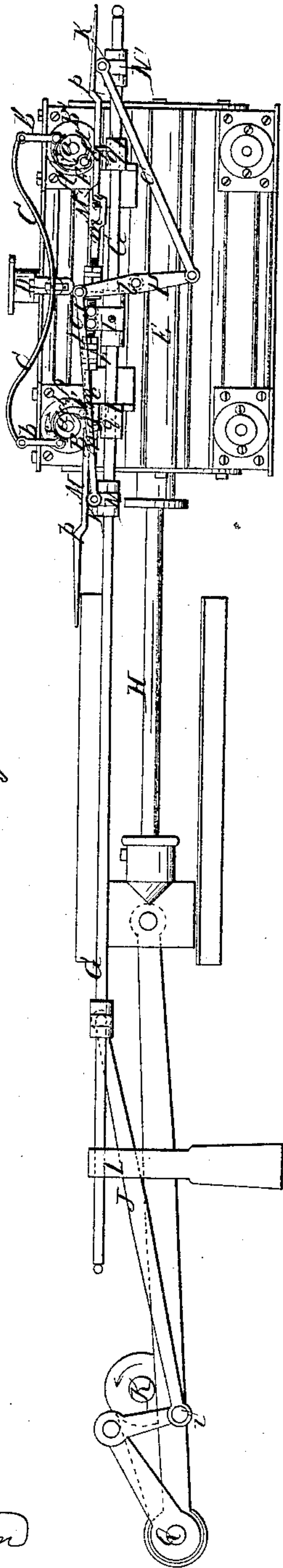


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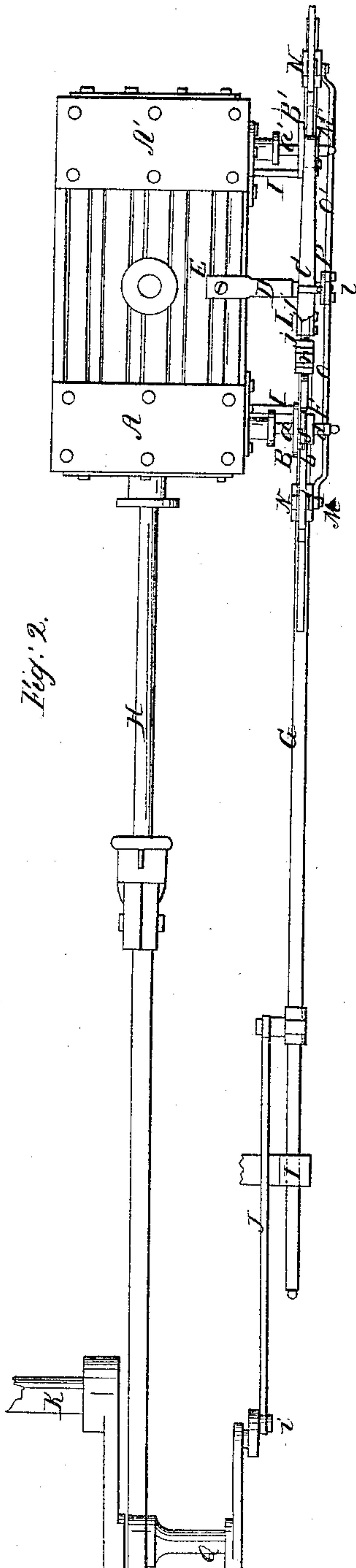
*Steam-Engine Valve-Gear.*

*N<sup>o</sup> 27,431.*

*Patented Mar. 13, 1860.*



*Fig. 1.*



*Fig. 2.*

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# UNITED STATES PATENT OFFICE.

ADDISON CROSBY, OF FREDONIA, NEW YORK.

## INDUCTION-VALVE GEAR FOR STEAM-ENGINES.

Specification of Letters Patent No. 27,431, dated March 13, 1860.

*To all whom it may concern:*

Be it known that I, ADDISON CROSBY, of Fredonia, in the county of Chautauqua and State of New York, have invented a new and Improved 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 exhibiting the application of my invention to a horizontal steam-engine. Fig. 2, is a top view of the same.

