

G. S. COFFIN.
VALVE.
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1,341,544.

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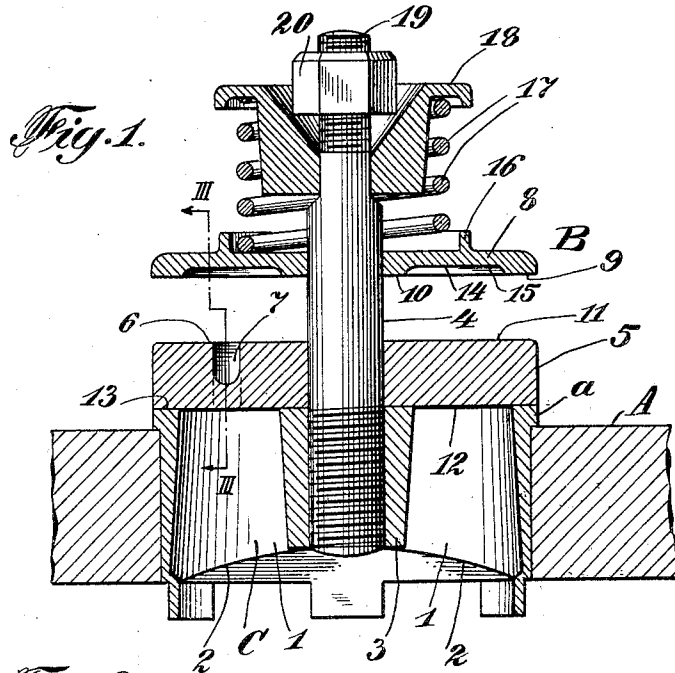


Fig. 2.

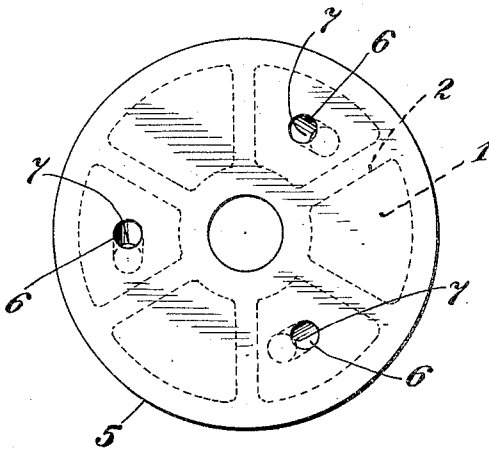


Fig. 4.

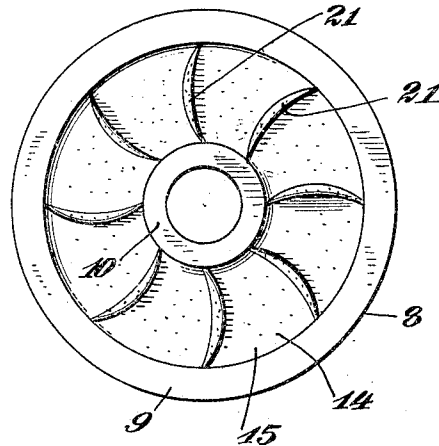
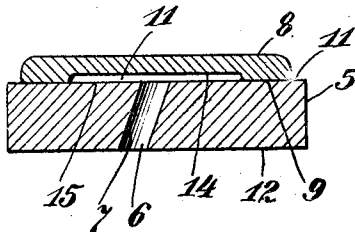


Fig. 3.

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VALVE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GRANGE S. COFFIN, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented a certain new and useful Improvement in Valves, set forth in the following specification.

This invention relates to valves, and more particularly to such that operate to open automatically in response to fluid pressure and close to check reverse flow. Such valves are exemplified in pumps. The object of the invention is to improve the means and method of effecting long life by insuring even-wear upon the fluid-sealing plate by effecting an automatic rotation of this plate when the valve is in service.

