(No Model.) 2 Sheets—Sheet 1.

B. V. NORDBERG.

EXHAUST VALVE.

No. 421,606. Patented Feb. 18, 1890.

Fig. 1.

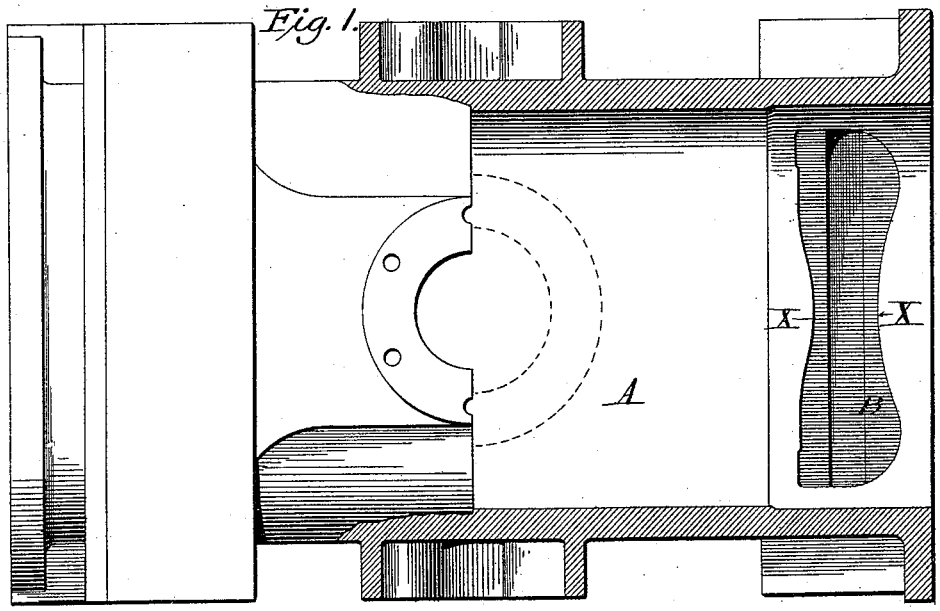
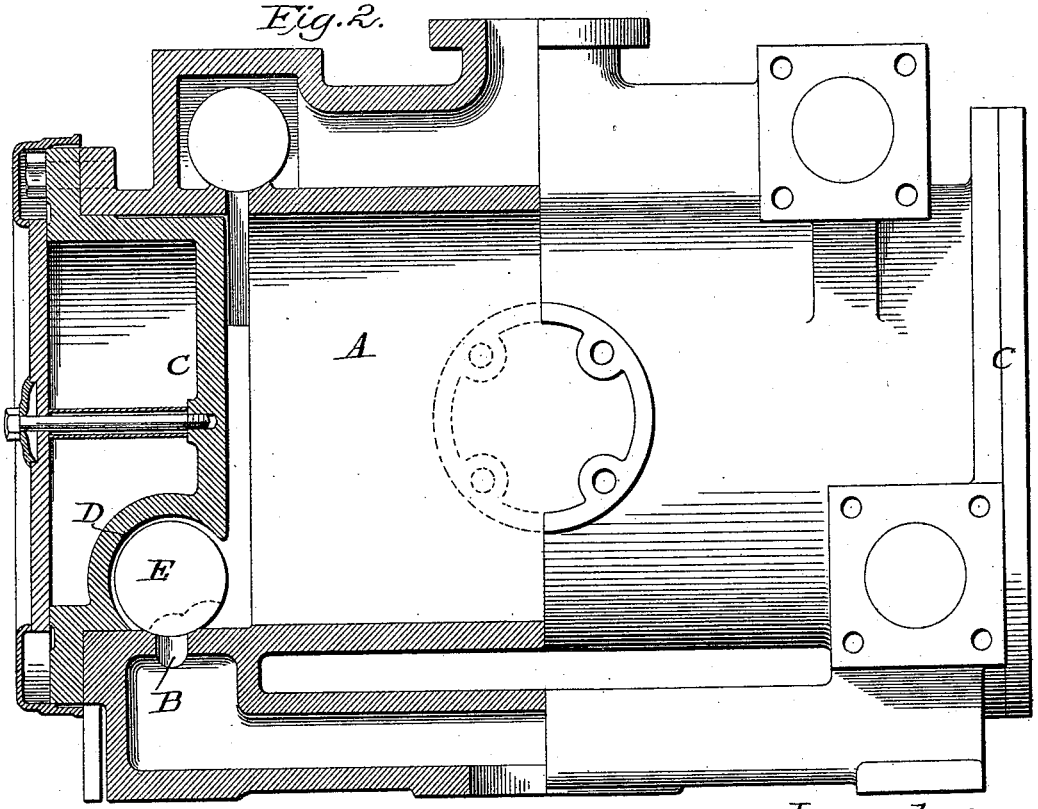


Fig. 2.



