No. 767,516. PATENTED AUG. 16, 1904.

E. H. FOSTER.

HYDRAULIC RAM.

APPLICATION FILED JAN. 26, 1903.

NO MODEL.

Fig.1

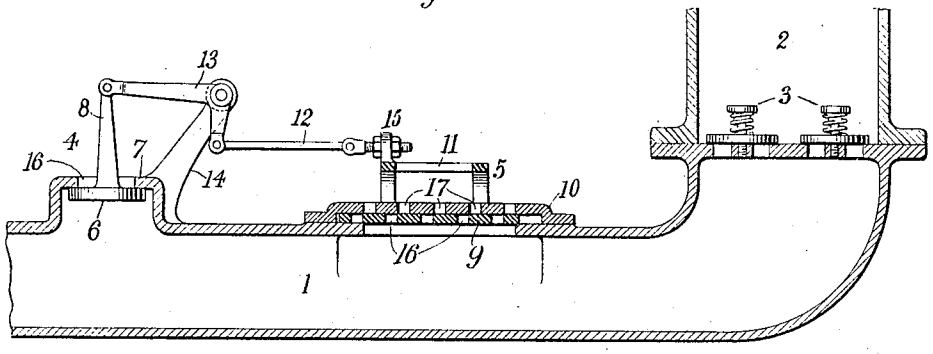


Fig.2

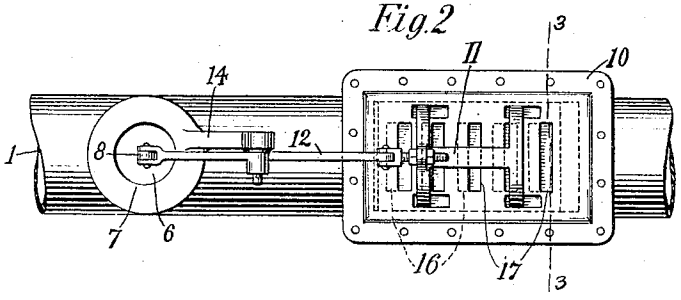


Fig.3

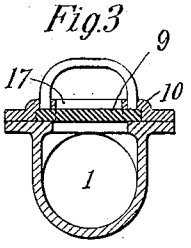


Fig.4

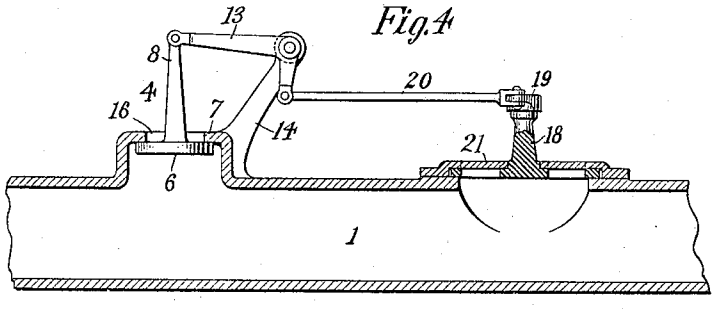
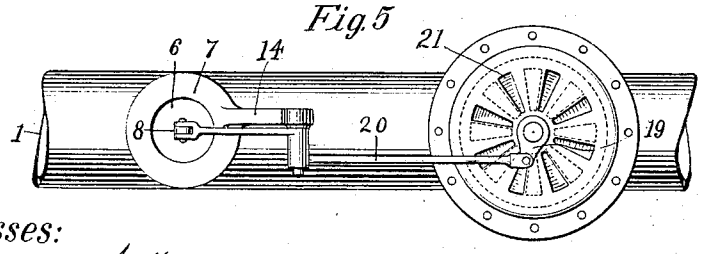


Fig.5



Witnesses:

Raphael Netter

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Inventor

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No. 767,516. Patented August 16, 1904.

UNITED STATES PATENT OFFICE.

ERNEST H. FOSTER, OF NEW YORK, N. Y.

HYDRAULIC RAM.

SPECIFICATION forming part of Letters Patent No. 767,516, dated August 16, 1904.

Application filed January 26, 1903. Serial No. 140,457. (No model.)

To all whom it may concern:

Be it known that I, ERNEST H. FOSTER, a citizen of the United States, residing at New York, county and State of New York, have invented certain new and useful Improvements in Hydraulic Rams, of which the following is a specification, reference being had to the drawings accompanying and forming part of the same.

Heretofore in the manufacture of rams of large size and power it has been found that the working or waste valve gives out after the apparatus has been in use but a comparatively short time. This is due to the great unbalanced or unsupported area necessary in a working valve of large size, on account of which the shock of sudden closing exerts a strain which the valve cannot long sustain. In order to overcome this difficulty, so that rams of large size may be constructed which will have as long life as the less powerful ones now in use, I have devised a waste-valve which with large capacity has very small unsupported area.

