A. H. FRANCFORT.

HYDRAULIC RAM.

APPLICATION FILED MAR. 6, 1911.

1,015,949.

Patented Jan. 30, 1912.

2 SHEETS—SHEET 1.

Fig. 4.

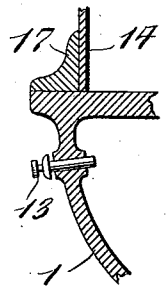

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

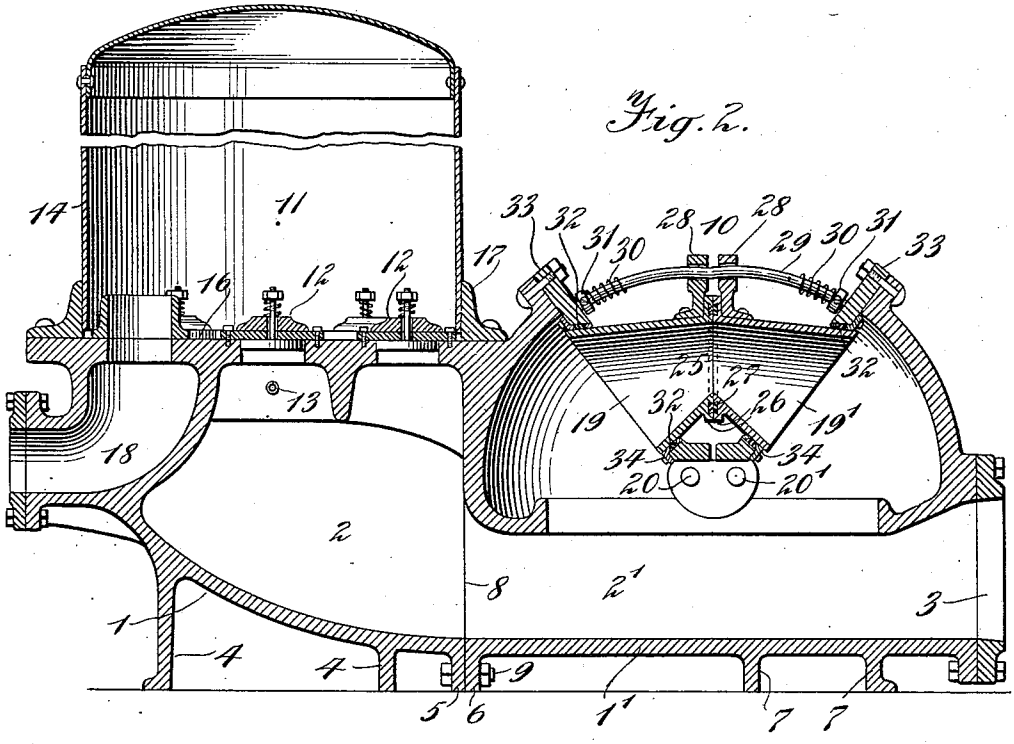
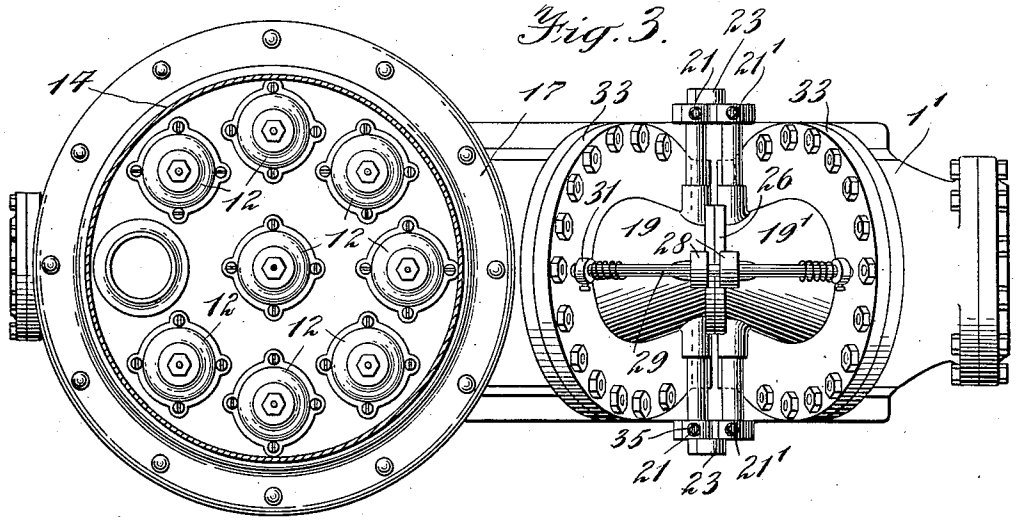


Fig. 3.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC RAM.

