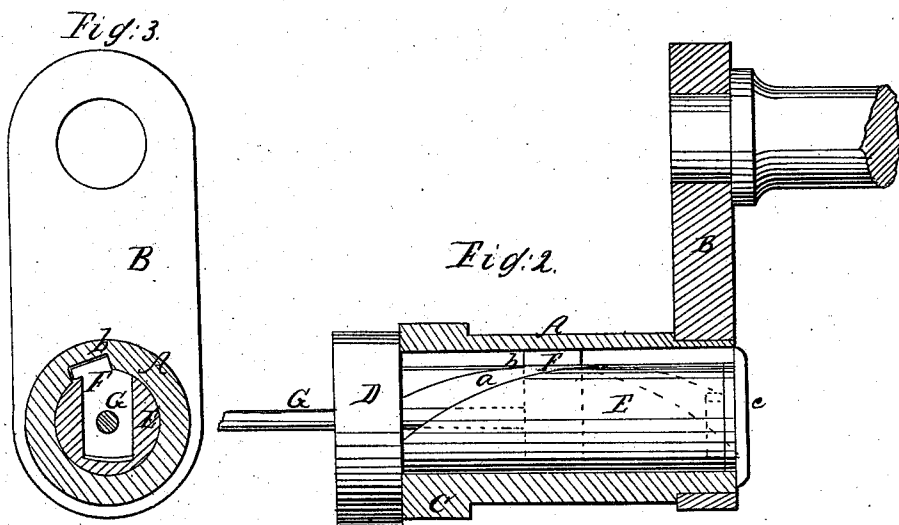
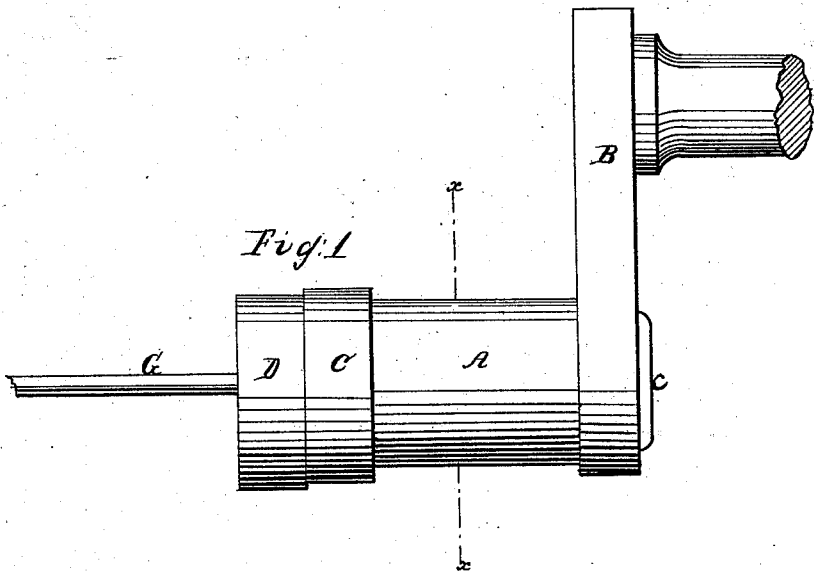


W. Harsen,

Variable Cut-Off Gear,

No. 100,619,

Patented Mar. 8, 1870.



Witnesses  
Geo. Haynes  
R. E. Kabeau

Inventor  
W. Harsen

# United States Patent Office.

WILLIAM HARSEN, OF GREEN POINT, NEW YORK.

Letters Patent No. 100,619, dated March 8, 1870.

## IMPROVEMENT IN VARIABLE CUT-OFF VALVE-GEAR.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, WILLIAM HARSEN, of Green Point, in the county of Kings, and State of New York, have invented a new and useful Improvement in Variable Cut-Off Valve-Gear, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing forming part of this specification, and in which—

Figure 1 represents a longitudinal view of a crank or engine-shaft with my improved variable cut-off valve-gear applied thereto;

Figure 2, a longitudinal section of the same; and

Figure 3, a transverse section through the line  $x x$  in fig. 1.

