No. 706,727.

Patented Aug. 12, 1902.

W. L. DEMING.

HYDRAULIC RAM.

(Application filed Apr. 24, 1901.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

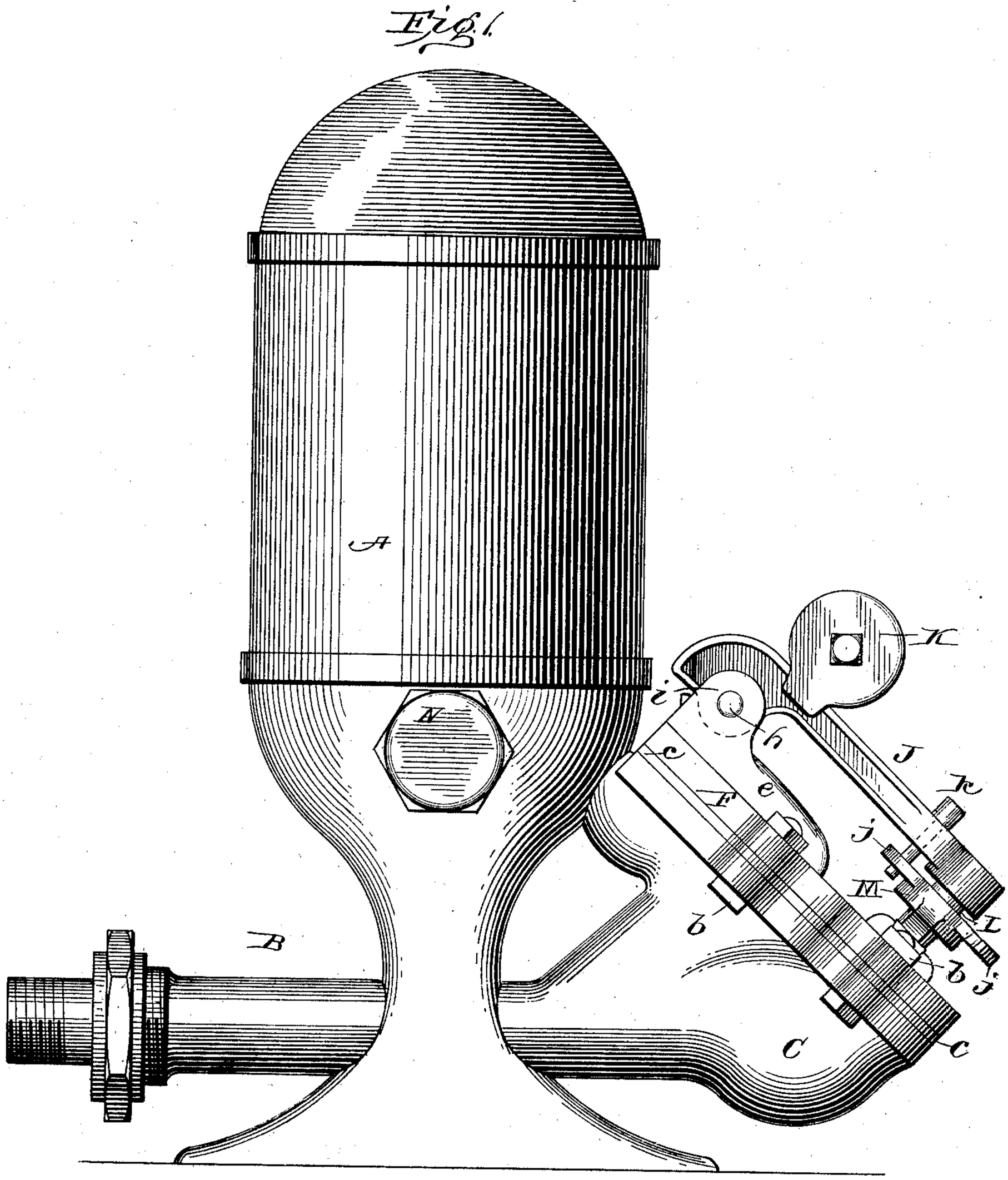

Fig. 5.

