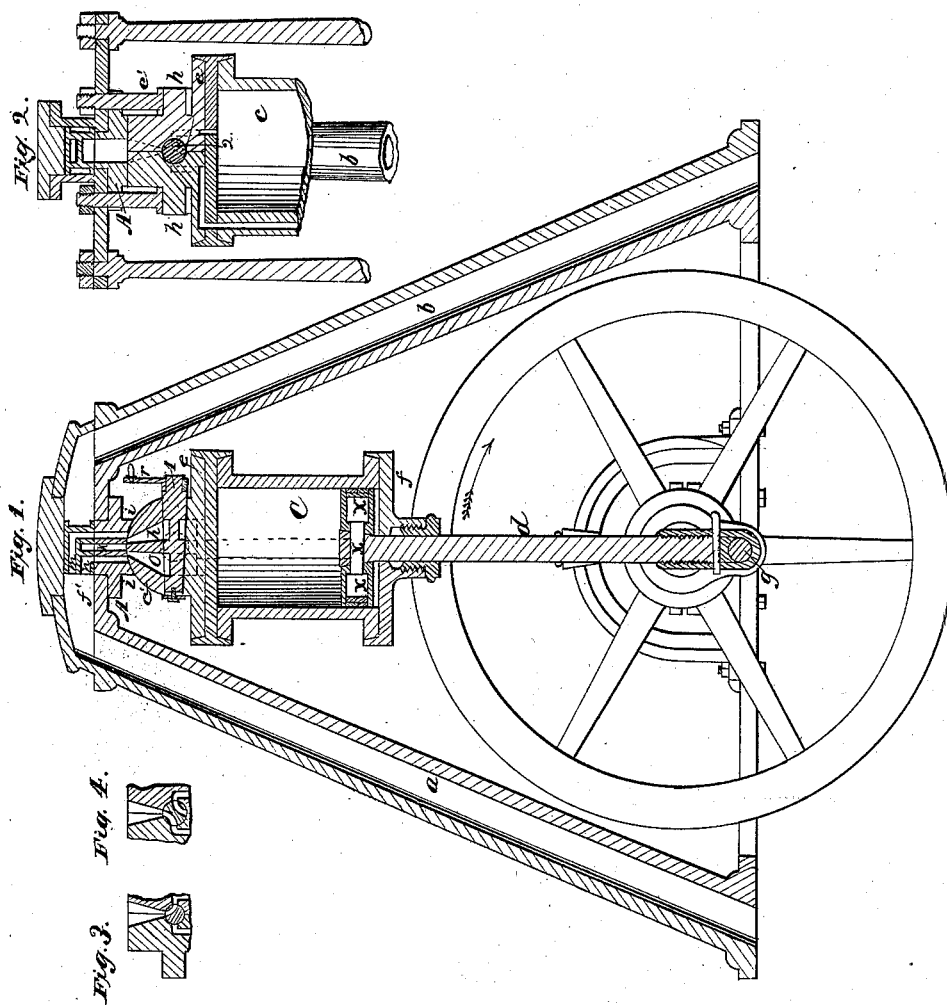


E. A. Lester,

N^o 3,426.

Patented Feb. 7, 1844.

