No. 868,194. PATENTED OCT. 15, 1907.

J. E. LESTER.

HYDRAULIC RAM.

APPLICATION FILED APR. 9, 1906.

2 SHEETS—SHEET 1.

Fig. 2.

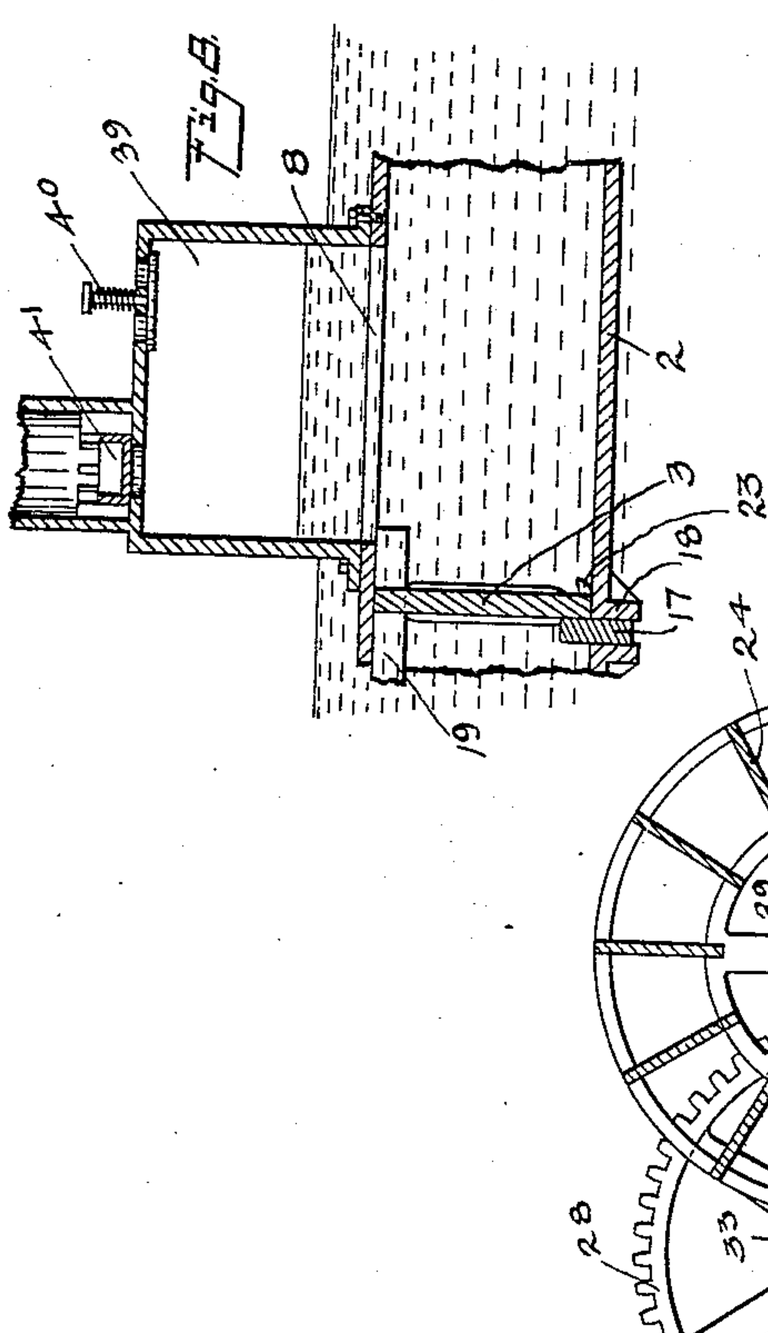

Fig. 1.

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2 SHEETS—SHEET 2.