Similar letters of reference indicate corresponding parts in both figures.

My invention consists in the combination of a bar or rod deriving a regular reciprocating motion from the engine, with the stems or shafts of two oscillating valves or with two rockshafts suitably applied in connection with two valves of any other description by means substantially as hereinafter described whereby the induction of steam is enabled to be effected with such amount of "lead" as may be desired, and the cutting off to be effected by the tripping or sudden liberation of the valves at any point in the stroke, under the control of a governor or of suitable means of adjustment at the command of the engineer.

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

$a, a'$ , represent the stems or shafts of two oscillating or rolling induction valves fitted to ports, in two steam chests  $A, A'$ , at opposite ends of the cylinder, one of the said valves, effecting the induction of steam to one end and the other to the other end of the cylinder. Each of the said stems or shafts has secured to it outside of its steam chest a plate  $B, B'$ , having a boss  $d$ , on its outer face, and these plates are connected by links  $b, b'$ , with opposite ends of a strong spring  $C$ , which is held by a bracket  $D$ , secured to the cylinder  $E$ , of the engine, and so applied as to exert a constant tendency to turn each plate in the direction indicated by an arrow upon it in Fig. 1, to close its respective valve; and each valve if not of such construction as to prevent it from moving in the direction in which it closes, further than is necessary to close it, must have a stop applied to prevent such further movement. Each of the plates  $B, B'$ , has

attached to it outside of its boss  $d$ , a lever like dog  $F$ , or  $F'$ , which is capable of swinging freely on the pin  $e$ , by which it is attached, and each of these dogs has applied to it a spring  $f$ , which is attached to the boss  $d$ , of its respective plate  $B$ , or  $B'$ , and which acts upon it in such a manner as to press the upper end of it toward the boss and throw the lever end out therefrom. The said dogs are applied on the sides of the bosses of the two plates  $B, B'$ , which are opposite each other, and arranged in such a manner that when pressure is applied to the toes  $g, g$ , of the dogs in such a manner as to force the other ends of the dogs into contact with their bosses  $d, d$ , it tends to turn the plates in the opposite direction to that in which the spring  $C$ , tends to turn them and hence to open the valve.

$G$ , is a rod arranged below the plates  $B, B'$ , parallel with the piston rod  $H$ , of the engine, and with a plane passing through the axes of both stems or shafts  $a, a'$ , in guides  $I, I$ , in which it is fitted to slide longitudinally. This rod derives a reciprocating rectilinear motion from a wrist  $i$  carried by the crank shaft  $K$ , of the engine by its being connected with the said wrist by means of a connecting rod  $J$ , the said wrist being so arranged relatively to the crank pin  $Q$ , as to give the rod  $G$ , the lead of the piston, that is to say to cause it to commence its stroke in either direction before the commencement of the stroke of the piston in that direction.

$L$ , is a block secured firmly to the rod  $G$ , and having attached to it by two pins  $j, j$ , above the said rod, one end of each of two similar bars  $M, M'$ , each of which is supported at some distance from its other end by one of two rollers  $k, k'$ , each of which rollers is fitted to one of two blocks  $N, N'$ . These blocks  $N, N'$ , are fitted to slide upon the rod  $G$ , and are connected by the rods  $O, O'$ , one for each, with opposite arms of a lever  $P$ , which is arranged to work on a stationary fulcrum  $l$ , for the purpose of adjusting the position of the said blocks  $N, N'$ . The two bars  $M, M'$ , which may be termed catch bars are free to work vertically or in a plane parallel with the faces of the plates  $B, B'$ , on the pins  $j, j$ , and are straight with the exception that each has a recess  $m, n$ , in its upper side, and has some distance farther from its pin  $j$ , a step  $p$ , on its under side. The said bars move along with the



rod G, and in such movement work between the plates B, B', and upright guide pins  $q, q$ , which are secured on the guides I, I.

