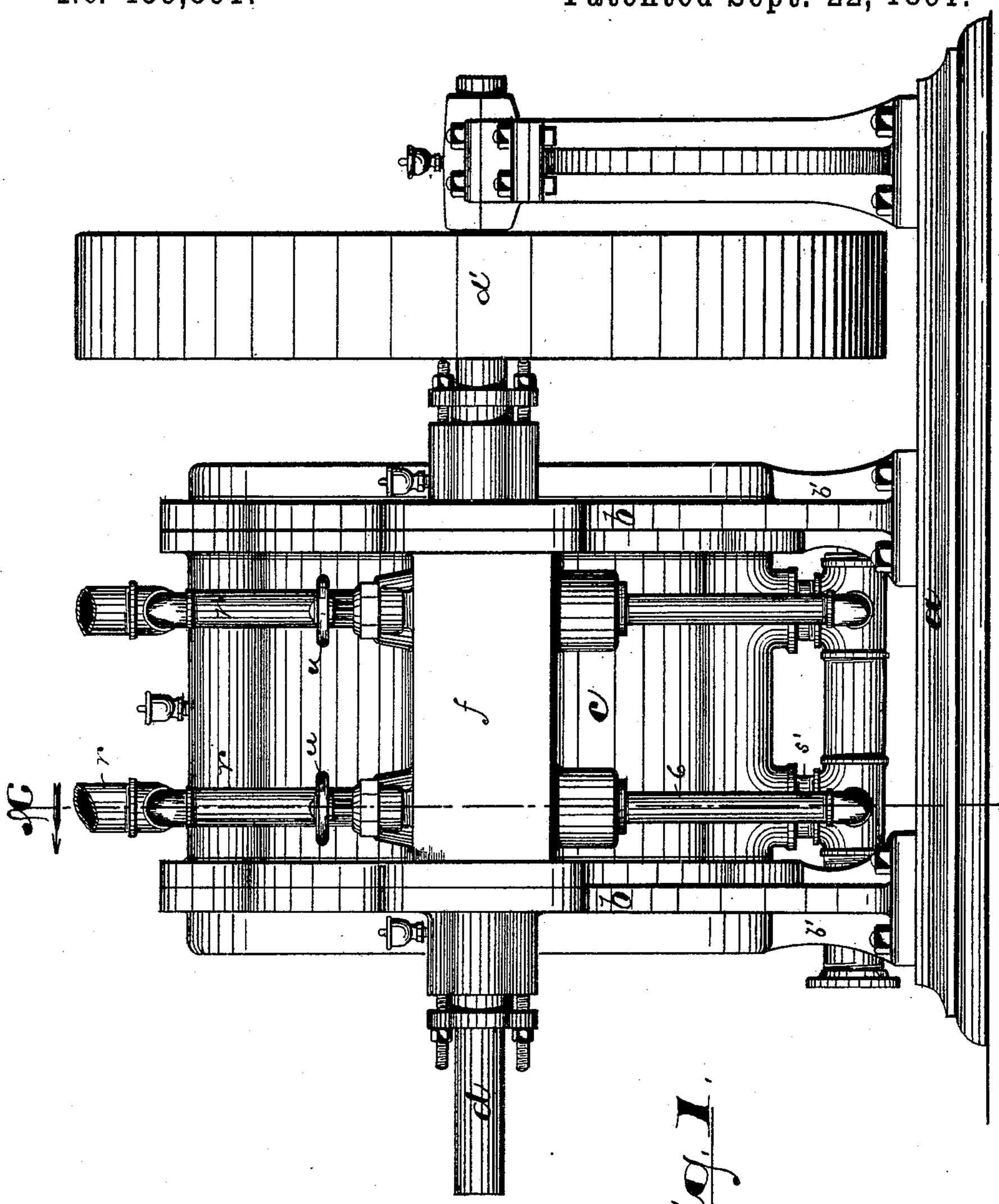
(No Model.) 4 Sheets—Sheet 1.

