(No Model.)

E. F. SPAULDING.

VALVE GEAR.

No. 362,400. Patented May 3, 1887.

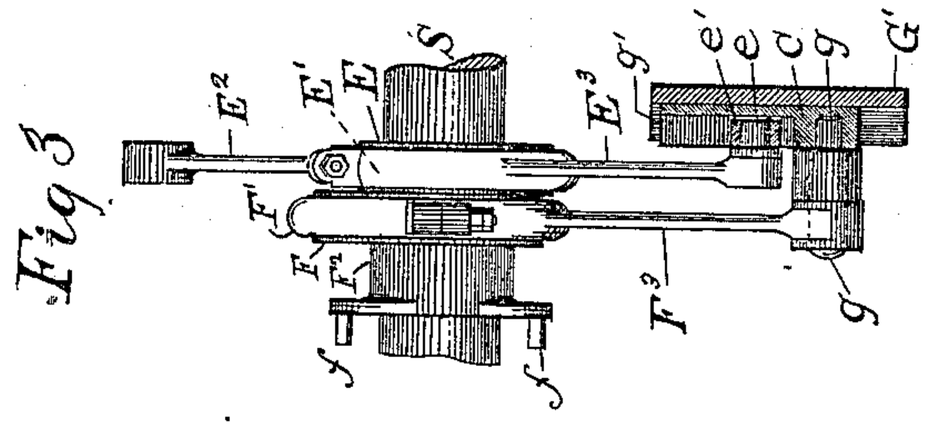

Fig 3.

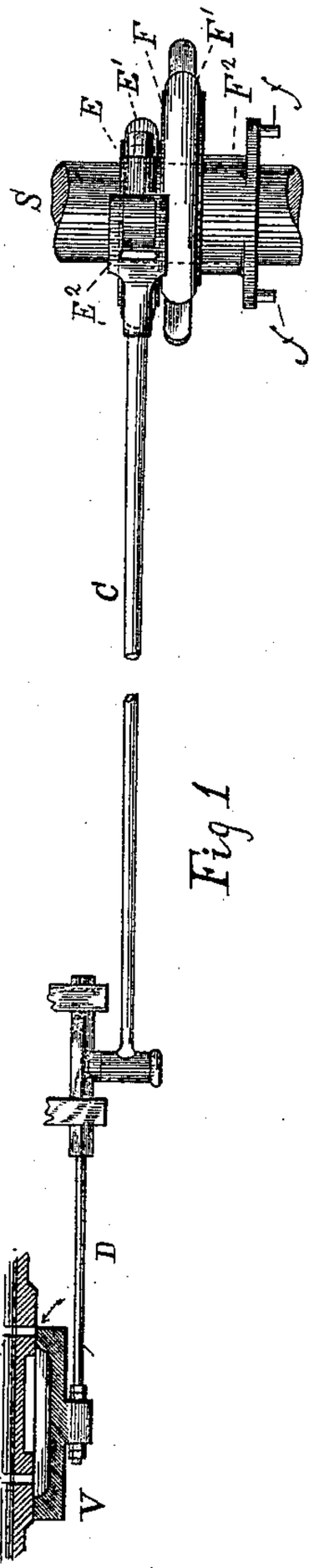

Fig 1.

