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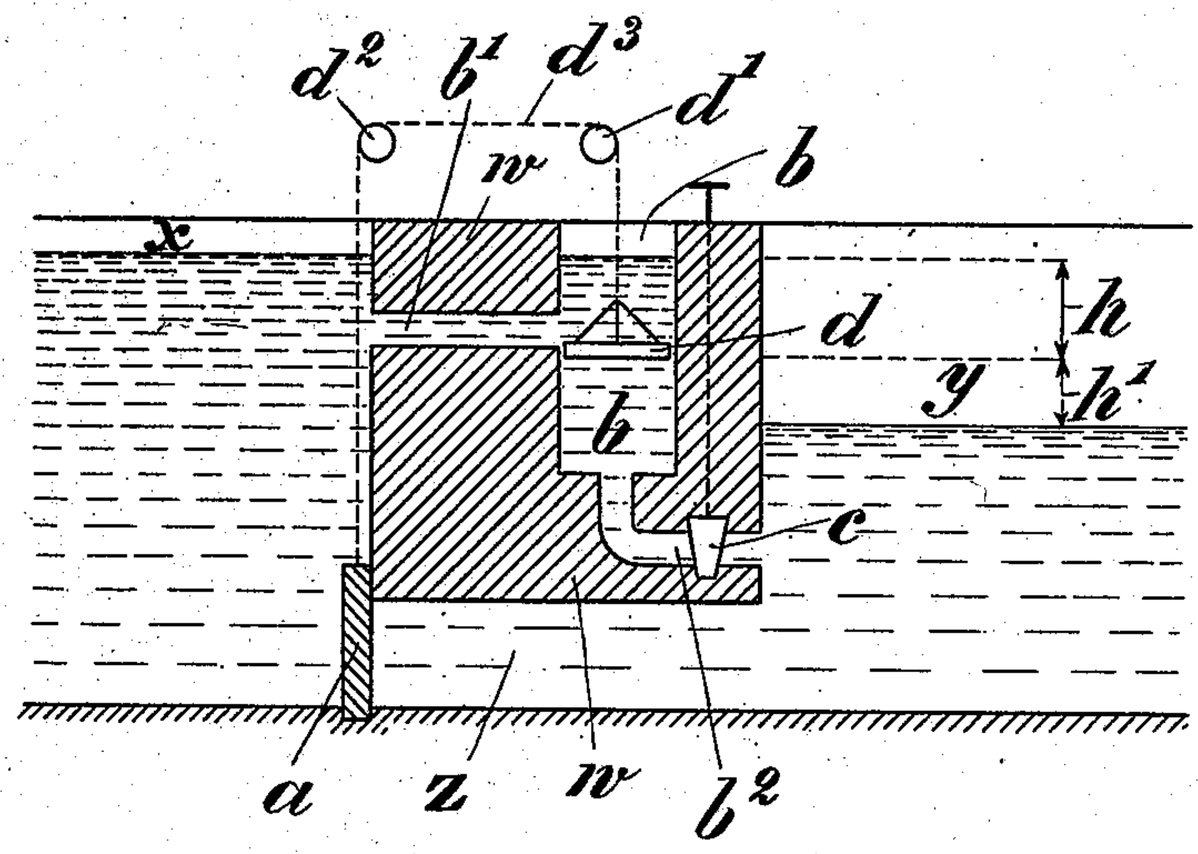
HYDRAULIC DEVICE FOR MOVABLE CLOSING ORGANS IN WATERWAYS WITH FALLS.

APPLICATION FILED MAY 25, 1908.

899,700. **Patented Sept. 29, 1908.**

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

Jesse N. Sutton.

B. B. Sommers

Inventor.

