(No Model.)

F. M. STEVENS.

Rotary Valves.

No. 232,775. Patented Sept. 28, 1880.

Fig. 1.

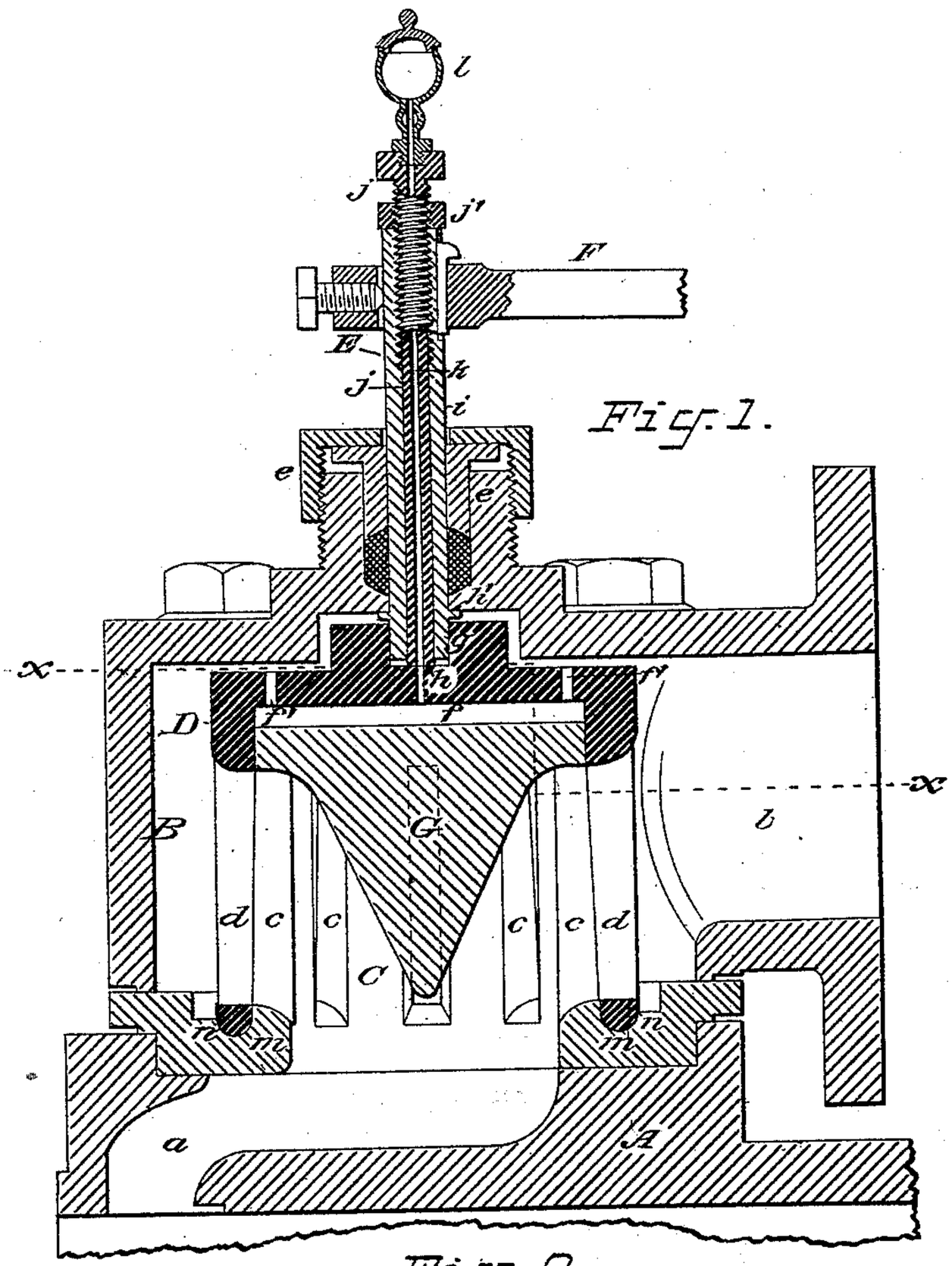


Fig. 2.

