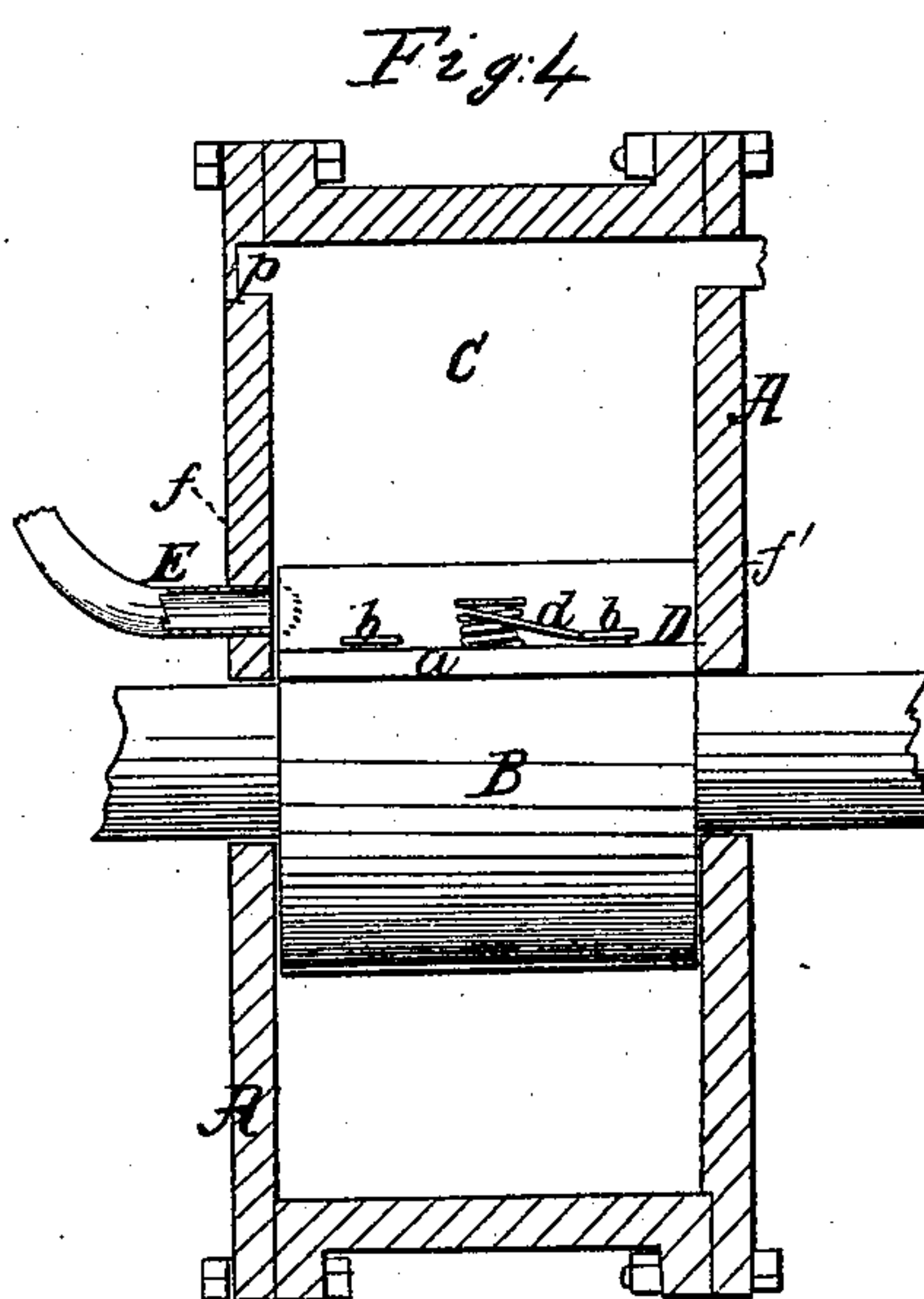
