

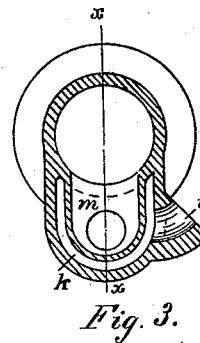
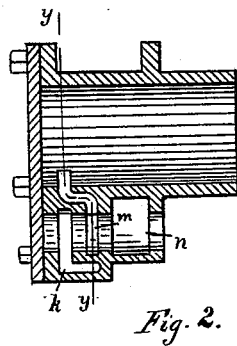
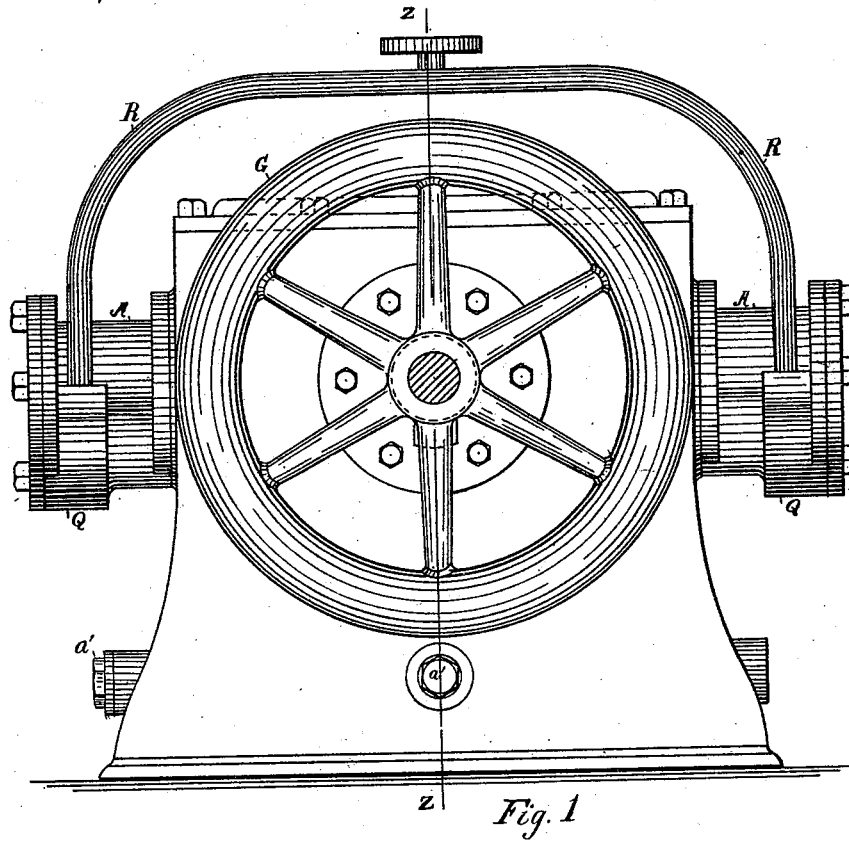
(No Model.)

3 Sheets—Sheet 1

T. S. DAVIS.  
STEAM ENGINE.

No. 455,311.

Patented July 7, 1891.



WITNESSES:

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Ernest E. Bache

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Thomas S. Davis  
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James A. Whitney  
ATTORNEY.

(No Model.)

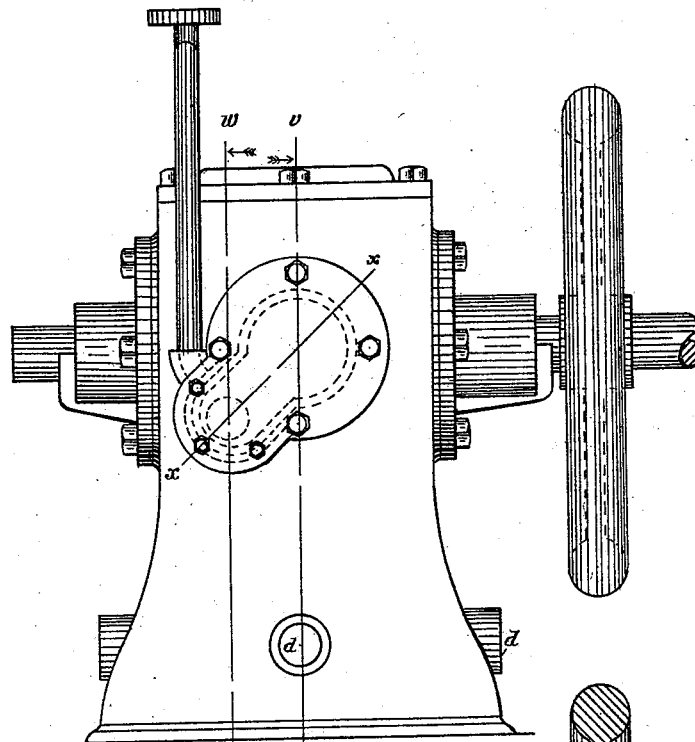
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T. S. DAVIS.  
STEAM ENGINE.

