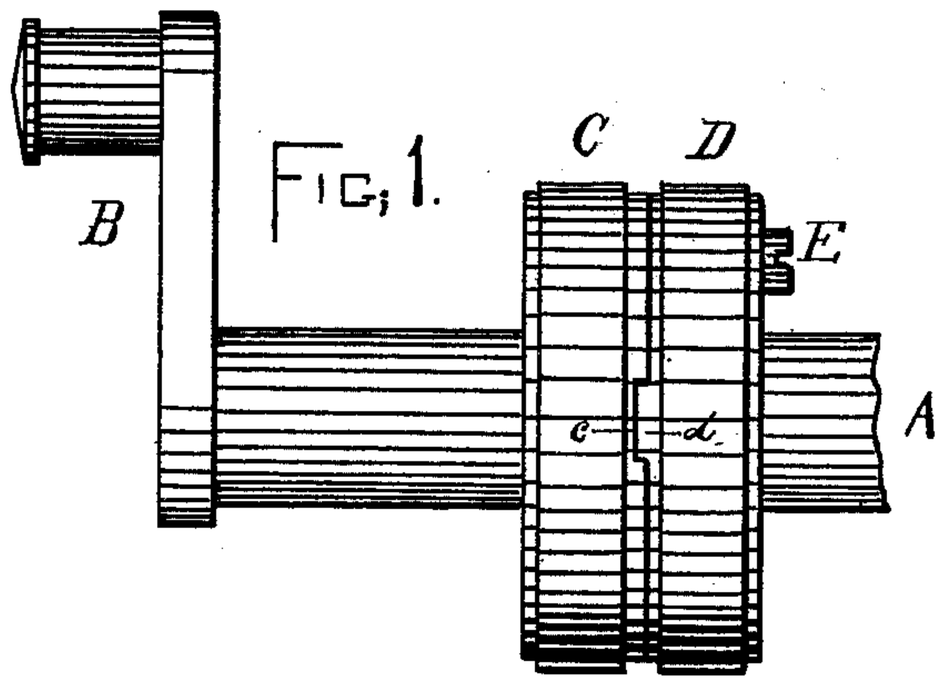
2 Sheets—Sheet 1.

F. H. BALL.

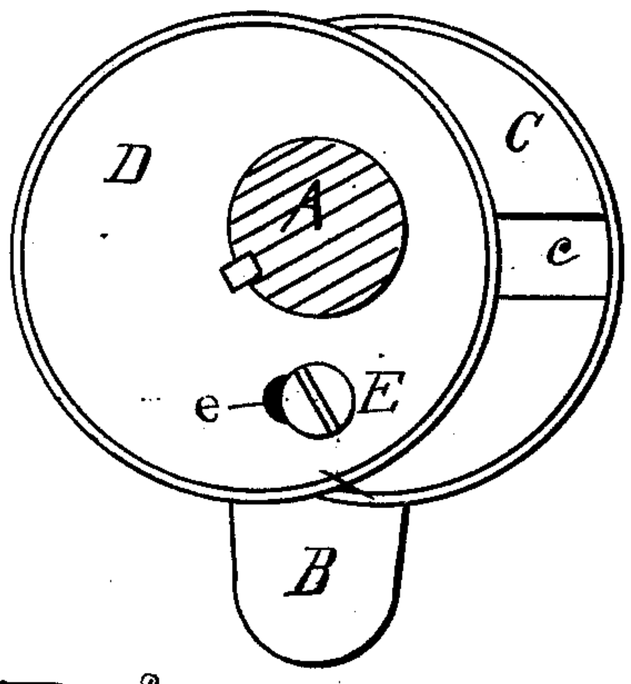
Valve Gear for Steam Engines.