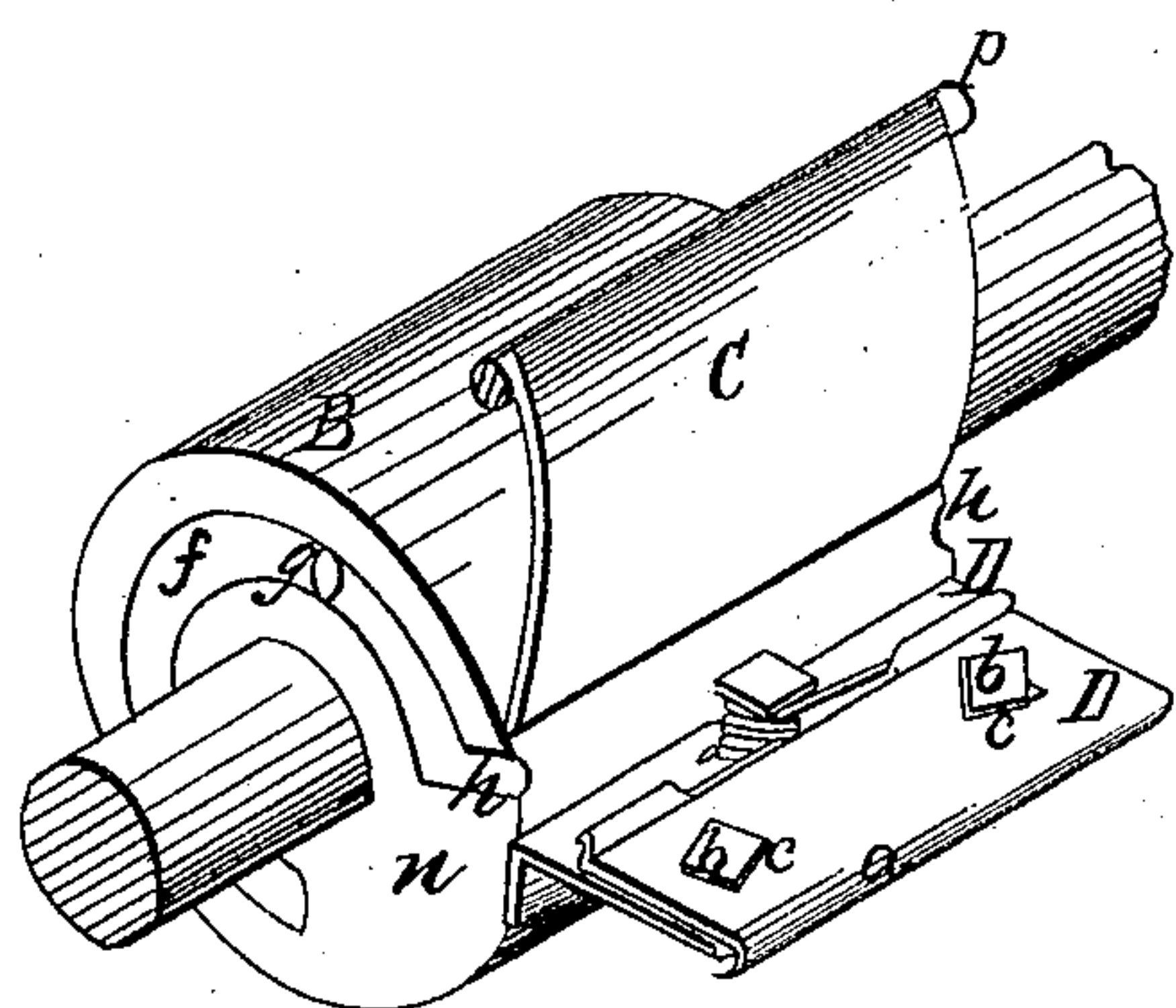