My invention, which consists of the novel features and combinations more particularly pointed out in the claims, is illustrated in the drawings, in which—

Figure 1 is a section of a ram having my improved valve. Fig. 2 is a top plan view of the valve. Fig. 3 is a section on line 3 3 of Fig. 2. Figs. 4 and 5 are section and plan, respectively, of a modification.

The drive-pipe 1 is of any convenient form and is connected in the usual manner with an air-chamber 2, having suitable valves 3.

In lieu of the customary single escape or working valve I use a double arrangement consisting of a pilot-valve 4 and a main valve 5. The pilot-valve consists, preferably, of a disk 6, adapted to fit a seat 7 and carrying a vertical stem 8. The opening and closing of this valve differs in no way from the operation of the ordinary waste-valve; but it is much smaller than would be required for a ram of the size on which it is used. In order, therefore, to compensate for its small size, I employ another valve 5, closed not directly by the friction of the escaping water, but by the pilot-valve.

The valve 5 consists of a gridiron-plate 9, sliding in suitable guideways formed by the flanged plate 10 on the upper side of the drive-pipe and preferably adjacent the pilot-valve. Immediately below the sliding plate 9 are similar openings in the drive-pipe, as shown, to register with those in the plate 9. The plate carries a bail 11, having connected thereto a jointed connecting-rod 12, which latter is connected to one arm of a bell-crank lever 13, pivotally mounted on an arm 14. The other arm of the bell-crank is connected to the vertical stem 8 of the pilot-valve.

It will be readily understood from the foregoing that by means of the screw-thread devices 15 on the end of the rod 12 the relation between the pilot-valve and the plate-valve may be so adjusted that when the former is opened by the fall of pressure in the drive-pipe the latter will move forward, so as to bring the two sets of openings into register. The water in the pipe 1 now has ample means of escape through the openings 16 17. When the flow through 16 has attained a sufficient momentum, the pilot-valve closes suddenly in the usual manner, closing, by means of the connecting-levers, the plate also, after which the water enters the air-chamber. Thus it will be seen that while the valves for the waste are of large capacity they are so constructed as to have very small unsupported areas. Consequently the impact of the water as they are closed is sustained without danger of the valve giving way. At the same time they may be made comparatively light in weight, thereby effecting an appreciable economy in manufacture. The pilot-valve being operated by a volume of water much greater than is sufficient merely to close it, develops enough power to actuate the valve 5 with certainty—that is, the latter is not too heavy a load to prevent the system from always operating. On the other hand, the load is sufficient to dampen or check the speed of the pilot-valve in closing, so that the shock and consequent strain is considerably reduced

without materially affecting the efficiency of the engine.

The operation of the modified form shown in Figs. 4 and 5 is essentially the same as the foregoing. In this form a rotary plate-valve 17 is substituted for the sliding plate, having a crank-arm 18 and crank 19, which latter is connected to the bell-crank lever by the rod 20. Thus the opening and closing of the pilot-valve will rotate the other to cover or uncover the corresponding openings 21 in the drive-pipe.

It is obvious that my invention is capable of many embodiments other than the one described, and therefore I do not consider myself limited thereto. For example, other forms of valves might be used or other means of operatively connecting the two together, or the pilot-valve might be arranged to operate a plurality of main valves. Many other variations will readily suggest themselves to the engineer or any one skilled in this art.

Therefore what I claim is—

1. In a hydraulic ram, the combination of a drive-pipe, a pilot waste-valve, a second waste-valve, and means connecting said valves whereby said second waste-valve is operated by said pilot-valve, as set forth.

2. In a hydraulic ram, the combination with a drive-pipe, of a pilot-valve operated by the liquid in said pipe, and a second valve operated by said pilot-valve, as set forth.

3. In a hydraulic ram, the combination with a drive-pipe, of a pilot-valve operated by the liquid in said pipe, a second valve, and a system of levers connecting said valves whereby the pilot-valve actuates the second valve, as set forth.

4. In a hydraulic ram, in combination, a pilot-valve, a drive-pipe having a series of openings therein, a plate having openings corresponding to the openings in the drive-pipe movably mounted on said pipe, and means whereby the operation of the pilot-valve moves said plate to throw its openings in and out of register with the openings in the drive-pipe, as set forth.

5. In a hydraulic ram, in combination, a drive-pipe, a pilot-valve having a stem, a bell-crank lever attached thereto pivotally mounted on said pipe, and a second valve connected to said lever, whereby said pilot-valve operates said second valve.

ERNEST H. FOSTER.

Witnesses:
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