

J. WHITNEY.

BALANCE PISTON VALVE AND GEAR.

No. 174,602.

Patented March 7, 1876.

Fig. 1—

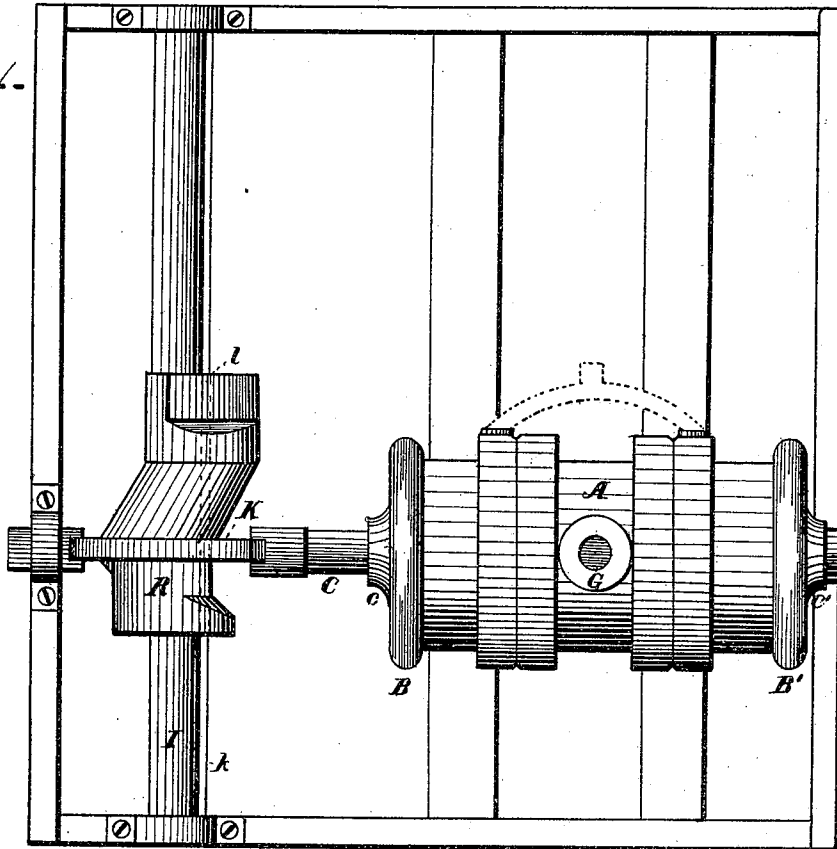
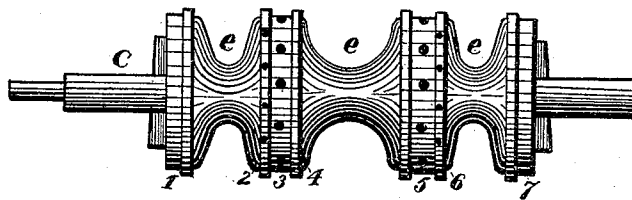


