No. 881,314. PATENTED MAR. 10, 1908.

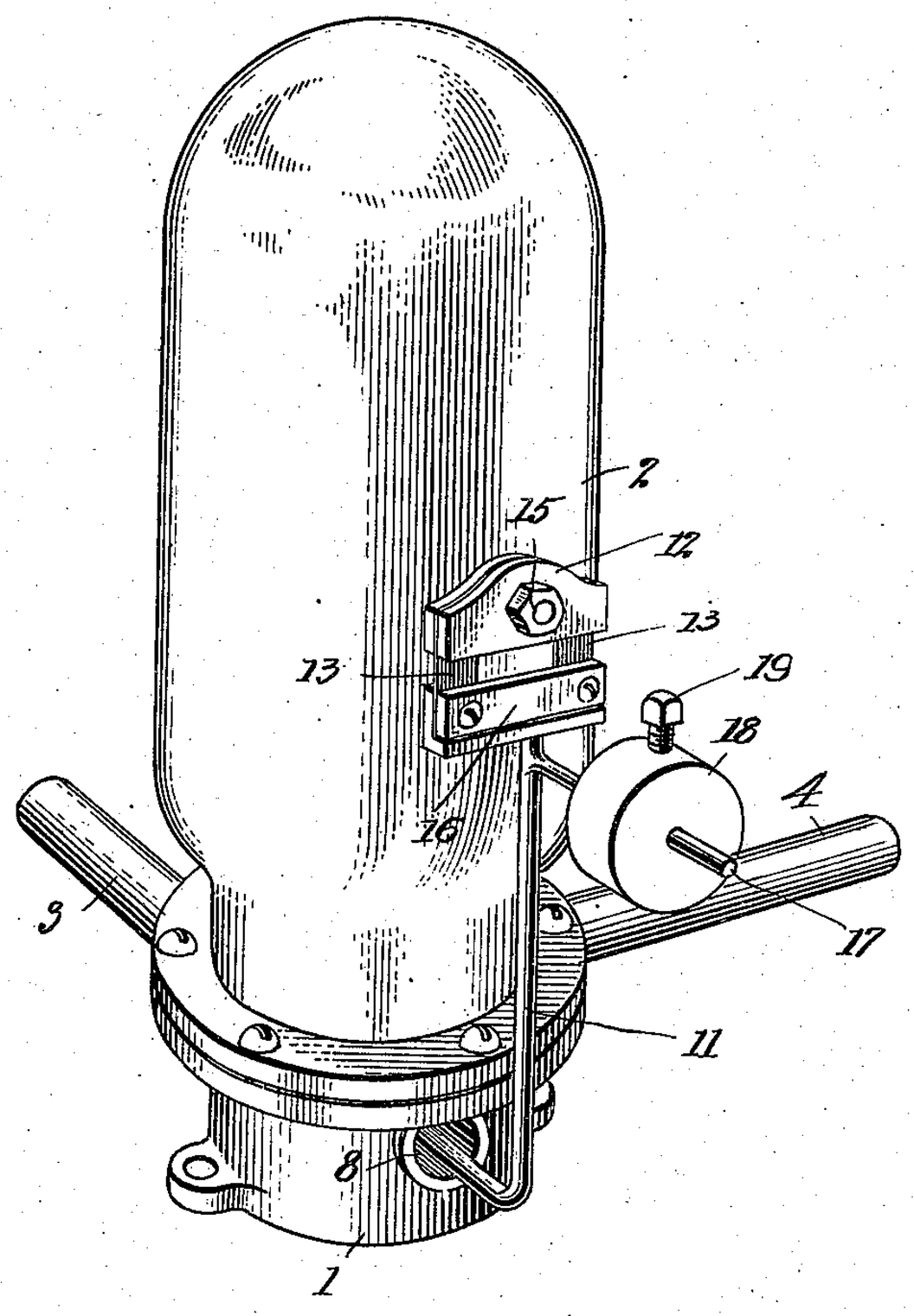
A. H. FRANCFORT.

HYDRAULIC RAM.

APPLICATION FILED FEB. 26, 1907.

2 SHEETS—SHEET 1.

Fig. 1



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2 SHEETS—SHEET 2.

Fig. 2.

