(No Model.)

2 Sheets—Sheet 1.

J. H. BLAKE.

ROTARY ENGINE.

No. 273,446. Patented Mar. 6, 1883.

Fig: 1.

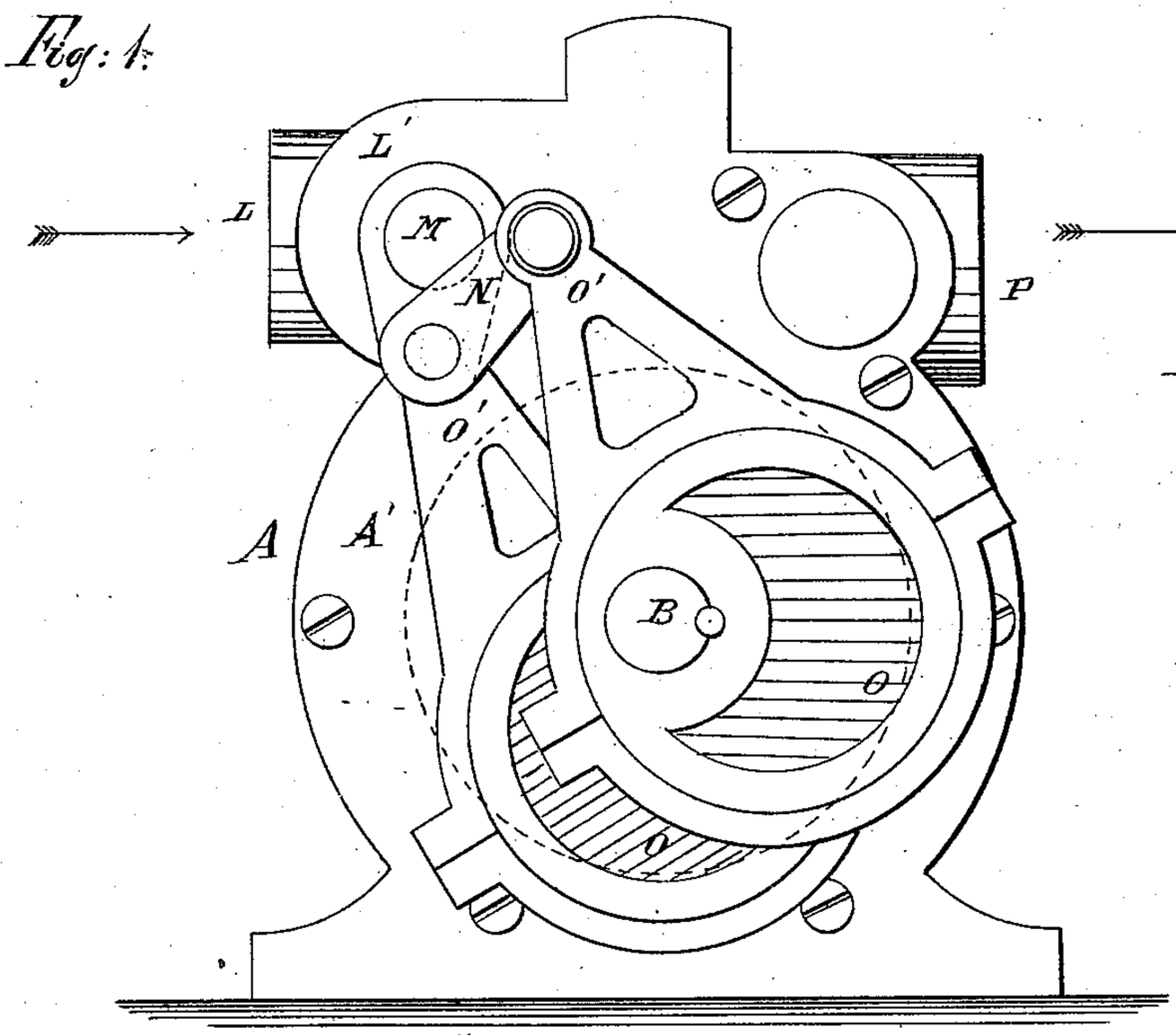


Fig: 3.

