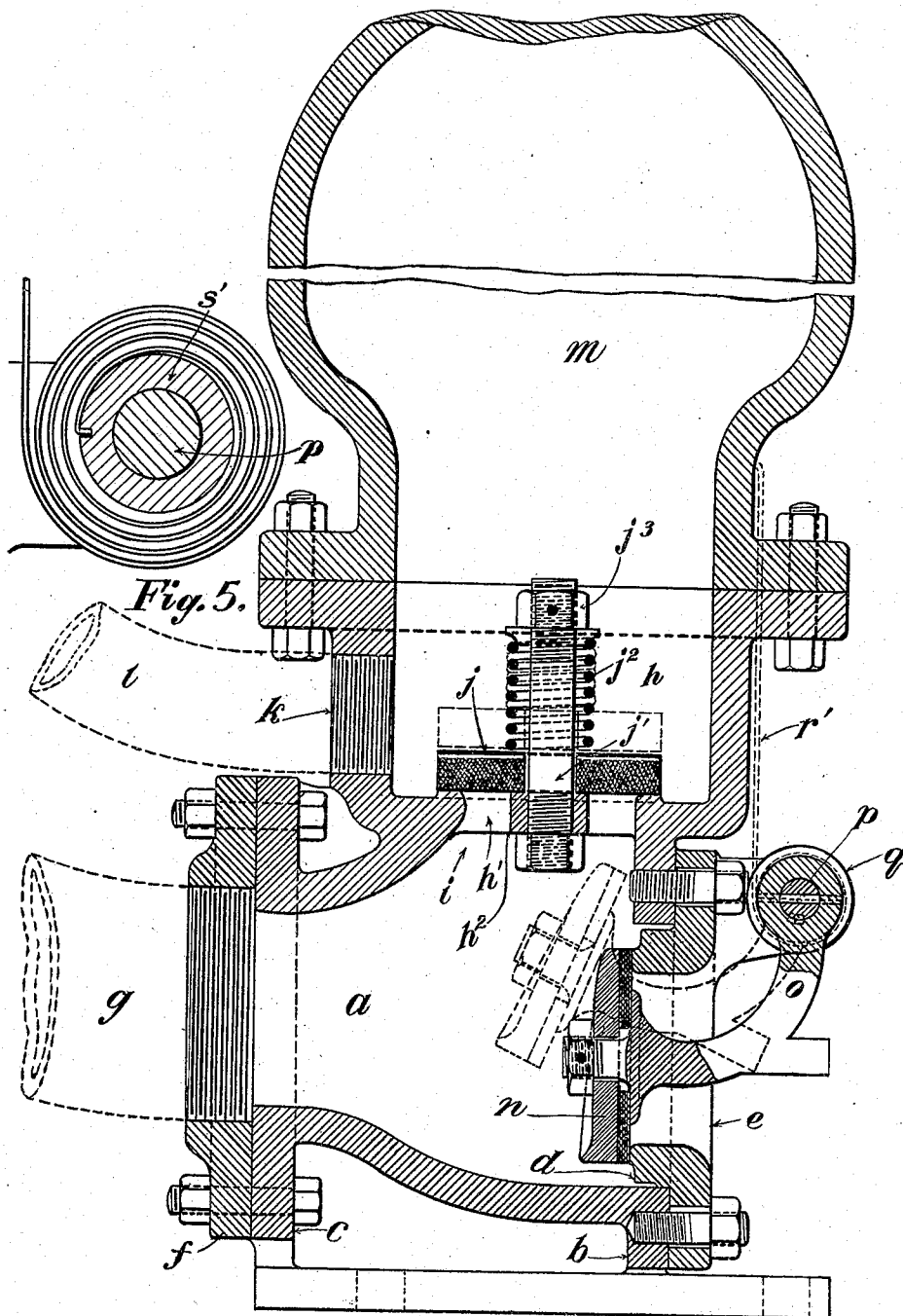


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APPLICATION FILED APR. 13, 1907.

Patented Sept. 7, 1909.
3 SHEETS—SHEET 2.



WITNESSES:

A. W. Gerking,
Cecil Long.

Fig. 6.

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Philip E. Alger
by *F. J. Kreider*
ATT'Y

