W. Lake.

Canal Lock Gate.

No. 1,163. Patented Jan. 7, 1839.

Fig. 2.

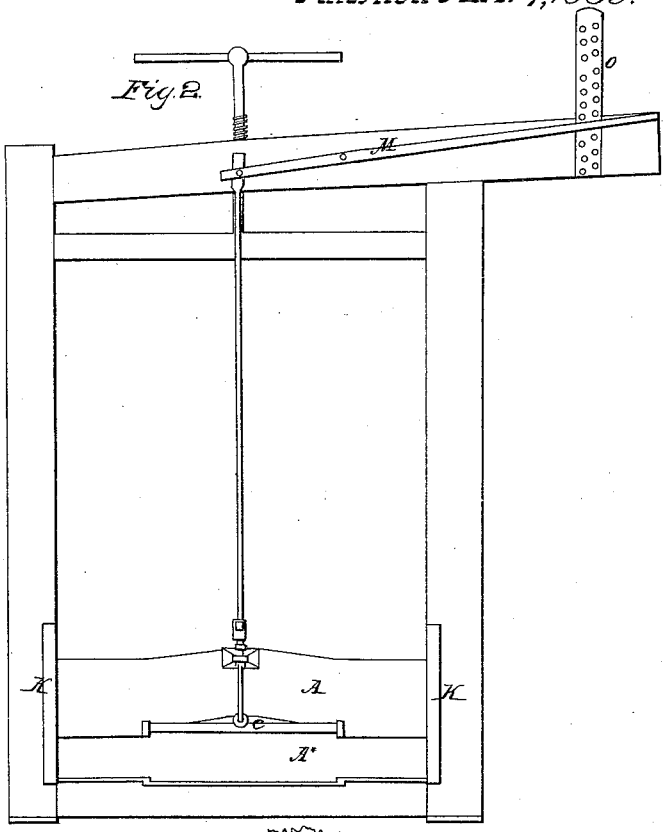
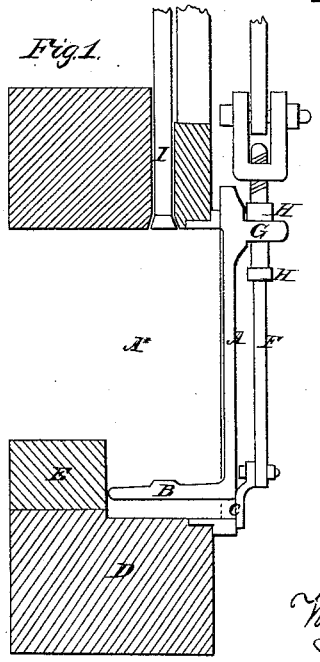


Fig. 1.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

WM. LAKE, OF RICHMOND, VIRGINIA.

SLIDING VALVE FOR CANAL-LOCKS, &c.

Specification of Letters Patent No. 1,163, dated June 7, 1839.

To all whom it may concern:

Be it known that I, WILLIAM LAKE, of the city of Richmond, in the county of Henrico, in the State of Virginia, civil engineer, have invented a new and useful improvement in sliding valves for canal and river locks and in the form of the apertures to which the said valves are applied, by means of which improvements the said valves are opened by the pressure of the water flowing through the apertures in filling and discharging the locks; and I hereby declare that the following is a full and exact description thereof.

The valves of locks are subject to a pressure the intensity of which is measured by the height of the head and the area of the valves, and this pressure on the common sliding valves for locks of ordinary lifts is of such magnitude and requires the application of so great a force to open them as greatly to detract from the superiority which they otherwise possess.

My improvement consists in giving such form to the valves and apertures that by the momentary application of a very small force in opening a small orifice I apply the hydrostatic pressure in such a manner as to open the valves.

Upon the back of the valves closing the aperture through which the water flows in filling and discharging the lock I attach a flange of the same length as that of the aperture, and of such a width as to have the same proportion to the width of the valve as the friction of the valve on its seat has to the pressure. At the lower edge of the valve below the flange, I make an orifice of about one inch in width and about half the length of the valve. This orifice I open and shut by means of a lever and connecting rod.

