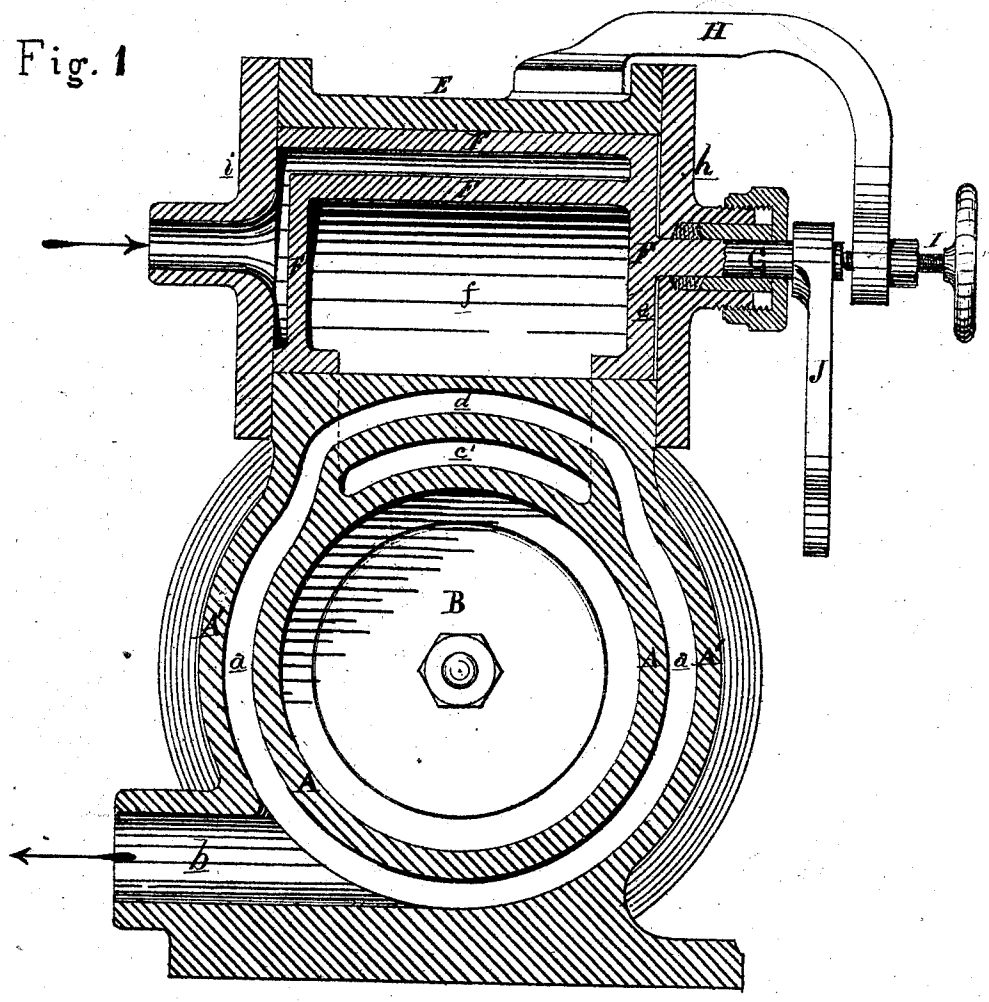
2 Sheets--Sheet 1.

E. H. Rees.

Steam Engine.

No. 121,064. Patented Nov. 21, 1871.

Fig. 1



Witnesses:
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per Attorney,
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2 Sheets--Sheet 2.

E. H. REES.

Steam Engine.

No. 121,064 Patented Nov. 21, 1871.

