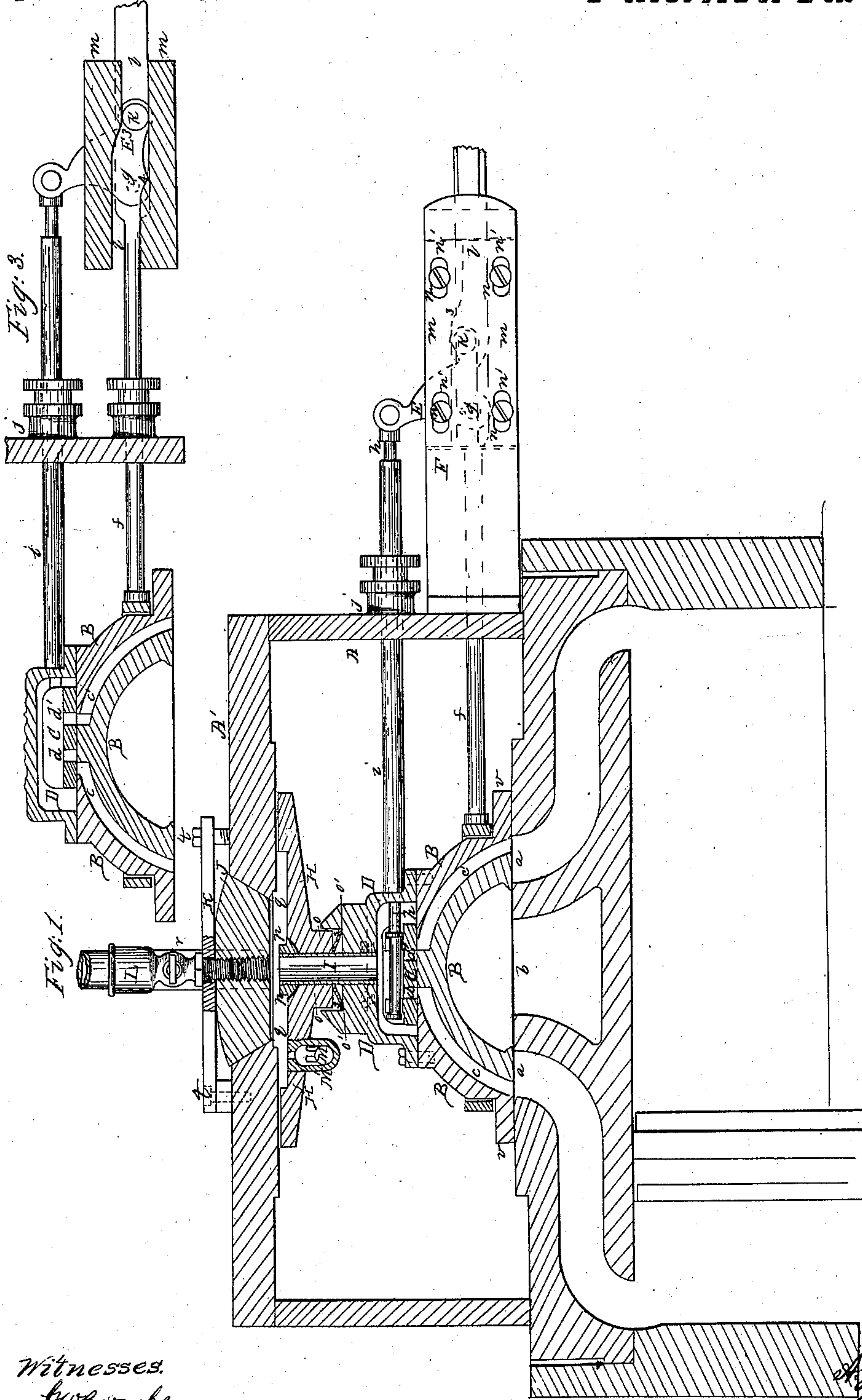


*A. J. Sterens,*  
*Steam Balanced Valve.*

*N<sup>o</sup> 32,589.*

*Patented June 18, 1861.*



*Witnesses.*

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# UNITED STATES PATENT OFFICE.

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## SLIDE-VALVE FOR STEAM-ENGINES.

