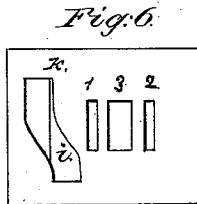
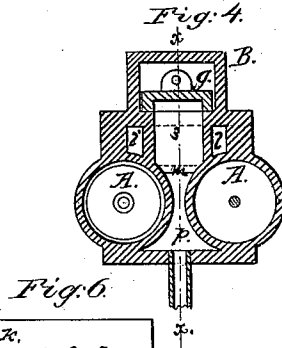
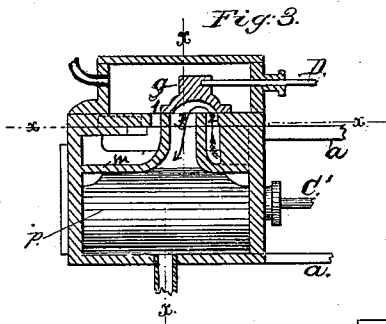
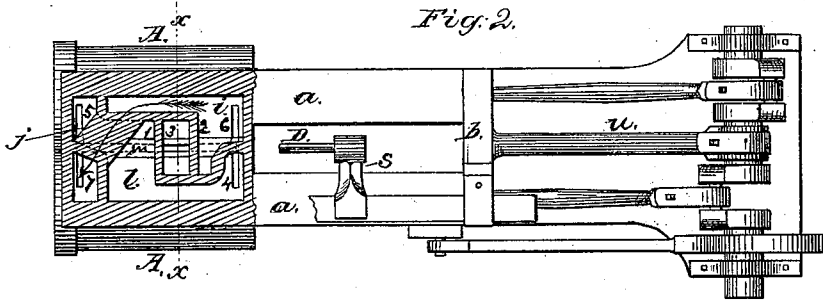
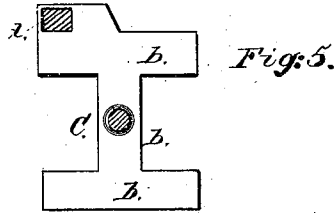
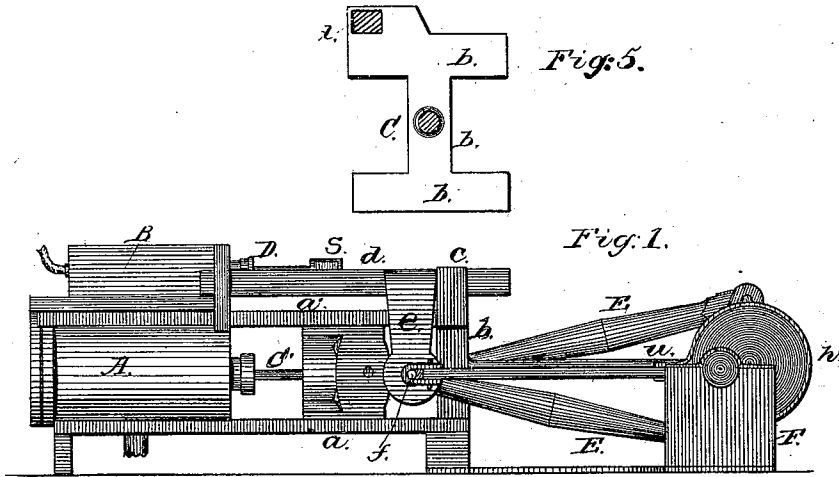


H. MERRILL.
 DUPLEX BALANCED STEAM-ENGINES.

No. 193,772.

Patented July 31, 1877.



Witnesses:
 John F. C. Frinkert
 Geo. F. Graham

Inventor
 Helem Merrill

UNITED STATES PATENT OFFICE.

HELEM MERRILL, OF BROOKLYN, E. D., NEW YORK.

IMPROVEMENT IN DUPLEX BALANCED STEAM-ENGINES.

Specification forming part of Letters Patent No. **193,772**, dated July 31, 1877; application filed July 26, 1877.

To all whom it may concern:

Be it known that I, HELEM MERRILL, of Brooklyn, E. D., in the county of Kings and State of New York, have invented certain new and useful Improvements in Duplex Balanced Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, 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, and to the letters of reference marked thereon, which form a part of this specification.

The invention has for its object the lessening of the jar and agitating motion due to the thrust of engines coupled at right angles, and also to some of what are generally known as reciprocating engines.

The invention consists in arranging two cylinders side by side with an exhaust-port or exit between them, communicating with certain novel induction and eduction steam-ports under the valve-seat, whereby the steam is introduced to the opposite ends of each cylinder simultaneously through the same port, so that while one piston is traveling in one direction the other is traveling in an opposite direction to the end of their stroke, said cylinders also exhausting at the same time, and through a single exhaust-port common to both cylinders. Thus, while one piston is pushing the other is pulling, thereby balancing the thrust or jar consequent to one-cylinder engines, or those coupled at right angles, by which the object is only to overcome the dead-centers. It will be further observed that the two cylinders act only as one engine. When used as stationary engines and one pair of cylinders working together with the usual common **D** slide-valve, a fly-wheel will be required, as with the usual single-cylinder engine; but when used for locomotives, street-cars, or traction-engines, &c., then a pair of engines are used, viz., a pair of cylinders on each side with the cranks at right angles.