No. 229,797. **Patented July 13, 1880.**

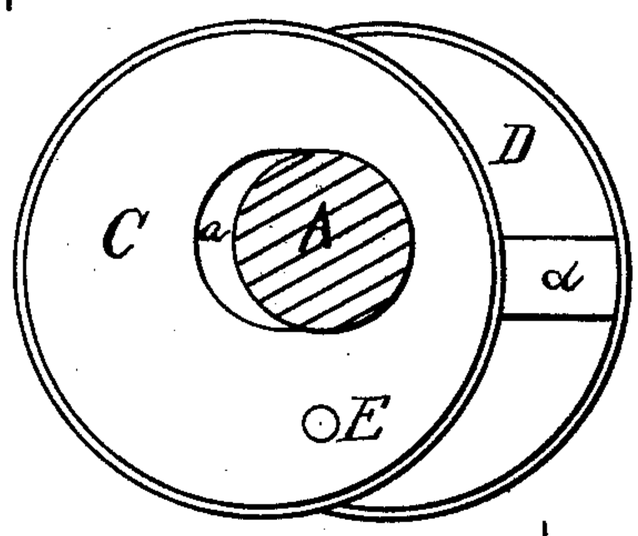
FIG; 1.



FIG; 2.



FIG; 3.



WITNESSES

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INVENTOR

Frank H. Ball

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2 Sheets—Sheet 2.

F. H. BALL.

Valve Gear for Steam Engines.

No. 229,797. Patented July 13, 1880.

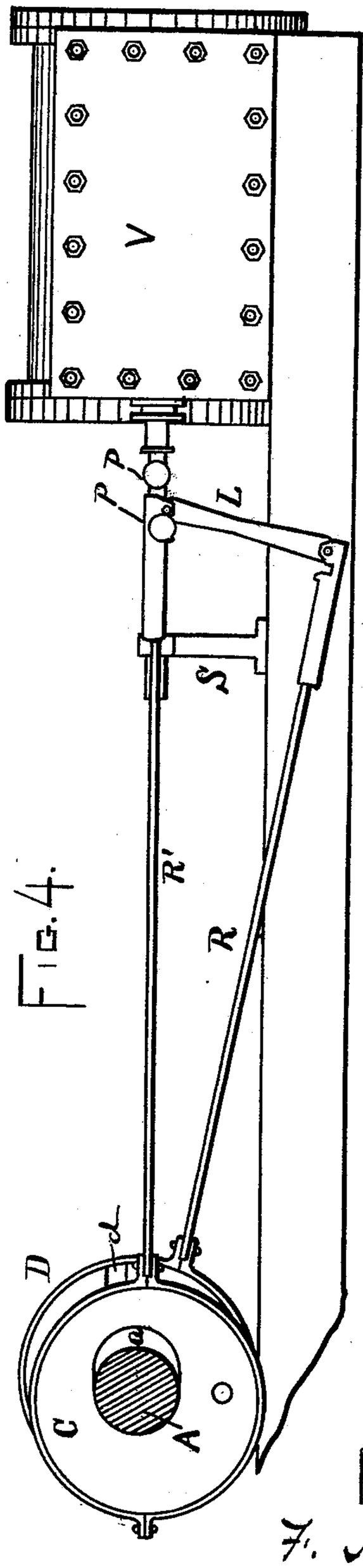

FIG. 4.

WITNESSES

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UNITED STATES PATENT OFFICE.

FRANK H. BALL, OF ERIE, PENNSYLVANIA.

VALVE-GEAR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 229,797, dated July 13, 1880.

Application filed December 4, 1879.

To all whom it may concern:

Be it known that I, FRANK H. BALL, of Erie, in the county of Erie and State of Pennsylvania, have invented a new and useful Improvement in Valve-Gears for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My improvement in the valve-gear of a steam-engine consists in providing the link-movement of a reversible engine with means whereby the said engine may be made to run with more power in its forward than in its reverse movement, or vice versa, and by which it can be adjusted at any time so as to run with more or less power in its forward movement or in its backward movement than it formerly did. In other words, my invention consists in providing a reversible steam-engine with means whereby it may be adjusted or set so as to most economically perform the work assigned it.

