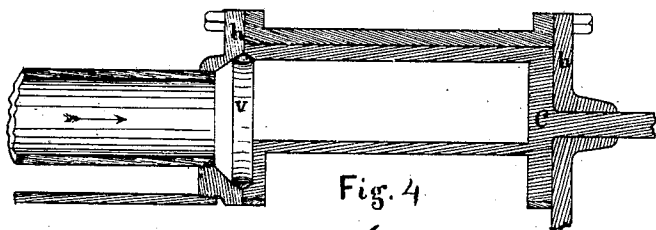
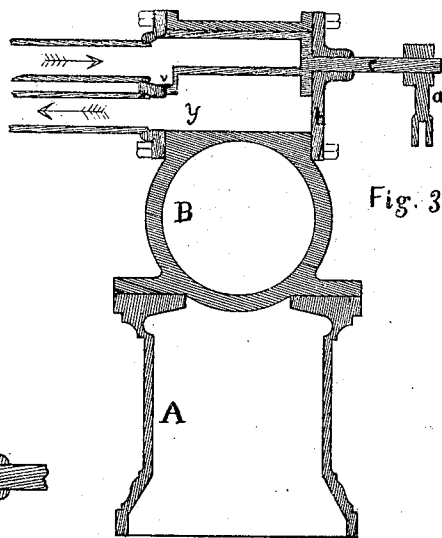
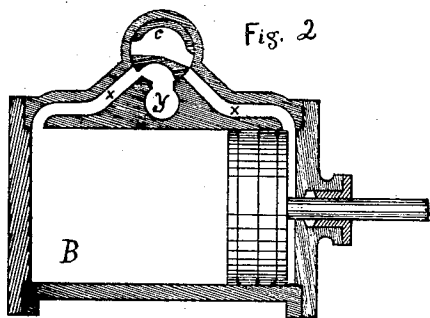
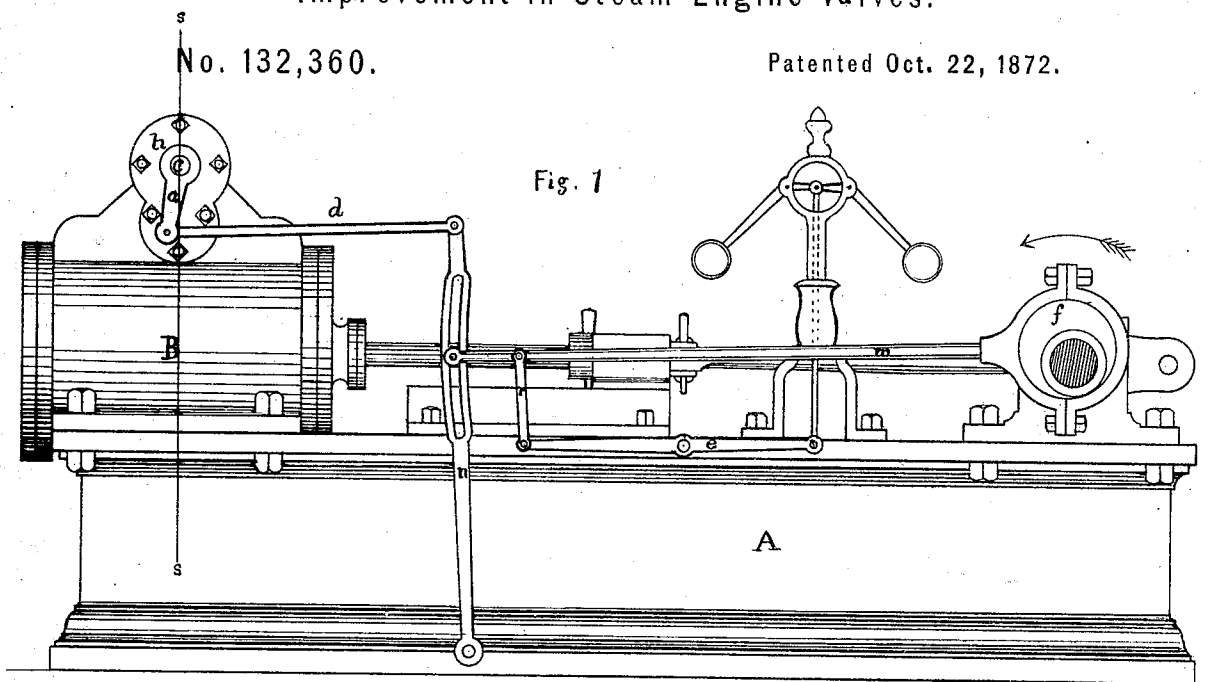


A. W. FOX.

Improvement in Steam-Engine Valves.

No. 132,360.

Patented Oct. 22, 1872.



Witness. *John M. Skillman*
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IMPROVEMENT IN STEAM-ENGINE VALVES.

Specification forming part of Letters Patent No. **132,360**, dated October 22, 1872; antedated October 19, 1872.

To all whom it may concern:

Be it known that I, AARON W. FOX, of Union, in the county of Broome and State of New York, have invented certain Improvements in Steam-Engines, of which the following is a specification:

The first part of my invention relates to the arrangement of an eccentric rod, the back end of which is free to swing in a curved slot in a vibrating arm, one end of which arm is pivoted to the bed-plate, and the other end is attached to the valve-rod. The governor is attached to the eccentric rod, to regulate its position in the curved slot, and these parts are so arranged with reference to the length of the eccentric rod, length and position of the vibrating arm, and lap of the valve, that steam is admitted to the cylinder at the proper moment without any regard to the distance the valve travels; and by this arrangement I obtain a variable expansion engine, worked by the governor, and use only a single valve. The second part of my invention consists in the employment of a ring at the end of a cylindrical valve, where the steam is admitted to the interior thereof, to prevent steam leaking through, and thereby keep the valve balanced.

