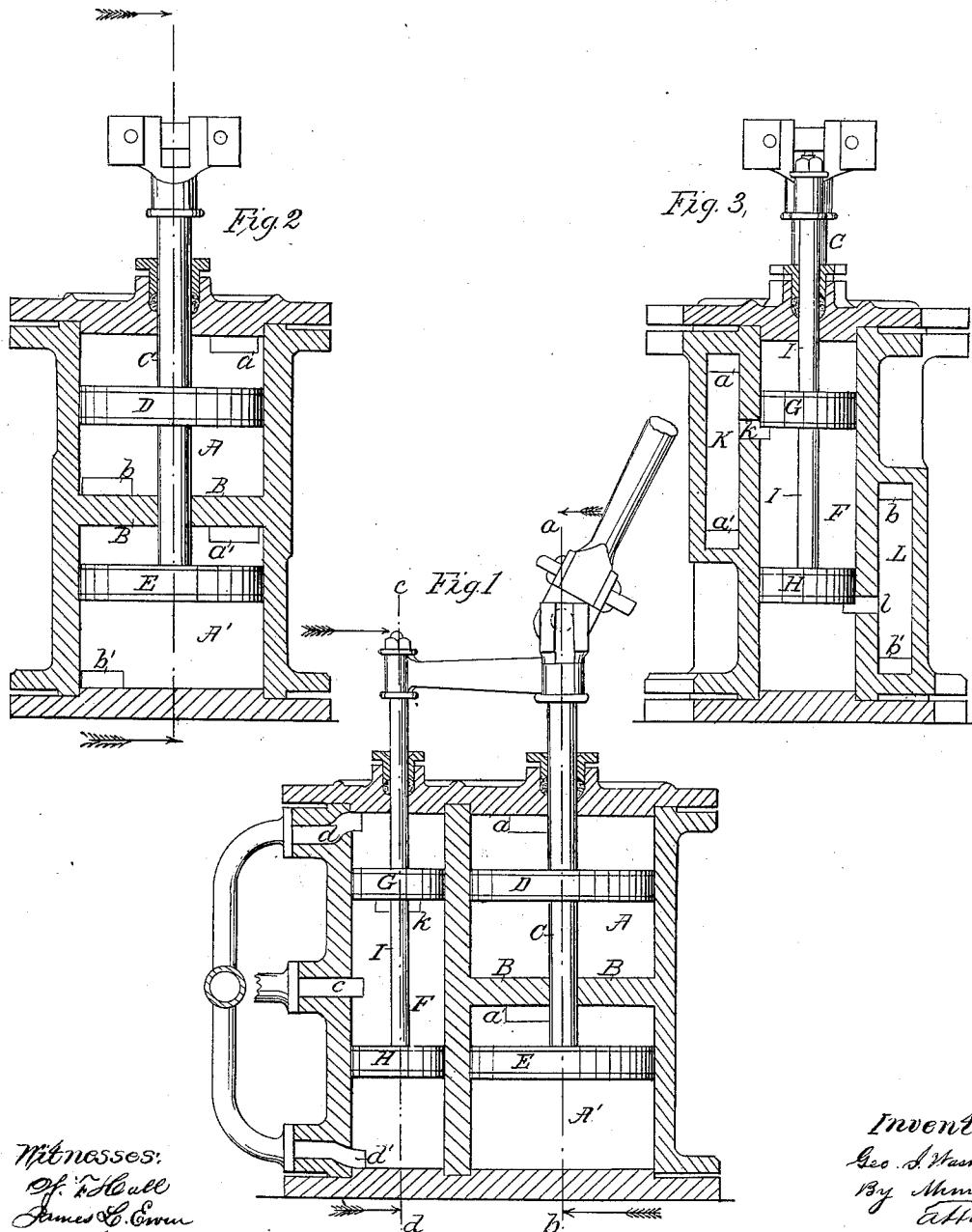


G. I. Washburn,

Reciprocating Steam Engine,

No 57,799.

Patented Sep. 4, 1866.



Witnesses:

Dr. F. Hall  
James C. Evans

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# UNITED STATES PATENT OFFICE.

GEORGE I. WASHBURN, OF WORCESTER, MASSACHUSETTS.

## IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. 57,799, dated September 4, 1866.

*To all whom it may concern:*

Be it known that I, GEORGE I. WASHBURN, of the city and county of Worcester, State of Massachusetts, have made new and useful Improvements in Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the nature, construction, and operation of the same sufficient to enable one skilled in the art to which it is allied to construct and use the same, reference being had to the accompanying drawings, which are made part of this specification, and in which—

Figure 1 is a central vertical section through cylinder and valve-chamber *e f*, Fig. 2. Fig. 2 is a section through the cylinder at right angles to Fig. 1, (*a b*, Fig. 1.) Fig. 3 is a section through the valve-chamber parallel to Fig. 2, (*c d*, Fig. 1.)

In this engine two double-acting pistons are arranged upon one piston-rod in a double or diaphragm cylinder, the pistons being operated by one valve.

In the drawings, *A A'* is the cylinder, which is divided in the middle by a diaphragm, *B*, whose central opening admits the piston-rod *C*. On this piston-rod are two pistons, *D E*, to whose upper and lower faces the steam is alternately admitted and withdrawn at openings *a a' b b'*, the steam acting simultaneously upon corresponding sides of each piston.

In the valve-chest *F* is a valve consisting of disks *G H* and a stem, *I*, and on each side of the valve-chest is a side chamber or pipe. (Marked, respectively, *K L*.) These chambers are the means of communication between the valve-chest and the cylinder *A A'* by means of the openings *k l*, which lead into the valve-chest, and the openings *a b*, leading to *A*, and *a' b'* leading to *A'*.

The steam is admitted to the valve-chest through the port *c*, and exhausted through the ports *d d'*, the steam constantly occupying the space between the disks *G H*, which always includes the port *c*, and alternately includes the ports *d* and *d'*.

The valve being in the position shown in

Fig. 1, the steam admitted through opening *c* occupies the space between the disks *G H*, and passing through the port *k*, side chest, *K*, and ports *a a'*, exerts its pressure upon the upper sides of the pistons *D E* in the spaces *A A'* of the double cylinder. At the same time the steam beneath the said pistons is permitted to escape through the openings *b b'* into the side chest, *L*, and through opening *l* into the lower end of the valve-chamber beneath the disk *H* and out at the exhaust-port *d*, to the escape-pipe.

The return-motion is the counterpart of that described, the steam being admitted from the same source through opening *l*, side chamber, *L*, ports *b b'*, to the under sides of the pistons, the escape-steam passing through ports *a a'*, side chest, *K*, port *k*, escaping eventually through port *d*.

I have shown a double-disk valve; but the ingress and egress of steam may be controlled by a valve of any suitable kind.

In a double engine, with cranks set upon the shaft at an angle of ninety degrees with each other, the crank would be connected to the piston-rod of the respective engines.

Having described my invention, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The arrangement, in the diaphragm-cylinder, of the two pistons on the same rod, operated as described.
2. In its arrangement with the double cylinder and pistons, the single valve controlling the steam-openings, substantially as described.
3. The arrangement of the valve-chest *F*, double-cylinder *A A'*, and side chests or pipes, *K L*, the latter communicating each by a single port with the chest *F*, and simultaneously, by duplicate ports, with the spaces on corresponding sides of the two pistons.

GEO. I. WASHBURN.

Witnesses:

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