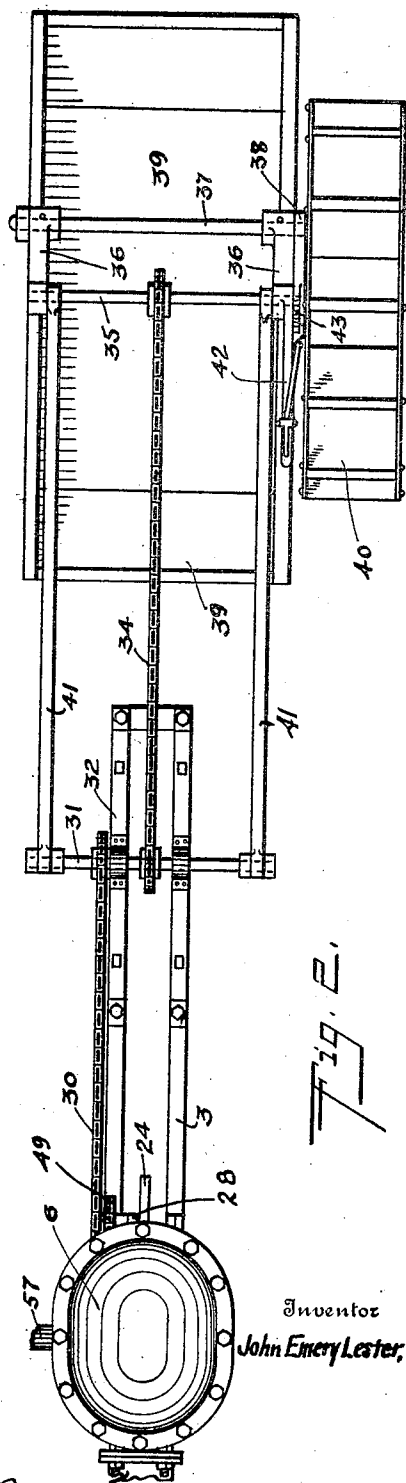
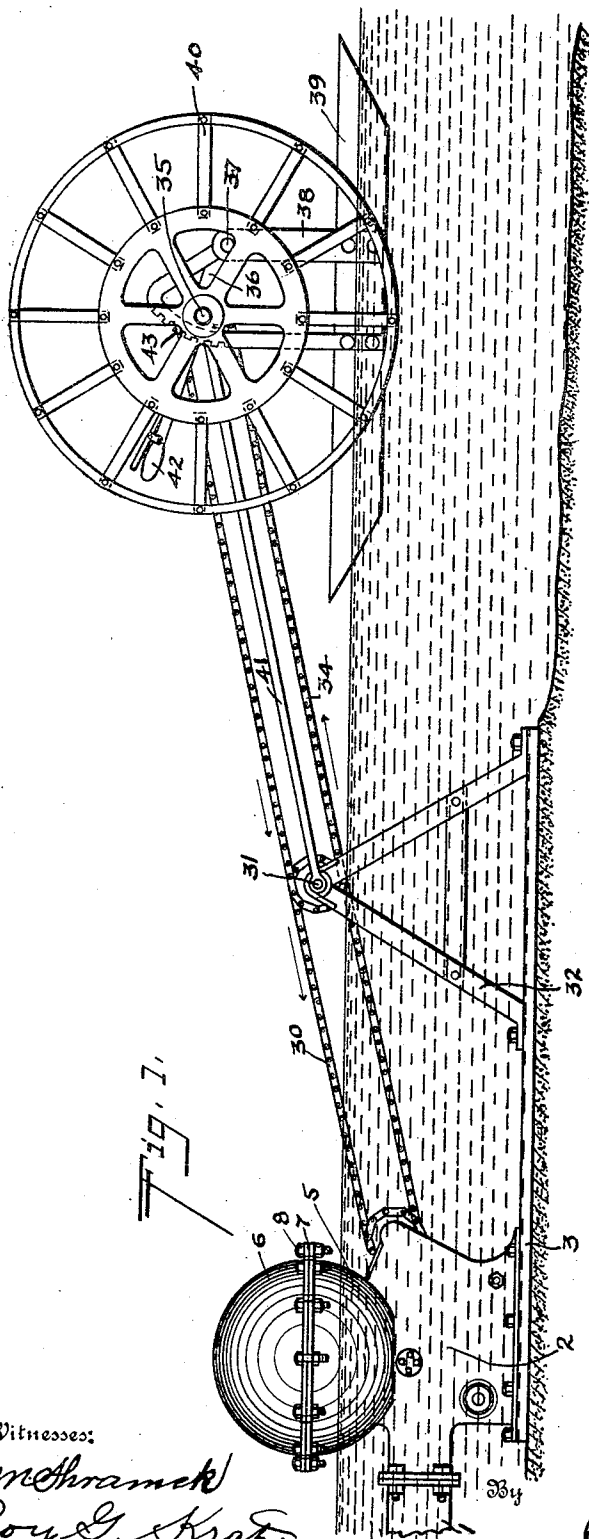


