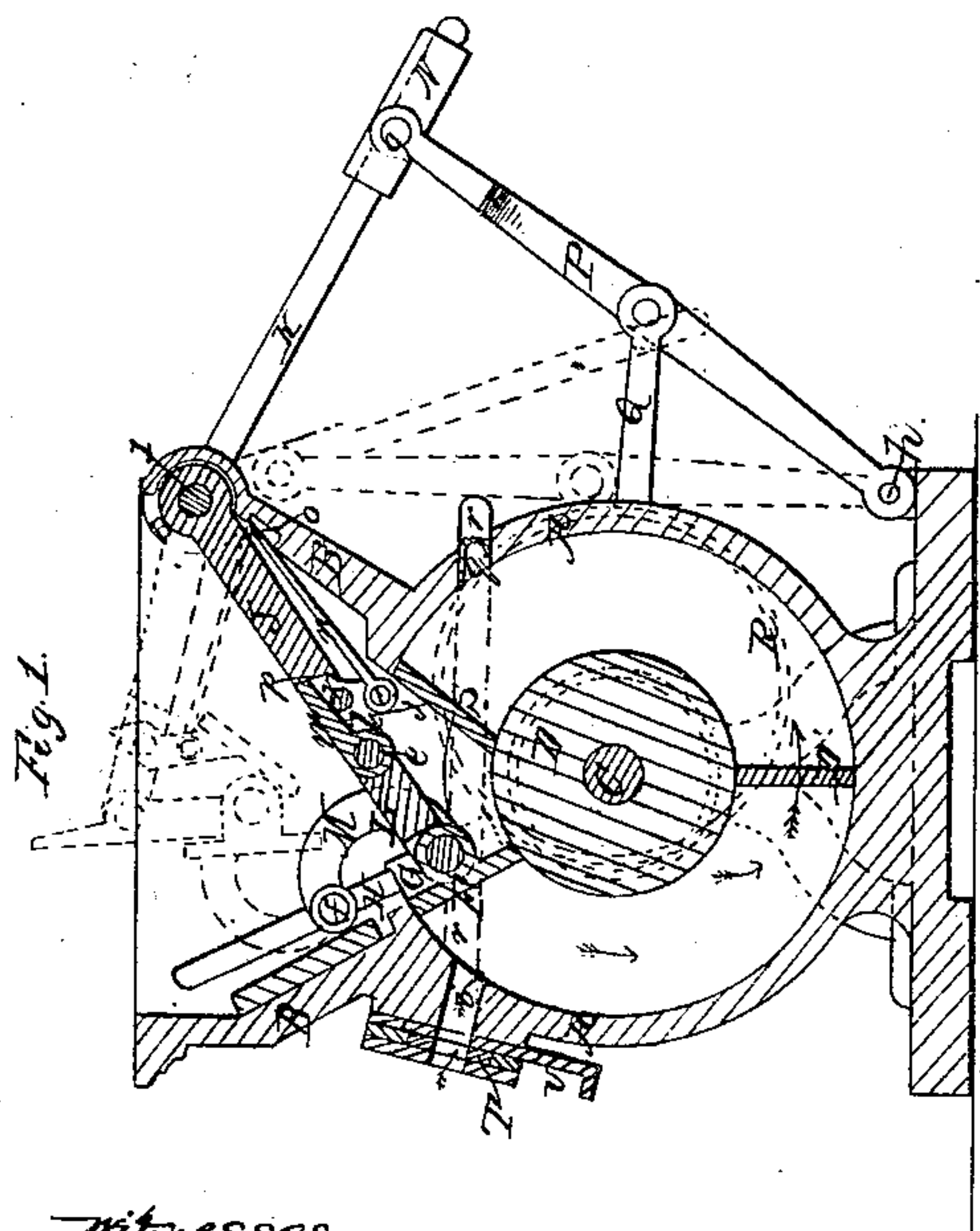


No. 28,624.

PATENTED JUNE 5, 1860.

T. H. WITHERBY.
ROTARY ENGINE.



Witnesses.

*R. S. Spencer
H. W. Coombs*

Fig. 2.

