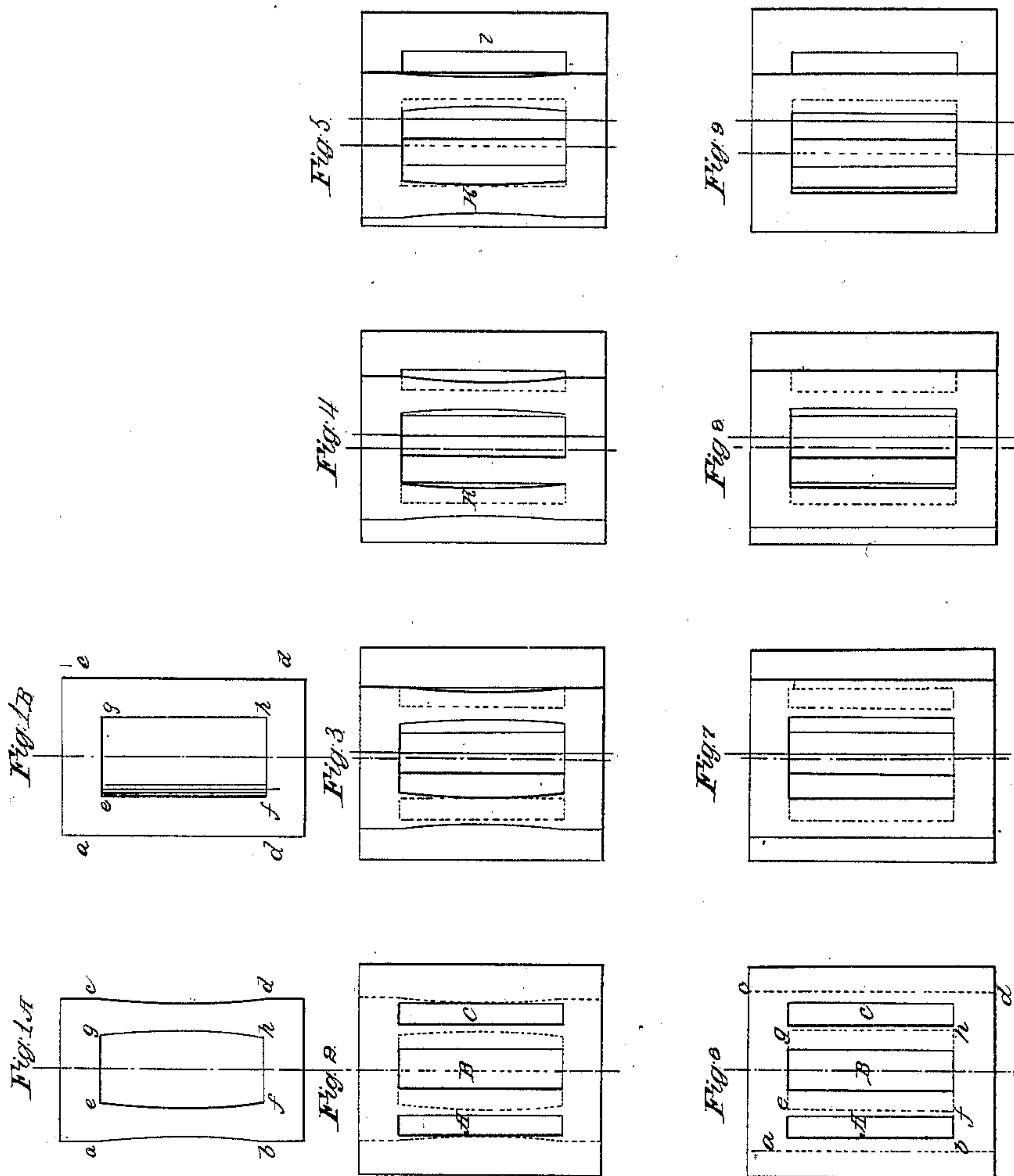


*N. Atherton,*  
*Steam Slide Valve.*

*N<sup>o</sup> 18,667.*

*Patented Nov. 24, 1857.*



*Witnesses*  
*Charles D. Freeman*  
*John Harding*

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# UNITED STATES PATENT OFFICE.

NATHAN ATHERTON, OF PHILADELPHIA, PENNSYLVANIA.

## SLIDE-VALVE FOR STEAM-ENGINES.

Specification of Letters Patent No. 18,667, dated November 24, 1857.