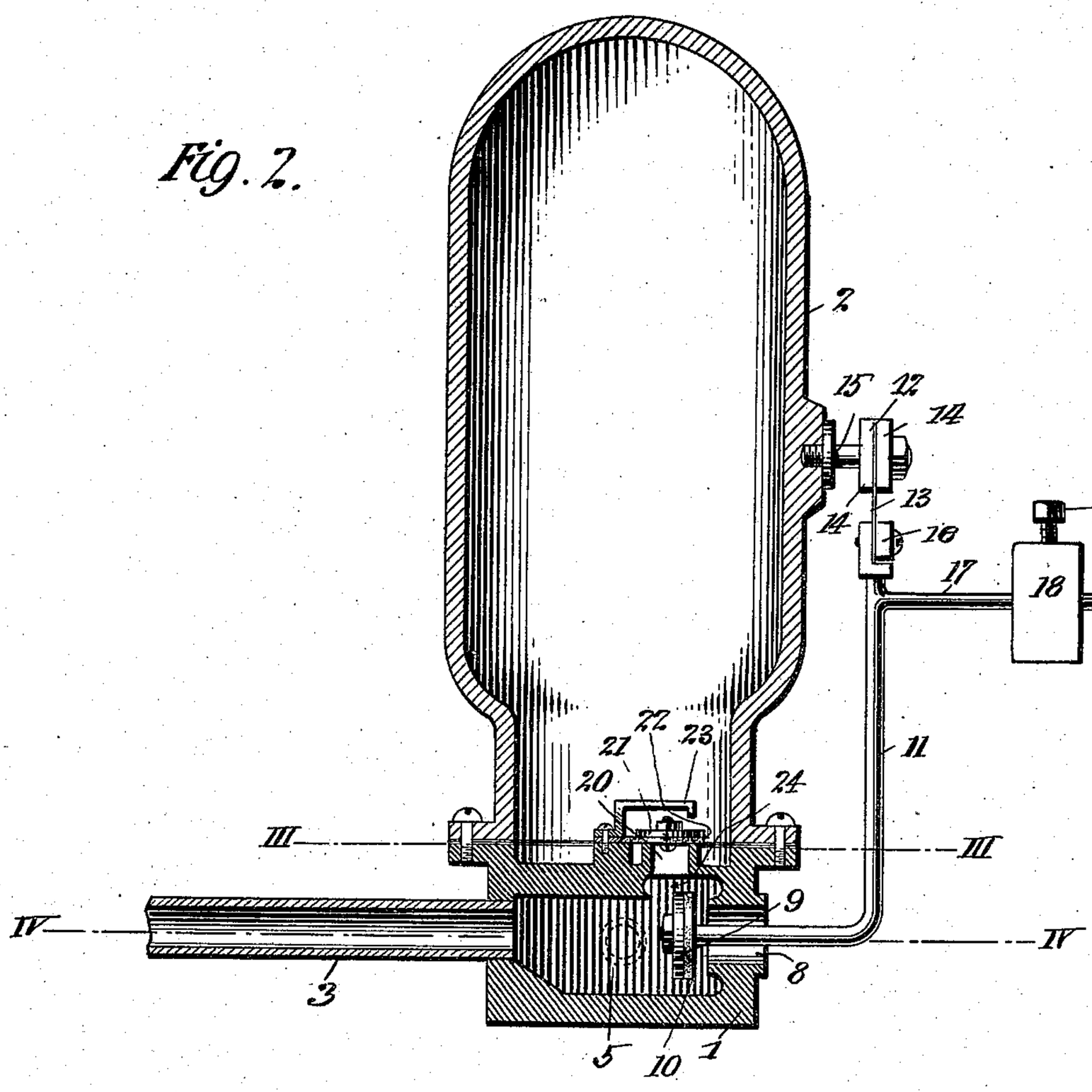


Fig. 3.

