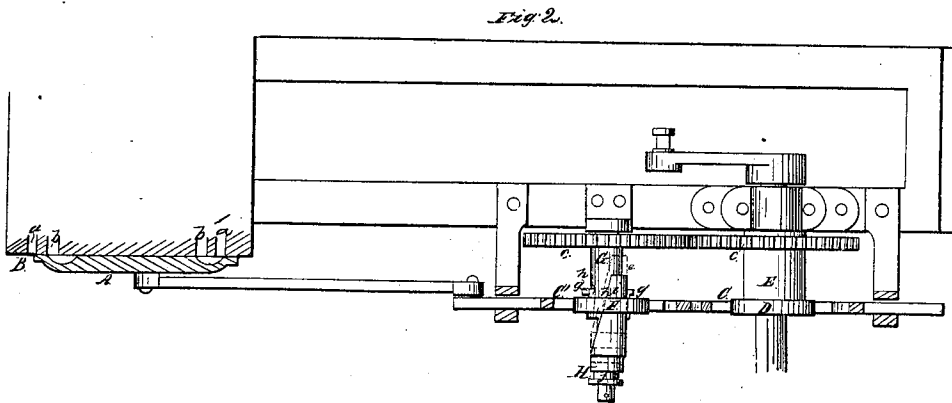
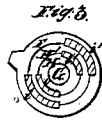
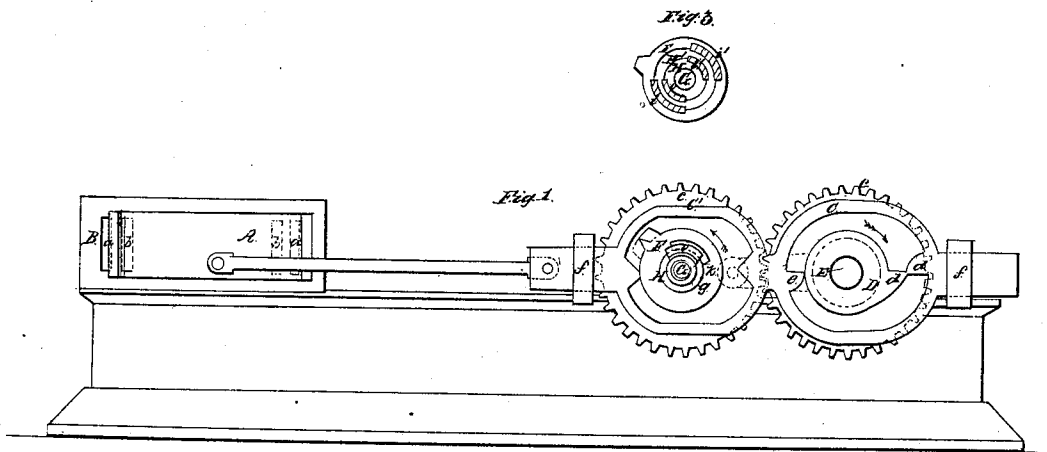


W. W. WADE.
CUT-OFF GEAR.

No. 13,934.

Patented Dec. 11, 1855.



UNITED STATES PATENT OFFICE.

WM. W. WADE, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO HIMSELF AND CHAS. BURNHAM.

VARIABLE CUT-OFF GEAR FOR STEAM-ENGINES.

Specification of Letters Patent No. 13,934, dated December 11, 1855.

To all whom it may concern:

Be it known that I, WILLIAM W. WADE, of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Variable Cut-Off Gear for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, is a side view of a variable cut-off gear constructed according to my invention. Fig. 2, is a top view of the same with the slide valve and cam yoke in section. Fig. 3, illustrates a modification of a part of the same.

Similar letters of reference indicate corresponding parts in the several figures.

This invention consists in certain improved mechanism by which such a movement may be given to a common single slide valve as to make it cut off the steam at any point from one eighth to seven eighths of the stroke.

To enable those skilled in the art to make and use my invention I will proceed to describe its construction and operation.

A, is the slide valve and B, its seat. *a, a,* are induction ports and *b, b,* eduction ports.