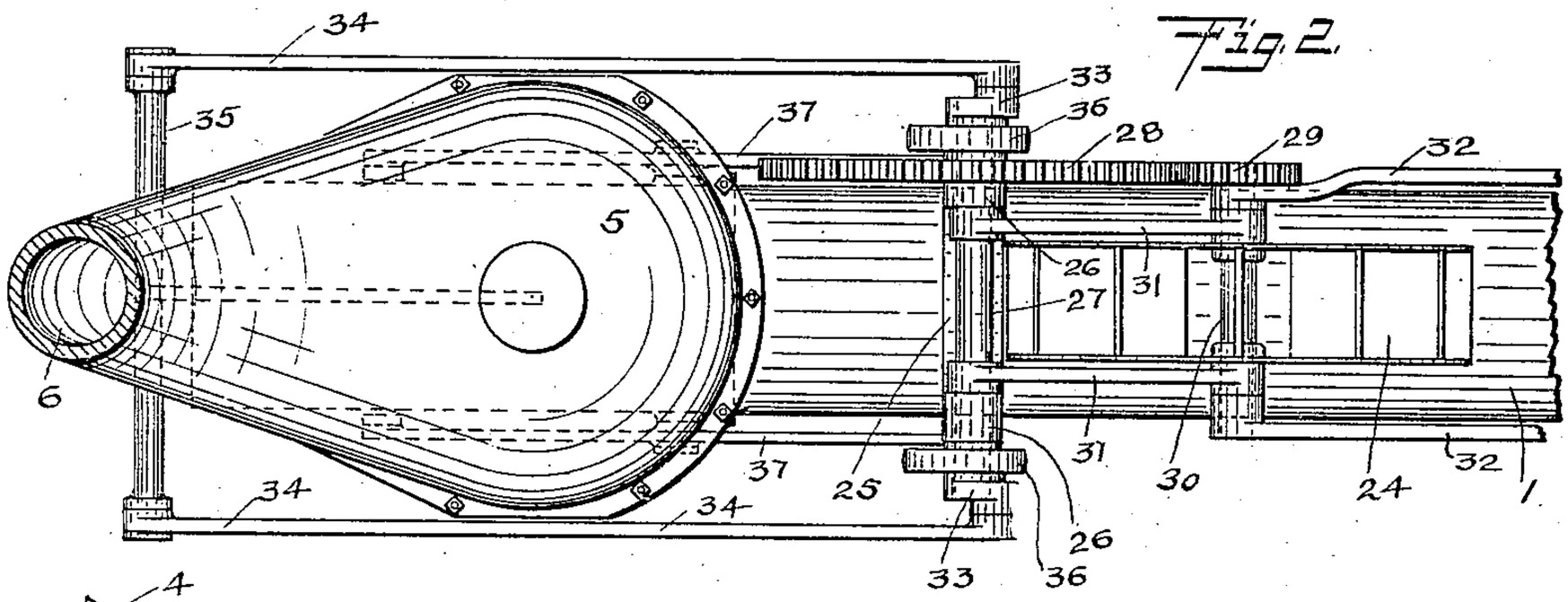


Fig. 2.