On the sill of the aperture along the outward edge of the flange I fix a stop of such height as the width of the valve may render necessary. This stop must be so placed that the flange may play up and down freely when the valve is moved in either direction, but so near the edge as to prevent the escape of any considerable quantity of water. The ends of the flange must, in like manner, be so fitted to the ends of the frame of the aperture as to play freely up and down with the valve without allowing the water to escape between them. When the valve is closed a space of about half an inch must be left between the sill of the aperture and the underside of the flange, and immediately opposite to the small orifice made in the under edge of the valve this space must be increased so that it shall not be less in height than the width of the said orifice.

In filling or discharging the lock the small valve above mentioned is opened, when the water rushes through the orifice and fills the space between the sill of the aperture and the under side of the flange and immediately presses upward with a force due to the height of the head and the area of the flange. This force continues of the same intensity till the underside of the flange rises to the top of the stop, but as soon as it gets beyond this point water escapes, and the upward pressure diminishes. The rate of this diminution is governed by the excess of area which the inside of the aperture has over that of the outside. If the inside area of the aperture be represented by A, that of the outside by a, and the height of the head by h, the pressure on the underside of the flange will be equal to the hydrostatic pressure under the head $\left(\frac{1-a^2}{A^2}\right)h$.

When the width of the flange is properly proportioned to the friction of the valve on its seat it will be found, from the above formula, that if the inside aperture, when the valve is fully open, is about two tenths greater than that of the outside the diminution of the upward pressure is nearly equal to the diminution of the friction of the valve on its seat. In order to work the small valve which admits the water under the flange very little machinery is necessary. A simple lever placed in any convenient position to which a rod is attached connected with the small valve is sufficient; and the same apparatus serves also to regulate the opening of the valve and to transmit any additional power that may be requisite should the valve and flange not be properly proportioned to each other. In order to effect this I make a projection on the valve through which I pass the rod for working the small valve, and upon this rod I attach two stops one of which is in immediate contact with the upper side of the projection when the small valve is closed, and the other at such a distance below as will allow the said small valve sufficient motion to uncover the orifice to which it is applied before it comes in contact with the underside of the said projection. When the lever before mentioned is

pressed down with sufficient force it raises this small valve till the lower stop comes in contact with the underside of the projection and the power then applied to the lever acts upon the large valve and endeavors to raise it. In a similar manner the power applied to the lever in a contrary direction is, by means of the upper stop attached to the rod, brought to act upon the valve so as to prevent its rising.

The weight of the valve may be counterbalanced by a weight attached to the lever.

The valves of locks are generally opened against a full head and closed when the water has the same level on both sides. When it is necessary to close them against a full head the application of a considerable force is required. This object I effect by means of a screw fixed in any convenient situation to be worked by a lever—a rod of wood or iron is connected with this screw which when circumstances require the valve to be closed before the water has attained the same level on each side, is caused to press upon the flange by means of the screw and lever and so to close the valve.

Figure 1 in the annexed drawing is a vertical section of the valve and aperture. A, is the valve. A* is the aperture. B is the flange at the back of the valve. C, is the small valve which closes the orifice at the lower edge of the valve A. D, is the sill of the aperture. E is the stop placed along the outward edge of the flange B. F is the rod by which the small valve is worked. G is a projection on the valve through which the rod F passes. H, H, are two stops fixed on the rod F, one above and the other below the projection G. I, is the rod which is caused to press upon the flange in order to close the valve when necessary under a full head.

Fig. 2 is an elevation showing the valve party open. A is the valve. A* is the aperture. C is the small valve which closes the orifice at the lower edge of the valve A. K, K, are guides which confine the valve A in its situation. L, L, are similar guides for the small valve C. M is the lever to which the rod F is attached. N is the screw which acts upon the rod I in Fig. 1. O is a guide for the lever M.

The valves may be constructed either of metal, or wood, or of a combination of these materials.

In the annexed drawing I have represented the valve as fixed in a lock gate; but I by no means intend to restrict myself in the application of my said improvements to valves placed in this particular situation. Neither do I claim as my invention the manner of applying the lever and screw exhibited in the drawing.

What I do claim as my invention and desire to secure by Letters Patent is—

The application of the hydrostatic pressure to open sliding valves for canal and river locks and making such improvements in the construction of the said valves and in the form of the apertures to which they are applied as will adapt them to the application of this pressure; as herein described.

WM. LAKE.

Witnesses:
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