A. W. Foster, Jr.,

Steam-Engine Valve-Gear.

No. 51,821. Patented Jan. 2, 1866

Fig 1

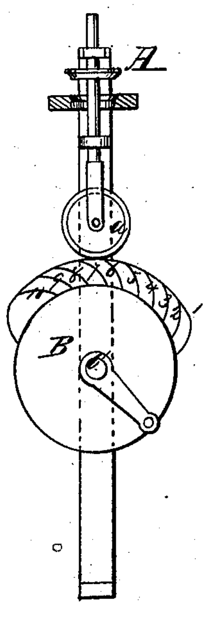
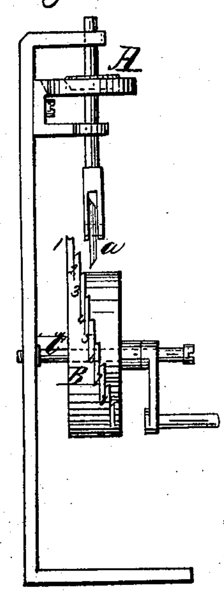


Fig 2



Witnesses:
Wm Trewin
Theo. Tusch

Inventor.
A W Foster
By Munn & Co

UNITED STATES PATENT OFFICE.

ALEXANDER W. FOSTER, JR., OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN CUT-OFF VALVE-GEARS.

Specification forming part of Letters Patent No. **51,821**, dated January 2, 1866.

To all whom it may concern:

Be it known that I, ALEXANDER W. FOSTER, Jr., of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and Improved Adjustable Cut-Off; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a front elevation of this invention. Fig. 2 is a side elevation of the same.

Similar letters of reference indicate like parts.

This invention relates to a cut-off in which the valve is tripped by the action of a combination-cam or a cam formed of a series of cams of decreasing length, said combination-cam being made self-adjusting on its axis by the motion of the governor in such a manner that when the speed of the engine increases and the balls of the governor fly out the cam is brought in such a position that the valve is kept open for a shorter time than it is when the speed of the engine slacks off and the balls of the governor sink down. The several cams which form the combination-cam are made V-shaped, and they operate, in combination with a V-shaped friction-roller at the end of the valve-stem, in such a manner that the governor is prevented from moving the cam while the valve is being seated, and the length of the several cams is so adjusted in relation to each other that each cam cuts off at a certain constant or regular percentage on the one immediately preceding, thus differing from ordinary cut-offs, which cut off at equal intervals on the stroke of the piston.

A represents the cut-off or throttle-valve of a steam-engine, which is opened and closed by the action of a combination cam or drum, B. This drum slides back and forth on its axis C, and it is to be connected with the governor in such a manner that it is moved on its axis in the direction of the arrow (marked near it in Fig. 2) when the speed of the engine increases and the balls fly out, and in the direction opposite to said arrow when the speed of the engine decreases and the balls of the governor shut down.

The cam or drum B is composed of a series of cams, 1 2 3 9 10, which decrease in length, and as said drum rotates with the axis C one of the cams, 1 2 3, &c., acts on the friction-roller *a* in the end of the valve-stem and raises the valve, keeping it open for a longer or shorter period, according to the length of the cam acting on the roller. The cam 1 is the longest of the series, and if the drum B is brought in such a position that this cam acts on the valve said valve is kept open during the entire stroke of the piston. The next succeeding cam, 2, is somewhat shorter than the cam 1, &c., down to the cam 10, which is the shortest, and keeps the valve open only for a very small portion of the stroke. The length of the cams decreases according to a certain rule, so that each cam cuts off at a certain constant or regular percentage on the one next preceding. For instance, suppose a two-foot engine-cam No. 10 to be five inches on the stroke, by adding twenty per cent. we have No. 9 at six inches, and twenty per cent. on this for No. 8 at seven and two-tenths inches; for No. 7 add twenty per cent. on the last gives eight and sixty-four one-hundredths inches; for No. 6 we have nine and thirty-seven one-hundredths; for No. 5 we have eleven and fourteen one-hundredths; for No. 4 we have thirteen and thirty-seven one-hundredths; for No. 3, sixteen and four one-hundredths; for No. 2, nineteen and twenty-five one-hundredths, and for No. 1 we have twenty-three and ten one-hundredths inches. By this arrangement the speed of the engine is rendered more regular and more uniform than by the ordinary cut-off arrangements, which cut off at equal intervals on the stroke of the piston.

The working-faces of the cams 1 2 3, &c., form V-shaped grooves, and the face of the friction-roller *a* is formed to correspond to said grooves, so that while the valve is being seated—that is to say, during the time the roller *a* runs in the V-shaped groove of one of the cams—the drum B cannot be shifted on the axis C by the action of the governor. By this arrangement violent fluctuations of the governor are prevented and the speed of the engine is gradually brought to the desired point.

I am aware that cut-offs have been used analogous in principle to mine, but having a single oblique-faced cam instead of the series of

cams above described. My invention is superior to such in being more definite and precise in the period and extent of its action upon the valve, and also in avoiding any tendency to lateral pressure and consequent unequal wear.

I claim as new and desire to secure by Letters Patent—

1. The drum B, constructed, as herein described, with a series of cams, 1 2 3 9 10, of gradually-decreasing length and made to shift on its axis by the action of the governor, to operate in combination with the valve A, substantially as and for the purpose described.

2. Providing the working-faces of the cams 1 2 3 10 with V-shaped grooves to operate in combination with the V-shaped roller *a* on the valve-spindle, substantially as and for the purpose set forth.

ALEXANDER W. FOSTER, JR.

Witnesses:
A. W. FOSTER,
DOUGALD MUNN.