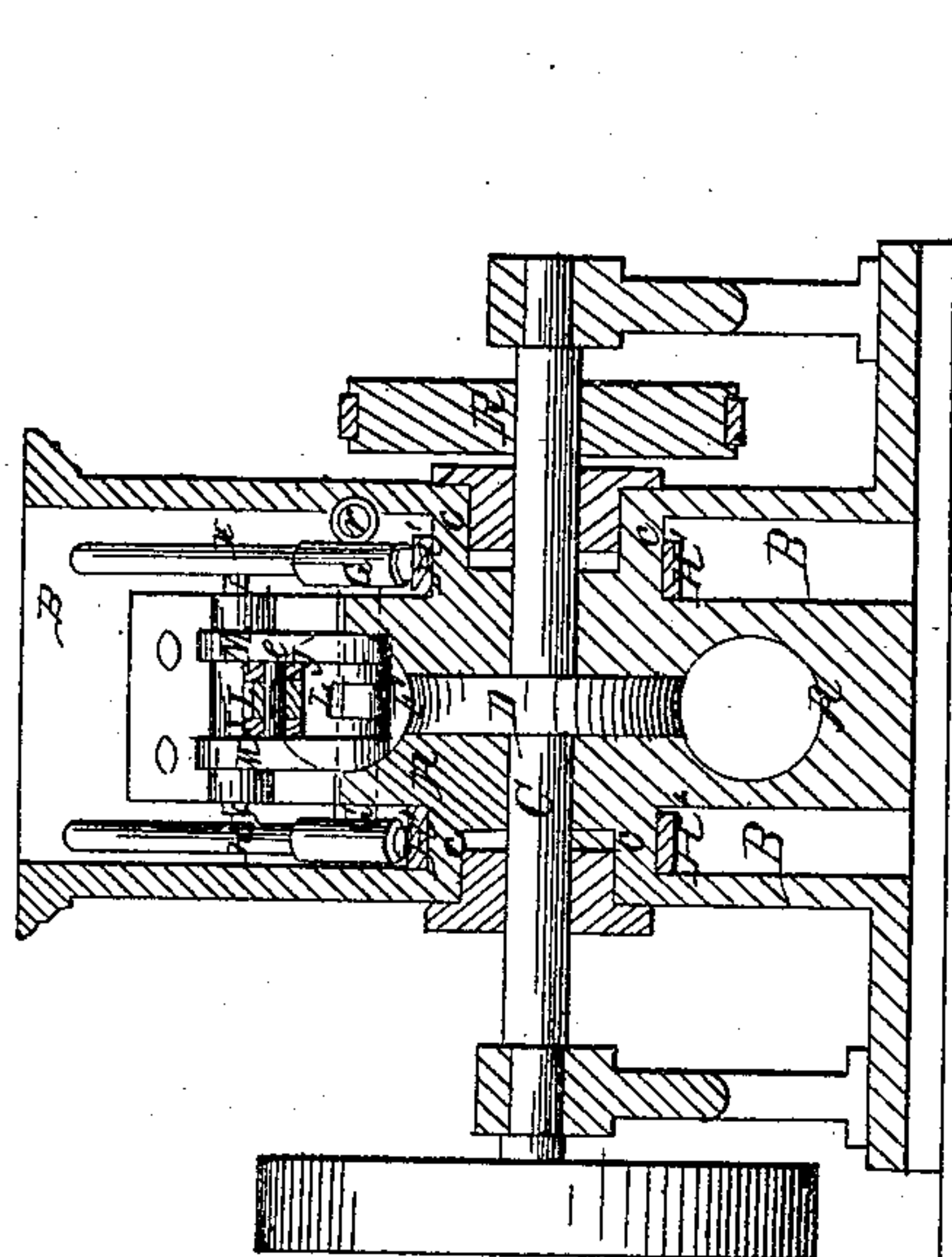
