2 Sheets—Sheet 1.

N. W. TWISS.

Cut-Off Gearing.

No. 212,285. Patented Feb. 11, 1879.

Fig. 1

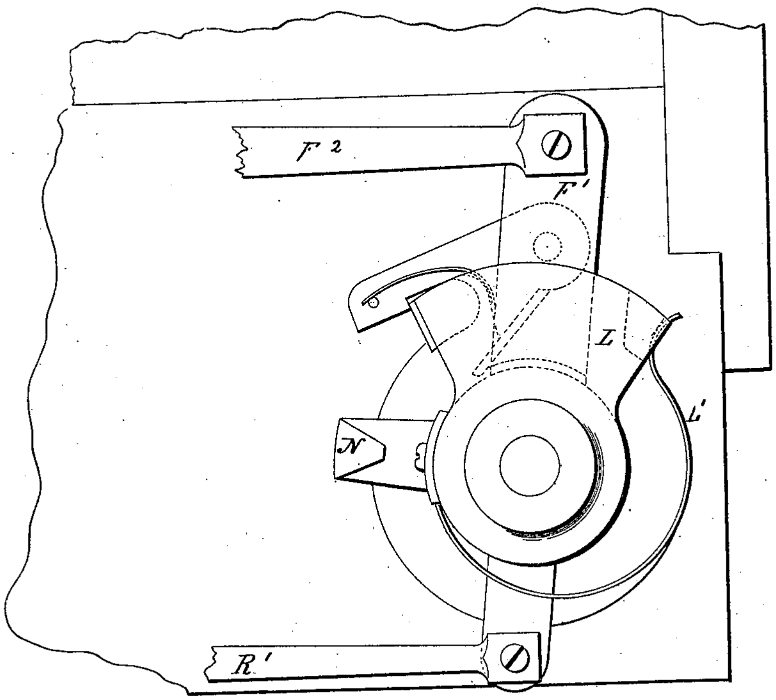


Fig. 2.

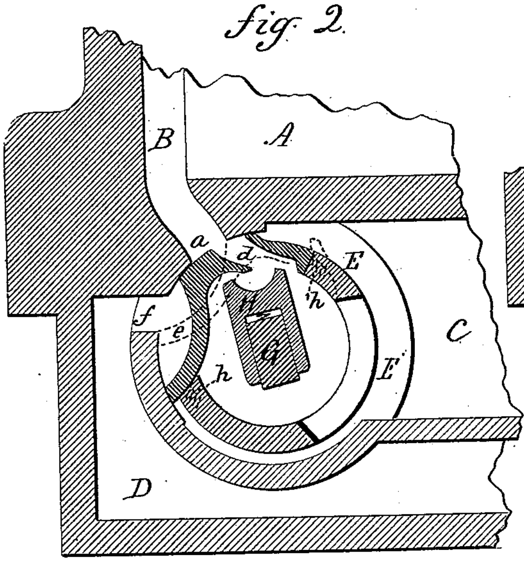
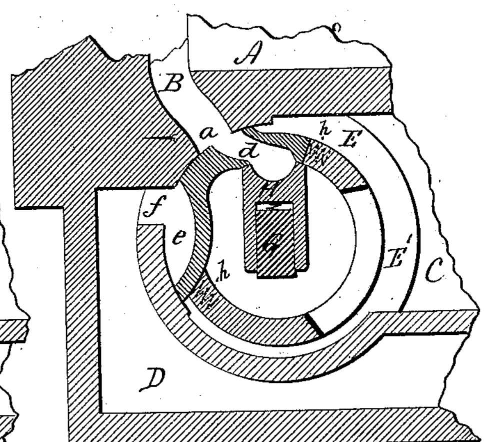


Fig. 3.



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2 Sheets—Sheet 2.

N. W. TWISS.

Cut-Off Gearing.