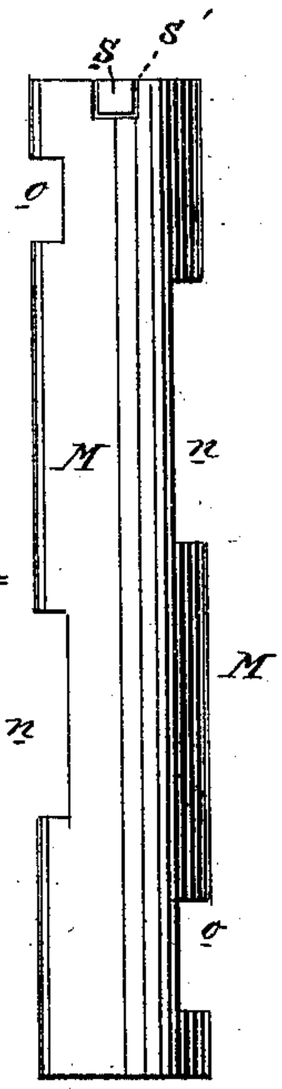
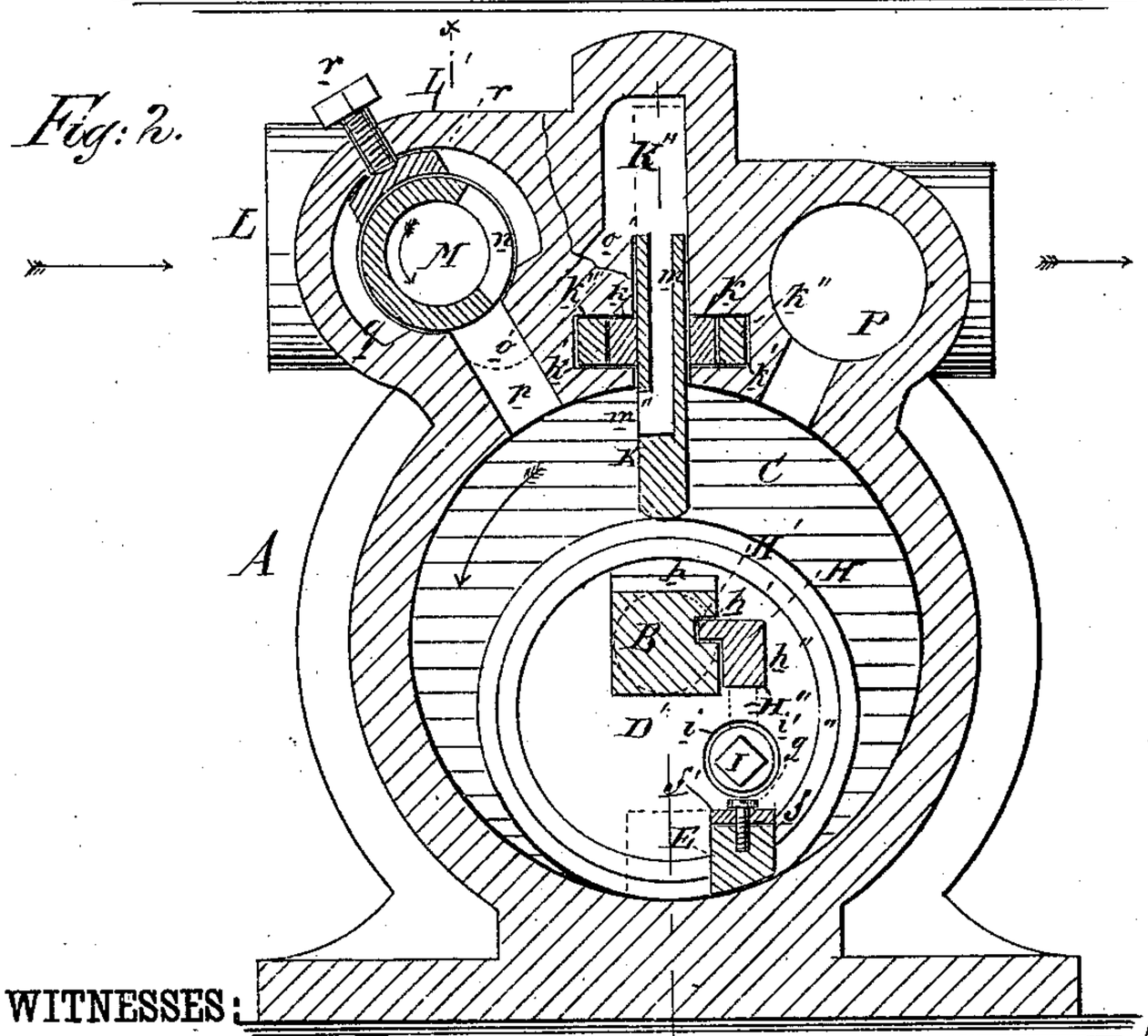


Fig: 2.