J. E. LESTER.
HYDRAULIC RAM.
APPLICATION FILED MAY 13, 1908.

946,607.

Patented Jan. 18, 1910.

3 SHEETS—SHEET 1.



Witnesses:
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Roy G. Kraz

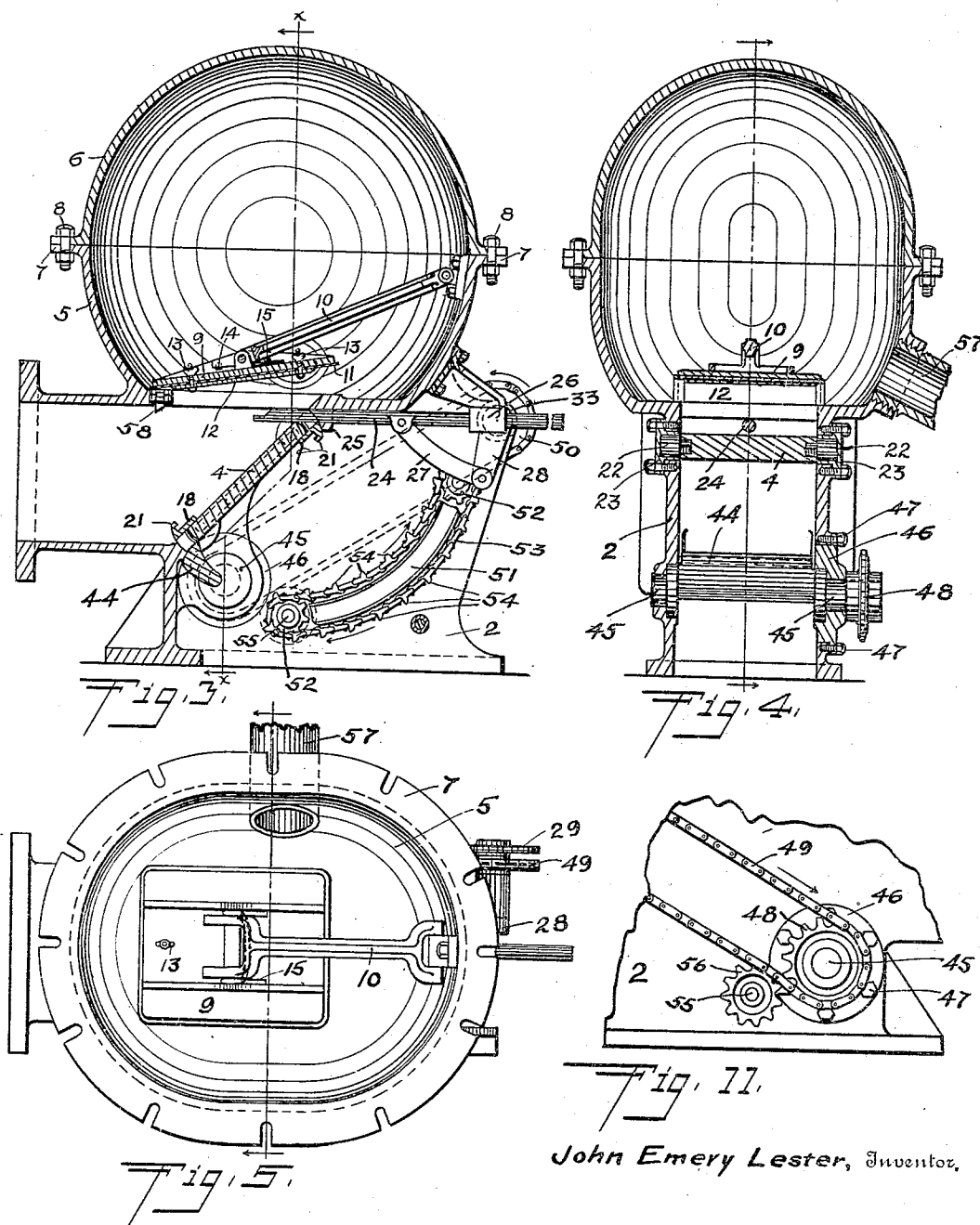
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3 SHEETS—SHEET 2.



