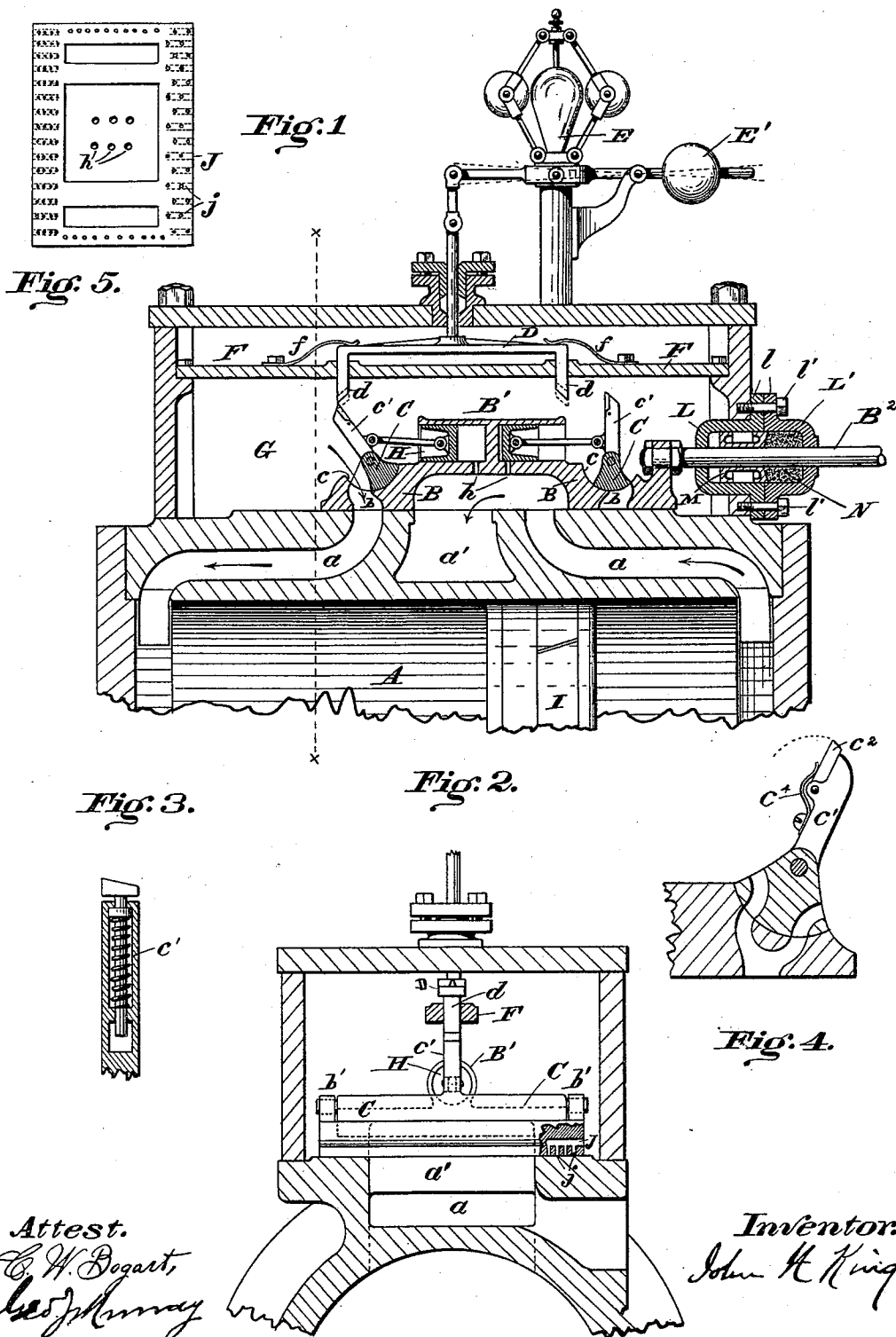


(No Model.)

J. H. KING.
CUT-OFF VALVE.

No. 449,123.