WITNESSES:

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C. Sedgwick

INVENTOR:

J. H. Blake

BY Munn & Co

ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

J. H. BLAKE.

ROTARY ENGINE.

No. 273,446. Patented Mar. 6, 1883.

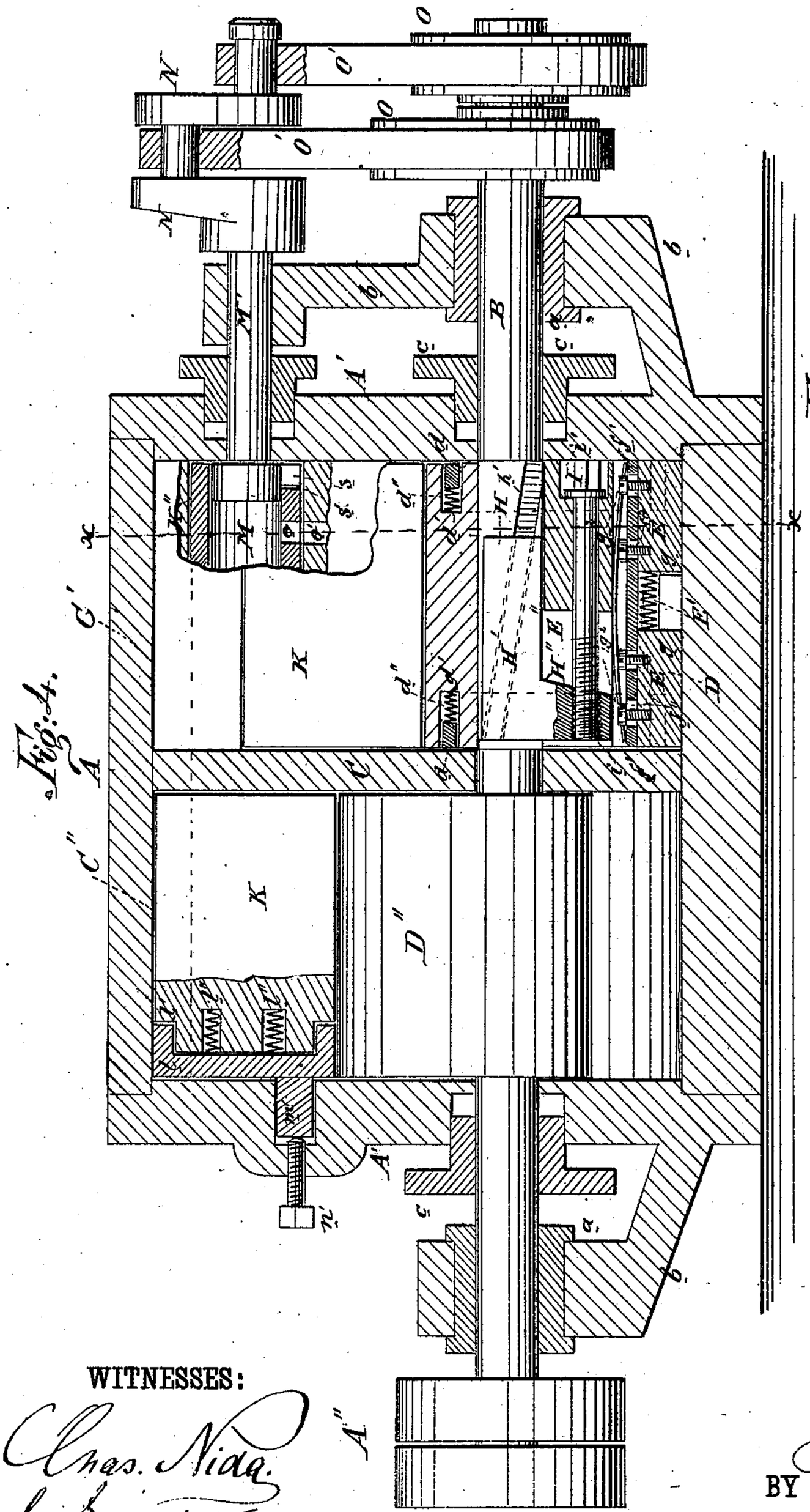

Fig. 4.