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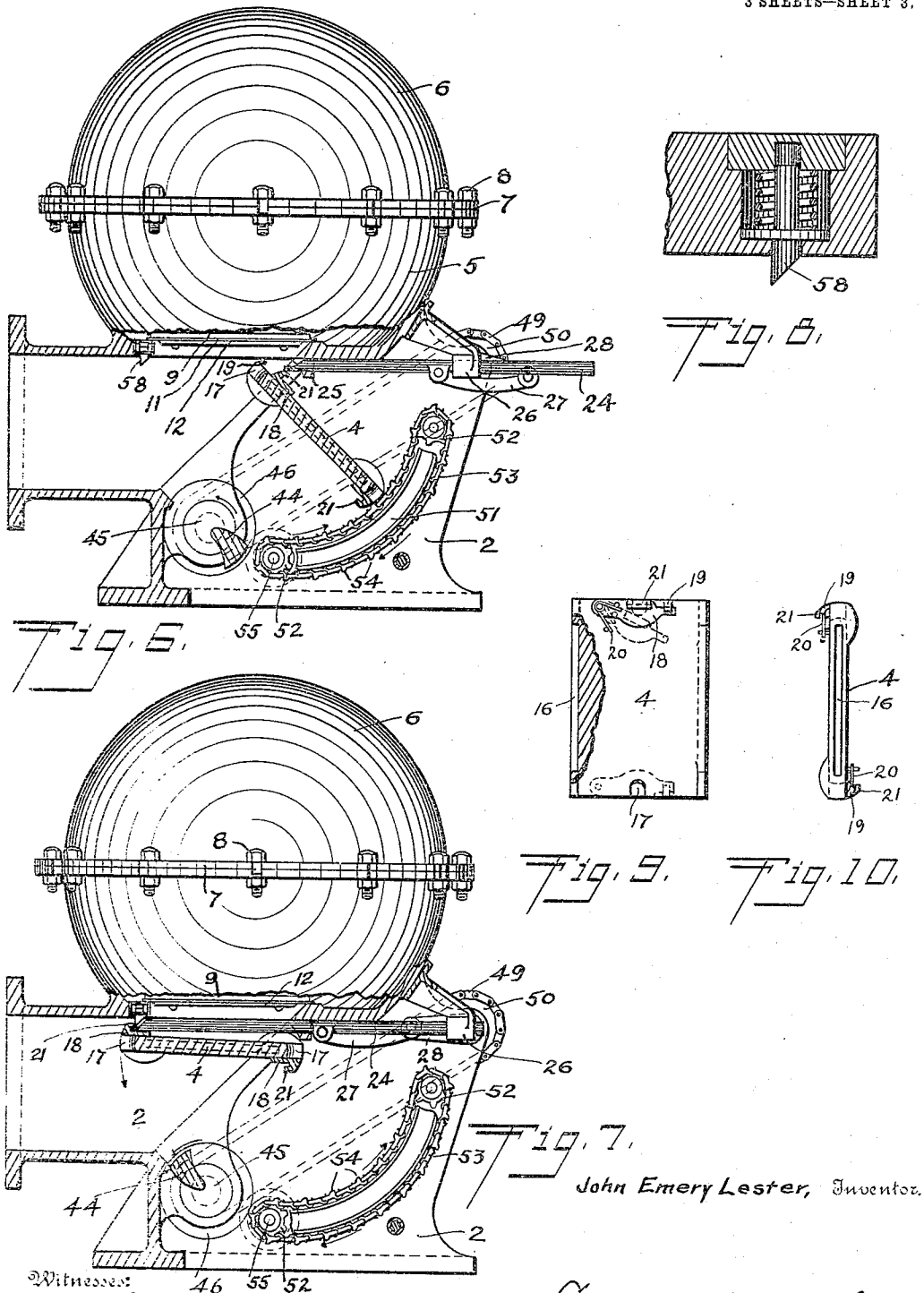
By *David O. Barnell,*