The work to be performed by a reversible steam-engine is often lightest when it is running reversed, and often the above conditions are reversed. For example, in running a hoist or crane, the forward work is much the heavier, while in running a saw-mill the reverse is true; for although, when running reversed, as in gigging, the saw is not at work, the speed required to gig quickly requires that the steam be admitted to the cylinder throughout a greater part of the stroke of the piston than when the slow steady work of sawing is being done. So it is obvious that if the engine can be adjusted so as to more nearly consume the amount of steam required in each of its operations such a change will be economical.

Of course, if it were known when the engine was being made what its work was to be, the eccentrics of the valve-gear could be then adjusted properly; but such is not always the case, and the same engine often changes its work. So it is advantageous to have the valve-gear so constructed as to be capable of proper adjustment. I effect this by making one of the eccentrics of the valve-gear adjustable, directly transverse the shaft, upon the side of the other eccentric, which is fixed. By this means the throw of one of the eccentrics can be varied with relation to the other, and as the adjustment is directly transverse the shaft the lead of the valve is not changed, but the cut-off of the valve is changed.

In setting up the engine the fixed eccentric can be made to cause the valve to cut off, so as to have a reasonable amount of expansion of steam in the cylinder, and then the movable eccentric can be so adjusted as to run the engine with more or less expansion, as may be desired. It will therefore be preferable that the adjustable eccentric be the one that moves the engine in its forward movement, as the engineer can then adjust it so as to run with more or less expansion than the fixed eccentric provides for, and so adjust the engine to the character of the work it has to perform.

I am aware that it is not new to provide an eccentric with means whereby it can be adjusted directly transverse the shaft.

My invention consists in combining within the valve-gear of a reversible engine a fixed eccentric and a movable eccentric adjustable upon the side of the fixed eccentric, whereby the engine can be adjusted in the manner and for the purposes above set forth.

Figure 1 is a side elevation. Fig. 2 is an elevation taken on the right of Fig. 1. Fig. 3 is a like view taken from the left of Fig. 1. Fig. 4 is a side elevation of a steam-engine valve-gear, and shows my invention applied to the same.

A is the shaft, B the crank, and C D are the eccentrics, of the valve-gear. R R′ are the connecting-rods, of which R is attached to the eccentric which moves the engine in its forward movement, and R′ to the eccentric which moves the engine in the reverse movement. L is the link. P P are the pins on the valve-stem with which the link engages. S is the valve-stem guide, and V is the valve-chamber.

My device is constructed as follows: The adjoining faces of the eccentrics are finished with a spline and groove, *c d*. The eccentric C has its opening for the shaft made elliptical, as at *a*, Figs. 3 and 4. On one side of the eccentric D is a slot, *e*, in which is a set-screw, which screws into the other eccentric.

It will be seen that by means of the elliptical opening *a* in the eccentric C it can be moved laterally at right angles to the shaft, so as to change its eccentricity, and by the set-screw E it can be secured at any desirable point.

The spline and groove *c d* serve as a guide, and prevent any deviation from a direct right-angle movement of the eccentric in its adjustment. This is essential, as any deviation from a direct right-angle lateral movement would change the lead of the valve, as well as its traverse or throw, and would be fatal to the efficiency of the device. The adjustable eccentric C is the one that moves the valve in the forward movement of the engine.

What I claim is as follows:

1. In the valve-gear of a reversible steam-engine, the combination, with the reversing-link and connecting-rods, of a fixed eccentric, with a movable eccentric attached to the side thereof and adjustable diametrically thereon, substantially as and for the purposes set forth.

2. The combination of the eccentrics C and D, spline and groove *c d*, elliptical opening *a*, slot *e*, and set-screw E, substantially as and for the purposes set forth.

In testimony whereof I, the said FRANK H. BALL, have hereunto set my hand.

FRANK H. BALL.

Witnesses:
JNO. K. HALLOCK,
H. R. BARNHURST.