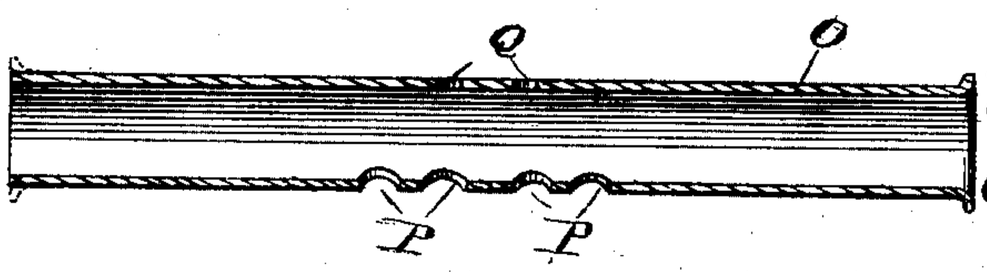

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Fig. 2.

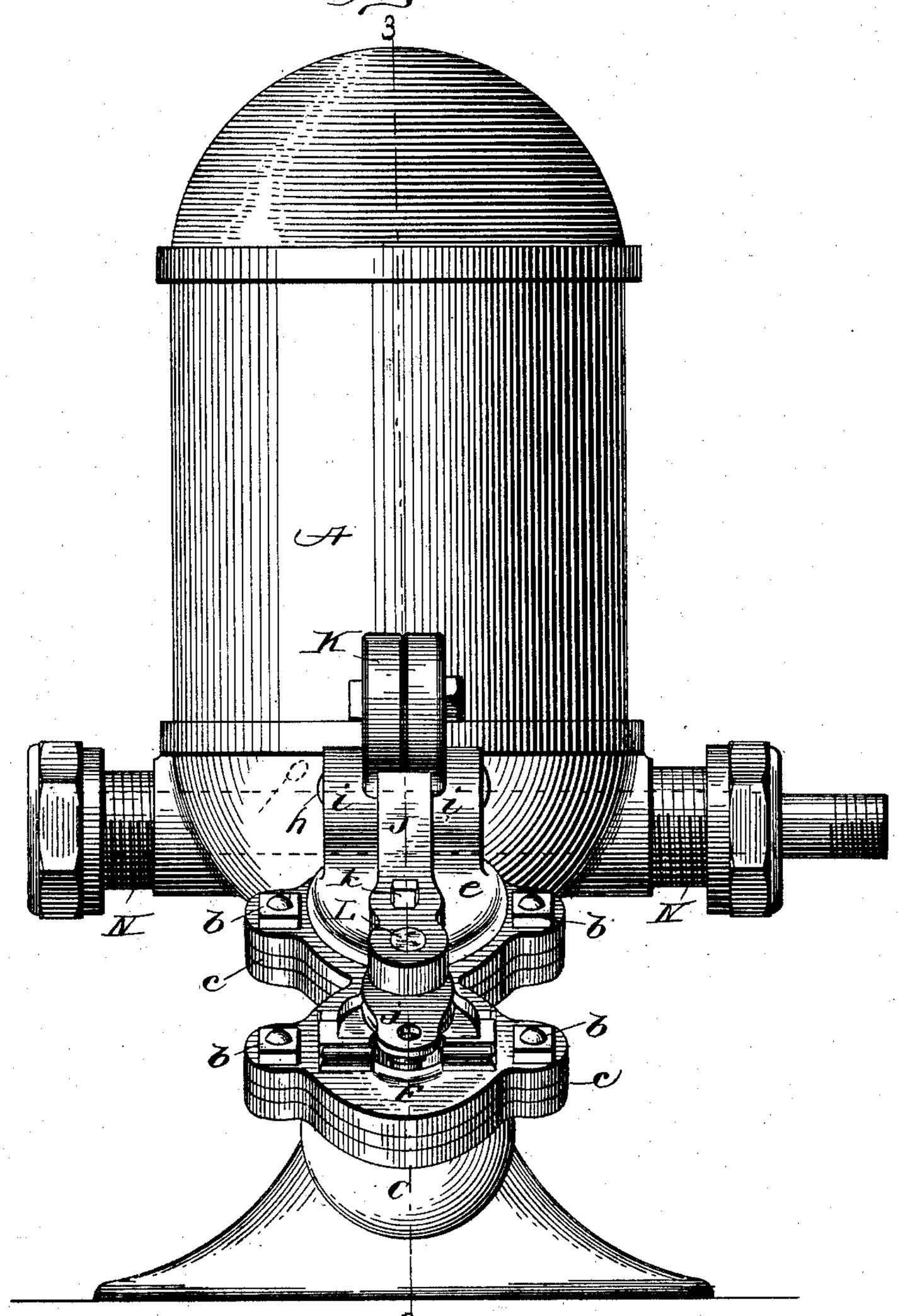
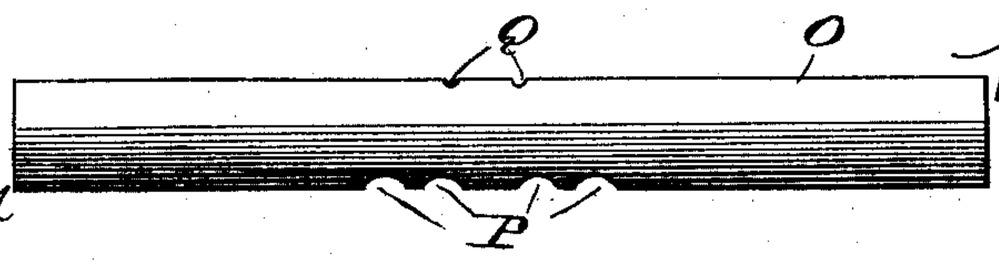