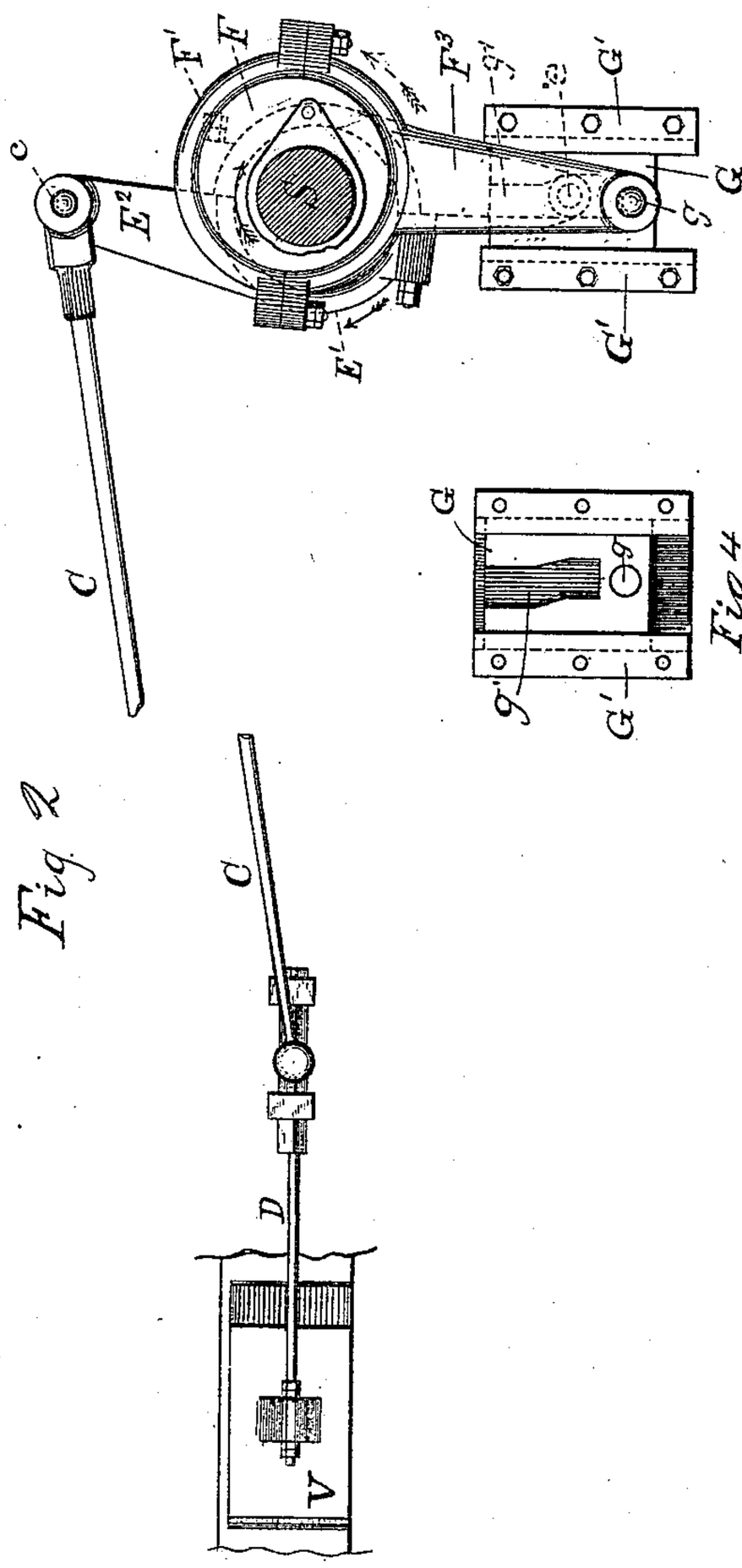

Fig 2.

Fig 4.

Witnesses:
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UNITED STATES PATENT OFFICE.

ELIJAH F. SPAULDING, OF OIL CITY, ASSIGNOR OF ONE-THIRD TO JOHN K. HALLOCK, OF ERIE, PENNSYLVANIA.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 362,400, dated May 3, 1887.

Application filed February 17, 1887. Serial No. 227,927. (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 Valve-Gears for Steam-Engines; 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 valve-gears for steam-engines; and it consists in certain improvements in the construction thereof, as will be hereinafter described, 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 my improved steam-engine valve-gear. Fig. 2 is a side elevation of the same. Fig. 3 is an end elevation taken from the right of Figs. 1 and 2. Fig. 4 is an elevation view of the slide G unobstructed by other parts.

S is the engine-shaft. V is the engine-valve. D is the valve-stem. C is the eccentric-rod. E is the main eccentric. E′ is the main-eccentric strap. F is the auxiliary eccentric. F′ is the auxiliary-eccentric strap. F^2 is a sleeve for connecting the auxiliary eccentric with any desirable governing device.

Other parts will be properly indicated by letters of reference in proper place in the following general description.

The main eccentric is fixed to the shaft, and the auxiliary eccentric is loose upon the shaft, and will be rolled thereon by the governing device, which is not shown, but which connects with the pins *f* on the sleeve F^2.

The main-eccentric strap E′ has an arm, E^2, extending above the shaft, by which it engages with the eccentric-rod, and a second arm, E^3, which extends below the shaft and carries a pin, *e*, with friction-roller *e′*, which lies in a groove, *g′*, in the face of a slide, G, guided in guides G′, which will ordinarily be fixed to the bed of the engine. It will therefore be seen that the eccentric-strap E′, with its arms E^2 and E^3, becomes a lever, having its fulcrum at *e*, its weight at *c*, where it connects with the eccentric-rod C, and its power at E, which is the main eccentric. The shifting or auxiliary eccentric strap F′ has an extension or arm, F^3, which extends below the shaft and engages a pin, *g*, fixed in the slide G. It will therefore be noted that the eccentric F as it rotates will reciprocate the slide G.

