

(No Model.)

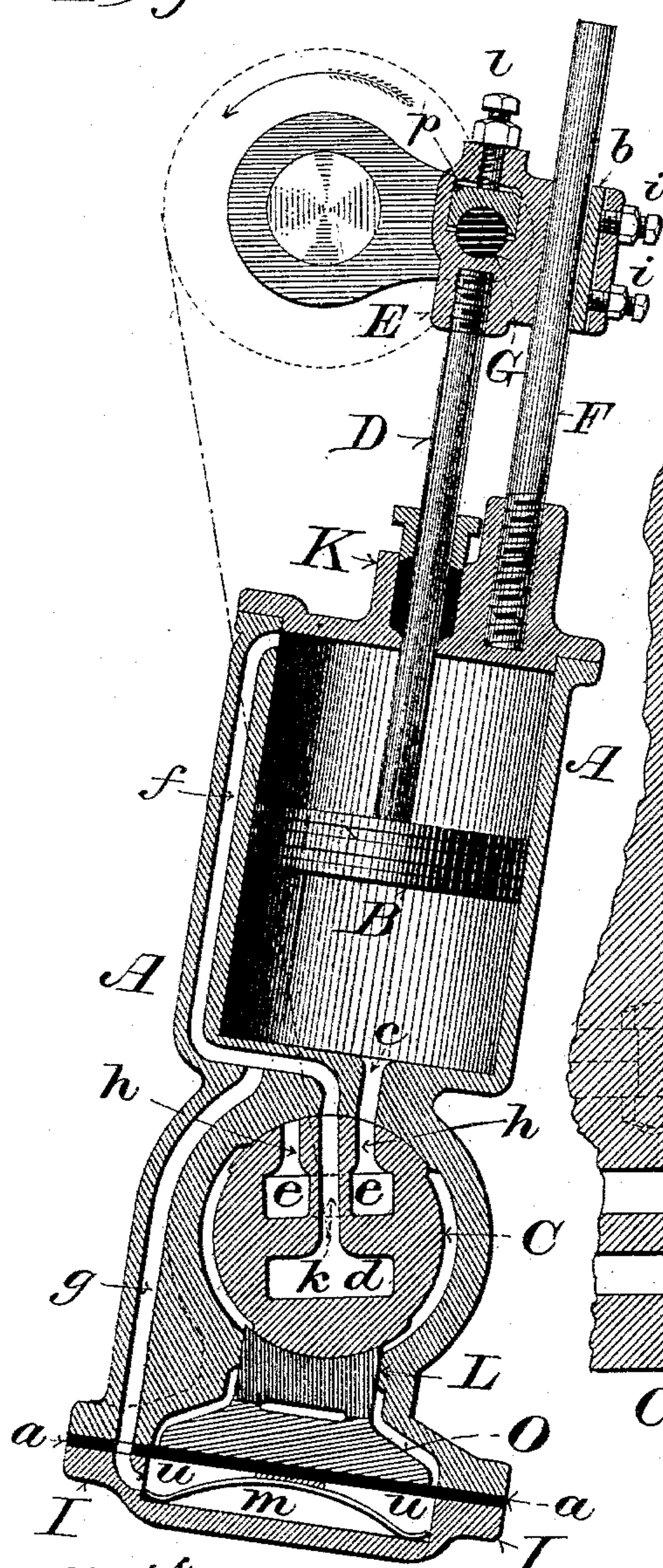
A. CUNNINGHAM.

OSCILLATING ENGINE.

No. 323,298.

Patented July 28, 1885.