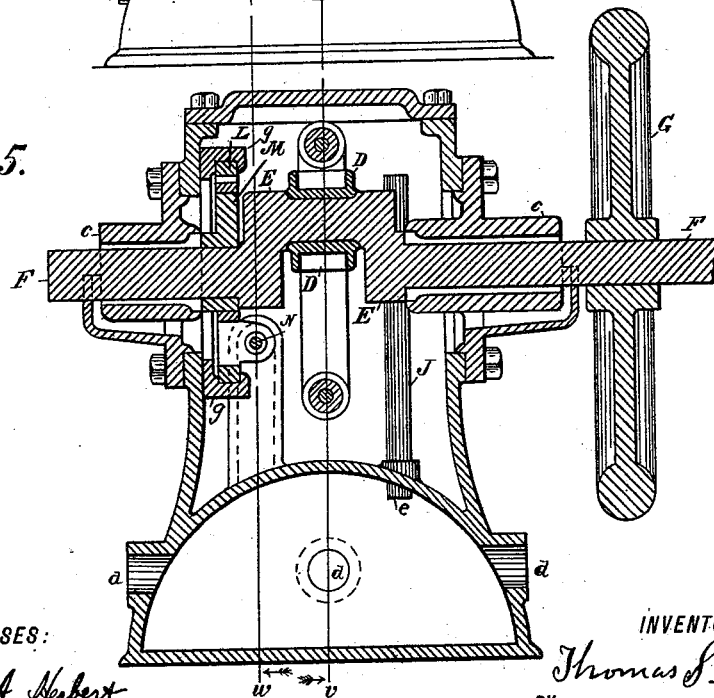
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*Fig. 4.*