Fig. 2—



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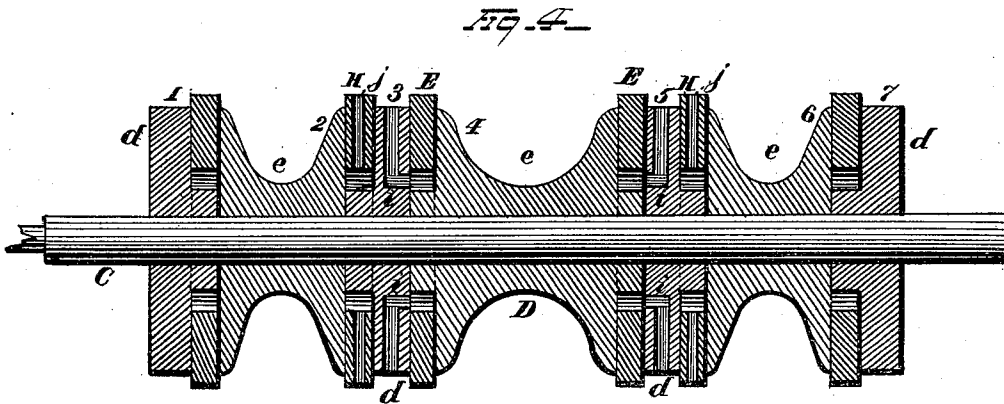
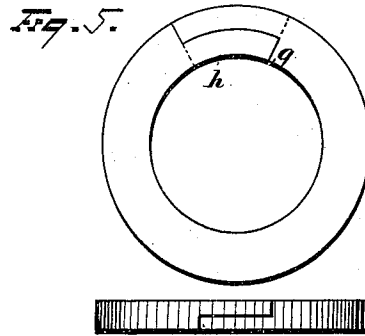
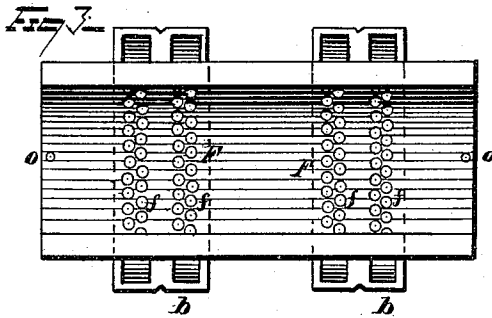
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UNITED STATES PATENT OFFICE.

JAMES WHITNEY, OF YANKTON, DAKOTA TERRITORY.

IMPROVEMENT IN BALANCE PISTON-VALVES AND GEARS.

Specification forming part of Letters Patent No. **174,602**, dated March 7, 1876; application filed February 26, 1876.

To all whom it may concern:

Be it known that I, JAMES WHITNEY, of Yankton, in the county of Yankton and Territory of Dakota, have invented certain new and useful Improvements in Balance Piston-Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to certain improvements in piston-valves and valve-gear; and it consists in certain details of construction and combinations of parts, which will more fully appear from the following description and claims.

Figure 1 represents a plan view of the valve-chest and valve-gear. Fig. 2 shows the piston-valve detached from its chest. Fig. 3 shows a portion of the valve-chest. Fig. 4 is a longitudinal section of the piston, showing the combination of the packing-rings therewith. Fig. 5 represents one of the packing-rings.

A is the valve-chest, formed of the upper and lower half-sections, around which are formed the annular steam-passages *b*. The heads B B' of the valve-chest are provided with openings or boxes *c c'* for the passage of the ends of valve-stem C. The balance-valve D consists of four pistons, *d*, the space between said pistons being cut away to form concave recesses *e*, as shown in the drawings; or the several pistons may be formed complete in themselves, and keyed to the valve-stem. As at present constructed the balance-valve D is made up of the detachable sections 1, 2, 3, 4, 5, 6, and 7, between each of which sections metallic packing-rings are secured. These sections may be made of any desired length to insure any desired lap or lead to the valve. The packing-rings on one side are cut partly through, as at *g*, while the opposite side of the ring is formed with an overlapping joint, *h*, which construction effectually prevents the escape of steam, not only through the packing-rings in a longitudinal direction, but also in a vertical direction. The balance-valve D may be secured to the valve-stem by a key or

nut, as desired. The interior of the valve-chest, opposite each of the steam-passages *b*, is provided with two or more rows of perforations, *f*, preferably circular in form, and said perforations are arranged in such a manner that an opening in one row shall be between two openings of the opposite row of perforations, in order that the wear on the piston shall be equalized. The central enlarged portion of the valve D has steam-passages *i* leading from the outside of the valve in an inclined direction to the inner periphery of the central packing-rings E. The inner surface of the packing-rings is equal to the aggregate area of perforations *f*, so that as the valve moves over the steam-port F live steam, which flows from the steam-inlet G and surrounds the central portion and balances the valve, will pass through the perforations *f*, leading to the steam-port F. Steam will flow from port F through openings *i* in the valve, and enter beneath and exert sufficient pressure on the interior of the packing-rings to equalize the pressure on the entire outer surface of the rings as they are passing over the steam-ports.