It has been appreciated by others that, if a valve-plate or disk constantly opens and closes against a valve-seat in the same relative rotary position, the valve-seat will tend to cut into the valve-plate locally and soon cause the valve to leak, whereas, if constantly new portions of the plate are presented to the seat upon each closing of the valve, the wear of the plate will be uniform and a tight valve will be insured.

The patent to Clark, 948,132, granted Feb. 1, 1910 for pump valve attempts to effect such rotation by inclined apertures through the fluid-sealing valve-plate which are covered when the valve is closed, by a flat faced cover-plate directly engaging the flat apertured face of the valve-plate. In this patented structure the cover-plate is subjected, when the valve is closed, to pressure tending to lift it only over an area equal to the cross section of the apertures through the valve-plate, whereas the valve-plate itself has lifting pressure applied to it throughout its entire under surface extending across the opening through the valve-seat and which area is much greater than that of the cover-plate to which lifting-pressure is applied. In consequence Clark's cover-plate and valve-plate when lifted on the opening of the valve are lifted against the force of the closing spring solely as if they were one plate instead of two by the pressure applied to the valve-plate. That is, the valve-plate lifts in response to increasing fluid-pressure and carries with it fast against its outer surface the cover-plate, so that there can

be no flow of fluid through the inclined apertures because they are closed by the cover-plate and, in consequence, no reaction tending to rotate the valve-plate is created.

It is an object of my invention to provide an apertured valve plate with cover-cap for a cover-plate, so formed that the valve opening fluid-pressure shall be greatest upon the cover-plate to effect the initial lifting of the cover-plate by itself and cause the initial rush of fluid to be through the inclined apertures of the cover-plate, whereby the rotative reaction upon the valve-plate can and must take place. To this end I propose to form a cover-plate so that a fluid-pressure chamber between itself and the outer face of the valve-plate is provided within a fluid seal through the medium of a lip or flange at its rim or circumference. By this construction opening fluid-pressure is introduced through the apertures between the outer face of the valve-plate and the inner face of the cover-plate and in the opening of the valve the cover-plate is the first to lift in direct response to fluid-pressure acting directly upon the cover-plate itself in contradistinction to its being lifted by a lifting force applied mechanically through the valve-plate, the lifting of which valve-plate necessarily lifts the cover-plate as if it were one piece with said valve-plate.

The following claims are directed merely for purposes of illustration to the illustrative embodiments described in the annexed specification in connection with the accompanying drawings which form a part hereof.

In the drawings Figure 1 is a vertical section of a preferred embodiment of my invention as it may be applied to a partition in a pump;

Fig. 2 is a plan view of the valve-plate or disk, showing in dotted lines the relative position of the valve-seat opening;

Fig. 3 is a section showing staggered planes corresponding to the line III—III in Fig. 1; and Fig. 4 is a bottom view of a modified form of the cover-plate.

A indicates any partition from below which to above which fluid-flow is to be permitted when the desired pressure has been reached, while reverse flow therethrough is to be checked. This function is to be accomplished by the valve mechanism B. Any

commercial valve-seat construction, such as *a*, to be seated in the usual opening in the partition A is employed and provides the usual opening C in the form of ports 1 between webs 2 which support the central boss 3. Mounted axially of the valve-seat *a* in the boss 3 is the valve-stem 4. It is preferable that the valve-seat be of bronze and the stem 4 of steel. Loosely guided on the stem 4 is a valve-plate or valve-disk 5, made of any suitable composition such as compressed fiber or hard rubber and is provided with one or more inclined apertures 6, the inclined wall 7 of each of which, by reacting against passage therethrough of fluid, tends to rotate the disk 5 upon the stem 4. Although three apertures 6 are shown any other suitable number such as four is contemplated. The cover-plate in the form of a cap 8 is likewise loosely mounted on stem 4 and has fluid-sealing rims or lips 9 and 10 seating against the smooth outer surface 11 of the valve-plate 5, just as does the smooth inner surface 12 of plate 5 seat upon the outer face 13 of valve-seat *a*.

