

(No Model.)

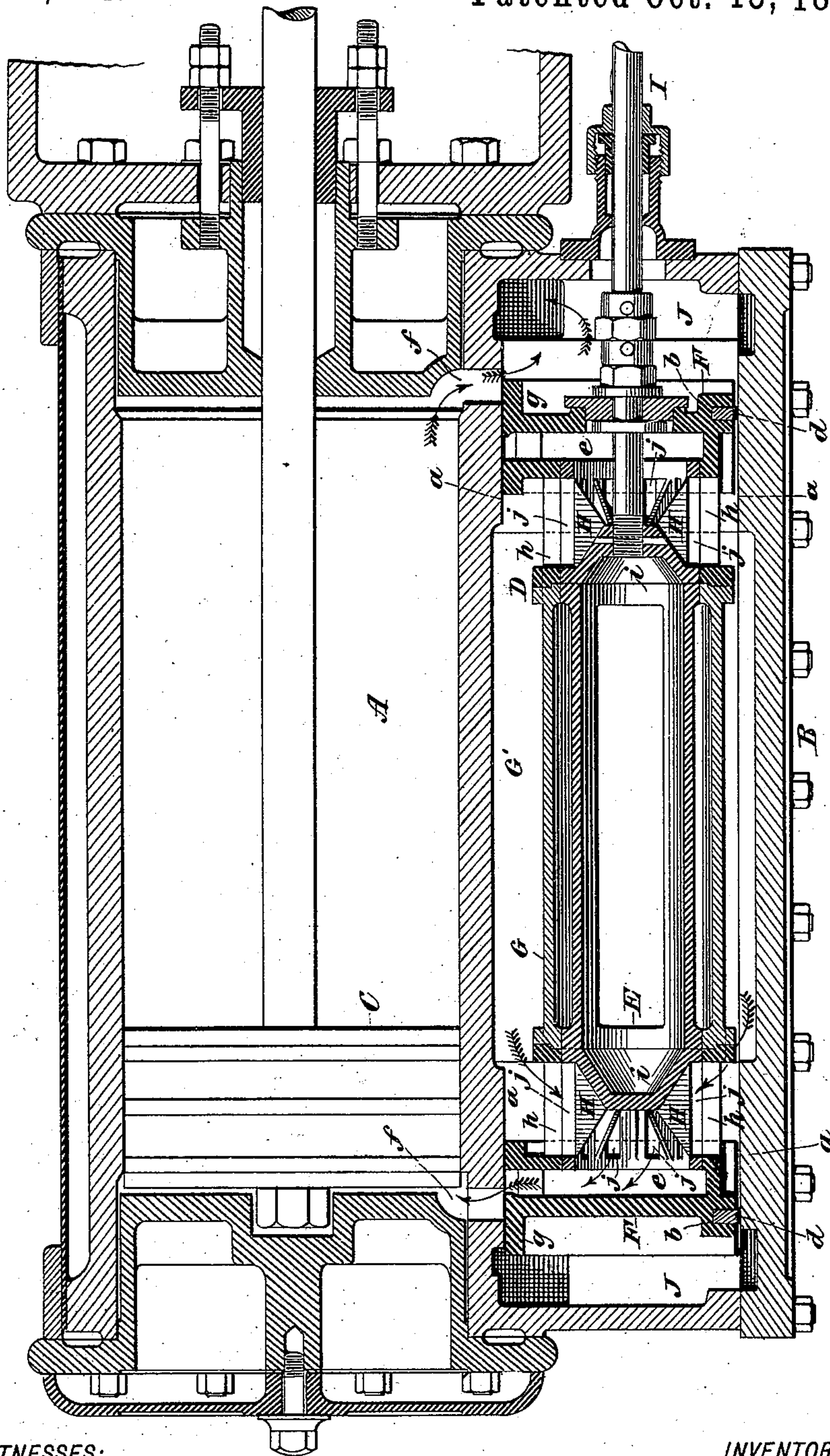
2 Sheets—Sheet 1.