*Fig. 5.*



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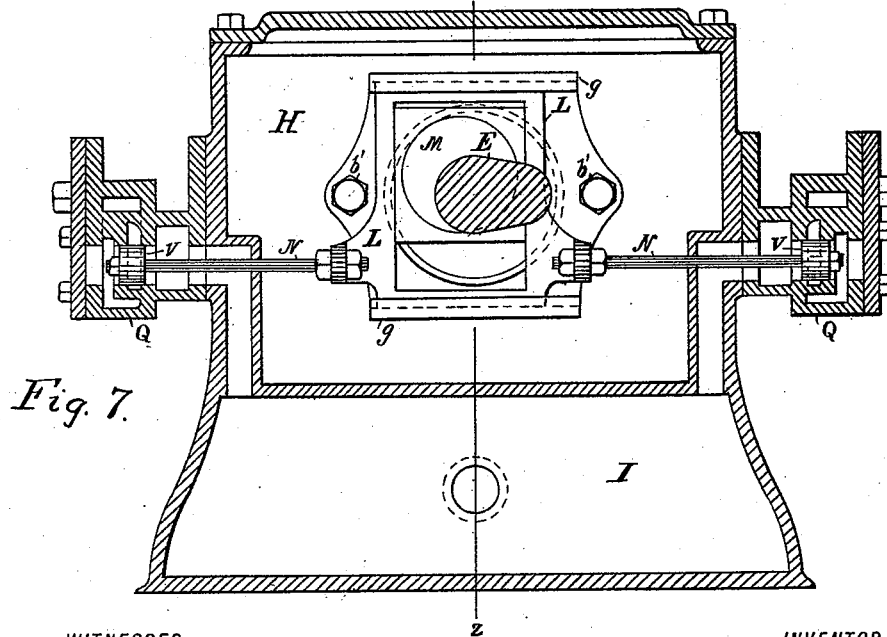
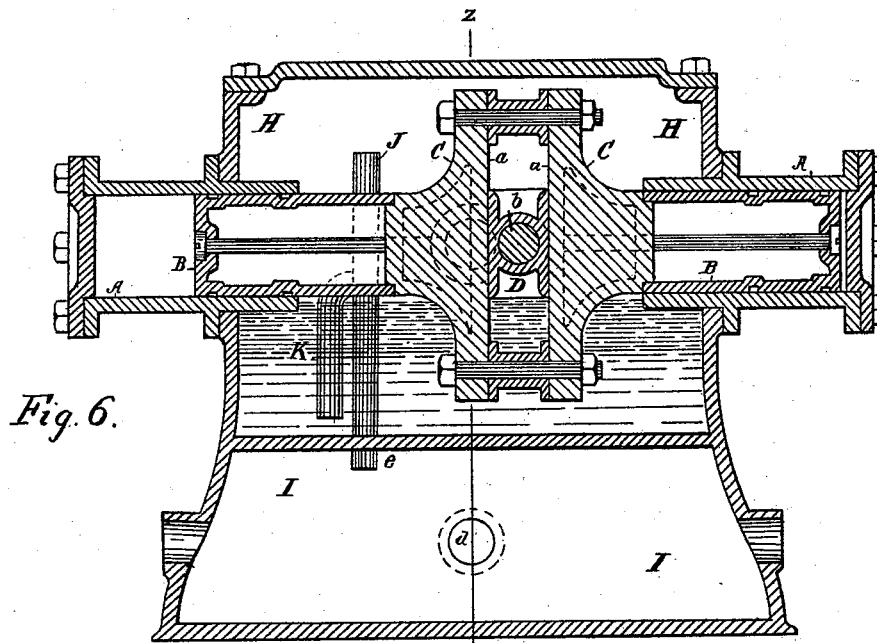
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3 Sheets—Sheet 3.

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# UNITED STATES PATENT OFFICE.

THOMAS S. DAVIS, OF BROOKLYN, NEW YORK.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 455,311, dated July 7, 1891.

Application filed July 12, 1890. Serial No. 358,484. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS S. DAVIS, of Brooklyn, in the county of Kings and State of New York, 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.

The object of this invention is to provide an engine to be operated by steam or other elastic fluid, which should be capable of being run at a high speed with great steadiness and uniformity of motion, as is required in many applications of power—as, for example, in running dynamos for electric lights, my said invention being also characterized by great simplicity, strength, and compactness of construction, whereby it is enabled to occupy very little room when applied to use.

Figure 1 is a side view of an engine constructed according to my said invention. Fig. 2 is a detail sectional view of one of the steam-cylinders and valve-chest, taken in the line *xx* of Figs. 3 and 4. Fig. 3 is a detail sectional view of said cylinder and valve-chest, taken in the line *yy* of Fig. 2. Fig. 4 is an end view of said engine, and Fig. 5 is a transverse sectional view taken in the line *zz* of Figs. 1, 6, and 7. Fig. 6 is a vertical longitudinal sectional view taken in the line *vv* of Figs. 4 and 5, and Fig. 7 is a similar view taken in the line *ww* of said Figs. 4 and 5.

AA are two steam-cylinders placed axially in line with each other and opposite each other.

BB are the two pistons which work in said cylinders, and which are connected at their inner ends to the yoke or cross-head C. This cross-head is provided with vertical guides *a*, in which moves the vertical sliding block D, which receives the wrist *b* of the crank E, the shaft F of which works in suitable bearings *c*, provided in the frame-work of the engine. Said shaft F may be furnished with a balance-wheel G and any other suitable adjuncts. The cylinders A, pistons B, and yoke or cross-head C may be of any suitable construction, so long as the parts are arranged in the described relation with each other to co-operate in the manner hereinafter