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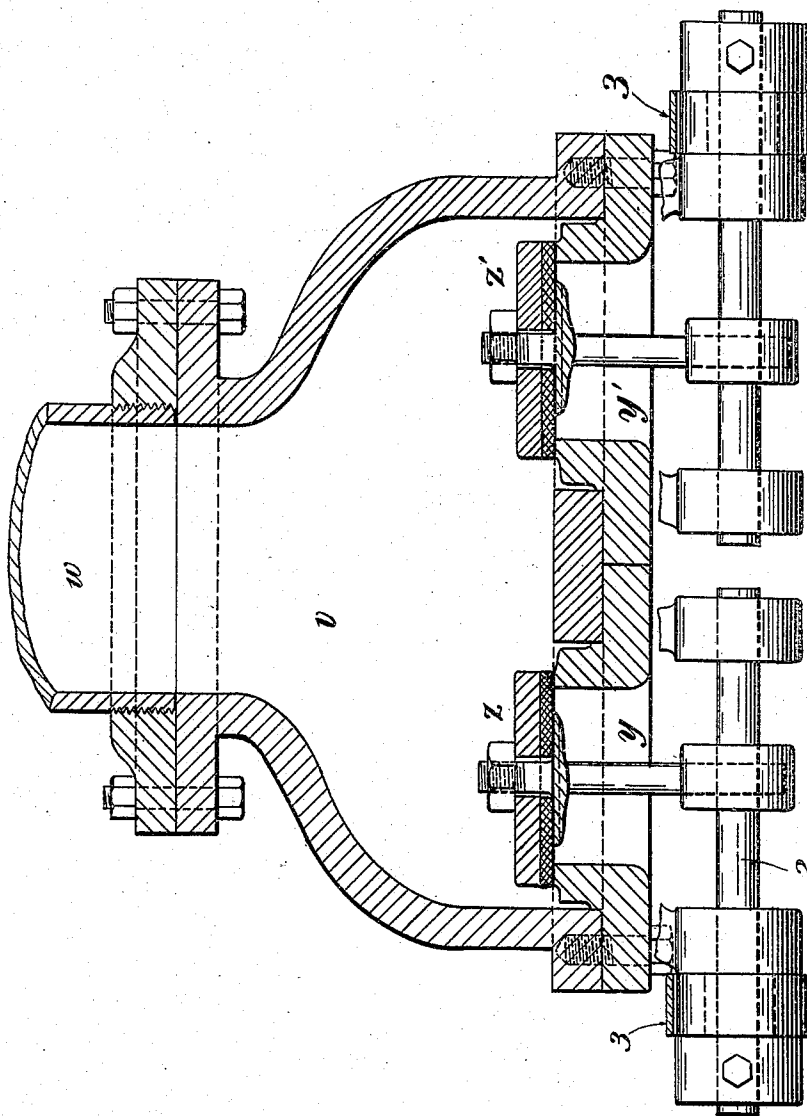


Fig. 7.

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HYDRAULIC RAM.

933,283.

Specification of Letters Patent.

Patented Sept. 7, 1909.

Application filed April 13, 1907. Serial No. 368,116.

To all whom it may concern:

Be it known that I, PHILIP E. ALGER, a citizen of the United States, and a resident of Portland, in the county of Multnomah and State of Oregon, have invented a new and useful Improvement in Hydraulic Rams, of which the following is a specification, reference being had to the accompanying drawings as constituting a part thereof.

This invention relates to that type of hydraulic ram heretofore invented by Frederick Hesse, and has for its object to overcome certain defects which were discovered in the practical operation of the latter, namely: The waste-valve in the ram referred to was opened during the periods of regurgitation by the force generated by an oscillating pendulum weight, but it was found that the pendulum would periodically be out of synchronism with the cyclic motion of the waste-valve, whereupon the ram could be brought to a standstill and it was necessary for the same to be started over. To prevent this condition, I have eliminated the pendulum mechanism and substituted therefor a spring by which the waste-valve is dependably operated, and I provide also means for adjusting the tension of the spring, the whole device being arranged and cooperating as hereinafter fully described.

In order to readily understand the purpose of my improvements, I have given full illustrations of the construction of the ram referred to.

In the drawings, Figure 1 is a side elevation of my hydraulic ram; Fig. 2 is a front view thereof, drawn on a somewhat reduced scale; Fig. 3 is a plan of the valve-seat of the delivery valve; Figs. 4 and 5 are details of construction, more fully described in the body of the specification; Fig. 6 is a vertical longitudinal section taken approximately on a line $x-x$ of Fig. 2; and Fig. 7 is a plan section of a modification of my ram, adapting the same to be used in connection with a larger drive-pipe.

The general construction of the ram referred to may be more readily observed from Fig. 6. It comprises a short body, a , made with flanges b , c , to the former of which is bolted a waste-valve seat d , having a central opening e , and to the flange c is bolted a companion flange f , in which is inserted the drive-pipe g . The upper part of the body is made with a delivery-valve opening con-

trolled by a valve j , and has integrally formed thereon a delivery chamber h , having an outlet k , in which is inserted the delivery pipe l . On the chamber h is mounted an air chamber m . The delivery pipe j rests on a gridiron web h' made with a central eye h^2 (see Fig. 3) through which extends a bolt-like valve-stem j' , on which is a coil-spring j^2 , the tension of which is adjustable by a nut j^3 to regulate the degree of resistance of the valve j .