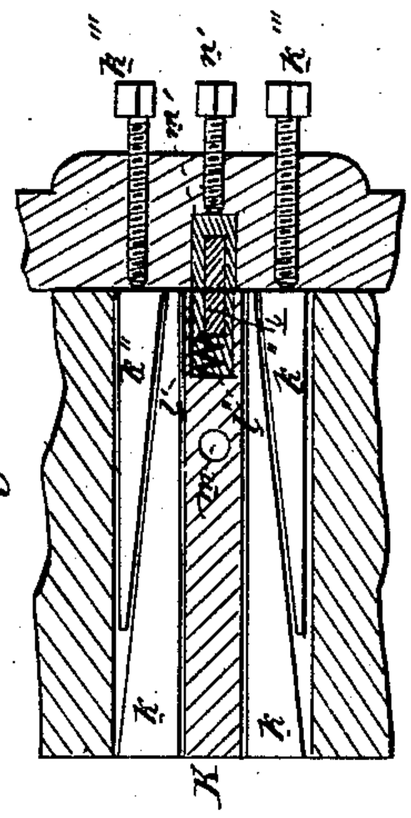

Fig. 6.

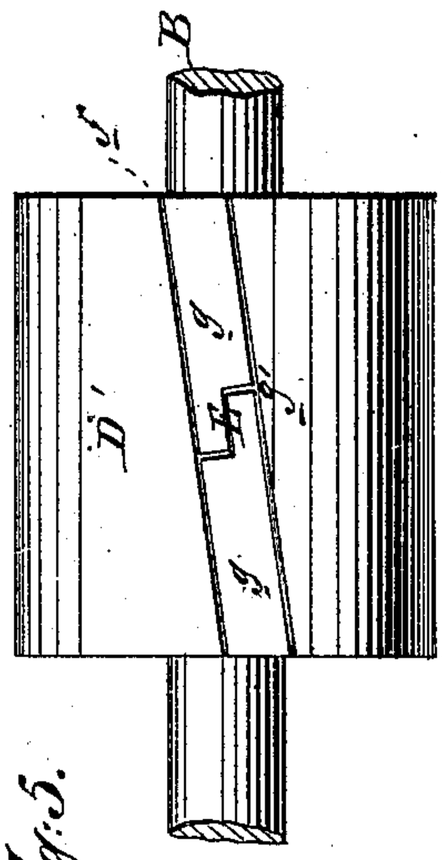

Fig. 5.

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UNITED STATES PATENT OFFICE.

JOHN H. BLAKE, OF BATAVIA, NEW YORK.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 273,446, dated March 6, 1883.

Application filed July 9, 1880. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. BLAKE, of Batavia, in the county of Genesee and State of New York, have invented a new and Improved Rotary Engine, of which the following is a specification.

The object of this invention is to construct a more efficient and durable rotary engine.

The invention consists of devices for causing the abutments to move readily and noiselessly, for packing the abutments and piston, for adjusting the piston as it wears against the face of the cylinder, for retaining the steam-valve in place, and of other novel devices, all of which are hereinafter described.

Figure 1 is an end elevation of the engine, showing the eccentrics. Fig. 2 is a vertical sectional elevation on line *x x*, Fig. 4. Fig. 3 is a longitudinal elevation of the steam-valve. Fig. 4 is a longitudinal sectional elevation, with parts broken away to better exhibit other parts. Fig. 5 is a front elevation of a piston, showing the packing. Fig. 6 represents a sectional plan view of an abutment, showing the abutment-packing.

Similar letters of reference indicate corresponding parts.

In the drawings, A represents the engine-cylinder, and B the driving-shaft, that extends longitudinally through said cylinder A, and is journaled in boxes *a a*, that are supported on the braces *b b*, which are projected outward and upward from the cylinder ends, as shown in Fig. 4. The glands *c c* make tight joints about the shaft B where it passes through the cylinder-heads A′ A′. A″ is the driving-pulley, keyed on one end of the shaft B.