Similar letters of reference indicate corresponding parts.

My improvement has reference to cut-off gears or motions in which the supply of steam is cut off at any desired point in the stroke of an engine by a secondary or cut-off valve, operated by an adjustable eccentric, which is distinct from the eccentric used to drive the main valve.

In this connection the invention consists, in combination with a hollow or tubular crank-shaft and eccentric thereon, for operating the main valve of a secondary eccentric for controlling the cut-off valve, arranged to rotate in a plane which is a parallel to the first-mentioned eccentric, but adjustable in relation thereto, for the purpose of cutting off earlier or later in the stroke by forming the cut-off eccentric with a hollow sleeve that takes its bearing within the tubular shaft, and has a spiral slot in or along it, through which a follower passes and projects into a longitudinal or straight groove in the interior of said shaft, so that while the latter serves to rotate the cut-off eccentric, through gear of the follower with it, said eccentric is made capable of necessary adjustment by a longitudinal sliding movement of the follower, as effected by a rod arranged to project through the cut-off eccentric.

Such combination forms a very simple, efficient, and durable arrangement of means, capable of operation either by the governor or by hand, for establishing a variable action to the cut-off valve.

Referring to the accompanying drawing—

A represents the crank-shaft of the engine, made tubular, as represented in figs. 2 and 3;

B, the crank; and

C, the fixed eccentric, for giving motion to the main valve.

D is the secondary or adjustable eccentric for operating the cut-off valve, which may be arranged on back of the main valve for controlling the admission of steam to or through the latter.

This secondary eccentric D has a fixed plane of ro-

tation outside of the main eccentric C and parallel to the latter, with which it revolves in common, but is adjustable so as to establish more or less lead to the secondary valve, accordingly as it is required to cut off earlier or later in the stroke.

The means by which this is accomplished are as follows:

Said eccentric D is formed with a hollow sleeve, E, arranged to fit and rotate within the tubular shaft A, that serves as a bearing to it.

This sleeve carries within it a longitudinally-sliding follower, F, capable of operation from the exterior by a rod, G, arranged to project through the secondary eccentric in the axial direction of the crank-shaft, or thereabout.

This follower F is fitted to project through a spiral slot,  $a$ , made in or along the sleeve E, and furthermore, to enter and fit a straight longitudinal groove,  $b$ , formed in the interior of the shaft A.

From this description it will be seen that on the sleeve E being restricted from longitudinal movement, which may be secured by the eccentric D, at one end, and a collar,  $c$ , at the other end of it, either forward or backward adjustment, in the plane of its rotation, may be given to the eccentric D, to give an earlier or later cut-off action to the secondary valve by simply sliding in or out, in the axial direction of the shaft A, the rod G, and of a necessity communicating a corresponding motion to the follower F, which, by its gear with the sleeve E and shaft A, through the spiral slot  $a$  and straight groove  $b$ , turns the eccentric D, as required to effect the necessary adjustment of it, said follower F furthermore serving to act as a driver to the eccentric D to rotate it in common with the shaft A.

The rod G may either be slid in or out by hand, through any suitable means to give any desired amount of cut-off required, by altering the set of the eccentric D relatively to crank B or fixed eccentric C, or it may be geared or connected so as to be operated by the governor of the engine. In either case the invention forms an adjustable or variable cut-off gear, which is simple, compact, efficient, or easy to work, and durable, not liable to get out of order, and securing an extensive range of cut-off action.

What is here claimed, and desired to be secured by Letters Patent, is—

The arrangement of the spirally-channeled sleeve E of the eccentric D and its follower F, within the longitudinally-grooved hollow shaft A of the eccentric C and crank B, as shown and described.

WM. HARSEN.

Witnesses:

FRED. HAYNES,  
HENRY PALMER.