upon the strip 20 after the cage has been placed in proper position on the outlet pipe E and then the set screw 13 is tightened. In this simple way the cage is held in position without any need of extra fastening means other than that provided in the standard flushing mechanism for the tank A.

In the normal water closet flushing mechanism, the valve stem is rigidly secured to the flush valve and there is a sliding connection between the upper end of the valve stem and a guide stem that is carried by the free end of the lever B. This construction permits the flush valve to move upwardly during the initial flushing of the tank, the valve being buoyant enough to be supported by the water in the tank and the valve stem sliding in the eyelet provided in the guide stem. As the water in the tank flows out through the outlet pipe E, a point is reached where the suction on the flush valve created by the water passing into the pipe E, overcomes the buoyant tendency of the valve to float on the top of the water and at this moment the valve theoretically will be caused to move downwardly and seat so as to close the outlet pipe E.

All too frequently, the valve stem will become "hung up" in the eyelet of the guide stem (not shown). The friction resulting between the valve stem and the eyelet in the guide stem, will cause the flush valve to be held suspended in the highest position into which it has been lifted by the original upsurge of the flush valve due to the buoyancy of the water. As the water in the tank moves out through the outlet pipe, the "hung up" valve will remain in its highest position and the suction of the water as it passes out through the pipe will have no effect in drawing the flush valve into seating position to close the outlet pipe E because it will be too far removed from the valve. The only time the suction of the water will have any effect to seat the valve is when the valve stem will not become "hung up" and the flush valve will continue to float on top of the water in the tank and gradually be lowered as the tank water passes out through the outlet pipe E.

In order to overcome the above disadvantage, I provide a positive and yet a pivotal connection between the top of the stem G and the lever B so the flush valve will be urged downwardly. I then slidably mount a weight K on the lever B and secure the weight in place by means of a wire 22 looped around the lever, see Figure 1. The looped portions 23 of the wire 22 frictionally hold the weight K in the position into which it has been moved on the lever B. The weight can be moved toward or away from the pivot point 1 of the lever B. I have found that the weight on the lever B will create a sufficient downward force on the valve stem G to move the stem downwardly at the time the flushing operation is completed and the result will be a positive seating of the valve F on the seat 5 each time the water tank is flushed. The degree of downward force exerted by the lever B against the stem G can be controlled by sliding the weight K along the lever into the desired position.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood.

The device is secured to the flushing mechanism of the tank A in the manner already described. When the handle C is depressed, the lever B will be swung upwardly and will lift the stem G and the flush valve F. There is complete freedom of movement of the stem G in the slot 21 and there is a loose connection of the stem loop 12 with the larger opening 11 in the lever B. There is, therefore, no binding action as the lever B swings upwardly and causes the opening 11 to describe an arc whose center is the pivot 1. The vertical guides 18 of the cage J will permit the free upward movement of the flush valve and yet will prevent the valve from swinging too far in a lateral direction.

The weight K has been adjusted so that it will not interfere with the normal flushing of the tank. However, the pivotal connection 11 of the lever with the stem will prevent any upward movement of the stem after the lever strikes the upper stop 3. The flush valve F will remain near the top of the cage J until practically all of the water in the tank has been allowed to run out. The strip 20 will hold the flush valve in a position where it will be acted upon by the final suction of the water as it leaves the tank at the end of the flushing operation. The weight K will cooperate with the water suction to cause the valve to seat. The cage J will cooperate with the universal connection of the valve with the stem so that a proper seating will result each time the valve is operated. The float L, see Figure 1, controls the cutting off of the inflow of water after the outlet flush valve F closes and a sufficient quantity of water has entered the tank to raise the water level to the point indicated at 24 in Figure 1. The device is now ready for the next operation.

I claim:

1. In a device of the type described: the combination with a water outlet pipe for a flush tank and having a valve seat therein; an overflow pipe having a portion communicating with the outlet pipe at a point below the valve seat; and a guide

arm mounted on the overflow pipe; of a valve cage having a ring-shaped lower end fitting snugly on the outlet pipe adjacent to the valve seat and having a recess for receiving the communicating portion between the overflow pipe and the outlet pipe, the recess having two opposed walls for contacting with the adjacent outer surfaces of the communicating portion for positioning the cage properly on the outlet pipe and preventing any rotative movement therebetween; a buoyant flush-valve mounted in the cage and being free to reciprocate vertically in the cage; said cage having a top for limiting the upward movement of the flush-valve therein; a valve stem having a loose connection laterally and longitudinally of the stem permitting a substantially universal movement with the flush-valve; the top of said cage having a slot for slidably receiving the stem; the guide arm being secured in adjusted position on the overflow pipe, with the guide arm contacting with the top of the cage for holding it down upon the outlet pipe; and means for raising the stem for lifting the flush-valve off from the valve seat.

2. In a device of the type described: the combination with a water outlet pipe for a flush tank and having a valve seat therein; an overflow pipe having a portion communicating with the outlet pipe at a point below the valve seat; and a guide arm mounted on the overflow pipe; of a valve cage having a ring-shaped lower end fitting snugly on the outlet pipe adjacent to the valve seat and having a recess for receiving the

communicating portion between the overflow pipe and the outlet pipe, the recess having two opposed walls for contacting with the adjacent outer surfaces of the communicating portion for positioning the cage properly on the outlet pipe and preventing any rotative movement therebetween; a buoyant flush-valve mounted in the cage and being free to reciprocate vertically in the cage; a valve stem having a loose connecting laterally and longitudinally of the stem permitting a substantially universal movement; the guide arm being secured in adjusted position on the overflow pipe, with the guide arm contacting with the cage for holding it down upon the outlet pipe; and means for raising the stem for lifting the flush-valve off the valve seat.

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