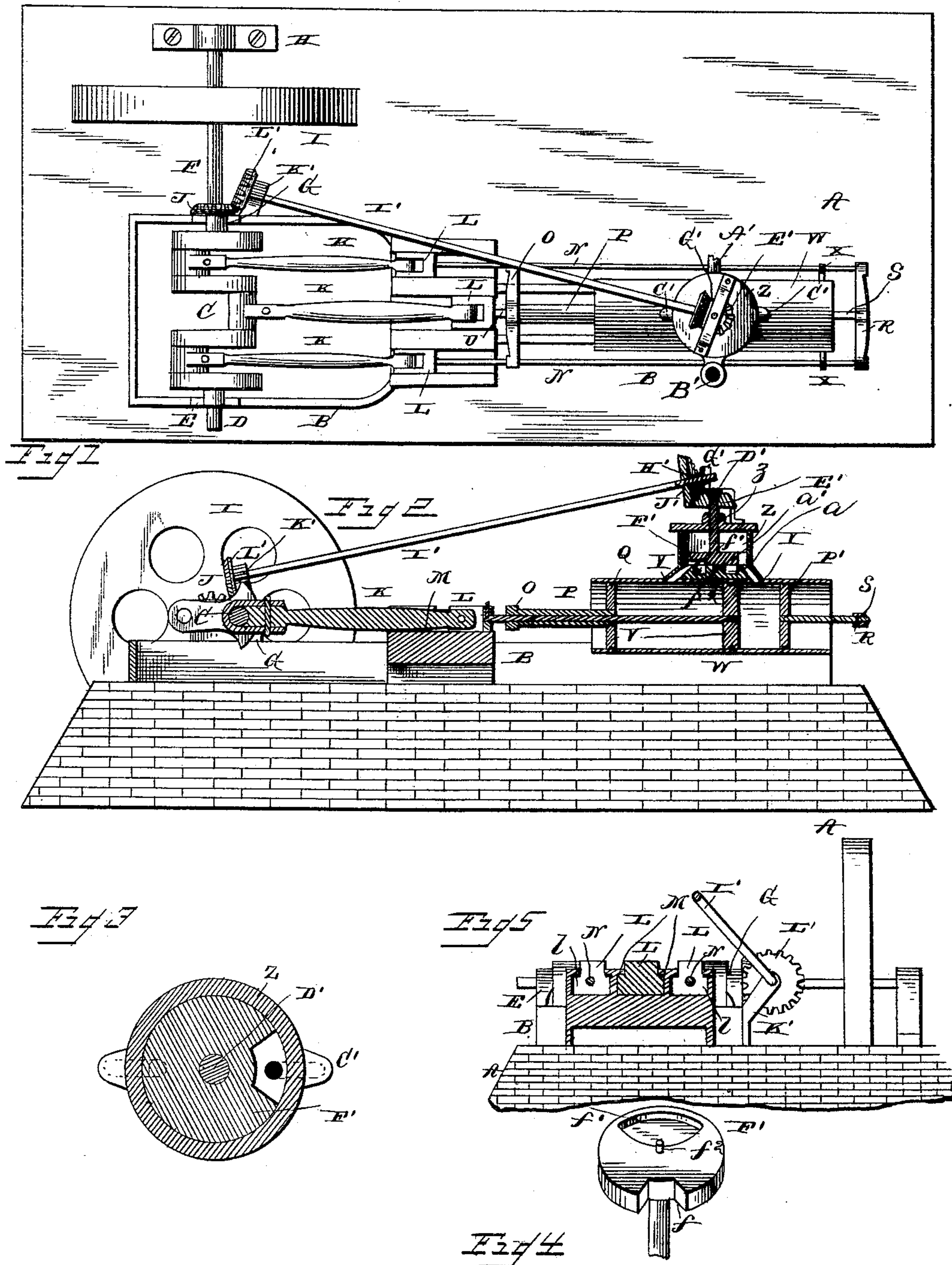


(No Model.)

W. E. JONES.  
STEAM ENGINE.

No. 410,525.

Patented Sept. 3, 1889.



WITNESSES  
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# UNITED STATES PATENT OFFICE.

WILLIS E. JONES, OF ALBA, MICHIGAN.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 410,525, dated September 3, 1889.

Application filed January 15, 1889. Serial No. 296,386. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIS E. JONES, a citizen of the United States, and a resident of Alba, in the county of Antrim and State of Michigan, have invented certain new and useful Improvements in Steam-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 appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a top plan view of my improved steam-engine. Fig. 2 is a longitudinal vertical sectional view. Fig. 3 is a horizontal section through the steam-chest. Fig. 4 is a detail view of the valve, and Fig. 5 is a cross-sectional view through the connecting-sleeves.

Like letters of reference denote corresponding parts in all the figures.

My invention has relation to steam-engines; and it consists in the improved construction and combination of parts of the same, as will be hereinafter more fully set forth and described.

In the accompanying drawings, the letter A represents the bed-plate. Suitably secured to this bed-plate is a supporting-frame B. To the rear of the frame is arranged transversely a three-throw crank C, having connected to one side thereof, and turning in unison therewith, a short shaft D, having its outer end journaled in a bearing E, secured to the side of the frame. The opposite end of the three-throw crank is secured to a second short shaft F, passing through a bearing G, and having its outer end journaled in a pillow-block H, secured to the bed-plate. This short shaft F carries a fly-wheel I, and has also secured thereto a bevel-gear J.

