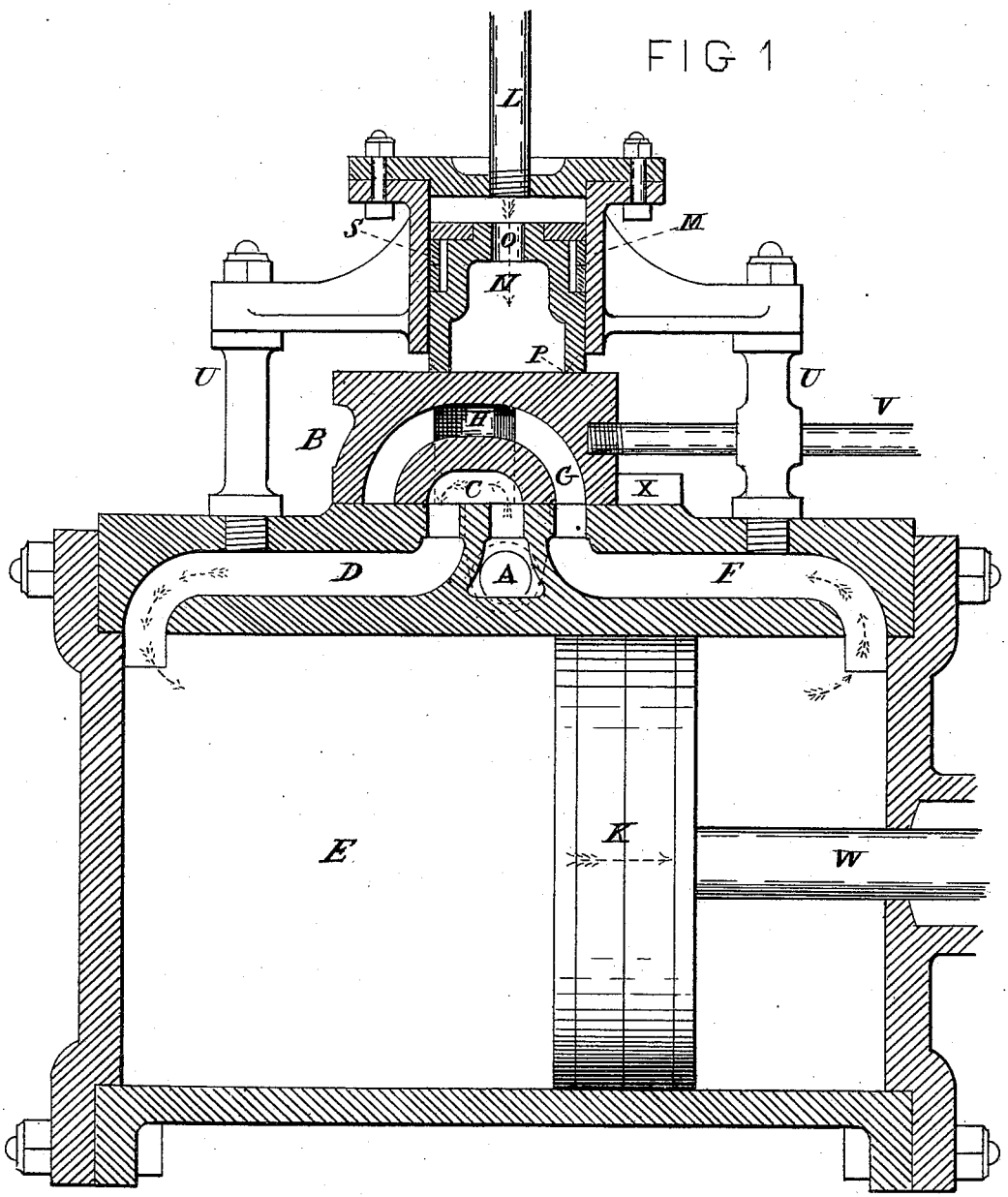
(No Model.) 2 Sheets—Sheet 1.

Z. T. RENO.

SLIDE VALVE.

