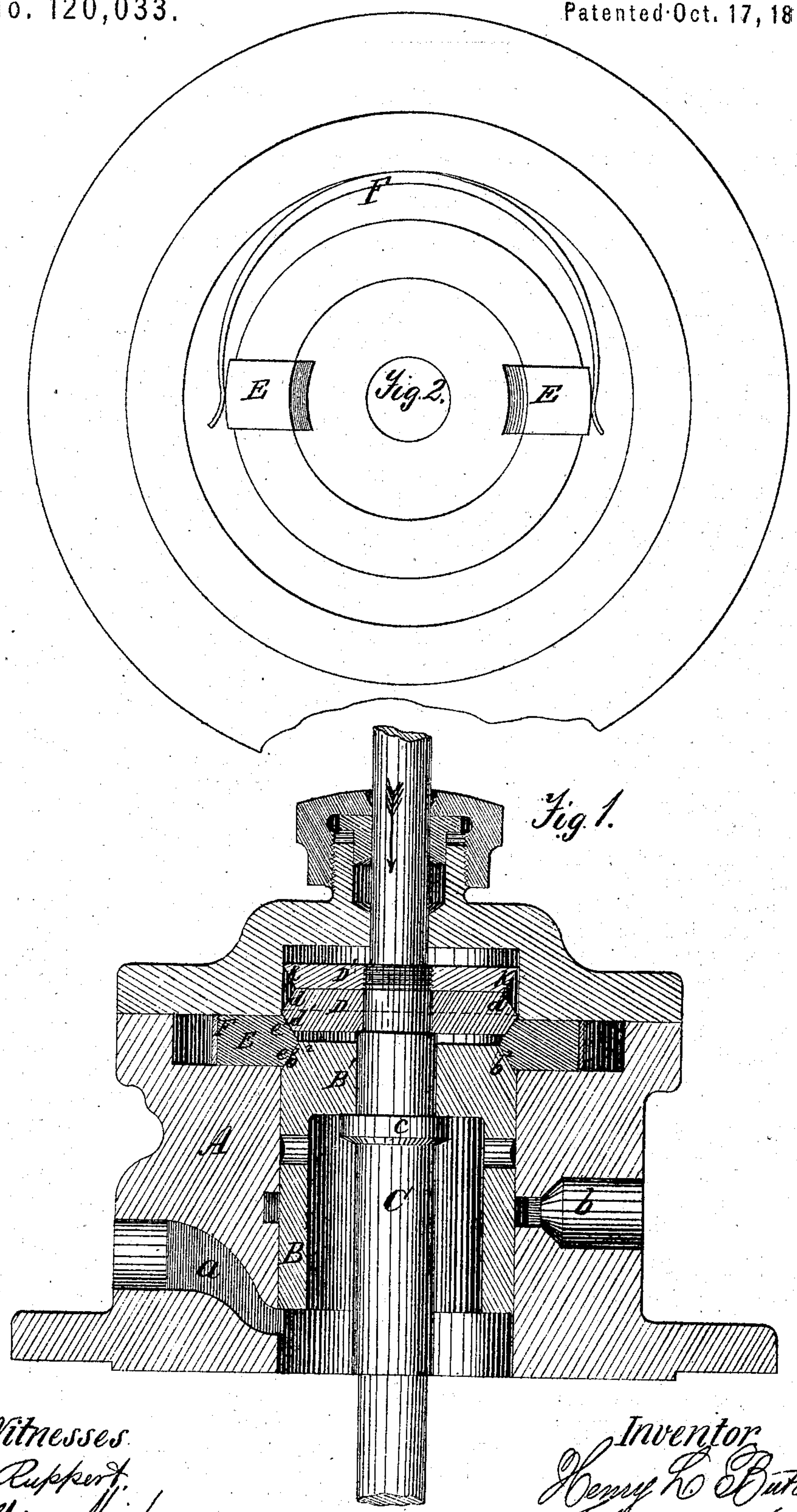


HENRY L. BUTLER.
 Improvement in Valves for Steam Engines.
 No. 120,033. Patented Oct. 17, 1871.



Witnesses
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HENRY L. BUTLER, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN VALVES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 120,033, dated October 17, 1871.

