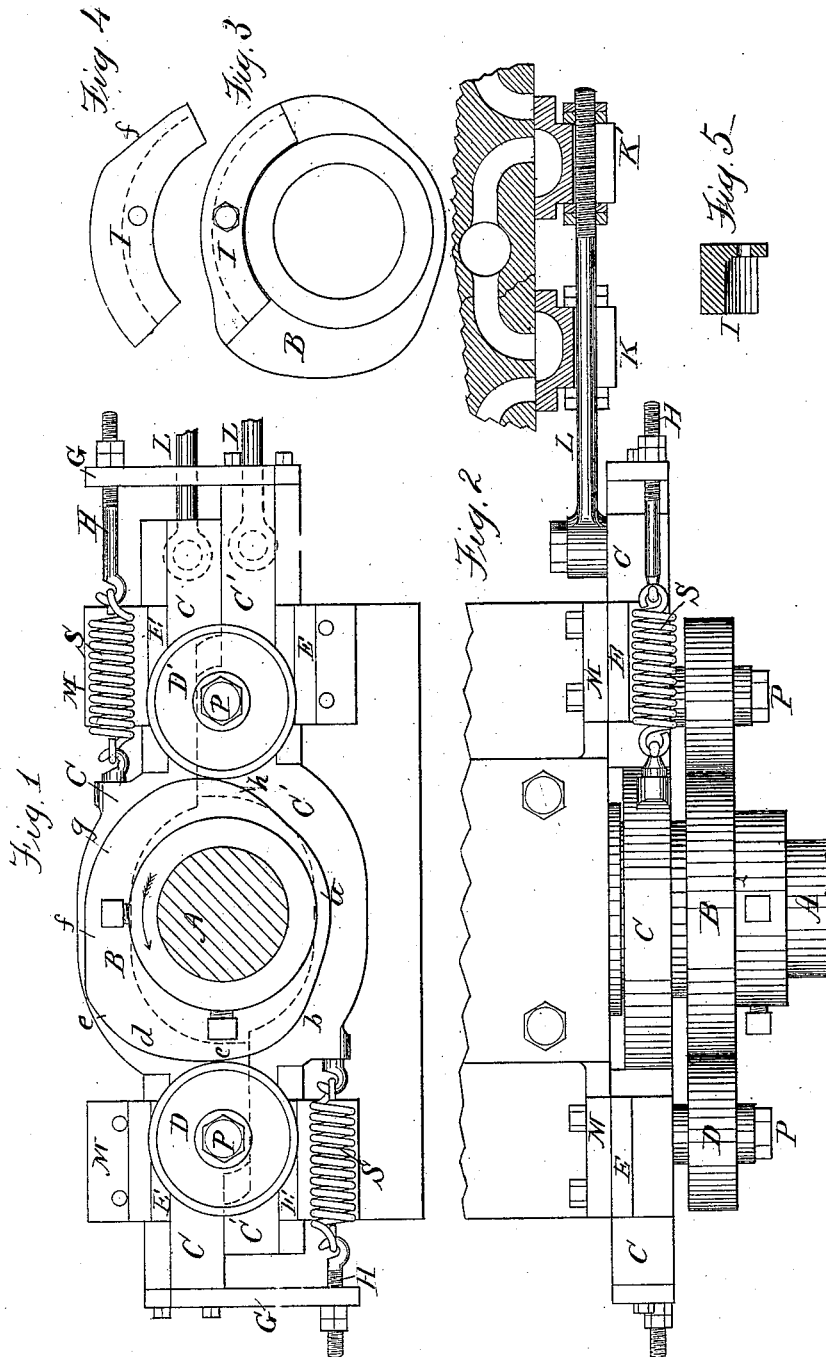


(No Model.)

H. BROOMELL.
CUT-OFF VALVE GEAR.

No. 266,425.

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WITNESSES:

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HENRY BROOMELL, OF CHRISTIANA, PENNSYLVANIA.

CUT-OFF-VALVE GEAR.

SPECIFICATION forming part of Letters Patent No. 266,425, dated October 24, 1882.

Application filed August 18, 1882. (No model.)

To all whom it may concern:

Be it known that I, HENRY BROOMELL, of Christiana, in the county of Lancaster and State of Pennsylvania, have invented certain new and useful Improvements in Cut-Off Valves for Steam Engines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

My invention relates to that class of valve-gear in which a cam and yoke are used to actuate the valves.

It consists of a single cam whose periphery is so constructed that the valves are caused alternately to admit, cut off, and exhaust the steam in the cylinder.

It further consists in making the yoke of two independent sections or moving pieces, and mechanism, hereinafter described, by which the sections are kept in contact with the faces of the cam.

It finally consists in operating two valves by one cam, whereby the valves are made to admit, cut off, and exhaust steam from the cylinder of the engine.

Heretofore the cams in valve-gear in which yokes are used were constructed with their diameters or distances equal between the points of contact with the yoke. Therefore one valve only can be used, and that only to admit or exhaust the steam. In other devices in which two valves are actuated by one cam they admit and cut off steam only, a separate valve or valves and cam being provided to exhaust the steam from the cylinder.

By my device I do away with a number of parts heretofore used, which are liable to get out of order, lessen the expense of manufacture, and produce a valve-gear which is more accurate in its movements, lighter, and of neater design.

In the accompanying drawings, Figure 1 is a side view of my device. Fig. 2 is a top or plan view, partly in section. Fig. 3 is a side view of the cam. Fig. 4 is a side view of the removable cut-off face of the cam, and Fig. 5 is a section of the same.