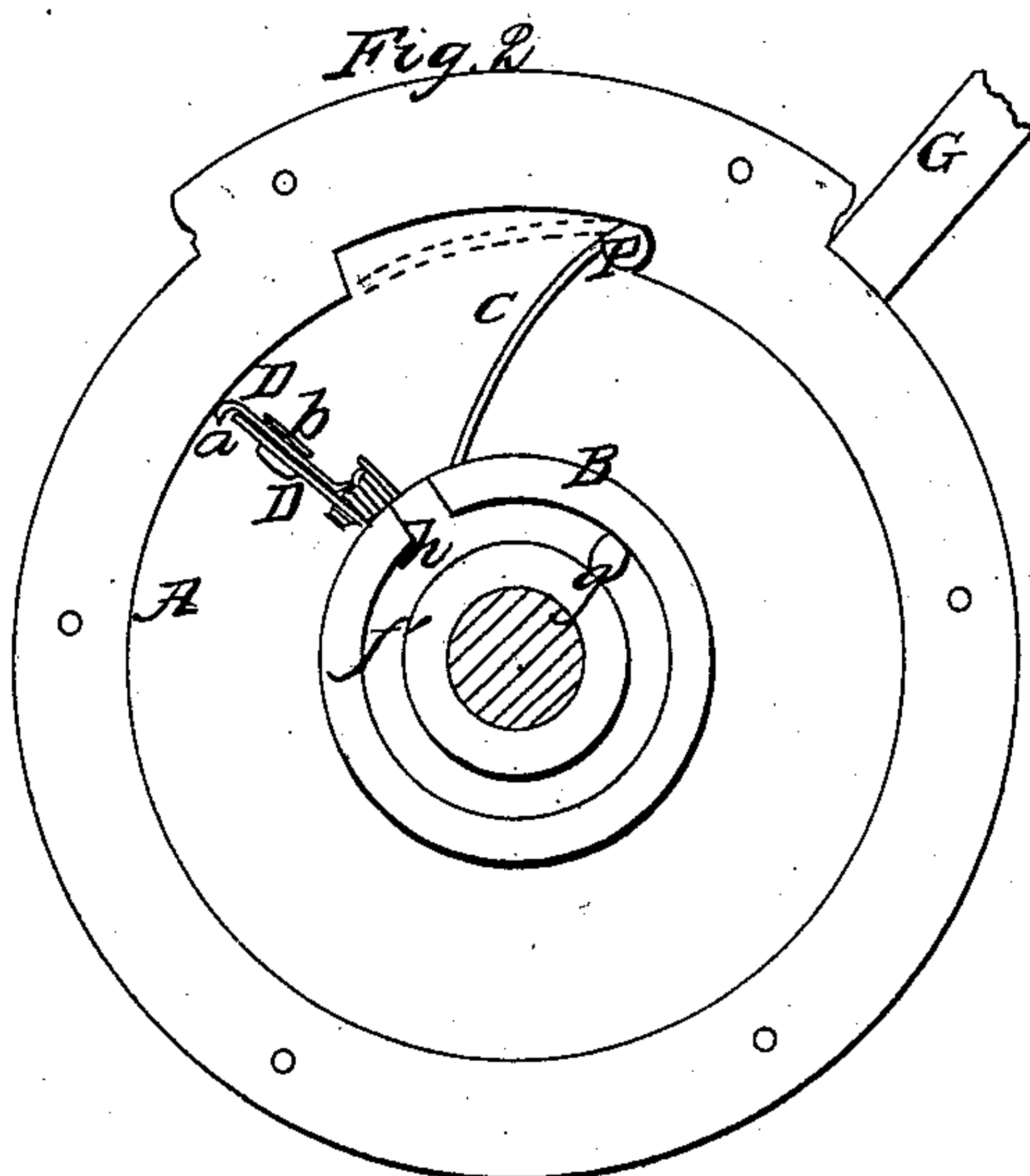
