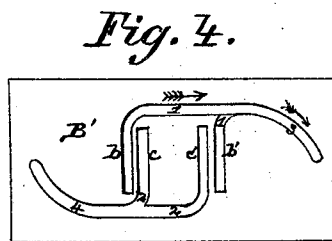
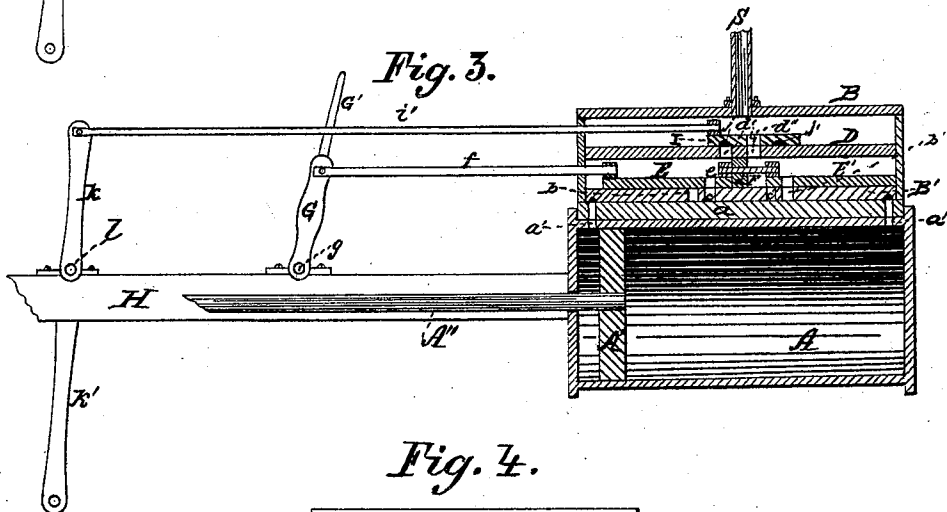
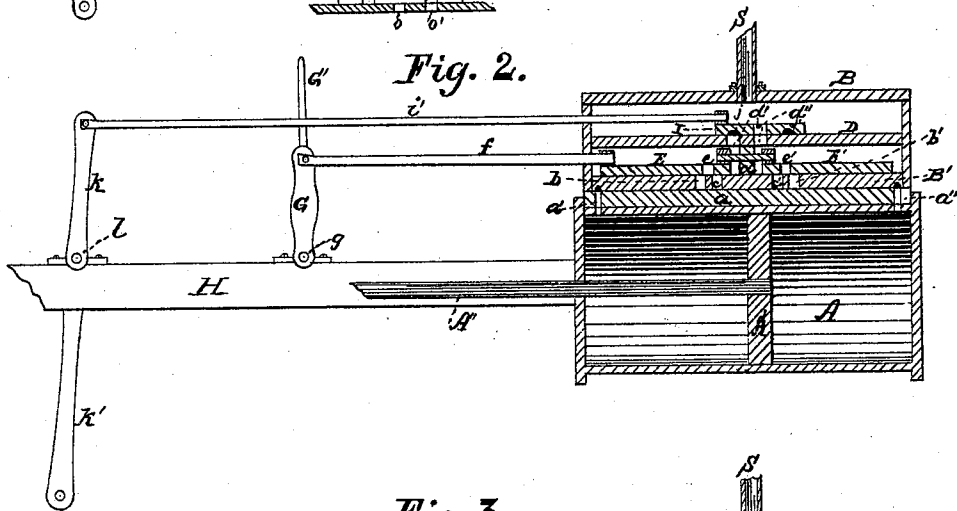
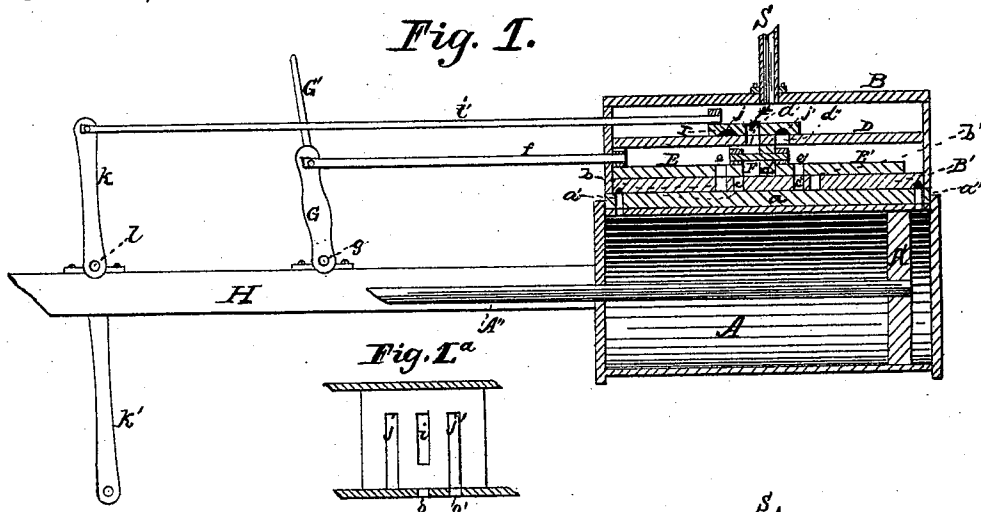


