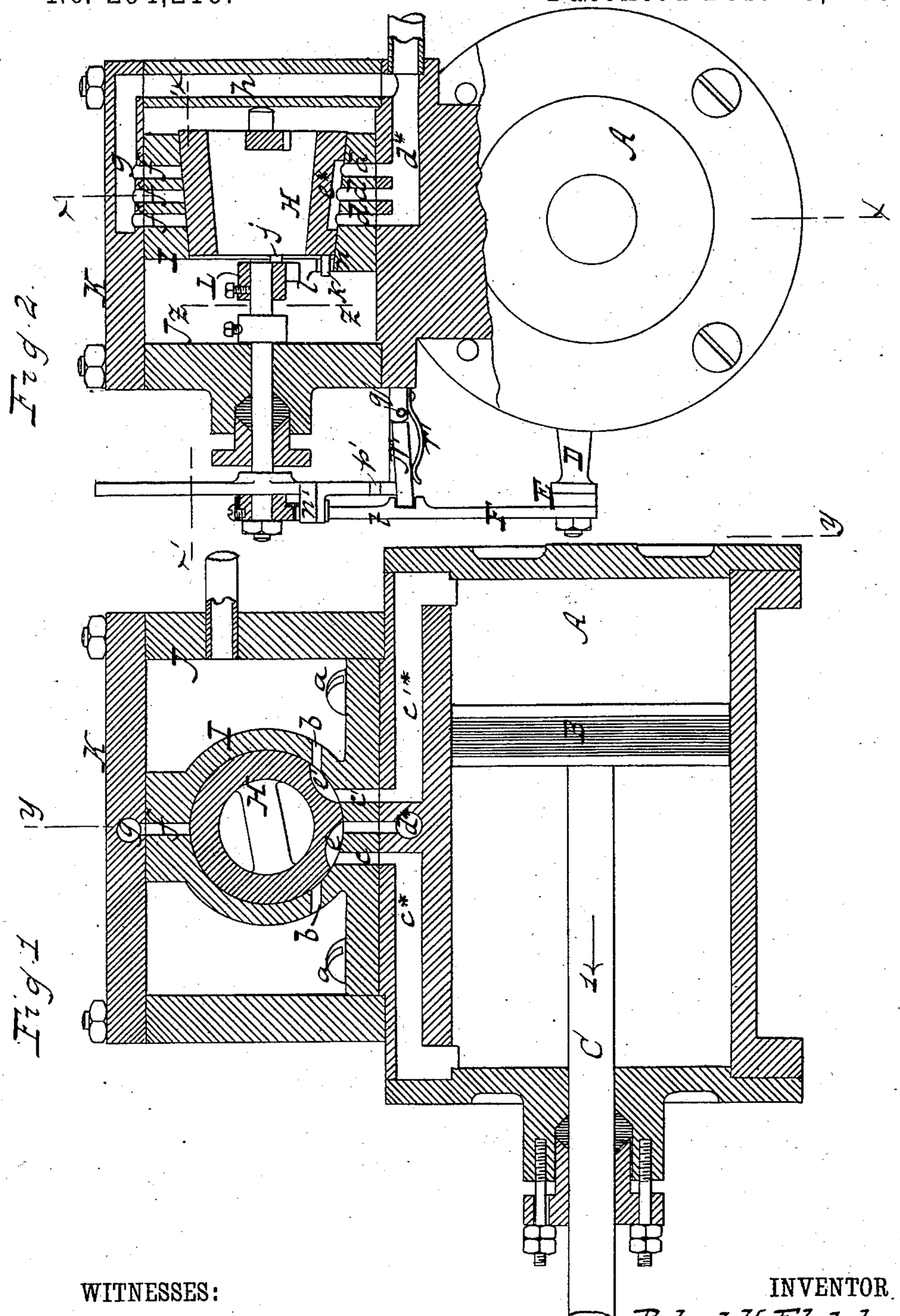
(No Model.) 2 Sheets—Sheet 1.

R. H. FLETCHER.

BALANCED ROTARY VALVE.

No. 294,216. Patented Feb. 26, 1884.



WITNESSES:

William Miller
Otto Sinfeland

INVENTOR
Robert H. Fletcher

BY Van Santvoord & Hauff
his
ATTORNEYS

(No Model.) 2 Sheets—Sheet 2.

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Fig. 1.