P. B. TAYLOR.

ROTARY ENGINE.

No. 459,861. Patented Sept. 22, 1891.



Witnesses

Oscar A. Michel.

Chas P. Michel.

Inventor.

Percy Bell Taylor,

By Drake & Co. Atty's.

(No Model.) 4 Sheets—Sheet 2.

P. B. TAYLOR.

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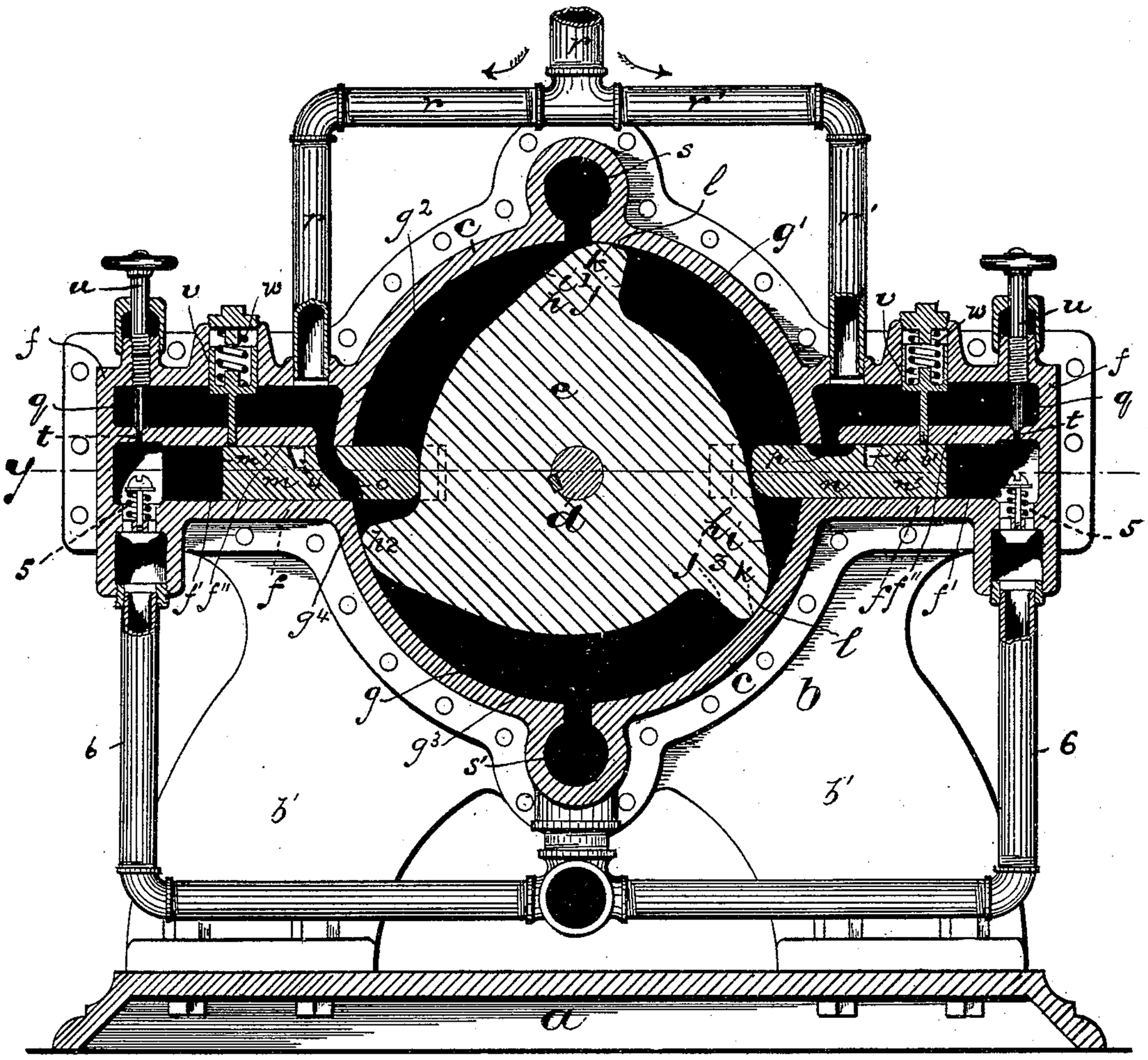

Fig. 2.

