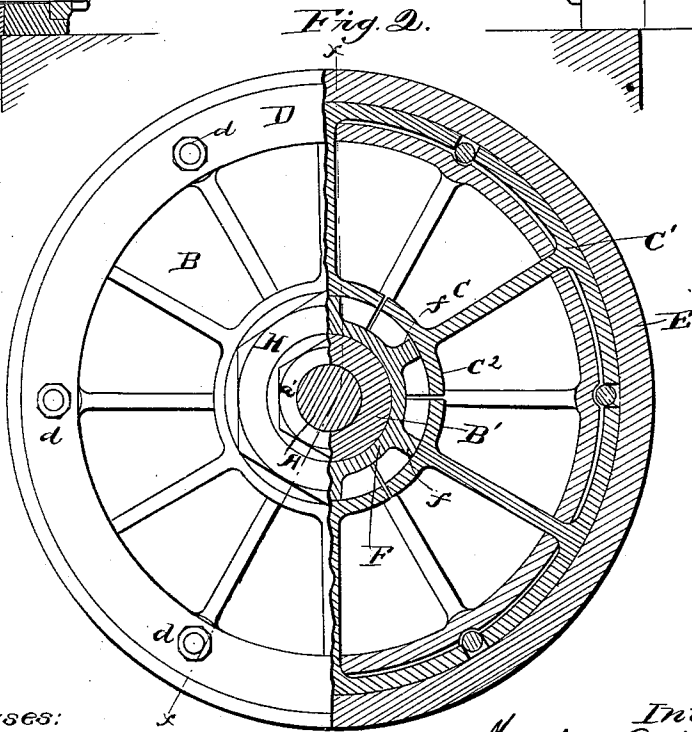
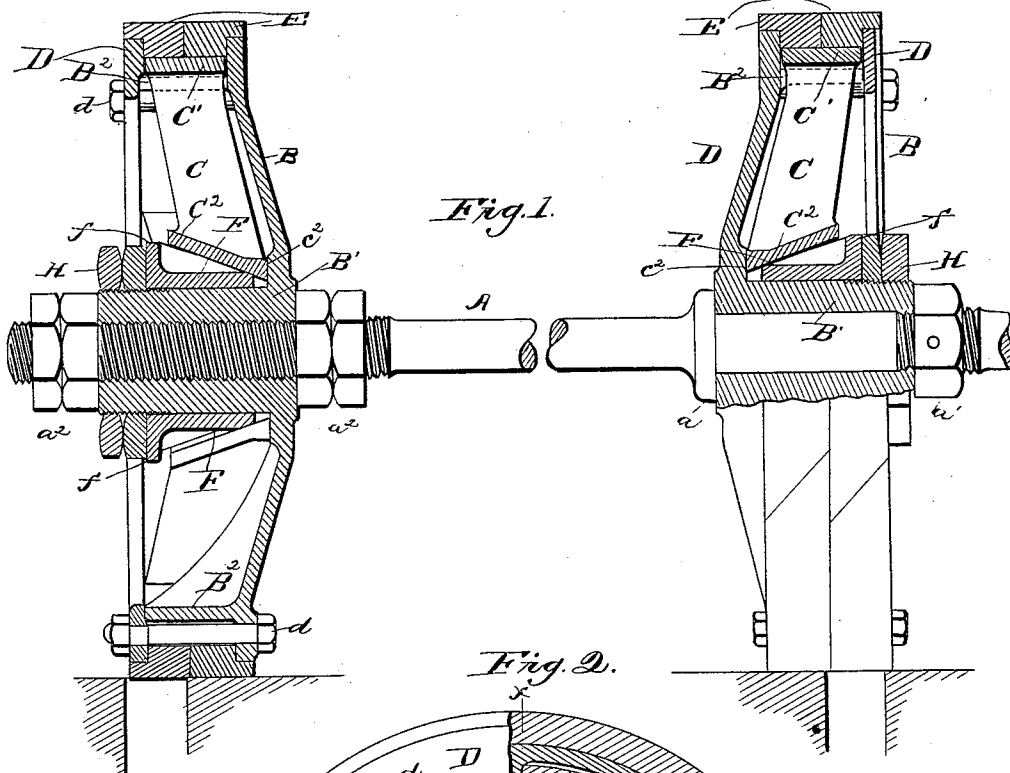


(No Model.)

M. E. HERSHEY.
PISTON VALVE.

No. 479,273.

Patented July 19, 1892.



Witnesses:

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UNITED STATES PATENT OFFICE.

MARTIN E. HERSHEY, OF HARRISBURG, PENNSYLVANIA.

PISTON-VALVE.

SPECIFICATION forming part of Letters Patent No. 479,273, dated July 19, 1892.

Application filed April 11, 1892. Serial No. 428,681. (No model.)

To all whom it may concern:

Be it known that I, MARTIN E. HERSHEY, of Harrisburg, in the county of Dauphin and State of Pennsylvania, have invented certain
5 new and useful Improvements in Piston-Valves for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming
10 a part of this specification, and to the letters of reference marked thereon.