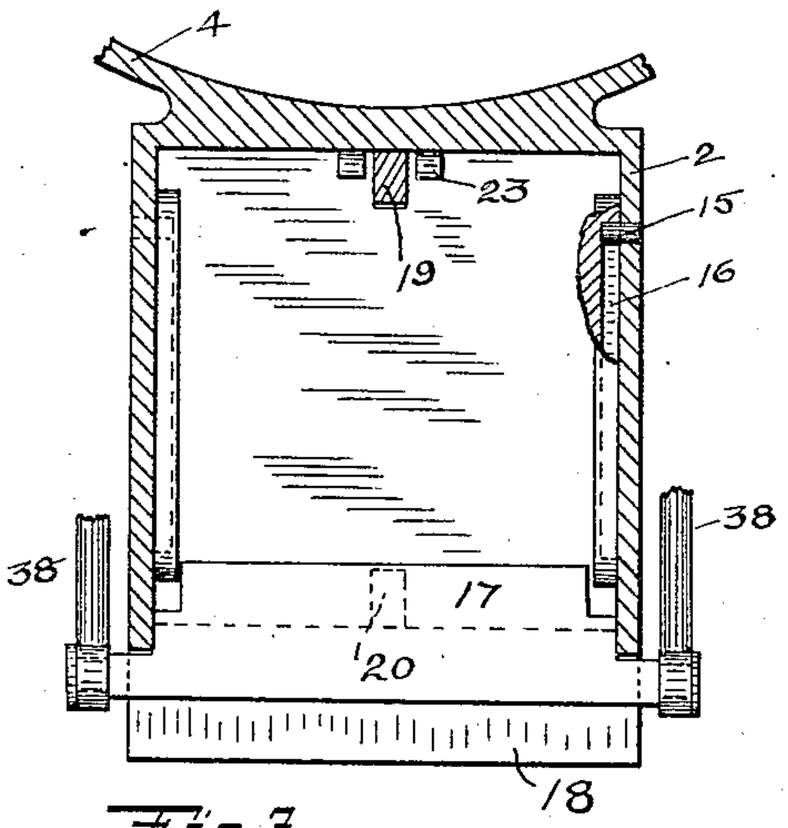


Fig. 3.

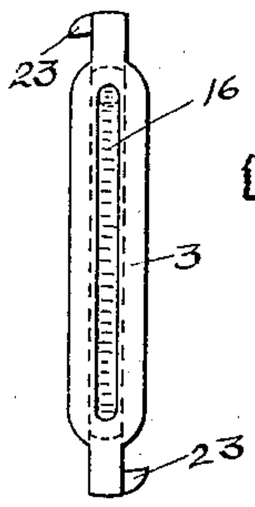


Fig. 4.

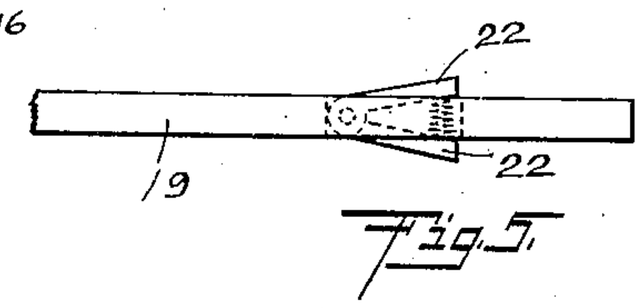


Fig. 5.

