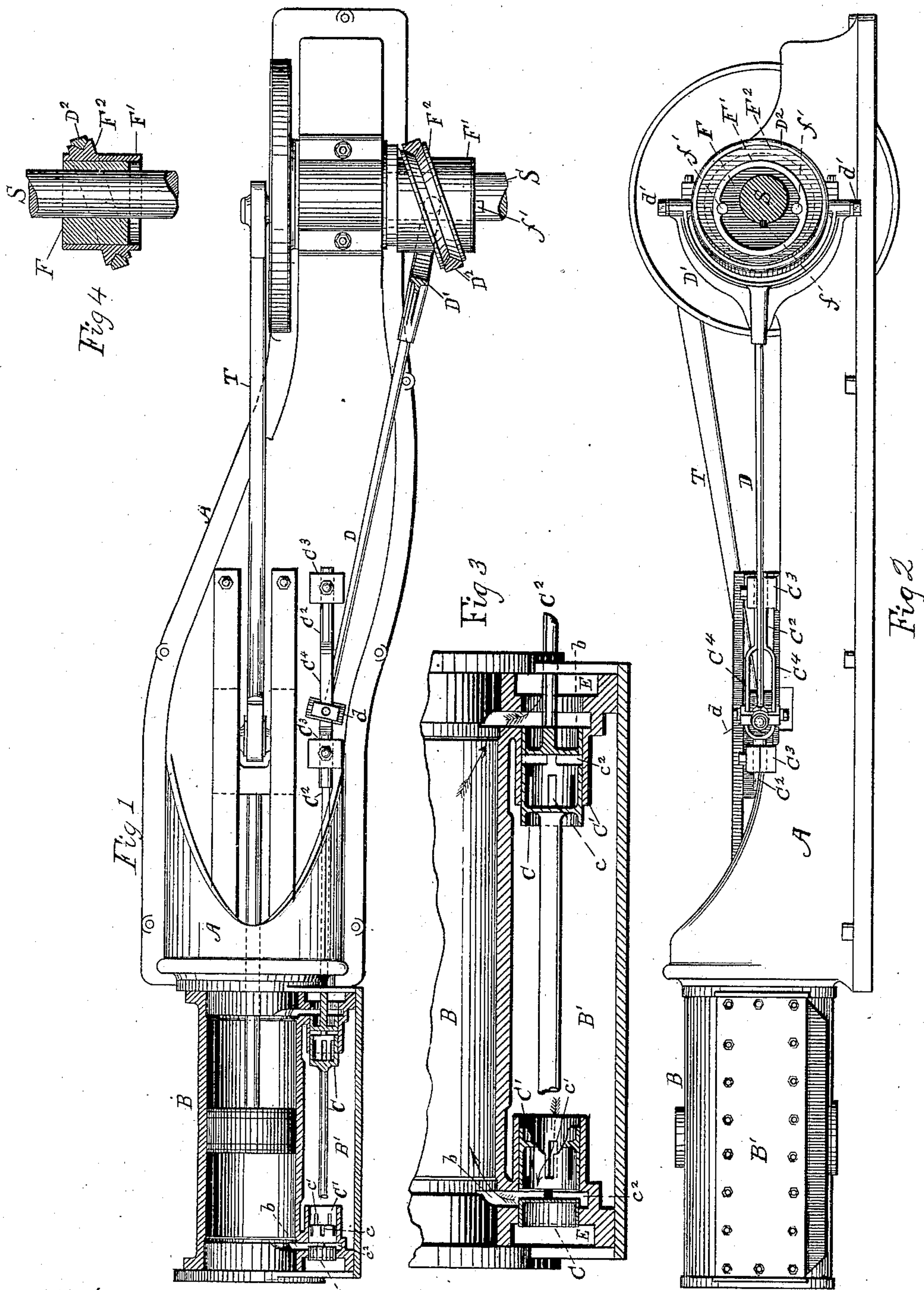


(No Model.)

E. F. SPAULDING.  
VALVE AND VALVE GEAR.

No. 385,533.

