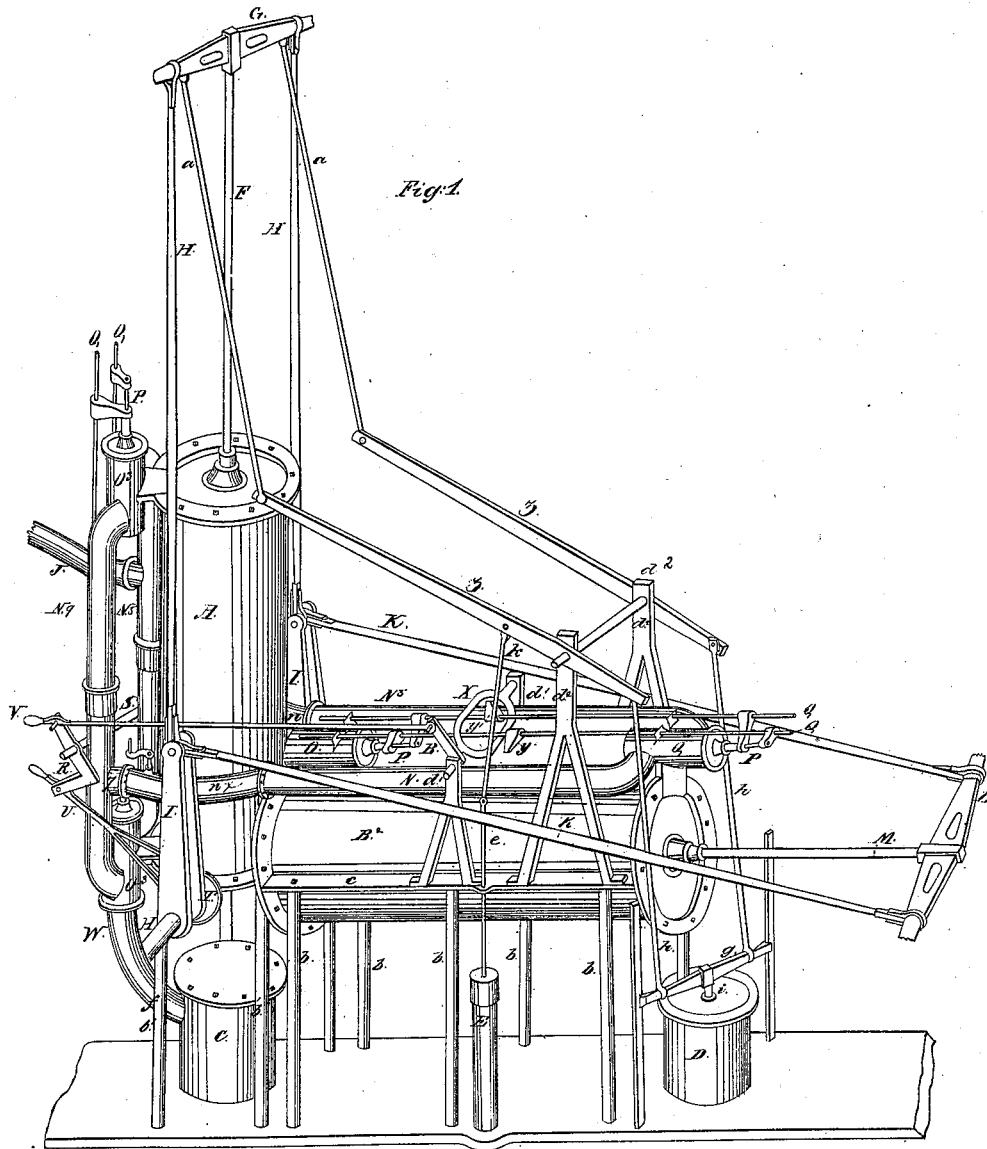


C. L. Ferris,
Reciprocating Steam Engine,
No. 1,667, Patented July 1, 1840.



UNITED STATES PATENT OFFICE.

CALEB L. FERRIS, OF COURTLAND, NEW YORK.

IMPROVEMENT IN THE MODE OF ARRANGING THE CYLINDERS IN DOUBLE-CYLINDER ENGINES FOR PREVENTING A DEAD-POINT ON THE CRANK.

Specification forming part of Letters Patent No. **1,667**, dated July 1, 1840.

To all whom it may concern:

Be it known that I, CALEB L. FERRIS, of the town of Courtland, in the county of Westchester and State of New York, have invented a new and useful Improvement in Steam-Engines for Preventing what is termed the "Dead-Point" of the Crank, which improvement is as follows, reference being had to the drawing, which makes a part of this specification.

The figure is a perspective view of the engine, and similar letters refer to similar parts on the drawing.

Vertical: A is the vertical cylinder; F, the piston-rod; H H, the connecting-rods; N^s N^s, steam and exhaust pipes; O^s O^s, the valve-boxes; G, cross-head; Q Q, lifting-rods; P, valve-rods.

Horizontal: B² is the horizontal cylinder; N^s N^s, exhaust and steam pipes; O O, the valve-boxes; e, the flanges; M, the piston-rod; L, cross-head; K K, connecting-rods; X, top bar.

4 is the main or crank shaft; I I, cranks; W, eduction-pipe; J, induction pipe; C, condenser; D, air-pump; E, force-pump; Z, lever which operates the pumps; a a, connecting-rod of the lever; h h, connecting-rods of the air-pump; e, connecting-rod of the force-pump.

