Oct. 7, 1930. J. P. MARCHAL 1,777,647

VALVE

Filed May 4, 1928

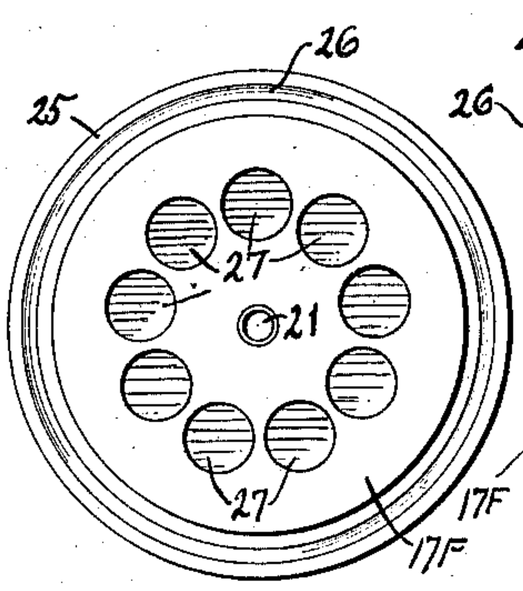

Fig. 1.

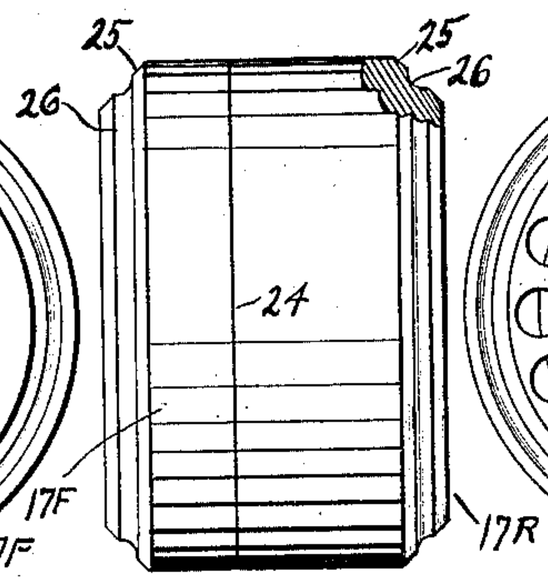

Fig. 2.

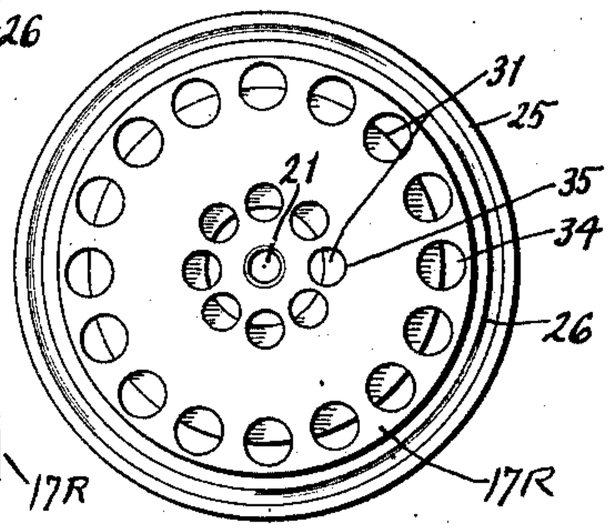

Fig. 3.