1,015,949. Specification of Letters Patent. Patented Jan. 30, 1912.

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To all whom it may concern:

Be it known that I, ALFRED H. FRANCFORT, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Hydraulic Rams, of which the following is a full, clear, and exact description.

This invention relates to hydraulic rams, and has for its object an improved construction of the main valve or gate of such devices, whereby greater efficiency of the device as a whole may be obtained, while minimizing the shock or jar incident to the operation of devices of this character.

A further object of the invention is to devise a form of valve adapted for use in connection with apparatus of this character in which the parts while being very light in construction, nevertheless possess practically a maximum of strength; being of a novel construction heretofore never employed to the best of applicant's knowledge in any device of this or a similar character.

A still further object of the invention is to provide a valve which shall operate more quickly and abruptly than those heretofore used in ram constructions, whereby to check the flow of fluid in the ram with a maximum degree of suddenness.

These and other objects of my invention will be hereinafter described and more particularly set forth in the appended claims.

In the drawings which form a part hereof and in which like reference characters designate like parts throughout the several views: Figure 1 is a side elevation of a hydraulic ram constructed in accordance with the principles of my invention. Fig. 2 is a vertical longitudinal section of said ram. Fig. 3 is a plan of said ram; and Fig. 4 is a detail of an air vent used therein.

In general it may be stated that the efficiency of a hydraulic ram is largely dependent upon the abruptness with which the main valve thereof is closed, and since the closure of this valve is effected by the fluid pressure, the suddenness with which it closes can be increased by enlarging the total effective area of the operative part or parts acted upon by such pressure and by diminishing the weight of the individual movable parts and thereby correspondingly reducing the inertia thereof. In my Patent No. 845,402, issued Feb. 26, 1907, I disclosed a valve construction, such that a considerable increase in efficiency in rams embodying the same was obtained over rams in use up to that time. I have now discovered that it is possible to still more markedly increase the efficiency of these devices by means of the novel valve to be hereinafter described, in which in place of having a stationary seat as in all other devices of this character as heretofore constructed, I employ what is in effect a movable seat, or, preferably, the seat may be substantially a duplicate of the valve so that said parts actually constitute a valve consisting of a plurality of elements which are adapted to approach and recede from each other, the closure of the valve being preferably effected by the juxtaposition of the seating faces of the movable elements.

Referring now to Fig. 1, wherein is exemplified one form of my device, the ram casing which is preferably in two sections 1, 1′, has therein the usual main central chamber, the respective portions of which have been designated 2, 2′, and an inlet pipe 3, through which the fluid is admitted from the drive pipe. The casing is adapted to be firmly supported in an upright or any desired position, the base thereof being preferably stiffened with flanges 4, 5, 6 and 7. The casing is divided as at 8 to facilitate the construction thereof, flanges 5 and 6 extending around the abutting ends of the respective portions 1, 1′ of the casing and being secured together by means of bolts 9, or the like. Communicating with the portion 2′ of the central chamber is the main valve or gate broadly designated 10.

An equalizing chamber 11 is in communication with that portion of the chamber designated 2 by means of a series of check valves 12, which serve to prevent the return of liquid impelled therethrough into said equalizing chamber. The usual air valve 13 which is employed in this class of apparatus to supply a small quantity of air to the fluid so as to compensate for that absorbed by the water in the equalizing chamber 11, is preferably disposed in one side of the casing section 1 as shown in Figs. 1 and 2. The equalizing chamber may be formed of a sheet metal cylinder 14, the upper extremity of which is closed by a dome secured thereto in any suitable manner, the cylinder being held in place upon the table-like surface 16, provided at the upper portion of casing section 1, by means of an annulus 17. The table 16 affords a seat for