Patented July 3, 1888.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## VALVE AND VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 385,533, dated July 3, 1888.

Application filed February 17, 1887. Serial No. 227,928. (No model.)

*To all whom it may concern:*

Be it known that I, ELIJAH F. SPAULDING, a citizen of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Engine Valves and Valve-Gears; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to steam-engines; and it consists in improvements in the construction of the valve and valve-gear thereof, as will be hereinafter fully set forth, and pointed out in the claims.

My invention is illustrated in the accompanying drawings, as follows:

Figure 1 is a top or plan view of a steam-engine having my improvement thereon, the cylinder and valve-chamber being in horizontal section and the eccentric-rod yoke being also in horizontal section. Fig. 2 is a side elevation. Fig. 3 is an enlarged view of the valve and valve-chamber and a fragment of the cylinder in horizontal section. Fig. 4 is a horizontal sectional view of the eccentric, the sleeve upon the eccentric, and the eccentric-strap.

The construction is as follows:

The valve C is a piston-valve, and has at each end a chamber with longitudinal ports  $c$ , and transverse or circumferential ports  $c^2$ . The valve-seats  $C'$  have the ordinary transverse ports,  $b$ , leading into the cylinder, and longitudinal ports  $c'$ , communicating with the steam-chamber  $B'$ .

E E are exhaust-passages at the ends of the valve seats. On the left of Fig. 3 arrows show the passage of steam into the cylinder, and at the right of the same figure arrows show the passage of exhaust-steam from the cylinder. The valve is designed to have two movements, a reciprocating and a rocking movement. The rocking movement brings the ports  $c$  of the valve into or out of communication with the ports  $c'$  of the valve-seat, and the reciprocating movement brings the ports  $c^2$  of the valve into and out of communication with the ports  $b$  of the valve-seat.

I am aware that it is common to make piston-valves with longitudinal ports and impart to said valves both a reciprocating and a rocking movement, (see, for example, Patents Nos. 322,711 and 339,814;) but such a construction does not embody my invention, because the transverse ports in the valve which I show do not appear. The valve-gear by which these movements are given to the valve, as will be hereinafter fully explained, gives to the valve a uniform and unchanging reciprocation, but permits of a varying rocking movement, which variation will be effected by the action of the governing apparatus. The cut-off is effected by the rocking of the valve, and hence is variable, while the traverse of the valve is invariable, and hence the exhaust is never choked. It will therefore be seen that by giving this valve the proper movement it will produce all the effects of two valves, one a variable cut-off and the other an invariable exhaust-valve.

The gear for handling this valve is as follows:  $C^2$  is the valve-stem, which runs in guides  $C^3 C^3$ , where it is round and free to turn, so as to rock the valve. Between the guides the valve-stem is split or slotted, as at  $C^4$ .

D is the eccentric-rod, which connects with the valve-stem by a joint, which allows the eccentric-rod to rise and fall, but compels it to communicate to the valve-stem any twisting or rocking motion it may have imparted to it by the eccentric-gear. (The eccentric-rod has no lateral swinging motion.)

The eccentric-gear consists, first, of an eccentric, F, which is keyed to the shaft; second, a sleeve,  $F'$ , which is loose upon the eccentric and may be rolled thereon independently; third, a diagonally-arranged eccentric-strap holder,  $F^2$ , which is concentric with and fixed to the sleeve  $F'$ ; fourth, an eccentric-strap,  $D^2$ , adjusted in the holder or path  $F^2$ ; fifth, a yoke,  $D'$ , on the eccentric-rod which spans the strap  $D^2$  and is connected with it by trunnions  $d' d'$ . On the sleeve F are pins  $f f$ , or other means for connecting that part with any desirable form of governing device by which said sleeve may be varied in its position—that is, revolved upon the eccentric.

