# E. G. Otis,

## Oscillating Steam Engine.

No. 30,241. Patented Oct. 2, 1860.

Fig. 1.

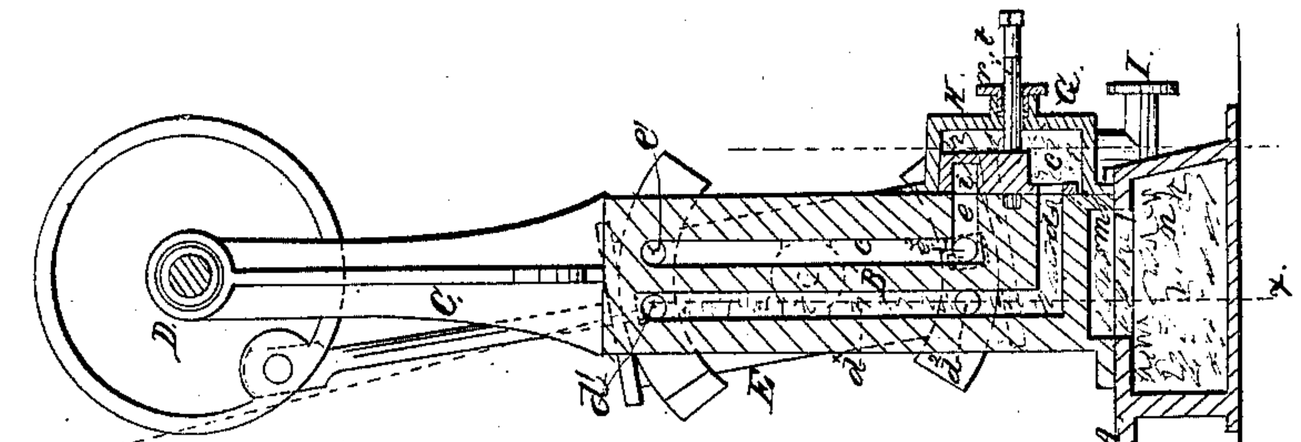


Fig. 3.

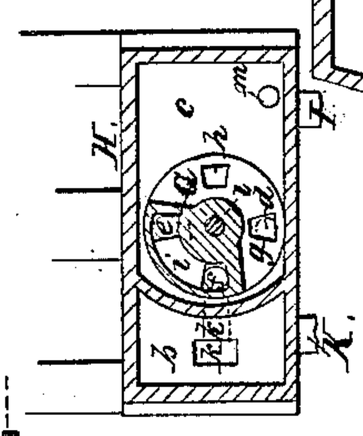


Fig. 2.

