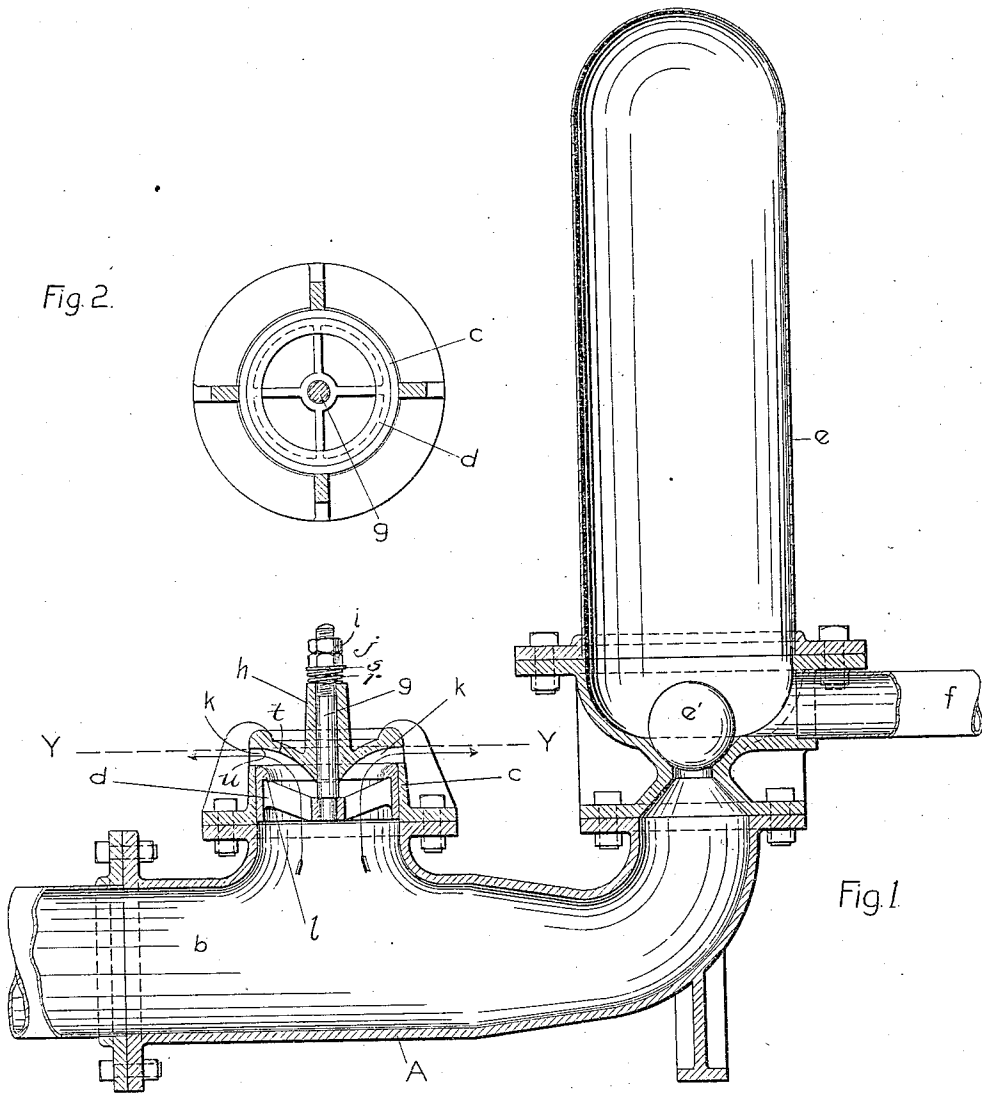


W. R. PHILLIPS.
 HYDRAULIC RAM.
 APPLICATION FILED OCT. 18, 1910.

1,069,285.

Patented Aug. 5, 1913.
 2 SHEETS—SHEET 1.



