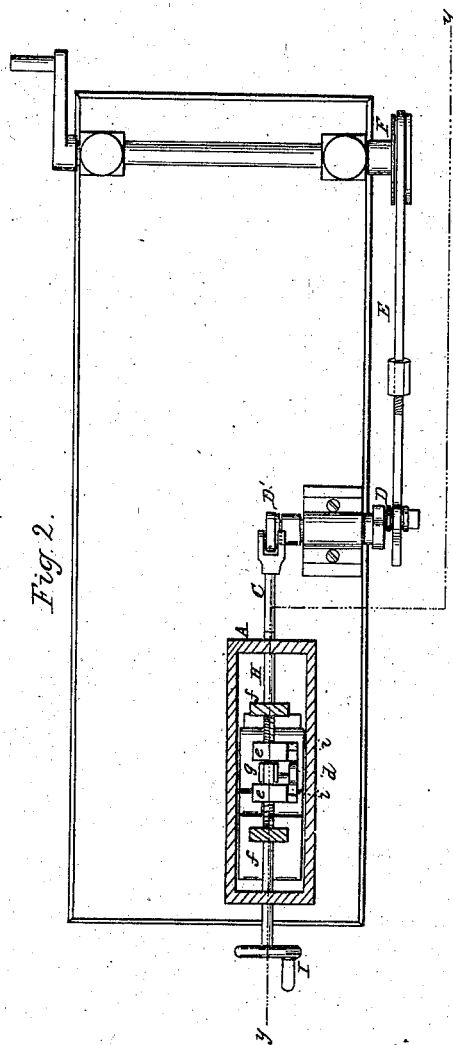
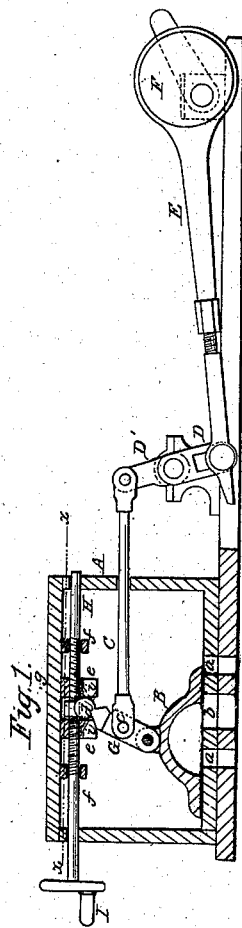


J. B. Cochran,
Steam Balanced Valve.
No 47,932. *Patented May 30, 1865.*



Witnesses.
Geo. Bush
Wm. Brown

Inventor.
J. B. Cochran
per mmw & c
Attorneys.

UNITED STATES PATENT OFFICE.

JOHN B. COCHRAN, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN SLIDE-VALVES.

Specification forming part of Letters Patent No. 47,932, dated May 30, 1865.

To all whom it may concern:

Be it known that I, JOHN B. COCHRAN, of Brooklyn, Kings county, State of New York, have invented a new and useful Improvement in Operating Slide-Valves; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others 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 is a vertical longitudinal section of a slide-valve and its connections made according to my invention, the section being taken on the bent line *y* of Fig. 2. Fig. 2 is a horizontal section taken on the line *x* of Fig. 1.

Similar letters of reference indicate like parts.

This invention consists in a novel mode of operating slide-valves of steam-engines, so that it may be made to cut off steam at any desired part of the stroke and be also moved with a quick stroke, one of the features of the invention being the communication of the motion of the valve-stem to the valve through a vibrating lever, whose upper end, which is free, is made the fulcrum of the said lever.

A is the steam-chest, which contains the slide-valve B.

a a designate steam-ports, and *b* an exhaust-port, which are made to communicate with the cylinder of the engine in the usual way.

F is an eccentric, and E a connecting-rod, which is adjustably connected to the rock-shaft arm D. The toe D' of the rock-shaft is connected to the valve-stem C, which passes into the steam-chest A, through its adjacent end, at about or above the middle of its height, and its end within said steam-chest pivoted to a lever, G, which extends upward from the top or back of the slide-valve, to which its lower end is pivoted. The upper free end of the lever G is rounded, the rounded part being separated from the body of the lever by a neck whose sides respectively come opposite the wedge-shaped projections *ii*, standing out from the sides of the traveling nuts *ee*. The edges of the projections *ii* and the neck of the lever G are thus fitted and arranged for the purpose of reducing the frictional contact of those parts to the smallest limits.

H is a rod or shaft passing through the ends of the steam-chest and made capable of re-

volving in bearings formed in said ends, but having no motion endwise. Its place in this example is directly above the axis of the valve and of the valve-stem and parallel therewith. It has both a right-hand and a left-hand screw-thread formed on it, each commencing near the middle of its length, and each screw-thread has a traveling nut, *ee*, which travel either toward each other or away from each other at like speed and at like times, when motion is given to the rod H through its crank I. The outward movements of the nuts are limited by stops *f f*, depending from the top of the steam-chest, and through which the rod passes, and their movements toward each other are limited by a fixed nut or stop, *g*, placed on the rod at the middle of its length, in the same vertical plane with the center of the exhaust-port *b*. From this construction and arrangement it will be seen that I produce an adjustable cut-off of a very simple character, since the valve-stem gives motion to the valve through the lever G; and since the upper end of said lever, which is its fulcrum, (it being a lever of the third order,) is movable, it is evident that the amount of motion imparted to the valve by the reciprocating movements of the valve-stem will be governed by the distances of the nuts *ee* from the center of the central stop, *g*—or, in other words, from each other. When the valve has been moved toward the left, as seen in Fig. 1, it is not again acted upon by the eccentric and its connections until the head of the lever G has moved across the distance which separates the nuts *e*. When it has been brought in contact with the nut on the right-hand side, the further movement of the valve-stem first begins to act upon the valve. I am thus enabled to change the throw of the valve and cut off steam sooner or later in the stroke by simply rotating the rod H and moving the nuts *ee* near to or farther away from each other.

The valve-stem can be attached to the lever G at any part of its length and in such a way as not to bind the valve-stem where it passes through the wall of the steam-chest. The valve-stem C and the screw-rod H should pass through stuffing-boxes, where they enter the sides of the steam-chest, so as to prevent the escape of steam.

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

1. The combination of the valve-stem C with

the lever G, whose lower end is pivoted to the back of the valve and whose upper end is movable, so that the fulcrum by means of which the valve is moved to and fro is a movable one for each throw of the valve, substantially as above described.

2. The combination of the rod H and its

nuts *e e*, operated as set forth, with the lever G, substantially as described.

JOHN B. COCHRAN.

Witnesses:

M. M. LIVINGSTON,
C. L. TOPLIFF.