C is a circular partition fixed centrally within the cylinder A, and dividing it into two cylindrical chambers, C′ C″. In each chamber C′ C″ a hollow cylindrical piston, D′ D″, respectively is keyed eccentrically on the shaft B in diametrically-opposite positions to each other. Each piston D′ D″ is packed on the ends by rings *d d*, let into each end a little distance from the periphery of said piston, which rings *d d* are held out against the cylinder-heads A′ A′ and the partition C, respectively, by the spiral springs *d′ d′*, that are set in the annular grooves *d″ d″* behind each ring *d d*. The faces of the pistons D′ D″ which bear against the bore of the cylinder A are cut away for a distance on the arc of the circle of the bore of said cylinder A sufficient to give to each piston D′ D″ a good broad bearing-surface. In the broad bearing-face of each piston D′ D″ a diagonal groove, *f*, is formed, extending from one end to the other of the piston, and within this groove *f* is placed a metal strip, *f′*, provided with elongated bolt-holes *f″*. A packing-strip, E, of brass or other suitable material, made in two parts or sections, *g g*, with a central rabbeted joint, *g′*, is set over the strip *f′*, and held thereto by the screws *g″ g″*, that pass through the elongated bolt-holes *f″*. The object of placing the packing-strip E diagonally is that when said packing-strip E is passing beneath an abutment, K, some portion of the piston-surface itself shall be in contact with said abutment at all times, and to prevent these strip-sections E from being displaced, and to permit of their lateral motion to pack against the cylinder-head A′ and partition C, they are held by the screws *g″ g″* in the elongated holes *f″*, as set forth. A spring, E′, sets between the contiguous ends of the sections *g g* and presses them apart against the cylinder-head A′ and partition C, while a spring, E″, behind the metal strip *f′*, holds said packing-strip E out to its proper position against the bore of the cylinder A.

The face of a piston in time becomes so worn by bearing against the bore of the engine-cylinder and against the abutments as to require adjustment. The following means is employed to effect this adjustment in this case—*i. e.*, the portion of the shaft B inclosed by the pistons D′ D″ is left square, as indicated in Fig. 2. Each piston D′ D″ is fitted to its square shaft-section on all sides excepting on the side opposite the face of the piston, at which point the openings *h* in the pistons D′ D″ are made large enough, as shown in Fig. 2, to admit of considerable adjustment of said pistons D′ D″. The piston D″ is adjusted in the same manner as the piston D′, as hereinafter described—*i. e.*, an oblique keyway, *h′*, is cut in the square section of the shaft B, and an opposite straight keyway, *h″*, cut in the piston D′ parallel with the shaft B. A key, H, whose straight part fits in the keyway *h″* of the piston D, and

whose oblique feather H′ fits in the oblique keyway *h′* of the shaft B, is set in place, as shown in Figs. 2 and 4, said key H being provided with an arm, H″, projecting at right angles therefrom, in the end of which arm H″ is a screw-hole, *i*. A screw-bolt, I, is entered through an end of the piston D′ and into the screw-hole *i* of the arm H″, the head of said screw-bolt I being inclosed in the socket *i′* in the end of said piston D′. On tightening said screw-bolt I the key and arm H H″ are pulled toward the head of said screw-bolt I, and thereby the oblique feather H′ of said key H moves the whole piston D′ against the bore of the cylinder A and holds it in that position.

K K are the abutments that move vertically up and down in the abutment slots or sockets K″ K″. Each abutment K is packed on its sides by packing-strips *k*, that are placed in the longitudinal grooves *k′*, which are made on the opposite sides of the slot or socket K″ and as near the bore of the cylinder A as possible with due regard to the strength of said cylinder A, and said strips *k* are set out against the faces of the abutment K by means of wedges *k″*, that are forced in behind them by the set-screws *k‴*, that are entered through the cylinder-heads A′ A′, as shown in Fig. 6. The outer end of an abutment K is packed by strip *l*, set vertically in a corresponding groove, *l′*, in the end of said abutment K, said strip *l* being set out by the springs *l″* behind it against a head of the cylinder A. The space on either side of the strip *l* is packed by a forked or U-shaped piece of metal, *m′*, let into the head of the cylinder, and set against the abutment K by a set-screw, *n′*, thereby pressing the inside end of said abutment K in contact with the partition C and saving a packing-strip on that end of said abutment. Each abutment K is provided with a vertical central bore, *m*, which extends a little more than half the depth of said abutment K, and at its bottom is intersected at right angles by a bore, *m″*, the two bores *m m″* forming a steam-escape port for the escape of steam from the abutment slot or socket K″.