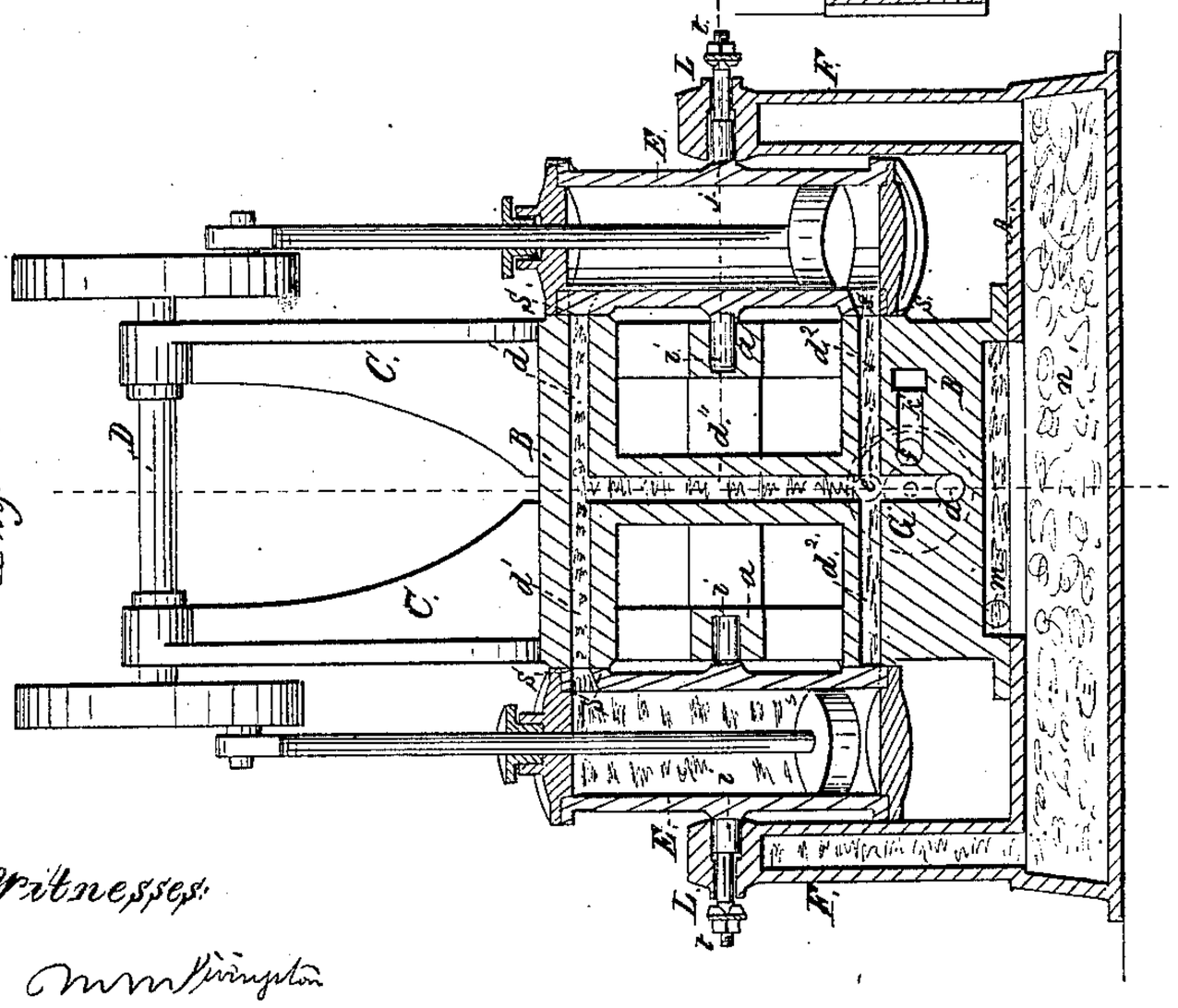
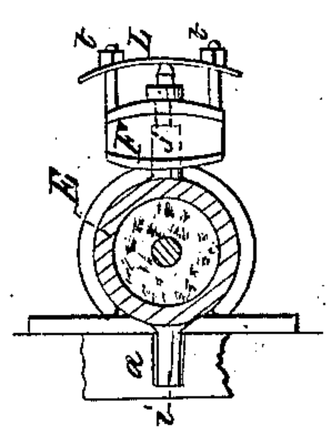


Fig. 4.



Witnesses:

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G. G. Reed

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# UNITED STATES PATENT OFFICE.

E. G. OTIS, OF YONKERS, N. Y.

## OSCILLATING ENGINE.

Specification of Letters Patent No. 30,241, dated October 2, 1860.

*To all whom it may concern:*

Be it known that I, E. G. OTIS, of Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Oscillating 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 central vertical section at right angles to the shaft of a double oscillating engine with my improvements. Fig. 2, is a vertical section of the same taken parallel with the shaft in the plane indicated by the line *x*, *x*, Fig. 1. Fig. 3, is a vertical section of the reversing valve and valve chest. Fig. 4, is a horizontal section of one of the cylinders.

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

My invention consists in a certain arrangement of the framing steam chest and passages of a double oscillating engine whereby I make a durable and effective oscillating engine of very cheap construction.

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

A, is the bed-plate of the engine.

B, is a steam chest in the form of a quadrangular box of cast iron with a system of passages to be presently described formed by coring. This steam chest may be considered as the principal portion of the framing of the engine as it supports the two standards C, C, in which are the bearings of the main shaft D, and also supports the bearings *a*, *a*, for one trunnion *i*, of each of the two cylinders E, E. The other two trunnions *j'*, *j'*, are supported in bearings in two standards F, F, erected on the bed plate one on each side of the steam chest.

