F. F. HEMENWAY.

AUTOMATIC CUT-OFF GEAR FOR STEAM-ENGINES.

No. 193,952. Patented Aug. 7, 1877.

Fig. 1.

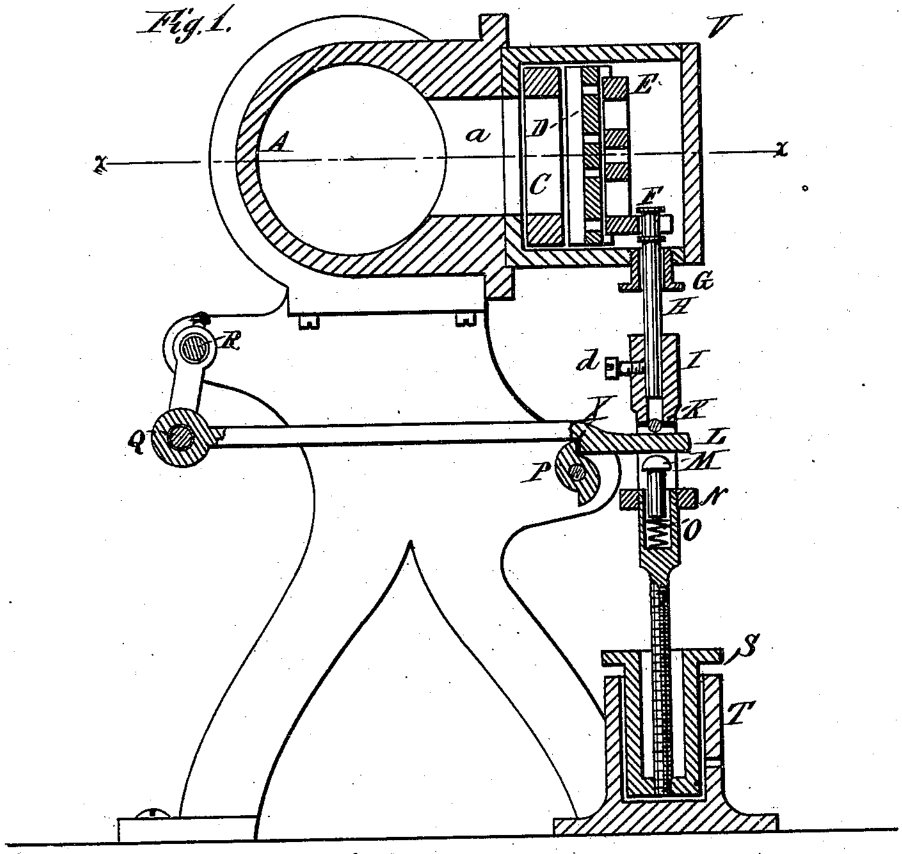
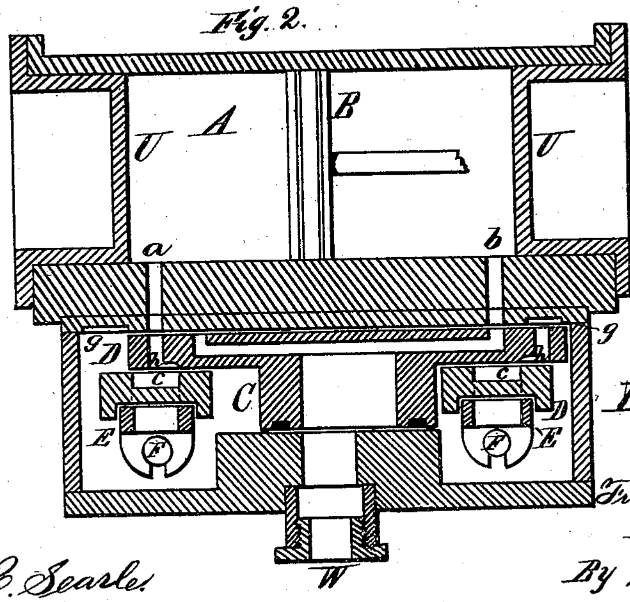


Fig. 2.



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2 Sheets—Sheet 2.

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Fig. 3.