Patented Mar. 31, 1891.



UNITED STATES PATENT OFFICE.

JOHN H. KING, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF TO JOHN
O. SLOAN, OF SAME PLACE.

CUT-OFF VALVE.

SPECIFICATION forming part of Letters Patent No. 449,123, dated March 31, 1891.

Application filed June 9, 1887. Serial No. 240,689. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. KING, a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Cut-Off Valves for Steam-Engines, of which the following is a specification.

My invention is an improvement in slide-valve engines. Its objects are to provide an automatic cut-off whereby the steam may be admitted to the cylinder and cut off from it during any portion of the piston's stroke, to lighten the pressure of the valve upon its seat, and, finally, to provide a simple and efficient means for packing the rod and piston.

The invention consists in the several combinations of devices, which will be first fully described in connection with the accompanying drawings, and then particularly referred to, and pointed out in the claims.

Referring to the drawings, in which like parts are represented by similar reference-letters wherever they occur throughout the various views, Figure 1 is a vertical longitudinal section of a steam-chest provided with my improvements and so much of a steam-cylinder as is necessary to show the relation of the valves and ports. Fig. 2 is a transverse vertical section of the same, taken through line *x* *x* of Fig. 1. Fig. 3 is an enlarged view in longitudinal section of a modification of the bar of the cut-off valve, and Fig. 4 is a modification of one of the cut-off valves. The valve in this view is a multiple-port valve. Its bar is an enlarged view of the valve-bars shown in Fig. 1. Fig. 5 is an inverted plan view of the slide-valve.

The cylinder A, with its admission-ports *a* and exhaust-ports *a'*, is of the usual construction. The slide-valve B has its end laps perforated, forming the admission-ports *b* *b*, which ports are controlled by the segmental cut-off valves C, which are seated in segmental grooves *c*, running transversely across each end of the valve B. The valves C are journaled in lugs *b'*, projecting up from each side lap of the valve B. Each of the cut-off valves C has an arm *c'* with a spring-latch attachment at top, as shown in Fig. 4, to engage the

vertical ends of a yoke or angle-bar D, which is connected to the rod *e* of the governor E. The yoke D is steadied and guided vertically by the bar F, which is secured upon studs *f*, projecting inwardly from the ends of the steam-chest G, the ends *d* passing through the bar for this purpose.

Upon the top of the valve B, and preferably cast in one piece with it, is a cylinder B, which is bored from both ends to near the middle to receive the pistons H, which are connected to the arms *c'* of the valve C by link-rods *h*. The cylinders B' have through their lower sides perforations *b'*, leading to the exhaust-port *a'*. The aggregate area of the openings in each of the cylinders should be about equal to the area of the front of the pistons H, so that the exhaust-steam, which enters either of the cylinders when the piston H is drawn out to near the end of its cylinder by the valve-arm *c'* when the port *b* is opened, as seen on the left-hand side of Fig. 1, may be readily discharged into the exhaust *a'* by the steam-pressure on the front of the valve H, and thus rapidly close the port *b* by returning the rod *c'* to its vertical position by means of the link *h*.

Upon the top of the bar F are two springs *f*, which reach over and bear upon the bar D to hold it down with a gentle pressure against the weight of the counterpoise E'. The upper ends of the bars *c'* are provided with pivoted latches *c''*, (see Fig. 4,) which are held against the bar *c* by springs *c'''*, and the upper end of these latches are beveled, as shown. The lower ends of the bars *d* are beveled in opposite directions, so that the spring-latches of the bars *c'*, which travel in the path of the bars, may be caught by the bar *d* to open the ports *b* when traveling in one direction, and the latches are caught by the bars *d* and turned back when the slide-valve is traveling in the opposite direction without elevating the bar *d* or opening the cut-off valve upon the return-stroke.

The pistons H are shown plain; but to compensate for wear I pack them with the usual snap-ring, such as is generally used upon steam-pistons.

