R. C. Bristol,

Balance Puppet Valve,

No. 50,443, Patented Oct. 17, 1865.

Fig. 1

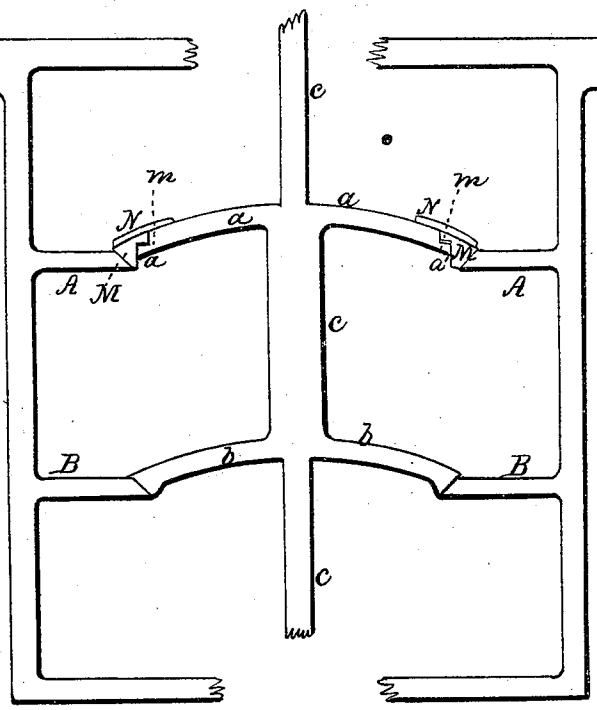


Fig. 3



Fig. 4

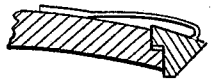
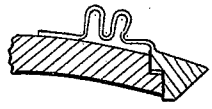
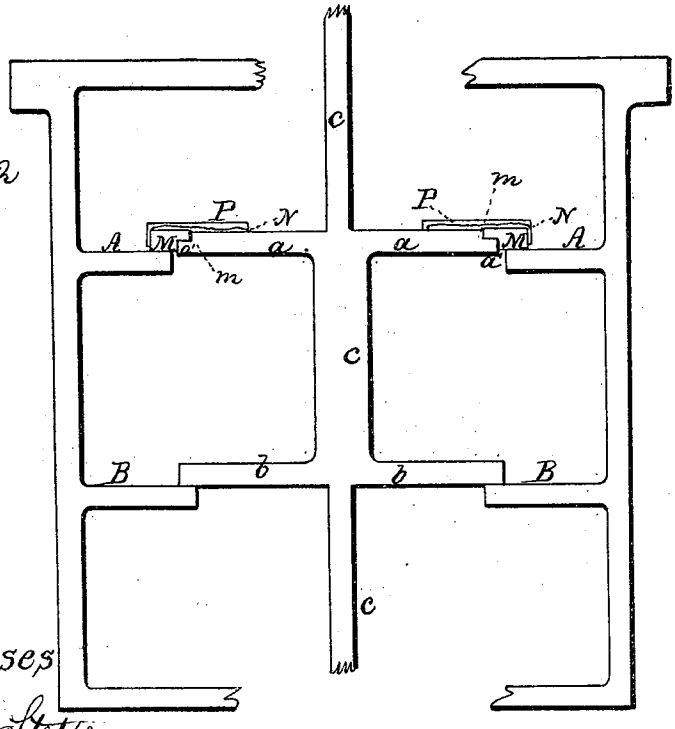


Fig. 5



Sectional Views

Fig. 2



Witnesses

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Figs. 1 & 2. Sectioned

UNITED STATES PATENT OFFICE.

RICHD. C. BRISTOL, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN BALANCE PUPPET-VALVES.

Specification forming part of Letters Patent No. **50,443**, dated October 17, 1865; antedated October 8, 1865.

To all whom it may concern:

Be it known that I, RICHARD C. BRISTOL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Balance Puppet-Valves for Steam-Engines; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a central vertical section through the valve and its seats constructed in accordance with one modification of my invention, and Fig. 2 is a corresponding section of the valve constructed in accordance with another form of my invention.

Similar letters of reference indicate like parts in both the figures.

My invention relates to provisions for allowing the valves to be of less length than the interval between the seats, and allowing the expansion of the parts by the heat of the steam to vary the length of the valve or of the interval between the seats, or of both, within certain limits, without interfering with the tightness of the valve.

My invention is applicable to balance puppet-valves, and, by reason of its requiring no alteration of the valve-stem or any of the parts outside of the steam-chest, may be used in nearly or quite all situations.

In steam-engines the variations in the heat, by causing unequal expansion in the metal of the valve or of the steam-chest, induces a liability to leakage, however carefully the valves may be ground and fitted when cold. The evil is partly remedied by grinding the valves when all the parts are heated; but it is obvious that this operation involves much trouble, and still fails to provide for the variations in the temperature and for the elastic yielding of the metals under varying pressures and temperatures of steam. Ordinarily the temperature of steam varies in accordance with the pressure, so that a valve subject to any uniform pressure of steam and properly ground to its seat under such pressure will be always subject to the same heat; but sometimes steam is superheated, either intentionally or accidentally, and it is practically impossible to perfectly adapt a rigid valve to all the conditions liable to be experienced.