Secured to the crank-shaft C are rods K K K, said rods being pivotally connected at their forward ends to cross-heads L L L, said cross-heads being provided with lower flanges *l l l*, adapted to move in ways or grooves M M in the frame. Secured to the outer cross-heads are piston-rods N N, connected by a cross-head O, said cross-head having secured thereto a hollow piston-rod P, said shaft carrying upon its forward end a piston-head Q. The outer piston-rods are connected at their ex-

treme ends by a cross-head R, having extending inward from the center thereof a piston-rod S, carrying a piston-head P'. The central cross-head has also secured thereto a piston-rod U, which passes through the hollow piston-rod P, and has secured on its end a piston-head V.

The letter W indicates the steam-cylinder in which the several piston-heads are reciprocated, the piston-heads Q and P forming the outer pistons, and the piston-head V the inner piston. This cylinder is seated upon the forward side pieces of the frame, and is provided upon its forward end with laterally-extending perforated lugs X X, through which the side piston-rods pass. It is also provided upon its upper cylindrical surface with port-holes Y Y.

Secured to the top of the steam-cylinder is the usual steam-chest Z, having the steam-inlet A' and exhaust or outlet B' and side steam-pipes C' C'. The bottom of this steam-chest is provided with a cylindrical recess *a*, having a central lug or projection *a'* extending therefrom, said bottom forming the valve-seat. Passing through a central perforation *z* in the steam-chest is a vertical shaft D', provided on its upper end with a bevel-gear E' and on its lower end with a valve F', said valve having its periphery provided with a notch *f*, and provided on its bottom with a recess *f'* and a central pin or pintle *f''*, adapted to turn in the central lug or projection of the valve-seat. A bracket G' is also secured to the top of the steam-chest, and is provided with an upwardly-extending bearing H'. A rod I' has its bearing in this perforated lug, and is provided with a bevel-gear J', meshing with the gear upon the upper end of the vertical shaft D', and passes down diagonally through an angle-bearing K', secured to the bed-plate, and is provided on this end also with a bevel-gear L', meshing with the bevel-gear J on the shaft.

The above being the construction of my improved steam-engine, the operation is as follows: When steam is let into the steam-chest through the inlet A' and the segmental slot is brought to register with one of the side steam ports or openings C' in the valve-seat, and at the same time the segmental recess is above or registering with the opposite steam



channel or port, the steam contained within the chest will pass down through the port C' into the steam-cylinder. After the segmental notch reaches the steam port or opening diametrically opposite the one by which steam was first introduced into the cylinder, as previously described, live steam will again pass down into the steam-cylinder through the medium of the steam channel or pipe leading thereto, while the segmental recess registering with or above the diametrically-opposite channel permits the exhaust-steam from the cylinder to pass within the space formed by this recess, which, when said recess reaches the outlet-opening, passes down the same and through the laterally and forwardly extending pipe into the open air. By this means the valve is made to alternately admit steam between the piston-heads from one port or channel, while it exhausts steam from between the piston-heads from the opposite port or channel. It will be further seen that the three-throw crank-shaft has the effect of actuating the several piston-rods in opposite directions—that is to say, the central piston-rod passing through the hollow piston-shaft P will move backward, while the side piston-rods and the hollow piston-shaft P will be moved forward, and vice versa. This will have the effect of bringing the inner piston-head and the outer piston-heads alternately together and apart. When the inner piston-head reaches a point beneath the innermost of the ports of the steam-cylinder, the valve opens and permits the steam to enter. The moment it enters its expansive power again forces the piston-heads apart. When the outer forward piston-head reaches its limit after thus being forced from the central piston-head, the revolving vertical shaft opens the valve and admits the steam to the forward port, and, passing between the outer forward piston-head and the inner piston-head carried by the central rod, the two pistons are likewise forced apart, at the same time forcing the steam contained within the opposite end of the cylinder up into the steam-chest, as previously explained. It will be seen

by this arrangement of the pistons that the outside pistons are controlled by the side rods and work in the same direction, while the center piston works in an opposite direction, thereby making a balanced engine.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

The combination of the bed-plate provided with central ways or grooves having upper flanges, the three-throw crank-shaft, the pitman connected thereto, the cross-heads working in the grooves or ways and provided with steps or shoulders passing beneath the upper flanges of the ways or grooves, and also having the forward ends of the pitman secured thereto, the frame surrounding the cylinder, the inner ends of the side pieces thereof being connected to the outer sliding cross-heads, and their forward ends passing through bearings upon diametrically-opposite portions of the cylinder, the cross-heads connecting said side pieces transversely, the forward one of which connects the extreme front ends thereof, and the rear cross-head connecting said side pieces at a point somewhat removed from their rear extremity, the piston-rods extending from the cross-heads, the piston-rod upon the innermost cross-head being hollow, the central piston-rod connected to the central sliding cross-head constructed to pass through said hollow piston-rod and to be actuated in an opposite direction to the piston-rods upon the cross-heads, the steam-cylinder, the steam-pipes leading into the steam-cylinder and provided with induction and eduction openings, and the valve for alternately admitting steam into the cylinder and exhausting the same therefrom, substantially as set forth.

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

WILLIS E. JONES.

Witnesses:

HENRY W. SLOAT,  
WILLIAM BUNDY.