Witnesses

Oscar A. Michel

Chas P. Michel

Inventor:

Percy Bell Taylor,

By Drace & Co. Atty's.

(No Model.)

4 Sheets—Sheet 3.

P. B. TAYLOR.

ROTARY ENGINE.

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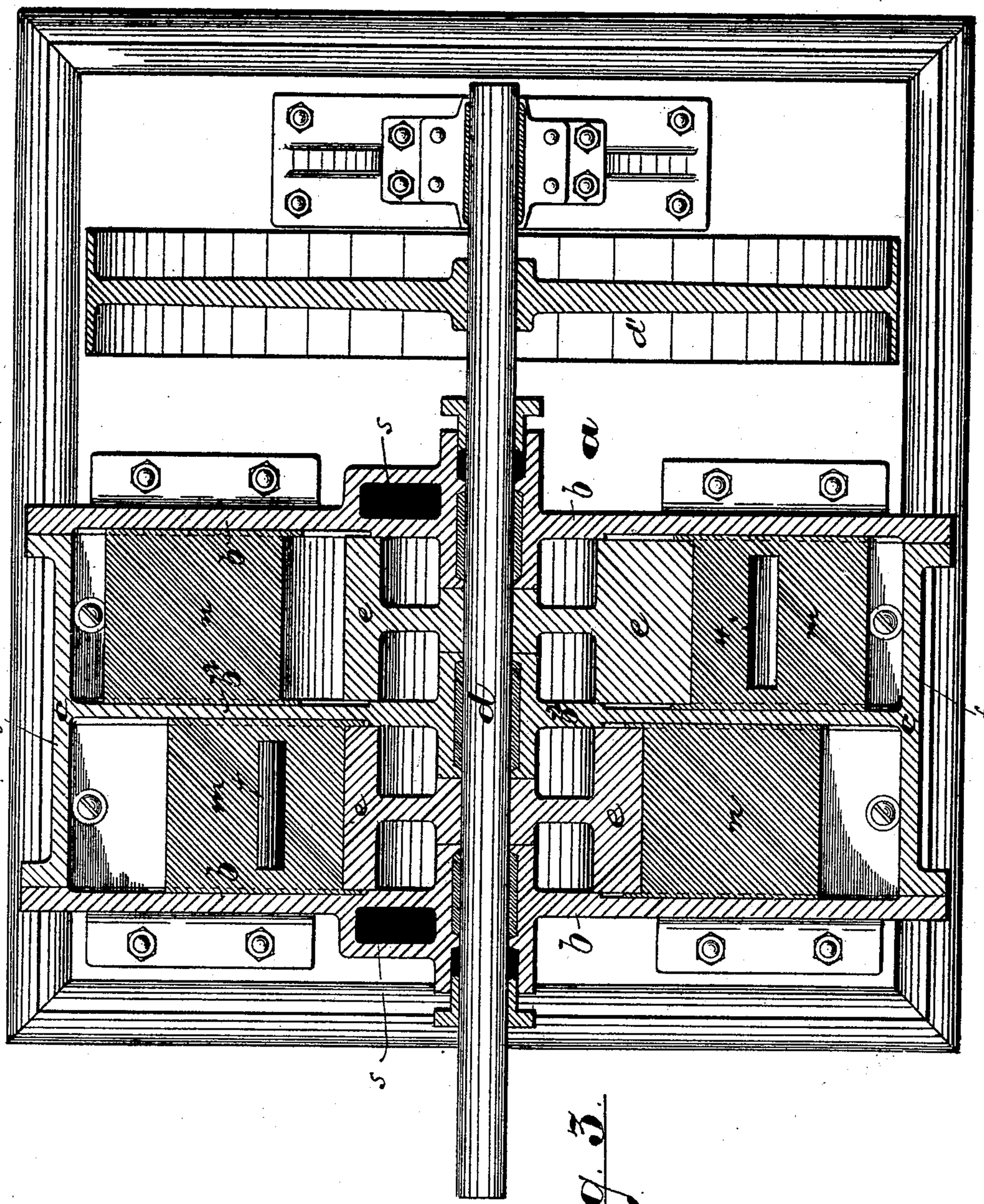