This invention relates to piston-valves for steam-engines, and particularly, though not exclusively, to that form in which two heads
15 are employed with a steam-space between them.

The primary object of the invention is to provide a piston-valve which shall be capable of rigid adjustment to compensate for
20 wear, whereby the adjustment is maintained throughout the stroke of the valve and while subjected to peripheral pressure in passing over the ports.

A further object is to provide a valve of this character which when the parts are cool will contract and prevent sticking or injury to the
25 wearing-surfaces—as, for instance, when the engine is started after a period of rest.

The invention consists in certain novel details of construction and combinations and arrangements of parts, all as will be now described, and pointed out particularly in the
30 appended claims.

In the accompanying drawings, Figure 1 is a section, partially in elevation, through a valve constructed in accordance with my present
35 invention. Fig. 2 is an elevation at right angles to Fig. 1, showing half of the head in section.

40 Like letters of reference indicate the same parts in both figures.

For the present purposes I have not deemed it necessary to illustrate the cylinders or steam-chest further than to indicate some of
45 the parts in Fig. 1, for a purpose which will presently appear.

The letter A indicates the valve-rod, which directly or indirectly is connected with the usual valve-operating mechanism—such as an
50 eccentric on the main shaft—and serves to move the valve in the ordinary manner. The portion of this valve-rod lying within the

valve-chest is adapted for the reception of the head or heads which constitute the valve proper, preferably having clamping means
55 such as nuts screwing directly upon the rod.

In the preferred construction I employ two heads to form the valve, the casting or disk B constituting the body of one of which may, if desired, be secured permanently in position
60 on the rod by being clamped against the shoulder or enlargement *a* by the nut *a'*, while the other disk or body B is held between two pairs of nuts *a² a²*, which permit of its bodily adjustment longitudinally of the rod. Each
55 body, or, as I shall term them, “disk” B, is provided with a relatively long central hub B', and a flange B², located on one side a short distance from the periphery, the said flange being perforated or slotted at intervals
70 for the passage of the radial arms C of the sectional spider. The edge or face of the flange is dressed for the reception of a face-plate or ring D, held in place by through-bolts *d* to form with the edge of the disk
75 proper an annular or peripheral channel for the reception of the packing-rings E. These rings may be split or expansible rings of approved type, preferably, however, having laterally-projecting flanges overlying the peripheries
80 of the disk and face-plate or ring, and being solid in cross-section, as shown.

The sectional spider, the arms C of which have been before mentioned, is composed of a series of radial segments formed by segmental plates C', underlying the packing-rings within the peripheral channel, and
85 similar plates C², surrounding the hub B', while the arms C unite the plates and are guided at the outer ends in the slots before mentioned.

By referring to Fig. 1 it will be seen that the plates C² are inclined, and together form a conical central opening, into which fits an expander, consisting of a sleeve F, working
95 snugly on the hub B', and having a series of wedge-shaped radial flanges or ribs *f*, taking a bearing on the inner surfaces of the plates C². Now it is obvious that longitudinal movement of the expander will enlarge the diameter of the split spider by giving each segment
100 a radial movement, and in order to move the expander lock-nuts H are threaded on the end of the hub B² in position to abut against

the face of the expander, as will be readily understood. The inner edges of the plates C² work against a straight surface c² on the inside of the disk B and prevent movement longitudinally of the shaft when the expander is set up. The adjustment of the rings, it will be noted, can be made extremely fine, due to the double wedge formed by the screw-thread and expander acting on the segmental plates C². Hence the slightest wear may be at once compensated for, and when the adjustment is made the parts are held absolutely rigid, the peripheral pressure of the steam as the heads cross the ports not affecting the adjustment in the least, permitting of the use of the valve where the ports are large or extend a large part of or entirely around the inner circumference of the valve-chest.

In all piston-valves as heretofore constructed, solid as well as adjustable, great difficulty has been encountered by reason of the sticking of the valve, particularly when the engine was started after the valve and chest had become cool and the parts had contracted, the result being that the wearing-faces of the valve and chest were cut and ruined, frequently requiring that the entire faces should be redressed at great expense. Now I have overcome this difficulty effectually by utilizing the different rates of expansion of different metals, whereby as the heads cool they are caused to contract in such manner as that pressure on the packing-rings is relieved and the valve is left free to move without sticking when the engine is first started.

In the form of valve-head under consideration the desired result is easily secured without material increase in cost by forming the body portion of metal having a small range of expansibility, such as cast-iron or steel, while the packing-ring support, or, as I have termed it in the present structure, the "sectional spider," is formed of metal having a far greater range of expansibility, such as brass. Other metals of course might be employed, if desired, the essential being that the support for the packing-rings or wearing-surface of the head shall have a greater range of expansibility than the chest in which it works, and if an adjustable head a greater rate of expansion than the body of the head. It is also desirable that the part depended upon to give the greater range of expansion shall be of such shape as to be quickly and evenly affected by changes in temperature—as shown, for instance, where the arms C are comparatively thin and long.