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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

JOHN EMERY LESTER, OF PORTLAND, OREGON, ASSIGNOR TO LESTER HYDRAULIC RAM & IRRIGATION COMPANY, OF PORTLAND, OREGON, A CORPORATION OF OREGON.

HYDRAULIC RAM.

946,607.

Specification of Letters Patent.

Patented Jan. 18, 1910.

Application filed May 13, 1908. Serial No. 432,733.

To all whom it may concern:

Be it known that I, JOHN EMERY LESTER, a citizen of the United States, and a resident of Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Hydraulic Rams, of which the following is a specification.

My invention relates to hydraulic rams, more particularly to rams of the type shown in United States Letters Patent No. 868,194, issued to me October 15, 1907, in which the waste valve is formed by a slidably and pivotally hung gate, mechanically controlled and arranged to swing toward the waste outlet both in the opening and closing of the valve.

It is the object of my present invention to provide in a ram of this class means for insuring the steady operation of the swinging gate, for reducing the friction losses due to sudden changes in the direction of flow through the machine, for automatically maintaining a constant speed of operation, to provide an improved form of discharge valve, and to so arrange all parts of the mechanism that the same may be economically manufactured.

Constructions embodying my invention are shown in the accompanying drawings in which—

Figure 1 is a side elevation of the ram, set in operative position, Fig. 2 is a plan view of the same, Fig. 3 is a longitudinal section of the mechanism containing the valves, Fig. 4 is a transverse section on the line $x-x$ of Fig. 3, Fig. 5 is a plan view with the cover of the air-chamber removed, Figs. 6 and 7 are longitudinal sectional views, showing different positions of the swinging gate, Fig. 8 is a detail showing the spring-stop for preventing rearward sliding movement of the gate, Fig. 9 is a detail elevation of the gate, Fig. 10 is a detail side elevation of the same, and Fig. 11 is a detail side elevation of the gate-casing showing the arrangement of the driving sprockets for the rotary gate-stop and gate-lifting chain.