No. 212,285. **Patented Feb. 11, 1879.**

fig. 4

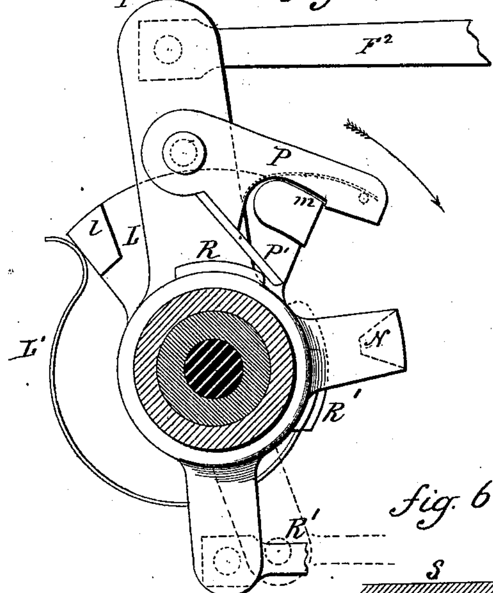


fig. 6

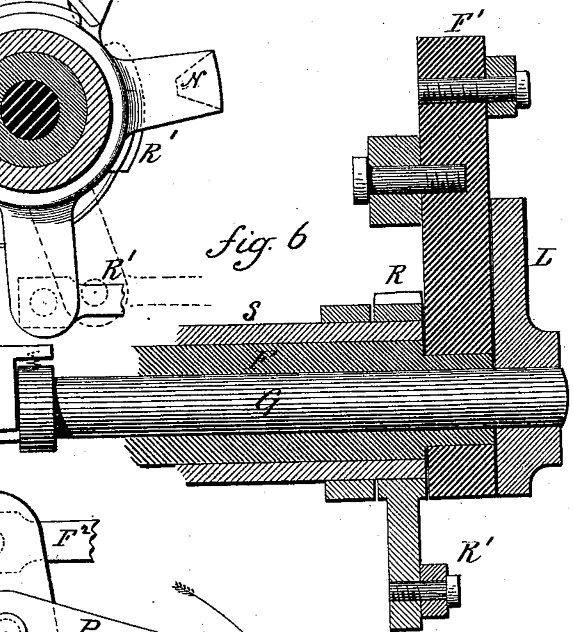
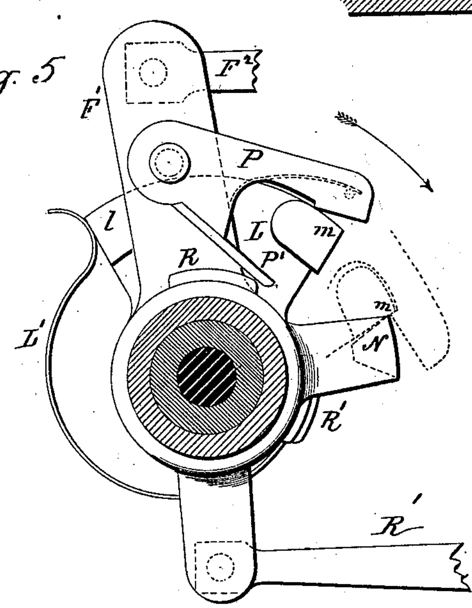


fig. 5



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UNITED STATES PATENT OFFICE.

NELSON W. TWISS, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN CUT-OFF GEARING.

Specification forming part of Letters Patent No. **212,285**, dated February 11, 1879; application filed November 1, 1878.

To all whom it may concern:

Be it known that I, NELSON W. TWISS, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Automatic Cut-Offs for Steam-Engines; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a front view of a part of my valve-gear; Figs. 2 and 3, transverse sections through the valve longitudinally, through the steam and exhaust passages; Figs. 4 and 5, views of the gearing to illustrate the operation; Fig. 6, a longitudinal section through the gearing.

This invention relates to an improvement in that class of cut-offs for steam-engines which are adjusted automatically by the action of the governor; and it consists in the construction, as hereinafter described, and more particularly recited in the claims.

In illustrating the invention, the valve and its gearing are shown only as arranged at one end of the cylinder, it being understood that a like arrangement is made for the other end.

A represents the cylinder, showing an interior view; B, the steam-passage; C, the steam-chamber, and D the exhaust-steam way.

The valve E is of a hollow cylindrical form, working upon a correspondingly circular face at the port *a*, and attached to a hollow shaft, F, in axial line therewith, and to which a constant and regular oscillation is imparted through the lever F^1 on said shaft F by connection with the eccentric through the rod F^2, in the usual manner for operating steam-valves.

The cylindrical valve E has an opening, E′, to the steam-chamber, through which steam freely passes at all times; and from this cylinder is an opening, *d*, through that portion of the valve which bears against the valve-seat around the port *a*, and in the surface of the valve near this bearing portion is a depression, *e*, and in such relation to the opening *d* that as the valve is turned, say, to the position indicated in broken lines, Fig. 2, the depression *e* covers the port *a*, and opens communication to the passage *f* for the exhaust. The oscillation of the valve, therefore, alternately presents the opening *d* and the depression *e* to the port *a*, the opening *d* admitting steam to the cylinder, and the depression opening for the exhaust, the action being substantially the same as would be made by a slide-valve.

That the valve may be self-packing, that portion of the cylinder in which is the depression *e* and the opening *d* is made separate from the cylinder E, and between the edges of the cylinder and the said active portion springs are introduced, as at *h*, more or less in number, the tendency of which is to hold the said active portion to the seats around the port and exhaust, the steam always holding the valve to those positions, and thus accommodating the valve to the wear to which it is subjected.