*To all whom it may concern:*

Be it known that I, NATHAN ATHERTON, of the city of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in the Construction of Slide-Valves for Steam-Engines; and I do hereby declare the following to be a full and exact description of the same, reference being had to the annexed drawings, in which—

Figure 1<sup>A</sup> represents the face of my improved slide valves. Fig. 1<sup>B</sup> represents the face of the common slide valve. Fig. 2 represents the face of the steam chest; Fig. 3, the position of my valve over the ports just before the exhaust port is opened; Fig. 4, the position of my valve after the exhaust commences; Fig. 5, the position of my valve at the termination of the stroke, there being full exhaust on one side of the piston and full head on the other side. Fig. 6 represents the shape of the face of the common slide valve; Fig. 7, the position of the common valve corresponding to Fig. 3; Fig. 8, the position of the common slide valve after the exhaust commences corresponding to Fig. 4. Fig. 9 represents the position of the common valve at the same time as mentioned in Fig. 5.

The common slide valve is constructed of the shape shown in Fig. 1<sup>B</sup>, with the lines *a, b, c, d, e, f*, and *g, h*, straight lines, and when placed upon the face of the steam chest, as shown in Fig. 6 when the steam is shut off and the engine at rest the line *a, b*, laps or projects over or beyond the outside edge of the steam port A, as shown in that figure, and the line *e, f*, laps or projects beyond the inner edge of the same port, as shown in same figure, and in like manner the line *g, h*, laps or projects over the inner edge of the steam port C, as shown in same figure, and the line *a, d*, laps or projects beyond the outer edge of the port C, as shown in same figure. This is the position of the several parts of the old valve immediately over the steam chest when the central line of the slide valve is immediately over the central line of the steam chest. Fig. 7 represents the position of the parts when the center of the slide valve is passed beyond the center of the steam chest, the central line of the slide valve being shown by a red line and the central line of the steam chest being shown by the black dotted line. This

was the position of the slide valve when the piston was approaching the extremity of its stroke. Fig. 8 shows the position of the slide valve after the exhaust has commenced. The effect of the construction and arrangement of the common slide valve is such that when the piston has nearly completed its stroke the exhaust is opened behind the piston, the piston moves on a short distance, the lead of steam is then admitted, forming a cushion in front of the piston. The piston then completes its stroke. At the instant the piston begins to move toward the opposite end of the cylinder the entering steam pressing against the piston with a vacuum behind causes a jar or shock against the shackle or crank pin. This is slightly felt in the ordinary crank engine, but in my improved engine with the screw like projections the shock is more considerable from this cause.

The nature of my improvement consists in forming the lap of the steam valve on the under side with curved edges, as is shown in Fig. 1 and as hereinafter explained, so that steam shall be admitted in front of the piston an instant before the close of the stroke, and so that the exhaust shall not be opened behind the piston until the stroke is entirely completed, and thus the piston at the extremity of its stroke will have an equal or nearly equal pressure on each side of it, thus avoiding the unpleasant jar which results from the sudden admission of steam in front of the piston after the exhaust has been opened behind the piston as above explained.

In order to introduce the steam gradually and gently behind the piston as the piston approaches the end of the stroke as above mentioned and in order to open the exhaust gradually behind the piston, the edges *a b c d* and *e f, g h* are curved, as shown in the drawing. It will be observed that when the slide valve so constructed is placed upon the steam chest it will present at the several portions of the stroke the several positions shown in Fig. 3, Fig. 4 and Fig. 5, while the Figs. 7, 8 and 9 show the corresponding positions of the common slide valve. The red dotted line shows the position of the center of the slide valve and the black dotted line the position of the center of the steam chest in each case.

By my improvement the steam at the last



instant of the stroke would enter the cylinder gradually through the passage K, Fig. 4, while at the same time the passage to the exhaust would not yet have opened, the effect of which will be that the piston would move when it reached the extremity of the stroke with a pressure in front of the piston due to the steam entering through and a pressure behind the piston due to the expansive force of the steam in the cylinder before the exhaust opens. Immediately after the piston has reached the end of its stroke the valve continuing to slide opens an increased passage at *l*, as shown in Fig. 5, and at the same time the exhaust opens at K and the piston returns to its former position.

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

The construction of the slide valve with curved edges *a b c d* and *e f, g h*, arranged with such a lap over the faces of the steam chest that the steam shall be admitted in front of the piston an instant before the stroke has been completed and so that the exhaust shall not be made behind the piston until after the stroke has been entirely completed substantially as above described.

NATHAN ATHERTON.

Witnesses:

CHARLES D. FREEMAN,  
GEO. W. HARKINS.