No. 647,000. Patented Apr. 10, 1900.

J. M. KLINE.

HYDRAULIC RAM.

(Application filed Aug. 30, 1899.)

(No Model.) 2 Sheets—Sheet 1.

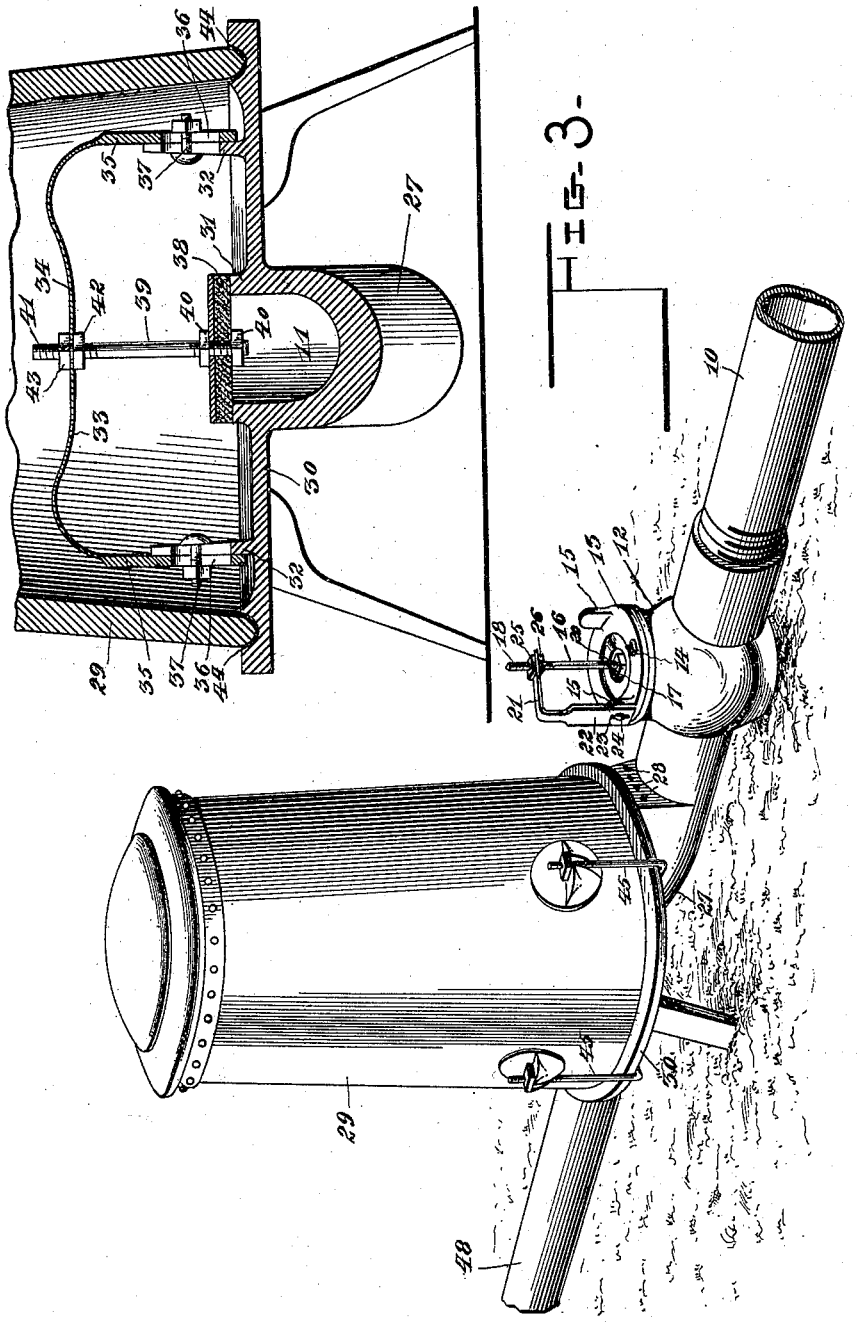

FIG. 3.

FIG. 1.

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FIG. 4.

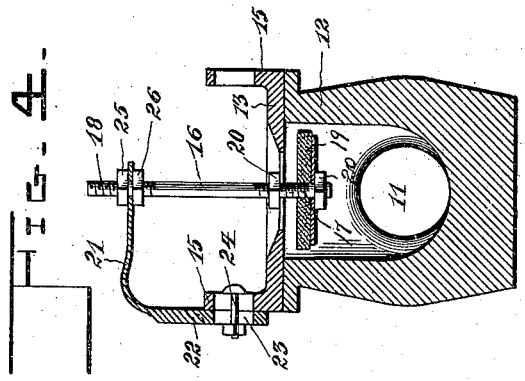

FIG. 2.

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UNITED STATES PATENT OFFICE.

JAMES M. KLINE, OF BEAVERTOWN, PENNSYLVANIA.

HYDRAULIC RAM.

SPECIFICATION forming part of Letters Patent No. 647,000, dated April 10, 1900.

Application filed August 30, 1899. Serial No. 728,983. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. KLINE, a citizen of the United States, residing at Beavertown, in the county of Snyder and State of Pennsylvania, have invented a new and useful Hydraulic Ram, of which the following is a specification.