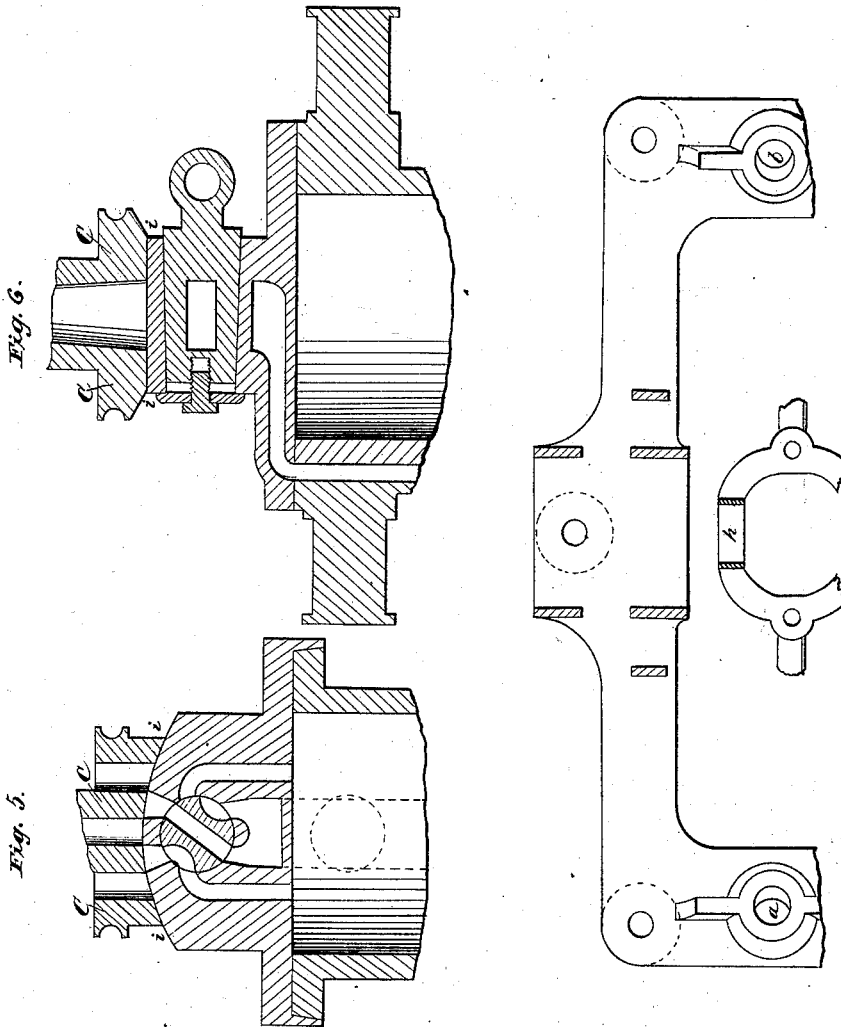


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Oscillating Steam Engine.

N^o 3426.

Patented Feb. 7, 1844.

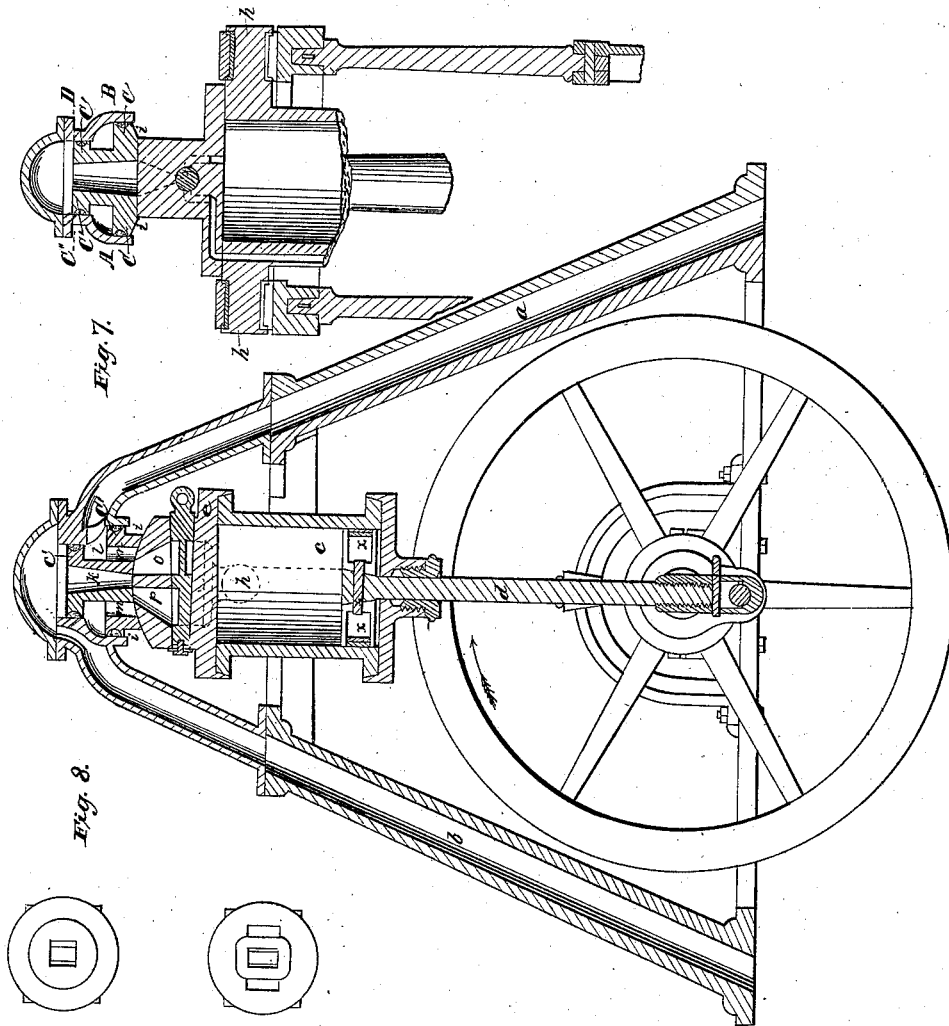


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UNITED STATES PATENT OFFICE.