described. The frame-work of the engine is provided with a chamber H, which surrounds the yoke or cross-head C and those portions of the pistons B which are exposed to the interior of said chamber in the operation of the invention. Below this chamber H, and provided by the frame-work of the engine, is a second chamber I. This chamber I is provided with an outlet *d*, from which the steam, as hereinafter explained, may escape. In order that pipes may be carried in any direction from said chamber H, any desired number of these outlets *d* may be provided. Usually, however, only one of these outlets will be in use at any one time, the others being closed in any suitable manner—as, for example, by screw-plugs *a'*, as indicated in Fig. 1. Extending from the interior of the chamber I up into the chamber H is a pipe J, open at the top and bottom. From this pipe J extends a pipe K, the lower end of which is open and arranged at any desired distance from the bottom of the chamber H. The junction of this pipe K with the pipe J is so arranged that liquid passing up the pipe K will pass down through the lower part of the pipe J into the chamber I. The lower portion of the chamber H is filled with water, upon which is placed any suitable depth of oil, which, from less specific gravity, floats upon the water in said chamber. The water supports this oil, so that it reaches the junction of the pipe K with the pipe J at about the lower part of the pistons B. As the said pistons, together with the yoke or cross-head C, reciprocate rapidly, the liquids in the chamber H are agitated and thrown about to an extent sufficient to throw or direct the oil upon the surface exposed thereto of the pistons B, the said pistons being thereby automatically and effectually lubricated.

Bolted at one side of the frame of the engine, by bolts *b'* or otherwise, is a casting constructed to provide guides *g*, in which slides a frame L. This frame constitutes, in fact, a yoke, within which works an eccentric M, which is fast on the crank-shaft F, and which when rotated by the motion of said crank-shaft gives a reciprocating movement to the frame or yoke L, and consequently to the valve-rods N, each of which has at its outer end a valve V, which, as shown in the draw-

ings, is a piston-valve. It will thus be seen that the valves of the two cylinders receive their proper motion from said eccentric M, as described. The valves V play back and forth in suitable valve-seats provided in the valve-chest Q, which in their relation with the cylinders are illustrated in detail in Figs. 2 and 3, taken in connection more particularly with Fig. 1. The valve-chest Q connects with the steam-pipe R by means of the steam-inlet *i*. The pipes R may be connected with the steam-generator or other source of supply of elastic fluid. The pipe or passage *i* connects with the inlet-port *k*, and when the piston-valve is withdrawn to the requisite degree—that is to say, toward the right in Fig. 2—the steam passes through the inner passage *m* into the cylinder and behind the piston. When the valve is moved in the opposite direction and to the opposite extreme, communication between the ports *k* and passage *m* is shut off and the passage *m* communicates, the valve having moved to a sufficient distance to open communication with the outlet-passage *n*, whence the exhaust-steam passes down into the chamber I, from whence, as hereinbefore explained, it may be conducted by pipes through the outlet *d*.

It is of course to be understood that when the inlet-port of one of the cylinders is open the corresponding port of said cylinder is closed, and vice versa. By the means just described a simple and effective valve motion and means for insuring the proper inlet and outlet of steam to the cylinders are provided.

A portion of the exhaust-steam passes from the chamber I up into the chamber II, and being there condensed adds to the supply of water in the lower part of said chamber II. When such supply becomes excessive, it rises

to the junction of the pipe K with the pipe J, and passes down through the lower part *e* of the pipe J, thereby escaping into the chamber II.

It will be observed that by the arrangement hereinbefore described of the cylinders A and the two pistons B, having the yoke or cross-head C between them, the said pistons and cross-head are, so to speak, suspended by the cylinders and in such manner that said cylinders constitute the guides for the pistons. In other words, the two cylinders with their two pistons, each being single-acting, operate substantially as a double-acting engine, and the use of guides for the pistons and cross-head C is obviated.

What I claim as my invention is—

The combination, with the cylinders A, placed opposite to and in line with each other, of the pistons B, the cross-head C, connecting said pistons, the crank-shaft F, having its crank-wrist *b* extended through said yoke or cross-head, the block D, connecting said wrist with said yoke or cross-head, the chamber II, surrounding the yoke or cross-head and the exposed inner ends of the pistons, the vertical pipe J, having its lower end extended to form an outlet from said chamber II and connected with the exhaust-chamber I, and the pipe K, having its lower end in communication with the lower part of the chamber II and its upper end in communication with the pipe J, the whole arranged for joint use and operation, substantially as and for the purpose herein set forth.

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Witnesses:

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