Aug. 20, 1929. C. E. HELMICK 1,725,637

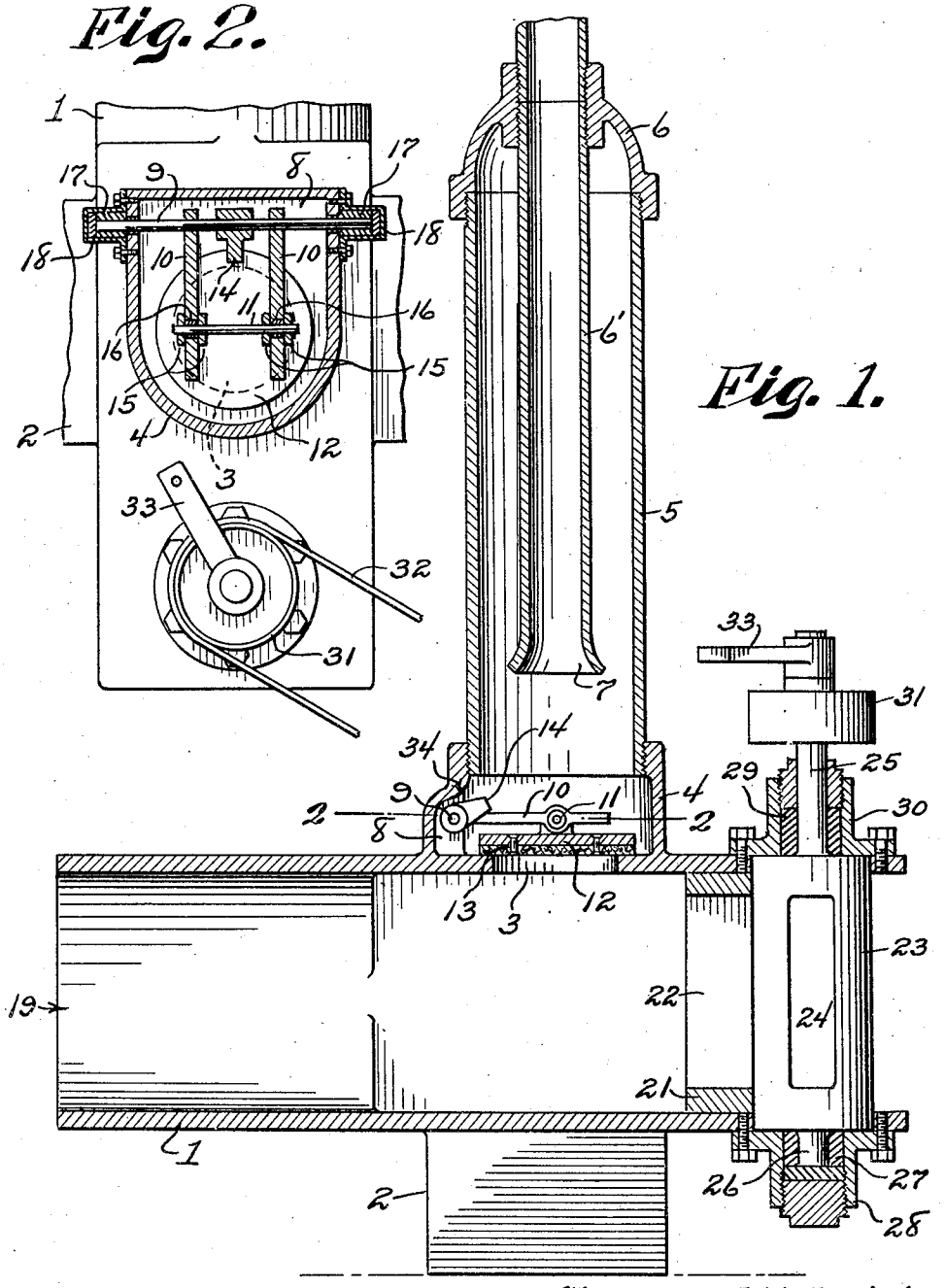
SUPERHYDRAULIC RAM

Original Filed Aug. 26, 1927

Fig. 2.