In the arrangement shown in Fig. 1 the supply pipe 1 is supported in the current of a running stream, as in my former patent No. 868,194, above referred to. The supply pipe 1 is secured by a flange connection with the gate-casing 2 which has a suitable base formed integrally therewith, which base

may be secured to timbers 3 placed on the bed of the stream. The gate 4 is so arranged within the casing that when in closed position it stands at an incline of about 45° , as shown in Fig. 3. In the upper part of the casing in front of the upper edge of the gate is the discharge opening which communicates with the air-chamber, the said chamber being formed by a globular casing, the lower part thereof 5 being integral with the casing 2 and the upper part 6 being secured to the portion 5 by means of the slotted flanges 7 and the bolts 8. The discharge-valve-plate 9 is pivotally connected with a forked arm 10 which is, in turn, pivotally connected with the rearward side of the air-chamber casing 5. The portion of the valve which contacts with the seat is formed by a sheet 11 of leather or other suitable material which is held between the plates 9 and 12, the plate 12 being removably connected with the plate 9 by means of the screws and thumb-nuts 13. The forward ends of the forked arm 10 are extended beyond the pivot pin connecting the same with the plate 9, and the said extended portions are provided with stop-pins 14 against which the forward portion of the plate 9 is normally held by the tension of a spring 15 which is coiled around the pivot pin, the ends thereof engaging the arm 10 and valve-plate 9. The said stop-pins 14 are so arranged that when the valve-plate 9 is in contact therewith it will also be in such position as to rest squarely upon the valve-seat.

By the described method of hanging the discharge valve the same may open in two substantially different ways. In the first, the entire valve is lifted, swinging up on an arc from the pivot center of the rearward end of the arm 10, thus fully uncovering the discharge opening and permitting a large volume of water to pass rapidly into the air-chamber, as is necessary when working against low pressure. When working against higher pressures, where smaller quantities of water are being forced into the air-chamber, the valve may be opened sufficiently by tilting up the rearward side thereof, as shown in Figs. 3 and 4, the valve closing by the pressure of the spring 15 when the upward water pressure becomes less than the air-chamber pressure.

The gate 4 consists of a rectangular metal

plate having slots 16 in the longitudinal edges thereof, and rounded notches 17 in the ends thereof, as shown in Figs. 9 and 10. On opposite sides and ends of the gate, plates 18 are pivotally connected therewith, said plates being adapted to swing over and cover the notches 17 in the ends of the gate. Adjoining the notches 17 hooks 19 are formed on the gate, with which hooks the ends of the plates 18 are normally held in engagement by the springs 20 arranged as shown in Fig. 9, the plates being swingable on the pivots thereof to the position shown in dotted lines in said figure, thereby uncovering the notches 17 when necessary to permit the push-rod to pass through the same. On the plates 18 over the notches, hooks 21 are formed for engagement by the end of the push-rod as hereinafter described.

The gate is slidably and swingably held within the casing 2 by means of the pins 22 which have flattened ends thereon entering the slots 16 in the sides of the gate, the said pins being revolvably held in bearings 23 which are removably secured in the sides of the casing, as shown in Fig. 4. At the center and upper end of the casing 2 is arranged the push-rod 24 which is longitudinally slidable through the bearing 25 on the casing, and the bearing 26 formed at the end of a bracket secured to the air-chamber casing 5. A longitudinal reciprocating motion is imparted to the rod 24 by the following means: On the rod 24 between the bearings 25 and 26 is formed a lug to which is connected the rod 27. The rearward end of the said rod 27 is connected with a crank 28 carried on the inner end of a transverse shaft 33 which is journaled in a bearing formed at the rearward end of the casing 2. On the outer end of the crank-shaft 33 is a sprocket 29 from which a chain 30 extends to a sprocket carried on a shaft 31 which is journaled in a frame 32 secured to the base-timbers 3. On said shaft 31 is a second sprocket from which a chain 34 extends to a sprocket carried on the wheel-shaft 35. The said shaft is journaled in bearings formed at the ends of radius rods 36 which connect with a shaft 37 supported in standards 38 which are carried by a float 39. On the end of the shaft 35 is carried a paddle- or current- wheel 40 of the ordinary under-shot type. A uniform distance is maintained between the centers of the shafts 31 and 35 by means of radius rods 41 having the ends thereof connected with the respective shafts. The speed of rotation of the paddle-wheel, relative to the speed of the current in which it is placed, may be varied by raising and lowering of the wheel relative to the float 39. The said raising and lowering of the wheel is accomplished by means of a ratchet-lever 42 which is connected with one of the radius rods 36 and is adapted to engage a notched segment 43 ar-

