

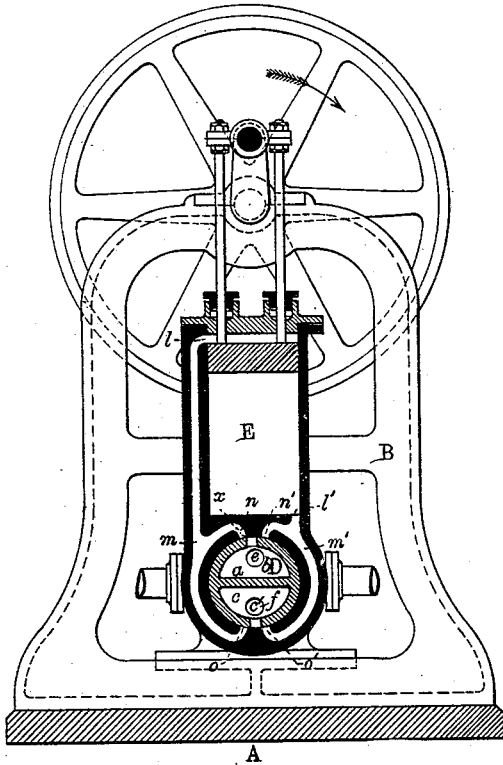
S. GIBSON & D. C. EBERHART.

OSCILLATING STEAM-ENGINE.

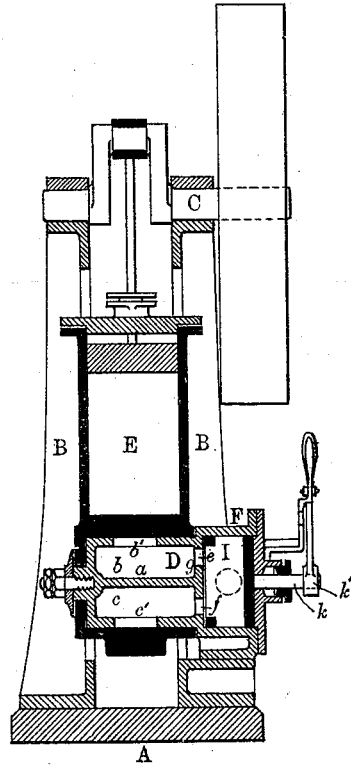
No. 191,134.

Patented May 22, 1877.

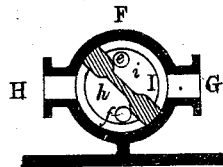
—FIG. I—



—FIG. II—



—FIG. III—



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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN OSCILLATING STEAM-ENGINES.

Specification forming part of Letters Patent No. 191,134, dated May 22, 1877; application filed
April 27, 1877.

To all whom it may concern:

Be it known that we, SAMUEL GIBSON and DAVID C. EBERHART, both of Shrewsbury, in the county of York and State of Pennsylvania, have invented certain Improvements in Oscillating Steam-Engines, of which the following is a specification; and we do hereby declare that in the same is contained a full, clear, and exact description of our said invention, reference being had to the accompanying drawing, and to the letters of reference marked thereon.

This invention relates to certain improvements in that class of oscillating engines in which the steam-cylinder vibrates upon a single fixed trunnion, to which steam is admitted from the boiler, a portion of the said trunnion being adapted as a steam-chest, and provided with a valve to regulate the direction of the steam passing to the interior of the cylinder, and thereby govern the direction of rotation of the crank-shaft and its connections.

The said invention consists in a novel arrangement of the various steam and exhaust passages in the fixed trunnion, and in the adjacent parts of the steam-cylinder, as will hereinafter fully appear.

In the further description of the invention which follows, reference is made to the accompanying drawing, forming a part hereof, and in which—

Figures 1 and 2 are vertical sections of the engine, centrally of the steam-cylinder thereof, as seen from different points of view. Fig. 3 is a sectional front view of the portion of the fixed trunnion, corresponding with and used as a steam or valve chest, and the valve therein.

Similar letters of reference indicate similar parts of the invention in all the views.

A is the bed-plate of the engine, and B the frame of the same, secured to the bed-plate, and supporting the crank-shaft C. D is the fixed trunnion, upon which the steam-cylinder E oscillates, divided by a partition, *a*, into two compartments, *b* and *c*. An extension of the fixed trunnion forms the steam-chest F of the engine, to which steam from the boiler is admitted through the steam-pipe G. H is the exhaust-pipe, leading from the steam-chest F to the outer air.

The means of communication between the

steam-chest and the compartments *b* and *c* in the trunnion D are the openings *e* and *f* in the circular partition *g*, dividing the chest from the said compartments, and which circular partition is the seat for the throttle and reversing valve I. The valve I consists of a double-ported cylindrical shell, having a transverse central plate, dividing it into two chambers, *h* and *i*, and adapted to be partially revolved by means of a central stem, *k*, and a suitable lever, *k'*, secured to the outer end of the same.

