H. S. COLE.

VALVE-REGULATOR FOR STEAM-ENGINES.

No. 180,205. Patented July 25, 1876.

Fig. 1.

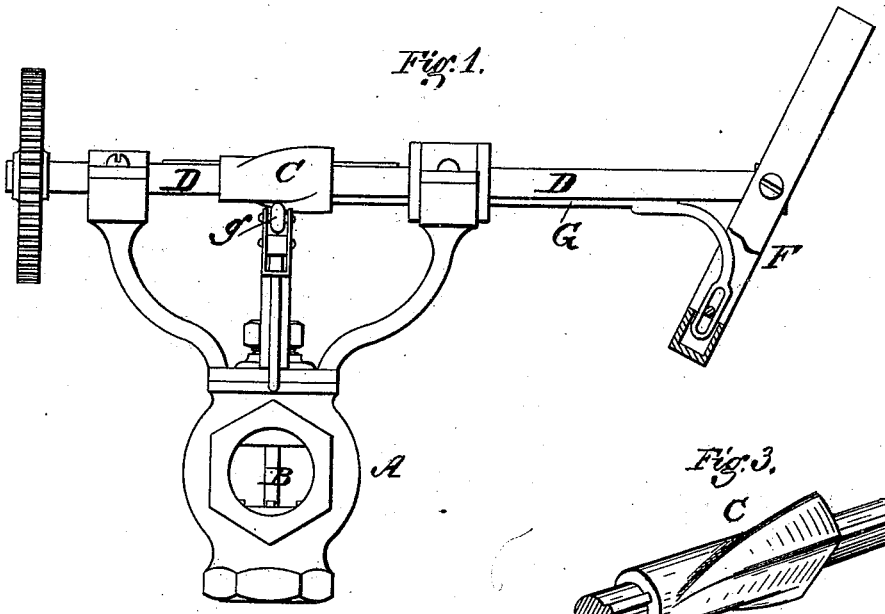


Fig. 3.

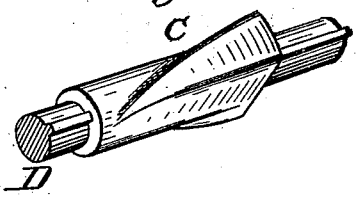
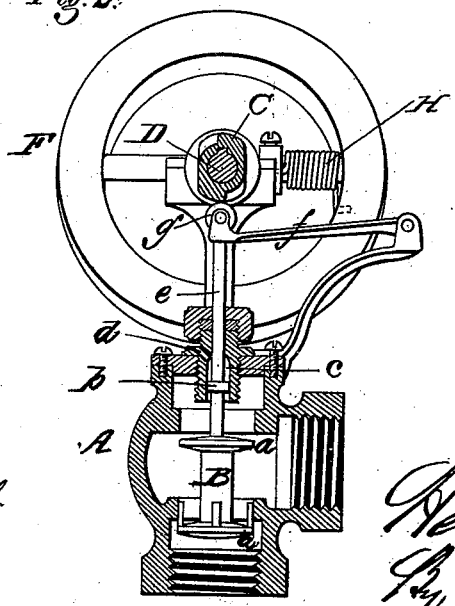


Fig. 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY S. COLE, OF MILWAUKEE, WISCONSIN.

IMPROVEMENT IN VALVE-REGULATORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **180,205**, dated July 25, 1876; application filed April 18, 1876.

To all whom it may concern:

Be it known that I, HENRY S. COLE, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain Improvements in Cut-Off Valve-Gear and Valve for Steam-Engines, of which the following is a specification:

My invention consists in the peculiar combination of a puppet-valve, a rotary sliding cam operating said valve, and a governor-wheel controlling the action of the cam, in such manner as to vary the point at which the steam is cut off; and it also consists in the peculiar construction of the balanced valve, having a small supplemental piston, by which it is caused to close under the steam-pressure.

Figure 1 represents a side elevation of my cut-off mechanism; Fig. 2, a transverse vertical section through the center of the same; Fig. 3, a perspective view of the cam.

A represents the body of the valve, and B the round sliding valve therein, of a construction similar to others now in use, with two pistons, *a*, seated in corresponding throats, and receiving the pressure of the steam in opposite directions, so that the pressure upon one is balanced by that on the other, and the valve thereby caused to open and close with ease, and without being affected by the pressure of the steam. In order to cause the automatic closing of the balanced valve by the pressure of the steam, I provide it with a small piston, *b*, working in a small cylinder, *c*, formed in the top of the body, and, in the upper end of the cylinder, make a hole, *d*, communicating with the atmosphere, as shown in Fig. 2. The pressure of the steam against the under side of the piston forces the valve B upward, closing it, and keeping it closed, except when opened by the application of an external force. The valve is provided with a spindle, *e*, extending out through a stuffing-box at the top of the body. The spindle sustains upon its upper end the free end of a pivoted arm, *f*, which is provided with a roller, *g*, acted upon by a depressing-cam, C, which is mounted on a horizontal shaft, D, as shown. The cam, depressing the roller and spindle, opens the valve, and admits steam to the engine, and then, as its rotation continues, it releases the parts, and permits the steam-pressure to close the valve again. The cam is shaped so as to actuate the valve twice during each revolution, and is arranged to turn at the same speed as the main shaft of the engine, whereby the opening of the valve and admission of steam is effected at the proper time. The cam is made of an elongated form, and arranged to move endwise on the shaft, and has its projecting faces, or cam-faces proper, which actuate the valve, made of decreasing width from one end to the other, as shown, so that by shifting the cam endwise, and bringing into action a wider or a narrower portion of its faces, it may be caused to hold the valve open a longer or a shorter time, as required. The front edges of the cam-faces are in line with the axis of the shaft, so that the valve is always opened at the same time or point in the stroke of the engine; but, owing to the variation in the width of the faces, the closing takes place sooner or later, according to the position of the cam on the shaft. When the cam is in such position that the narrow ends of its faces act upon the roller the valve is held open but a short time, and, consequently, the steam is cut off at an early point in the stroke; but, as the cam is shifted endwise, the point of cutting off the steam is gradually delayed until the maximum limit of supply is reached. The proper movement of the cam endwise to vary the point of cutting off the steam is effected by means of pendulum balls or weights, or a governor wheel or ring, F, pivoted to a transverse arm on the cam-shaft, as shown, and connected, by a sliding bar, G, to the cam. A spring, H, is applied in the manner shown, to tip the wheel over at an inclination, and thereby push the cam into such position that its wide ends will come into action, and hold the valve open the maximum length of time; but, as the speed of the engine increases, the consequent increased speed of the governor-wheel develops a centrifugal force to correspond, whereby the wheel is caused to straighten up from its inclined position, and move the cam endwise until it cuts the steam off at such point as to reduce the speed of the engine to the proper limit. Thus it will be seen the governor-wheel controls the action of the cam in such manner that the steam is cut off at

just such point as to keep the engine running at the desired speed. By constructing the balanced valve with the small piston, as described, and combining it with the cam and governor, I produce an exceedingly cheap, simple, and reliable cut-off, and one which operates with great delicacy.

What I claim as my invention is—

1. In combination with the sliding cam C, mounted on the shaft D, and arranged to operate the valve B, the governor-wheel F and the connecting-bar G, seated in the groove in the shaft, and connected at one end to the cam, and at the other, by a pin and slot, with the governor-wheel, as shown.

2. The combination of the body A, provided with the two valve-throats and the cylinder *b*, and the valve B, provided with the balancing-pistons *a* and closing-pistons *c*, substantially as shown.

HENRY S. COLE,

Witnesses:
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