E. E. Groom,

Steam-Engine Valve-Gear.

No. 52,707. Patented Feb. 20, 1866.

Fig. 1.

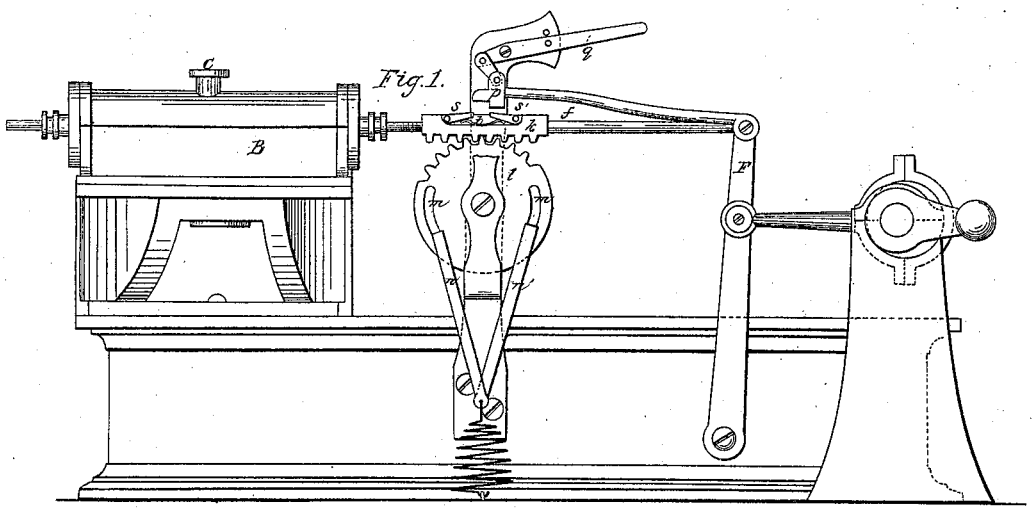


Fig. 2.

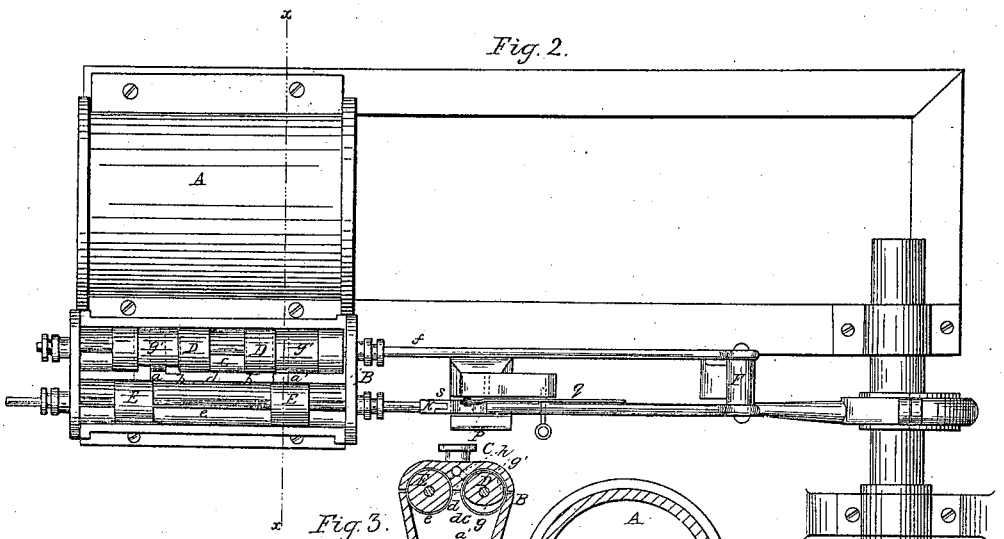
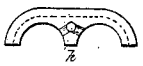


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

ELBERT E. GROOM, OF NEW YORK, N. Y.

IMPROVEMENT IN STEAM AND CUT-OFF VALVES.

Specification forming part of Letters Patent No. **52,707**, dated February 20, 1866.

To all whom it may concern:

Be it known that I, E. E. GROOM, of the city, county, and State of New York, have invented a new and Improved Steam and Cut-Off Valve; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 represents a side elevation of this invention. Fig. 2 is a plan or top view of the same, the cover of the valve-chest having been removed to show the position of the valves. Fig. 3 is a transverse vertical section of the same, the line *x x*, Fig. 2, indicating the plane of section. Fig. 4 is a detached end view of the valve-chest cover.

Similar letters of reference indicate like parts.

This invention refers to the use of a double piston-valve, each piston being provided with a cavity between its ends to operate in combination with steam supply and exhaust ports, in the same manner as an ordinary D-valve, steam being admitted through the cavities in the piston to the steam-ports, while said cavities serve also to form the communication between the steam and exhaust ports, and small recesses extending from said cavities allow the steam to pass clear round the central portions of the piston-valves, rendering the same equally balanced and independent of the pressure of steam in which they act.

In order to balance the piston-valves from the ends in case one should leak the steam-chest cover is provided with a channel which serves to equalize the pressure on the ends of the piston-valves. These balanced double piston-valves are combined with a cut-off valve composed of two pistons which are subjected to the action of a spring and of an adjustable tripping device. The spring acts by two hooked rods on a double-slotted toothed segment which gears in a toothed rack secured to the cut-off-valve rod, in such a manner that in whatever direction the toothed segment will be turned the spring has a tendency to carry it back to its original position and to hold it there, and consequently if the valve is opened immediately upon being released it will close and stay closed until it is disturbed in its position by some external force.