Fig. 3.

Witnesses

Oscar A. Michel.

Chas. R. Michel.

Inventor

Percy Bell Taylor.

By Drake & Co. Atty's.

(No Model.) 4 Sheets—Sheet 4.

P. B. TAYLOR.

ROTARY ENGINE.

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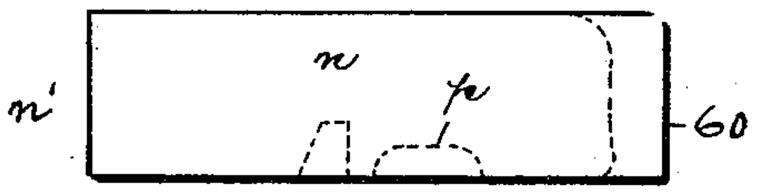

Fig. 4.

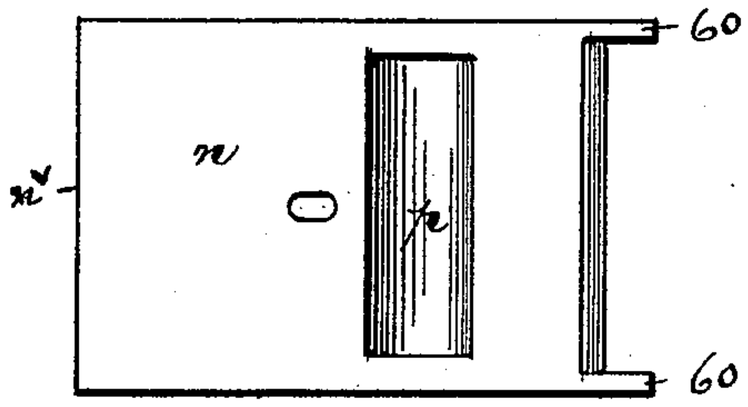

Fig. 5.

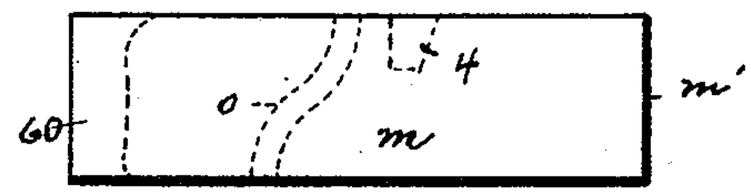

Fig 6.

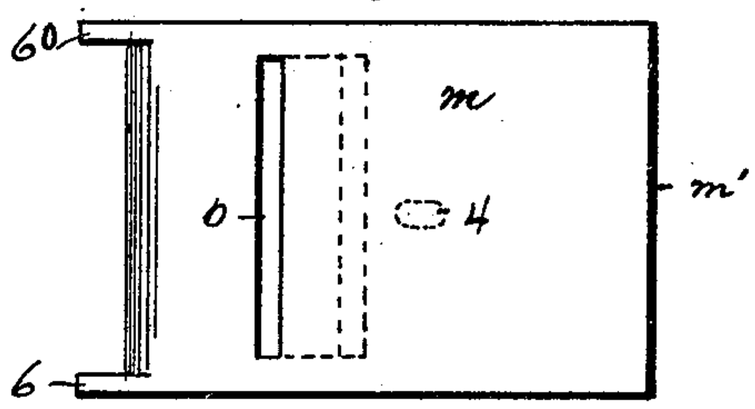

Fig. 7.