Johannes Christoffer Nyholm

by Henry Orth & Co Atty

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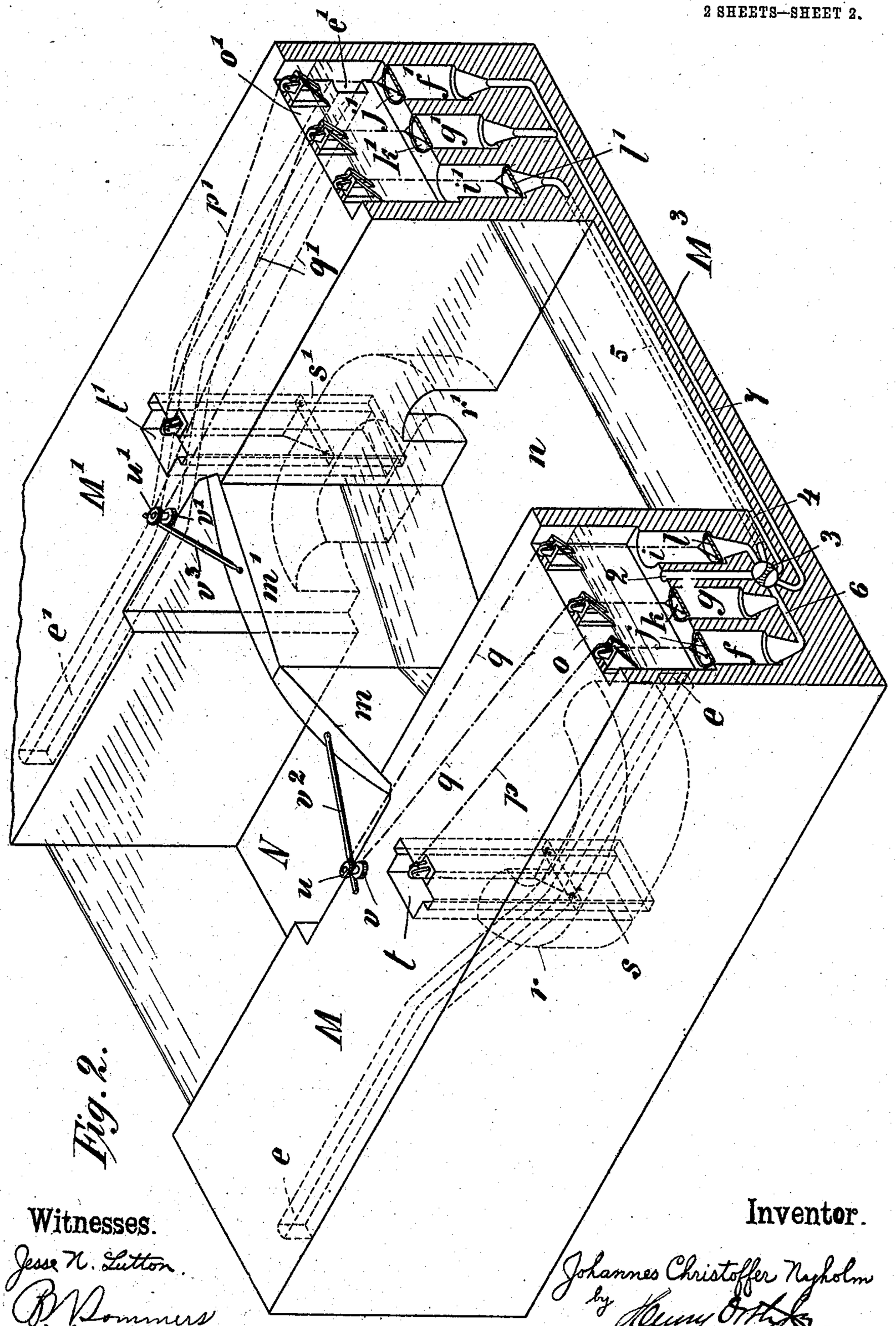

Fig. 2.

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UNITED STATES PATENT OFFICE.

JOHANNES CHRISTOFFER NYHOLM, OF BREMEN, GERMANY.

HYDRAULIC DEVICE FOR MOVABLE CLOSING ORGANS IN WATERWAYS WITH FALLS.

No. 899,700. Specification of Letters Patent. Patented Sept. 29, 1908.

Application filed May 25, 1908. Serial No. 434,981.

To all whom it may concern:

Be it known that I, JOHANNES CHRISTOFFER NYHOLM, a subject of the King of Denmark, and resident of Bremen, Germany, have invented certain new and useful Improvements in Hydraulic Devices for Movable Closing Organs in Waterways with Falls, of which the following is a specification.

This invention relates to improvements in hydraulic devices for operating movable closing organs (hatches, lock gates, weirs) in waterways with falls.

The invention consists in the new arrangement and combination of the various parts described hereinafter with reference to the drawings, in which

Figure 1 is a diagrammatical view of an hydraulic moving device in accordance with the invention for a hatch built in a waterway with a fall; and Fig. 2 is a perspective view, partly in section, of a tail-bay of a chamber lock, which is arranged according to the invention and embodies the same.

Similar letters of reference designate like parts in the figures.