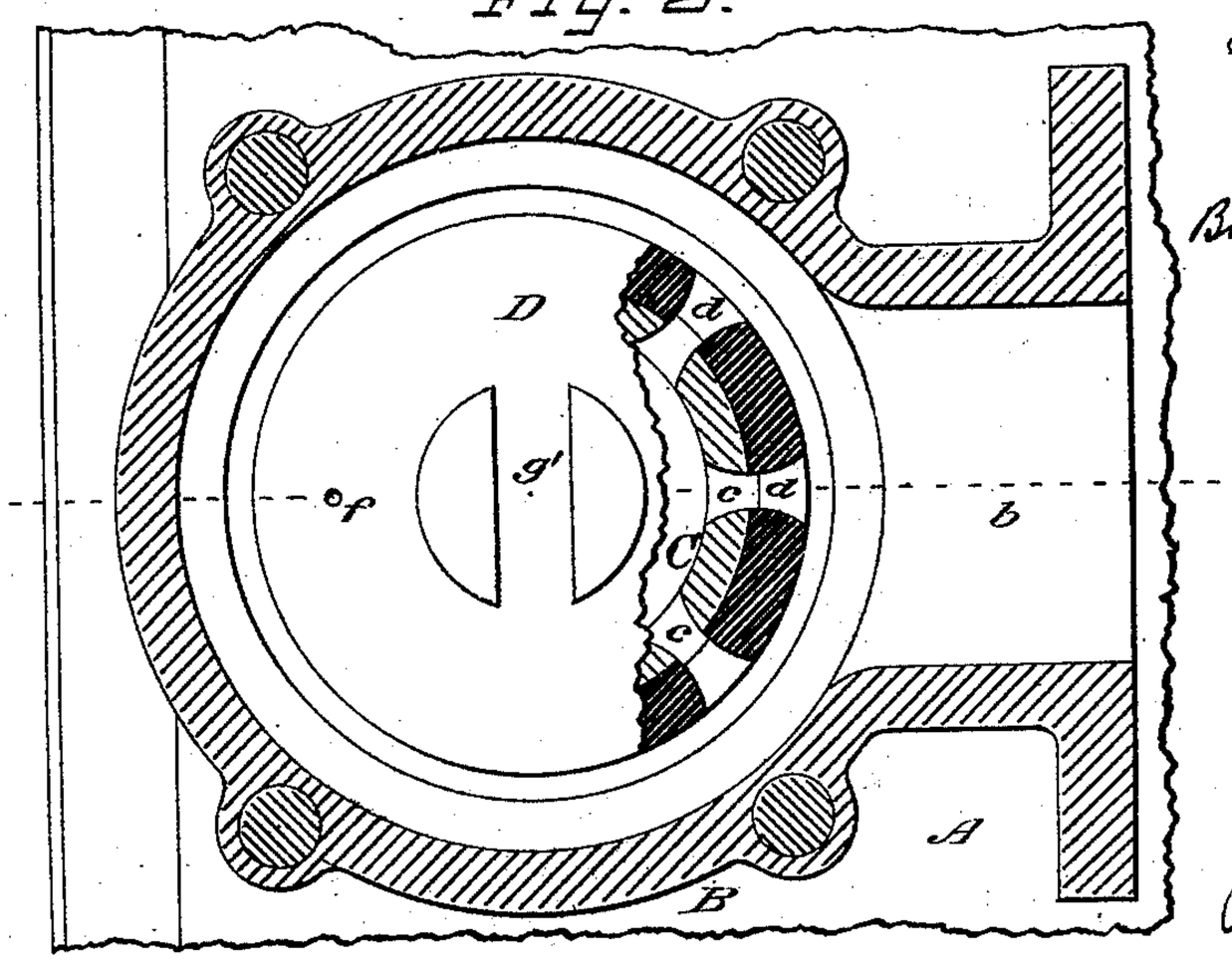


Fig. 3.

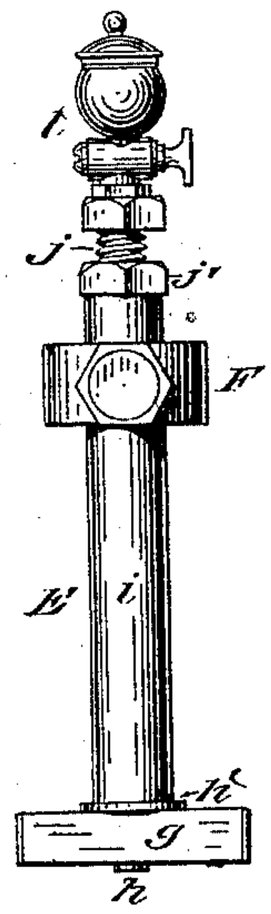
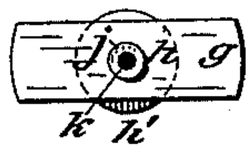


Fig. 4.



INVENTOR:

Frank M. Stevens.

By his Attorneys,

Burke, Fraser & Connette.

ATTEST:

Saml Russell,

Julian A. Wardle.

UNITED STATES PATENT OFFICE.

FRANK M. STEVENS, OF CONCORD, N. H., ASSIGNOR OF ONE-HALF OF HIS RIGHT TO JOHN H. PEARSON; SAID PEARSON ASSIGNOR OF ONE-HALF OF HIS RIGHT TO CHARLES C. PEARSON, ALL OF SAME PLACE.

ROTARY VALVE.