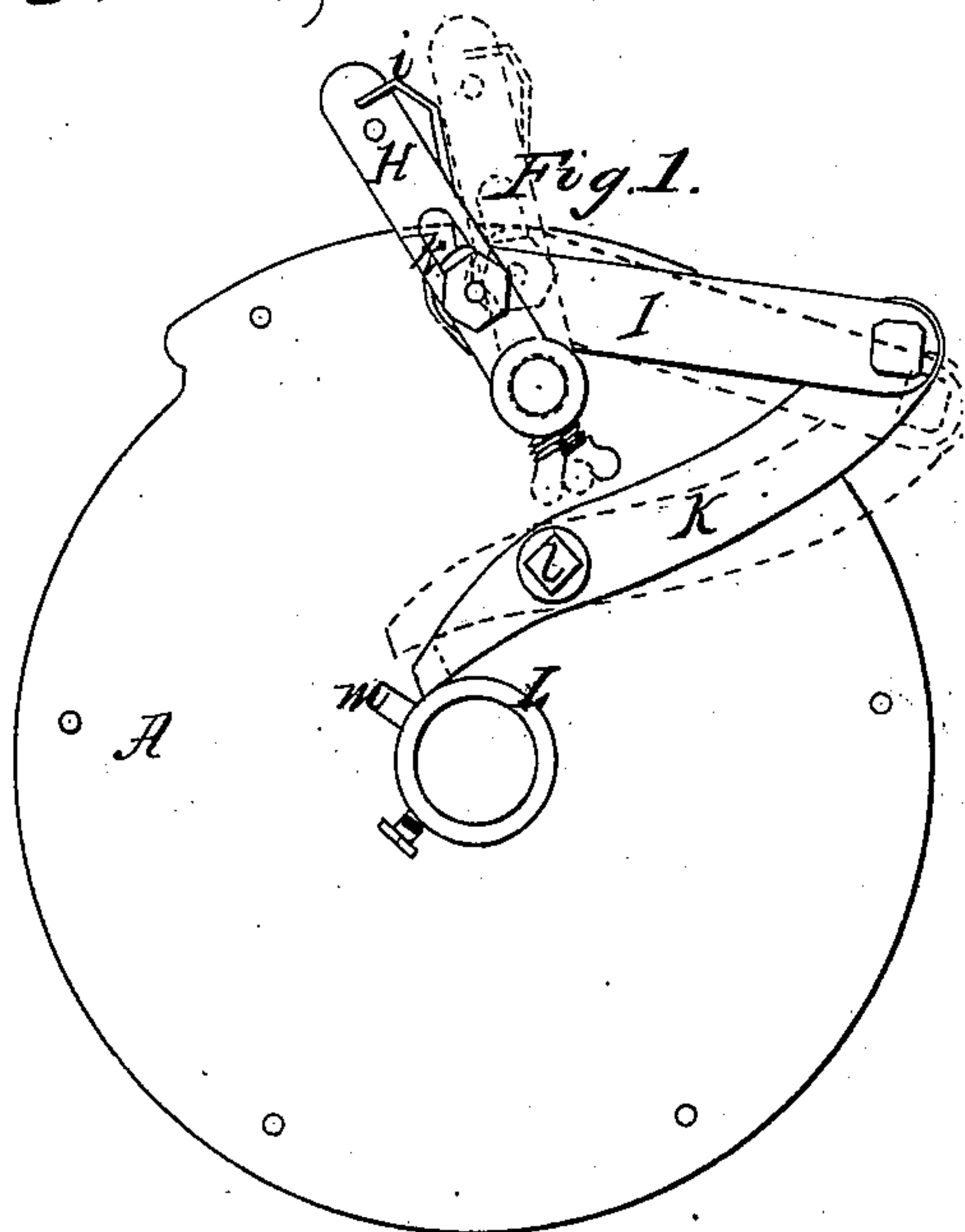