B is the cam, secured to the shaft A by set-screws, or by any well-known means. The cam, of whose contour and operation a more definite description will appear hereinafter, has a removable cut-off face, I, set in recess in said cam and made flush therewith.

The sectional yoke or cam-yoke C C is composed of an upper and a lower section. Each section has an elongated curve to clear the shaft and permit a longitudinal movement, and it terminates in a straight piece, which forms a bearing for the yoke. To each section are attached the valve-stems L L. To the lower right-hand end and to the upper left-hand end of the sections of the yoke are fixed the journal-pins P P, upon which revolve the rollers D D. I do not confine myself to the use of rollers, as a projecting lug on each of the sections would answer; but the friction would be a little greater. I therefore use the rollers. Upon the end of the lower section and extending above the end of the upper section, and upon the end of the upper and extending below the end of the lower section, are secured arms C C. Through the ends of these arms are bolts H H for adjusting the tension of the springs S S, one end of the springs being attached to the bolt and the other to one section of the yoke or carriage. It will be seen by the tension of these springs that the rollers are kept in contact with the faces of the cam. I do not confine myself to the use of springs to accomplish this, as it is evident that a slight difference in construction would permit other means to be used to accomplish the same purpose. For instance, the valve-stems may be enlarged at the point where they enter the steam-chest, thereby forming small pistons; or counter-weights may be employed. The yokes are placed together, having their faces upon the straight portion of the sections, the faces being smooth to permit a free movement on the opposite sides. To these faces the straight portions are beveled, the same being inclosed by the caps E, and with the brackets M M forming guides for the sections and keeping them together, permitting independent longitudinal movements only of the sections.

The cam consists of three concentric portions, *a e g*, and their connecting curves. The part *a* is the lowest or nearest to the center,

and when this part of the cam is in contact with the roller D on the left of the figure the valve K, which is moved by the roller, is open to the exhaust side. As the cam revolves in the direction of the arrows the outward face, *b*, closes the exhaust, the face *c*, now in contact with the roller D, opens the valve on the live-steam side at the commencement of the stroke, and the face *d* continues to move it until it is open to its full extent. While the concentric face *e* is passing the roller the valve remains stationary and open. The extent of this concentric face depends upon the point at which it is desired to cut off the steam.

f is the cut-off face of the cam, and when it reaches the roller the face would recede from it, owing to the yoke being in sections; but each section is actuated by the cam in one direction and by the springs S in the other. Therefore the yoke is caused to remain in contact with the cam and partake of its receding motion, which is communicated to the valve, and the steam is cut off from the cylinder. While the concentric part *g* is passing the roller the valve is again stationary, covering the steam-port. In this position the steam works expansively until the piston has reached the end of the stroke and the exhaust-face *h* has reached the yoke or roller. The face *c* of the cam is made nearly concentric with the center of motion of the shaft, in order to produce a slow motion of the valve at the first admission of steam, for the purpose of preventing a shock to the piston.

The above description of the operation of the cam upon one of the sections of the yoke and valve applies to the other, as the movement is identical.

It will be readily seen that the position of the crank (not shown in drawings) is at the right of the center of the shaft or opposite part, *e*, of the cam, and if the movement of the valve be followed it will be found that it is quickly thrown wide open to the exhaust, that it remains fully open during the greater part of the stroke of the piston, and that it is quickly closed. The movement of the valve is determined by the shape of the faces of the cam.

For varying the degree of expansion I construct my cam so that interchangeable cut-off faces of varying lengths may be inserted. This I accomplish by forming a recess in the face of the cam and terminating in a deeper recess on its side. In this deeper recess the flange of the cut-off face is bolted, thereby preventing lateral movement, the backward and forward movement being prevented by the shoulders at the end of the recess.

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

1. The combination, in a steam-engine valve-gear, of a cam, a sectional yoke or carriage, and means for keeping each side of the carriage in contact with the cam, substantially as and for the purpose described.

2. The combination, in a steam-engine valve-gear, of the cam, the sectional yoke or carriage, the friction-rollers, and means for keeping the rollers in contact with the cam, substantially as described.

3. In a steam-engine valve-gear, the combination of the cam, the sectional yoke or carriage, the friction-rollers, and the springs, whereby the yoke is kept in contact with the cam, substantially as and for the purpose described.

4. In a steam-engine valve-gear, the combination of the cam, the sectional yoke or carriage, the friction-rollers, the springs, and means for adjusting the tension of the springs, substantially as described.

5. In a steam-engine valve-gear, the combination of the cam, the sectional yoke or carriage, means for keeping the yoke in contact with the cam and the two valves, and stems whereby the two valves are operated by the cam, substantially as described.

6. In a steam-engine valve-gear, the combination of the cam, the sectional yoke or carriage, means for keeping the yoke in contact with the cam, and guides for the yoke, substantially as described.

7. In a steam-engine valve-gear in which a single cam operates two valves, the combination of a cam having its contour as follows: an admission, a cut-off, a stop for expansion, and an exhaust-face, and means by which the valves are alternately operated, substantially as described.

8. In a steam-engine valve-gear, the combination of the cam, the sectional yoke or carriage, means for keeping the yoke in contact with the cam, and the detachable cut-off face of the cam, substantially as described.

9. In combination with a steam-engine, the two valves and means for operating them alternately and independently of each other, to admit, cut off, and exhaust the steam supplying the cylinder, substantially as described.

10. In a steam-engine valve-gear, the combination of the cam, the sectional yoke or carriage, the guides, the rollers, the adjustable springs, and the valves and rods, all arranged as shown, and operating as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

HENRY BROOMELL.

Witnesses:

BRINTON WALTER,
P. E. HANNUM.