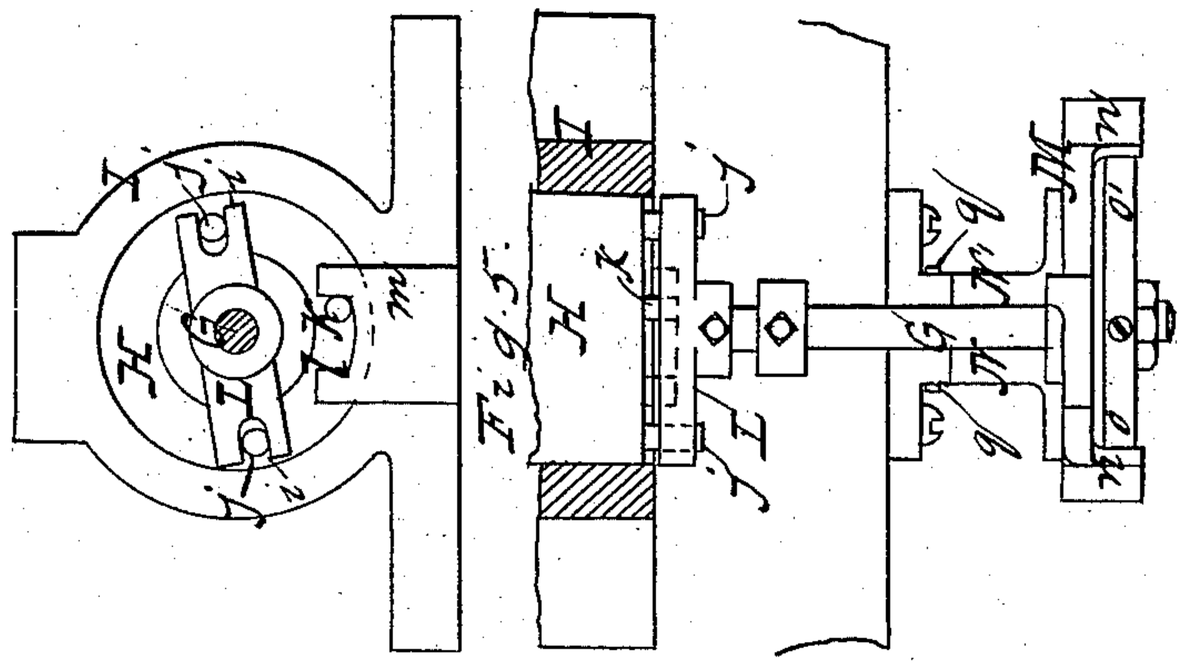
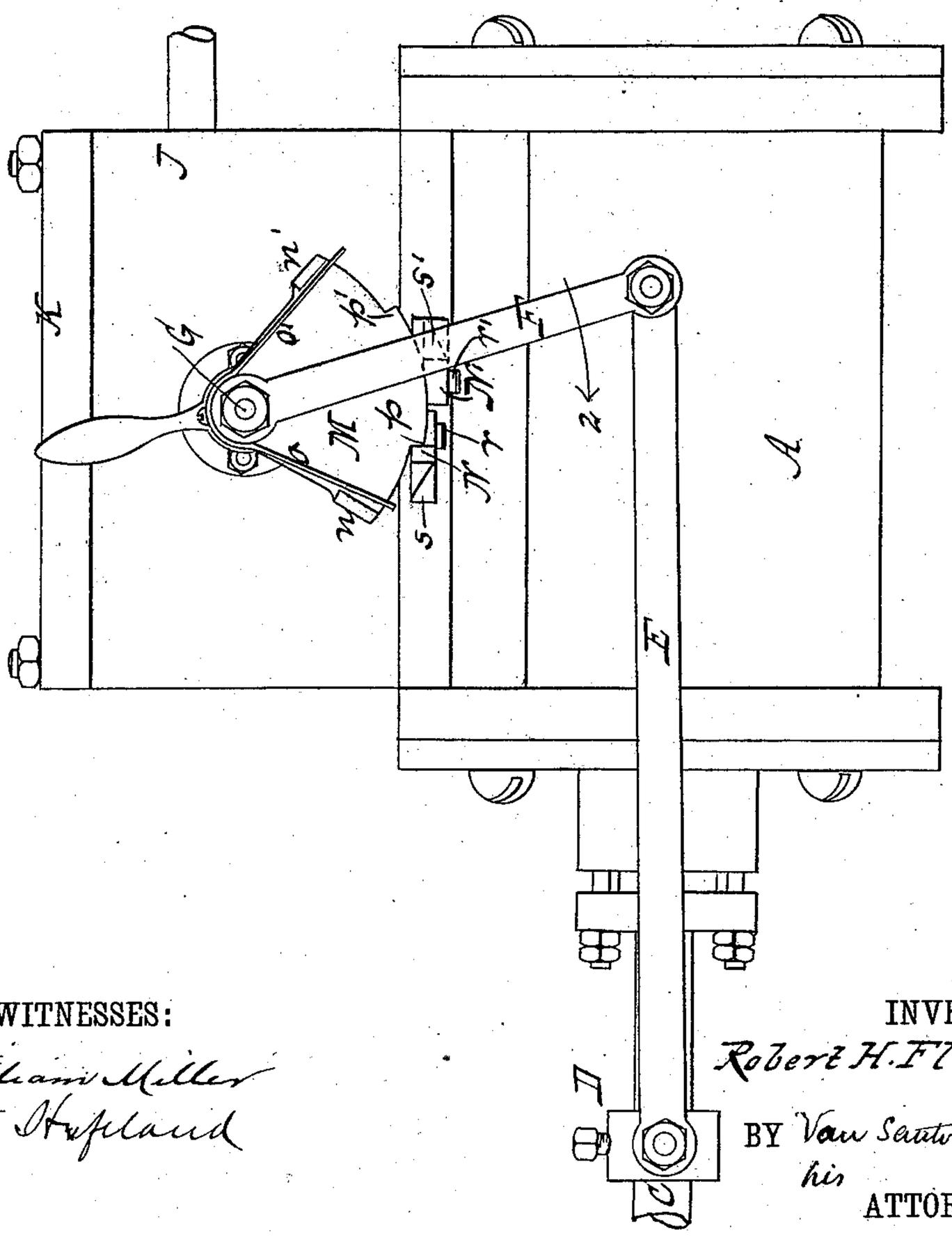