E. F. SPAULDING.  
VALVE FOR STEAM ENGINES.

No. 547,814.

Patented Oct. 15, 1895.

Fig. 1.



WITNESSES:

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INVENTOR

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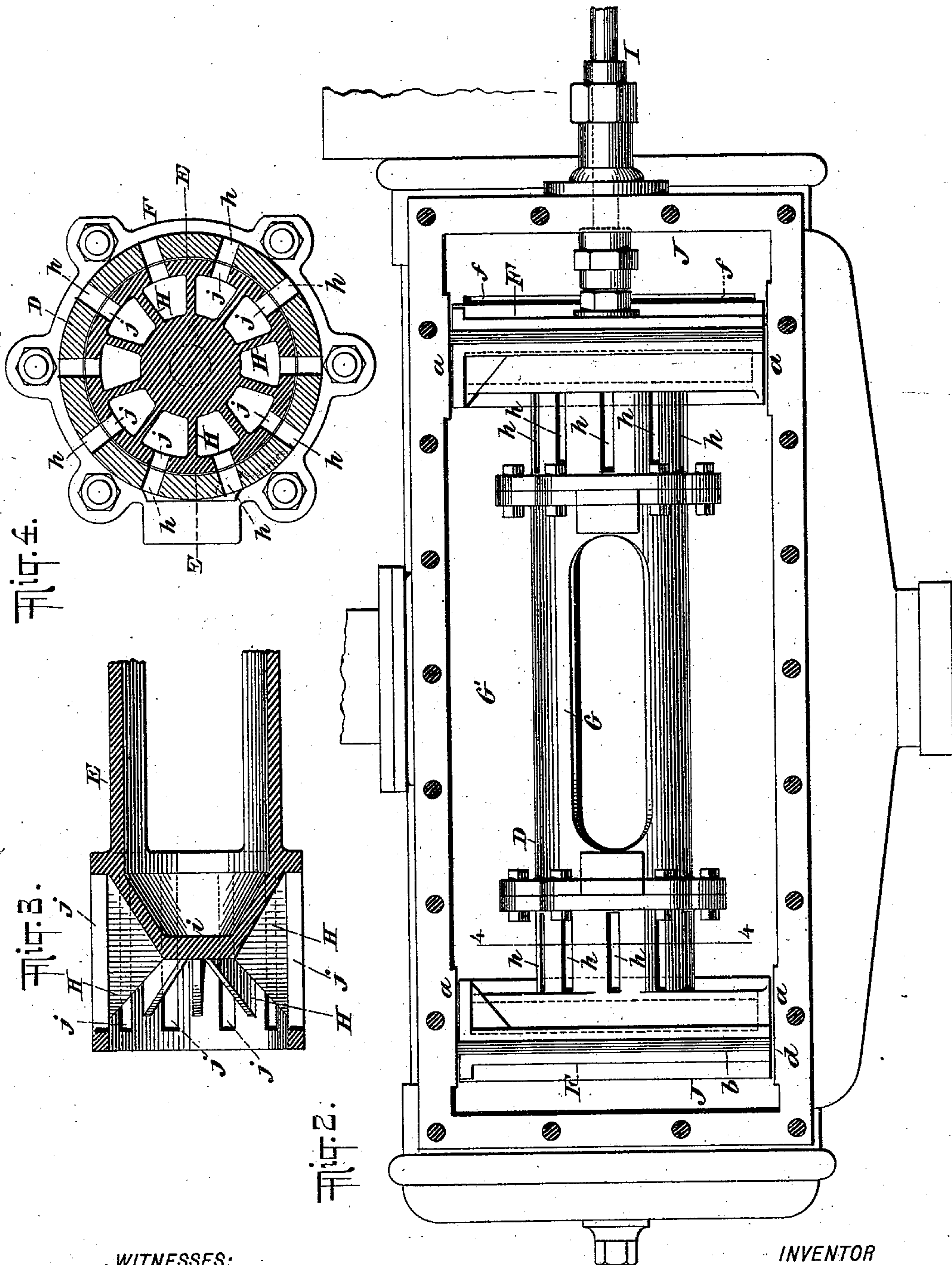
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# UNITED STATES PATENT OFFICE.