ranged concentrically to the shaft 37 and supported by the standards 38. It may be noted that by the use of the float to carry the paddle-wheel, the same is automatically maintained at a uniform "dip" regardless of the height of water in the stream in which the ram is placed. The gate-stop 44 is formed integrally with short shouldered shafts 45 which are journaled in bearings arranged in the casing 2 near the lower side thereof, as shown in Figs. 3 and 4. One of said bearings for the shafts 45 is formed in a plate 46 which is removably secured to the casing by bolts 47, the opening in the casing in which the plate is held being sufficiently large to permit the gate-stop to pass through the same in assembling the machine. On the outer end of the shaft 45 passing through the plate 46 is a sprocket 48 from which a chain 49 extends diagonally upward to a sprocket 50 carried on the crank-shaft 33. The sprockets 48 and 50 are of equal size so that the crank-shaft and gate-stop are driven synchronously.

On the inside of the casing 2, behind and below the gate, is formed an arcuate guide 51, the curvature of which is concentric to the gate-pivot pins 22. Near the upper and lower ends of said arcuate guide are sprockets 52, and a chain 53 passes around said sprockets and guide. The said chain is provided at regular intervals with outwardly extending lugs 54, as shown. The lower of the sprockets 52 is carried on a shaft 55 which extends through a bearing formed in the casing 2, and is provided at its outer end with a sprocket 56 adapted to engage the chain 49, as shown in Fig. 11, and be driven thereby. The chain 53 is thus driven in the direction indicated by the arrows in Figs. 3, 6 and 7.

The operation of the mechanism will be apparent by reference to Figs. 3, 6 and 7. The parts being in the position shown in Fig. 3, rotation of the gate-stop will release the lower end of the gate, permitting the same to fall by gravity to a vertical position. At this position it is engaged by the lugs 54 on the chain 53 and is thereby swung upwardly, as indicated in Fig. 6, to a substantially horizontal position. Having reached the horizontal position and the push-rod 24 being at the rearward end of its stroke, as the rod starts forward the flat pointed end thereof engages the hook 21 on the plate 18 and the gate is thereby pushed forwardly to the position shown in Fig. 7, sliding upon the flattened end portions of the pins 22 which enter the slots 16 in the sides of the gate. Upon reaching the position shown in Fig. 7, the spring-actuated latch 58, shown in detail in Fig. 8, engages the hook 21 and prevents the possibility of rearward sliding movement of the gate. As the push-rod begins its rearward stroke it disengages

from the hook 21 and the gate then falls to the closed position shown in Fig. 3, where it is stopped momentarily by engagement with the stop 44, and then the cycle of movements is repeated. During the time that the gate is open a rapid flow of water is established through the supply pipe and casing, which flow is, by the closing of the gate, interrupted and diverted so that a quantity of water passes up through the discharge valve into the air-chamber. The opening of the valve is automatically varied to suit the quantity of water delivered, for small quantities the valve simply tilting upon its seat, as shown in Fig. 3, while for larger quantities the entire valve may be lifted from the seat and swung upwardly around the pivoted rear end of the arm 10.

It will be noted that by having the gate at an inclined position when closed, the flow of water from the drive pipe in striking upon the gate is diverted thereby upwardly through the discharge valve with but slight loss of momentum, on account of the slight change in the direction of flow. It will also be noted that there are no pockets, corners or recesses, or other dead space in front of the gate which would cause eddies or other disturbing counter-currents tending to retard the flow of water into the air-chamber.

The discharge pipe 57 is preferably connected with the lower part of the air-chamber, being directed downwardly to the bed of the stream, and thence to any point desired.