Within the circumferential lip 9 is the wall 14, offset outwardly over the plane of the fluid-sealing faces 9 and 10 and providing a fluid-pressure chamber 15 within lips 9, which chamber, even when the cap 8 is closed against the disk 5, is in fluid-pressure communication with the opening C in the valve-seat *a* through the apertures 6 so that the opening or lifting pressure is directly applied to the entire wall 14 and a closing pressure is applied downwardly or inwardly against the outer face 11 of valve disk 5 which forms the completing wall for chamber 15.

The flange 16 seats a closing compression spring 17 which operates directly against the cap 8 and reacts against the locking cap-washer 18 held on the threaded end 19 of stem 4 by the nut 20.

If desired, reaction ribs 21 may be applied to the wall 14 but should not project outwardly to the plane of the lip-faces 9 and 10. These ribs 21 operate on the principle of the turbine to provide opposite reaction relatively between the cover 8 and the valve plate 5 upon the flow of fluid through apertures 6.

Operation.

As the pressure increases below partition A, with the valve closed and the cap 8 closed tight against plate 5, a point is reached when the fluid-pressure against wall 14 is sufficient to overcome the spring 17 whereupon the cap 8 lifts and a rush of fluid takes place first through the apertures 6. This rush of fluid has no rotational movement through the valve opening C on account of the webs 2 and by reaction against

the inclined walls 7 exerts a rotating force about the stem 4 upon the disk 5 which, subsequent to the lifting of cap 8, itself lifts to provide a full opening for the valve and is held lifted by the flowing stream of fluid through the valve-seat until, on a subsidence of the flow, the exertion of spring 17 overcomes the lifting force and closes the two valve parts, disk 5 and cap 8 until disk 5 seats upon valve-seat *a* but with a new position having been given to the disk 5 so that new surfaces engage the valve-seat webs 2 and the wear of the disk is made uniform.

In designing the area of the lifting wall 14 on cap 8 it should be borne in mind that the following inequality should be maintained

$$C - 14 < 14 \text{ or } C < 2(14)$$

when the characters are understood as representing areas, C being the entire port area of the valve-seat opening, 6 the entire cross section of the apertures 6 and 14 the area of wall 14. The amount by which 14 is greater in this inequality determines the relative rapidity of the independent lifting of cap 8.

What is claimed and what is desired to be secured by United States Letters Patent is:—

1. In a valve, a valve-seat; a fluid sealing valve-plate cooperating with said seat; means to guide said plate into open and closed position relatively to said seat and permitting the rotation of said plate relatively to said seat, said plate having one or more fluid-ducts extending to its outer surface from the opening in said seat; a cover-plate movable into and out of fluid sealing position against the outer face of said valve-plate having a fluid sealing rim facing said valve-plate and having a wall within said rim spaced outwardly from the face of said rim and valve-plate so that said wall is exposed to fluid pressure through said ducts from the opening in said valve seat when said valve is closed; said valve-plate having one or more inclined surfaces against which fluid flowing through said valve will react to rotate said valve-plate; and a spring operating upon said cover-plate tending to close said cover-plate against said valve-plate and said valve-plate against said seat, all whereby said cover-plate lifts first under the valve opening action of fluid pressure to permit a reacting flow of fluid to rotate said valve-plate.

2. In a valve, a valve-seat; a central stem outwardly projecting from said seat; a fluid-sealing valve-disk movably guided upon said stem to cooperate with said seat and having one or more ducts formed by inclined walls and extending through the

body of said disk, which ducts are in communication even when the valve is closed with the opening through said seat; a fluid-sealing cover-cap having a lip to engage
5 with said valve-disk and providing a pocket within said lip and between the outer face of said disk and said cap whereby even
when the valve is closed, fluid-pressure may be applied directly against the inner face of said cap through said ducts; and 10 means tending to force said cap and disk toward said seat.

GRANGE S. COFFIN.