J. STUMPF.

VALVE.

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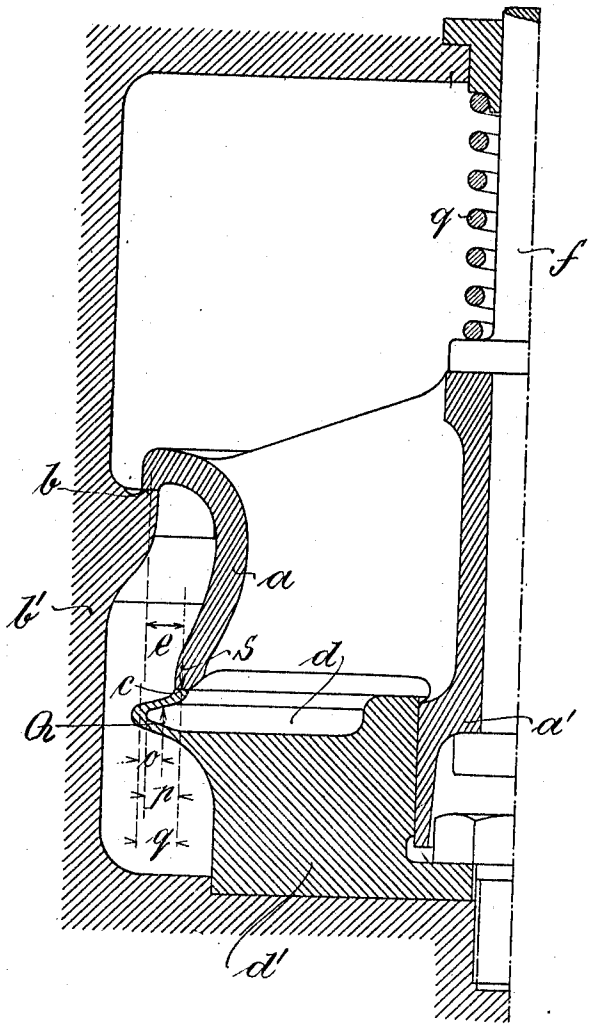
**1,004,494.**

**Patented Sept. 26, 1911.**




Witnesses:
Corinne Myers
Vera Paulsen.

Inventor:
Johann Stumpf
by L. K. Böhm,
Attorney

# UNITED STATES PATENT OFFICE.

JOHANN STUMPF, OF BERLIN, GERMANY.

## VALVE.

1,004,494. Specification of Letters Patent. Patented Sept. 26, 1911.

Application filed April 6, 1911. Serial No. 619,261.

*To all whom it may concern:*

Be it known that I, JOHANN STUMPF, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented certain new and useful Improvements in Valves, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in distribution valves for steam engines, compressors and the like and is a further development of the valve described in my co-pending application Serial No. 588,936, filed Oct. 25, 1910. In that application there is described a form of double seat valve made in one piece with one pair of closing faces co-acting rigidly and pressed into engagement by a spring and another pair of co-acting faces co-acting resiliently and pressed together by steam or fluid pressure.

According to the present invention, the valve has two seats and one of its seats is supported on a resilient ring or annulus so as to be pressed by fluid pressure against one of the seating faces of the valve, while the other seat is rigid.

In stop valves, it has already been proposed to provide double seat valves with a resiliently supported seat or face; such valves being screwed down tightly. In screwing down stop valves of this type, the resiliently co-acting faces come into engagement before the rigid pair and the resilient pair are thus held tight, wholly or partly by the tensioning of their resilient support and as the force applied to the screw down spindle may be considerable, a considerable initial tension may be applied to the resilient supporting member or spring. In distribution valves, however, the initial tensioning is necessarily limited as the holding down force is supplied by a spring. In engines, especially high speed engines, this spring cannot be made of unlimited strength and in fact it is desirable to reduce the strength of this spring as much as possible in order to reduce the energy absorbed in operating the valves. There is thus this essential difference in the design of a stop valve and a distribution valve viz., the closing force in the case of the stop valve may be made ample to provide a large margin to insure absolute tightness whereas the distribution valve may only have a restricted force. In the case of distribution valves, therefore, it is of the utmost importance that the closing force be small and that this closing force be uniform on each unit area of the valve.