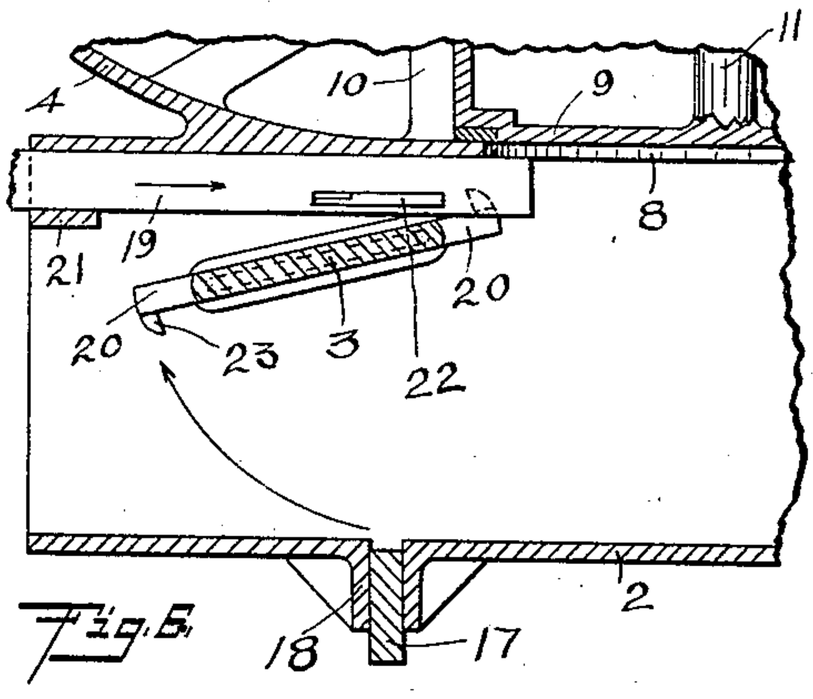
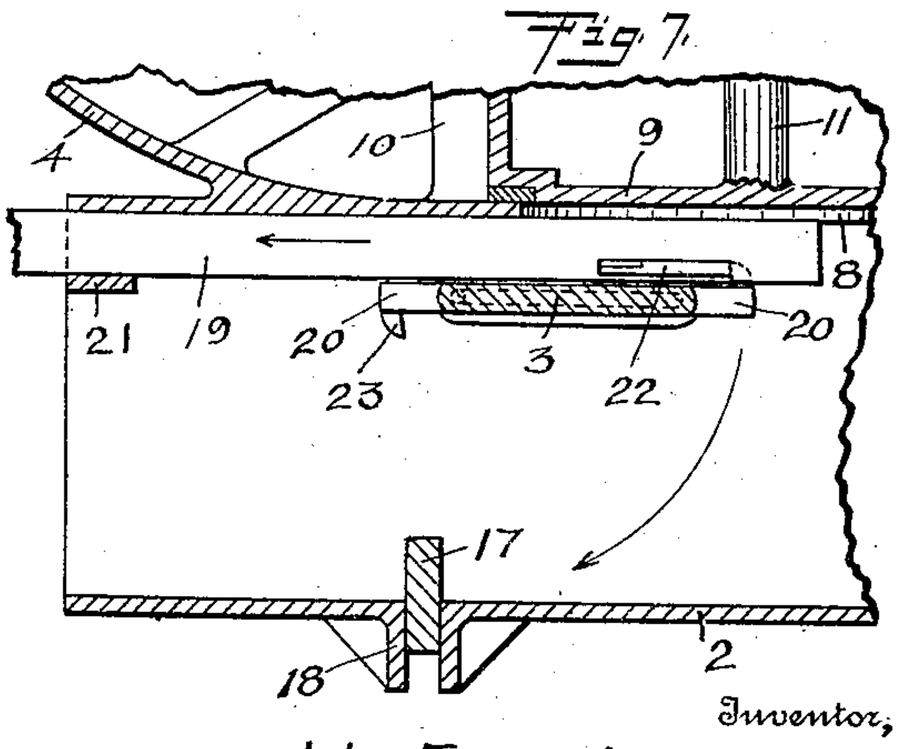


Fig. 6.

Fig. 7.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC RAM.

No. 868,194. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed April 9, 1906. Serial No. 310,842.

To all whom it may concern:

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

My invention relates to hydraulic rams and it is the object thereof to provide a device of this character suitable for use in running streams of only moderate fall where it is impossible to secure any considerable head of water without damming the stream or running pipes for long distances, and where it is desired to raise large quantities of water for moderate heights, as in irrigation works.

Further objects of my invention are to provide a mechanically-controlled swinging gate for stopping the outlet from the supply pipe, which gate when open will not restrict or impede the flow of water through the pipe; to provide means for adjusting the mechanical controlling means so as to vary the period of discharge of the mechanism; and to provide means by which the mechanism may be used for compressing air where it is not desired for use in raising water.

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

Figure 1 is a longitudinal section of the mechanism arranged for elevating water, Fig. 2 is a plan view of the same, Fig. 3 is a detail transverse section on the line *x*—*x* of Fig. 1, Fig. 4 is a detail side elevation of the swinging gate, Fig. 5 is a detail plan view of the reciprocating latch bar, Figs. 6 and 7 are detail longitudinal sections showing the operation of the gate, and Fig. 8 is a detail showing the modification necessary to adapt the mechanism for compressing air.