I overcome the difficulties by adapting the upper disk (by which I mean the upper half of the valve) to yield upward slightly around its periphery, while it is stoutly defended against yielding downward too far in the manner and with the effect which will be explained below.

My invention is capable of being constructed in many modifications. I will describe the two which I consider the most desirable by the aid of the drawings and of the letters of reference marked thereon.

A and B indicate, respectively, the upper and lower seats, and *a* and *b* the upper and lower disks or parts of the valve, which is adapted to fit thereon. The parts *a* and *b* are rigidly connected to each other and the stem *c*, and are raised and lowered by suitable mechanism, (not represented,) all in the ordinary manner.

It will be understood that the spaces above the upper seat, A, and upper disk, *a*, and below the lower seat, B, and lower disk, *b*, are filled with steam from the boiler, and that the space between is in communication with the interior of the cylinder, the steam being admitted to the cylinder or excluded therefrom according as the valve is raised or lowered. The annular surface by which the parts *a b* touch and rest upon the seats A B may be either plane or conical or of any other approved form, and should be ground with emery or scraped or otherwise accurately fitted.

I will describe the novelty by referring to the figures separately.

In both figures, M is a ring of metal surrounding and forming the periphery of the upper part, *a*, of the valve. The joint *m* between the ring M and the disk *a* is loose or easy, so as to allow one to lift relatively to the other; but the stout lip or shelf *a'* extends out from the disk *a* directly under the ring M, so as to compel the latter to lift with it.

In Fig. 1, N is a thin annular plate of brass or other elastic metal, united by soldering or otherwise on its outer edge to the ring M, and and at its inner edge to the part *a* of the valve.

In Fig. 2, N is an annular sheet of rubber, vulcanized and prepared in the most approved manner to endure the temperature of steam and to maintain its elastic and flexible condition under such temperatures; and P is a thin

covering or protection of brass or other suitable material, united by small screws or otherwise at its outer edge to the ring M, and its inner edge to the part *a* of the valve. I esteem it important that the protection P shall be bent down over the periphery of the ring M, and be secured along its outer edge in the manner substantially as represented, in order to completely cover the edge as well as the upper surface of the rubber plate N.

In both forms of my invention it will be observed that the connection between the ring M and the part *a* of the valve is capable of yielding slightly, but sufficiently to allow the ring M to conform to its seat, although the valve and chest may be unequally affected by expansion, the form of the ring M and of the part *a a'* of the valve being such as allows the weight of the ring M and the entire pressure of the steam or other load which may rest upon it to be supported directly upon the valve in the act of lifting the valve without any tax on the elasticity or flexibility of the yielding connection N.

Figs. 3, 4, and 5 will be readily understood. They show on a larger scale sections of a part of a valve having the cover of the joint constructed with several modifications.

The operation of my invention will be readily understood. While the valve *a b c* rests on its seat the ring M will rest fairly on the seat A, and will be thereby lifted slightly out of direct contact with the lip *a'* of the valve, while the edge of the part *b* of the valve rests firmly and directly on its seat B. When the proper time arrives and the action of the proper mechanism in the engine raises the entire valve by the stem *c*, the first effect is to lift the valve *b* off its seat B and to raise the lip *a'* into contact with the ring M. The further lifting of the valve raises the ring M off its seat A and holds it suspended. When the valve is lowered the ring M strikes its seat A, and is thereby stopped, while the part *b* and the rigidly-connected part *a* continue to sink lower, being allowed to do so by the yielding of the elastic or flexible part N. The part N, being tightly connected to the valve *a* and to the ring M, forbids the passage of any steam through the joint *m* between the parts *a* and M under any circumstances.

It is not necessary in practice to make the motion of the ring M relatively to the part *a a'* of the valve very considerable. One thirty-second ($\frac{1}{32}$) of an inch is sufficient.

The variations of heat on exhaust-valves are not as great as on steam-valves.

I have described the invention as applied to steam-valves alone. The invention is applied to exhaust-valves in a manner precisely similar, except that in such case the pressure is from the interior of the cylinder outward or upward past the part *a*, and downward past the part *b*, as will be obvious.

A ring corresponding to the ring M may be mounted and equipped on the seat, substantially as described, instead of on the disk of the valve, and the effect will be as above; but the labor and expense of applying it and keeping it in order will be greater, and I deem such a very undesirable construction.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

In balance puppet-valves, the ring or annulus M, carried on one of the parts *a* or *b* of the valve, and adapted to yield or conform to its seat, and having its joint *m* protected by a yielding cover or shield, N, substantially in the manner and for the purpose herein set forth.

R. C. BRISTOL.

Witnesses:

D. W. STETSON,

EMIL VOSSNACK.