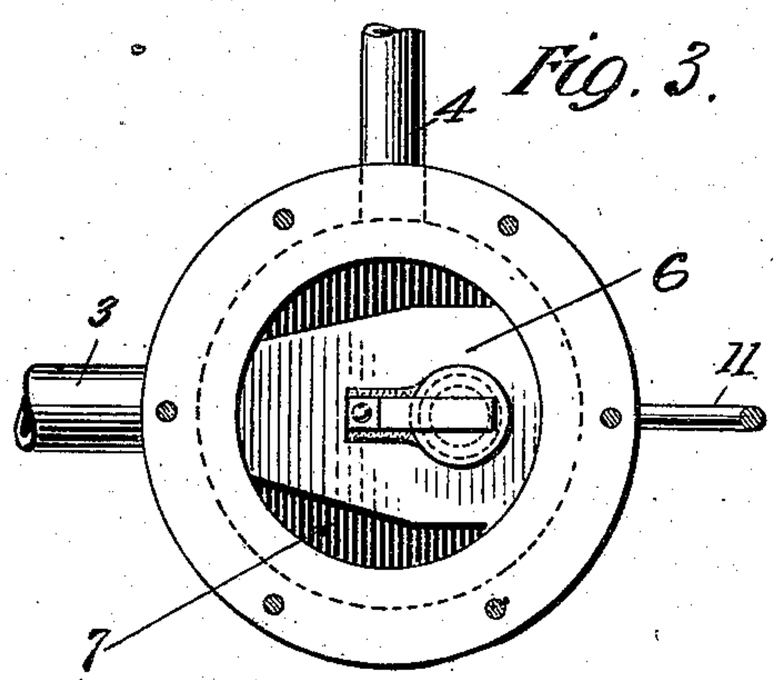
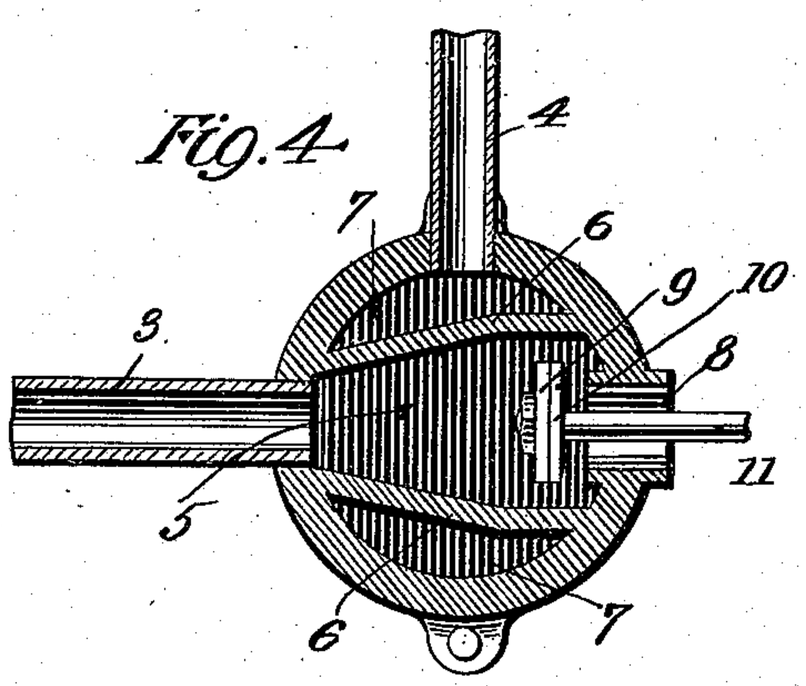


Fig. 4.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC RAM.

No. 881,314. Specification of Letters Patent. Patented March 10, 1908.

Application filed February 26, 1907. Serial No. 359,421.

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.

My invention relates to hydraulic rams, and particularly to several featurs of improvement therein by which it is rendered more efficient in operation, and more simple and durable in construction.

In hydraulic rams the fluid stream, the pressure of which it is desired to increase, is led through a drive pipe into a chamber having different outlet valves. These valves operate to intermittently check the flow of fluid in the drive pipe so as to obtain and make use of an increased pressure arising from the momentum of the fluid. These principles are well known and of universal application in all rams.

The present invention relates to certain improvements in the valve mechanism by which the flow of the fluid is checked more abruptly in the drive pipe, and certain other advantages obtained, which will be later more particularly pointed out.

With these objects in view the invention consists in the features of construction and combination hereinafter set forth and claimed.

In the drawings: Figure 1 is a perspective view showing the general appearance of a hydraulic ram embodying the principles of my invention; Fig. 2 is a sectional view of the same; Fig. 3 is a view of the line III—III of Fig. 2, looking downward; and Fig. 4 is a section on the line IV—IV of Fig. 2.

In addition to the general principles above outlined relating to the operation and efficiency and which I desire to improve, there are certain practical considerations in the use of hydraulic rams which give rise to annoyance and trouble. One such important practical consideration is the fact that the hydraulic ram is almost constantly in operation and is generally located at a river bank, or at some place where expert supervision is not given, so that the movable parts generally become badly worn at the pivots and journal bearings. When this occurs, the ram does not work properly and the bearings have to be renewed. In carrying out the present invention I aim to avoid the use of journals or bearings which require attention or lubrication. There is a further practical feature to be obtained in all hydraulic rams, and this is the introduction of a small body of air into the pressure chamber along with the water. A body of air is required in the pressure chamber to keep the pressure equalized, and unless this air is constantly replenished in the manner above mentioned, it will be soon carried away by the fluid which issues from the chamber. In some cases the air has been supplied through a small auxiliary valve, but in the present case I so form the valves and parts that it is supplied in the normal operation of the ram without any special valve.