C. H. BREED.  
VALVE-GEAR FOR STEAM-ENGINES.

No. 171,500

Patented Dec. 28, 1875.



WITNESSES=  
Phil. W. Hale,  
Parker H. Swatlow.

INVENTOR  
Charles H. Breed,  
per Wm. Beale Hale,  
Attorney.

# UNITED STATES PATENT OFFICE.

CHARLES H. BREED, OF MASSILLON, OHIO.

## IMPROVEMENT IN VALVE-GEARS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **171,500**, dated December 28, 1875; application filed June 23, 1875.

### *To all whom it may concern:*

Be it known that I, CHARLES H. BREED, of Massillon, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Valve-Gear of Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to an improvement in the valve-gear of steam-engines, and its object is to afford means for reversing the motion of said engines, and for holding them stationary. It consists in providing the valve-box with a supplementary valve or valves to be worked by hand, and by means of which the course of the steam may be directed to either end of the cylinder at pleasure, or an equal amount thrown on each side of the piston, for the purpose of holding it stationary and preventing any motion of the engine. My invention is particularly applicable to locomotive-engines, where its use would render unnecessary the ordinary cumbersome reversing devices, but may be applied to any engine using reciprocating valves. The details of construction involved in my invention will be hereinafter fully described and explained with reference to the accompanying drawing, in which like letters indicate like parts in the different figures.

Figure 1 is a vertical central section of a steam-cylinder and valve-box having my supplementary reversing and holding valves. Fig. 2 is a similar section, showing said valves in position for holding the piston stationary. Fig. 3 is a similar section, showing a different position of said valves. Fig. 4 is a plan view of the bottom of the valve-box, showing the steam-passages leading from the valve-box to the cylinder. Fig. 1<sup>a</sup> is a sectional detail view.

A is the steam-cylinder, A' the piston, and A'' the piston-rod. The shell of the cylinder is cast with a flat, table-like top, *a*, through which pass the steam-ports *a' a''*, and upon which is secured the valve-box B. B' is the bottom of the valve-box, through which are

openings or ports *b b' c c'*. In the under side of this bottom of the valve-box are cut grooves or channels 1 1 and 2 2, from one end of each of the openings or ports just mentioned, the channels from the outer ports *b b'* meeting and merging in a single groove or channel, 3, which leads to the steam-port *a''*, and those from the inner ports *c c'* meeting and merging in a single groove or channel, 4, which leads to the port *a'*.

D is a longitudinal partition, dividing the valve-box into an upper and lower chamber, and *d* is a transverse vertical partition, dividing the lower chamber into two smaller chambers of equal size. E E' are slide-valves, one on each side of vertical partition *d*. Each of these valves has an opening, *e* and *e'*, through it, and the two valves E E' are connected by a rod, F, which plays through an opening in partition *d*. A stuffing-box may be arranged in this opening. The rod F is of such length that when the opening in one of the slides E or E' coincides with one of the outer ports *b* or *b'*, the opening in the other slide will coincide with one of the inner ports *c* or *c'*. To the front slide E is attached a rod, *f*, which works through an opening in the front wall of the valve-box, fitting said opening snugly to prevent the escape of steam; or this opening also may be provided with a stuffing-box. The outer end of rod *f* is attached to an arm, G, which is fixed on the end of a short rock-shaft, *g*, working in a journal-box on beam H. To the other end of this short rock-shaft is fixed a lever, G', to be worked by hand. On a locomotive-engine a rod would extend from the lever G' to a hand-lever in the cab. In the partition D are two ports, *d' d''*, opening respectively into the lower chambers of the valve-box on opposite sides of the partition *d*.