The above conditions are met in my prior case by suitably proportioning an unbalanced resilient ring on the valve. According to the present invention the requirements mentioned are met in a different way.

Referring to the drawing which shows one convenient form, the valve $a$, is made in one piece of steel or other suitable metal and is operable by a reciprocating rod $f$, which raises the valve against its spring $q$, and when the valve is as shown, the rod also raises it against the unbalanced pressure on the overhanging annulus $e$. The upper seating face of the valve closes on a seat $b$, machined on a ledge on the valve casing $b'$. The hub $a'$, of the valve is guided in a part $d'$, which is fixed in the valve casing or chest $b'$. This removable part $d'$, has at its upper edge a resiliently supported seat $c$, formed on a ring $d$.

The hollow annulus or ring $d$, extends outward and upward toward the seat $b$, then is bent around to extend inward and upward. The valve seat is formed on the end of said inwardly and upwardly extending part and this seat forms the point of contact of the resilient annulus and the lower seating face of the valve. The ring $d$, is bellied outwardly with respect to the pressure side and it is to be assumed that the interior of this ring is subjected to high pressure while the exterior is subjected to atmospheric pressure or to condenser pressure. The valve is also subjected to the pressure of a spring $q$, tending to hold it down. Further, in the form shown, the upper seating face overhangs the lower seating face by an amount $e$. The ring $d$, is filled with steam which tends to press the seat $c$, upward against the valve with a pressure (neglecting the force necessary to expand the ring) dependent upon the amount of the steam pressure and the area of the surfaces on which it acts. By properly proportioning the ring $d$, the pressure of the seat $c$, upward may be such as to give the same pressure per-unit area on both the upper and lower faces of the valve. The ring $d$, extends beyond the center of the seat $c$, by an amount $p$. According to the amount of the overhang $p$, a greater or smaller pressure Q acts upwardly and its moment about the center line of the outer part of the resilient ring is $Q \times O$. This

moment is equal to the moment S×P and S is the downward pressure of the face at *c*. The force tending to close the valve is the spring pressure F plus the pressure, say P, of the fluid on the annulus *e*. The pressure on the upper pair of faces is thus P+F−S so that uniform pressure per unit area over both seats will be secured if S:P+F−S= length of seat *c*: length of seat *b*, that is to say in the same ratio as the radii of the seats.

In comparing the form according to this invention with that described in my prior case, it will be seen that in my prior case the whole of the spring pressure acts on the rigidly coacting faces while the unbalanced pressure on the valve acts on the resiliently co-acting faces, that is to say P acts on the resilient pair and F acts on the rigid pair of coacting faces. In the present case however, the determining factor for the uniformity of the pressure is the ring *d* which as described above determines the amount of the downward pressure S.

I claim:

1. In combination with a reciprocatory rod, a valve having two seating faces attached to said rod, a casing for said valve, a seat arranged rigidly with said casing for coöperating with one of said seating faces, a detachable part fixed in said casing and a resiliently supported seat on said detachable part, said last named seat being pressed by the action of the pressure fluid against the other of said seating faces.

2. In combination with a reciprocatory rod, a valve having two seating faces attached to said rod, a casing for said valve, a seat arranged rigidly with said casing for coöperating with one of said seating faces, a detachable part fixed in said casing, a resilient annulus on said detachable part, said annulus being pressed by the action of the pressure fluid against the other of said seating faces when the valve is seated, a spring tending to press said valve against said seat and annulus.

3. In combination with a reciprocatory rod, a valve having two seating faces attached to said rod, a casing for said valve, a seat formed rigidly with said casing for coöperating with one of said seating faces, a detachable part fixed to said casing and extending toward the seat on said casing, a resilient hollowed out annulus at the end of said part nearest to said seat, said hollow annulus extending outwardly and upwardly and then inwardly and upwardly, the end of the inwardly and upwardly extending portions of said annulus constituting a valve seat and arranged to co-act with the other of said seating faces.

4. In a valve, a detachable seat-carrying part comprising a body part having a resilient annulus thereon, said annulus extending outwardly and upwardly and then inwardly and upwardly, and a valve seat carried by the end of the inwardly and upwardly extending portion of said annulus.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

JOHANN STUMPF.

Witnesses:
WILLY WINTER,
FRANZ MÜLLER.