Fig. 4.



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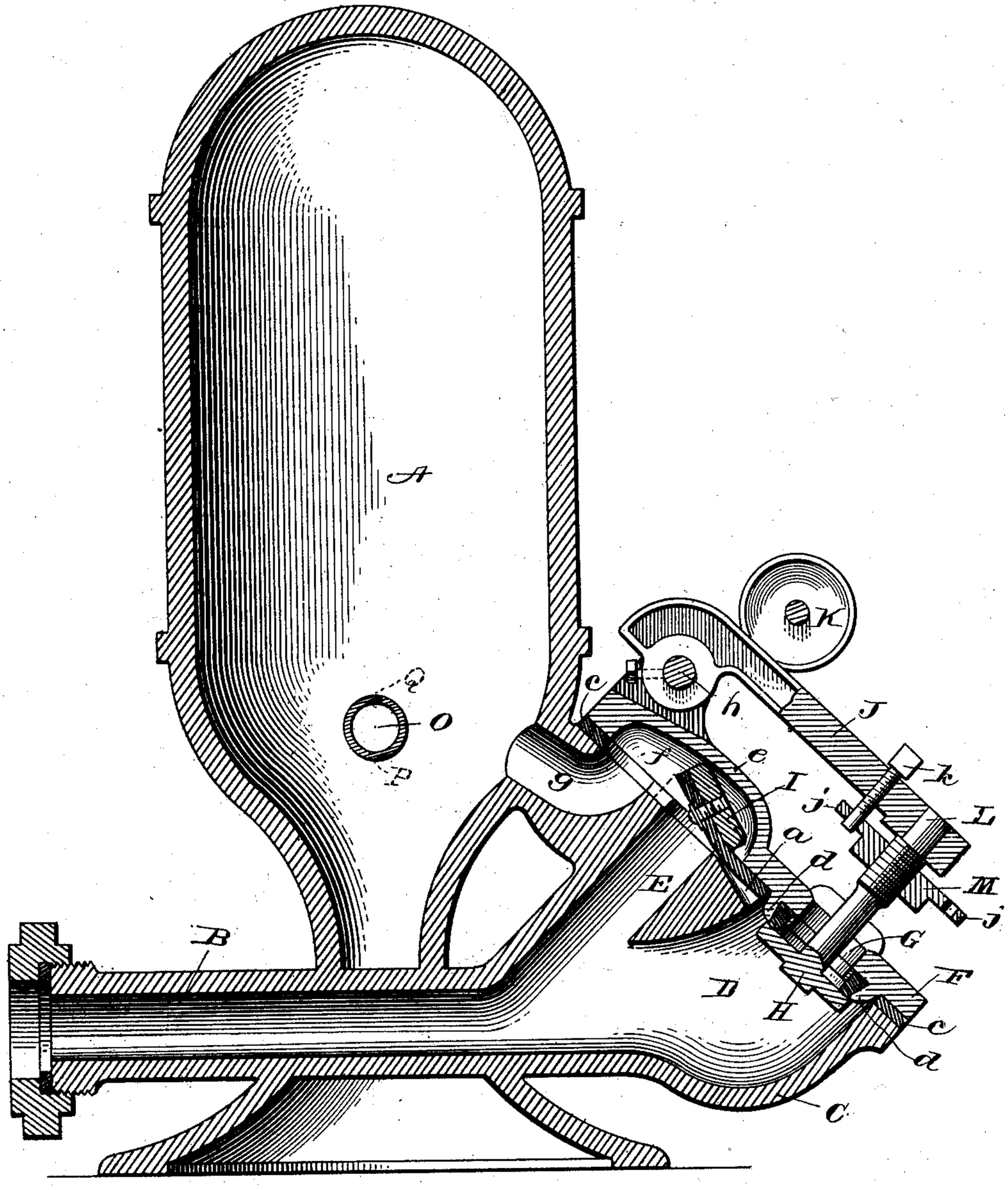
(No Model.) 3 Sheets—Sheet 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC RAM.