In the construction shown in Fig. 1 I provide a cylindrical supply pipe 1 which is placed in the stream of running water parallel with the general direction of the current therein. This pipe is so arranged as to be completely submerged and may be carried by floating barges or, in shallow streams, laid on the bed of the stream. The up-stream end of the pipe, shown in the drawings as broken away, is left open but may be covered with screening of coarse mesh to exclude large obstructions and debris therefrom. The length of the pipe is varied according to the diameter thereof and the varying conditions which may be met with in practice. At the lower or down-stream end of the pipe is placed the gate chamber casing 2 which is of rectangular cross section and preferably attached to the pipe 1 by a screwed connection, as shown. Within the gate chamber is hung the swinging gate 3 which is arranged to be alternately opened and closed, as will be explained in detail hereinafter. Above the gate chamber is the valve chamber of which the lower part of the casing, 4, may be made integral with the gate casing, the upper part of the valve chamber casing, 5, being bolted thereto and having thereon an upwardly extending neck 6 leading to the discharge pipe 7, as shown.

The opening 8 between the gate chamber and valve chamber is normally closed by the check valve 9 which is retained in operative position by the vertical guides 10. When the valve is raised the stem 11 engages the plunger 12 which is slidably retained in the nipple 13 on the casing 5. A spring 14 presses the plunger yieldingly downward and absorbs the shock occasioned by the impact of the valve stem thereon.

In the sides of the casing 2 adjacent the top thereof are the pins 15 which extend into the grooves 16 in the sides of the gate, as shown in Figs. 3 and 4, said pins forming pivots on which the gate hangs, turns and slides. Passing through a slot in the bottom of the casing 2 is the vertically reciprocal gate stop 17, the same being guided by the downwardly extending flanges 18 on the casing. The longitudinally reciprocal latch bar 19 extends along the upper side of the casing 2, passing through one of the notches 20 in the gate 3 and being guided by the loop 21 on the casing, as shown. In a slot adjacent the inner end of the bar are the spring actuated latches 22. The said latches are normally in the laterally extended position shown in Fig. 5 but may be pressed inwardly so as to lie flush with the sides of the bar 19 when passing through the notch 20 during the forward stroke of the latch bar. On each face of the gate adjacent one of the notches 20 are hooks 23 with which the latches 22 are adapted to engage during the rearward stroke of the latch bar.

The reciprocating gate stop and latch bar may be actuated by any suitable mechanism connected therewith and regulated to move the same at the proper relative periods. In the drawings the said devices are shown as actuated by a small current- or paddle-wheel 24 of ordinary construction. On the pipe 1 back of the gate and valve chamber casings is secured the saddle 25 having thereon the standards 26 carrying boxes in which is journaled the crank shaft 27. On said shaft is a gear 28 which meshes with a pinion 29 on the paddle-wheel shaft 30, said shaft being connected to the shaft 27 by the radius bars 31. From the shaft 30 the brace bars 32 extend diagonally rearward and engage pins on the sides of the pipe 1, as indicated by dotted lines in Fig. 1, several of such pins being provided so that by engaging the bars therewith the paddle-wheel may be raised or lowered so as to dip more or less in the water. On the ends of the shaft 27 are the cranks 33 from which the connecting rods 34 extend forward to the cross head 35 on the latch bar. Adjacent the cranks 33 are the eccentrics 36 of which the rods connect with the rear ends of the walking beams 37 which are fulcrumed on the sides of the casing 2 and have their front ends connected with the gate stop by the rods 38, as shown. The latch bar and gate stop are thus operated synchronously and at a rate proportional

to the speed of the current in which the ram is placed, the wheel 24 being adjusted by means of the brace bars 32 to dip in the water an amount sufficient to cause the actuation of the devices at the most advantageous speed.

The operation of the gate will be obvious by reference to Figs. 6 and 7. At the downward stroke of the gate stop the lower end of the gate is released so that the flow of water from the supply pipe swings the same forward as shown and indicated by the arrow in Fig. 6. The latch bar then beginning the rearward stroke, the latches 22 engage the hooks 23, raise the gate to horizontal position, and push the same back to the position shown in Fig. 7. At the beginning of the forward stroke of the latch bar the latches release the hooks on the gate which then tends by its own weight to fall to the vertical position. A flow of water having been established through the gate chamber during the time that the gate was open and being pushed back by the latch bar, the current through the chamber has a further tendency to close the gate which, swinging forward with the current, does not check the same until reaching the vertical position and striking the stop 17 which meanwhile has been raised to the position shown in Fig. 7. The flow of water through the supply pipe and gate chamber being thus suddenly stopped, the momentum of the water therein causes a pressure in the gate chamber sufficient to raise the check valve 9 and force a quantity of water into the valve chamber and up through the discharge pipe 7. As the gate is turned over at each operation thereof the stop 17 must extend high enough to cover the lower of the notches 20 and prevent leakage of water through the same when the gate is closed, the upper of the notches 20 being always closed by the latch bar.