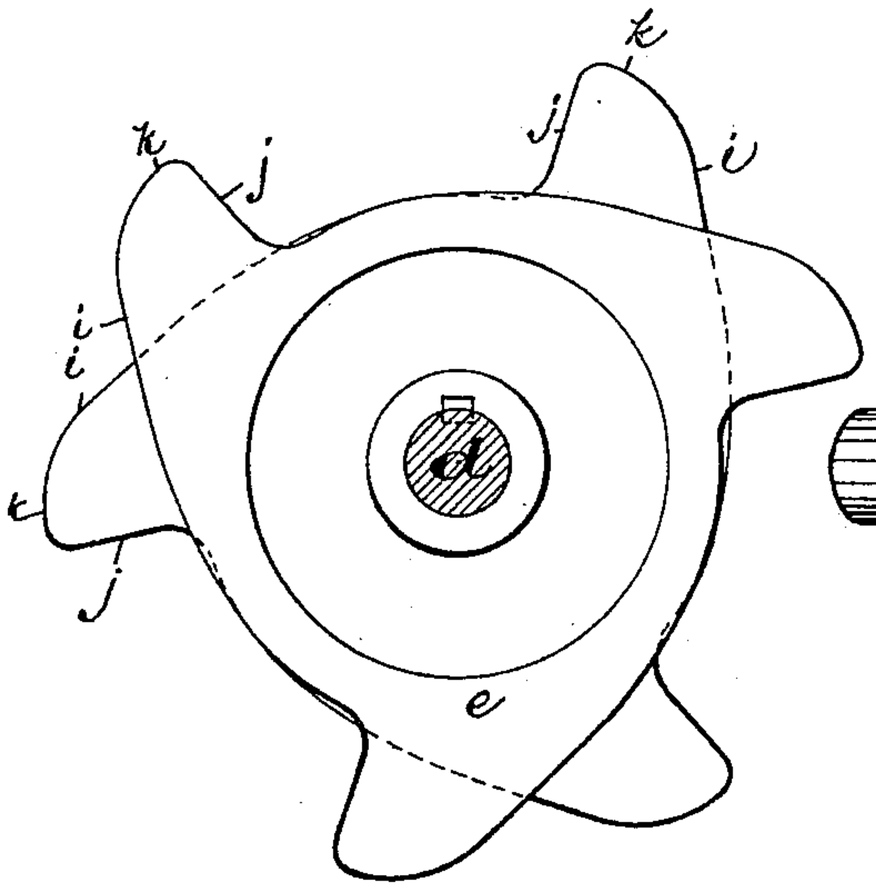

Fig. 8.