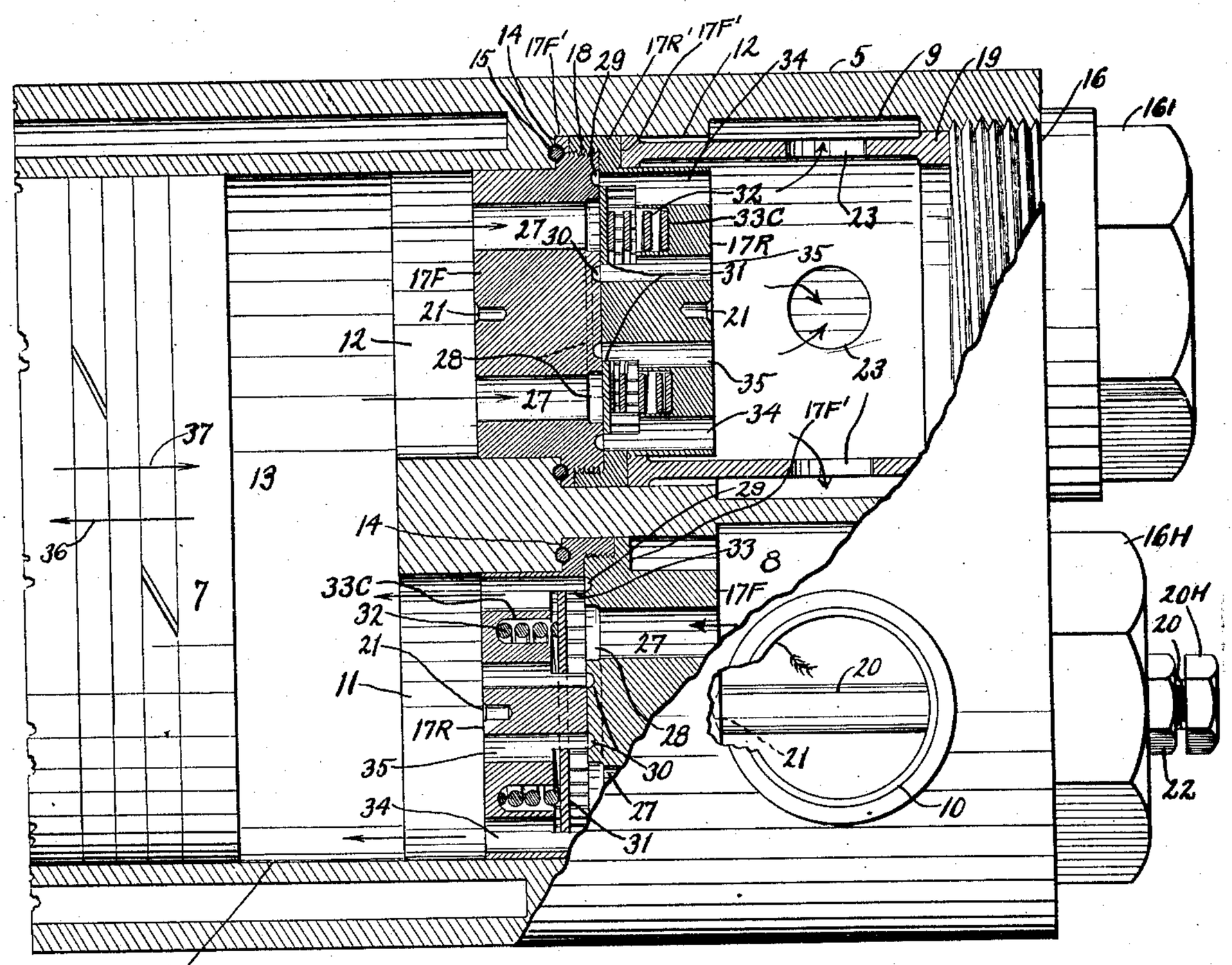

Fig. 4.

INVENTOR:
Joseph P. Marchal
BY David E. Carlsen
ATTORNEY

Patented Oct. 7, 1930 1,777,647

UNITED STATES PATENT OFFICE

JOSEPH P. MARCHAL, OF ST. PAUL, MINNESOTA

VALVE

Application filed May 4, 1928. Serial No. 275,062.