The waste-valve opening e is controlled by a disk valve n , which is rigidly connected by its stem o to a spindle p , journaled in bearings q , q , integral parts of the valve-seat casting d . Excepting the means of periodically opening the waste-valve, the foregoing description represents the ram prior to my improvement thereof. To accomplish the purpose of my improvement, the waste-valve n is controlled by a spring r , fastened to a boss s' of the collar s (see sections Figs. 4 and 5), and the collar s is adjustably fixed on the spindle p by a set-screw t . The spring r terminates in a straight leaf r' , which bears against a lug u or other fixed object on the exterior of the delivery chamber h . To aid the reading of Fig. 6 the position of the spring is therein indicated in dotted outline.

The function of the spring r is to open the waste-valve automatically as soon as the pressure on the interior face of the valve disk will permit it, and by moving the collar s circumferentially on the spindle p , the tension of the spring r may be increased or diminished to suit the conditions present. When a large volume of water is available, the tension of the spring r is increased to give the waste-valve n a longer interval of opening, thus causing the flow of drive water to reach its maximum speed before closing the valve. This condition permits a maximum quantity of water to be lifted and discharged through the delivery pipe j , and is the proper adjustment of the ram when it is desired to lift a maximum quantity of water without regard to economy in the waste of the drive water. On the other hand, when only a small volume of water is available, the tension of the spring r is to be diminished so as to make the opening of the waste-valve as short and quick as possible, this reduces the duration of the flow and the resultant friction of water in the drive-pipe,

causing a greater number of impulses in a given unit of time. By this adjustment a large quantity of water is lifted in proportion to the quantity wasted. The adjustment of the spring r controlling the waste-valve is also an essential ingredient of my invention to enable the adjustment of the ram to meet the conditions of a high or low head of water; that is to say, when having to deal with a high head the force of the spring r would have to be increased, and in case of a low head the power of the spring would have to be correspondingly diminished.

The parts described cooperate as follows: Supposing the drive-water to have filled the ram-body and to be in a state of equilibrium and rest, if the waste-valve n be then opened by pushing it back with sufficient force to overcome the pressure against its interior, the water will begin to flow out of the waste-valve e with increasing velocity. The delivery-valve j will remain closed during the flow of water through the outlet e . When the force of impact against the waste-valve is sufficient to overcome the tension of the spring r and the waste-valve is forced against its seat, the energy contained in the moving column of water will be directed against the delivery-valve j , opening the latter and forcing the water into the delivery-chamber h , and the superimposed air-chamber m , compressing the air in the latter. And as soon as equilibrium is established above and below the discharge valve j , the compressed air in the air-chamber m will push back the water and close the valve j , as apparent. The water which escapes downward through the delivery-valve j before the closing thereof, imparts a backward or regurgitating movement to the water in the ram-body and drive-pipe, sufficient to generate a partial vacuum behind the waste-valve n , and by so doing relieves the interior pressure against the latter and permits the spring r to act and open the waste-valve, whereupon the cycle of motion is resumed, and the action of the waste-valve becomes thenceforth automatic. The partial vertical suspension of the waste-valve opposes only a fraction of its weight against the action of the spring r , and this arrangement enables the use of a comparatively low tension spring, which in turn minimizes the resistance to the force of effluent water.

When it is desired to build a ram of larger size embodying my improvements, I modify the construction of the ram-body, as shown, for example, in Fig. 7.

The theory of such modification is that the capacity of the waste-valve passage is proportionate to its diameter and the capacity of the drive-pipe is as the square of its diameter, thus in a large sized ram, the lift of the waste-valve must be greater to afford the same escape for the waste-water; but a greater lift causes a correspondingly greater impact, a fact which generally prevents the use of rams of large diameter. In my modification, the body v is connected to a large drive-pipe w , and is expanded, so as to allow the drive-water to pass through a plurality of waste-valve openings, y, y' , individually of smaller diameter than required but aggregating the same area of passage as would be afforded by a single waste-valve of the required diameter. The waste-valve disks z, z' , shown in Fig. 7, are suspended from a spindle 2, arranged and journaled the same as the spindle p in the smaller type, and the spindle of such disk-valves is controlled by one or more springs 3, the parts operating substantially as above described of the single waste-valve.

The throat i of the delivery-valve constitutes a receptacle for holding part of the air admitted during each opening of the waste-valve, and which air enters from the throat into the air-chamber upon each opening of the delivery-valve, a snifter-valve not being required in this type of ram.

I claim:

In a hydraulic ram, the combination with a body having a vertical enlargement and a waste-outlet in the lower part thereof, of a valve seat secured to said outlet, hinged lugs projecting outward from the upper part of said valve seat, a spindle supported by said lugs, a waste-valve provided with an outwardly projecting curved arm by which it is connected to said spindle, a set collar on said spindle, a leaf spring, one end of which is affixed to and coiled on said set collar, and the upper end projecting outward, and a lug on the body, against which the projecting end of said spring bears.

PHILIP E. ALGER.

Witnesses:

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T. J. GEISLER.