SPECIFICATION forming part of Letters Patent No. 706,727, dated August 12, 1902.

Application filed April 24, 1901. Serial No. 57,280. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. DEMING, a citizen of the United States, residing at Salem, in the county of Columbiana and State of Ohio, have invented certain new and useful Improvements in Hydraulic Rams; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to pumping apparatus, and has particular reference to that class of automatic pumps known as "hydraulic rams."

The chief object and purpose of my present invention is a general increase in the efficiency of pumps of this class, a result which is amply obtained by the novel construction and relative arrangement of parts hereinafter set forth.

Additional objects and advantages of the invention reside in its simplicity of construction and consequent facility of manufacture, its durability and freedom from derangement, its easy adjustability to varying conditions, and special means for maintaining a uniform pressure in the air-chamber, which will hereinafter more fully and at large appear.

In the accompanying drawings, which form part of this specification, and whereon the same letters indicate corresponding parts in the several views, Figure 1 represents a side elevation of my invention. Fig. 2 is a front view thereof; Fig. 3, a central vertical section taken on the line 3 3 of Fig. 2. Fig. 4 is a side elevation of a combined air-pressure-regulating and water-discharge tube, and Fig. 5 is a longitudinal central section of said tube.

Reference being had to the accompanying drawings, which form part of this specification, and to the letters thereon, A indicates an air-chamber, B the lowermost underlying end of a drive-pipe, and C the enlarged extremity of said drive-pipe for reception of the valve mechanism, said chamber, pipe, and enlarged extremity being by preference cast integral. The enlargement C is provided with upwardly-extending waste and discharge ports D E, respectively, the latter terminating in a plane above that of the former and the two communicating through the medium of a small air-passage *a*, intersecting both at the upper edge, for purposes which will hereinafter appear.

Covering the entire extremity of pipe B is a single removable cap-plate F, secured in place by bolts *b b b b* and resting upon a suitable packing-gland *c*, the latter cut and perforated to conform to the outlines of said cap and permit passage therethrough of water without interruption. Likewise cap-plate F is broken by a discharge-outlet G, surrounding which on its under side is a suitably-packed valve-seat *d*, against which latter impinges the impetus-valve H of the invention. Near its upper end plate F is provided with an enlargement *e*, constituting a valve-chamber *f*, which communicates with air-chamber A by way of an interposed supply-duct *g*, also with discharge-port E and the air-passage *a* aforesaid, said port and passage being guarded by a discharge-valve I, hinged upon a portion of packing-gland *c*, as shown by Fig. 3.

Upon a stub-shaft *h*, mounted in lugs *i i*, rising above chamber *f*, is mounted a rocker-arm J, having clamped thereon an adjustable counterweight K. Secured to its extremity is a valve-stem L, carrying in turn the impetus-valve H, which accordingly moves to and from its seat in the arc of a circle having for its center the shaft *h* aforesaid. Upon the valve-stem L and in screw-threaded relation therewith is adjustably mounted a nut M for limiting the stroke of valve H, said nut being provided with perforated side lugs *j j* for reception of a locking-screw *k*, carried by the arm J and adapted to enter one of the perforations aforesaid.

At either side of air-chamber A are delivery-ports N N, to one or both of which may be secured service-pipes for delivering water to a supply-tank or other points of utilization, while intersecting said ports N N, and consequently passing entirely through the air-chamber above its base, is a combined air-

pressure-regulating and water-discharge tube O, located in a plane above that of the discharge-valve I. The under surface of tube O is broken by perforations P, which may be of any shape or number, provided their combined area is equal to or greater than that of the service pipe or pipes. Similarly the opposite or upper surface of tube O is provided with small air-vents Q Q, which for convenience in drilling are preferably located diametrically opposite the perforations P. These, however, may be located at any point or points throughout the length of said tube and permit the escape of air from chamber A into the service-pipe when the pressure becomes excessive, as will now more fully appear in a description of the operation of my invention.