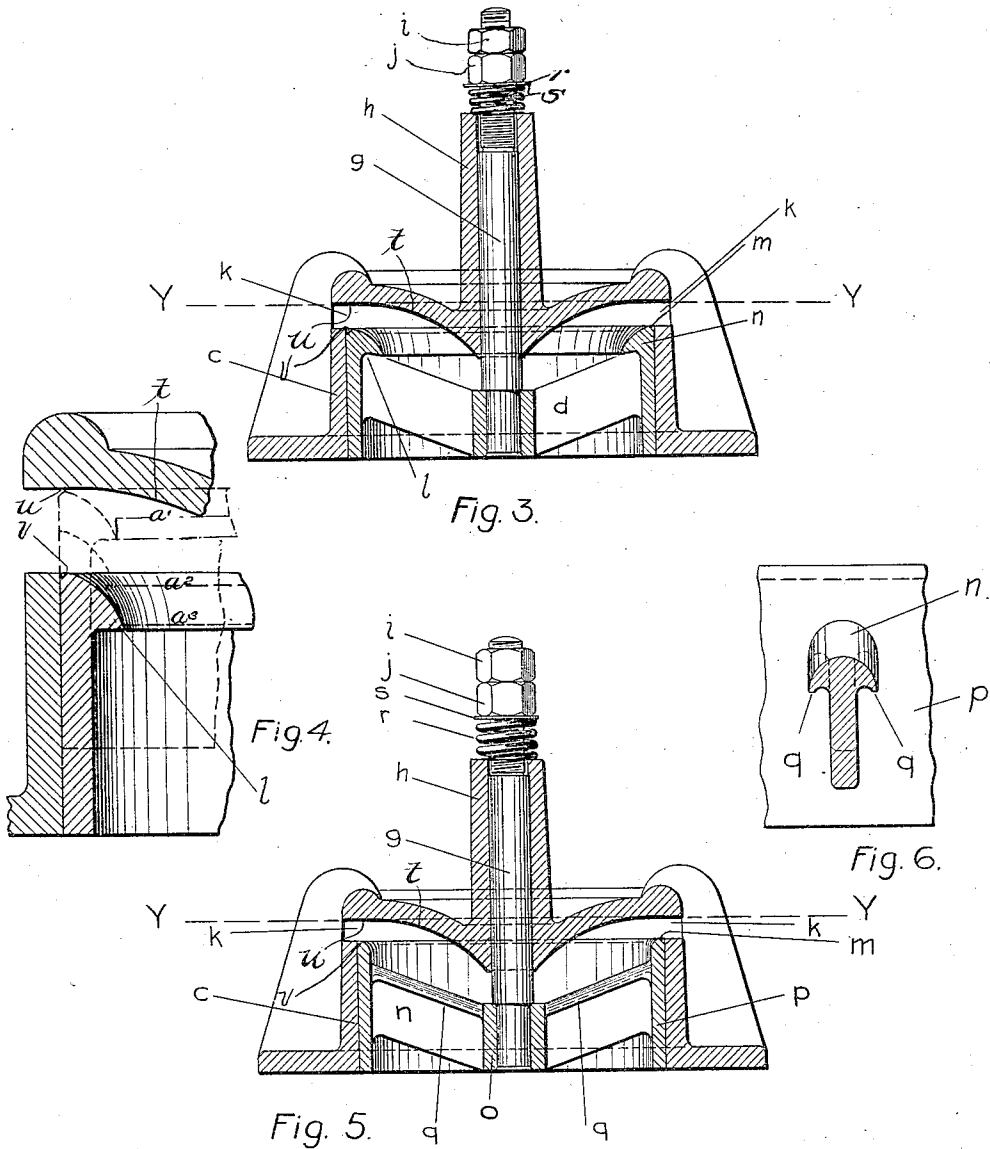
WITNESSES:
 C. B. Long
 Martin.

INVENTOR
 William R. Phillips.
 BY
 T. J. Geisler
 ATTORNEY

W. R. PHILLIPS.
 HYDRAULIC RAM.
 APPLICATION FILED OCT. 18, 1910.

1,069,285.

Patented Aug. 5, 1913.
 2 SHEETS—SHEET 2.