ELIJAH F. SPAULDING, OF BOUND BROOK, NEW JERSEY.

## VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 547,814, dated October 15, 1895.

Application filed August 17, 1894. Serial No. 520,560. (No model.)

*To all whom it may concern:*

Be it known that I, ELIJAH F. SPAULDING, a citizen of the United States, and a resident of Bound Brook, in the county of Somerset and State of New Jersey, have invented certain new and useful Improvements in Valves for Steam-Engines, of which the following is a specification.

The invention relates to improvements in valves for steam-engines and pertains particularly to the valves located within the steam-chest. In accordance with my invention I provide within the steam-chest a slide-valve which has a uniform reciprocation, and within this valve is located an inner or cut-off valve which has no reciprocation from or toward its seat, but simply at the proper time an axial rotation against its seat, the time of the motion of the cut-off valve being variable and under the control of the governing devices. The form and construction of both the slide-valve and the cut-off valve are new and constitute a part of the present invention, which in its broader scope is not limited to details of construction, but without regard to form and details comprises a reciprocating slide-valve within the steam-chest and having a uniform reciprocation and a cut-off valve within the slide-valve and having an axial oscillatory motion which is variable, the two valves receiving their motions from one rod operated by the valve-gear.

The invention will be more readily understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, forming a part of this application, and in which—

Figure 1 is a central horizontal longitudinal section through the cylinder and valve-chest of an engine, the valves within the chest being constructed in accordance with and embodying the invention. Fig. 2 is a side elevation of same, the outer face of the valve-chest being removed. Fig. 3 is an enlarged detached central longitudinal section of one end of the inner or cut-off valve, and Fig. 4 is an enlarged vertical transverse section of the valves on the dotted line 4 4 of Fig. 2.

In the drawings, A designates the steam-cylinder, and B the valve-chest. The steam-

cylinder A is of usual construction and contains the customary piston C.

The reciprocating valve within the steam-chest is designated by the letter D and the cut-off valve within the reciprocating valve by the letter E. The valve D has at its ends the corresponding heads F F, and these heads are connected by the cylindrical open frame G, the meeting portions of said heads and cylindrical frame being provided with flanges and bolts, as shown in Figs. 2 and 4, to effect their union and form a continuous slide-valve. The outer portions of the heads F F are rectangular in general outline and are adapted to travel on the seats *a a*, formed in the valve-chest, and said outer portions of the said heads are provided with the grooves *b*, containing packing *d*, the steam spaces or ports *ee*, which at the proper time are adapted to communicate with the steam-cylinder A through the usual ports *ff*, and the flanges *g*, which are adapted to cover and uncover said ports *ff*, as indicated in Fig. 1. The inner ends or portions of said heads F F are cylindrical and contain the series of longitudinal ports *h*, and the inner surfaces of these cylindrical portions of the heads F F constitute seats for the inner cut-off valve E, which is cylindrical, and has at each end, beyond a closed head *i*, the longitudinal ports *j*, adapted to register with or be turned to cut off communication through the longitudinal ports *h* in the heads F F. The middle or intermediate section of the valve E is open to the steam-chamber G', and the closed heads *i* afford supports for those portions of the cut-off valve containing the ports *j*, radial flanges H being provided and extending from said heads outward to points intermediate the ports *j*. The valve E has no movement longitudinally except with the valve D, and hence said valve never leaves its valve-seats, but has simply an axial oscillatory movement thereon sufficient to bring the ports *j* into alignment with the ports *h*, so as to establish communication from the steam-chamber G', through said ports *j h*, to the steam-space *e*, port *f*, and cylinder A, as shown at the left-hand end of Fig. 1, or to remove said ports *j* from alignment with the ports *h*, so as to cut off such communication from the steam-chamber G' to the space *e* and steam-cylinder.