The operation of the part of my invention

above described is as follows: In Fig. 1 the valve B has just completed its stroke to the right and the arm c' on the left just escaped its throwing-arm d and is just on the point of being returned to its vertical position to close the port b by the action of the steam upon the left piston H, the cut-off in this instance being at a little more than half-stroke of the engine-piston I. Upon the return-stroke of the slide-valve B the valve-bar c' upon the right reaches its bar d about the time the piston I has completed its stroke, the valve-bar c' upon the opposite side having passed its bar d by this time. The port b upon the right is thrown and retained open until the slide-valve B nearly completes its stroke, as before described. It is obvious that the length of time the admission-ports are kept open will depend upon the position of the vertically-sliding bar D $d d$, and as its position is controlled by the governor the cut-off must be regulated by the speed of the engine. Thus when the ends $d d$ of the bar D are in the lower position, as indicated by the lower dotted lines, Fig. 1, the ports b will be kept open a longer time and the cut-off will be at about full-stroke, while if the engine is running at a high speed the ends d will be drawn up to the position shown in upper dotted line, when the cut-off will be quicker or at about quarter-stroke. The cut-off is thus automatically varied from a complete cut-off to a cut-off at full-stroke, depending upon the pressure of the steam or the duty required of the engine.

In Fig. 3 the arm c is cored out to receive a spring-actuated plunger c' , which may be substituted for the form of spring-latch shown in Fig. 4.

In Fig. 4 I have shown a multiple-port cut-off, which I propose to use when it is desired to make the cut-off extremely sensitive.

To insure an easy motion of the slide-valve upon its seat, I perforate the side laps with a number of small holes j , which may be bored entirely through the laps or into perforations J, bored in from the edge of the laps. Through these holes steam is admitted to the seat to partially balance the valve and at the same time lubricate it. These holes j should be arranged as shown at the right-hand side of Fig. 5, with the holes in one transverse row opposite the spaces between the holes in the rows upon each side, so that the wear upon the seat will be equal. The end laps may also be perforated with small holes, as shown at $k k$. In order to further reduce the

power required to move the slide-valve I have invented the improved rod packing or stuffing box shown at the right of Fig. 1, which I will now describe.

L L are two metallic shells having flanges l , by which they are bolted together and to the end of the steam-chest by bolts l' . The shell L is bored true upon the inside to receive the metallic follower M, which is axially perforated, as is also the case formed by the shells L L' to receive the valve-rod B². Within the shell L, around the valve-rod B², is a packing N of hemp or similar material. The outer end of the follower or loose piston M is preferably slightly dished, as shown, so as to crowd the packing N around the rod. The rod passes freely through the inner end of the shell L, and the pressure of steam acting upon the inner end of the follower presses it against the packing with sufficient force to produce a suitably-tight joint with very little friction. The follower or guide M is reduced at m , forming a chamber within which the condensed steam collects, assisting to keep the live steam from escaping and lubricating the surfaces.

What I claim is—

1. The combination, substantially as specified, of the slide-valve B, having ports b and seats $c c$, with the segmental cut-off valves C C, journaled to said slide-valve upon opposite ends and having arms $c' c'$, and suitable tripping devices, such as shown, controlled by the governor and adjustable in the path of said arms, for the purpose set forth.

2. The combination, substantially as set forth, of the steam-chest, the slide-valve having admission-ports near each end, the cut-off valves to control said ports and carried by said slide-valve, with tripping devices, such as shown, located in the path of the cut-off valves to open said ports, the cylinders B', carried by the slide-valve, the pistons H, and links h to close the admission-ports $b b$ when the cut-off valves are released by the tripping devices.

3. The combination of the steam-chest, the cut-off valves C c , cylinders B, carried by the slide-valve, the pistons H, linked to the valve-arms, and the vertically-sliding angle-bar D $d d$, located in the path of the valve-arms and controlled by the governor, substantially as and for the purpose set forth.

JOHN H. KING.

Witnesses:

H. H. MALES,
DAVID S. OLIVER.