Fig. 1.

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# UNITED STATES PATENT OFFICE.

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## SUPERHYDRAULIC RAM.

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My present invention has reference to a hydraulic ram and my object is the provision of a ram for this purpose which will overcome the deficiencies of hydraulic rams of the usual constructions by overcoming the power of the "water-hammer" which prevents the practicability of the use of a penstock or drive pipe of greater than a comparatively small diameter and which likewise prevents a continuous and constant flow of water and the elevation thereof beyond a certain height.

A further object is the provision of a hydraulic ram in which a discharge valve of an especially and peculiar construction is employed, hinged only at one point to permit of a perfect conformity of the valve face with the valve seat and in which an exhaust valve of either a reciprocatory or rotary type is provided and operated by suitable mechanism so that the ram is not of the automatic type but wherein the construction of the same is such that the closing of the exhaust valve permits of a high intense pressure of water opening the discharge valve and being directed into the compression chamber, where the air is compressed by a series of violent waves of resultant pressure which applies weight to the mass of water, stores up the pressure waves, seats the discharge valve and produces a continuous flow of water through the discharge pipe, and likewise wherein the continuous opening and operation of the exhaust valve produces an alternating impulse of pressure and relax of such pressure in the compression chamber to positively assure a free and constant flow of water through the discharge pipe and the elevating thereof to any desired height.

A still further object is the provision of a hydraulic ram in which the valves employed are seated in bearings of a construction which are lubricated by contact of water therewith.

The invention will be fully and comprehensively understood from a consideration of the following detailed description when read in connection with the accompanying drawings which form part of the application, with the understanding, however, that the improvement is capable of extended application and is not confined to the exact showing of the drawings nor to the precise construction described and, therefore, such changes and modifications may be made therefrom as do not affect the spirit of the invention nor exceed the scope thereof as expressed in the appended claims.

In the drawings:

Figure 1 is an approximately vertical central longitudinal sectional view through my improved hydraulic ram.

Figure 2 is a sectional view on the line 2—2 of Figure 1.

The ram has its lower portion, of course, arranged in a flowing body of water, the same including a conduit 1, which is preferably mounted upon a suitable base 2 and thereby elevated above the body of water. The pipe member or conduit 1 has on its top a round opening 3 and disposed away from but surrounding this opening the said top is further provided with an upstanding annular flange 4. To this flange, there is screwed or otherwise secured the lower end of the compression chamber 5. The top of the chamber 5 is closed by a dome-like cap 6, and threaded through the center of this cap and entering the compression chamber 5 there is a water outlet pipe 6′. The lower branch of this pipe is flared outwardly, as at 7, and the same is disposed a slight but suitable distance above the conduit 1.

The flange 4 has an inner chambered portion 8 on one of its sides, in which there is mounted a shaft 9 that carries an outstanding arm 10. To this arm there is pivoted, as at 11, the valve 12 that closes the opening 3. This valve 12 is in the nature of a disc and comprises two members. The valve is preferably of a compressible nature and the members constituting the same are riveted or otherwise connected together, as indicated by the numeral 13. On the shaft 9 there is fixed a finger 14 and this finger is in the path of contact with the upper and angle wall provided by the chamber 8 so that the opening of the valve is thus limited. As disclosed by the drawings there is arranged on the shaft 9 two arms 10 which are suitably spaced, and by reference to Figure 6 of the drawings it will be seen that the finger 14 is disposed between these arms. Also it will be noted that the pivot or shaft 11 passes through spaced ears 15 on the valve, and that the said pivot passes through a bearing in the arms. These bearings 16, are of the lignum vitæ type and consequently are lubricated by the water contacting therewith. The bearings for the shaft 9 are also of lignum

vitæ type. These bearings, indicated by the numeral 17, are received in suitable closed caps or housings 18 that are fixed to the sides of the flange 4.