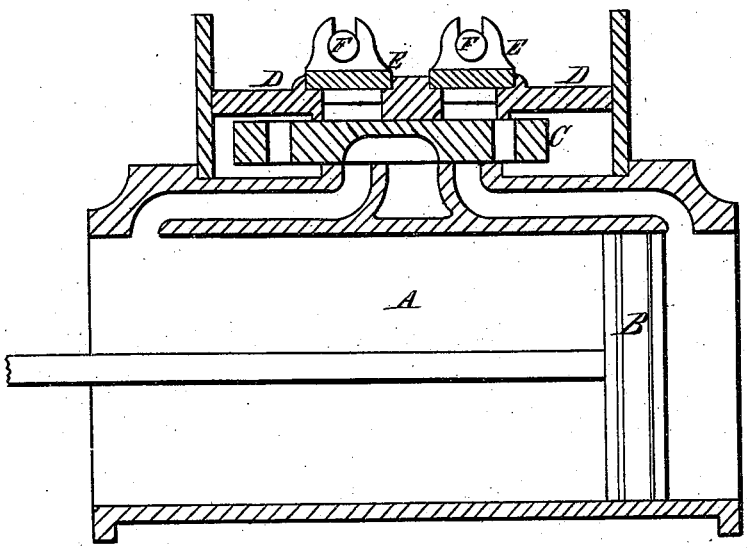
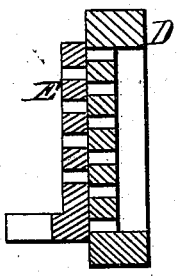


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANK F. HEMENWAY, OF TROY, NEW YORK.

IMPROVEMENT IN AUTOMATIC CUT-OFF GEAR FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **193,952**, dated August 7, 1877; application filed May 16, 1877.

To all whom it may concern:

Be it known that I, FRANK F. HEMENWAY, of Troy, county of Rensselaer, and State of New York, have invented certain new and useful Improvements in Automatic Cut-Off Gear, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Figure 1 is a sectional elevation upon a plane at right angles to the axis of the cylinder, and passing through the center of one of the cut-off valves. Fig. 2 is a horizontal section through the line *x x* of Fig. 1. Fig. 3 is a sectional view, showing the form and location of the "dead-plate," when arranged in connection with a slide-valve which governs the flow of steam to and from a cylinder provided with the ordinary S-ports. Fig. 4 is a longitudinal section of the dead-plate, showing also the cut-off valve mounted thereon.

Like letters of reference in all the figures refer to corresponding parts.

The object of my invention is to provide an improved means of cutting off the admission of steam to the cylinder of an engine at any desired position of the piston; to accomplish which it (the invention) consists, first, in the provision of a dead-plate between the cut-off and the main slide-valves; second, in a wearing-piece inserted in the lifter-post, and held in contact with the lifting-lever, so as to prevent unnecessary wear, and obviate the clacking noise common to cut-off mechanisms; and in certain arrangements or combinations of parts necessary to the successful operation of the machine, all of which will be hereinafter fully described, and then pointed out in the claims.

A is the cylinder, having inlet and outlet ports *a b*. B is the piston; C, the main slide-valve, which controls the admission of steam from the steam-chest V to the cylinder and the exhaust in the usual manner; and W is the main exhaust-port. Upon the outer face of the valve C, and over the openings into the cylinder, I place the plates D, called the "dead-plates." These are provided with a sufficient number of perforations to permit the passage of steam freely, and are undercut or hollowed out, as at *c*, for the purpose of partially balancing them, in a manner well known in connection with valve mechanism. They are held in contact with the main valve by the excess of steam-pressure upon their outer surfaces, permitting the valve to traverse backward and forward without destroying or breaking the contact between the two faces. To prevent any tendency of the dead-plates to travel with the main valve, and thus interfere with the operation of the cut-off valves, they may be locked so that they cannot so travel by simple studs or other means attached to the interior of the steam-chest, but should be left free to move in a direction perpendicular to the face of said valve.

Over the dead-plates are located the cut-off valves E, perforated to correspond with said plates, and these are controlled by the cam P operating through the medium of the lever L and lifter-posts. The cam is connected with the driving mechanism, and is double-faced, so that it will have to revolve once while the main valve travels back and forth twice.

The lever is provided with a sharp angular jog, X, and is connected with the rock-shaft R by means of the pin Q, and depending arm. The governor is attached to or connected with the shaft R, so that the motion in the latter will be automatically regulated, and will cause the lever to be thrust forward or drawn backward, accordingly as the speed of the engine is high or low. The position of the jog in the lever with respect to the cam is determined by this thrust, and it obviously determines the instant at which the cut-off takes place, or at which the lifter-posts are permitted to drop.

