2 Sheets—Sheet 1.

R. H. EDSON.

STEAM-ENGINES.

No. 194,034. Patented Aug. 14, 1877.

Fig. 1.

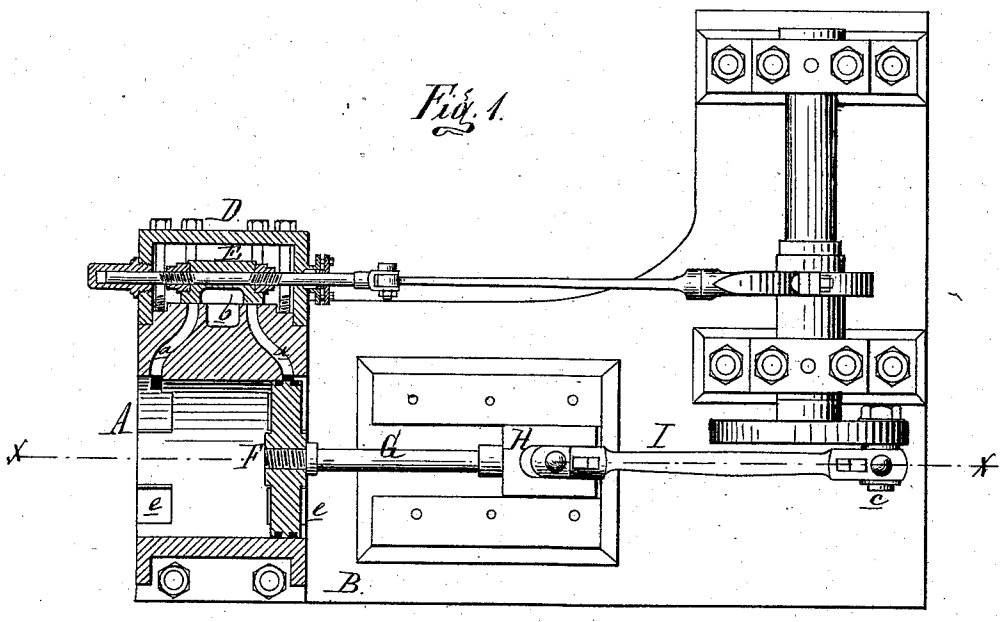
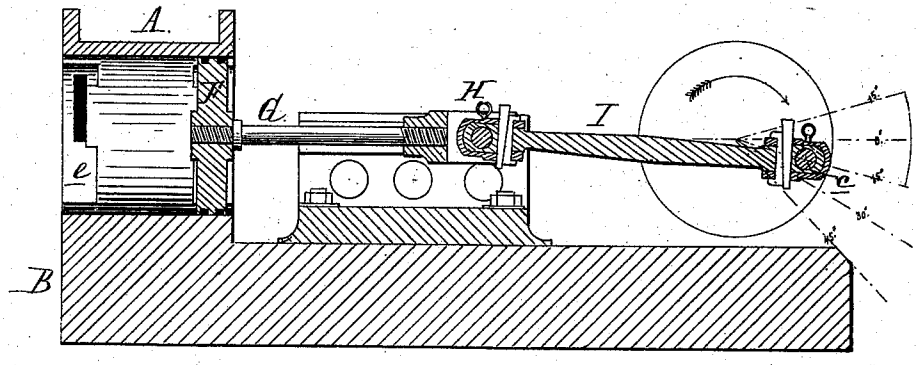


Fig. 2.



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2 Sheets—Sheet 2.

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Fig. 3.

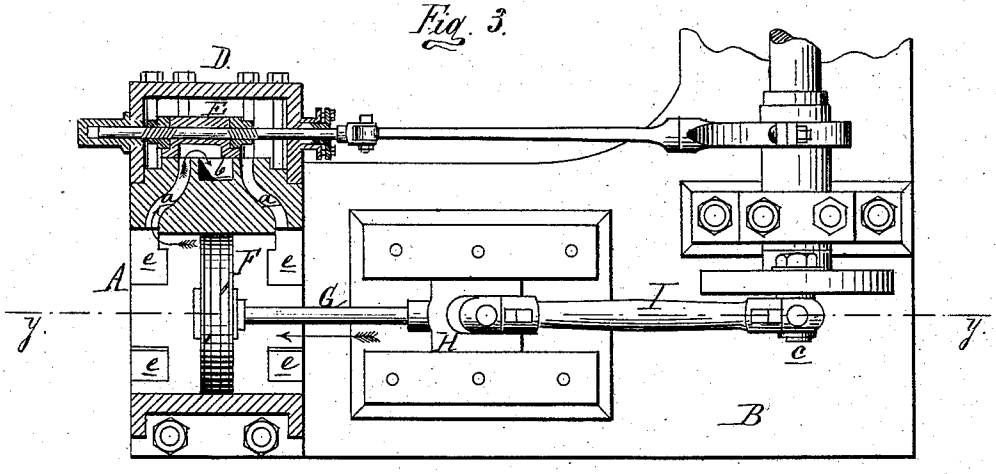


Fig. 4.

