

No. 647,543.

W. W. VENABLE.  
MOVABLE DAM.

Patented Apr. 17, 1900.

(Application filed June 29, 1899.)

(No Model.)

2 Sheets—Sheet 1.

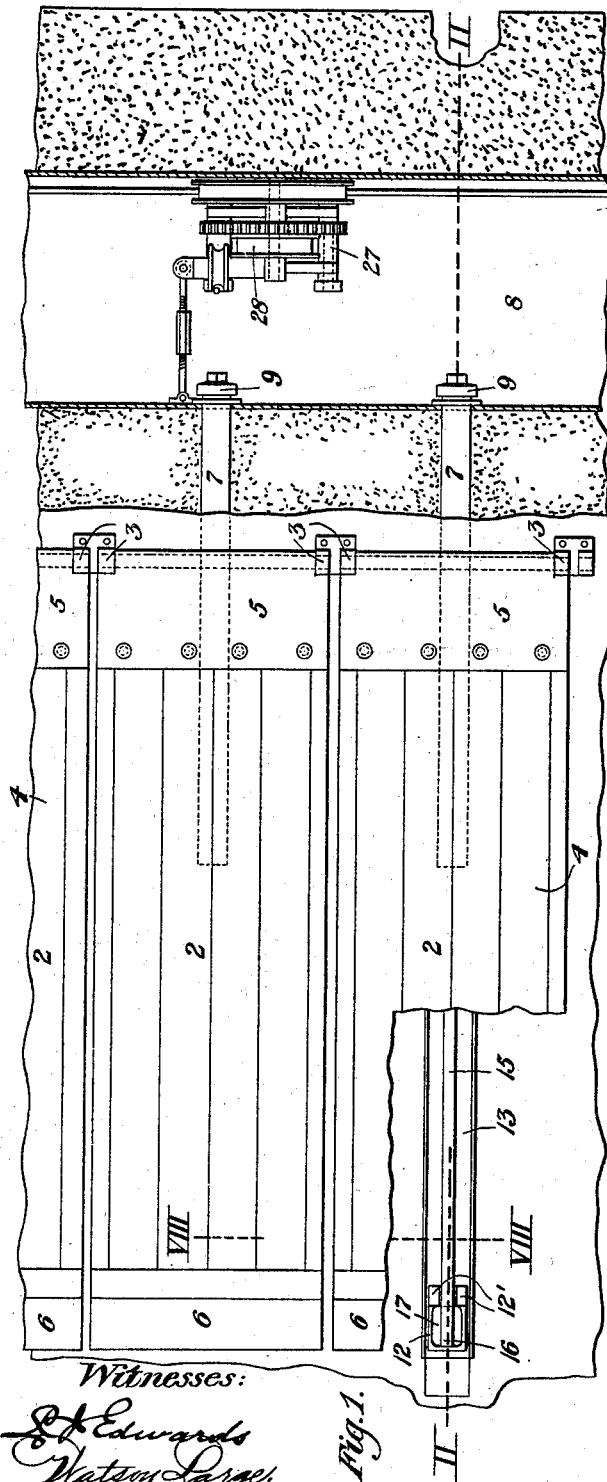


Fig. 1.

Witnesses:

*J. Edwards*  
*Watson Large*

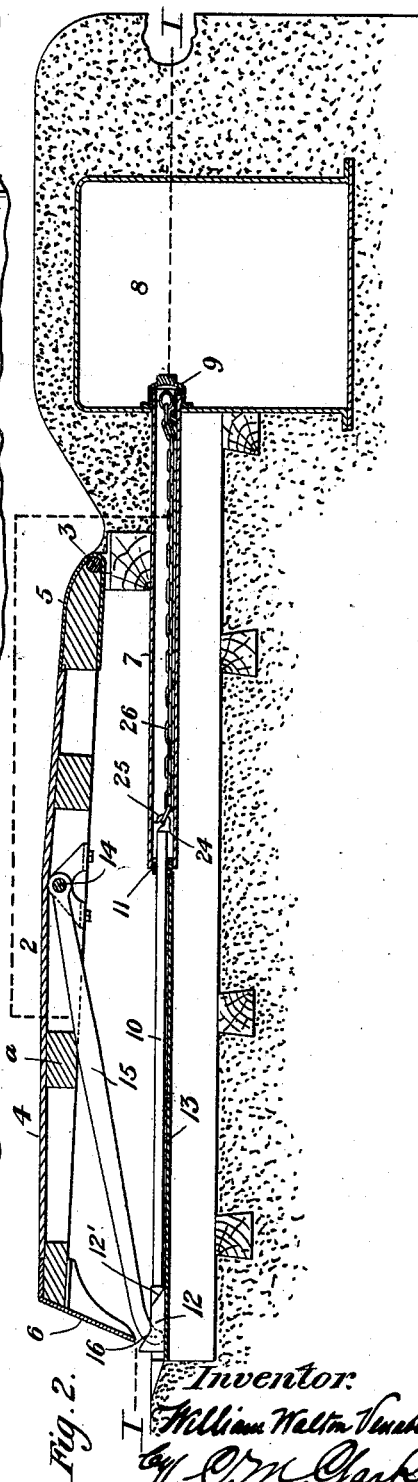


Fig. 2.

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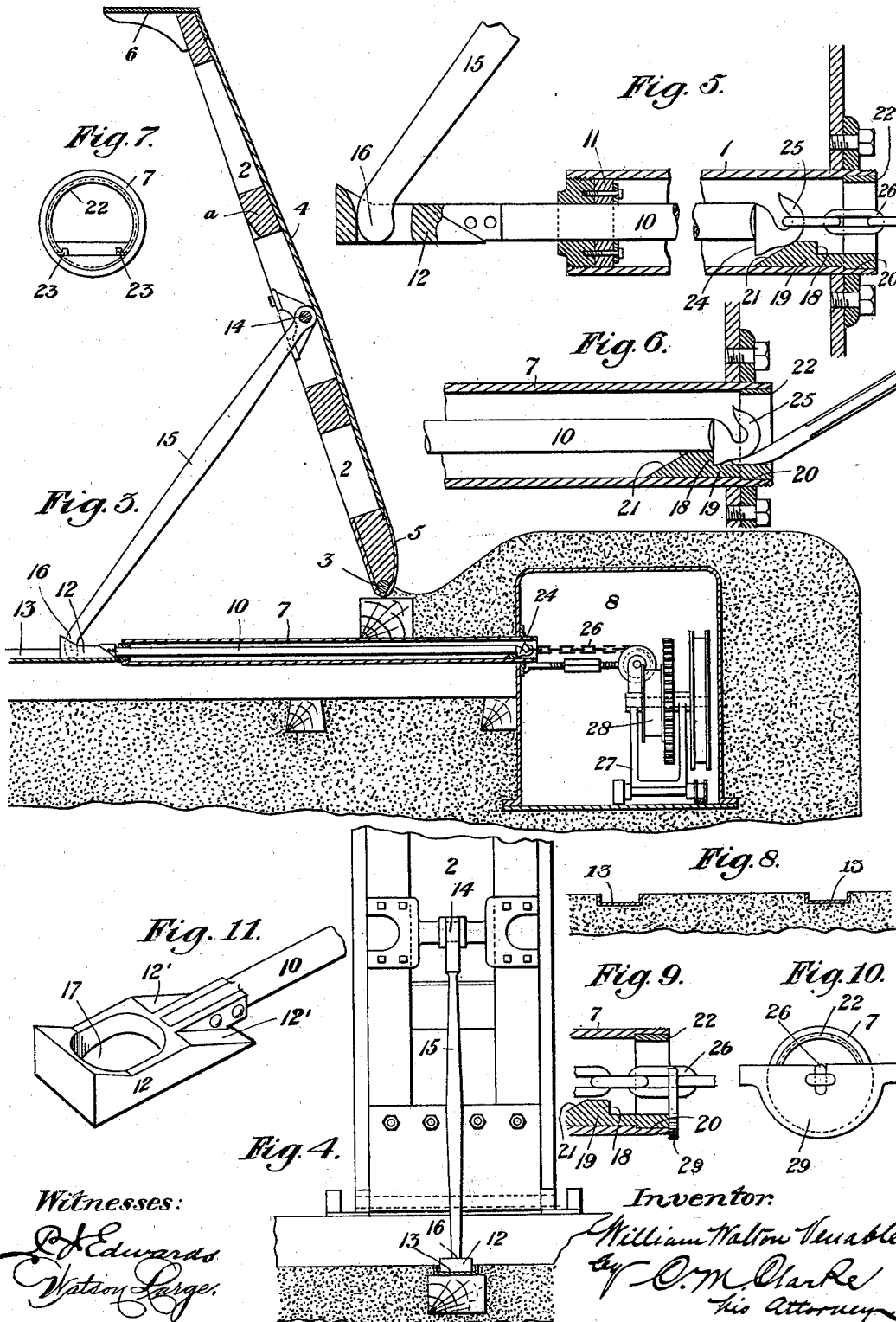
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# UNITED STATES PATENT OFFICE.