Referring to the diagrammatical Fig. 1, x is a waterway with a high water level and y is one with a lower water level; both waterways are divided by a weir w, but can be connected with one another by opening a hatch a closing a connecting channel z, so that water can pass from x to y. Arranged at a suitable position on one of the banks of the waterway or in or on the weir itself is a shaft b, which is in connection with the upper water by a pipe or conduit b^1 and has an outflow conduit b^2 provided with a suitably actuated closing means c (valve, cock or the like), the outflow conduit discharging into the lower water or other suitable place. In the shaft b is a piston like plate d, the diameter of which is somewhat less than that of the shaft, that is to say, it does not fit the sides of the shaft closely. This plate or piston is connected with the hatch by a chain d^3 guided over rollers d^1 d^2.

If the valve c is opened the water flows out of the shaft b into the lower water y and the plate sinks correspondingly, whereby the gate is pulled up by the chain d^3 and the desired connection through the channel z is effected. As long as the closing member c (cock or valve) remains open, the plate d (which rests on the bottom of the shaft b when the gate is fully raised) holds up the hatch a. When it is desired to again close the hatch a it is only necessary to close the closing organ c. Thereupon the upper water passes under the plate d, so that the pressure is again balanced on either side of the plate. The hatch a then sinks down into the closed position owing to its weight and draws up the plate d. In the closed position, or position of rest, of the parts the plate d is, to a certain extent, kept floating by the upper water acting from above and below.

If the water column bearing on the plate d be h, that underneath the plate be h^1 and A be the atmospheric pressure then the pressure acting from above on the plate is $= A + h$, less $A - h^1$, hence the total pressure $= A + h - (A - h^1) = h + h^1$. As this equation stands for any height of the plate d the power active on the plate is always equal to the whole water column representing the fall, hence the tractive force exerted by the plate through the transmitting members connected therewith to the moving parts corresponds to the pressure of the whole of the water column (height of fall) at the beginning as well as at the conclusion of the fall of the plate d. The speed of the sinking plate d can be regulated at will by opening the closing organ c in the outflow b^2 to a greater or lesser extent.

It is immaterial at what height the pipe b^1 enters the shaft b, as the level of water in the shaft b always rises to the same height as the level of the upper water x. The base of the shaft may also be higher than the water level of the lower water y. The conduit b^2 might also discharge above the level of the lower water, in which case however the whole of the fall with respect to the pressure and lift would not be utilized.

The diameter or cross section of the shaft b, or the plate d must be such that the surface of the plate and the height of the fall produce a column of water the weight of which is equal to the load to be moved plus frictional resistance and so forth.

If a closing organ is to be moved in two directions alternately to and fro, instead of in one direction as shown in Fig. 1, then of course two shafts must be provided in which the plunger plates or pistons work in opposite directions and act in opposite directions by means of suitable transmission gear on the closing organ to be moved. Such an arrangement is shown in Fig. 2 which represents the tail-bay of a chamber lock as above mentioned.

The opening in the tail-bay through which the traffic passes from the upper waterway, that is to say the chamber lock N, into the lower waterway or aft part n, or inversely, is closed in the usual manner for example by two gates m m^1. Built in the side walls M, M^1 of the tail-bay are circulating channels r r^1 which allow the water to pass around the gates m m^1 when the hatches s s^1 are drawn up. The latter are located in suitable wells t t^1. In each side wall M M^1 there is a chamber o o^1 which are connected with the upper water by channels e e^1, so that the water in these chambers is always at the same level as the upper water in front of the head-bay not shown. Passing down from the bottom of each chamber o o^1 are three shafts f, g, i, f^1, g^1, i^1 in which are pistons j, k, l, j^1, k^1, l^1. The pistons j, j^1 are connected by suitably guided chains p, p^1 with the hatches s, s^1, while the pistons k, l, k^1, l^1 are connected by chains q, q^1 to chain-wheels u, u^1, the rotation of which by means of toothed wheels or pinions v, v^1 is transmitted in the form of a pushing or tractive movement to the racks v^2, v^3 linked to the gates m, m^1.

A pipe 2 is arranged on one side between the shafts g and i and leads to a four-way cock 3 built in a discharge pipe 4 passing to the lower water. The shaft i is in direct connection with the four-way cock and the shaft i^1 is connected with the latter by a pipe 5 built in the base M^3 of the bay, the shafts f, g are likewise connected by a pipe 6 to the four-way cock and the shafts f^1, g^1 connected to the latter by a pipe 7 passing across the base of the bay.