It will be seen that the action of the eccen-



trick to reciprocate the eccentric-rod is invariable; also that the diagonal eccentric-strap path or holder  $F^2$  will give to the eccentric-rod a twisting or rocking movement; and, further, 5 that the relation of the twisting movement to the reciprocating movement can be varied by rolling the sleeve  $F'$  on the eccentric  $F$  without changing the reciprocating movement. The degree of twisting movement is not 10 changed, only its relation to the reciprocating movement is changed; hence the time or place in the stroke or traverse of the valve when it rocks or twists is changed; but the degree to which it rocks is unchanged. I am aware that a 15 wobble-gear has been used in a valve-gear for the purpose of rocking the valve—for example, see Patents Nos. 186,135,264,301,79,341,86,070, and 331,436; but in every instance, so far as I am aware, the wobbles are concentric with 20 the shaft, and the angle of the wobble-gear to the shaft is made variable, and so the degree of rocking movement of the valve is changed, and the steam-supply is regulated by the degree to which the valve is rocked. In an Eng- 25 lish patent, No. 4,859 of 1886, there is shown a wobble which is eccentric to the shaft; but it is not invariably supported at an angle to the shaft. The regulation in that device is effected by varying the angle of the wobble to 30 the shaft, so as to produce a varying degree of rocking movement in the valve. All this is very different from my device.

The office of the eccentric  $F$  and the sleeve  $F'$  is to support the eccentric-strap holder or 35 path  $F^2$  in eccentricity to the shaft, and any other means which will so support said part  $F^2$  and permit it to be shifted by the governor will of course serve the same office or purpose and be the equivalent of the eccentric and 40 sleeve.

What I claim as new is—

1. In a steam-engine, the combination, substantially as set forth, of a valve having transverse and longitudinal ports  $c$  and  $c^2$ , and a 45 valve-gear which reciprocates and at the same time rocks the said valve.

2. In a steam-engine, the combination, substantially as set forth, of a piston-valve having longitudinal ports  $c$  and transverse ports  $c^2$ , 50 a valve seat or chamber having longitudinal ports  $c'$  and transverse ports  $b$ , and a valve-gear which reciprocates and at the same time rocks said valve.

3. In a steam-engine, the combination, substantially as set forth, of a valve having at 55 each end a chamber with longitudinal ports  $c$  leading into it and transverse ports  $c^2$  leading from it, a cylinder having thereon a valve seat or chamber at each end, having longitudinal ports  $c'$  leading from the steam-chest in 60 to said chamber, and transverse ports  $b$  leading from said chamber to the cylinder, said ports coinciding in form and position, respectively, with the ports  $c$  and  $c^2$  in the valve, and a valve-gear for moving said valve which im- 65 parts to it both a reciprocating and a rocking movement.

4. In a steam-engine, the combination, with a reciprocating valve which turns upon its seat to effect a cut-off, of a valve-gear for im- 70 parting an invariable reciprocating movement to said valve, and also a rolling movement which is invariable in degree, but variable as to the point in the longitudinal traverse of the valve at which said rolling move- 75 ment begins and ends, which gear consists of an invariable eccentric on the engine-shaft, a sleeve upon said eccentric which can be rolled thereon, an eccentric strap holder or path which is invariably fixed upon said sleeve at 80 an angle to the shaft, an eccentric-strap loose within said path, and an eccentric-rod connected at one end with said strap by trunnions and at the other end with the valve-rod or stem by a proper joint. 85

5. In a steam-engine-valve-gear, the combination, substantially as set forth, of an invariable eccentric, a sleeve variable by rolling on said eccentric, a diagonal eccentric-strap path invariable upon said sleeve, an eccentric-strap 90 loose within said path, and an eccentric-rod connected with said strap by trunnions in the manner shown, whereby the said eccentric-rod will have imparted to it an invariable reciprocating movement and a rocking move- 95 ment which is invariable in degree, but variable as to the point in its longitudinal traverse at which said rocking movement begins and ends.

In testimony whereof I affix my signature in 100 presence of two witnesses.

ELIJAH F. SPAULDING.

Witnesses:

EDWIN SQUIRE,  
HARLEY W. FISHER.