Were it not for the construction above set forth the pressure of steam on the outer surface of the packing-rings would contract the rings to such an extent that live steam would flow by the same into the exhaust-passage of the valve-chest.

The central packing-rings H are formed with passages *j*, leading to the inner surface of the ring. When the valve moves in a direction to exhaust, steam will flow through passages *j*, and exert sufficient pressure on the interior of the ring to counterbalance the pressure on the outer surface of the same. Exhaust steam may escape from the exhaust-ports either in the lower or upper part of the valve-chest, as desired.

As it is impossible for steam to gain an entrance to the space at each end of the valve, the valve-box need not necessarily be provided with the usual stuffing-boxes, but simply with boxes that serve as guides or bearings for the ends of the valve-stem.

I is a rotary shaft, which is journaled in suitable bearings, and, if intended for use on locomotives, a shaft is provided for each en-

gine of the same. This shaft has a spline, *k*, which engages with a groove, *l*, formed in a sliding variable cam-shaft, *R*, which may either be made solid or in sections, as desired. *K* is a yoke, attached to the valve-stem, the outer end of said yoke having a rod or bar sliding in a guide or bearing to steady and support the same while in operation. The cam is constructed to snugly fit the yoke, to impart a smooth and steady stroke to the valve. The sliding cam-shaft, as shown, is formed in such a manner that by simply varying its position on shaft *I* steam may be cut off at any desired stroke of the piston, or the shaft may be thrown completely out of engagement with the yoke, in order to entirely cut off steam from the cylinder, and allow the valve to remain stationary in its chest when a locomotive is running down grade.

As stuffing-boxes are entirely dispensed with in my improved valve, much time, labor, and expense will be economized thereby.

The bearings in the heads of the valve-chest serving as guides for the valve-stem, and also to support the weight of the valve, the heads of the valve-chest are not necessarily ground to make a steam-joint, and also simple and light means of attachment may be used, as they are not obliged to resist steam-pressure, as in ordinary valves. Provision is made for the escape of any steam from the ends of the valve-chest should any escape thereto. The ends of the cylinder are provided with small perforations *a*, to which pipes leading to the exhaust-pipe or smoke-arch are secured.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The valve-chest *A*, having two rows of external ports, the steam and exhaust ports of each row being separated by a central partition, and the cylinder provided with rows of perforations leading to each external port, all constructed and arranged substantially as and for the purpose specified.

2. The valve-cylinder, provided with rows of perforations, the perforations in one row being between the perforations of the opposite row, substantially as and for the purpose set forth.

3. The combination, with the valve-chest *A*, constructed with four rows of perforations leading to four external steam-ports, of the valve *D*, having four pistons, as shown, substantially as and for the purpose specified.

4. The valve *D*, provided with passages *i*, in combination with the metallic packing-rings and perforated cylinder, substantially as and for the purpose set forth.

5. The combination of the packing-rings *H*, having passages *j*, with the valve *D* and perforated cylinder, substantially as and for the purpose specified.

6. The combination, with the yoke *K*, secured to the valve-stem, of the sliding cam-shaft *R*, the same constructed with variable cam-surfaces, as shown, whereby variable intermittent movements may be imparted to the valve, substantially as and for the purpose set forth.

7. The combination, with the rotary shaft *I*, provided with spline *k*, of the sliding cam-shaft *R*, having a groove, *l*, the said cam-shaft formed with variable cam-surfaces, substantially as and for the purpose specified.

8. The combination, with the yoke *K*, of the sliding cam-shaft *R*, the latter having a portion of its length of less diameter than the opening of the yoke, whereby the cam-shaft may be thrown completely out of engagement with the yoke, if desired, substantially as and for the purpose specified.

In testimony that I claim the foregoing I have hereunto set my hand this 24th day of February, 1876.

JAMES WHITNEY.

Witnesses:

THOS. B. HALL,
ALBERT W. BRIGHT.