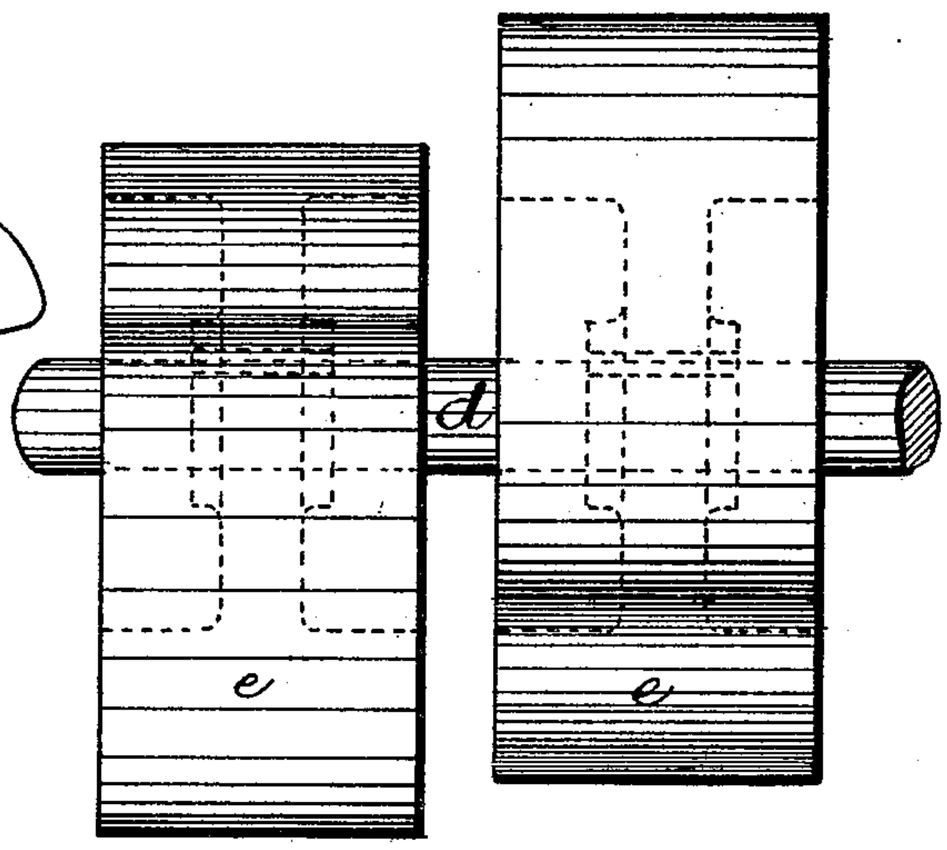

Fig. 9.

Witnesses

Oscar A. Michel.

Chas R Michel

Inventor:

Percy Bell Taylor.

By Drake & Co. Atty's.

UNITED STATES PATENT OFFICE.

PERCY BELL TAYLOR, OF NEWARK, NEW JERSEY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 459,861, dated September 22, 1891.

Application filed October 10, 1890. Serial No. 367,748. (No model.)

To all whom it may concern:

Be it known that I, PERCY BELL TAYLOR, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

The objects of this invention are to reduce the cost of construction; to secure a machine which will be more compact in its arrangements and in which the working parts will be covered and protected from dust, &c., and will thus be more durable, and the escape of steam and the loss occasioned thereby will be reduced or entirely prevented; to secure a greater efficiency of power from the steam, and to secure other advantages and results, some of which will be referred to in connection with the description of the parts and the operations of the same.

The invention consists in the improved rotary engine having the arrangements and combinations of parts substantially as will be hereinafter set forth, and finally embodied in the clauses of the claims.

Referring to the accompanying drawings, in which like letters and numerals indicate corresponding parts in each of the several views, Figure 1 is an elevation of the improved engine. Fig. 2 is a section of the same, taken on line *x*, Fig. 1. Fig. 3 is a section taken on line *y*, Fig. 2. Figs. 4, 5, 6, and 7 are side views and plans of certain slide-valves, and Figs. 8 and 9 are views of reversed rotary cams for operating the said slide-valves and transmitting power to the main driving-shaft.