My invention consists in the particular manner in which I combine and arrange the vertical cylinder A and the horizontal cylinder B² at right angles, or nearly so, one vertically, the other horizontally, for the purpose of overcoming what is termed the "dead-point" on the crank. Two cylinders have heretofore been placed at right angles to effect the same object; but the manner in which they were arranged was different, the angle of junction being formed by the piston-rods being inclined toward each other, which invention was not applicable to marine engines on account of its occupying too much room. The manner in which I arrange the cylinders is different. Instead of having piston-rods or upper ends of the cylinders inclined toward each other I point them outward and bring the opposite or closed ends together and place the main shaft at or near their junction, the connecting-rods being brought from the cross-heads on the piston-rods or both cylinders to the cranks on the main shaft for operating the same. The posi-

tions of the cylinders may be varied, providing they are arranged as I have prescribed—that is, with their bottoms or closed ends united at right angles with each other; but as I find the following the most convenient and permanent arrangement I give it the preference:

I erect, in the first place, one of the ordinary vertical cylinders, (see A on the drawing,) which is provided with a piston, piston-rod, cross-head, and steam and exhaust valves worked by lifting-rods operated by a rock-shaft, as in the ordinary way. The valves and mode of operating them may be varied, as that does not form a part of my invention. I next place a horizontal cylinder (see B² on the drawing) having the same appendages of valves, lifting-rods, piston, piston-rod, cross-head, &c., the bottoms of both cylinders being placed in opposition, so as to form a right angle, or nearly so, and so arranged that a line drawn longitudinally through the center of the horizontal cylinder would pass at the distance of half the thickness of the main shaft below the bottom of the vertical cylinder. As it is necessary that the cylinders should be elevated in proportion to the elevation of the main shaft, I cast for this purpose a flange on each side of the horizontal cylinder, (see C on the drawing,) and place standards (see b on the drawing) thereunder; but both the flanges and standard may be dispensed with and a wall or frame-work used instead of them. The bottom of the vertical cylinder also rests on standards in the usual manner. (See b' b' on the drawing.) It may, however, be supported on a platform erected for that purpose in place of standards. Having arranged the cylinders in this manner, I then place the main shaft directly or nearly under the center of the vertical cylinder and place it at or near the angle of lines supposed to be drawn lengthwise through the center of both cylinders. (See 4 on the drawing.) I have two cranks on the main shaft, one on each side of the cylinders, as in the ordinary cross-head engines, (see I I on the drawing,) and operate them by means of connecting-rods extended from the cross-heads of both piston-rods and attached to them. (See H H and K K on the drawing.) The condenser (when one is employed) I place under the vertical cylinder, (observe C on the drawing;) but it may be arranged differently, as circumstances

may require. The air and forcing pumps I place below the horizontal cylinder and operate them by means of a lever, Z, like the ordinary walking-beam lever, to which their piston-rods are attached by means of connecting-rods. The above-mentioned lever is supported on two standards (observe d^2 d^2 on the drawing) placed on the flanges of the horizontal cylinder, and consequently vibrates over the cylinder, being operated by the cross-head of the vertical cylinder by means of connecting-rods (observe a a on the drawing) attached to it. Both cylinders are provided with the ordinary steam and exhaust pipes, which are so constructed as to need but one eduction-pipe (see W on the drawing) and one induction-pipe (J on the drawing) for both cylinders on account of their being connected together by short pieces of pipe which curve around the vertical cylinder. (Observe n n^* on the drawing.)

The valves on the vertical cylinder, as I have stated, are operated in the ordinary way by an eccentric on the main shaft giving motion to a rock-shaft working the lifting-rods that open and shut the steam and exhaust valves of the cylinder. The rock-shaft or tip-bar X of the horizontal cylinder is operated, however, rather differently. It is placed over the cylinder and is supported on standards raised on the (see d' d') flanges, which I have described as being cast on the cylinder. It is operated by a connecting-rod, V, attached to the crank B, which extends along the cylinder and is fastened to one end of the crank R of a horizontal shaft, S, which I erect for this purpose on the side of the vertical cylinder opposite to that on

which the horizontal cylinder is situate and at the same elevation as the tip-bar X to the crank R of the shaft S. An eccentric, T, on the main shaft is attached, the motion given by which to the crank is communicated to the tip-bar X by means of the connecting-rod V.

The shaft S may be supported in any manner, either by standards from the floor or otherwise; but it is represented by the drawing as supported by and moving in collars attached to the steam-pipes N^s and N^o of the vertical cylinder.

Having described the above-mentioned engine by this specification and the annexed drawing, to which it refers, I will proceed to state what I claim as my improvement and wish to have secured by Letters Patent of the United States.

What I claim as my invention, and desire to have secured by Letters Patent, is—

The manner in which I have arranged and combined the horizontal and vertical cylinders—that is to say, placing said cylinders, (whether one be horizontal and the other vertical or otherwise, providing their relation to each other be still the same,) at right angles, or nearly so, with their closed ends adjoining each other, and the crank or main shaft between them at the junction of the angle, and operating the cranks by means of having the connecting-rods of both cylinders attached to them.

Witness my hand this 12th day of May, 1840.

CALEB L. FERRIS.

Witnesses:

H. BAGARLY,

DAVID THOMAS.