

(No Model.)

A. F. HALL.  
RELIEF VALVE FOR STEAM CYLINDERS.

No. 458,845.

Patented Sept. 1, 1891.

Fig: 1.

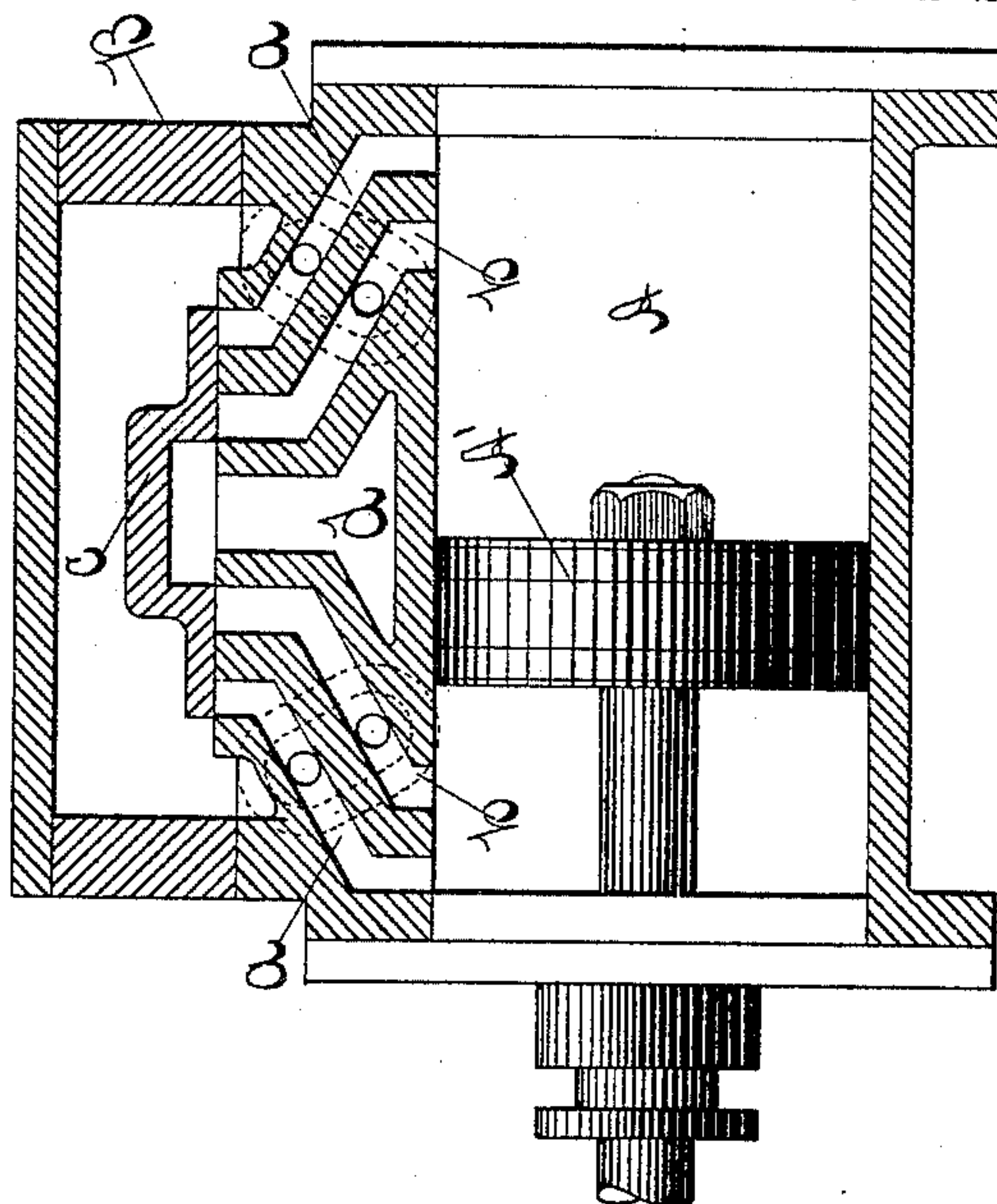
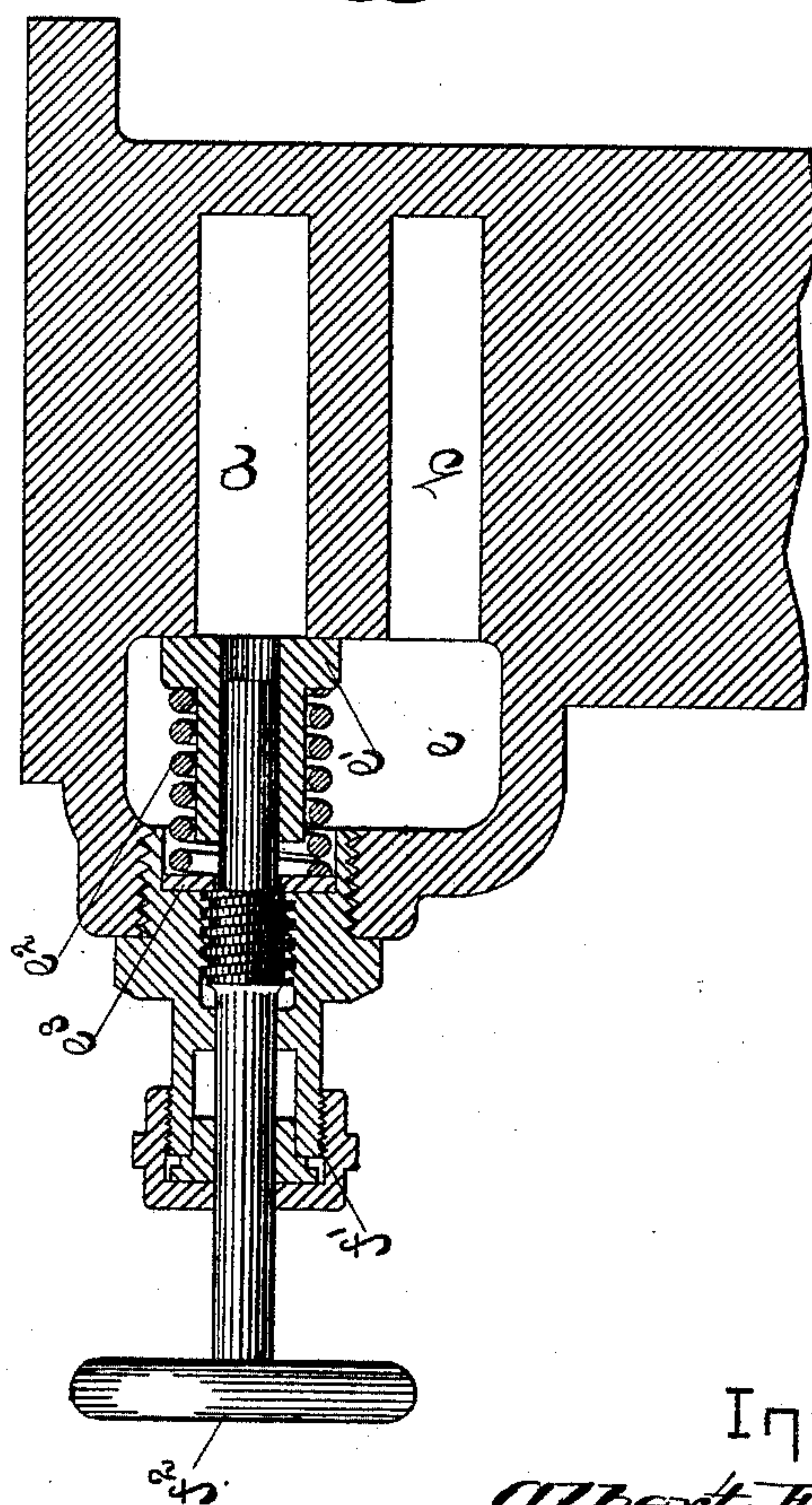