Fig. 2

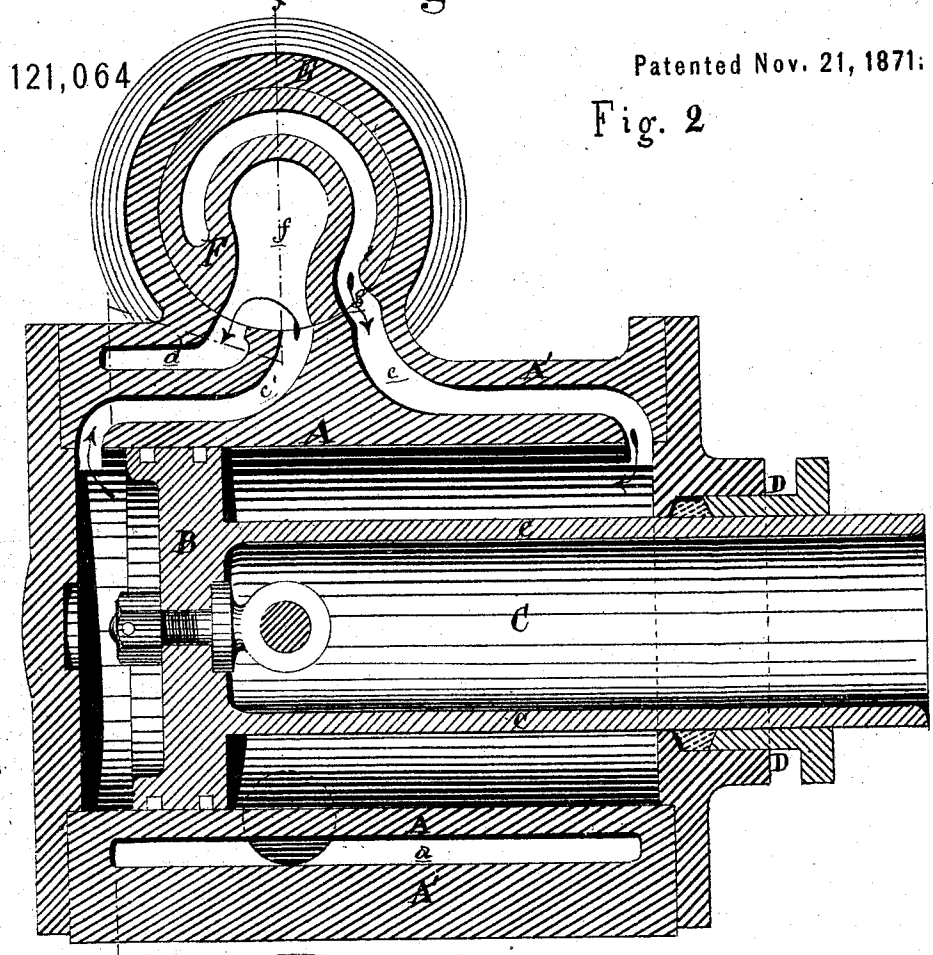
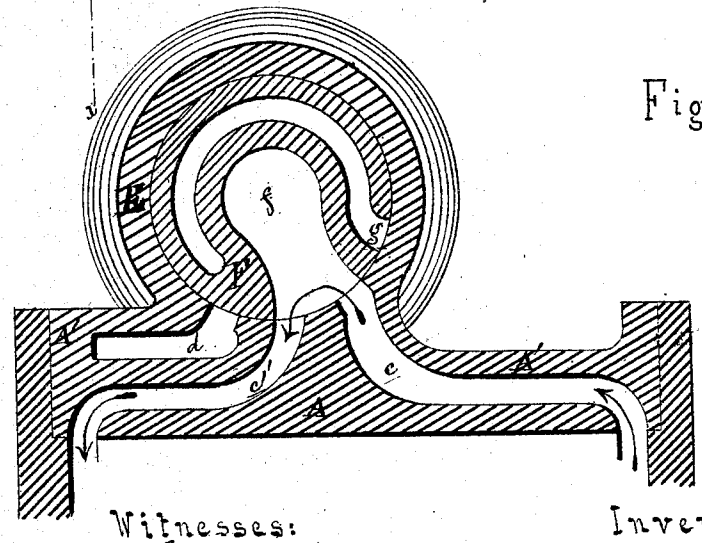


Fig. 3



Witnesses:
H. F. Eberts.
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Inventor:
Edward H. Rees.
per Attorney,
Wm. S. Sprague

UNITED STATES PATENT OFFICE.

EDWARD H. REES, OF MANSFIELD, OHIO.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. 121,064, dated November 21, 1871.

To all whom it may concern:

Be it known that I, EDWARD H. REES, of Mansfield, in the county of Richland and State of Ohio, have invented a new and useful Improvement in Steam-Engines; and I do declare that the following is a true and accurate description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon and being a part of this specification, in which—

Figure 1, Plate 1, is a cross-section taken on *x x* in Fig. 2, being a cross-section of the cylinder and a longitudinal section through the cylindrical steam-chest of my engine. Fig. 2, Plate 2, is a longitudinal section of the cylinder with a cross-section through the steam-chest, and Fig. 3 is the same, but with the valve shifted.

Similar letters of reference indicate corresponding parts in each figure.

This invention has for its object an improved and simplified construction of steam-engines of that class known as compound engines, wherein, first, the active or direct pressure of the steam is exerted, and afterward the reaction or expansion of the same, in the propulsion of the piston or pistons. Such engines, as now constructed, necessitate the employment of two steam-cylinders, pistons, and valve-gear, in order to utilize the full benefit of high expansion, and, consequently, are heavy, complicated, and expensive both in first cost and maintenance, preventing their employment in many instances where their economy in fuel would render them desirable. My improvement consists in, first, the peculiar construction of an engine of the trunk variety, an oscillating steam-valve, and the arrangement of the ports and passages, whereby steam from the generator is first admitted to the front or trunk side of the piston, acting thereon to propel it to the end of the stroke, when, by the shifting of the valve, that volume of steam is discharged to the opposite end of the cylinder, and, by its expansion, reciprocates the piston, no fresh supply of live steam being admitted to the cylinder during the return-stroke, which being completed, the steam is finally exhausted into and through a jacket surrounding the cylinder to maintain as high a temperature in it as possible, in order to prevent loss of heat by radiation and consequent loss of power by a partial condensation of steam in the cylinder; and secondly, in the general construction and arrangement of its various parts, as more fully hereinafter set forth.