No. 342,633. Patented May 25, 1886.

FIG 1



WITNESSES

Frederic Cook
Walter D. Cook

INVENTOR

Zachary Taylor Reno

(No Model.) 2 Sheets—Sheet 2.

Z. T. RENO.

SLIDE VALVE.

No. 342,633. Patented May 25, 1886.

FIG 2

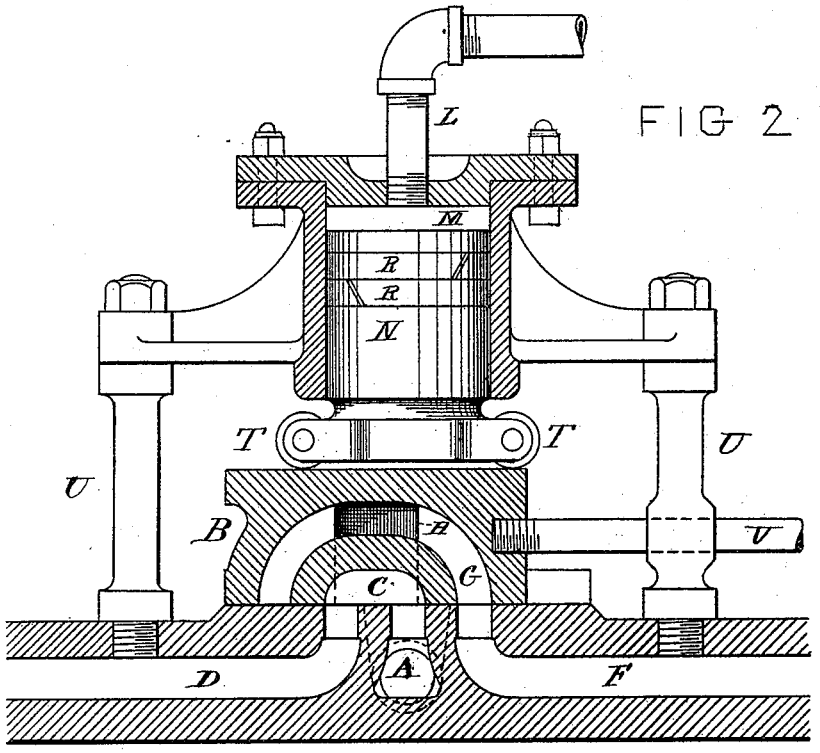


FIG 3

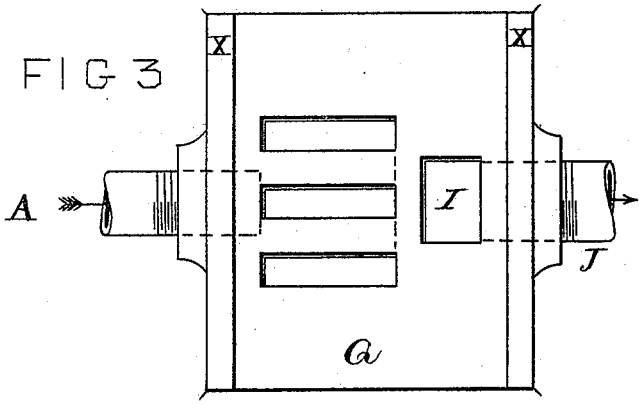
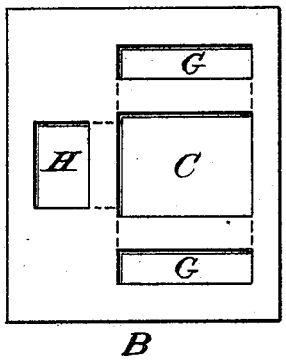


FIG 4



WITNESSES

Frederic Cowie

Walter H. Cook

INVENTOR

Zachary Taylor Reno

UNITED STATES PATENT OFFICE.

ZACHARY TAYLOR RENO, OF NEW ORLEANS, LOUISIANA, ASSIGNOR OF ONE-HALF TO DAVID GREER McCAN, OF SAME PLACE.

SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 342,633, dated May 25, 1886.

Application filed October 3, 1885. Serial No. 178,945. (No model.)

To all whom it may concern:

Be it known that I, ZACHARY TAYLOR RENO, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and useful Improvement in Slide-Valves for Steam-Engines, of which the following is a specification.

My invention relates to a balanced slide-valve that is arranged to have steam-pressure applied both above and below, and to work in the atmosphere without being incased in a steam-chest.

The invention consists in the construction and combination of parts, as hereinafter set forth.

Figure 1 is a longitudinal section of the balanced-valve mechanism and the cylinder and piston of a steam-engine. Fig. 2 is a longitudinal section of my valve with part of the steam-cylinder of engine and mechanism for reducing friction. Fig. 3 is a plan of the valve-seat of a steam-engine cylinder as adapted to my valve. Fig. 4 is a face view of the under side of the valve.

Similar letters refer to similar parts in all the views.

The course of the steam is shown by the arrows. The steam, as indicated in the drawings, enters at A, Fig. 1. It passes up under the valve B at C; thence along the steam-passage D into the cylinder E. The exhaust-steam passes out through passage F into exhaust-passage G; thence through hole H in valve B, down through hole I in valve-seat, Fig. 3 to exhaust-pipe J, opposite steam-pipe A, Fig. 3. When the piston K has reached the end of the stroke and returns, the operation of the valve B reverses and the return-stroke is made, and so on.

At L, Fig. 1, is another steam-pipe, admitting steam to a small steam-cylinder, M. In this is a steam-tight piston, N.

At O is a hole, through which the steam enters and presses on top of the valve B. The area of the space inside the piston N, where the steam presses on top of the valve B, must be equal to the area of the space at C on the under side of the valve B, so that a perfect balance is effected, or nearly so. The difference of the areas of the steam-cylinder M and the area of the inside of the piston N causes the steam-pressure on that difference to keep the joint steam-tight at P. The valve B has faced seats top and bottom. The valve-seat Q and bottom of piston being also faced, no steam can escape to the atmosphere.

At Fig. 2 the piston N has a solid top, and is provided with packing-rings R, as shown at S, Fig. 1.

At T are rollers to diminish friction, working on upper face of the valve B, and holding it to its seat.

L is the steam-pipe that admits steam to the cylinder M.

The operation of the steam is otherwise the same as described for Fig. 1.

In Figs. 1 and 2, U are standards to hold up cylinder M. V is the valve-stem; W, Fig. 1, the piston-rod, and E the engine-cylinder. X are ledges, between which the valve B works, acting as guides. It is obvious that the arrangement may also be reversed, the steam being admitted into the outer openings of the valve B, and the exhaust passing into the central opening. In that case the steam would enter pipe J, and exhaust through pipe A.

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

1. The combination, with an engine-cylinder and its slide-valve, of a frame secured to the outer side of the engine-cylinder, a cylinder supported in said frame, and having a steam-inlet, and a steam-tight piston inclosed in said cylinder, and having a bearing on the outside of the slide-valve, substantially as described.

2. The combination of an engine-cylinder, a slide-valve therefor, said valve having steam-pressure below and above, and working in the atmosphere without being inclosed in a steam-chest, and a steam-tight piston incased in a steam-cylinder and adapted to bear on the outside of said slide-valve, substantially as described.

3. The combination of the cylinder E, having ports A D and F J, the slide-valve B, having ports C G H, the cylinder M, having steam-inlet L, and the piston N, incased in said cyl-

inder, and having a bearing on the outside of the slide-valve, substantially as described.

4. The combination, with the engine-cylinder E, having ports A D and F J, and the slide-valve B, having ports C G H, of the cylinder M, having a steam-inlet at one end, and the piston N, incased in said cylinder and provided with rollers T, having a bearing on the slide-valve, substantially as described.

ZACHARY TAYLOR RENO.

Witnesses:
FREDERIC COOK,
W. H. COOK.