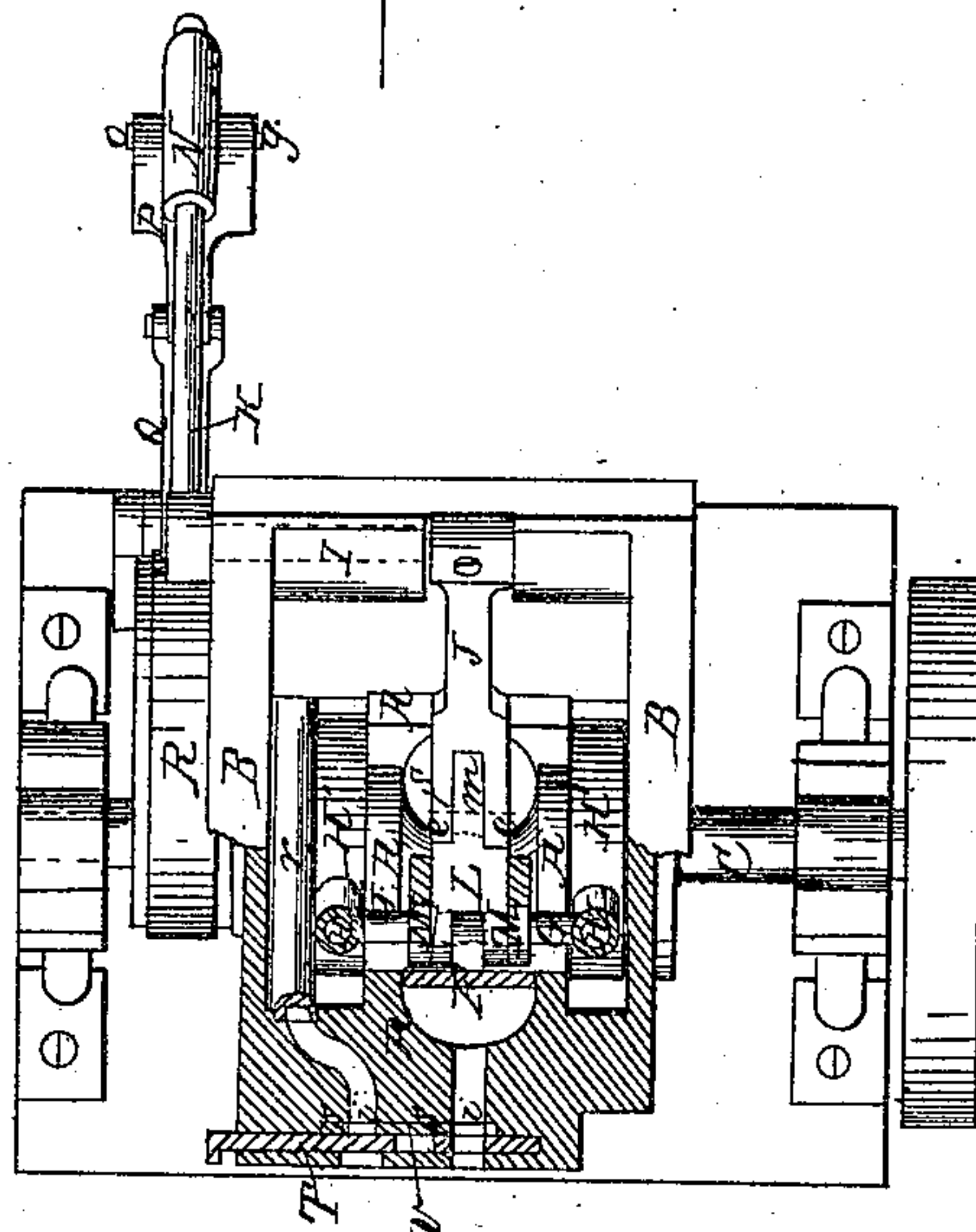