In the drawing, A represents the steam-cylinder; B, a piston, to which is attached the trunk C, working through a suitable stuffing-box, D, in the front head. The cylinder A is cast with and within a lighter external one, A′, leaving a belt or space between the two, forming an exhaust-steam jacket, as shown at *a*. In the lower part of this belt is an opening, *b*, through which the exhaust steam is finally discharged. Transversely across the cylinder A′ is cast therewith, or securely bolted thereto, as may be preferred, another cylinder, E, which serves as a valve-chest, and from the bottom of which two steam-ports' *c c′*, respectively open into the front and back ends of the cylinder A, while a third port, *d*, communicates with the exhaust-belt *a*. F is a cylindrical valve with a solid head, *e*, at one end and, with a longitudinal exhaust-recess, *f*, in its lower periphery. This exhaust-recess is closed by a head at each end, while the remainder of the valve is hollow, forming a crescent-shaped steam-belt around the recess, with a single port, *g*, at one side of said recess. The construction of this valve and the arrangement of its passages will be readily understood on reference to the drawing, as also its position in the cylindrical chest. The spindle G of the valve passes through a suitable stuffing-box in the head *h* of the chest, terminating in a T-shaped head engaging with a vertical slot planed in the solid head of the valve, the other end of which abuts against the inner face of the bonnet *i* of said chest, being ground or scraped to a steam-tight face. H is a curved arm secured to and projecting from the top of the steam-chest, terminating in a prolongation of the axis of the valve, where a set-screw, I, passes through it to press on the axis of the spindle, which is provided with a rocker-arm, J, to which a vibratory movement is imparted by an eccentric on the crank-shaft of the engine, through a proper valve-rod. The steam-pipe leading from the generator enters the bonnet of the steam-chest and delivers steam to the crescent-shaped steam-belt of the valve, which exerts no pressure on its surrounding seat beyond that on the bottom half, due to its weight, and is, therefore, a balanced valve. By means of the set-screw the end of the valve is pressed against the bonnet with just sufficient force to prevent steam from blowing through.

The operation of this valve is as follows: When in the position shown in Fig. 2 steam is entering the valve, passing through its port *g* into the port

c, thence to the front end of the cylinder, exerting its pressure on the trunk side of the piston until the stroke is completed. In the mean time the exhaust-recess of the valve keeps open a communication between the ports *c'* and *d*, so that the steam exhausting from the other side of the piston through the port *c'* into the exhaust-recess of the valve passes through the port *d* into the exhaust-belt or steam-jacket *a*, and finally out through the opening *b* into the atmosphere. As the piston completes its stroke the eccentric shifts the valve so as to close its port *g* to the egress of steam, and likewise the port *d* leading to the exhaust-belt, as shown in Fig. 3. The exhaust-recess of the valve now includes the ports *c c'*, when the steam contained in the front end of the cylinder now rushes through to the other side of the piston, and, expanding in the greater area of that end of the cylinder, (owing to the absence of the trunk,) reciprocates the piston with nearly or quite the speed imparted to it by the initial pressure of the steam in the other direction, due to the greater area of piston-surface, although the pressure thereon is much less than in the first instance, and decreasing with the movement of the piston.

This form of engine is exceedingly compact, cheap of construction, economical in operation, and is peculiarly adapted to portability, as it may be bolted through a saddle on the bottom of the cylinder to the boiler, as may also be the pillar-block, dispensing with a bed-plate.

In very small engines, where economy of fuel may not demand the use of a steam-jacket, the latter may be dispensed with. In this case the steam-passages to the cylinder may be arranged in the usual manner, while the port *g* of the valve should be duplicated at the other side of the exhaust-recess.

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

1. The hollow cylindrical rotating valve F provided with a solid head, *e*, longitudinal exhaust-recess *f*, and one or more ports, *g*, constructed, arranged, and operating within the valve-chest E, against the bonnet *i* thereof, with relation to the steam and exhaust-ports of a steam-engine, substantially as described.

2. The combination, in a trunk-engine, of the two cylinders A and A' having the exhaust-belt *a* between them, and the steam-valve F, the several parts being constructed and arranged as described and shown, for the purposes set forth.

3. The construction and arrangement of the cylinders A A', passages *c c' d*, piston B, trunk C, cylindrical steam-chest E, hollow cylindrical valve F provided with head *e*, exhaust-recess *f*, and port *g*, the spindle G, curved arm H, and set-screw I, substantially as and for the purposes set forth.

EDWARD H. REES.

Witnesses:

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