Through the hollow shaft F a second shaft, G, extends to within the cylinder, and is there flattened, as in Figs. 2 and 3, to serve as a guide for the independent cut-off or valve H, which is arranged thereon, as seen in Figs. 2 and 3. The surface of this valve H is made to correspond to the opposite edges of the opening *d*, and so that when brought together, as in Fig. 3, the opening *d* will be closed or turned away, as in Fig. 2, and open the steam-passage to the cylinder. On the outer end of this shaft G is fixed a lever, L, and to this lever a spring, L′, is applied, the tendency of which is to force the valve H into its closed position, (seen in Fig. 3,) and when in that position a shoulder, *l*, on the lever L strikes the lever F^1, as seen in Fig. 5, and from that point the lever L is moved by and with the lever F^1, and would therefore be always closed. To open this valve, however, its movement in the direction indicated by arrow, Figs. 4 and 5, is arrested by a stationary stop, N.

As the lever F′ is turned forward by the eccentric, the lever L follows it until the lever L strikes the stop N, and this occurs as the piston approaches the opposite end of the cylinder, and when the valve has reached nearly its full exhaust position; then the lever F^1, continuing its movement and opening the exhaust, also turns the valve E so as to open the passage *d*, and at the extreme move-

ment of the lever F^1 a dog, P, on the said lever F^1 passes over and engages with a shoulder, *m*, on the lever L, as seen in broken lines, Fig. 5, which connects the lever L with the lever F^1; then, as the lever F^1 reverses, it takes with it the lever L and the valve H, both turning together and opening the steam-passage to the port, as seen in Fig. 2.

Should this connection of the dog continue throughout the stroke, then the valve would be open continuously; but it will be readily seen that should the dog be tripped from its engagement with the lever L at any point during the movement of the lever F^1, the spring L′ would immediately act and turn the lever L, so as to turn the valve H and close the steam-passage *d*, and there cut off the steam.

To automatically make this disengagement during the movement of the lever F^1, to close the valve H, a cam, R, loose on the shell S, which supports the shafts F G, is connected by a rod, R′, with the governor; and from the dog P an arm, P′, extends downward in the path of the said cam, and whenever the said arm P′ strikes the cam R, as seen in Fig. 4, the dog will be raised from its engagement with the lever L, and leave that lever L free to turn by the force of the spring L′, as seen in Fig. 5, and which brings the shoulder *l* on the lever L into engagement with the lever F^1 on the opposite side, closing the valve H, as seen in Fig. 3, from which time the two levers F^1 and L, with the valves E and H, move together in their closed condition.

The action of the governor turns the cam R nearer to or farther from the point where the dog P engages the lever L, accordingly as the engine runs faster or slower, and if so slow that the cam is not reached before the completion of the stroke, then the valve will be open through the entire stroke; but as the speed of the engine increases, the cam R will be moved toward the dog, and trip the dog accordingly. The time of tripping may be adjusted in the usual manner of adjusting the action of a governor.

To provide against any interruption of the action of the governor, as by a disconnection of the power which drives it, there is a second elevation, R′, on the cam forward of the cam R, and which, when the governor stops, will be turned up, as indicated in broken lines, Fig. 4, so that the arm P′ will strike it at the extreme forward movement of the lever F^1, and hold it away from its engagement with the lever L, in which case the lever L would not be turned until the lever F^1 should strike the shoulder *l* thereon, and consequently the steam-passage would not be opened, as the valve H would be closed from the start, and through the entire movement.

The valve H is preferably arranged with springs between it and its guide or shaft G, the action of which is to force the valve H radially from the shaft, so as to make it self-packing or self-adjustable around the opening *d*.

The form of the valve E need not be that of a cylinder, as shown, as that portion of the cylinder below the active valve part is only necessary to support that part; and if that active part be attached directly to the shaft which rotates the valve, it will be evident that the remainder of the cylinder may be dispensed with, it only being essential that the valve shall be oscillating, and substantially concentric with the axis of the valve H.

I claim—

1. The combination of an oscillating valve, provided with both steam-passage and exhaust-passage, alternately presented to the cylinder-port, and an independent oscillating valve concentric with said steam-valve, but independent thereof, and arranged so as to automatically close or open the steamway through the said steam-valve to the cylinder, substantially as described.

2. The combination of the hollow shaft F, the steam-valve in connection therewith, provided with a steam-passage, a shaft, G, within said shaft F, concentric thereto, carrying the independent valve H, with the lever F^1 on said shaft F, in connection with the eccentric of the engine, the lever L on said shaft G, the spring L′, stationary stop N, dog P, hung upon said lever F^1, and the adjusting-cam R, in connection with the governor, substantially as described.

3. The combination of the hollow shaft F, the steam-valve in connection therewith, provided with a steam-passage, a shaft, G, within said shaft F, concentric thereto, carrying the independent valve H, with the lever F^1 on said shaft F, in connection with the eccentric of the engine, the lever L on said shaft G, the spring L′, stationary stop N, dog P, hung upon said lever F^1, and the adjusting-cams R and R′, in connection with the governor, substantially as described.

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