The transverse central plate of the valve I is of such width as to cover the openings *e*, *f*, and stop the admission of steam to the interior of the cylinder when the said valve is placed in its central position; but upon the circumferential movement of the said valve in either direction, one of the said openings is brought into communication with a chamber supplied with steam from the chest, and the other placed in communication with the exhaust-pipe H. The compartments *b* and *c* in the fixed trunnion are each furnished with a port, through which steam is transferred to and from the cylinder. The said ports are represented in the drawing by *b'* and *c'*; and it will be seen that they occupy positions diametrically opposite each other, and slightly deviating from the vertical center line of the engine.

The ports of the cylinder are represented by *l* *l'*, the one *l* leading to the upper end of the cylinder, and the one *l'* to the lower end of the same. The ports *l* *l'* connect with the opening in the steam-cylinder, into which the fixed trunnion D is inserted by means of channels *m* *m'* and the passages *n*, *n'*, *o*, and *o'*, which passages bear such relation to the ports *b'* and *c'* in the compartments *b* and *c* of the trunnion as, in the oscillating movement of the cylinder, to give ingress and egress of steam alternately to the upper and lower ends of the steam-cylinder, and thereby cause the operation of the engine.

In the foregoing description allusion has been made to those parts only of the engine embodying the present improvements, or those connected immediately therewith, the other parts of the machine being of the ordinary

description used in engines of this class, and familiar in construction to those versed in the manufacture of steam-engines.

The parts of the engine occupying the relative positions shown in the drawing, steam entering the steam-chest F passes through the valve I to the opening *e*, and thence to the compartment *b* in the trunnion. From this compartment it passes through the port *b'* to the port *n*, and thence, by way of the channel *m* and port *l*, to the upper end of the cylinder. The crank being at its upper dead-center, the action of steam on the upper side of the piston does not cause its movement; but it will be observed that the steam, entering the limited aperture represented by *x*, has the effect of increasing its area, and in this increase the cylinder is moved slightly in a circumferential direction; and this direction is the same as that which the cylinder is to take to revolve the crank-shaft. By this means the crank is moved from its upper dead-center and steam fully admitted to the cylinder to complete the downward stroke of the piston. During the admission of steam to the upper end of the cylinder the space below the piston is in communication with the exhaust-pipe H through the medium of the port *l'*, passage *m'*, ports *o' c'*, compartment *e*, opening *f*, and chamber *h* of the exhaust-valve.

Upon the completion of the stroke of the piston, and after the crank has turned or passed its lower dead-center, steam from the compartment *b* is admitted through the port *b'* to the passage *n'*, and thence through the channel *m'* and port *l'* to the lower end of the cylinder and beneath the piston therein.

During the return stroke of the piston the steam from the upper end of the cylinder is exhausted through the passage *o*, port *c'*, opening *f*, compartment *e*, and thence to the exhaust-pipe by means of the chamber *h* in the valve I. The direction of movement of the shaft—the parts of the engine operating as described—is shown by the arrow; and to change this direction the valve I is reversed in position, when the compartment *e* in the trunnion is used for the conveyance of steam to the cylinder, and the one *b* for the exhaust, as will be readily understood by reference to the drawing.

By locating the ports *b' c'* in an angular position with reference to the center line of the cylinder, as shown, steam is admitted to the upper end of the cylinder when the crank is at its upper dead-center, the shaft revolving in one direction, and to the lower end of the cylinder, and while the crank is at its lower center, when the direction of rotation of the shaft is reversed; consequently the crank may be moved from either center by admitting steam to the upper or lower end of the cylinder, as the case may require, by the circumferential movement of the reversing or throttle valve.

This peculiarity is specially advantageous in oscillating engines of limited stroke, which are liable to stop at either center upon the closing of the throttle-valve. By reversing the angular position of the ports *b' c'*, the centers, overcome by the admission of steam to the cylinder, as described, are also reversed; but the result attained is practically the same.

Having thus described our invention, what we claim as new, and wish to secure by Letters Patent of the United States, is—

The steam-cylinder E, having the opening for the insertion of the fixed trunnion D, and provided with the passages *n, n', o,* and *o'*, connecting the said opening indirectly with the interior of the said cylinder, in combination with the said fixed trunnion D, having the partitions *a* and *g*, dividing the same into the steam-chest F and the compartments *b* and *e*, the said compartments having the ports *b' c'* placed in an angular or inclined position with reference to the center line of the said cylinder, and the reversing-valve I, adapted to be partially revolved within the said steam-chest, for the purpose of changing the direction of the steam to and from the said compartments, substantially as herein shown and described.

In testimony whereof we have hereunto subscribed our names this 21st day of March, in the year of our Lord 1877.

SAMUEL GIBSON.
DAVID C. EBERHART.

Witnesses:

JAMES GERRY,
G. F. MILLER.