SPECIFICATION forming part of Letters Patent No. 232,775, dated September 28, 1880.

Application filed March 23, 1880. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. STEVENS, a citizen of the United States, residing at Concord, in the county of Merrimack and State of New Hampshire, have invented certain new and useful Improvements in Valves, of which the following is a specification.

This invention relates to cup-shaped valves which fit over hollow fixed seats and rotate or oscillate thereon, the valve and seat having coinciding ports, and an axial stem being provided through which to operate the valve. A valve of this character is shown in my patent of July 16, 1878, No. 205,982, upon which my present invention is an improvement.

In the accompanying drawings, Figure 1 is a vertical mid-section of the valve and its seat, chest, and stem. Fig. 2 is a horizontal section of the same, taken in the plane of the line *x x*, the valve being partly in plan. Fig. 3 is a side elevation of the stem removed from the valve and valve-chest, and Fig. 4 is an inverted plan of the head of the stem which engages the valve.

The valve is represented in the drawings as applied to a steam-cylinder, lettered A, (a portion only of which is shown,) to control the admission or discharge of steam through its port *a*, and I will so describe it hereinafter, but it is equally applicable to controlling the flow of other fluids in other connections.

Let B designate the valve-chest, provided with an inlet or outlet opening, *b*; C, the valve-seat, provided with ports *c c*; D, the valve, provided with ports *d d*, corresponding to those of the seat, and E the valve-stem.

The valve and its seat have each the form of a cylindrical or slightly conical cup, the seat fitting inside the valve, and the ports *c* and *d* are formed in the side walls of the valve and seat. The contact-surfaces of the valve and seat may be cylindrical, but are preferably slightly conical, that the wear may be taken up, and are ground to fit each other accurately, although not necessarily closely.

I have shown the valve and seat as inverted cups with a vertical valve-stem; but this position may in some cases be reversed, or the devices arranged at some intermediate inclination.

The valve-chest B is secured to the cylinder A by bolts or screws in the usual manner, and is provided with a gland, *e*, for packing the valve-stem E. The seat C is secured in place by means of a bottom flange, and the valve is made deeper than the seat, leaving a clear space, *f*, above it, which space communicates with the interior of the valve-chest through holes or openings *f'*, in order that the steam may have access to it, and thus counterbalance the pressure from above, which tends to force it down tightly upon its seat. So far as described there is no present novelty in this valve, the parts and features thus far referred to being shown in my own patent, hereinbefore recited.

A valve of this character is apt to lift from its seat at times, especially when used as an exhaust-valve, thus causing leakage; and it is also liable when turned suddenly to tilt somewhat upon its seat, or be forced to one side, thus wearing unevenly and also inducing leakage. To obviate these and other defects is the object of my present invention.

I provide, first, a means for holding the valve to its seat, consisting of two shoulders or bearing-points on the stem, whose relative distance can be adjusted, one being at the bottom of the stem and bearing down upon the top of the valve, and the other being above this point and bearing up against some fixed part.

I form the valve-stem in a separate piece from the valve and provide its lower end with a head, *g*, which engages a socket, *g'*, in the top of the valve. By this construction the valve and stem, when in place, are compelled to move together; but the stem may be lifted off with the valve-chest, leaving the valve in its place on the seat.

The head *g* is preferably a cross-head, and the socket *g'* a cross-groove, into which the head fits; but any other suitable form of head and socket may be employed, if preferred, as a square or X shape.

The valve-stem will usually be operated through a radial arm, F, which is fixed to it; and as this arm is turned to one side there is a slight tendency to tilt the stem in its bearings in the gland *e*, in which the stem may have some slight lateral play. Any tilting

movement that may thus be imparted to the stem will not in my construction be communicated to the valve, there being sufficient looseness at the connection between the stem and valve to permit the stem to tilt without affecting the valve, to which it can impart no other than a rotary movement.

If the stem and valve were fixed solidly together, as heretofore, the tilting of the stem would cause a corresponding tilting of the valve upon its seat, and thus induce unequal wear of the valve and seat.

The valve-stem is formed in two parts, on one of which is a downward-bearing point, *h*, preferably the lowest point on the valve-stem, which bears downwardly upon the valve and holds it to its seat, and upon the other part is an upward-bearing point, *h'*, adjustable with relation to the point *h*, and which bears upwardly against some fixed part, as the roof of the valve-chest, to keep the point *h* from lifting.

I prefer to make the two parts of the valve-stem to work one within the other, the outer part being a tube, *i*, and having the bearing-point *h'* formed upon it as a shoulder, and the inner part being a rod or tube, *j*, screwing into the tube *i* and projecting normally beyond it at both ends, its lower end forming the bearing-point *h*, and its upper end being provided with a head, by which it may be turned. By screwing the part *j* up or down in the part *i* the distance between the bearing-points *h* and *h'* may be adjusted, and when properly adjusted, so as to hold the valve down firmly upon its seat without causing any binding or undue friction, a set-nut, *j'*, is screwed down tightly upon the top of the tube *i*, thus preventing further rotation of the two parts relatively to each other.