WILLIAM WALTON VENABLE, OF CHARLESTON, WEST VIRGINIA.

## MOVABLE DAM.

SPECIFICATION forming part of Letters Patent No. 647,543, dated April 17, 1900.

Application filed June 29, 1899. Serial No. 722,279. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM WALTON VENABLE, a citizen of the United States, residing at Charleston, in the county of Kanawha and State of West Virginia, have invented or discovered a new and useful Improvement in Movable Dams, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of a portion of the dam partially broken away and shown in section, as indicated by the line I I of Fig. 2. Fig. 2 is a vertical longitudinal section transverse of the dam, taken on the line II II of Fig. 1. Fig. 3 is a view similar to Fig. 2, showing the shutter erected. Fig. 4 is a partial view of the back of one of the shutters erected. Fig. 5 is a detail view, on an enlarged scale, of one of the cylinders and the raising-rod partly broken away. Fig. 6 is a similar view illustrating the manner of dislodging the front end of the rod to release the shutter. Fig. 7 is a face view of the front end of one of the cylinders, showing the cap removed. Fig. 8 is a cross-sectional view through two of the shoe-slides indicated by the line VIII VIII of Fig. 1. Figs. 9 and 10 are detail views illustrating the application of a chain-stop to hold the shutter at any position. Fig. 11 is a perspective detail view of one of the sliding shoes.

My invention relates to the class of movable dams wherein the dam is composed of a continuous series of adjustable wickets adapted to be raised and lowered across the bed of the stream; and it consists in the novel features of construction, as shown in the drawings and as hereinafter more fully set forth in the specification. In the general class of dams of this character as at present constructed the wickets are either hinged at one end or at an intermediate point and are raised to an erected position by means of a lifting power applied from some point outside of and independent of the dam structure proper. This has previously involved the use of separate trestlework or floating platforms, from which raising power was applied through suitable connections, entailing extensive structural construction and involving considerable expense while rendering the operation

of the dam dangerous, complicated, and laborious.

My invention has for its object the construction of a dam which will obviate these difficulties; and to this end I have employed a tunnel located beneath the bed of the stream immediately above the sill of the dam, from which tunnel the power is applied to each section of the dam, and I shall now proceed to describe its construction and operation in detail.