To all whom it may concern:

Be it known that I, HENRY L. BUTLER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain Improvements in the Method of Operating Valves of Steam-Engines, of which the following is a specification:

This invention relates to that class of slide-valves of steam-engines and steam-pumps the shifting of which is initiated by some reciprocating part of the engine but completed by mechanism acting entirely independent of the engine; and the first part of my improvement consists in the combination, with the valve and its stem, of a cross-bar or disk with double-inclined ends or periphery bearing against similarly-inclined pushers, which are acted upon by a stiff spring or springs, all so arranged in relation to one another that the initial motion of the valve-stem will carry the apexes of the inclines of its bar or disk just beyond the apexes of the receding pushers, and the throw of the valve completed by the reaction of the springs which return the pushers to their normal positions. The second part of the invention consists in providing for a little end play of the stem independent of the valve, so that the apexes of the inclines may pass each other just before one steam-passage is closed and the other opened, to obviate the possibility of the stoppage of the engine at the end of each stroke, which might occur, especially in working slowly, were the apexes or crests of the inclines to come opposite to each other at the moment when one steam-passage is closed and the other not opened. The third part of the invention consists in the use of inclined surfaces, corresponding with the inclines on the pushers, which are arranged to check the throw of the valve in each direction by abutting against the pushers, thus cushioning the valve and preventing the hammering which would occur if the valve were thrown against a fixed object. The fourth part of my invention consists in arranging the herein-described valve-operating mechanism within the valve-chamber, and thus dispensing with any external or exposed parts.

Figure 1 is an axial section of the valve and chest. Fig. 2 is a plan view with the chest-cover removed.

The same letters indicate identical parts.

The valve and chest shown form part of an

engine, the piston of which is driven by live steam in one direction and by hydrostatic pressure in the opposite direction; but the valve is, of course, applicable to engines the pistons of which are driven by steam in both directions. A refers to the steam-chest containing the steam-induction passage *a* and the exhaust-passage *b*. B is the cylindrical valve, fitted into a corresponding aperture in the chest and constructed with ports *b' b'* which open into its cavity and match with the annular passage *b* in the chest when the steam is exhausted. One end of the valve has a head, B', by which it is carried upon the stem C, between a collar, *c*, thereon and the cross-bar or disk D, which is firmly secured on the stem after the valve has been slipped on it. The steam works through a stuffing-box in the cover of the chest, and its initial movement may be imparted to it, through any known means, from some reciprocating part of the engine. The edges of the cross-bar or disk D are beveled each way from the center, forming the inclines *d d'* which meet at their apexes or crests. The inclined edges of the disk bear against the similar inclines *e* or *e'*, according to the position of the valve upon the ends of the pushers E E which project into the aperture in the chest above the valve. The cross-bar or disk D is secured by a nut, D', the edge *k* of which is beveled to form, in connection with the incline *d*, a V-shaped groove to fit over the ends of the pushers so as to prevent the valve being thrown too far in moving away from contact with the pushers. The upper end of the valve is beveled at *b²* to correspond with the inclines *e* of the pushers against which it bears in the position shown in Fig. 1. The pushers are arranged opposite to each other in seats in the top of the chest, held down by the cover thereof. Their beveled ends project into the valve-aperture, and their other ends extend into an annular groove in the chest bearing against the ends of a curved spring, F, or against separate springs if preferred, which should be made of sufficient stiffness to overcome the pressure of the steam on the valve at the end of the stroke. The space between the collar *c* of the stem and the disk D thereon is a little greater than the thickness of the head B' of the valve, permitting the stem to move a short distance before it begins to move the valve, for the purpose explained. In the position of the valve

shown in Fig. 1, steam enters below its lower end through the uncovered passage *a* to drive the piston down. Near the end of the stroke the valve-stem is moved endwise in the direction of the arrow by a reciprocating part of the engine until the crests of the cross-bar or disk *D* are carried just beyond the crests of the pushers *E E*, which are spread apart, but immediately returned to their normal positions by the spring on the crests of the inclines passing one another, whereby the throw of the valve is completed; the passage *a* being covered, while the ports *b' b'* of the valve are brought opposite the exhaust-passage *b*. Holes are bored through the head of the valve to admit steam above it, for the purpose of balancing it as nearly as possible.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of the double-inclined cross-bar or disk *D*, the valve *B*, valve-stem *C*, dies or pushers *E E*, and spring *F*, operating substantially as described.

2. The valve-stem *C*, having its collars or parts operating the valve *B*, arranged as described, so that the one can move independently of the other, substantially as and for the purpose specified.

3. The bevel surfaces *b²* and *k*, arranged to check the movement of the valve, substantially in the manner described.

4. The arrangement, entirely within the steam-chest, of the herein-described mechanism for completing the throw of the valve, so that no stuffing-box shall intervene between the valve and the spring imparting the terminal movement.

In testimony whereof I have hereunto signed my name this 2d day of September, A. D, 1871, in presence of two subscribing witnesses.

HENRY L. BUTLER.

Witnesses:

J. WILLIAM MISTER,
JAMES P. CHAFFEE.

(152)