In said drawings, *a* indicates the machine bed-plate. *b b* are side plates providing legs or standards *b' b'*, and *c* indicates a casting securely and imperviously secured to said side plates and having the general outline of a cylinder, which, taken in connection with the side plates, forms a steam chest or chamber and provides bearings for certain valves and other working parts. At the opposite sides of the cylinder, integral therewith, are certain offsets *f f*, in which are formed valve-chambers and steam-passages, and the main steam-chamber, formed by the casting and side plates, may be divided into two by a central partition b^2, formed integral with said casting, as indicated in Fig. 3. Said partition is employed when the machine is constructed for use as a reversing engine, in connection with two oppositely-disposed cams *e*, arranged on the driving-shaft *d*, as will be understood upon reference to Figs. 3, 8, and 9. The driving-shaft has its bearings in the side plates, suitable stuffing-boxes being provided thereat to prevent the escape of steam, and on said shaft is arranged a belt-pulley or a fly-wheel *d'* in any ordinary manner. The central partition may be dispensed with when but one cam is employed in connection with a single-acting engine. The offsets *f f* at the opposite sides of the cylindrical casting are arranged or disposed horizontally, and the steam-chambers therein are divided horizontally by partitions *f'' f''*, the upper ones of which receive the supply of steam from the boiler, and the lower ones serve as valve-chambers, being open at their inner ends to allow the slide-valves to project into engagement with the cams *e*. The said cams *e* are provided with a plurality of cam projections *h*, which are numbered, for convenience in describing the operation of the machine, 1, 2, and 3. Said cams at their forward sides are tangential, as at *i*, and at their opposite or rear sides are radial, as at *j*, the tangential sides serving especially as inclines to gradually press the sliding valves to a closed position within their chambers, while the radial surfaces serve to receive the expansive force of the steam as it enters through the suddenly-opened valves. The said radial surfaces may be slightly inclined with reference to the direction of movement of the slide-valves, so that the latter, when forced inward or toward the cam by back-pressure, will not strike with a too direct and sudden impact on the cam and produce a hammering effect, but rather will be forced down the incline of said radial surface, as will be understood. The extremities *k* of the cam extend into engagement with or into very close proximity to

the walls *l* of the cylinder, so that steam cannot to any material extent pass between and escape through the exhaust-opening without operating in the production of effective power.

Within the valve-chambers *f'* in the offsets are nicely-arranged slide-valves *m n*. These are preferably right-angular blocks of hardened steel having steam-ducts *o p* therein, which communicate with chambers *q*, formed above the partitions *f'' f''* and with the main steam-chamber *g* in the cylinder, so as to allow at certain moments in the operation of the device a free passage of steam from one chamber to the other. At other moments, alternating with the first, the said valves *m n*, forced by the cam to a position more fully within the cam-chambers, cut off communication through said ducts. The slide-valves, besides bearing on the walls of the valve-chambers, have bearings in the side plates, the latter being grooved to receive the same, and to prevent an escape of steam through said grooves the slide-valves are provided with projections 60, which enter said grooves at the sides of the cam and serve to plug the same, as will be understood. The cam projections are so formed and arranged in relation to the sliding valves as that when one is in position to allow a passage of steam the other is in position to cut off said steam; but as the said valves work alternately and the strokes are in quick succession the pressure against the cam to keep the same rotating is practically constant, and thus a smooth and regular motion of the cam is maintained, which motion is transmitted directly to the shaft *d*, on which the cam is keyed or firmly fastened. The steam coming from the boiler in the direction indicated by the arrows enters through the supply-pipe *r* into the steam-chamber *q* of the offset. Should the duct *o* of the valve *m* be open because of the valve being at its innermost projection, as illustrated in Fig. 2, the steam rushes through said duct directly against the radial surface *j* of the cam projection 2, forcing the cam pivotally with the shaft *d*. This movement of the cam causes the tangential bearing of another 3 of the cam projections to engage the valve *n* and to force the same outward, (or into its valve-chamber,) closing the duct *p* therein for a time. The duct in the valve *m* is an inclined perforation extending through the valve-slide adapted to lead the steam or direct the same downward against the downwardly-moving cam projection, and in the opposite valve-slide *n* the duct *p* has a recess on the upper face of the slide and when open is adapted to direct the steam against the upwardly-moving cam projection. Thus the steam is directed in opposite directions on opposite sides of the cam.