EBEN. A. LESTER, OF BOSTON, MASSACHUSETTS.

VIBRATING STEAM-ENGINE.

Specification of Letters Patent No. 3,426, dated February 7, 1844.

To all whom it may concern:

Be it known that I, EBENEZER A. LESTER, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Vibrating Steam-Engines, of which the following is a specification.

My improved engine has a vibrating cylinder, is suspended in a position the reverse of that of the vertical engines in most common use—that is, the piston rod instead of passing through the upper plate or head of the cylinder, passes through the lower plate and thence extends down directly to the crank pin to which it is attached in the usual manner of attaching the connecting rod to this pin or it is attached to the end of a lever beam or to whatever other thing it is desired to connect the same to. The cylinder is suspended on gudgeons at or near the top plate or head of the cylinder, and the line of the center of oscillation on those gudgeons may be through that head or a little below it. When the engine is in operation the revolutions of the crank or the traversing upward and downward of the end of the lever beam causes the cylinder to vibrate to and fro through a certain arc of a circle at each revolution of the crank or traverse of the lever beam.

In the annexed drawings the engine frame is represented as having four supports with a top piece to which the engine is suspended and connecting cross pieces at the bottom. In the drawings Figure 1 (which is a vertical section through the cylinder) only two of the supports are exhibited the side support being hidden by the piston rod, but they are shown at *a' b'* Fig. 2. The supports may be only two if they are properly braced or they may be more than four, and the top piece *A* may be raised in form provided it admits of the entire construction of a steam chamber and steam channels and the construction and adaptation of working surfaces as hereinafter described. The two side supports as represented in the drawing Fig. 1 are tubular being intended for steam pipes as well as supports, this mode of construction being both economical and convenient, but it is not essential to my improvement, for the steam may be conducted to the upper part of the frame by separate pipes. In Fig. 1 (*a*) is the induction pipe, and (*b*) is the eduction pipe, (*c*) is the cylinder and (*x*) the piston, (*d*) the

piston rod, (*e, e'*) the upper cylinder head, (*f*) the lower cylinder head or plate, (*g*) the crank pin. Fig. 2 represents a section of the upper part of the engine at right angles to Fig. 1, *h, h*, is the central section of the gudgeons (on which the cylinder oscillates) continued through the upper cylinder head, or plate, the axis being parallel to the axis of the shaft. The upper part *e'* of the upper cylinder head or plate, is convex, being part of the surface of a cylinder the longitudinal center of which is the central line of the gudgeons *h, h*. The cylindrical surface is represented in the drawing by the curved line (*i* to *i*) this surface is exactly fitted to a corresponding concave surface represented by the same line (*i* to *i*) in the cap piece *A*, the two surfaces being ground together so as to be steam tight, so that as the crank turns and the cylinder and its piston and rod vibrates from right to left or vice versa as seen in Fig. 1, the cylindrical surface at the top of the upper head of the engine cylinder moves upon the corresponding surface in the top piece, the engine being so suspended as to bring and keep these surfaces in exact contact. If required these surfaces may be packed with metal or other packing. The pipe (*k*) communicates with the eduction pipe (*b*) and has directly behind it as shown in the drawing (*f'*) a steam chamber extending on the left and connected with the induction pipe (*a*) so as to include the spaces (*m* and *n*) therewith the sides or walls of the steam channel (*k*) as represented by the spaces not shaded, are equal in breadth or thickness from right to left to the breadth of the steam channels (*m* and *n*); and these walls must also be transversely of at least equal dimensions with those steam channels respectively—that is the solid partition between (*n* and *k*) and between (*k* and *m*) are equal in dimensions from right to left of these channels and at least equal in dimensions transversely or from front to rear, as seen in the Fig. 2 so that when the engine is on its dead center the solid wall between (*n* and *k*) is a stopper to the channel (*o*) and the solid wall between (*k* and *m*) is a stopper to the channel (*p*) suppose then the crank to move from the lower dead center in the slightest degree in the direction indicated by the arrow in this figure it will open the steam channels (*m* and *p*) and the steam will be forced down

through the channel in the side pipe of the cylinder of the engine and force the piston up, at the same instant the steam channels (*k* and *o*) will open forming a communication with the eduction pipe and discharge the steam from the upper part of the steam cylinder to be condensed or dissipated in the atmosphere. Suppose the crank to revolve till the piston comes to the upper dead center the steam channels then become closed or stopped; suppose the crank to move onward again in the slightest degree the steam channels (*n* and *o*) will open for steam above the piston and the channels (*k* and *p*) will also open for discharging the steam from below the piston into the eduction pipe to be condensed.