The outer tube is engaged by the lever F or other provision for rotating or oscillating the valve, and the inner tube and valve move with it.

I provide the valve-stem with an oil-duct, *k*, extending downward through it from an oil-supply above the gland *e* to its lower end, where it communicates with the steam-space *f* through a hole or opening in the top of the valve. This duct may be an annular space between the parts *i* and *j* of the valve-stem, or it may be, as I prefer, a longitudinal bore through the center of the part *j*, which thus becomes a tube, and at its upper end it communicates with any suitable oil-cup *l*, or with some other oil-supply; but this I do not herein claim, as it will be made the subject of a separate application.

To insure the even movement of the valve upon its seat, and to prevent its tilting or being forced to one side when turned suddenly, thereby causing unequal wear and consequent leakage, I form an annular groove, *m*, around the bottom of the seat, which groove embraces the bottom edge of the valve, and its outer side or annular shoulder, *n*, prevents any lateral movement of that edge away from the valve-seat, while its bottom affords a uniform bearing for the bottom edge of the valve and keeps it from being forced down so tightly upon its seat as to bind thereon.

I prefer that the valve should bear more forcibly upon the bottom of the groove *m* than it does against the surface of its seat, that the wear at its contact with the seat may be reduced to a minimum, and that for use with steam the valve shall conform accurately and closely to its seat, but shall ordinarily not actually touch it, being borne and guided wholly by the groove *m*. To maintain this proportion in use as the valve wears, the width of bearing-surface between the bottom of the valve and the groove *m* must be so proportioned to the surface and coning of the seat that the wear of the respective contact-surfaces shall exactly correspond.

To properly guide the incoming or outgoing fluid between the valve-ports *c d* and the cylinder-port *a*, I provide a deflector, G, of substantially inverted cone shape, which is fixed to the roof of the valve-seat, or is formed in one piece therewith, as preferred. Were it not for this deflector the incoming streams of fluid from the opposite ports, *c c*, when my invention was used as an inlet-valve, would be directed against each other at the center of the hollow seat, and would retard each other's flow to the port *a;* and, conversely, when used as an outlet or exhaust valve, the upward stream of fluid from the port *a* would impinge upon the roof of the valve-seat before passing to the ports *c*.

The deflector G obviates these disadvantages, and by deflecting the incoming streams downward, or dividing the upwardly-flowing stream and directing it outwardly to the several ports *c*, it greatly facilitates and accelerates the flow of fluids through the valve.

It will be evident that those parts of my invention which relate to the connection between the valve and stem, the retention of the valve down upon its seat, and the introduction of oil between the valve and its seat are applicable also to rotary disk-valves as well as to rotary cup-valves.

The valve D, whether oscillated or rotated, moves axially, and by this latter term I desire to include both of said movements.

I claim as my invention—

1. The conical shell-like slotted valve-seat C and the hollow annular slotted valve D, fitted externally upon the said seat, and provided with a socket, combined with the separable valve-stem, having its lower end fitted loosely into the said socket and bearing against the valve to hold it down upon its seat, and also prevent it from being tilted as it is moved axially, all substantially as described.

2. The inverted cup-shaped axially-movable valve D, finished internally to fit the valve-seat externally, and the valve-seat C and valve-chest, combined with the loosely-connected valve-stem having upward and downward bearing points, substantially as de-

scribed, one to bear upon the valve and hold it down to its seat, the other against the chest, the outer and inner parts of the stem being made adjustable with relation to each other, as and for the purpose described.

3. The ported conical valve-seat having an annular groove, *m*, about its base, combined with the cup-shaped ported hollow shell-like valve D, finished internally and fitted externally to the valve-seat, the lower end of the valve entering the said groove *m*, and the valve-shell being longer than the seat to leave space between the top of the seat and the interior of the valve-shell above it, thereby enabling the valve to freely descend and fit the said groove and conical exterior of the valve-seat and take up wear between the valve and seat, all as described.

4. The axially-movable valve and hollow ported seat, combined with a deflector located inside the seat, adapted to direct the incoming or outgoing fluid, substantially as set forth.

5. The axially-movable cup-shaped valve D, combined with hollow ported valve-seat C, provided with an annular groove, *m*, to receive, and with shoulder *n* to embrace, the lower end of the valve and hold it in place laterally, and with the deflector G extended down within the hollow valve-seat to direct the incoming or outgoing fluids, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. STEVENS.

Witnesses:
HENRY CONNETT,
ARTHUR C. FRASER.