My invention relates to improvements in hydraulic rams, and one object in view is to provide an improved construction of the relief-valve by which it is rendered extremely sensitive in action and the ram is made to operate automatically at all periods of service, thus obviating the necessity for manual operation of the relief-valve when the ram is started or at other periods of its service.

A further object is to provide an improved construction of spring-support for the relief and inlet valves by which said support may be adjusted to vary the tension of the spring-pressure on said valve and the valve may be adjusted independently of the spring-support to compensate for wear and to make it fit accurately to the valve-seat.

With these ends in view the invention consists in the novel combination of elements and in the construction, arrangement, and adaptation of parts, which will be hereinafter fully described and claimed.

To enable others to understand the invention, I have illustrated a preferred embodiment thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a perspective view of a single-acting hydraulic ram constructed in accordance with my invention. Fig. 2 is a vertical sectional elevation taken longitudinally through the ram shown by Fig. 1. Fig. 3 is a vertical transverse section on the plane indicated by the dotted line 3 3 of Fig. 2, and Fig. 4 is a similar transverse section in the plane of the dotted line 4 4 of Fig. 2.

The same numerals of reference are used to indicate like and corresponding parts in each of the several figures of the drawings.

10 designates the drive or pressure pipe, which may receive its supply of water from a creek or river, and 11 is the water-chamber. Said chamber has a vertical extension 12 extending above the plane of the drive-pipe at the point where the latter is coupled to said chamber, and upon the upper end of the extension is fitted a seat-plate 13, the lower face of which constitutes a seat for the automatic relief-valve. This plate is secured firmly but detachably in position on the water-chamber by the transverse bolts 14, and the plate is also provided with one or more lugs 15, which are integral with said plate and extend upwardly therefrom.

The stem of the relief-valve is indicated by the numeral 16, said stem being provided with a short threaded length 17 at its foot, while the upper part of the stem is threaded for a considerable distance, as at 18. The relief-valve 19 consists of a metallic washer and a layer of suitable pliable material superposed upon the metallic washer, said valve being fitted on the lower threaded end 17 of the stem and secured firmly thereto by means of the clamping-nuts 20, which have threaded engagement with the length 17 of the stem, whereby the relief-valve may have its packing compressed firmly upon or between the washers by adjusting the nuts on the valve-stem. This relief-valve is supported in operative position within the extension of the water-chamber and in yieldable relation to the seat-plate 13 thereon by means of a single spring 21, which is shown more clearly by Fig. 4 of the drawings. This spring is formed of a single piece of metal by bending the same to provide an overhanging arm, the other end of the spring being widened in one direction and thickened in the opposite direction to produce a substantial unyielding foot or stock 22. The spring is arranged for its thickened and widened foot to bear laterally against one of the lugs 15, so that its arm will overhang the opening in the seat-plate 13 of the water-chamber. The thickened foot or stock of this single spring is provided with a vertical longitudinal slot 23, through which passes a transverse bolt 24, that is secured to the lug 15, whereby the spring is attached to the lug in a manner which insures vertical adjustment of the spring on the seat-plate of the water-chamber. A transverse aperture is formed in the yieldable overhanging arm of the spring near its free end for the upper threaded length 18 of the valve-stem to pass therethrough, said threaded length of the valve-stem having the clamping-nuts 25 26

screwed thereon to bind against opposite sides of the spring-arm, so that the stem and relief-valve may be adjusted in a vertical direction on the spring and independently of any adjustment of the slotted spring-stock on the seat-plate. I attach especial importance to this adjustable connection of the relief-valve stem to the spring-support and to the adjustable fastening of the spring-support to the seat-plate, because such connection between the stem and spring permits the valve to be adjusted in a manner to accurately fit the seat-surface on the plate 13 without disturbing the spring or involving variation in the tension thereof, and at the same time the last-described adjustable connection of the spring-support to the seat-plate enables the spring and valve to be adjusted in order to vary and regulate the tension of the spring, and thereby determine within the exact limits the pressure exerted by the spring upon the relief-valve, whereby the spring and valve may be adjusted to secure extreme sensitiveness in the action of the relief-valve.

The spring-support 21 is adjusted to maintain the relief-valve normally in a position free from engagement with the valve-seat, and said spring-support exercises its tension on the stem of the relief-valve in a manner to resist the upward movement thereof. At the same time, however, the spring-support is yieldable with the relief-valve under the pressure of the water acting against the under surface thereof, so that the relief-valve will be closed under the pressure of the water at the period of opening of the inlet-valve from the drive-pipe to the air-chamber of the hydraulic ram.

The delivery end of the water-chamber 11 is curved or extended in an upward direction by a gradual curvature thereof, as indicated by the numeral 27 in Fig. 2, for the purpose of discharging the water in an upward direction and into the air-chamber under minimum friction on the body or mass of moving liquid. This water-chamber is also provided with air-inlet ports 28, which are formed in an inclined direction to the longitudinal axis of the chamber and between the relief-valve and the upwardly-curved end 27, such ports serving to admit air to the water-chamber, from whence the air, with the water, will eventually find its way into the air-chamber under the intermittent flow of the water in its action on the ram.