the valves 12, which latter may be of any suitable or known construction. The exhaust conduit 18 from the equalizing chamber is preferably formed integrally with the casing 1. The main valve 10 consists of two valve elements 19, 19′, which are respectively pivotally connected to the casing at 20, 20′, by means of levers 21, 21′. The lever 21 is substantially straight and is of the first-class, the long arm thereof being adjustably secured to the valve element 19, while the short arm 22 of said lever projects below the pivotal point 20, and has the extremity thereof pivotally connected to a link 23. Lever 21′ however is of the second-class and preferably has a protuberance or lug 24 thereon which is in turn pivotally connected to the other end of link 23; the points of connection being such that the valve elements will tend to move in unison into valve opening or closing relationship. These valve elements may each have somewhat the form of a truncated cone; the truncated portions of the respective cones being preferably adapted to abut against each other substantially on the median line of the valve. Each of the elements may be provided with flanges 25 which may be grooved as at 26 for the reception of packing rings of rubber, or the like, so that when the respective elements are in juxtaposition, a liquid tight closure is effected therebetween. Buffer brackets 28 are carried by each of these valve elements and are adapted to engage the respective arcuate portions of a rod 29; this rod being preferably round and bent as shown in Fig. 2. Brackets 28 are adapted to engage springs 30 when the elements are in open valve position, these springs serving to take up the shock due to the falling of the said elements into such relationship. The amount of opening between the elements is adjustable by means of collars 31, which may be provided with set screws 32′, said collars being movable along the rod 30; the set screws affording means for locking said collars in any position desired. When the valve elements are in closed position, the enlarged ends thereof are adapted to effect a substantially liquid tight closure by engaging suitable packing rings 32 which are disposed within substantially circular apertures provided in plates 33, which may be secured to the casing in any suitable manner; the packing rings 32 being held in position by means of glands 34, or the like.

The operation of the device is as follows: Water flows through the inlet pipe connection 3 into the portion 2′ of the main chamber, and since the valves 12 are normally held closed under moderate pressure, the liquid will flow upward through the casing and out through the respective conical valve elements upon both sides of the median line of the valve; valve elements 19, 19′, being in open position, which they tend normally to assume by reason of the fact that their respective centers of gravity are beyond the perpendiculars passing through the respective pivotal points 20, 20′. Water will of course also escape around the base of the respective conical elements, and out through the opening between said elements and the plates 33. When the water has attained a sufficient velocity, the pressure which it exerts upon the respective valve elements will be sufficient to force the latter upwardly and toward each other into valve closing relationship. By reason of the fact that these elements are coned interiorly, the effective closing pressure exerted upon said elements is considerable; and the total area subjected to this pressure is that of not merely one valve element, but of both. It should further be noted that when in open position the valve elements in effect constitute a pair of nozzles which are angularly disposed with respect to each other so that the streams of water issuing from said nozzles impinge against each other substantially on the median line of the valve, but since the impinging streams are angularly disposed with respect to each other, this impingement does not materially interfere with the issuance of fluid through the respective nozzles, but merely forms a sheet of water which is disposed substantially in the vertical plane passing through the said median line. When the valve elements start to move upwardly into closed relationship, the angle between these streams gradually becomes more oblique, but the velocity which the elements will acquire when moving upwardly is such that they will be thrown together with great abruptness, the shock of impact being cushioned, however, by reason of sheet of water formed by the, at such time, diametrically opposing streams. This action is of very material importance in that it conserves the life of the mechanism and the operative parts thereof. At the same instant that closure is effected on the median line of the valve, the enlarged outer ends of the elements thereof correspondingly seal the openings in the plates 33. It will be observed that, when in open position, flow of water is permitted through virtually four openings, to wit, through the respective nozzles and around the outsides thereof, which openings are all simultaneously and very abruptly closed, affording the requisite suddenness of action whereby to obtain a maximum of efficiency. The flow of water through the valve having been thus abruptly checked, the momentum acquired by the bulk of the fluid in the central chamber causes such fluid to exert considerable pressure against and to thereby force open the valves 12; injecting fluid under relatively high pressure

into the equalizing chamber 11 from whence it flows through the conduit 18. When the momentum of the water in the central chamber has thus been utilized to force water into the equalizing chamber, the up-lifting pressure exerted by the water against the valve elements 19, 19′ decreases to a point where such elements may drop under the influence of gravity; the said elements swinging apart in guided relationship and at substantially equal rates until the brackets 28 impinge upon the buffer springs 30; the shock of the falling valves being taken up by said springs. It will thus be seen that I have not only devised a valve mechanism in which a very large opening is closed in a minimum of time, but also one in which the operation of the movable parts are cushioned most effectively against the shock of operation, and the mechanism herein presented hence meets the requirements with a maximum of efficiency, in every particular.