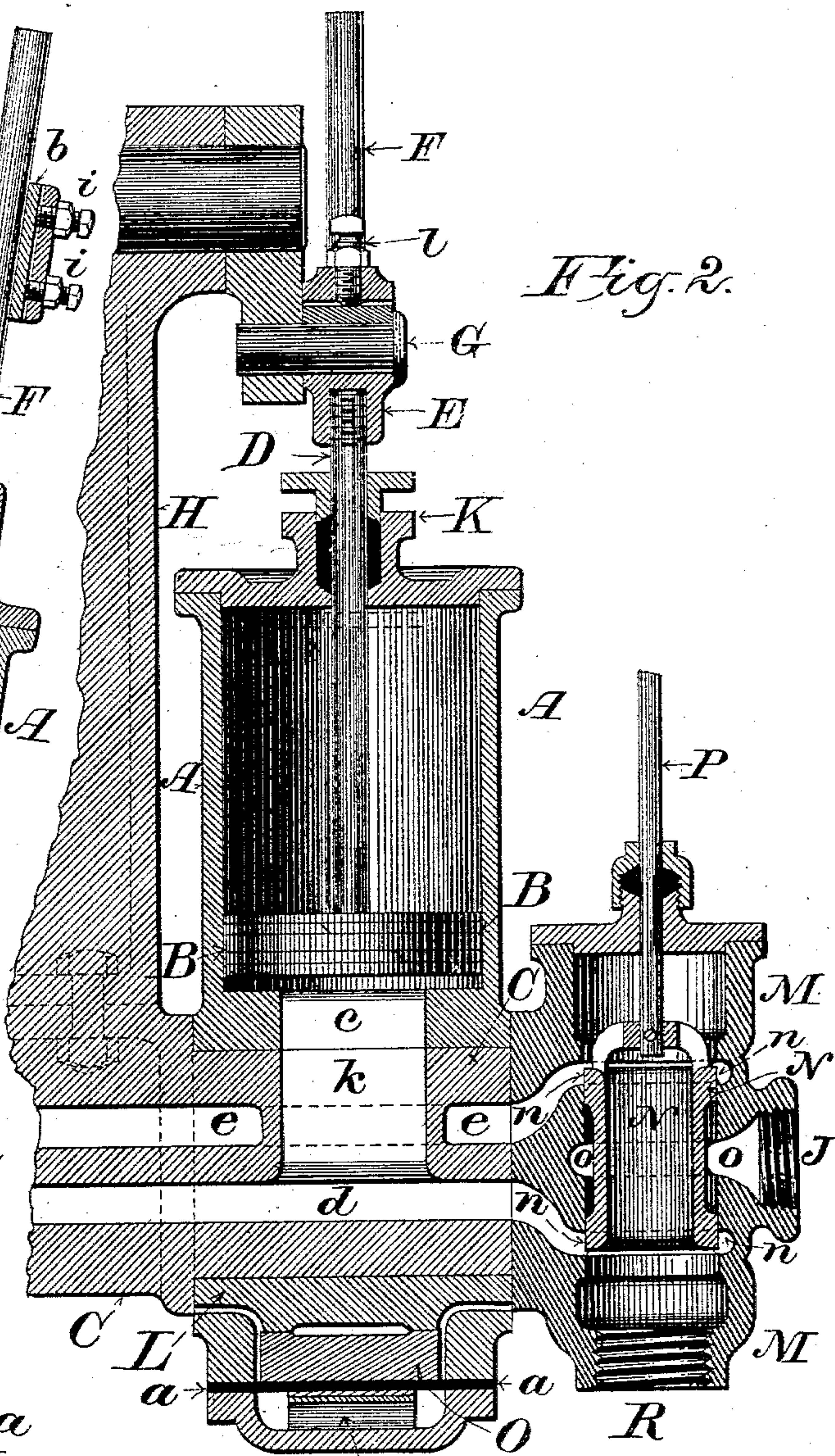
Fig. 1.



Witnesses:

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Fig. 2.



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UNITED STATES PATENT OFFICE.

ALBERT CUNNINGHAM, OF MILWAUKEE, WISCONSIN.

OSCILLATING ENGINE.

SPECIFICATION forming part of Letters Patent No. 323,298, dated July 28, 1885.

Application filed February 2, 1885. (No model.)

To all whom it may concern:

Be it known that I, ALBERT CUNNINGHAM, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Oscillating Engines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The objects of my invention are, first, a compact, fast-running, and easily-controlled oscillating engine for saw-mill feed-works, hoisting, or any other use for which engines of this class are adapted; second, to introduce steam into the cylinder through the trunnion upon which it turns; and, third, to hold the valve-face of the cylinder down upon the trunnion against the lifting tendency of the steam in the upper end of the cylinder.

In the accompanying drawings like letters refer to the same parts in both figures.

Figure 1 is a vertical medial section of my improved engine, at right angles to the trunnion, and Fig. 2 is a like section, cutting said trunnion longitudinally.

A represents the cylinder, provided in the usual manner with the piston B, piston-rod D, and stuffing-box K. At the end opposite the stuffing-box it is bored out horizontally and at right angles to the plane of its oscillation, to receive the trunnion C, upon which it oscillates. The trunnion C is provided with the two steam-passages, *d e*, running one above the other lengthwise through said trunnion. Two offset passages, *h h*, lead upward from the passage *e* and open at the top of the trunnion, so as to register successively with corresponding passages, *c* and *f*, communicating with opposite ends of cylinder A. An offset passage, *k*, leads upward from passage *d*, through the middle of passage *e*, and opens at the top of the trunnion midway between the openings of passages *h h*, so as to register, like them, successively when the engine is running with the passages *c* and *f* in the cylinder.

To one end of the trunnion C is attached the valve-chamber M, with the passages *d* and

e in communication with the annular recesses or ports *n n* therein.