Supposing a boat wishes to pass from out the lock chamber filled up to the level of the upper water into lower waterway, then the four-way cock 3, which can be operated from the top of the wall M by suitable means, not shown, is turned into the position shown in Fig. 2, whereby the hatch operating shafts f, f^1 and the gate opening shafts g, g^1 are connected with the lower water in the aft part n and the water underneath the pistons j, k, j^1, k^1, runs away. These four pistons thus only receive pressure from above, while the pistons l, l^1, are subjected to pressure from above and below because their shafts i, i^1 remain connected from below with the upper water in the chamber o by the pipe 2, the four-way cock 3 and the pipe 5. As however, the gates m, m^1 are kept closed by great pressure resulting from the head of water within the lock chamber only the pistons j, j^1 sink and the hatches s, s^1 rise, the pistons k, k^1, however, remain for the present at rest, because their surfaces are not sufficiently large to produce enough pressure or tractive force to open the lock gates. The water level in the chamber N is now falling according to the passing of the upper water through the opened channels r, r^1, and as soon as a sufficiently small difference in the level of the water in front and aft the gates is attained the pressure or the under pressure respectively on the pistons k, k^1 becomes sufficiently high, so that they also sink down and by pushing the racks v^2, v^3 with the aid of the chains q, q^1, chain wheels u, u^1 and pinions v, v^1 swing out or open the lock gates m, m^1. When the pistons k, k^1 go down the pistons l, l^1 go up into their upper end position. If the lock gates m m^1 of the tail-bay are to be closed again after the vessel has passed out from the chamber N emptied to the level of the lower water, then the four-way cock 3 is turned through an arc of 90° so that the pipe 2 passes upper water out of the chamber o through the pipes 6 and 7 into the shafts f, g, f^1, g^1 whose pistons j, k, j^1, k^1 are thereby raised, while the pistons l, l^1 simultaneously sink owing to the cock 3 connecting up the pipe 4 with the shafts i, i^1. This transposition of the pistons and the movement of the chains p, p^1 and q, q^1 in the opposite direction resulting therefrom, causes the hatches s, s^1 and the gates m, m^1 to shut. The pistons in the shafts with the shorter inlet or outlet pipes would, it is true, move faster than the pistons to which the water is passed or led away by longer pipes. This can be prevented or balanced by keeping the shorter pipes and the longer ones apart up to the cock 3, by giving the shorter pipes a smaller cross section or by providing them with throttle valves actuated by pedals or the like, not shown.

I claim:

1. In a hydraulic moving device for operating organs in water-ways, the combination with a connecting channel between two levels and an organ controlling and closing the same; of a shaft communicating with the higher level and having a discharge at a lower level a valve to control the discharge a piston loosely fitting the shaft and means to operatively connect the organ and piston, whereby upon opening said valve the water contained in said shaft by the combined pressure of the water on the piston and the suction beneath the same will move the piston to open the organ.

2. In a hydraulic moving device for operating organs of water ways, the combination with a connecting channel between two levels and an element to control and close the same; of a shaft communicating with the higher level and having a discharge at lower level, a valve to control the discharge, a submerged piston loosely fitting the shaft and means to operatively connect the organ and piston.

3. The combination with a connecting channel between two water-ways of different level and an element to open and close the same; of a shaft having a communication above its bottom with the upper level and a discharge at the lower waterway beneath the

surface of the water thereof, a valve controlling said discharge, a piston loosely fitting the shaft and operatively connected to said element to open the same when the valve is opened.

4. The combination with a connecting channel between different water levels and an element to open and close the same; of a shaft having a communication with the upper water level and a discharge beneath the surface of the water of the lower level, a water passage between the discharge end of the shaft and its upper end, and a valve controlling the discharge to divert the water in the shaft to the lower level or to connect the discharge end and water passage.

5. The combination with a connecting channel between different water levels and a plurality of water gates, one of said gates controlling said channel; of a plurality of shafts each communicating at its upper end with the water at the higher level and at its lower end beneath the normal water surface at the lower level, a piston loosely fitting in each shaft, said pistons operatively connected to the gates, and a single valve controlling the discharge of all of the shafts to operate their pistons.

6. In a lock between different water levels, lock gates therefor, a channel in each side wall of the lock forming a connection between the high and low water on opposite sides of the gates, a gate to control each of said channels, a plurality of shafts at each side of the lock, means to supply water from the higher level to said shafts, a discharge pipe at the bottom of each shaft, pistons in each shaft operatively connected to the gates, and a single valve to control the discharge of water from all of the discharge pipes, substantially as described.

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