My invention relates to plate valves particularly adaptable for use in ammonia plants, compressors or other places where liquids, gaseous element or saturated gases are pumped, as by means of a piston, from one place to another. The main object of the invention is to provide a very simple, highly efficient but inexpensive valve embodying certain features of construction and simplicity such that its operation is not subject to clogging by metal particles and the flow of liquid or other elements is free and unobstructed. An important feature is the single and simple valve plate so seated and operated that its opening movement is very short yet allowing for maximum flow of gases or liquid. The plate stroke being very short it is obvious that the slapping action of a long stroke action is eliminated. Further objects and advantages of my valve will be fully set forth in the following specification, reference being had to the accompanying drawing, in which,—

Fig. 1 is a front end elevation of my improved valve.

Fig. 2 is a side elevation of my device, shown partly in section.

Fig. 3 is a rear end elevation, or might be considered as a right hand end elevation of Fig. 2.

Fig. 4 is mainly a longitudinal, central, section of what may be considered the head or compression chamber, intake and outlet parts of an ammonia pump as used for refrigerating plants and illustrated as an example of the use of my devices, two of said devices forming a modification of the valve in Fig. 1 being shown in operative position in longitudinal section.

Referring to the drawing by reference numerals I will first describe the compressor head of an ammonia pump engine used as an illustration of the use of my device though it is obvious that the device may be used either singly in straight bore conveying means not shown, or in pairs in a head as shown. The compressor head comprises a casing 5, bored as 6 for a reciprocable piston 7. 8 and 9 are respectively intake and outlet chambers in the head, the former having an intake port 10. Each chamber has a bore communicating with the compression chamber 13, said bore from chamber 8 being designated as 11 and the bore from chamber 9 designated 12. Both said bores are enlarged toward the chamber end providing a circular shoulder 14 serving as a seat for my valve cage, said seat may be provided with a circular groove for a packing ring 15 of any suitable compressible material. The head end the compressor may be threaded and closed centrally of each chamber with a threaded cap 16 having a polygonal outer part 16H to be engaged by a wrench.

My device comprises a round cage of cylindrical appearance inserted in the chambers 8—9 toward the piston and has a shoulder adapted to engage the seat 14 or its packing ring 15 and be pressed toward the seat 14 by means presently to be described.

In the form of my devices shown in Fig. 4 each device comprises two similar cylindrical body members or casings of identical diameter toward their free ends, said members hereinafter designated as the front casing member 17F and the rear casing member as 17R, both casings being formed with enlarged circular flange at their adjacent faces, one casing provided with female thread and the other with male thread to connect them concentrically, said threads being designated as 18 in Fig. 4, to flange of casing 17F designated as 17F′ and the corresponding flange of 17R designated as 17R′. In the upper part of Fig. 4, chamber 9 is occupied by a removable metal sleeve 19 slidable into the large part of bore 12 and its inner perimetral edge arranged to bear against flange 17R′, its outer edge being engaged by the threaded plug or cap 16 which may be adjusted to thus press my device securely and air-tight against the seat 14 and its packing 15. In the lower part of Fig. 4 my device is the same as in the upper chamber but instead of a sleeve 19 I use a center pin 20 threaded in cap 16H and extending inwardly to engage a small central counterbore 21 in the end of my device. 20H is the head of this pin exteriorly of the cap 16H and 22 is a lock nut under it. The sleeve 19 must be provided with suitable

outlets 23 for free passage of liquids or gases to chamber 9.

In Figs. 1, 2 and 3 my device is shown with no exterior flange, it being made with a plain cylindrical exterior, the casings 17R—17F threaded together as in Fig. 4 but only the abutting edges being indicated by line 24. At the perimeter of the opposite end faces they are chamfered, as 25 and said angular faces preferably each having a groove 26 to receive a circular packing ring such as 15 in Fig. 4. It will be understood that these faces 25 are angular or curved to correspond to the shape of seats to which the device is to be clamped.

I will now describe the plate valve, its automatic actuating means and the arrangement and operation of ports in the opposite members 17F and 17R.