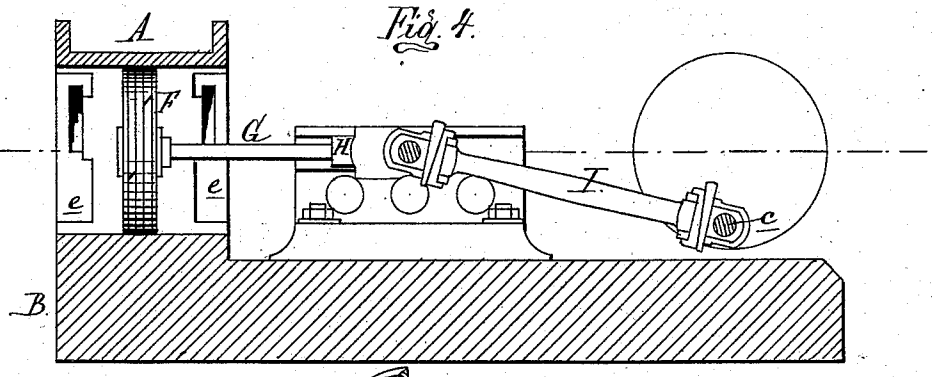
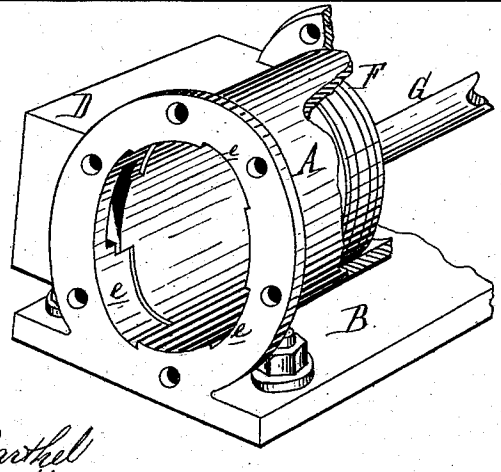


Fig. 5.



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UNITED STATES PATENT OFFICE.

ROBERT H. EDSON, OF DETROIT, MICHIGAN.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **194,034**, dated August 14, 1877; application filed August 31, 1876.

To all whom it may concern:

Be it known that I, ROBERT H. EDSON, of Detroit, in the county of Wayne and State of Michigan, have invented an Improvement in Steam-Engines, of which the following is a specification:

The object I have in view is to effect an economy in the use of steam in reciprocating engines, by relieving the piston-head from all pressure at the end of each stroke, and balancing the pressure of steam upon both sides of such piston, thus making a saving of steam both in condensation and in clearance; and to this end my invention consists in providing the cylinder with a series of channels or passages in the bore at each end, in combination with a main valve adapted to close and keep closed both ports while the crank-pin is passing the line of centers, as more fully hereinafter set forth.

Figure 1, Sheet 1, is a sectional plan of my engine, showing the relative position of the parts when the crank has passed down fifteen degrees below the line of centers. Fig. 2 is a sectional side elevation of the same at *x x*. Fig. 3, Sheet 2, is a sectional plan of the same with the crank at mid-stroke. Fig. 4 is a sectional side elevation at *y y*. Fig. 5 is a partial perspective view of the cylinder with the heads removed.

In the drawings, A represents the steam-cylinder, cast with the usual steam-ports *a a* and intermediate exhaust-passage *b*. The cylinder is secured to a bed-plate, B, and is provided, in the present case at the side, with a steam-chest, D, in which a main valve, E, is actuated by an eccentric, in the usual manner, except that this valve is so constructed that it will close and keep closed both steam-ports *a*, while the crank is traveling through an arc of thirty degrees or more while passing the line of centers.

F is the piston, connected by its rod G, cross-head H, and connecting-rod I with the crank-pin *c*, in the ordinary manner.

There is no counter-bore in the ends of the cylinder; but at each end several circumferential channels, *e*, are cut in the bore, extending back or inward as far as the inner face of the piston (or its rings) would travel while the crank-pin is passing through the arc above mentioned.

The effect of this arrangement is, that as the piston approaches the end of its stroke, and both ports *a* being then closed, the steam contained in the cylinder, after having thus impelled the piston, is allowed to pass through the passages or channels *e* to the other side of the piston, thereby causing an equilibrium of pressure thereon.

In the return stroke the piston closes the passages *e* (retaining the steam on the exhaust side) just before the main valve uncovers the port for admitting live steam behind the piston for continuing the stroke.

The valve has a slight lead on the exhaust side by giving it a trifle less inside lap.

The steam remaining in the cylinder behind the piston fills all clearance-space with live steam for the succeeding stroke, and thus avoids all loss by clearance, and loss of energy in steam newly admitted by condensation.

In large engines, or with engines coupled in pairs, steam may be cut off from admission through a longer arc while the crank is passing the line of centers.

If it be desired to use steam expansively, an independent cut-off valve must be added.

This improvement can be readily applied to most existing engines.

What I claim as my invention is—

In a steam-engine, the combination, with the cylinder and piston, of the usual steam-ports *a*, entering near the ends of the cylinder, the circulating channels *e* in each end of the said cylinder, and the main valve E, adjusted to close both steam-ports while the crank-pin is passing the line of centers, and while the piston is at the end of each stroke, substantially as described and shown.

ROBERT H. EDSON.

Witnesses:

H. S. SPRAGUE,

CHARLES J. HUNT.