H, is a valve chest, bolted to the front of the steam chest B, containing the reversing valve G. This valve chest is divided into two compartments *b*, and *c*, to the latter of which is connected the steam pipe I, and to the former of which is connected the exhaust pipe K. The compartment *c*, contains the valve which is of the oscillating disk kind and which fits to a flat seat provided for it on the steam chest B. This seat contains three ports *d*, *e*, *f*, of which *d*, and *e*, communicate with separate sets of passages in the steam chest B, as will be presently described, and *f*, communicates by a passage *k*, in the steam chest B, with the exhaust compartment *b*. The valve has in its face a cavity *i*, which will bring either the port *d*, or *e*, into communication with the port *f*, and has two openings *g*, *h*, right through it so arranged that when the cavity *i*, covers the ports *d*, and *f*, the port *h*, will be opposite to *e*, and when the said cavity covers the ports *e*, and *f*, the port *g*, will be opposite to *d*, as shown in Fig. 3. The central stem *l*, of the valve G, works through a stuffing box *r*, in the steam chest H, outside of which it is to be furnished with a lever for the purpose of bringing it to either of the positions above specified or to a position to close both ports *d*, and *e*, for the purpose of stopping the engine. Near the valve there is a passage *m*, leading from the induction compartment of the valve box through part of the steam chest B, to a chamber *n*, formed in the bed plate said chamber being in communication with the cavities of the standards F, F, and the said chambers and cavities being kept filled with steam from the induction compartment *c*, of the valve box.

The cylinders are furnished each on the side next the steam chest B, with two flat faces *s*, *s*, one near each end, said faces constituting valves, and each of them containing one port for the induction and eduction of steam through two ports on corresponding faces provided on the valve chest for the said faces of the cylinder to work against, the said ports in the cylinder and steam chest being opened and closed to each other in turn by the oscillation of the cylinder in a manner which is common to many well known oscillating engines and therefore requires no description. The port *d*, in the valve seat communicates with an upright passage *d**, in the steam chest and from this passage, passages *d'*, *d'*, $d^2$, $d^2$, branch off to the ports in the side faces of the steam chest, one passage leading to the upper, and another to the lower end of each cylinder. The port *e*, in the valve seat communicates with a similar upright passage *e**, in the steam chest, and from this passage similar passages *e'*, *e'*, $e^2$, $e^2$, branch off to the ports in the side faces of the steam chest, one passage leading to the upper and the other to the lower end of the cylinder. By bringing the valve G, to one or other of the positions hereinbefore mentioned that is to say to open

either of the ports *d*, *e*, to the steam compartment and the other to the exhaust compartment of the valve chest either set of passages $d^*$, $d'$, $d'$, $d^2$, $d^2$, or $e^*$, $e'$, $e'$, $e^2$, $e^2$, may be made to constitute induction passages and the other set to constitute eduction passages according to the direction in which the rotation of the crank shaft is desired, and by shifting the valve from one to the other of such positions the engine may be reversed.

L, L, are springs secured to the standards F, for the purpose of pressing against the ends of the trunnions $j'$, $j$, and thereby holding the cylinders close up to the steam chest and preserving steam tight joints between them. These springs have screws and nuts $t$, $t$, applied to them for the purpose of graduating their pressure.

By providing the chamber *n*, in the bed plate connecting the induction chamber of the valve chest with cavities in the standards F, F, not only is the bed plate caused to expand and contract as the cylinder becomes heated and cooled thereby keeping the joints between the cylinder and steam chest tight, but the standards F, F, are caused to expand and contract vertically in a manner corresponding with the vertical expansion and contraction of the steam chest, and by that means the bearings of the outer trunnions will rise and descend with the bearings of the inner ones and the axis of oscillation of the cylinders will remain always parallel with the axis of the main shaft D.

I do not claim the employment of two sets of passages for the purpose of enabling the reversal of an oscillating engine to be effected by the simple movement of a valve. Nor do I claim making a steam chamber in the bed plate of an oscillating engine for the purpose of making it expand and contract correspondently with the lateral expansion and contraction of the cylinder; but

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

1. The arrangement of the steam chest B, containing the two sets of passages $d^*$, $d'$, $d'$, $d^2$, $d^2$, $e^*$, $e'$, $e'$, $e^2$, $e^2$, in such a manner as to constitute the main framing of the engine that is to say as to support the bearings of the main shaft and of one trunnion of each cylinder substantially as herein described.

2. The arrangement of the steam chamber *n*, in the bed plate in communication with cavities in the standards F, F, for supporting the outer trunnions whereby the outer trunnion bearings are caused to rise and descend with the inner ones, as the latter rise and descend with the expansion of the steam chest B.

3. The springs L, L, applied to the outer trunnions substantially as and for the purpose herein specified.

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Witnesses
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