Considering casing member 17F as the front member of my device, I provide a single row of circularly spaced holes 27 longitudinally therein, the inner ends of said holes communicating with a circular recess 28 in the inner face of said casing. Concentric of this recess is provided smaller outer recess 29 and a like inner recess 30 the circular faces thus provided between the recesses 28—29—30 comprising a seat for the valve plate 31 which resembles a common washer normally pressed against its seat by a single helical coil spring 32, made either of flat spring material as shown in the upper valve in Fig. 4 or of spring wire as shown in the lower valve in said Fig. 4. Said spring is seated in a circular pocket or counterbore 33C in casing 17R, and said counterbore being simply an inward continuation of a larger bore or pocket 33 in the inner face of casing 17R (see Fig. 4). Said casing is provided with two circular concentric rows of holes of which the outer ones are designated 34 and the inner ones as 35, (see Figs. 3 and 4), said outer holes being arranged in a circle of such diameter that they communicate with the recess 29 of casing 17F and the inner holes communicate with recess 30 of said casing 17F.

It will be readily seen that the valve plate can only travel as much as the depth of bore 33 in casing 17R will permit against the pressure of the spring. The area of holes 34 and 35 must be greater than the area of holes 27 in casing 17F. In Fig. 4 it will be seen that the lower valve plate 31 is drawn back from its seat, and although the distance it travels is short there is ample opening thus provided for liquids or gases to be drawn through apertures 27 and thence by said valve plate and through the holes 34 and 35 into chamber 13 when the piston moves away as to the left, indicated by arrow 36 (Fig. 4) and creating a semi-vacuum or suction which causes the valve plate to be moved against the spring action. The area of holes or ports 34—35 being greater than area of holes 27 it is obvious that the liquids or gases will flow freely and rapidly through the device into the compression chamber 13. On the return or compression stroke of piston 7 as in direction of arrow 37 in Fig. 4 it is obvious that the gases or liquids in the chamber will be expelled from the pump as through the upper valve in Fig. 4, said upper valve being mounted to operate in the opposite direction to the lower one and the gases or liquids pass through it under compression, out of cage 19 through its ports 23 and chamber 9 and to any suitable outlet (not shown) from said latter chamber.

From the above description the use and operation of my improved valve will be readily understood.

I claim:

1. In a valve comprising two casing members adapted to be detachably connected face to face and means for securing said valve in a bore and to regulate passage of gases or liquids therethrough; said casing members comprising an intake member provided with a large circular recess in its inner face and two concentric smaller recesses one outwardly and one inwardly of said large recess and a row of ports in said member communicating with said large recess; the other member comprising an outlet member provided with two concentric circular rows of ports aligned to communicate with said outer and inner recesses of the inner face of the intake casing, a ring shaped valve plate normally closing said large recess of the intake member, spring means pressing said plate to seating position thereon, said valve plate adapted to yield from its seat position against the pressure of said spring means when the pressure thereon through the ports of the intake casing is greater than the pressure in the ports of the outlet casing.

2. The structure specified in claim 1 in which said plate valve is of washer shape, and said outlet casing is provided with a similarly shaped shallow recess for the said plate to reciprocate in, and a secondary deeper recess concentric of said shallow recess, a helical compression coil spring seated in said latter recess and normally pressing said valve plate to position against the adjacent face of the intake casing.

3. The structure specified in claim 1 in which said plate valve is of washer shape, and said outlet casing is provided with a similarly shaped shallow recess for the said plate to reciprocate in, and a secondary deeper recess concentric of said shallow recess, a helical compression coil spring seated in said latter recess and normally pressing said valve plate to position against the adjacent face of the intake casing, said valve plate being of outside and inside diameters of such size as to leave free communication between the ports of the outlet casing and the

smaller recesses of the intake casing, and said plate arranged to open free passage from said ports in the intake casing and through both sets of ports in the outlet casing.

4. The structure specified in claim 1 in which the combined cross sectional area of the ports in the outlet casing are greater than the corresponding area of the ports in the intake casing, for the purpose set forth.

In testimony whereof I affix my signature.

JOSEPH P. MARCHAL.