Specification of Letters Patent No. 32,589, dated June 18, 1861.

*To all whom it may concern:*

Be it known that I, A. J. STEVENS, of Aurora, in the county of Kane and State of Illinois, have invented a new and useful Improvement in Slide-Valves for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal section of a slide valve, valve-chest and their appendages illustrating my invention. Fig. 2 exhibits some of the details of the invention in positions different from Fig. 1.

Similar characters of reference indicate corresponding parts in both figures.

The object of my invention is to obviate the great objection to the use in steam-engines of a slide valve with a long lap, viz: the compression of the steam on the exhaust side of the piston by the closing of the port before the stroke of the piston is completed, and, by enabling the valve to be made with a longer lap than has been heretofore considered practicable, to provide for a greater degree of expansion of the steam in the cylinder; and to this end my invention consists in what I denominate an "anti-compression valve" fitted to a chest provided for it on the main valve, and operating in combination with passages opening into the face of the main valve, substantially as herein described.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation.

A is the valve chest of the engine.

$a$ ,  $a'$  are steam ports, and  $b$ , the exhaust port, constructed and arranged in the manner common to engines using a single short slide valve.

B is the slide valve made like an ordinary short slide valve except that it has provided in it two passages  $c$ ,  $c'$ , running from its face to its back, the back being planed true and parallel with the face in order to form a seat for the small slide valve C, which I term the "anti compression valve."

The lower ports of the cavities  $c$ ,  $c'$ , should be so far from the end of the valve that the portions  $v$ ,  $v'$ , of the valve face outside of these ports are equal in width to the width of the ports  $a$ ,  $a'$ . This valve C, consists simply of a flat plate having two ports  $d$ ,  $d'$ ,

of a width equal to that of the upper ports of the passages  $c$ ,  $c'$ , but so much nearer to each other than the latter ports that when one port  $c$ , or  $c'$ , is opened by the corresponding port  $d$ , or  $d'$ , of the valve, the other  $c'$ , or  $c$ , is closed by the valve as illustrated by both Figs. 1 and 2.

The anti-compression valve C, is completely inclosed by the chest D, which is bolted to the back of the main valve B.

$f$  is the stem of the main valve passing through the usual stuffing box in the valve chest A; and  $h$  is the stem of the anti-compression valve passing through a tube  $i$ , which is rigidly attached to the chest D, and which passes through a stuffing box  $j$ , in the valve chest A. The stem  $h$ , is connected with one arm of a bell-crank lever E, which is pivoted to the main valve stem  $f$ , by a pin  $g$ , secured in the latter stem, and the other arm of the said lever E, is furnished with an anti-friction roller  $k$ , which is received within a groove  $l$ , in a plate F, that is rigidly secured to the steam chest or to any other stationary part of the engine, the said groove having curves 3, and 4, on opposite sides, best shown in Fig. 2. The groove  $l$ , is formed of two separate adjustable plates  $m$ ,  $m$ , secured to the fixed plate F, by screws  $n$ ,  $n$ , passing through slots  $n'$ ,  $n'$ , in the latter and screwing into tapped holes in the former.

H is a counter pressure plate secured to the top of the anti-compression valve chest D, and working against a flat surface provided for it on the interior of the back or cover A', of the main valve chest A, for the purpose of counteracting the pressure of the steam on valve B. This plate has a square boss  $o$ , which is received in a square box  $o'$ , provided for it in the back of the valve chest D, and the said plate is attached to the said valve chest, consequently to the main valve, by a tube I, which screws into the chest D, passes through the said plate and receives a nut  $p$ , above the said plate; and the said plate is held up in steam-tight contact with the cover A', by means of a spring  $s$ , applied within the box  $o'$ , the nut  $p$ , being adjusted to prevent excessive friction between the said plate and cover; and the said tube forms a communication between the interior of chest D, and a cavity  $q$ , which is formed between the said plate and the back or cover A', of the valve chest by a shallow recess in each, such cavity being connected with the



main exhaust pipe of the engine, or being placed in communication with the atmosphere by a pipe *r*, attached to the back or cover A'.