By suitable adjustment of the actuating mechanism the action of the gate may be so regulated that the flow of water through the supply pipe is never entirely stopped. In other words, the action may be so timed that after the gate is closed and the flow diverted into the air-chamber, at the instant when the velocity and momentum of the water in the supply pipe has fallen to a point where it will no longer overcome the pressure in the air-chamber, and before the velocity has fallen to zero, the gate may be opened so that the flow will continue, increasing in velocity until reaching the maximum just before the gate is again closed. The result of the above described action is a marked increase in efficiency over an action in which the flow is permitted to be entirely stopped.

It will be obvious to those skilled in the art, that the herein described type of gate and actuating mechanism therefor may be employed in a ram for compressing air, by combining the same with an air-chamber arranged as shown in Fig. 8 of my Patent No. 868,194, hereinbefore referred to.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a hydraulic ram, a supply pipe, a

gate casing connected therewith, there being a waste outlet to said casing in substantially horizontal alinement with the supply pipe, a gate slidably and pivotally hung within the casing and adapted to close the waste outlet thereto, there being a valved discharge opening in the casing adjoining the gate, and a rotary stop arranged in the casing to interrupt the swinging movement of the gate in such a position that the same will close the waste outlet, and the gate when in such closed position being at a substantially equal incline to the lines of flow through both the waste outlet and discharge opening.

2. In a hydraulic ram, a casing having a valved discharge opening and provided with a supply pipe and a waste outlet, a gate slidably and swingably hung adjacent to said discharge opening and within the waste outlet, a rotary body disposed adjacent to the waste outlet, means for swinging the gate to a substantially horizontal position, means for sliding the gate longitudinally to a position from which it may swing against the rotary body, the said body being so disposed that when the gate engages the same it will close the waste outlet, and means for driving synchronously the said rotary body and the gate actuating mechanism.

3. In a hydraulic ram, a casing having a valved discharge opening and provided with a supply pipe and a waste outlet, a gate pivotally and slidably mounted in said casing and adapted to swing from a horizontal position past a position at which it will close the waste outlet to a second horizontal position, a rotary stop adapted to engage the gate momentarily when it is at the position closing the waste outlet, means for sliding the gate from the second horizontal position to the first horizontal position, and motor-driven actuating means for the gate and rotary stop.

4. In a hydraulic ram for use in a running stream of water, a waste valve, mechanism for actuating and controlling said valve, a float, a paddle-wheel carried by said float, means for adjusting the position of the paddle-wheel relative to the float, a driving shaft connected with said valve actuating and controlling mechanism, driving means connecting said driving shaft with the paddle-wheel, and means for maintaining a spaced relation between the driving shaft and paddle-wheel whereby the float may automatically maintain the paddle-wheel at a constant relation to the surface of the stream without changing the relation of the same and the driving shaft.

5. In a hydraulic ram, a casing forming an air-chamber and a gate-chamber, there being a discharge opening connecting said chambers, a valve-plate for closing said discharge opening, an arm having one end

pivotally connected with the casing and the other end pivotally connected with the valve-plate, a stop for limiting movement of the valve-plate relative to the arm, and a
5 spring normally holding the plate in engagement with the stop.

6. In a hydraulic ram, a supply pipe, a gate chamber casing connected therewith, there being a waste outlet to said casing, a
10 gate pivotally and slidably hung adjacent to said waste outlet, the said gate being adapted to swing from a horizontal position past a position at which it will close the waste outlet to a second horizontal position,
15 a rotary stop for interrupting the swinging

movement of the gate at the closed position, means for raising the gate from a vertical position to the second horizontal position, a push-rod for sliding the gate from the latter position to the first horizontal position, 20 and driving mechanism for synchronously actuating the stop, push-rod and gate-raising means.

In testimony whereof I have hereunto subscribed my name in the presence of two 25 witnesses.

JOHN EMERY LESTER.

Witnesses:

G. A. JOHNSON,
CHARLES STOUT.