L is the steam-supply port of the engine, and L′ the cylindrical steam-chest, containing the rotary steam-valve M, whose stem M′ extends through a head of the cylinder A, and has keyed on it the double crank N, and is journaled in an upward prolongation of an end brace, *b*. This valve M is hollow and has a steam-opening, *n*, for supply of steam for moving the piston, and an opening, *o*, for supply of steam to hold the abutment K down on the piston D′, formed in its opposite sides, the abutment-openings *o* being toward the ends of the cylinder A, and connecting or opening into the abutment steam-ports *o′*, that lead from the steam-chest L′ to the top of the abutment sockets or slots K″. Each piston and abutment steam-port *p o′* respectively are entirely independent of the others, and each has its own corresponding opening in the valve M, which is cut away so as to give the proper amount of lead to check the upward movement of the abutments K. This valve M is held in its seat by a portion of the valve-seat in the form of a rib, *q*, at each end of the steam-chest L′, being continued up and around said valve M, as shown in Fig. 2, and to insure said valve M being tight at all times a set-screw, *r*, enters through the steam-chest wall at each end and bears on the valve M through the bearing-block *r′*, as shown in Fig. 2. Rotary motion is imparted to the valve M from the valve-stem M′ by a dog, *s*, on the stem M′, fitting into a slot, *s′*, in the end of the valve M, which arrangement allows the valve M to seat and adjust itself without being interfered with by the stem M′. Rotary motion is imparted to the valve-stem M′ by means of the eccentrics O O, that are secured at right angles to each other on the outer end of the shaft B, and are connected by suitable straps, O′ O′, to the cranks N, that are fixed on the end of the said valve-stem M′. P represents the exhaust-port of the engine.

The action of the engine is as follows: Suppose the face of a piston, D′, to have just passed the exhaust-port P, when the steam-valve M would be closed, and the exhaust is taking place. As the piston D′ passed on it would raise the abutment K to its highest point, and if the momentum of said abutment K were not immediately checked it would strike the top of the slot K″, in which it works, which would cause noise both then and when it again seated on the piston D′; but at the proper moment, just before the abutment K reaches its highest point, steam passes through an opening, *o*, of the valve M and through an abutment steam-port, *o′*, into the top of the abutment-slot K″, and holds said abutment K down on the piston D′, and so holds said abutment K in constant contact with said piston D′. After the face of the piston D′ has passed the steam-port *p* steam is admitted directly into the cylinder-chamber C′ through the steam-port *p* by the opening *o* in the valve M, and the abutment K being held in contact with the piston D′ by the pressure in slot K″, the stroke commences. The steam can be cut off at any portion of the stroke, but at one-third would probably be the most desirable point, and the expansion continuing the stroke until the exhaust-port P is reached and the steam escapes. Steam is cut off from the abutment-port *o′* at a point sufficient to carry the said abutment K to its lowest point, and to provide for the expansion and escape of said steam from the slot K″ the bore *m m″* is provided in said abutment K.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, the combination, with abutment K, provided with bore *m m″*, of the hollow piston D′, provided with diagonal packing-strip E, substantially as herein shown and described.

2. In a rotary engine, the combination, with the abutment K, provided with bore *m m″*, of the valve M, provided with abutment steam-

opening *o* and abutment steam-port *o'*, substantially as herein shown and described.

3. In a rotary engine, the combination, with the abutment K, of the end packing-strip, *l*, springs *l''*, U-shaped packing-strip *m'*, and set-screw *n'*, substantially as herein shown and described.

4. In a rotary engine, the combination, with the piston D', provided with a diagonal groove, *f*, of the metal packing-strip *f'*, having elongated bolt-holes *f''*, sectional packing-strip E, springs E' E'', and bolts or screws *g'' g''*, substantially as herein shown and described.

5. In a rotary engine, the combination, with the driving-shaft B, provided with an oblique keyway, *h'*, in the square part of the shaft, of the hollow piston D', provided with straight keyway *h''* and key H, provided with oblique feather H' and arm H'', and screw-bolt I, substantially as herein shown and described.

6. In a rotary engine, the hollow cylindrical rotary valve M, provided with a piston steam-opening and an abutment steam-opening, *n o*, respectively, on opposite sides, substantially as herein shown and described.

7. In a rotary engine, the combination, with the rotary cylindrical valve M, provided with an end slot, *s'*, of the valve-stem M', provided with a dog, *s*, substantially as and for the purpose described.

8. In a rotary engine, the cylinder A, provided with steam-chest L', abutment steam-port *o'*, abutment-slot K'', and piston steam-port *p*, substantially as herein shown and described.

9. The combination, with the valve M and valve-stem M', provided with double crank N, of the driving-shaft B and eccentrics and straps O O', substantially as herein shown and described.

JOHN H. BLAKE.

Witnesses:
JAMES FITT,
JAS. M. HAMILTON.