The valve is connected by its rod with a double yoke frame C, C', sliding in suitable guides *f, f,* parallel with the movement of the valve. One of the yokes C, of this yoke frame receives a cam D, which is fast to the crank shaft E, of the engine and is for the purpose of moving the valve to open the induction ports, and the other yoke C', which is in the same plane as C, receives a variable cam F, which is fitted to and revolves with the shaft G, which is geared by spur wheels C, C, of equal size, to run at the same speed as the crank shaft, whose duty it is to move the valve to close the induction ports.

The form of the induction cam D, is that of a circle with an abrupt offset *d,* and at the ends of the yoke are two abrupt offsets *e, e.* The effect of this form of cam and yoke—the cam being properly set on the shaft—is to give a very sudden opening to the valve commencing before the stroke of the piston has quite terminated and giving a full opening to the induction port, almost

at the instant the engine is on the center, and moreover it admits of the valve being moved back to close the port immediately after it has been opened. The forms of the cut off cam F, and its yoke C', are substantially like those of the induction cam D, and yoke C, in order to give a quick movement to the valve in closing it. The cut-off cam F, instead of being fitted tightly to its shaft G, is fitted loosely to a collar *g,* which is secured tightly to the shaft, and this collar has an opening *h,* between it and the shaft to receive an inclined piece *i,* attached to a sliding collar H, which fits loosely to the shaft G. The inclined piece *i,* works in a slot *k,* which is made in the cam. As the shaft G, revolves its tight collar *g,* carries around the inclined piece *i,* and sliding collar to which it is attached, and the inclined piece drives the cam.

Now it is evident that as the inclined piece is pushed in or out the cam is advanced or carried back on the shaft and the movement of the valve to cut off the steam will take place earlier or later, and therefore by connecting this sliding collar H, with a governor taking hold of its groove *j,* so as not to interfere with its revolution, in such a manner as to push in the inclined piece as the speed of the governor begins to increase or pull it out as the speed begins to diminish, the cam will be advanced or retarded to cut off earlier or later and thereby will govern the engine. The effect of the pushing in of the inclined piece is illustrated in Figs. 1 and 2 by dotted lines, the position of the inclined piece shown in Fig. 2 in dotted outline, corresponding to the position of the cam in Fig. 1, the cam being in advance of the position represented in bold black outline which corresponds to the position of the inclined piece shown in bold outline in Fig. 2.

The movement given to the valve by the above gear is a double movement the valve being left stationary by the induction cam D, at the extremity of its movement in one direction, and the first part of its movement in either direction being given by the cut off cam just far enough to cover both steam ports, and the movement being finished by the induction cam. If the valve and steam ports are properly set out the eduction port may remain a little way open till the final movement of the valve takes place for in-

duction. This movement or this arrangement of valve and ports I do not consider as part of my invention.

To engines for some purposes such as
 5 working trip hammers, pile driving, or any work where the power is suddenly put on and thrown off and the variation of the cut off requires to be very great and sudden, I would use two sliding collars and inclined pieces like H, and *i*, as shown in Fig.
 10 3, the second collar H', being applied outside H, and being varied by the action of the inclined piece *i*, attached to H, and the inclined piece *i'*, attached to the sliding collar H, acting on the cam, but the second not
 15 acting till the first has finished. This will avoid making the inclination of the piece *i*, too sudden, or otherwise making the said piece of too great length. Fig. 3 also
 20 shows that each sliding collar may have

two inclined pieces arranged opposite each other, and I consider it preferable to employ two where only one sliding collar is used. The arrangement of the induction and cut-off cams on separate shafts with a
 25 double yoke frame having the yokes one before the other affords greater facility for adjustment than can be had with two yokes side by side and two cams on the same shaft.

What I claim as my invention and desire
 30 to secure by Letters Patent, is—

The arrangement of the induction and cut off cams upon two parallel shafts to operate in a yoke frame containing two separate yokes one before the other substantially
 35 as herein described.

WILLIAM W. WADE.

Witnesses:

JOHN M. STEBBINS,
 A. CHAS. BURNHAM.