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2 sheets-sheet 2.

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Fig. 2.

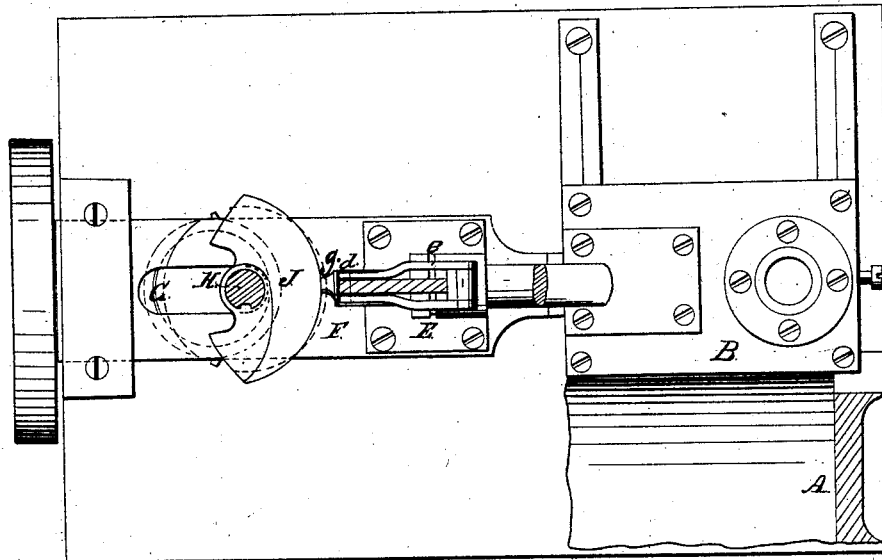
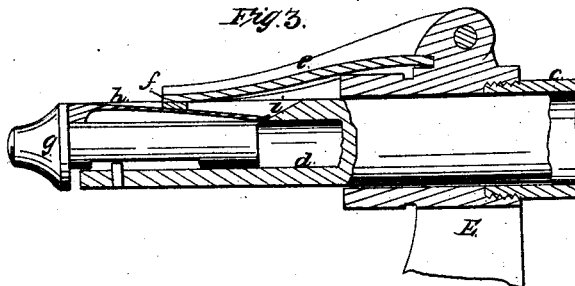


Fig. 3.



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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN CUT-OFFS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **46,020**, dated January 24, 1835.

*To all whom it may concern :*

Be it known that I, J. H. PAINE, of Hartford, in the county of Hartford and State of Connecticut, have invented a new and Improved Cut-off; 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 part of this specification, in which—

Figure 1 is a sectional side elevation of this invention. Fig. 2 is a sectional plan of the same. Fig. 3 is a detached sectional view of the valve-rod in a larger scale than the previous figures.

Similar letters of reference indicate like parts.

This invention consists in the employment or use of a spiral cam applied in combination with the governor and with the main valve and cut-off valve of a steam-engine in such a manner that by the action of the cam on the rod of the cut-off valve the steam is cut off instantaneously, (or nearly so,) and, the wire drawing of the steam is avoided, and, furthermore, the cam being in action for a short space of time, leaves the governor free during the largest part of the stroke.

It consists, further, in the application of a latch and sliding pin, in combination with the rods of the main valve and of the cut-off valve and with a suitable cam in such a manner that by the action of the latch the main and cut-off valves are locked open, leaving no liability to close the ports until the proper time arrives, and by the action of the cam and pin the two valves are disconnected instantaneously, allowing them to move in the same or in opposite directions as occasion may require.

A represents a steam-cylinder, which is provided with two steam-chests, B, one at each end, and each steam-chest contains a separate slide-valve, C, and cut-off valve D.

One end of the cylinder only is shown in the drawings; but the operation of my cut-off will be readily understood from the following description, since the valves at that end of the cylinder which is not shown are operated by the same cam precisely in the same manner as those which are represented.

The cylinder takes steam through the port *a* in the valve-seat and through a corresponding channel, *a\**, in the main valve C, and it

exhausts through the port *b* and corresponding cavity, *b\**, in the face of said valve, and the channel *a\** is alternately closed and opened at the proper intervals by the cut-off valve D.

The stem *c* of the main valve C is hollow and firmly secured in a standard, E, which rises from a slide, F, to which a reciprocating motion is imparted by an eccentric, G, mounted on the spindle H of the governor I, or by any other suitable means.

The cut-off valve D is fitted steam-tight on the back of the main valve C, and it is provided with a channel, *a'*, which can be brought to register with the channel *a\** in the main valve or not, as circumstances may require. If both channels register wholly or partially with the port *a*, steam passes into the cylinder; but if one of the two channels or both do not register with said port steam is cut off.

The stem *d* of the cut-off valve D extends through the hollow stem *c* of the main valve, and the two are locked together by a latch, *e*, which is hinged to the top of the standard E and drops in a notch, *f*, in the valve-stem *d*. The position of the latch and notch in relation to each other is such that when by their action the two valve-stems are locked together, the channel *a\** in the main valve registers with the channel *a'* in the cut-off valve, or, in other words, the two valves are locked open and are not allowed to close before the specified time.

In order to release the latch automatically at the proper instant, a pin, *g*, is fitted into the end of the valve-stem, and a flat spring, *h*, secured to the front end of this pin, bears with its loose end on an inclined plane, *i*, under and behind the notch *f*, as shown in Fig. 3 of the drawings.

If by some pressure exerted on its head the pin *g* is driven back in its socket, the spring *h* ascends the inclined plane *i*, and the latch is raised so as to clear the notch *f*, and when the pressure ceases the spring *h* carries the pin back to its original position. This object is effected automatically at the desired instant by a cam, J, which is arranged on the spindle H of the governor, so that it rises and falls freely on the same, but is compelled to rotate with it. Said cam is formed by a spiral flange, which acts on the pin *g* during different parts of the stroke, according to the higher or lower position of said cam on the spindle of the gov-

error. If the cam is moved down on the spindle as far as it will go, steam is admitted during the full stroke of the piston; but if the cam is moved up to its central position steam is cut off at half-stroke, and if the cam is raised as high as it will go no steam at all is allowed to pass into the cylinder, or steam is cut off at full stroke.

It will be readily understood what the effect of the cam will be in its intermediate positions, and if the cam is connected to the governor the position of the cut-off valve will be regulated automatically according to the requisite speed of the engine. The connection of the cam and governor may be effected in a simple manner, and the action of the cam is such that it leaves the cam free during the largest part of its revolution, and the friction between the valves is nearly all removed, as the stem of the cut-off valve is held in contact with the cam only until the port is closed, and is then allowed to travel with the main valve. The sensitiveness of the governor is thereby increased and a more uniform speed of the en-

gine effected than with governors and cut-offs of the ordinary construction.

An adjustable stop, *j*, is secured in the outer end of the steam-chest, which serves to retain the cut-off valve stationary in the proper position while the main valve traverses under it. This stop is so adjusted that the port in the cut-off valve will register with that in the main valve until the action of the cam *J* on the pin *g* commences.

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

1. The spiral cam *J*, applied in combination with the governor and with the main valve *C* and cut-off valve *B*, substantially as and for the purpose set forth.

2. The sliding pin *g* and hinged latch *e*, in combination with the valves *C D* and cam *J*, constructed and operating substantially as and for the purpose described.

J. H. PAINE.

Witnesses:

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