For distinction the intake end of the conduit 1 is indicated by the numeral 19. At the outlet end of the said conduit there is received in the conduit and fixed thereto, by means 20, a hollow extension 21. The outer end of the extension 21 is concaved and provides a seat or rest for a rotary valve 23. The valve has an alining transverse port 24 which communicates with the hollow extension 21. The valve has upper and lower stems 25 and 26, respectively, the stem 25 being in the nature of a stop and being received in a bearing of the lignum vitæ type, 27, that is suitably housed in a casing 28 that is fixed on the top and bottom of the conduit that extends beyond the hollow member 21. The sides of the conduit, at the said extending and outlet end are cutaway. The upper stem 25 for the valve 23 is received through a lignum vitæ bearing 29 that is in turn received in a suitable housing 30 fixed in the top of the conduit. The stem 25 may have on its upper end a belt wheel 31 around which a belt 32 is trained, the said belt being connected to any desired source of power which will revolve the valve 23 in proper timed relation to aline with and out of registration with the hollow member 21 of the conduit 19. If desired and as disclosed by the drawings there may be fixed on the stem 25 above the belt wheel 31 an arm 33, and the arm may be connected to any desired source of power which will impart a reciprocatory turning to the valve 23.

With my improvement the outlet or discharge pipes may be of any desired height and preferably decrease in cross sectional diameter from the inner to the outer ends thereof. Also with my improvement it will be noted that the water flowing through the conduit will open the valve 12. The opening of this valve is limited by the contact of the finger 14 with the shoulder 34 in the flange 4, so that the water will partly enter the flared or bell-shaped end of the pipe 8 and compress air thereabove in the chamber 5. The force of this water will close the valve so that air is compressed in uniformity in the said chamber 5. The opening of the valve permits of the free flow of the water through the conduit but the compressed air in the chamber 5 and the volume of water therein will close the valve 12, causing the water from the chamber to pass in an even flow through the outlet pipe 6. With my improvement all of the power developed by what is known as the "water-hammer" in the ordinary rams is utilized in the discharge of the water, and also with my improvement the energy is stored to aid in a continuity of flow in the discharge pipe so that the water pressure, wasted in the ordinary rams, is thus utilized. Also it is to be noted that the surge pipe within the compression chamber may be modified to properly function under different conditions.

The improvement is of an extremely simple construction and the advantages thereof, will, it is thought, be readily apparent to those skilled in the art.

Having described the invention, I claim:—

1. A hydraulic ram including a water conduit, a chamber on the top thereof having a restricted communication therewith, a bell-shaped cap closing the top of the chamber, an outlet pipe screwed through the cap and having a portion entering the chamber and said portion having a bell-shaped end, a valve comprising two connected compressible discs for closing the passage between the conduit and the chamber, a shaft journaled in water lubricating bearings, arms extending therefrom pivotally connected to the top of the valve, a finger on the shaft for limiting the opening of the valve and a revoluble valve having stems journaled in water lubricating bearings at the outlet end of the conduit, in combination with means for actuating said valve.

2. A hydraulic ram including a conduit through which water passes, said valve having a large opening in the top thereof, an annular flange disposed away but surrounding the opening and having a pocket in one of the walls thereof, a compression chamber fixed to the valve and extending thereabove, a conical cap member closing the outer end of the compression chamber, an outlet pipe screwed through the cap and entering the chamber and having a lower outwardly flared end, a valve comprising two discs for closing the opening in the conduit, a shaft journaled in water lubricating bearings in the ends of the pocket, spaced arms extending from the shaft, pivotally connected to the valve, a finger fixed on the shaft in the path of contact with the upper wall of the pocket for limiting the opening of the valve, a hollow member fixed in the outlet end of the conduit and having its wall concaved, and said conduit, outward of said member, having its sides cutaway, a cylindrical valve having a transverse passage therethrough and having stems on the opposite ends thereof, which latter are journaled in water lubricating bearings in the top and bottom at the cut-away portions of the conduit and said valve designed to be received in the concaved end of the hollow member.

In testimony whereof I affix my signature.

CLARENCE E. HELMICK.