N is a hollow cylindrical valve having annular bearing-faces at the ends, between which it is turned down to form between itself and the walls of the valve-chamber a recess for the reception of steam through the annular port *o o*, communicating with the induction-pipe at the opening J. The valve N is connected at one end by means of a spider-frame with the valve-rod P, through which it is operated.

The valve-chamber is accurately faced internally about the several ports *n n o*, and the valve N exactly fitted thereto. In its central position, as shown in the drawings, both the passages *d* and *e* are partially open to exhaust the upper passage through the hollow valve N to the induction-pipe communicating with said valve-chamber at R.

To relieve the piston-rod D from the strain occasioned by the throw of the vibrating cylinder, I provide a guide-rod, F, secured at one end to the cylinder-head parallel with said piston-rod D, and passing through and having a bearing in box E, by which said piston-rod is connected with the crank-pin G of the driving-shaft. A gib, *b*, controlled by adjusting-bolts and jam-nuts *i i*, furnishes means for taking up any wear of the guide-rod in its bearing in box E.

The trunnion C has bearing-faces upon its upper side about the openings of passages *h h* and *k* and upon its under side. Between these bearing-faces both trunnion and cylinder are slightly recessed, to prevent unnecessary friction and to insure a closer fit between those parts, forming, in effect, the valve-faces.

Below the trunnion C, or upon the side opposite the cylinder A, the box in which it bears is open or recessed to receive the quarter-box L, which alone bears upon the lower face of said trunnion, and the loose pressure-plate O, upon which said quarter-box rests.

A recessed cover, I, between which and the cylinder-box and pressure-plate O is inserted an elastic diaphragm, *a a*, of rubber, sheet metal, or any other suitable material, retains said quarter-box L and pressure-plate O in place, and incloses a steam cavity or chamber, *u u*, which is connected by the passage *g* with

the passage *f*, leading from the trunnion C to the upper or farther end of cylinder A. By thus constructing the trunnion C and the box which turns thereon, the valve-faces of said trunnion and cylinder bearing are not only held snugly together, but all wear is taken up and the unequal expansion of the parts due to the unequal heating thereof is permitted without causing said trunnion to bind in its bearings.

To counterbalance the pressure of steam in the passage *k* or passages *h h* against the face of the cylinder-bearing when steam is not admitted to chamber *u*, I provide a spring, *m*, bearing against the bottom of chamber *u*, and, through the diaphragm *a a*, pressure-plate O, and box L, against the under side of trunnion C.

Any wear of the crank-pin G in its box E may be taken up by turning the set-bolt *l* down upon the brass *p*.

H represents a part of the frame-work of the engine.

My invention operates as follows: The valve N is raised or depressed, according to the direction in which the engine is desired to be started. When raised, the lower port *n* is fully open to exhaust, and the upper part *n* is brought into communication with the induction-port *o*. Steam is thus admitted into passage *e*, thence through the offset passages *h h*, successively through passages *c* and *f*, into the opposite ends of cylinder A. Referring to Fig. 1 of the drawings, steam enters through the right-hand passage *h* and passage *c* into the lower end of cylinder A, while from the upper end of the cylinder the steam exhausts through passage *f* along the side of the cylinder, thence into passages *k* and *d* in trunnion C, whence it escapes through lower port *n* and valve-chamber M into the exhaust-pipe connected at R. The piston B is forced upward to the upper limit of its travel, the crank G turned in the direction indicated by the arrow, and the cylinder swung to the left. As it reaches and passes the center, the passage *c* is cut off from the right-hand passage *h* and brought into communication with the passage *k*, which is open to exhaust, while the passage *f* is in turn cut off from said passage *k* and brought into communication with the left-hand passage *h*, through which steam enters, and passes through said passage *f* into the upper end of the cylinder, forcing the piston down to the lower limit of its travel, the cylinder in the meantime swinging to the left and back to the center, when the relative positions of the passages *c* and *f* in the cylinder and the passages *h h* and *k* in trunnion C shift, and steam is again admitted into the lower end of said cylinder and exhausted from its upper end.

When it is desired to reverse the engine, the valve N is depressed until the upper port *n* is fully opened to exhaust, and steam is admitted from the passage about the valve through the lower port *n* into passage *d*,

whence it is supplied through passage *k*, and alternately through passages *c* and *f* to the ends of the cylinder A. The steam in turn exhausts through passages *h h* and *e* and upper port *n* into the upper end of valve-chamber M, whence it escapes through the cylindrical valve N into the exhaust-pipe below.