Thunell & Hedstrom,
Rotary Steam Engine.
No 77,780. Patented May 12, 1868.



Witnesses:

J. R. Dyall
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Attys.

United States Patent Office.

ALBERT I. THUNELL AND JOHN M. HEDSTROM, OF BUFFALO, NEW YORK.

Letters Patent No. 77,780, dated May 12, 1868.

IMPROVEMENT IN ROTARY STEAM-ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that we, ALBERT I. THUNELL and JOHN M. HEDSTROM, of Buffalo, in the county of Erie, and State of New York, have invented a certain new and useful Improvement in Rotary Engines; and we do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is an elevation of the cylinder, showing the apparatus for operating the valve.

Figure 2, a similar view, with the outer plate removed.

Figure 3 is a perspective view of the piston and its adjuncts.

Figure 4 is a vertical cross-section of the engine.

Like letters of reference indicate corresponding parts in all the figures.

Our invention relates to the construction and arrangement of the piston-head, and the means for operating the valve, as hereinafter described.

In the drawings, A indicates the cylinder or case, B the piston-head, and C the valve.

The piston-head is cylindrical, and it has a radial wing, D, extending out so as to strike against the inner periphery of the case. To produce a more perfect steam-tight packing, we provide the wing with a packing-slide, D', having a right-angled edge, *a*, shutting over the outer edge of the wing, so as to furnish a broad bearing at that point, and held in place by screws *b b*, passing through slots *c c*, as the wing is pressed up by a spring, *d*. This arrangement compensates for wear, and always keeps the joint tight, by reason of the broad bearing *a*, which can wear but slowly.

The induction-steam pipe E opens through the end of the cylinder directly against the end of the piston-head, while the eduction-pipe G opens from the periphery of the cylinder on the other side of the valve.

The end of the piston-head next the induction-pipe has a groove, *f*, extending concentrically around, in line with the pipe, but having a blank, *n*, of such extent as to correspond with the passage of the piston-wing from one side to the other past the valve. From this groove a passage, *g*, extends longitudinally through the piston-head, and at the opposite end opens into another groove, *f'*, fig. 2, similar to *f*, except that it has no blank, *n*. Both grooves open just in the rear of the piston-wing by notches *h h*, and thus allow it motion by the steam that enters from the induction-pipe.

The steam forces the piston-wing around till it comes to the exhaust, G, and in passing still further it is necessary that the valve C should rise, as indicated in red lines, fig. 2, to allow it passage.

To accomplish this, we connect outside, with the axis *p* of the valve, a crank-arm, H, pressed forward by spring *i*, and in a slot, *k*, of said crank-arm, we connect a bar, I, jointed at the opposite end to a rock-lever, K, pivoted at L, and its short arm resting against hub L, where it is acted upon to raise the valve by a cam-pin, *m*.

The operation will be readily understood. The steam entering behind the wing, the latter will be forced around to the exhaust, which nearly completes the revolution. At this moment the cam-pin *m* strikes the rock-lever K, and raises the valve, while the wing passes under, which it does by reason of the momentum gained.

A special feature of novelty in this case is the arrangement of the steam-grooves *f f'* in the ends of the piston, and the passage *g* connecting them. The groove *f*, being concentric with the end of the induction-pipe, and extending a long distance around, allows a constant flow of the steam to force the piston. At the moment, however, that the piston reaches the exhaust, the blank, *n*, comes opposite the induction-pipe, and cuts off the passage till after the wing has passed the valve, when it opens anew.

At the same time the steam passing through the passage *g*, fills the opposite groove *f'*, and not only acts upon the wing in the same manner at the opposite end, thus equalizing the action, but it balances the piston-head perfectly, so that the latter moves freely and easily. Were the steam to strike full against one end of the piston, the same would be practically inoperative.

By this arrangement of the steam-grooves we are enabled to dispense with a multiplication of piston-wings or paddles, and use only one instead, whereby the friction is greatly lessened, and the parts are less liable to

derangement, the full pressure of the steam all the way round being at the same time secured, and the cutting off and letting on of the steam are accomplished without an accurate packing of the valve, which is necessary in other arrangements.

We prefer to have the ends of the valve rest upon shoulders or ledges of the case, just in line with the periphery of the piston, to prevent undue friction upon said piston.

What we claim as our invention, and desire to secure by Letters Patent, is—

The arrangement of the concentric steam-grooves $f f'$, passage or passages g , and blank, n , when combined with the piston-head B, and steam-pipes E G, in the manner and for the purpose specified.

We also claim, in combination with the wing D, the spring-slide D', with right-angled packing-edge a , arranged and operating as herein set forth.

We also claim, in combination with the valve C, the crank-arm H, connecting-bar I, rock-lever K, and cam-pin m , the whole arranged and operating as herein set forth.

In witness whereof, we have hereunto signed our names in the presence of two subscribing witnesses.

ALBERT I. THUNELL,
JOHN M. HEDSTROM.

Witnesses:

J. R. DRAKE,
ALBERT HAIGHT.