Referring now to the drawings, 2 represents one of the movable sections of the dam, technically known as a "shutter," which is pivoted at its bottom in bearings 3, located in alinement across the bed of the stream upon suitable foundation-sills 3'. These shutters are preferably formed of timber sheathed over their upper face 4 and have reinforcing metal protecting-plates 5 at the parts subjected to the greatest wear from attrition. Their outer extremities terminate in a shelf 6 of the full width of the shutter, arranged at such an angle to its face that when erected, as shown in Fig. 3, a continuous series of such shelves will extend along the top of the shutters and form a continuous walkway. Immediately underneath the longitudinal center of each shutter is located a casing or cylinder 7, mounted on suitable foundation-bearings and extending into a water-tight tunnel 8 of any preferred or suitable construction, the inner end of the cylinder being closed by a cap 9, secured in place by screw-threads or otherwise. Within this tube is located an operating-rod 10, having a substantially water-tight bearing in the outer end of the cylinder by means of rubber packing 11, and upon the outer end of the rod is secured a hollow sliding shoe 12, which rests upon the bottom of a trough or slideway 13 longitudinal with the cylinder 7. The inner end of this shoe is provided with downwardly-slanting faces 12' at each side for the full width of the trough 13, terminating in edges which bear upon the bottom of the trough and act in the manner of a plow to clear the trough of debris, &c., in its travel therethrough, providing a clean bearing-surface for the lower end of the prop.

Pivottally secured to the under side of the shutter at or about its middle portion in a bearing 14 is the upper end of a supporting-

prop 15, the lower end of which is rounded in the form of a knob 16 and rests upon the bottom of the trough 13.

The sliding shoe 12 is provided with a vertical opening 17 of sufficient size to admit of the passage of the knob 16 at whatever position the pitman may assume, while the weight of the shutter is always borne by the pitman in either the erected or depressed position, as shown by Figs. 3 and 2 of the drawings.

As shown in Fig. 2, the shutter when depressed is supported entirely upon the prop through the agency of one of the timbers  $\alpha$  of the shutter intermediate of the bearing 14 and the outer end of the shutter, such timber bearing upon the prop between its bearing 14 and end 16, the prop acting in the manner of a bridge. By thus supporting the shutter all strain is relieved from its outer end, and the walkway is thus protected from injury, and I also avoid the necessity of using cushion-blocks on the floor of the dam, permitting a better circulation under the shutter and lessening the danger from drift when the dam is erected.

As the sliding shoe 12 surrounds the lower end of the pitman, it will be seen that when its position is changed the pitman will also change correspondingly and that when the rod is drawn forwardly in the tube 7 the pitman will also be drawn forward, forcing the shutter upwardly into an erected position, and, vice versa, when the rod is released the weight of the shutter and the force of the current will carry it down to the depressed position, the knob 16 of the pitman always being in engagement with the back end of the shoe. At the forward end of the tube is provided a shoulder 18, formed in a holding-piece 19, having a retaining-shoulder 20, which engages a corresponding recess in the cylinder and an inclined face 21, and the piece 19 is held in position by a ring 22 and wedges 23, which firmly prevent its removal.

The forward end of the rod 10 is provided with an under hook 24, which engages the shoulder 18 and firmly retains the rod and shoe in position against the pressure of the pitman when the shutter is erected, and this end of the rod also terminates in a hook 25, to which is attached one end of a chain 26, by which the rod is drawn forward through the tube. This chain is of such a length that when the rod is extended it will lie within the tube and be inclosed therein by the cap 9, and when the rod is drawn out and hooked in position to sustain the shutter in erected position the chain may be removed and the cap replaced, so as to prevent the escape of any water that may leak past the packing 11 into the interior of the tube. These chains and the rods may be drawn forwardly by any suitable power device located within the tunnel, and I have illustrated a convenient apparatus, consisting of a carriage 27, mounted on wheels and adapted to travel throughout the length of the tunnel. This carriage is

provided with a winding-drum 28, upon which the chain 26 may be wound, the drum being driven through suitable gearing by an endless rope or cable passing through the tunnel and adapted to transmit power from an engine located in a power-house on shore.

When it is desired to arrest the shutter at any position intermediate between its raised and lowered positions, I employ a chain-stop 29, consisting of a plate provided with a slot 30, adapted to engage any link of the chain and to hold it against outward travel, the plate bearing against the end of the tube. This chain-stop is preferably applied from below in order to more easily permit of its quick removal by striking it downward.