Witnesses:
James F. Duhamel.
A. P. Hollingsworth

Inventor:
Bruno V. Nordberg.
by Dodger Sons Attys.

(No Model.) 2 Sheets—Sheet 2.

B. V. NORDBERG.

EXHAUST VALVE.

No. 421,606. Patented Feb. 18, 1890.

Fig. 3.

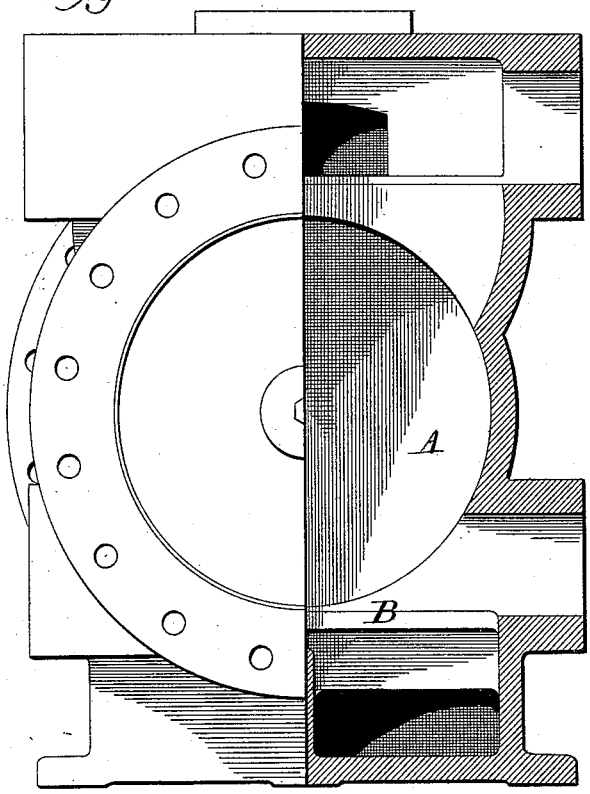


Fig. 4.

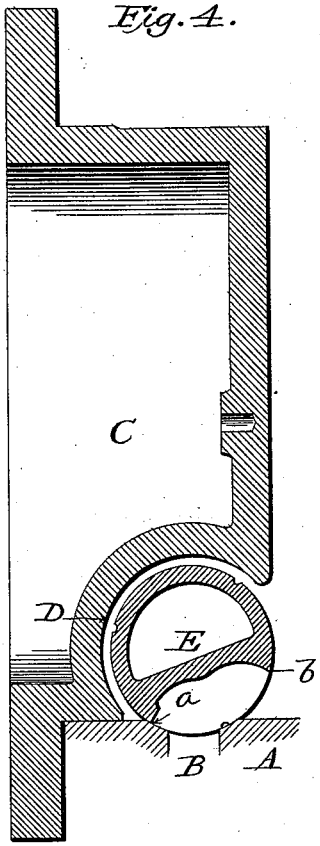


Fig. 5.

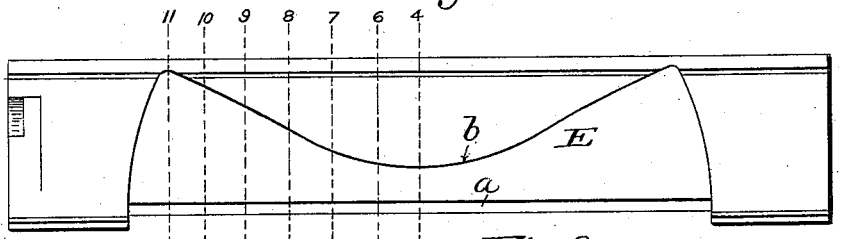


Fig. 6.

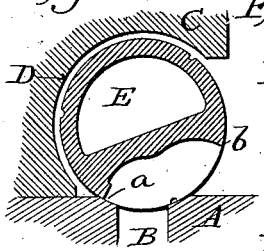


Fig. 7.

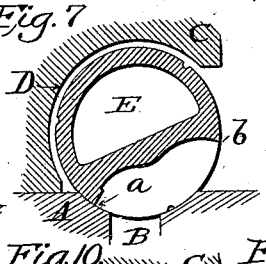


Fig. 8.

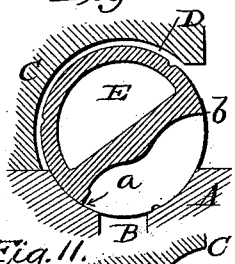


Fig. 9.