The air-chamber 29 has its base 30 arranged in the same horizontal plane as the seat-plate of the water-chamber, said chamber-base having an inward valve-seat 31 coincident with the upwardly-curved end of the water-chamber. This base is also provided on opposite sides of the valve-seat with integral upright lugs 32, on which is adjustably seated the double spring 33, which sustains the inlet-valve in yieldable relation to the valve-seat. This double spring is made by bending a single piece of metal to the form shown by Fig. 3 of the drawings in order to produce the curved bridge portion 34, the same being formed with a central aperture adapted to receive the stem of the inlet-valve. The end portions of this bowed spring are widened in one direction and thickened in the opposite direction to form the feet or stocks 35, and said feet have the longitudinal vertical slots 36. The enlarged slotted feet of the double spring are applied laterally against the outer faces of the lugs 32 in a position to have the bridge portion 34 of said spring span and overhang the valve-seat. Bolts 37 are passed through the slotted feet of the spring and the lugs 32 to securely fasten the spring at its terminals to the lugs; but the bolts may be loosened for the purpose of adjusting the slotted spring-feet in an upward or downward direction, whereby the tension or pressure of the spring upon the inlet-valve may be regulated. This inlet-valve 38 consists of a metallic washer having a facing or packing of suitable material, and this valve is secured to a vertical stem 39 by means of the nuts 40. The upper end of the stem is externally threaded and passed through the central opening in the bridge portion of the double spring, suitable clamping-nuts 42 43 being screwed on the stem to bear against opposite sides of the spring, so as to clamp the stem firmly thereto and also to secure a limited vertical adjustment of the stem on the spring independently of any adjustment of the spring on the lugs 32.

A packing 44 is interposed between the lower edge of the shell, which forms the air-chamber and the base 30, said packing being compressed by adjusting the nuts on the bolts 45, that serve to couple the air-chamber shell to said base.

One of the important features of my improved ram is the provision of a tapering water-discharge nozzle 46, the same being integral with the base 30 of the air-chamber and located at any suitable point thereon with relation to the inlet-valve. This discharge-nozzle is essentially of tapering form, with its enlarged end uppermost and its smallest end at the bottom, thereby forming a port 47 between the nozzle and the air-chamber, which port greatly exceeds the diameter and area of the port at the lower end of the discharge-nozzle. An off-bearing pipe 48 has suitable connection with the lower extremity of this nozzle 46. The employment of the tapered nozzle permits the water contained in the chamber 29 and forced downwardly therein by the pressure of air, which accumulates in the upper part of the chamber, to freely enter the nozzle through the enlarged port 47 in the base of the chamber and facilitates the passage of the water through the pipe 46.

The ram shown by the accompanying drawings is of the type known to the art as "single-acting" for the purpose of utilizing the flow of water from a creek or river to accumulate in an air-chamber and to compress air therein,

the pressure of which is utilized to force the water from said air-chamber to a desired place of storage for service.

Changes may be made in the form and proportion of some of the parts while their essential features are retained and the spirit of the invention embodied. Hence I do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

Having thus described the invention, what I claim is—

1. In a hydraulic ram, the combination with a fixed lug, of a spring-support fastened adjustably to said lug, a valve-stem connected adjustably to the spring-support for adjustment therewith and for adjustment thereon independently of the spring adjustment on the supporting-lug, and a relief-valve clamped to said stem, said spring-support adjusted to normally hold the relief-valve in an open position, substantially as described.

2. In a hydraulic ram, the combination with a water-chamber having a relief-valve seat, and a fixed lug, of a spring having a thickened and slotted foot fitted against said lug, a bolt connecting the spring adjustably to the lug, a relief-valve, a vertical valve-stem attached to said valve and having a threaded end fitted in an overhanging arm of the spring, and clamping-nuts screwed on the stem and binding against the spring to adjustably fasten the stem thereto, the stem and valve being adjustable on the spring independently of any adjustment of the spring upon its lug and the spring-support serving normally to hold the valve free from the seat, substantially as described.

3. In a hydraulic ram, the combination with an air-chamber having a valve-seat, and a water-chamber, of an arched spring-support secured adjustably at its end portions in the chamber, an inlet-valve, and a valve-stem secured to the inlet-valve and fastened adjustably to the spring-support, said inlet-valve and its stem being adjustable on said spring-support independently of any adjustment of the latter in the air-chamber, substantially as described.

4. In a hydraulic ram, the combination with an air-chamber having a valve-seat and the lugs on opposite sides of said seat, of an arched spring-support provided with the thickened and slotted feet fitted against said lugs, bolts which fasten the feet of the spring adjustably to the lugs, a valve-stem fitted centrally in the arched spring-support, nuts screwed on the stem and binding against said support to adjustably fasten the same to said support, and an inlet-valve fastened to the stem and adjustable therewith and with the spring-support, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JAMES M. KLINE.

Witnesses:
GEO. SPAID,
ALFRED SMITH.