The tripping device consists of two latches hinged to the upper edge of the toothed rack, in combination with a tappet-lever to which a reciprocating motion is imparted by a rocker-arm or other suitable means, and which is suspended from a lever which is adjusted either by hand or by the governor, in such a manner that by the action of said tappet-lever on the hinged latches the cut-off valve is carried along in either direction and tripped at the desired point, according to the position of the adjustable lever from which said tappet-lever is suspended.

A represents a steam-cylinder, to which steam is admitted through ports *a a'*, and from which the steam exhausts through said ports *a a'* and through the exhaust-ports *b b'*. The ports *a a' b b'* are situated in the bottom of the compartment *c* of the steam-chest B, as shown in Fig. 2 of the drawings, and the ports *a a'* pass through the partition *d* to the compartment *e* of said steam-chest, to which steam is admitted through the steam-pipe C.

The compartments *c e* of the steam-chest are bored out circular to receive the piston-valves D E, the valves D to represent the exhaust-valve, and the valves E the cut-off valve, of the engine.

The valves D connect by the rod *f* with the rocker-arm F, to which a vibrating motion is imparted by an eccentric on the crank-shaft or by any other suitable mechanism, and each of said valves is provided with a cavity, *g*, at its under side, (see Fig. 3,) so that when said cavity comes over the ports *a b* or *a' b'*, a communication is effected between the exhaust-port and the interior of the cylinder, and the steam is free to discharge. The cavities *g* are situated between the packed ends of the pistons D, which fit steam-tight into their compartment of the steam-chest, and they communicate with shallow recesses *g'*, extending round the upper parts of the pistons, so that the steam is permitted to pass clear round and each piston is perfectly balanced and rendered independent of the pressure of the steam to which it may be exposed.

In order to balance the piston-valves D from the ends, in case one of said pistons should leak, a channel, *h*, extends through the whole length of the steam-chest cover, as shown in Figs. 3 and 4. This channel communicates at both ends with both compartments of the

steam-chest, and consequently the pressure of the steam acting on the ends of the several piston-valves is equally balanced.

The communication between the steam-pipe C and the ports *a a'* is opened and closed by the action of the cut-off valves E. These valves are made in the form of pistons, as previously stated, and they work in the compartment *e* of the steam-chest. Their position is governed by the action of a tripping device, which is constructed as follows: The rod *j*, on which the piston-valves E are mounted, terminates in a toothed rack, *k*, which gears in the cogs of a segment or disk, *l*, and this disk is provided with two slots, *m m'*, from each of which extends a hooked rod, *n* or *n'*, to a spiral spring, *o*, which is secured to the bed-plate of the engine or to any convenient spot. The spring *o* and the rods *n n'* are so arranged that the same have a tendency to keep the disk *l* in a central position—or, in other words, in such a position in which the same causes the valve E to close the steam-ports *a a'*—and whenever said disk is disturbed from its central position it will fly back immediately upon being released and cause the steam-ports to be closed.

The cut-off valves are opened by the action of a tappet, *p*, secured to the end of a lever, which is pivoted to the rocker-arm F, or to which motion is imparted in any covenient manner. This tappet is suspended from the bed of the engine or secured to any other convenient place, and it extends into a recess, *r*, formed between the ends of two latches, *s s'*, which are hinged to the upper edge of the toothed rack *k*, and subjected to the action of a weak spring, *t*, which has a tendency to throw their points up. Whenever the tappet passes the gap between the points of the hinged latches, it descends and catches against the point of one of the latches, carrying with it the toothed rack and valve E, and throwing the disk *l* out of its central position until, in its circular course round the end of the lever *q*, from which it is suspended, it rises and releases said latch, allowing the toothed rack, with the valves, to follow the action of the spring *o*, which will carry the disk *l* back to its central position, as above stated, and the steam-ports are again closed. By adjusting the lever *q* the tappet can be made to trip the cut-off valves sooner or later, according to the time when it is desired to cut off the steam. Said lever may either be adjusted by hand, or it may be connected to the governor, so that the cut-off is rendered self-adjusting. The principal advantage of this tripping mechanism is that the spring *o*, which is the principal agent of the same, is not liable to lose its power, since what it loses on one side it gains on the other. At the same time it must be remarked that said spring might be replaced by a simple weight. By such spring or weight the cut-off valve is securely closed whenever the tappet releases the latches on the top edge of the rack.

I claim as new and desire to secure by Letters Patent—

1. The cavities *g*, and shallow recesses *g'*, in the piston-valves D, adapted to operate in conjunction with the ports *a a' b b'*, in the manner and for the purpose specified.

2. The channel *h*, in the steam-chest cover, in combination with the double piston-valves D E, constructed and operating substantially as and for the purpose specified.

3. The tappet *p*, suspended from the adjustable lever *q*, in combination with the hinged latches *s s'*, toothed rack *k*, disk *l*, and spring *o*, or its equivalent, constructed and operating substantially as and for the purpose set forth.

The above specification of my invention signed by me this 25th day of August, 1865.

ELBERT E. GROOM.

Witnesses:

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