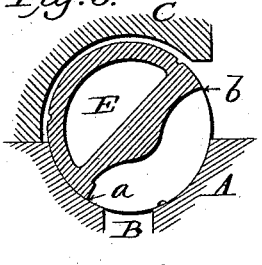


Fig. 10.

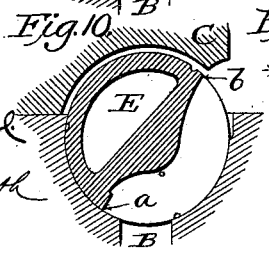
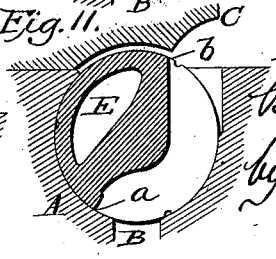


Fig. 11.



Witnesses:

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S. P. Hollingsworth

Inventor:

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Attys.

UNITED STATES PATENT OFFICE.

BRUNO V. NORDBERG, OF MILWAUKEE, WISCONSIN.

EXHAUST-VALVE.

SPECIFICATION forming part of Letters Patent No. 421,606, dated February 18, 1890.

Application filed August 28, 1889. Serial No. 322,216. (No model.)

To all whom it may concern:

Be it known that I, BRUNO V. NORDBERG, a citizen of Finland, Russia, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Exhaust-Valves, of which the following is a specification.

My invention relates to that class of steam-engines that employ oscillating exhaust-valves; and it consists in a novel construction and arrangement of the valves, as hereinafter set forth and claimed.

In the drawings, Figure 1 is a top plan view, partly in section, of a cylinder such as I employ; Fig. 2, a side view partly in section; Fig. 3, an end view partly in section; Fig. 4, an enlarged sectional view through the cylinder-head and valve at right angles to the axis of the latter on the line 4 4 of Fig. 5; Fig. 5, a face view of the valve; Figs. 6 to 11, sectional views of the valve on the lines 6 6, 7 7, 8 8, 9 9, 10 10, and 11 11, respectively.

A indicates a cylinder of the Corliss type, having at its lower side at each end an exhaust-port B.

C C indicate the cylinder-heads, which are each provided with a cavity D, for the reception of the oscillating exhaust-valve E, the valve being located within the bore of the cylinder.

The bore of the valve-seat intersects the bore of the cylinder, thereby forming an opening of the form represented by the line marked X in Fig. 1.

When the valve is in position, as shown in Figs. 2 and 4, its inside face is about on line with the inner face of the cylinder-head, so that I reduce the clearance to the minimum, and at the same time retain the advantage of having the exhaust-ports at the lower side of the cylinder.

The cutting-edge *a* of the valve E is straight, and is parallel to the straight sides of the exhaust-port B, across which it works. The other edge *b* of the valve is curved to correspond with the curved line of intersection of the cylinder-bore and the seat-bore, as shown in Figs. 5 to 11, thereby leaving a space between the two curves approximately equal to the width of the exhaust-port when the valve is on its extreme open position.

By placing the valve within the bore of the cylinder I am enabled to dispense with any passage between the cylinder and the valve for the exhaust-outlet, the cavity of the valve forming such a passage always in communication with the cylinder.

As the edge *b* of the valve is on a line equidistant to the line of intersection of the valve-seat bore and the cylinder-bore, the width of exhaust-passage presented to the flow of the exhaust-steam is the same at every point of said passage throughout the length of the valve.

The great advantage of the construction herein shown and described lies in the fact that the clearance is reduced to a minimum, the valve in its open position presenting a clear opening equal to that of the exhaust-port, while the passage through it is of minimum length.

Having thus described my invention, what I claim is—

1. In combination with a cylinder having an exhaust-port, a valve-seat located within the bore of the cylinder and intersecting the same, and a valve having its edge curved to conform to the line of intersection.

2. In combination with a cylinder having an exhaust-port, a valve-seat intersecting the bore of the cylinder, and a valve mounted in the cylinder and forming an outlet of the width of the exhaust-port over which it works.

3. In combination with a cylinder having an exhaust-port, a valve-seat intersecting the bore of the cylinder, and a valve E, having a straight cutting-edge *a* and a curved outer edge *b*, all substantially as shown.

4. The osciliating valve E, having a straight cutting-edge *a* and a curved outer edge *b*.

5. In combination with a cylinder having a valve-seat intersecting the bore of the cylinder, a valve mounted in the seat and constructed substantially as shown, whereby the width of the exhaust-passage presented to the flow of exhaust-steam is the same at every point of said passage throughout the length of the valve.

In witness whereof I hereunto set my hand in the presence of two witnesses.

BRUNO V. NORDBERG.

Witnesses:

GEO. G. PHILLIPS,

WALTER S. MCKINNEY.