The valve I will, as shown in Fig. 1, be secured to both the valve D and valve E, any suitable means of connection being employed, the essential consideration being that the rod  
 5 be enabled to reciprocate the valve D and at the proper time, regulated by the governing apparatus, turn the valve E. The valve-gear for driving and operating the valves D E will be of any suitable character, and as disclosing an example of satisfactory gear for this  
 10 purpose attention is called to Letters Patent of the United States No. 385,533, granted to me July 3, 1888. The present invention is not confined, however, to any special form or  
 15 construction of valve-gear.

At each end of the valve-chest B is provided the usual exhaust-space J.

The operation of the valves made the subject hereof will probably be understood from  
 20 the foregoing description. It may be said, however, that when the valves are in the position in which they are illustrated in Fig. 1 the steam at the right-hand end of the cylinder A may exhaust, through the port *f*, into  
 25 the space J at the right-hand end of the steam-chest, and the live steam from the chamber G' may pass through the longitudinal ports *h j* at the left-hand end of the valves D E, and enter the space *e*, then in communication  
 30 with the port *f* at the left-hand end of the cylinder A. The outward movement of the valve-rod I would reverse the position of the valves D E with relation to the ports *f f*, communicating with the steam-cylinder, and at  
 35 such time the exhaust would take place at the left-hand end of the cylinder and the admission at the right-hand end thereof. The longitudinal ports *h j* of the valves D E are shown in alignment with each other, and when  
 40 such is their position the steam from the chamber G' may pass freely through them to the spaces *e e*, whence it will escape to the cylinder A through that port *f* which at the time may be uncovered. When during the  
 45 operation of the engine the valve E is turned axially, its ports J are removed from alignment with the ports *h* of the valve D, and at such time the steam is entirely cut off from the spaces *e* and ports *f*.

50 As above described, the valve D has a uniform reciprocation, while the valve E has no reciprocation with respect to its seats and co-operating ports, but simply an axial oscillatory or rocking movement against its said  
 55 seats. The rocking motion of the cut-off-valve E is variable under the control of the

governing devices, while the transverse of the valve D is invariable.

What I claim as my invention, and desire to secure by Letters Patent, is— 60

1. In a steam engine, the reciprocating valve, combined with the cylindrical cut-off valve carried thereby and having a movement independent thereof and reciprocating valve  
 65 rod I connecting said reciprocating and cut off valves and adapted to turn axially and operate the latter, substantially as and for the purposes set forth.

2. In a steam engine, the reciprocating valve having the spaces *e* and longitudinal  
 70 ports *h*, combined with the cylindrical cut-off valve seated within said reciprocating valve and having the longitudinal ports *j* and the reciprocating valve rod I connecting said reciprocating and cut off valves and adapted to  
 75 turn axially and operate the latter, substantially as set forth.

3. In a steam engine, the reciprocating valve adapted to cover and uncover the ports  
 80 communicating with the steam cylinder, and having ports, combined with the cylindrical cut-off valve carried by said reciprocating valve and having ports arranged with respect to the ports thereof and the reciprocating  
 85 valve rod I connecting said reciprocating and cut off valves and adapted to turn axially and operate the latter; substantially as set forth.

4. In a steam engine, the reciprocating valve having the heads F, F, and cylindrical  
 90 intermediate section, said heads having the spaces *e* and inner cylindrical portions provided with longitudinal ports, combined with the inner cylindrical cut-off valve having closed heads and beyond these the longitudinal  
 95 ports, and the reciprocating valve rod I, connecting said valves and adapted to turn with the inner valve; substantially as set forth.

5. In a steam engine, the reciprocating valve having the longitudinal ports *h* and  
 100 spaces *e*, combined with the inner cylindrical cut-off valve having the closed heads *i* and beyond these the longitudinal ports *j* and radial flanges H; substantially as and for the purposes set forth. 105

Signed at New York, in the county of New York and State of New York, this 16th day of August, A. D. 1894.

ELIJAH F. SPAULDING.

Witnesses:

CHAS. C. GILL,  
 ED. D. MILLER.