In the face of the slide G is a groove, *g′*, which deviates from a straight course. It is straight at top and bottom, but angles near its middle part. As the pin *e* of the eccentric-strap lever E′ E^2 E^3 is set in the slot *g′*, and as this slot is angular in its course, and as the slide containing said slot is reciprocated, it will be seen that at each movement of the slide, both up and down, the said strap-lever will be moved. Whenever so moved, the fulcrum of the strap-lever will be on the eccentric, the power at the pin *e*, and the weight at the point *c*. It will be seen, also, that any such movement will move the valve independent of the eccentric. It will also be seen that this independent movement will occur twice in each revolution of the eccentric E. It will also be seen that the points where it will occur may be varied by rolling the eccentric F on the shaft, and thus changing the lead of the slide G, which operation will be performed by the governing device.

As shown in the drawings, the valve has been brought by the revolving shaft and eccentric E in the direction of the full-line arrow to a point just ready to open the steam-port and admit steam to the cylinder, and the main eccentric E not having reached its dead-center, the movement of the valve will be continued and the port opened if no other influence is brought to bear on the valve; but it will be observed that the position of the cut-off eccentric F and the direction of its movement is to move the slide G down, and has moved it to a point where the offset in the groove *g′* is in contact with the pin *e* on the arm E^3 of the strap-lever E′ E^2 E^3, and that any further movement will carry the pin *e* through the offset in the groove *g′*, and this will move the strap-lever E′ E^2 E^3 on the eccentric as a fulcrum, and draw the valve back and prevent it opening. Now, if the eccentric F were slightly shifted in the direction of the

dotted arrow, the pin *e* on the arm E^3 would be in the straight part of the groove, and the port would be opened by the valve.

The amount that the valve opens the port and the time of closing depend on the relative positions of the two eccentrics, and this is to be regulated by the governing device.

I do not show a governing device, because almost any of the well-known devices may be used, and its operation forms no part of this invention. The main eccentric being keyed to the shaft, the ports will be opened and closed to the exhaust, and to admit steam to the cylinder at the same point in the stroke of the piston, as the pin *e* on the arm of the main-eccentric strap will at such times always be in the straight part of the groove *g'* in the slide G. The same movement of the valve as is produced by my gear has been effected by other gears—as, for example, see Patent No. 12,729, to Schenck, April 17, 1855, and No. 287,879, to Skinner, November 6, 1883; but in each of those cases cams on the shaft and levers pivoted off of the shaft, and provided with followers for engaging said cams, are used. Such devices cannot be employed on engines running at high speed without much noise and inaccuracies.

My device, it will be seen, is much simpler in construction, and is entirely positive in its action, and may be run at high speed without rattling, and it is entirely different in its construction.

What I claim as new is—

1. In the valve-gear of a steam-engine, the combination, substantially as shown, of two eccentrics on the engine-shaft, one fixed and the other shiftable, a strap around the shiftable eccentric, with an arm extending therefrom carrying a reciprocating cam, a strap around the fixed eccentric having an arm extending therefrom, which engages with the said reciprocating cam in a manner substantially as shown, whereby the reciprocations of said cam will oscillate the said strap on the fixed eccentric, and gearing for operating the valve of the engine from said strap on the fixed eccentric.

2. In the valve-gear of a steam-engine, the combination, substantially as set forth, of two eccentrics on the shaft, one fixed and the other shiftable, a strap on the shiftable eccentric, which connects with and reciprocates a sliding cam, and a strap on the fixed eccentric which has one arm to which the valve-rod is connected and another arm which engages said sliding cam in a manner substantially as shown, whereby the said cam will rock the said strap on the fixed eccentric as it is reciprocated by the shiftable eccentric.

3. In a steam-engine valve-gear, the combination, substantially as set forth, of the eccentrics E and F on the shaft of the engine, of which E is fixed and F is shiftable, and is provided with means for connecting it with a governing device, the eccentric-strap F' on the eccentric F, having an arm, F^3, connecting with the pin *g* on the cam-slide G, and the eccentric-strap E' on the eccentric E, having arms E^2 and E^3, of which the arm E^2 connects with the valve-rod, and the arm E^3 engages with the cam in the cam-slide G.

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

ELIJAH F. SPAULDING.

Witnesses:

EDWIN SQUIRE,

HARLEY W. FISHER.