Fig. 3.



Inventor.

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per *Munroe*
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UNITED STATES PATENT OFFICE.

THOMAS H. WITHERBY, OF WORCESTER, MASSACHUSETTS.

ROTARY ENGINE.

Specification of Letters Patent No. 28,624, dated June 5, 1860.

To all whom it may concern:

Be it known that I, THOMAS H. WITHERBY, of Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Rotary Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming part of this specification, in which—

Figures 1 and 2, are vertical sections at right angles to each other of a rotary engine with my improvement. Fig. 3 is a plan of the same partly in section.

Similar letters of reference indicate corresponding parts in the several figures.

My invention relates to the further improvement of the improved rotary engine of the late John H. Hathaway which forms the subject of Letters Patent granted Novr. 15, 1859; to his administrator Charles Rice, the object of such improvement being to provide for the reversal of the rotary motion.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation.

A, is the cylinder; C, is the main shaft; D, is the hub secured to the said shaft to carry the circular piston D'.

F is a movable abutment fitted into one of the mouths of the cylinder and attached rigidly to a cross head G, which slides on the parallel vibrating arms H, H, which are attached to rings H', H', fitted to turn easily to the exteriors of the stuffing boxes c, c, of the cylinder through which the shaft works.

I, is a rock shaft arranged parallel with the main shaft C, in bearings in the box B, which surrounds the cylinder, and having rigidly attached to it two arms J, K, of which the arm J, is connected at its extremity by a joint pin e, with a link L, which is connected with the cross head G, the said arm and link combined forming a toggle. The cross head is also connected with a curved forked head M, vibrating on a fixed pin f. The other arm K, of the rock-shaft I, is fitted with a slide N, on the sides of which are journals g, g, by which it is connected with a forked lever P, which works on a stationary fulcrum h, and which is connected with the connecting rod Q, of an eccentric R, that is fast on the main shaft C. i, is a port for admitting steam to

the cylinder close to the mouth to which the abutment F is fitted.

The above described parts are all constructed and applied substantially as in the engine described in the aforesaid Letters Patent granted to C. Rice, and operated in the same manner, that is to say the revolution of the eccentric R, with the shaft G, operates through the lever P, and slide N, on the arm K, of the rockshaft I, to produce the movement of the said rockshaft by the action of whose arm J, operating through the link L, on the cross head G, guide arms H, H, and arm M, the necessary movement of the abutment F, to close the cylinder behind the piston D', is effected.

The single abutment F, provides only for running the engine in the direction indicated by the black arrow in Fig. 1; and to provide for its running in the opposite direction I apply a similar abutment S, to the opposite mouth of the cylinder. This abutment S, is attached loosely to the toggle arm J, of the rockshaft I, by a stem j, which is rigidly secured to the said abutment and a joint pin k, which passes through the said stem and arm J, the said stem which is fitted to a slot l, in the said arm being of elbow shape as shown in Fig. 2, and having its extremity so formed that when it rests against an oblique face p, at the back of the slot l, the said abutment occupies such a position relatively to the arm J, that the straightening of the toggle J, K, to close the other abutment F, closes S, also. The link L, of the toggle J, K, is extended beyond the joint pin e, in such form shown at m, in Fig. 1, as to lap over the stem j, of the abutment in such a manner as to bring it to the position above specified when the toggle is straightened. The stem j, of the abutment S, has jointed to it one end of a rod n, the other end of which rests in a recess o, in the box B. This rod, as the abutments open together, allows the lower part of the abutment S, to swing back out of the way of the cross head but as the abutments make their closing movement the end of the said rod comes into contact with the back of the recess o, and so causes the abutment S, to assume such a position that it will pass easily into its seat to be in readiness for the action of the part m, of the toggle as the toggle straightens. Besides the additional abutment S, it is necessary to have an inlet q, for the admission of steam to the cylinder

near the said abutment, to enable the engine to be worked in the opposite direction to the arrow shown in Fig. 1. This inlet is connected by a steam pipe *r*, with a port *i'*,
5 see Fig. 3, arranged in such proximity to the port *i*, in the same valve seat *s*, that either of the said ports may be opened and the other at the same time closed or that both may be closed by the slide valve *T*,
10 which constitutes a reversing valve and a stop valve, and the engine will work in one direction or the other according to which of the ports *i*, or *i'*, is open. It will be seen that with the two abutments in operation
15 one will always be closed in front of the piston at the same time the other is closed behind it, but this will not affect the operation of the engine as the portion of the cylinder in front of the piston has always

been exhausted of steam before the abutment closed. 20

U, is a cut-off valve intended to be operated by suitable valve gear driven from the shaft to admit steam to the cylinder immediately after the closing of the abutments, and cut it off therefrom previous to the opening of the abutments. 25

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

The abutment *S*, applied in connection 30 with the abutment *F*, and in combination with a reversing valve to operate substantially as and for the purpose herein set forth.

THOMAS H. WITHERBY.

Witnesses:

CALVIN K. WITHERBY,
WILLIAM A. HERRICK.