Fig. 2.



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UNITED STATES PATENT OFFICE.

ROBERT H. FLETCHER, OF BROOKLYN, NEW YORK.

BALANCED ROTARY VALVE.

SPECIFICATION forming part of Letters Patent No. 294,216, dated February 26, 1884.

Application filed October 24, 1883. (No model.)

To all whom it may concern:

Be it known that I, ROBERT H. FLETCHER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Balanced Rotary Valves, of which the following is a specification.

This invention relates to an improvement in balanced rotary valves, which is intended particularly for direct-acting steam-engines or steam-pumps, but which can also be used in other classes of engines or pumps.

The peculiar and novel construction of my valve is pointed out in the following specification, and illustrated in the accompanying drawings, in which—

Figure 1 represents a transverse section of my valve as applied to a direct-acting steam-pump, the line *x x*, Fig. 2, indicating the plane of section. Fig. 2 is a longitudinal section of the valve in the plane *y y*, Fig. 1. Fig. 3 is a side elevation. Fig. 4 is a section in the plane *z z*, Fig. 2. Fig. 5 is a horizontal section in the plane *x' x'*, Fig. 2.

Similar letters indicate corresponding parts.

In these drawings, the letter A designates a steam-cylinder, in which works the piston B.

C is the piston-rod, on which is firmly secured an arm, D, which connects by a rod, E, with a lever, F, that swings loosely upon the spindle G, which serves to transmit motion to the valve H. This valve is made in the shape of a hollow conical plug, and it works in a shell, I, situated in the steam-chest J, and fastened on the bottom of this steam-chest by screws *a*, or other suitable means.

In the side of the shell I are ports *b b'*, Fig. 1, and in its bottom are the ports *c c' d*, which correspond with and form continuations of the steam-ports *c* c'** and the exhaust-port *d** in the bottom of the steam-chest. The shell I is provided with two cavities, *e e'*, each of such an extent that it can cover two of the ports *b b' c c' d*, respectively. In the position which the valve occupies in Fig. 1, for instance, the cavity *e* covers the ports *c d*, and the cavity *e'* the ports *c' b'*, steam is admitted behind the piston B, which moves in the direction of arrow 1, and the steam before the piston exhausts. If the valve H is changed, so that the cavity *e* covers the ports *b e*, and the cavity *e'* the ports *c' d*, the motion of the piston is reversed. If desired, the ports *b b' c c' d* may be so located in relation to each other that it requires three cavities in the valve to produce the desired change of steam, and in that case the two outside cavities control the admission of steam to the steam-cylinder, and the central cavity controls the exhaust.