The advantages of my invention will be appreciated by those skilled in the art. The features of the walkway, the raising-prop and its bearing, and the manner in which the shutter is supported thereon when depressed, the sliding shoe, the means for operating these parts, and the working tunnel are all valuable features and new in this art.

The entire dam may be very quickly and safely raised or lowered, and its simplicity of construction is such as to permit of its erection, maintenance, and operation at a minimum cost.

What I claim is—

1. In a dam of the class described, a pivotally-mounted shutter, a prop pivotally secured to the shutter between its pivotal base and the top adapted to support the shutter in an erect position and to form a bridge-support for the shutter when depressed.

2. A pivotally-mounted shutter provided with a prop, and a movable hollow sliding shoe in engagement with the lower end of the prop.

3. A pivotally-mounted shutter provided with a prop, a movable hollow sliding shoe in engagement with the lower end of the prop, and means for operating the shoe.

4. A pivotally-mounted shutter provided with a supporting-prop, a movable hollow sliding shoe in engagement with the lower end of the prop, an operating-rod secured to the shoe, a casing for the rod, and means for applying power to draw the rod through the casing.

5. A pivotally-mounted shutter provided with a supporting-prop, a movable shoe in engagement with the lower end of the prop, a slideway for the shoe, an operating-rod secured to the shoe and provided with a retaining-hook, a casing for the rod, a chain attached to the rod, and an abutment for engagement with the retaining-hook.

6. In combination with a pivotally-mounted shutter provided with a supporting-prop, a movable shoe in engagement with the lower end of the prop, an operating-rod, a casing, and a tension-chain; a chain-stop adapted to be attached to the chain and to bear against the end of the casing.

7. In a movable dam, in combination with

a series of pivotally-mounted shutters and means for operating the shutters; an operating-tunnel located upstream from the shutter-bearings, and means for transmitting power therefrom to the shutter-operating devices independently.

8. The combination of a series of pivotally-mounted shutters provided with supporting-props, hollow sliding shoes in separable engagement with the props and mounted in slideways, operating-rods secured to the shoes and mounted in casings, an operating-tunnel communicating with the rods and casings, and means within the tunnel for transmitting raising power to the props.

9. A pivotally-mounted shutter provided with a prop, and a movable shoe mounted in a slideway and provided with an opening for engagement of the lower end of the prop.

10. A pivotally-mounted shutter provided with a prop and a movable shoe provided with a cleaning extremity mounted in a slideway and having an opening for engagement of the lower end of the prop.

11. In a movable dam the combination of a series of shutters hinged at the bottom and provided with supporting-props, movable shoes in engagement with the lower ends of the props, slideways for the shoes, operating-rods secured to the shoes, rod-casings, flexible connecting devices attached to the rod, and means for transmitting motion through such connecting devices, rods, shoes and props to raise the shutters.

12. In a movable dam, the combination of a series of hinged shutters provided with walkway extensions and supporting-props, movable shoes in engagement with the lower ends of the props, slideways for the shoes, operating-rods secured to the shoes, rod-casings, flexible connecting devices attached to the rods, and means for transmitting motion through such connecting devices, rods, shoes and props to raise the shutters.

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13. In a movable dam, the combination of a series of shutters hinged at the bottom and provided with supporting-props, movable shoes in engagement with the lower ends of the props, slideways for the shoes, operating-rods secured to the shoes, rod-casings, flexible connecting devices attached to the rods, a submarine tunnel transversely located upstream from the shutters in communication with the rod-casings, and power-transmitting mechanism located in the tunnel.

14. In a movable dam, the combination of a series of shutters hinged at the bottom and provided with supporting-props, movable shoes in engagement with the lower ends of the props, slideways for the shoes, operating-rods secured to the shoes and provided with means for retaining the rod, rod-casings, connecting devices attached to the rods, a submarine tunnel transversely located upstream from the shutters in communication with the rod-casings, and movable power-transmitting mechanism located in the tunnel.

In testimony whereof I have hereunto set my hand.

WILLIAM WALTON VENABLE.

Witnesses:

PETER J. EDWARDS,  
C. M. CLARKE.