Fig: 2.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

ALBERT F. HALL, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE GEORGE F. BLAKE MANUFACTURING COMPANY, OF NEW JERSEY.

## RELIEF-VALVE FOR STEAM-CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 458,845, dated September 1, 1891.

Application filed June 4, 1891. Serial No. 395,019. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT F. HALL, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Relief-Valves for Steam-Cylinders, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

Steam pumps or engines having their steam-cylinders provided with separate steam and exhaust ports at opposite ends of the cylinder when in operation frequently produce an objectionable hammering or pounding.

This invention has for its object to provide a device which may be attached to or embodied in the cylinder of any engine or pump, whereby the motion of the reciprocating parts may be gradually arrested to prevent such hammering or pounding.

Prior to this invention it has been common to connect the separate steam and exhaust ports at each end of the cylinder by an auxiliary port or passage, communication between the steam and exhaust ports through said auxiliary passage being controlled by a valve positively operated by hand.

This invention comprehends a valve to control said passage which shall be automatically operated by the steam-pressure, the resistance to the opening of the valve being made adjustable, so that the valve may open at any desired pressure.

One part of this invention therefore consists in a steam-cylinder provided at its opposite ends with separate steam and exhaust ports and an auxiliary port or passage connecting the same, combined with an automatically-operated valve to control said auxiliary port or passage, substantially as will be described.

Other features of this invention will be hereinafter described, and pointed out in the claims.

Figure 1 represents in vertical longitudinal section a steam-cylinder embodying this invention, and Fig. 2 an enlarged sectional detail showing the auxiliary port and valve to close the same.

Referring to the drawings, the steam-cylinder A, containing the piston A', and the

steam-chest B are and may be of suitable or desired type or construction.

The cylinder A is provided at each end with the usual steam and exhaust ports *a b*, together with a common main exhaust-port *d*, all controlled by the usual valve *c*. As the valve *c* is moved in one or the other direction steam will be admitted to one or the other steam-port *a*, forcing the piston to the opposite end of the cylinder, the exhaust-steam from that end of the cylinder escaping through the exhaust-port *b* and valve *c* into the main exhaust-port *d*.

The steam and exhaust ports *a b* at each end of the cylinder are connected by an auxiliary port or passage *e*, communication between the said steam and exhaust ports through said port or passage being controlled by an automatically-operated valve, as *e'*, which, as herein represented, is maintained against its seat by a spring *e<sup>2</sup>*, acted upon at its outer end by a washer *e<sup>3</sup>*, moved by the threaded spindle *f*, which latter passes out through a suitable stuffing-box *f'* and is fitted at its outer end with a suitable operating handle or wheel *f<sup>2</sup>*. Steam being admitted to the cylinder, the piston will be moved to the opposite end of the cylinder and before reaching the end of its stroke will close the exhaust-port *b* before the volume of steam at that side of the piston has been entirely expended, in which case said steam will be gradually compressed until its pressure has become greater than the resistance due to the spring which acts to maintain the cushion-valve *e* upon its seat, when the said valve will be moved from its seat to permit the compressed steam to pass into the exhaust-port through the port or passage *e*, thus gradually arresting the motion of the reciprocating parts and preventing a water-hammer. The pressure at which the cushion-valve *e'* will open may be regulated by rotation of the threaded spindle *f*, and rotation of the spindle a sufficient number of times will bring the washer *e<sup>3</sup>* into contact with the stem of the valve to hold the latter positively against its seat, and thereby cut off all communication between the steam and exhaust ports.

The auxiliary port or passage *e*, as herein



represented, is formed within the cylinder-casting; but I desire it to be understood that the same may be embodied in an independent device embodying substantially the same construction and be bolted or otherwise secured to the cylinder-casting. Neither is this invention limited to the particular valve and means to control its action herein shown, for the same may be varied to meet the various requirements without departing from the scope of this invention.

I claim—

1. A steam-cylinder provided at each end with separate steam and exhaust ports and an auxiliary port or passage connecting the same, combined with an automatically-operated valve to control said auxiliary port or passage, substantially as described.

2. A steam-cylinder provided at each end with separate steam and exhaust ports and an auxiliary port or passage connecting the same, combined with an automatic spring-controlled valve to control said auxiliary port or passage, substantially as described.

3. A steam-cylinder provided at each end with separate steam and exhaust ports and an auxiliary port or passage connecting the

same, combined with an automatically-operated valve to control said auxiliary port or passage and means to positively close said auxiliary port or passage, substantially as described.

4. A steam-cylinder provided at each end with separate steam and exhaust ports and an auxiliary port or passage connecting the same, combined with a valve to close said auxiliary port or passage, a spindle to positively hold said valve against its seat, and a spring interposed between said spindle and valve, to operate substantially as described.

5. A steam-cylinder provided at each end with separate steam and exhaust ports and an auxiliary port or passage connecting the same, combined with a valve to close said passage, a spring *e'* to hold said valve against its seat, the spindle *f*, and washer *e<sup>3</sup>*, to operate substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALBERT F. HALL.

Witnesses:

FREDERICK L. EMERY,  
EMMA J. BENNETT.