When a valve of this character is adjusted to fit the chest, it is of course desirable, if not absolutely necessary, that the parts should be in the condition under which they normally operate—i. e., hot—and for this purpose steam may be let into the space between the heads, or other means for heating may be resorted to while the adjustment is made. Then when the valve-chest is closed the valve will be

found to work perfectly, and will contract sufficiently when cool to prevent sticking or cutting of the wearing-surfaces when the engine is started.

The valve illustrated being formed by two heads, it becomes necessary to provide means for adjusting both while in place in the valve-chest, and for this purpose the adjusting-nuts for the sectional spider are located on the outside of each head. In other words, the heads are arranged oppositely on the rod, and both may be adjusted without dismembering the valve.

The advantages of a valve of this character will be at once appreciated by expert steam-engineers, for, besides the advantages incident to all piston-valves by reason of perfect balance, &c., it has advantages incident to its perfect adjustability and free working qualities, whereby it may be kept in perfect working order without great expense, which place it on a par with the best slide-valves heretofore most extensively used because of the last-mentioned qualities.

Having thus described my invention, what I claim as new is—

1. In a piston-valve, the combination, with the body formed by the disk having the annular peripheral channel on one side and the central hub projecting on the same side as the peripheral channel, of the packing-rings in the channel, the sectional spider underlying the rings, the expander surrounding the hub within the valve and co-operating with the sectional spider, and the set-nuts working on the end of the hub to adjust the expander, substantially as described.

2. In a piston-valve, the combination, with the body having the annular peripheral channel and central hub and the packing-rings in said channel, of the sectional spider having the segmental plates underlying said rings, the central inclined plates, and the radial arms uniting said plates, the conical expander working in the hub and co-operating with the inclined plates, and the set-nuts on the hub for holding the expander in adjusted position, substantially as described.

3. In a piston-valve, the combination, with the body formed by the disk, having the central hub and slotted flange near its periphery, the face-plate or ring secured to the flange, and the packing surrounding the flange between the disk and face-plate or ring, of the segmental plates underlying the packing-rings, the radial arms carrying said plates passing through the slots in the flange, and the conical expander working on the hub for moving the segmental plates outward to tighten the packing, substantially as described.

4. In a piston-valve, the combination, with the disk having the central hub and flange near the periphery, having slots or openings therein, the face-plate or ring secured to said flange, and the packing-rings between said plate and disk, of the sectional spider con-

sisting of thesegmental plates underlying the packing-rings, the central inclined plates, and the radial arms passing through the flange and uniting the said plates, the expander
5 working on the hub and having the inclined ribs or projections engaging the inclined plates, and the set-nuts for holding the expander in adjusted position, substantially as described.

10 5. In a piston-valve for steam-engines, the combination, with the piston-rod, of the two independent heads mounted on said rod and adjustable toward and from each other, substantially as described.

15 6. In a piston-valve, the combination, with the valve-rod and the head secured permanently thereon, of the opposite head mounted on said rod and having set-nuts on both sides of the same, whereby it may be adjusted longitudinally of the shaft, substantially as described.
20

7. In a piston-valve, the combination, with the rod, of the oppositely-arranged heads secured thereon and having the outwardly-projecting hubs and peripheral chambers, the packing-rings, the sectional spiders, the expanders, the set-nuts for adjusting said expanders screwing on the outer ends of the hubs, whereby the heads may be adjusted
25 while in the valve-chest and without dismembering the valve, and the nuts on the rod engaging the hub to hold the valve in place irrespective of the adjustment of the expanders, substantially as described.
30

35 8. A piston-valve for steam-engines, having the support for the packing-rings formed of metal having a greater range of expansibility than the valve-chest under the influence of variations in temperature, substantially as described.
40

9. In a piston-valve for steam-engines, the

combination, with the packing-rings, of the relatively thin radial arms for supporting the same, formed of metal having a greater range of expansibility than the cylinder under the
45 influence of variations in temperature, substantially as described.

10. In a piston-valve for steam-engines, the combination, with the body portion, of the packing-rings and the spider supporting said
50 rings, formed of metal having a greater range of expansibility than the body portion under the influence of variations in temperature, substantially as described.

11. In a piston-valve for steam-engines, the
55 combination, with the iron or steel body portion and the packing-rings, of the supporting-spider for said rings, formed of brass, substantially as described.

12. In a piston-valve for steam-engines, the
60 combination, with the body portion formed of metal having a small range of expansibility and the packing-rings, of the sectional spider supporting said rings, having its radial arms formed of metal having a greater range
65 of expansibility than said body portion, substantially as described.

13. In a piston-valve for steam-engines, the combination, with the body portion formed of metal having a small range of expansi-
70 bility and the packing-rings, of the sectional spider supporting said rings, having relatively thin radial arms formed of metal having a greater range of expansibility than said body portion, and an expander co-operating
75 with the sectional spider to adjust the same for wear, substantially as described.

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Witnesses:

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