I is a slide-valve, having a single passage, *i*, through it, and two channels or grooves, *j j'*, in its under side. These grooves extend from the edge of the slide to points near the opposite edge, and on a line with the end of the port *i*. When port *i* coincides with port *d'*, as shown in Fig. 1, groove *j'* coincides with port *d''*, and the end of said groove, which leads to the edge of the slide, then coincides with an eduction-port, *o'*, in the side wall of the valve-box, as shown in sectional view 1<sup>a</sup>.

When port *i* coincides with port *d''*, groove *j* will coincide with port *d'*, and the open end of said groove with eduction-port *o*. A rod, *i*, attached to slide I, leads through the wall of the valve-box to an arm, *k*, attached to one end of a short rock-shaft *l*, journaled at its middle on beam H. To the other end of this rock-shaft *l* is fixed an arm, *k'*, from which a rod may lead to and be suitably connected with an eccentric on a fly-wheel shaft of a stationary engine, or on the driving-wheel axle of a locomotive-engine, and the said eccentric can be arranged to properly operate slide I.

I have not deemed it necessary to show a pitman connecting the piston-rod *A''* with a fly or driving wheel, nor an eccentric and rod for operating slide-valve I, as they may be arranged in any suitable and well-known manner applicable to stationary or locomotive engines, as will be readily understood by persons familiar with the construction of such engines.

The operation of my invention is as follows: Referring to Fig. 1, the piston *A'* is supposed to be at the end of its stroke in one direction, and the valve I in position to direct the steam so as to drive the piston back to the opposite end of the cylinder. Steam comes from the boiler through steam-pipe S, enters valve-box, passes through port *i* of slide I, through port *d'* of partition D, through port *e* of slide E, through port *b* of bottom B', through channel 1 in under side of said bottom, and through groove 3, which leads to port *a''* of cylinder. As the piston moves back the steam in front of it is driven through cylinder-port *a'*, through channel 4 in the under side of bottom B' of valve-box, through channel 2, through port *c'* of said bottom, through port *e'* of slide E', through port *d''* of partition D, through channel *j'* in under side of slide-valve I, and off through eduction-port *o'* in side of valve-box.

Now, if, during this back stroke of this piston, the slides E E' should be shifted from the position shown in Fig. 1 to the position shown in Fig. 3, (slide I remaining as in Fig. 1,) the course of the steam will be changed from cylinder-port *a''* to cylinder-port *a'*, thus: through port *i*, port *d'*, port *e*, port *c*, channel 2, channel 4, port *a'*, into cylinder, and reverse the motion of the piston, which would then drive the steam before it through port *a''*, channel 3, channel 1, port *b'*, port *e'*, port *d''*, groove *j'* in under side of slide I, and off through the same eduction-port *o'* as before. By placing the slides E E' in the position shown in Fig. 2, it will be seen that an equal quantity of steam will pass through all the ports of bottom B', as the divisions between the pairs of said ports are not wide enough to close ports *e* and *e'*, and consequently an equal volume of steam will be thrown on each side of the piston, holding it stationary.

Having now fully described and explained my invention, I claim—

1. In a valve-box, the combination of horizontal partition D, having ports *d'* *d''*, bottom B', provided with ports and grooves, as described, slides E E', having ports *e* *e'*, and connected through the partition *d*, and slide I, having port *i* and grooves *j* *j'*, arranged to alternately coincide with escape-ports *o* *o'*, substantially as shown.

2. The valve E, having port *e*, in combination with bottom B', having ports *b* *c*, arranged to each receive half the flow of steam from port *e*, substantially as described.

In testimony that I claim the foregoing as my own invention, I affix hereto my signature in presence of two witnesses.

CHARLES H. BREED.

Witnesses:

WM. BEALE HALE,  
PHIL. W. HALE.