5 J is a movable circular plate fitted like a conical valve to an opening provided for it in the cover A', and secured in place by a bar K, and two screws *t*, *t*, screwing into the cover. The object of this movable plate is  
10 to provide for the adjustment of the nut *p*, which can be reached when the said plate is removed. In the center of the said plate J, there is a grease cock L, for lubricating the valves, said cock opening into the cavity *q*.

15 M is a ball-valve fitted to a cage M', which screws into the counter pressure plate H. This valve is kept closed by the upward pressure of steam in the main valve chest, but when the steam is shut off it allows  
2 grease to run from the cavity *q*, into the said chest to lubricate the main valve and its seat. Grease also runs from the said cavity *q*, down the tube I, into the anti-compression valve chest D, to lubricate the valve C, and  
25 its seat.

The main valve may derive motion from an eccentric or by any known or suitable means, its movement being similar to that of other lap slide valves, and the anti-  
30 compression valve derives, through the action produced on the bell-crank lever E, by its being brought in contact with the curves 3, and 4, of the slot *l*, such a movement as to open and close the upper ports of the  
35 passages *c*, *c'*, alternately at the proper time to permit the exhaust to be continued through those passages and through the chest D, tube I, cavity *q*, and pipe *r*, after either cylinder port *a*, or *a'*, has been closed  
40 to the main exhaust port *b*, by the main valve.

To explain the operation fully I will first suppose the main valve to be in the position shown in Fig. 1, that is to say, having in its  
45 movement to the right just closed the cylinder port *a*, to the port *b*, the piston (shown in red outline) not yet having completed its stroke to the left. The port *d*, of the anti-compression valve is over the upper port of  
50 the passage *c*, and the lower port of that passage is passing over the port *a*, and hence the exhaust is continued through the passage *c*, port *d*, chest D, tube I, cavity *q*, and pipe *r*. The passage *c*, remains in communication with *a*, till the outer edge of the  
55 main valve is about to pass the outer edge of *a*, and steam is about to be admitted to the left hand end of the cylinder when the roller *k*, moving along the slot *l*, comes in contact with the curve 3, and is thereby depressed causing the lever E, to give the  
60 valve C, a quicker movement in the same direction as that in which the main valve is

moving, viz. to the right, thereby causing it to close the passage *c*, and open *c'*, to the  
65 chest D, as shown in Fig. 2, which represents the main valve as commencing to give steam to the port *a*. The valve C, remains in this position relatively to the main valve, while the latter completes its stroke to the right,  
70 and during the greater portion of its movement to the left, permitting the exhaust from the port *a'*, to be continued through the passage *c'*, port *d'*, chest D', tube I, cavity *q*, and pipe *r*, after the port *a'*, has been  
75 closed to *b*, by the main valve; but just as the port *a'*, is about to be opened to take steam the roller *k*, comes in contact with the curve 4, of the slot *l*, and the lever E, is thereby caused to derive such a movement  
80 as to cause the valve C, to travel faster than B, and so to open the upper port of the passage *c'*, and close that of *c*, as shown in Fig. 1. The valve C, is now in the same condition relatively to the main valve as at  
85 first described with reference to Fig. 1, and so remains while the stroke of the main valve to the left has been completed and until in its stroke to the right it is about to admit steam to the port *a*; when by the ac-  
90 tion of the roller *k*, against the curve 3, the valve C, is shifted to close the upper port of *c*, and open that of *c'*, as before described. This alternate opening and closing of the  
95 passages *c*, and *c'*, by the valve C, is repeated in the same manner in every stroke of the main valve and the compression of the steam in the cylinder thereby effectually prevented.

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

1. The anti-compression valve C, inclosed in a chest D, secured to or formed upon the back of the main slide valve, and operating in combination with passages *c*, *c'*, in the  
105 latter valve substantially as and for the purpose herein specified.

2. The tube I, serving at the same time as a means of connecting the counter-pressure plate H, with the main valve, and as a  
110 means of communication between the anti-compression valve chest D, and the atmosphere or exhaust pipe.

3. Combining the anti-compression valve C, with the main valve by means of a bell-  
115 crank or elbow-lever E, connecting their stems as described, and having one of its arms furnished with a friction roller *k*, or its equivalent, working between stationary curved guides *m*, *m*, substantially as and for  
120 the purpose herein specified.

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Witnesses:

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