WITNESSES:
 C. B. Long
 O. Martin

INVENTOR
 William R. Phillips.
 BY
 J. J. Geisler.
 ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM R. PHILLIPS, OF PORTLAND, OREGON.

HYDRAULIC RAM.

1,069,285.

Specification of Letters Patent.

Patented Aug. 5, 1913.

Application filed October 18, 1910. Serial No. 587,772.

To all whom it may concern:

Be it known that I, WILLIAM R. PHILLIPS, a citizen of the United States, and a resident of Portland, county of Multnomah, and State of Oregon, have invented a new and useful Improvement in Hydraulic Rams, of which the following is a specification.

My invention relates to hydraulic rams, more particularly to the type employing a vertical waste-valve, and the object of my invention is:

First.—To obtain a waste-valve which shall be adapted to cause the impact thereof of the drive stream flowing through the ram to automatically close it, periodically in its cycle of motion. This result I obtain by constructing the body of the waste valve in the form of an annulus, and providing such body with a surface, opposed to the direction of travel of said stream, and of such area as to cause said out-flowing stream to drag said waste valve along and in so doing start it to close, the closure being completed by the ordinary, and continuing, impact of the drive water. My valve construction, however, is such as to minimize the force due to the pressure of the water against the under surface of the valve, for I depend upon the dragging action of the water flowing through the valve for the closing force.

Second.—To so construct the waste-valve that it presents the smallest practical, unbalanced area to the action of the stream of drive water at the instant of closure, in order to minimize undue wear upon the waste valve and its seat, as heretofore experienced in rams of the type referred to. In other words I have so constructed the top rim or face of my waste valve that there will be exposed sufficient area on the interior to balance the pressure against the under side of the waste valve, except to the degree required to obtain the dragging effect, described. I also very slightly bevel the exterior of the valve face so as to provide an exterior area for atmospheric pressure to act upon in re-opening the waste valve at the proper instant in the cycle of motion. This bevel is obtained by providing a chamfer, *v*, on the outer edge of the seated surface of the valve. This chamfer also prevents the upsetting of the metal at such surface.

These and other beneficial results which I obtain are fully stated in the body of this specification.

In the accompanying drawings: Figure 1 is an elevation in section of my improved ram; Fig. 2 is a horizontal section on line *y-y* of Fig. 1; Fig. 3 is a larger-scale section through the waste-valve and its casing; Fig. 4 is a sectional detail, on a still larger scale, relating to Fig. 3; Fig. 5 is a section similar to Fig. 3, but embodying certain modifications and additional features which are more conveniently described in the body of the specification; and Fig. 6 is a vertical cross-section through one of the arms connecting the center of the waste-valve with its outer portion, and related to the type of waste-valve illustrated in Fig. 5.

The apparatus is mounted on a tubular base *A*, a part of which is the supply pipe *b*. On the base is mounted a casing *c* of the waste-valve *d*, and the air chamber *e*, which is provided with a check-valve *e'* and a delivery pipe *f*, as usual. The details of construction of the waste-valve may be more readily seen in Fig. 3. The waste-valve *d* slides freely in its cylindrical casing *c* and is partly guided by its central stem *g*, which passes through a sleeve *h*, an integral part of the valve casing *c*. The guiding means comprising the stem *g* and the sleeve *h*, however, are merely used as a matter of convenience and are not essential to the action of the waste-valve, for it may be made of sufficient length to guide itself. The nuts *i*, *j*, shown on the upper part of the valve stem *g*, are provided as convenient means for adjusting the length of travel of the waste valve, and in so doing regulating the number of impulses, per unit of time, and, consequently, the quantity of water used. By means of the nuts *i*, *j*, the valve *d* may be raised so as to partly cover the escape-ways *h*. However, any other suitable means for accomplishing said adjustment will answer.