Whenever steam is admitted into the upper end of the cylinder A its tendency is to lift the cylinder from the trunnion C, upon which it turns, and to separate their valve-faces. It is for the purpose of counteracting this tendency that I introduce steam into the chamber *u u* from the passage *f*, communicating with the upper end of cylinder A. In this manner, whenever steam is admitted to the upper end of said cylinder, it is also admitted to chamber *u u*, and the same pressure which is exerted upon the upper face of piston B and the upper cylinder-head, tending to lift said cylinder from its trunnion C, is also exerted through pressure-plate O and box L against the under side of said trunnion and the cover-plate I, thereby tending with equal or greater force to hold said cylinder down upon its trunnion.

Various means may be employed for communicating the steam-pressure introduced into the upper end of the cylinder to the under face of the trunnion. For instance, the passage *f* may communicate with a small auxiliary piston connected by means of a lever or levers with box L, so as to transmit the steam-pressure to the under face of the trunnion. I do not, however, wish to claim this specific device here, but reserve it for another application.

For many purposes where a reversible engine is necessary two cylinders connected with cranks set at quarters are desirable to facilitate the starting of the engine. When two cylinders are used, they are both mounted upon the same trunnion, or upon trunnions which have the same steam-connections through passages *d* and *e*. The construction and operation of each cylinder in this case is precisely the same as that of the single cylinder hereinbefore described.

I claim—

1. The combination, in an oscillating engine, of the trunnion C, having bearing-faces on two diametrically-opposite sides, one of which is closed and the other provided with ports communicating through said trunnion with supply and exhaust ports or connections, cylinder A, having a transverse bore to receive said trunnion C, upon which it is mounted and oscillates, and passages *c* and *f*, communicating with opposite ends of said cylinder, and registering with the ports in said trunnion, substantially as and for the purposes set forth.

2. The combination, in an oscillating engine, of the cylinder A, having a transverse bore to receive the trunnion C, upon which it is supported and oscillates, trunnion C having passages leading from its end or ends and opening at one side thereof, so as to register

with ports or passages communicating with opposite ends of said cylinder, and a yielding box or block bearing against said trunnion upon the side opposite the openings of said passages therein, substantially as and for the purposes set forth.

3. The combination, in an oscillating engine, of the trunnion C, having bearing-faces on two diametrically-opposite sides, one of which is closed and the other provided with ports communicating through said trunnion with the valve-chamber M, cylinder A, having a transverse bore to receive said trunnion C, upon which it is mounted and oscillates, passages *c* and *f*, communicating with the opposite ends of said cylinder, and registering with the ports in said trunnion and valve N, substantially as and for the purposes set forth.

4. The combination, in an oscillating engine, of the cylinder A, mounted upon trunnion C and provided with passages *c* and *f*, communicating with the lower and upper ends of said cylinder, respectively, passage *g*, connecting passages *f* with a cavity, *u u*, below the trunnion, and the segmental box L, substantially as and for the purposes set forth.

5. The combination, in an oscillating engine, of cylinder A, trunnion C, upon which it is mounted and vibrates, passages *c* and *f*, leading from opposite ends of said cylinder to the face of the trunnion, passages through said trunnion registering with said passages *c* and *f*, box L at the opposite side of said trunnion, and a steam-connection with the passage supplying the upper end of said cylinder, whereby the same steam-pressure which is introduced to the top of said cylinder is exerted upon said box L, substantially as and for the purposes set forth.

6. The combination, in an oscillating engine, of the cylinder A, provided with passages *c* and *f*, communicating with its opposite ends and the trunnion upon which it swings, trunnion C, provided with induction and

duction passages which register with said passages *c* and *f*, segmental box L, pressure-plate O, diaphragm *a a*, steam-cavity *u u*, and passage *g*, connecting the same with passage *f*, substantially as and for the purposes set forth.

7. The combination, in an oscillating engine, of the cylinder A, having a transverse bore to receive trunnion C, upon which it is mounted and oscillates, trunnion C having passages *d* and *e* opening at one side and at the end or ends thereof, passages *c* and *f*, registering with said passages *d* and *e* and communicating with opposite ends of said cylinder A, and a connection between the face of said trunnion opposite the ports therein and the end of the cylinder, in which the pressure tends to separate the valve-face of said trunnion from its bearing, whereby the latter are held closely together, substantially as and for the purposes set forth.

8. The combination, in an oscillating engine, of the cylinder A, having a transverse bore to receive the trunnion C, upon which it is supported and oscillates, passages *c* and *f*, leading from said trunnion to the opposite ends of said cylinder, trunnion C, having passages *d* and *e* opening on one side thereof and registering with said passages *c* and *f*, the box or block L, bearing against said trunnion upon the opposite side, and connections between said block L and the end of said cylinder, in which the pressure tends to separate the valve-face of said trunnion from the valve-face against which it bears, whereby said valve-faces are held snugly together, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

ALBERT CUNNINGHAM.

Witnesses:

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A. G. WRIGHT.