While I have shown and described one form of apparatus adapted for the purpose in question, I do not wish to be limited to such specific form since it is obvious that various changes may be made in and to the several parts without departing from the spirit of the invention herein set forth. The breadth of the invention is hence to be deemed as being limited only by the scope of the appended claims.

In conclusion it may be pointed out that the valve elements 19, 19′, are adjustably but preferably quite firmly secured to the respective levers 21, 21′ by means of set screws 35, or the like. This feature permits of properly abutting the valve elements before clamping or otherwise securing the same to their supporting levers.

Having described my invention, what I claim, is:

1. In a hydraulic ram, a valve comprising a movable element having a passage therein through which liquid may flow, said element having a sloping wall, and a member having an aperture therein in which said element is adapted to move, said member being adapted to co-act with said sloping wall to form a substantially liquid tight closure, and separate, auxiliary means for stopping the flow of fluid through the passage in said movable element.

2. In a hydraulic ram, a valve comprising a plurality of pivotally mounted juxtaposable elements adapted to be swung toward and from each other, one at least of said elements having a fluid passage therein, flow of fluid through said passage being substantially prevented when said elements are in juxtaposition.

3. In a hydraulic ram, a valve comprising a plurality of juxtaposable elements adapted to be moved toward and from each other, one at least of said elements having a fluid passage therein, flow of fluid through said passage being substantially prevented when said elements are in juxtaposition.

4. In a hydraulic ram, a valve comprising a pivotally mounted element having a passage therein through which fluid may flow, and co-acting means for shutting off the flow of fluid through said passage, said means comprising a second pivotally mounted element.

5. In a hydraulic ram, a valve comprising a pivotally mounted element having a passage therein through which fluid may flow, co-acting means for shutting off the flow of fluid through said passage, said means comprising a second pivotally mounted element, and means for substantially preventing shock when said elements are in operation.

6. In a hydraulic ram, a valve comprising a pivotally mounted element having a passage therein through which fluid may flow, co-acting means for shutting off the flow of fluid through said passage, said means comprising a second pivotally mounted element, and means for substantially preventing shock when said elements are in operation, said shock preventing means comprising resilient buffers.

7. In a hydraulic ram, two substantially similar co-acting hollow valve elements, through which fluid may flow, and movable by the pressure of fluid thereagainst, said elements permitting of the flow of said fluid through said valve when in open position and substantially preventing the flow of said fluid when in valve closing relationship, said elements being simultaneously movable in opposite directions with respect to each other.

8. In a hydraulic ram, two elements adapted to be moved toward each other by fluid pressure, said elements having passages therein through which the fluid may flow when said elements are in retracted position, the flow of said fluid being substantially prevented when the elements have been moved toward each other the limit of their respective travels.

9. In a hydraulic ram, two elements adapted to be moved toward each other by fluid pressure, said elements having passages therein through which the fluid may flow when said elements are in retracted position, the flow of said fluid being substantially prevented when the elements have been moved toward each other the limit of their respective travels, and means for preventing the flow of water around said elements when so positioned.

10. In a hydraulic ram, a valve comprising a hollow element having flaring inner walls and formed to permit the passage of fluid therethrough, said element being movable by fluid pressure into valve closing position and movable by gravity into valve

opening position, and movable means co-acting with said element when in valve closing position to prevent the flow of fluid therethrough.

11. In a hydraulic ram, a plurality of movable apertured valve elements mounted to permit the flow of fluid therethrough when in open valve position, said elements being displaceable with respect to each other by fluid pressure, and means co-acting with said elements when the latter are in closed valve position for preventing the flow of fluid therethrough.

12. In a hydraulic ram, a plurality of movable apertured valve elements mounted to permit the flow of fluid therearound and therethrough when in open valve position, said elements being displaceable with respect to each other by fluid pressure, and means co-acting with said elements when the latter are in closed valve position for preventing the flow of fluid therethrough and therearound.

13. In a hydraulic ram, a valve comprising an element movable by the pressure fluid used in said ram, said element having a relatively large passage therein, as compared to the size of said element, through which said fluid may flow, and co-acting means for shutting off the flow of fluid through said passage, said means comprising a second element, also movable by said pressure fluid.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

ALFRED H. FRANCFORT.

Witnesses:
WALDO M. CHAPIN,
JAMES DE ANTONIO.