The waste-valve *d* is a hollow cylinder through which the stream of drive water flows on its way toward the escape-way *h*. The outer and inner surfaces of the valve are substantially parallel, so as to expose no avoidable surfaces to the pressure of the flow of water, also so as to minimize said pressure in the direction of travel of the valve and the force of impact of the valve against its seat in closing. The waste-valve is adapted to be periodically lifted to closed position by the dragging action of the stream of water flowing through it; and it is

such dragging action alone upon which I depend for the closing of my valve, the latter being especially adapted and constructed to present no unbalanced surfaces not required to produce said dragging action. To obtain such dragging action, the combined area of the surfaces of the base and the web of the waste-valve body, exposed and opposed to the direction of travel of the stream of drive water, must be sufficient for the outflowing water to seize and act upon and in so doing produce said closing effect. In other words, the construction of the waste-valve in the particulars referred to must be such as to cause a dragging of the water flowing through it against said surfaces to such degree as to periodically lift the waste-valve toward its closed position. If deemed preferable, the described effect may be promoted by providing the waste-valve with additional surface area; for example, with an interior annular projection or shoulder *l*, so as to obtain a surface of greater area, for the purpose stated; and in my judgment the provision of such additional surface area materially increases the efficiency of the waste-valve in its described action.

The operation of my waste valve, briefly stated, is as follows: Supposing the waste-valve *d* to have just been placed in its open position, as shown in Figs. 1 and 3, and that the water in the supply pipe *b* is beginning to flow through the waste-valve on its way toward escape-ways *k*. The velocity of the water so escaping will rapidly increase and cause it to exert a force upon said opposed surfaces of the waste-valve sufficient to start to lift the latter and the continued impact of the drive water will then close it. The curve, *t*, at top of interior of casing, as shown in Figs. 3 and 4, reduces the area of passage through which the water flows, at the instant the valve is in the act of closing. The effect of this is an increase in the velocity of the water past the lip and a consequent acceleration in the movement of the valve toward its seat *u*. In the action of a hydraulic ram, any escape through the waste valve after the water has reached its maximum velocity, results in a loss of efficiency. It follows then, that the ideal waste valve will stop the flow without loss, at that instant; and a waste valve that can by acceleration, as in this one, shorten the time of closing, will approach the ideal and be an important improvement over a valve in which such acceleration did not take place. Said lifting action ceases the instant the outflowing water is arrested by the closing of the waste-valve, and then the same conditions exist, and the same action takes place, as in any hydraulic ram at the same instant in the cycle of operation; in other words, causing a discharge of the water into the air chamber *e*. The energy of the water in

the supply pipe having been expended, the waste-valve *d* is permitted to return to its open or initial position, being moved to such initial position by the combined agencies of its own weight and regurgitation, and thereupon another cycle begins. Furthermore, to facilitate the reopening of the waste-valve after closure, I prefer to make the top rim thereof with a bevel *v*, more clearly seen in Fig. 4, so that when the waste-valve abuts against its seat in the roof of its casing, as occurs at the instant of closure, it will expose ample surface to exterior atmospheric pressure, and permit the latter to contribute its potency in causing the return movement of the waste-valve.

The waste-valve shown in Fig. 5 differs from that shown in the preceding views only in the following respects: Instead of providing the waste-valve with an interior annular shoulder like *l*, as shown in Figs. 1, 3 and 4, the arms *n*, connecting the central part, *o*, with the outer portion *p*, are provided on both faces with projections or shoulders *q*, *q*, as more clearly illustrated in the cross-section of the arm *n*, shown in Fig. 6. Furthermore, in Fig. 5 I have shown the valve stem *g* to be lengthened sufficiently to permit the introduction of a coil-spring *r* and washer *s* under the nuts *z*, *z*. The purpose of the coil-spring *r* is to relieve a condition where, by reason of the head of water being too low, the impact of the outflowing drive stream against said resisting surfaces of the valve body would be insufficient in itself to effectively overcome the inertia of the waste-valve, and in consequence render its closing movement too sluggish. The tension of the coil-spring *r* is just sufficient to place the waste-valve in a state of equilibrium.