The requisite dimensions and mass and kind of metal for the construction of the various parts of the engine will vary with its size, as will be obvious to any one skilled in steam engineering, and need not therefore be specified.

The engine as above described cannot be reversed in its motion. For the purpose of reversing it I use a three way steam cock (as shown in yellow shading at Nos. 1, and, 2,) in Figs. 1 and 2 and separately in Figs. 3 and 4. This cock is usually of a cylindrical form, but being slightly conical, so as to make when ground in, a perfect fit. This cock is inserted in the upper cylinder plate, or cylinder head, directly across the steam channels in that head and at right angles to a line passing through the center of the gudgeons. Each steam channel in that head as already described leads to one end of the steam cylinder and serves for an induction pipe when the piston is moving from that head and for an eduction pipe when the piston is moving toward that head this cock must then be so formed, as at least in one position, to admit of the free passage of the steam both into and out of each end of the cylinder of the engine and in such position the cock will evidently have no effect whatever upon the action of the engine, and this must be the condition of the resting position of the cock, its only function is to reverse the revolution of the crank and this being done nothing remains but to leave the steam channels unobstructed for the continuance of such reversed revolution until there shall be occasion again to reverse it.

Now in the engine as it has been described, each steam channel in the cylinder head communicates with its own end of the cylinder only. The object of this cock then is at some point between the two dead centers to change the current of steam to the opposite end of the cylinder, suppose the position of the cock as represented in Fig. 1. The steam communications are closed, by turning the crank (*r*) of the cock toward you the steam

communication will be open as shown in Figs. 2, 3 and 4 and by turning the plug crank from you the steam communications will be reversed and produce a reverse motion of the engine.

The formation of my three way plug cock is as follows: Let the circular solid part of the cock between the two parallel ways be equal to one eighth of a circle and sufficient to stop the steam channels; let two channels be made on the upper, and one on the lower side of the cock each of the same dimensions as the upper steam channels, at a quarter circle distance in the seat of the plug (as shown in Fig. 1) from the vertical plane of the central line of the cock leading into a chamber communicating with the upper end of the cylinder. In one position, and indeed, in two opposite positions, this will be a stop-cock; turn it one eighth of a circle from this position one way, and it will admit the steam so as to cause a direct action of the engine; turn it one eighth of a circle from the same position the other way, and it will cause the reversed motion of the engine. Another way of forming the three way plug cock is shown in the vertical section drawings, Figs. V and VI, in which the steam passes in one of its passages through the body of the cock at right angles to the longitudinal central line thereof, while the other passages are through curved apertures formed in the plug of the cock in its opposite sides. The operation of this plug for changing the motion of the engine being the same as before described to the other form of three way cock.

In Figs. VII and VIII, of the drawings a different mode of construction of the part above the cylinder head is represented. The object of this construction is that the part above the cylinder head *e*, is formed by a separate circular piece inserted into and through the steam chamber and made steam tight by grinding or packing having three steam channels passing perpendicularly through it as shown in Figs. V, VI, VII and VIII, see *C' C'*, *A B* and *C'' D* the surface from *i* to *i* corresponding to the surface *i* to *i* of the upper head of the cylinder and being made tight by grinding or packing, these surfaces kept in close contact by the gravity of the piece or by a spring or otherwise sufficient to resist the upward force of the steam and by its formation permitting it to move upward and downward to meet any wear of the gudgeons or surfaces or any spring of the engine or its parts.

What I claim as my invention and for which I ask a patent is—

The manner of arranging and combining the steam chambers, and the channels, or, steam ways in the top piece *A*, and in the upper cylinder head *e, e'*; the said top piece and cylinder head being, fitted to each other

by their concave and convex cylindric surfaces so as to cause the said steam ways, or channels, to operate by the vibration of the suspended cylinder, substantially as herein
5 set forth, and this I claim whether the engine be constructed so as to operate without a three way reverse plug cock or valve; or if made or constructed to be capable of reversing its motion by means of such plug
10 cock or cocks as hereinbefore described and shown in the drawings hereto annexed or by any other similar mode of forming such reverse cock or valve for obtaining the same

operation for reversing the motion by means substantially the same.

15

In testimony that the foregoing is a true specification of my invention or improvement I have hereunto set my hand and seal this twenty eighth day of September in the year of our Lord one thousand eight hundred and forty three. 20

EBEN. A. LESTER. [L. s.]

Attest:

H. MONTGOMERY,
SAML. B. DEAN.