The invention further consists in an abutment by means of which the outer ends of the guides, both above and below, are rigidly secured in position, and also in the arrangement of a brace or stay, which is provided at its outer end with a journal-bearing for the

shaft of the compound cranks, which serve to more securely steady the parts from the thrusting action of the engines, all of which will be more fully hereinafter described.

Figure 1 represents a side elevation, showing the guides *a* attached to the cylinders, as usual, and to an abutment, *b*, located at the end of said guides. This abutment extends up to a point over which a strap, *c*, is fitted, through which a movable slide, *d*, operates. This slide *d* has attached to it a rigid arm, *e*, depending down to connect with the eccentric rod *f*, to operate the valve *g, h* representing the eccentric. On a double engine this arrangement is duplicated, or the usual reversing-link with gear may be attached.

A represents the working-cylinders; B, the steam-chest; C', the piston-rod; D, the valve-stem; E, the connecting-rods, and F the pillow-block.

The same letters represent the same parts in all the figures.

Fig. 2 represents a plan view, showing the location of the steam-ports, in which *i* shows one port passing to the front of one cylinder and over the bridge to the back of the other. The largest portion of this port at the bridge is taken out of the bottom of the valve-seat *k*. (Shown in an inverted view at Fig. 6.) *l* shows the other port, crossing the first one through the bridge *j* to the back of one cylinder. This passage also leads to the front end of the other cylinder.

The valve-seat is provided with ports 1, 2, and 3, similar to those of a common single engine. An ordinary **D**-valve is used. When steam is admitted to the port 1 it passes into the passage 2—the port 4 in one cylinder and the port 5 in the other. The exhaust from the opposite ends of these cylinders takes place through the ports 6 7, passage 2, port 2 under the valve, and port 3, to the atmosphere. When the valve is reversed the live steam and the exhaust interchange ports and passages.

Fig. 4 is a cross-section at the line *x x*, Fig. 3, showing the metal partition *m*, located horizontally between the live-steam and exhaust ports.

It may be remarked that the exhaust-space nearly encircles the lower half of the cylinders, by which the radiation of heat is pre-

vented and the exhaust steam utilized. The conduit from this space may be continued to the open air or to a condenser, as may be desired.

Fig. 5 represents an elevation of my abutment *b*, the office of which has been heretofore set forth; and Fig. 6 an inverted view of the bottom of the valve-seat, the top of which is the same as the ordinary three-ported valve-seat, with the ordinary *D*-valve.

In Fig. 2, *S* shows an arm attached to the end of the valve-stem, to the slide *d*, which performs the function of the horizontal portion of the rock-shaft. The slide *d* is provided with an arm which connects with the eccentric rod.

The abutment *b*, (shown in front elevation in Fig. 5, side elevation in Fig. 1, and in plan in Fig. 2,) plays a very important part in the rigid formation of the machine. It forms the rest for the guides by which the cross-heads are made to run smoothly and firmly. It also forms the abutment of the brace *u*, thus in turn bracing and combining in one solid piece, as it were, the cylinders, abutment, crank-shaft, and pillow-blocks, securing in a great measure the absence of the jar and shaking motion generally due to the action of double-acting engines.

The cranks of this engine, as will be readily seen, are not at right angles, as in general use. While I do not claim this feature to be new in itself, I do claim advantages for it in my construction.

I am aware that many modifications may

be made embodying my invention, all of which I desire to secure without departing from the spirit thereof.

What I claim as new, and desire to secure by Letters Patent, is—

1. A combination, in an engine provided with two cylinders, a single valve common to both, the bridge *j*, with the port *i* under the valve-seat, said port connecting the front ends of one cylinder and the pistons with the back end of the other cylinder, which work in opposite directions, in the manner and for the purpose substantially set forth.

2. The combination, in a steam-engine, of the two cylinders working as one, the horizontal metal partition, and the bridge, having an under and an over conduit, with the two side passages *i* and *l*, formed by the longitudinal partition, as set forth and described.

3. The combination, in a two-cylinder engine, of the abutment *b*, the guides *a*, and brace *u*, with the crank-shaft and the cylinder-heads of the engine, whereby rigidity and firmness are given to the working parts, for the purpose set forth and described.

In testimony that I claim the foregoing I affix my signature in presence of two witnesses.

HELEM MERRILL.

Witnesses:

GEO. F. GRAHAM,

JOHN F. C. PREINKERT.