I claim:

1. In a hydraulic ram, a waste valve comprising a cylindrical casing provided with a valve-seat lying in a plane at right angles to its axis, said casing having a portion under said valve-seat cut away to provide a waste outlet, a cylindrical hollow valve whose outer and inner surfaces are substantially parallel to the axis of the cylinder, the opposed surfaces of the valve-seat and of the valve, in contact at the instant of closure, being adapted to expose, at such instant, adjacent the seated surface of the valve an interior area approximately equal to that of the opposite or rear surface of the valve, whereby the latter is placed substantially in balance at the instant of closure.

2. In a hydraulic ram, a waste valve comprising a cylindrical casing provided with a valve-seat lying in a plane at right angles to its axis, said casing having a portion under said valve-seat cut away to provide a waste outlet, a cylindrical hollow valve whose outer and inner surfaces are substan-

tially parallel to the axis of the cylinder, the surface of the valve seated against the valve seat being made with an interior bevel adapted to expose at the instant of closure of the valve an area approximately equal to that of the opposite or rear surface of the valve, whereby the latter is placed substantially in balance at the instant of closure

3. In a hydraulic ram, a waste valve comprising a cylindrical casing provided with a valve seat lying in a plane at right angles to its axis, said casing having a portion under said valve seat cut away to provide a waste outlet, a cylindrical hollow valve whose outer and inner surfaces are substantially parallel to the axis of the cylinder, the opposed surfaces of the valve seat and of the valve, in contact at the instant of closure, being adapted to expose, at such instant, adjacent the seated surface of the valve an interior area approximately equal to that of the opposite or rear surface of the valve, whereby the latter is placed substantially in balance at the instant of closure, and said valve made with a projecting surface perpendicular to its line of motion constantly exposed to the water flowing through the valve.

4. In a hydraulic ram a waste-valve comprising a cylindrical casing provided with a valve-seat lying in a plane at right-angles to its axis, said casing having a portion under said valve-seat cut away to provide a waste outlet; a cylindrical hollow valve whose outer and inner surfaces are substantially parallel so as to minimize the pressure of the outflowing water upon the valve in the direction of its travel; said valve formed with a surface projecting from it in a plane perpendicular to the interior surface of the valve, whereby the outflow of the water through the valve is opposed, and such outflowing water in escaping over such lip is caused to drag the valve into its closed position, the opposed surfaces of the valve seat and of the valve, in contact at the instant of closure, being adapted to expose, at such instant, adjacent the seated surface of the valve an interior area approximately equal to that of the opposite or rear surface of the valve; and means for

holding the valve in a state of poise when in its open position.

5. In a hydraulic ram, a waste valve comprising a cylindrical casing provided with a valve seat lying in a plane at right angles to its axis, said casing having a portion under said valve seat cut away to provide a waste outlet, a cylindrical hollow valve whose outer and inner surfaces are substantially parallel to the axis of the cylinder; said valve seat made with an interiorly projecting concaved conical surface adapted to reduce the area of passage through which the water flows at the instant the valve is in the act of closing; and the opposed surfaces of the valve seat and of the valve, in contact at the instant of closure, being adapted to expose, at such instant, adjacent the seated surface of the valve an interior area approximately equal to that of the opposite or rear surface of the valve, whereby the latter is placed substantially in balance at the instant of closure.

6. In a hydraulic ram, a waste valve comprising a cylindrical casing provided with a valve seat lying in a plane at right angles to its axis, said casing having a portion under said valve seat cut away to provide a waste outlet, a cylindrical hollow valve whose outer and inner surfaces are substantially parallel to the axis of the cylinder; said valve seat made with an interiorly projecting concaved conical surface adapted to reduce the area of passage through which the water flows at the instant the valve is in the act of closing; the opposed surfaces of the valve seat and of the valve, in contact at the instant of closure, being adapted to expose, at such instant, adjacent the seated surface of the valve an interior area approximately equal to that of the opposite or rear surface of the valve, whereby the latter is placed substantially in balance at the instant of closure; and said valve made with a projecting surface perpendicular to its line of motion constantly exposed to the water flowing through the valve.

WILLIAM R. PHILLIPS.

Witnesses:

O. O. MARTIN,
C. B. LONG.