Referring to the drawings in which like parts are designated by the same reference sign, 1 indicates the base, and 2 the pressure chamber of a hydraulic ram. The fluid is admitted through the drive pipe 3, and finally issues through the delivery pipe 4, to the point where it is to be used. The base 1 contains all of the valve mechanism for controlling the action, and it will be observed that this base is located directly beneath, and in a sense forms an extension of, the pressure chamber 2. I consider this arrangement as an important feature of the invention in that it secures a very compact arrangement of the parts, and certain other points of advantage which will later more particularly appear. The base 1 of the ram has an internal chamber 5, which is of considerably less size than the base, being narrow and elongated, and in the line of the drive pipe 3. This central chamber 5 is conveniently constructed in this way by having a web or partition 6, in the base which surrounds such chamber 5. In this way there are left two cavities 7, at either side of the chamber 5, and one of these cavities 7 is utilized as a passage or outlet connection to the delivery pipe 4. Also directly in line with the drive pipe 3 there is an opening 8, constituting the overflow valve. 9 designates the valve member therefor which is a metal disk or plate, having a washer 10. This valve member is fixed to the lower end of an angularly bent rod 11, which projects through the opening 8, and is flexibly hung to a part 12, of the fixed frame by flexible

strips 13, of resilient metal. The fixed part 12 of the frame is conveniently made of a pair of metal blocks 14, rigidly clamped together, and to the pressure chamber 2 by the stud bolts 15. The strips 13 of resilient metal are likewise anchored to the bent arm 11 by a suitable clamp or clamps 16. There is an extension 17 of the bent arm 11 adapted to receive a weight 18. This weight is adjustable on the extension 17 by means of a set screw 19.

The upper surface of the partition or wall 6 has a check valve 20, of any convenient form, for example, comprising a metallic disk 21, secured to a leather facing 22, and capable of slight vertical movement, limited by the overhang stop 23. It is evident that this valve allows fluid to pass up into the pressure chamber 2 whenever the pressure in the chamber 5 exceeds a certain amount.

I provide a special cavity directly beneath the valve 20, and I further so arrange the parts that the valve member 9 works partly in this cavity in its movement. The cavity is formed by coring out the metal of the base 1, as clearly shown at 24. And this cored-out portion is directly above the opening of the valve 8.

The operation is as follows: Under normal conditions the valve 9 is held open by the weight 18, and when fluid flows inward through the drive pipe 3, it passes into the chamber 5, and freely out through the opening 8. The path of the flow is therefore straight throughout, and the fluid quickly increases its velocity. After a very short interval of time the velocity is so great that the fluid stream impinging against the valve member 9 overcomes the gravity of the weight 18 and closes this valve. The pressure immediately mounts up in the chamber 5, due to the momentum of the fluid in the drive pipe, and becomes great enough to raise the valve member 21, and pass into the pressure chamber 2. When the flow is arrested, and its pressure has been utilized in this way, the valve member 21 closes, and the valve member 9 opens, and this cycle of movement is indefinitely repeated. All the movement of the valve member 9 takes place through the flexibility of the resilient metal strips 13. As these are not deformed beyond their elastic limit in the action, there is no wear, and this part of the mechanism lasts indefinitely.

The functions of the cavity 24 in supplying a small quantity of air at each actuation of the ram, are as follows: Whenever the valve 9 opens under the action of the weight 18, it creates a certain suction in such act, so that air enters from the outside and bubbles upward where it is immediately received and collected in said cavity 24. At this point it is in a position to be immediately impelled into the pressure chamber 2 with the next fluid charge. It is found that the amount of air admitted in this way is sufficient for all practical purposes in the operation of the ram. In some cases the pocket or cavity 24 may be omitted and still secure the above function to a certain extent. This is due to the arrangement of having the pressure chamber directly above the overflow valve. Both the pressure chamber and the check valve thereof are in intimate proximity and immediately above the valve member 9 of the overflow orifice, so that the bubbles of air which find their way inward through the overflow pass immediately upward into the pressure chamber and are not again expelled through the overflow orifice, as in the usual construction of hydraulic rams.

What I claim, is:—

A hydraulic ram having a base with an interior chamber having a valve opening and a flat inside upper face, a valve member within the chamber and comprising a disk coöperating with said opening and disposed in a substantially vertical plane perpendicular to said flat face, said chamber having a pocket or cavity 24 in said flat upper face directly above the valve member and into which said valve member projects slightly, said cavity or pocket having a larger diameter at its interior than at its point of communication with said chamber, and a pressure chamber communicating with said cavity or pocket at the upper side thereof, said communication being the only one provided between said chambers.

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

ALFRED H. FRANCFORT.

Witnesses:

WALDO M. CHAPIN,

MAY BIRD.