Presuming the ram to be suitably located, the natural conditions and requirements to be present, the stroke of the impetus-valve H to have been regulated by raising or lowering nut M upon valve-stem L, and finally that said valve has been set against the given pressure by adjustment of counterweight K upon its supporting rocker-arm J, accumulated pressure of water in drive-pipe B closes valve H, whereupon the natural recoil of water beneath same causes a discharge into chamber A by way of port E, valve I, chamber *f*, and duct *g*. Pressure upon valve H being thus relieved, valve I is again seated and valve H unseated by gravity, a small quantity of air in the meantime entering passage *a* between said valves. The aforesaid alternate and automatic action of valves H I is thereupon repeated and continued, an additional supply of water and fresh air being forced into chamber A with each stroke of the valves, from whence the water is driven into and through the service-pipes of the system by expansion of the compressed air contained in chamber A.

In the early stages of hydraulic rams when there was no provision for recharging or augmenting the air-supply it frequently happened that such rams would become inoperative, the air being gradually freighted off with water from the air-chamber, leaving nothing but water in the latter and no means of driving it through the service-pipes. At the present time the better class of hydraulic rams provide, as in the present case, means for automatically augmenting the air-supply; but, nevertheless, difficulty is sometimes experienced by obtaining an undue proportion of compressed air in the air-chambers, such as A. To regulate and determine the proper ratio of air-pressure contained in chamber A under varying conditions and demands upon the system is therefore, as before stated, a very important object of the present invention, and this is satisfactorily accomplished by agency of the combined air-pressure-regulating and water-discharge tube O in the following manner: The inherent expansibility of compressed air contained in the upper portion of chamber A serves at all times to drive the water contained in the lower portion of said air-chamber into and through tube O by way of the perforations P in the under side thereof. The normal water-line being thus somewhat above said tube O, the duct *g* and chamber *f* as a consequence are always flooded and the valve I submerged, which fact insures at all times a body of water back of the discharge-valve I to assist in seating it. When, however, as is sometimes the case, the air-pressure becomes excessive, the water-line is then lowered until air-vents Q are exposed and unsealed, whereupon such excess of air passes off into the service-pipes simultaneously as water enters from below. Thus the water-line at no time falls below the center of tube O, and on the other hand rises to its normal depth in chamber A immediately after the excessive pressure is overcome, as above stated.

The above being a general description of my invention, its use, and operation, it should be understood that I by no means limit myself to the precise construction and arrangement of parts hereinbefore set forth. On the contrary, various changes and modifications may be made and substituted for parts herein shown and described without in the least departing from the spirit of the invention, which is as follows:

1. In a hydraulic ram the combination with suitable valve mechanism, an air-chamber and service-pipe; of a horizontally-arranged perforated pressure-regulating and water-discharge tube intersecting the air-chamber and communicating directly with said service-pipe, substantially as described.

2. In a hydraulic ram the combination with suitable valve mechanism, an air-chamber and service-pipe; of a horizontally-arranged perforated pressure-regulating and water-discharge tube intersecting and supported in opposite walls of said air-chamber and communicating directly with the service-pipe aforesaid, substantially as described.

3. In a hydraulic ram the combination with suitable valve mechanism, an air-chamber and service-pipe; of a horizontally-arranged perforated pressure-regulating and water-discharge tube intersecting opposite walls of said chamber below the normal water-line and communicating directly with the service-pipe aforesaid, substantially as described.

4. In a hydraulic ram the combination with suitable valve mechanism, an air-chamber and service-pipe; of a horizontally-arranged pressure-regulating and water-discharge tube intersecting the air-chamber and perforated by water-inlet ports and superimposed air-inlet ports, substantially as described.

5. In a hydraulic ram the combination with suitable valve mechanism, an air-chamber

and service-pipe; of a horizontal pressure-regulating and water-discharge tube intersecting opposite walls of said chamber and communicating directly with the service-pipe, and water and air inlet ports the latter located above the former in the tube aforesaid, substantially as described.

In testimony whereof I subscribe my signature in presence of two witnesses.

WILLIAM L. DEMING.

Witnesses:
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L. P. METZGER.