In the accompanying drawing, Figure 1 is a side elevation of an engine embodying the first part of my invention; Fig. 2 is a vertical longitudinal section of the cylinder, ports, and valve; Fig. 3 is a vertical transverse section of the cylinder, bed-plate, and valve, at the line *s s* drawn across Fig. 1; and Fig. 4 is a section, on a larger scale, of the valve and its surroundings, the same as Fig. 3, to show more clearly the ring, its form and position, which is the second part of my invention.

A is the bed-plate of the engine, which bed-plate does not differ in form from those in common use, nor is it necessary to make any particular form of bed-plate in order to use my invention. B is the cylinder, a section of which is clearly shown in Figs. 2 and 3, the induction and eduction ports, also a cylindrical opening for the valve *c*, being all made together in a single casting. The cylinder is bored, and piston fitted in the ordinary manner. The cylindrical opening across the top is bored out true and smooth, and the valve *c* is turned and fitted therein; the valve being cylindrical externally, is made hollow,

with a concave or *D* extending nearly its whole length on the under side to exhaust steam. The valve has also a port or narrow opening in each side, from the interior to the outside, Fig. 2, which, as the valve rolls back and forth, are brought in connection with the ports *xx* to admit steam to the cylinder. The valve has a stem on one end, Figs. 3 and 4, on the outer end of which is fitted a short arm, *a*, Figs. 1 and 3, by means of which motion is given to the valve. To the lower end of the arm *a* is attached one end of the valve-rod *d*, Fig. 1, the other end being attached to the top of the vibrating arm *n*, the lower end of the arm *n* turning on a stud in the bed-plate at its base. The vibrating arm is provided with a curved slot through which a pin passes, connecting the arm *n* to the rear end of the eccentric rod *m*. The eccentric rod *m* takes motion from an eccentric on the engine-shaft in the usual manner. The governor, Fig. 1, stands on the bed-plate A, and by means of a vertical rod gives motion to a horizontal lever, *e*, attached by a stud in its center to the bed-plate, while the rear end has a short link, *r*, extending upward, and is connected to the eccentric rod near the end where it is connected to the arm *n*. The parts of the engine not particularly described are made, or may be made, without change from any of the forms of such parts in common use.

The engine being completed and set up, I will describe its operation: If it is in the position shown in Fig. 1—that is, “on its center”—with the crank horizontal and extending outward, the valve will be in the position to commence admitting steam to the end of the cylinder toward the crank, as seen in Fig. 2, and the “lap” of the valve will be all on the other side. The short arm *a* on the valve-stem and the vertical slotted arm *n* are both perpendicular when the valve laps equally on each side of the ports, but as shown, they incline sufficiently to place the valve in the position described. The eccentric being properly set, its large side is nearly upward, or above the engine-shaft, thus elevating that end of the eccentric rod, and it will be now seen that if the arm *n*, and eccentric rod *m*, are of the proper length to correspond with the required lap of the valve, the eccentric rod will be as the radius of the curved slot in the arm *n*, and the

end of the eccentric rod may be moved from one end of the slot to the other without changing the position of the valve. The engine being turned half a revolution, in the direction of the arrow above the eccentric, the crank is on the opposite center, the large side of the eccentric is nearly under the shaft, the arm *n* inclines toward it, and the eccentric rod and arm are in the same position with respect to each other as in the position first described, and the valve is in position to commence admitting steam to the back end of the cylinder. The governor, by means of the lever *e*, and link *r*, regulates the position of the end of eccentric rod in the curved slot, and this controls the travel of the valve, and the amount of steam admitted to the cylinder according to the motion of the engine, and the valve is always in position to admit steam at the proper time, without regard to the amount of steam or power required. The openings in the cylinder casting occupied by the valve, and the exhaust-steam passage *y* under it, are covered at their ends by plates or covers *h h*, Figs. 1, 3, and 4. One has a single hole in it for the valve-stem to pass through, and the other plate has a hole at the center of the valve to attach a pipe through which steam is supplied to the interior of the valve, and directly under it is another pipe screwed into the plate *h* connecting with the steam-passage *y*, through which passes off exhaust-steam. The open end of the valve should fit steam-tight against the plate in which the pipes are screwed, but

if by neglect or wear the valve is not kept steam-tight against the plate, steam will pass through and above the valve, thus destroying its balance. To obviate this difficulty, the inside of the valve is turned smooth a short distance at the open end, Fig. 4, and the hole in the plate *h*, where the supply-pipe is attached, is also turned to correspond with the end of the valve. Both the openings are largest at the joint, decreasing in diameter as they recede from it. A ring, *v*, Figs. 3 and 4, is turned to fit in the angle so formed, and cover the joint steam-tight, and prevent leakage if the end of the valve is not kept close to the plate *h*.

I do not claim any form of bed-plate, piston, cross-head, or governor; nor do I claim broadly a rolling valve; but

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

1. The arrangement of the eccentric rod *m*, vertical vibrating arm *n*, valve-rod *d*, and rock-valve *c*, together with the link *r*, and horizontal lever *e*, attached to and operated by a governor, constructed substantially in the manner herein set forth.

2. In combination, the hollow rocking valve *c*, and the ring *v*, when these parts are constructed in the manner, and operating substantially, as herein described.

A. W. FOX.

Witnesses:

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