By referring to Figs. 1 and 2 of the drawings, it will be seen that the valve H is balanced as far as the pressure of the live steam is concerned; but I have balanced my valve also in regard to the pressure of the exhaust by the following means: The shell I, which forms the seat of the valve, bears close against the inner surface of the cover K of the steam-chest, and it is provided with one or more openings, *f*, which communicate by means of a channel, *g*, in the cover K with a channel, *h*, in the side of the steam-chest, which leads into the exhaust-channel *d**. The combined area of the opening or openings *f* in the top of the shell J is equal to the combined area of the opening or openings *d* in the bottom of said shell, so that the upward pressure exerted by the exhaust-steam upon the valve is counterbalanced by the downward pressure through the channels *h g* and openings *f*.

My valve may be operated as follows: The spindle G has its bearing in the side of the steam-chest, and on its inner end is mounted a double-armed lever, L, provided in its ends with recesses *i*, which engage with pins *j*, projecting from the valve. (See Fig. 4.) In the valve is also secured a pin, *k*, which engages with a recess, *l*, formed in a lug, *m*, extending upward from the shell I, so that the valve cannot be turned beyond the desired limits. As already stated, the lever F swings loosely on the spindle G, and inside of this lever is situated a segment, M, which is firmly secured on the spindle. This segment is provided with two ears, *n n'*, which are exposed to the action of a double-armed spring, *o o'*, which is firmly secured to the lever F. If desired, two separate springs may be used without deviating from my invention. On the bottom edge of the segment M are formed two shoulders, *p p'*, which co-operate with latches N N', swinging on pivots *q*, Fig. 2, and exposed to the action of springs *r r'*, which have a tendency to force the same upward. On the outer ends of these latches are formed inclined planes *s s'*, which

are acted upon by a toe, *t*, projecting from the inner surface of the lever F, Fig. 2. In the position which the parts occupy in the drawings, the latch N′ is depressed by the toe of the lever F, and the shoulder *p* of the segment M bears against the inner edge of the latch N, so that the valve H is retained in the position shown in Fig. 1. As the piston moves in the direction of arrow 1, the lever F swings in the direction of arrow 2, Fig. 3, causing the spring *o* to bear upon the ear *n* of the segment, and when the piston approaches the front end of its stroke the toe *t* of the lever F rides up on the incline *s* of the latch N, this latch is depressed, the segment M is free to follow the action of the spring *o*, and the valve H is suddenly turned so as to change the steam and to reverse the motion of the piston. When the segment M turns by the action of the spring *o*, the latch N′ has been released by the toe *t* of the lever F, and it is free to follow the action of its spring, so that it rises behind the shoulder *p′* of the segment and retains the valve in position until, on the reverse stroke of the piston, the latch N′ is again depressed by the toe *t*, and the valve is changed by the action of the spring *o′* on the ear *n′* of the segment.

In order to produce these changes of the valve by the action of the springs *o o′*, it is essential that the valve shall turn freely in its socket, and it is therefore important to balance the valves not only in relation to the live steam, but also in relation to the exhaust.

I do not claim the devices shown and above described for operating the rotating valve, for the reason that other means can be employed for the same purpose; but the mechanism set forth will be found practicable and is clearly illustrated, in order to show one means of operating the valve.

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

1. The combination, substantially as hereinbefore described, of the hollow plug-valve H, seated in the shell I, which is secured to the bottom of the steam-chest, the cover K, fitting the top of the shell I, the opening or openings *d* in the bottom of the shell and communicating with the exhaust-port *d**, and the opening or openings *f* in the top of said shell and communicating through channels *g h* with the exhaust-port *d**.

2. A rotary valve having ports and cavities for balancing it in relation to the live steam, and also ports and cavities for balancing it in relation to the exhaust-steam, substantially as set forth.

In testimony whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

ROBERT H. FLETCHER. [L. S.]

Witnesses:
RUDOLPH T. KRIETE,
HENRY D. STRUSE.