The operation of this cut off gear is as follows: Shortly before the stroke of the piston toward the left hand of Fig. 1 terminates, the rod G, commences moving in the opposite direction carrying with it the catch bars M, M', the toe  $g$ , of the dog F, being at the time in the recess  $m, n$ , of the bar M; and just as the stroke of the piston terminates the end  $n$ , of the said recess comes into action on the toe  $g$ , of the aforesaid dog, and as the movement of the rod G, continues, turns the plate B, in the opposite direction to that indicated by the arrow shown on it in Fig. 1, thus opening the valves to admit steam to drive the piston to the right. The valve is caused to remain open after the recess  $m, n$ , passes out of the way of the dog F, for after the end  $n$ , of the recess leaves the toe  $g$ , the latter rests on the top of the bar, and continues to do so till in the continued movement of the bar M, with the rod, the step  $p$ , of the said bar passes over the rollers  $k$  and lets the said bar drop far enough to clear the toe of the dog, and so leaves the plate B entirely under the influence of the spring C, which instantly acts upon the said plate to close the valve. In this movement of the rod G, the bar M', pushes the dog F', out of the way, till the recess  $m, n$ , of the said bar arrives under the said dog, when the toe of the latter drops into the said recess to be ready to be acted upon by the end  $n$ , thereof, during the movement of the rod G, in the opposite direction which commences just before the stroke of the piston, and in which movement the said dog F', and plate B', are operated upon by the bar M', and spring C, under the control of the roller  $k'$ , in the same manner as the dog F, and plate B, were operated upon by the bar M, and spring C, under the control of the roller  $k$ , the dog F, being in the meantime moved out of the way of the bar M, by the said bar itself till the dog F, drops into the recess  $m, n$ , of the said bar to be ready for the movement of the rod G, to the right again. The liberation of the dogs F, F', from their respective bars M, M', to permit the closing of the valves and cutting off the steam is made to take place earlier in the stroke of the piston moving the lever P, so as to set the roller blocks N, N', farther apart, and later in the stroke by moving the said lever to bring the said blocks nearer together; and by providing for a proper range of these blocks N, N', the cut off may be effected at any point in the stroke or steam may be

cut off altogether or admitted through the whole stroke of the piston.

The lever P, may be connected with a governor to regulate the engine by the cut off or it may be adjusted by the engineer to cut off at a fixed point in the stroke of the piston.

To provide for the variation of the lead of the valves, the catch bars M, M', are made each in two pieces connected together near the joint pins  $j, j$ , by double nuts  $r, r$ , fitting to a right hand screw on one piece, and a left hand screw on the other, which enables the said bars to be shortened and lengthened, at pleasure by turning the nuts  $r, r$ . By setting the wrist  $i$  to give the rod G the greatest amount of lead that may be desired, and adjusting the length of the bars M, M', so that the ends  $n$ , of their recesses  $m, n$ , come into action on their respective dogs F, F', sooner or later after the commencement of the movement of the rod, the lead may be made more or less as desired, the less lost motion between  $n, n$ , and the dogs, the greater the lead and vice versa.

This cut off gear may be made applicable in connection with slide, puppet or other induction valves, by a proper connection of such valves with the stems or shafts  $a, a'$ , without any change in the mechanism, represented and described.

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

1. Combining the reciprocating rod G with the stems or shafts  $a, a'$ , by means of dogs F, F', attached to the said stem or shafts, and catch bars M, M', or their equivalents attached to the said rod, when the said catch bars or equivalents are so constructed and applied to the said rod, and so controlled, as to liberate the dogs during the stroke of the engine by a positive movement away from the said dogs, and transverse to the movement of the reciprocating rod substantially as herein described.

2. Controlling the liberation of the catch bars M, M', by means of blocks N, N', or their equivalents applied to slide on the reciprocating rod I, from which the valves derive their opening movement, substantially as herein described.

3. Providing for the variation of the lead of the valves, by so constructing the catch bars M, M', attached to the reciprocating rod as to be capable of being lengthened or shortened as herein specified.

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Witnesses:

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