It may be noted that owing to the rectangular form of the gate chamber its sectional area is greater than that of the supply pipe, the diameter of which is equal to the side of the chamber. This increased area in the gate chamber compensates for the slight reduction of flow which would otherwise be caused by the gate when open and in horizontal position, and a flow of water may be established through the pipe and chamber at a velocity equal to that of the current outside the pipe.

Should it be desired to use the ram for compressing air, an air chamber 39 is provided above the opening 8 in the gate chamber, the check valve 9 being omitted and the air chamber being provided with an inlet valve 40 opening to atmosphere and an outlet valve 41 opening into a discharge pipe, as shown in Fig. 8. The operation in compressing air will be obvious, the water alternately flowing up into the air chamber to force the contents thereof out through the valve 41, and falling back to the level of the stream when the gate 3 is opened, thus admitting another charge of air into the chamber 39 through the inlet valve 40.

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 waste outlet, a pivotally hung gate adapted to close said outlet, said gate when released being openable toward the outlet by pressure of water from the supply pipe, and motor-controlled mechanism for releasing the gate and for returning the same to a position such that it may be closed by movement toward the outlet.

2. In a hydraulic ram, a supply pipe, a waste outlet, a pivotally hung gate adapted to close said outlet, a releasable stop limiting movement of the gate toward the outlet, said gate when released being openable toward the outlet by pressure of water from the supply pipe, a discharge pipe, a valved connection between the same and the supply pipe, and motor-controlled means for releasing the gate stop and for returning the gate to a position such that it may close by swinging against the stop and toward the outlet.

3. In a hydraulic ram, a substantially horizontal supply pipe, a chamber connected therewith and having an outlet in horizontal alinement with the same, a gate for closing said outlet, said gate having grooves in the sides thereof, pins entering said grooves and forming pivots on which the gate may turn and slide, a reciprocal stop for engaging the lower part of the gate to limit movement thereof toward the outlet, and mechanism for turning the gate to horizontal position, sliding the same away from the outlet, releasing the same to permit it to swing against the stop and releasing the stop to permit the gate to swing past the same toward the outlet.

4. In a hydraulic ram, a substantially horizontal supply pipe, a chamber connected therewith and having an outlet in horizontal alinement with the same, a gate pivotally hung within the chamber and adapted to close the outlet thereto, a vertically reciprocal stop for limiting the swing of the gate toward the outlet, a horizontally reciprocal latch bar for turning the gate to open position and sliding the same to a position such that a current of water through the chamber will tend to close the gate, and mechanism for synchronously operating the gate stop and latch bar.

5. A hydraulic ram comprising a supply pipe submerged in a running stream of water substantially parallel with the general direction of the current therein, a discharge pipe, a valved connection between the same and the supply pipe, a waste outlet, a gate arranged adjacent said outlet, said gate being hung to permit a longitudinal sliding motion in one direction and a swinging motion in the opposite direction, and a releasable stop for interrupting the swinging motion at such position that the gate will close the said outlet.

6. In a hydraulic ram, a supply pipe, a waste outlet, a chamber adjacent said outlet, a gate disposed within said chamber, said gate being hung to permit a swinging motion thereof from the supply pipe toward the waste outlet, the gate during said swinging motion passing a position at which it closes the outlet, a releasable stop for interrupting the swing of the gate at such closed position, and means for returning the gate to its initial position by a longitudinal sliding motion.

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

JOHN EMERY LESTER.

Witnesses:
D. O. BARNELL,
J. L. ARMSTRONG.