As indicated in Figs. 1 and 2, the cut-off valves are dropped down and the admission of steam to the cylinder prevented, the piston not having completed quite half of its forward stroke. The cam P is cut with a very gradually-increasing radius, affording an easy incline for elevating the lever L between its lowest and highest positions, thus rendering its operation simple, smooth, and with gradually-increasing rapidity at an expense of very little power. The cam is terminated quite abruptly, that the lever which is provided

with a correspondingly abrupt notch or jog, X, may be permitted to drop instantaneously and not allowed to ride down upon the face of the cam, as has heretofore been done. This construction admits of the cut-off being closed in a like instantaneous manner, and it may be found desirable or advantageous to undercut both the abrupt face of the cam and the jog in the lever, to avoid any interference with this instantaneous motion which might result from undue wearing away of the parts or the slow traveling of the cam.

The cut-off valves are suitably attached to the lifter-post H, preferably by means of a notched collar fitting a recess in the said post, as indicated at F, so that the parts may be readily taken apart for alterations or repairs. This post passes through a stuffing-box, G, in the face of the steam-chest, and the cut-off E is forced downwardly by its own weight by the pressure of steam upon a surface equal in area to that of the post or rod, and by the weight of the mechanism attached to, or connected with, said rod.

An ordinary dash-pot, T, receives the piston S, which is attached to the lifter-post in the usual way, and serves the customary purposes of such devices.

The valve E is made adjustable upon the face of the dead-plate by any suitable contrivance, a representative of which is found in the set-screw *d*, by means of which the post H may be clamped at any desired position within the section I.

K is a steel bearing-pin, located within the section I at right angles to the upper face of the lever L, and M is a wearing plate or piece, held in contact with the lower face of the lever L by means of a spiral spring, O, placed in a suitable cavity in the dash piston-rod, or in the lower portion of section I.

The office of this wearing-plate is primarily to prevent the noise attending the sudden dropping of the lever L; and it also serves to prevent wear of the under face of said lever and the adjacent parts of the lifter-post.

It has not been deemed necessary to illustrate the connection between the governor and the rock-shaft, or between the cam-shaft and the driving mechanism, as these features are very well understood by those skilled in steam-engineering.

The outer face of the slide-valve, as represented in Fig. 2, is, of course, suitably-packed, and bears against a projection upon the cap of the steam-chest.

The different arrangement indicated in Fig. 3 is due solely to the change in location of the steam-ports, and the dead-plates therein are only different from those shown in Fig. 2 in that they are cast together instead of separately, their operation and functions being identical in the two cases.

The balancing of the cut-off valves is effected substantially as follows: The valve-seat is cut away, as at *g g*, forming passages for steam, which is admitted to the inlet-ports through said valve; thence outwardly to the space *c* beneath the dead-plates, and then through the perforations in these dead-plates to the face of the cut-off valves; and this passage of steam is facilitated by enlarging the inlet-ports slightly, as shown at *h h*.

From the arrangement shown in Fig. 2 (referring more particularly to the right-hand portion thereof) it will be observed that steam passes through the channel provided therefor, and is admitted to the inner face of the cut-off valves immediately after the main valve has closed the port to the steam-cylinder. At the same instant, if the cams be properly adjusted, they will commence to elevate or move the cut-offs, and a portion of their inner faces is thereby exposed to pressure from the inner side. This pressure balances that upon the outer faces, and the valve is thereby balanced in proportion to the extent of surface against which the inner pressure is brought to bear.

It will be further observed that the dead-plate rests wholly upon the outer face of the main valve, having no other support than said valve, and that it is held in steam-tight contact therewith by means of the pressure of steam upon its outer face.

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

1. The herein-described dead-plate, constituting a seat for a cut-off valve, said plate resting against the main valve, which forms its only support, being held in contact therewith solely by steam-pressure upon its outer face, and provided with ports through which the admission of steam to the cylinder may be cut off at any desired position of the piston, the several parts being combined to operate substantially as and for the purposes set forth.

2. The combination, with the herein-described movable dead-plate, which is held to its seat upon the main valve by steam-pressure, of the perforated and balanced cut-off valves, and the main valve, substantially as shown and described.

3. The combination of the herein-described movable dead-plate, held to its seat on the main valve by steam-pressure, the main valve, balanced cut-off valves, and a cam-surface operating to open and permit the closing of said cut-off, substantially as specified.

4. The combination of the herein-described dead-plate, held to its seat on the main valve by steam-pressure, the main valve, balanced cut-off valves, a cam-surface operating to open and permit the closing of said cut-offs, and a rock-shaft adapted to be connected with the governor, substantially as explained.

5. In combination with a lifting-post, slotted to receive the operating-lever, and provided with a wearing-pin, the wearing piece or block M, held against the under face of said lever by means of a spring, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

FRANK F. HEMENWAY.

Witnesses:
CHAS. R. SEARLE,
GEO. F. GRAHAM.