To provide for a continued expansion of steam in the portion *g'* of the chamber *g*, and to thus gain a more full benefit of its expansive force or power, I do not immediately on the closing of the valve *n* open an exhaust to allow the escape of steam from said portion *g'*; but, on the other hand, I so dispose the exhaust-pipes *s s'* as that the exhausting operation is delayed until the expansive power is fully developed or utilized, at which time the exhaust is open to said portion *g'* by the projection 1 passing over the exhaust-opening *s*. As the live steam enters through the duct *o* against the radial bearing of the projection 2 and turns the cam pivotally, as described, the said cam projection is brought to a point near the exhaust-opening *s'*, when the valve-duct *o* is closed by the bearing *i* of the projection 1, forcing the valve *m* outward. The compressed steam within the constantly-enlarging chamber g^4 continues to act, however, and to exert its power on the cam until the said projection 2 arrives at the exhaust-opening *s'*, when the steam escapes into the said opening, leaving the chamber devoid of pressure, so that the cam will not be retarded by material back-pressure after the projection has passed the exhaust-opening. The valves have a steam-tight bearing on the periphery of the cam, so that there can be no material escape of steam rearward or in the direction from chamber g^4 to chamber g^2. The sliding valves are held against the cam by steam-pressure acting constantly upon the rear extremity *m' n'* thereof, the steam entering to bear on said extremities through valve-openings *t* from the upper steam-chambers *q* to the valve-chambers *f'* at the rear of the valves. The said openings *t* can be closed or the amount of steam passing therethrough may be regulated and controlled by valves *u* of any suitable construction and operation.

To obtain a reversing engine, which I consider of large importance, I arrange a pair of cams of the construction described in separate chambers in connection with sets of sliding valves substantially such as hereinbefore described, the said valves being reversely arranged in correspondence with the reverse disposition of the cams illustrated in Figs. 8 and 9. In the offsets are arranged pistons *v*, at the back of which are arranged in a suitable chamber spiral springs *w* of slight tension. The lower extremities of the said pistons are provided with pins or lugs *v'*, which extend through perforations in the partition-walls *f''* and engage suitable bearings in or on the slide-valve. When steam is admitted, the pressure on the under side of the said pistons is sufficient to overcome the spring-power of the spiral, and thus the pins are held away from the sliding valve when the latter are at work, so that they can operate freely.

When it is intended to operate the machine to secure a movement in the reverse direction, it is only necessary to shut off the steam from the operating side of the engine, when the piston will be allowed to drop under the power exerted by the spring *w* into a recess or hole 4 in the valve, the said valve being

forced back into its chamber, so that the said hole 4 is brought into coincidence with the piston by the momentarily-continued movement of the cam, owing to inertia. Thus the latter will be held back out of operative relation to the cam. I then admit steam to the other side of the machine and thus raise its pistons and release the valves thereof and obtain the reverse movement desired.

The valve controlling the admission of steam to the pipes *r* may be an ordinary four-way valve, one of the ways therein being for the steam from the boiler, another for exhaust-steam, and the two others leading to each side of the engine.

To prevent an undue steam-pressure behind the sliding valves from any cause, I have provided tappet-valves 5 to the exhaust-pipe 6, adapted to automatically open when the pressure is excessive.

All the exhaust-pipes run to the bottom of the machine, and thus no water of condensation can accumulate where it will interfere with the working of the machine.

The engine may be equipped with any governor desired.

Having thus described the invention, what I claim as new is—

1. The improved rotary engine having a cylinder provided with steam-chambers having grooved sides and ducts, slide-valves arranged on opposite sides of the cylindrical chamber and having projections 60 working in said grooves and engaging the sides of the cam, and a rotary cam having a plurality of cam projections engaging said slide valves, the said valves being in engagement with said cam by constant steam-pressure at the rear extremity thereof, substantially as and for the purposes set forth.

2. The improved rotary engine having therein a rotary cam with cam projections thereon, and a plurality of sliding valves engaging the periphery of the cam and having projections 60 60 engaging the opposite sides of the cam and pressed to their closed positions by the said cam projections, the said valves having a constant pressure tending to force them in the opposite direction, substantially as set forth.

3. In a rotary engine, the combination, with the reversely-set cams and slide-valves, of pistons for holding said slide-valves inoperative, substantially as set forth.

4. In a rotary engine, the combination, with the reversely-set cams and slide-valves, of steam-operated pistons held away from said slide-valves by steam-pressure, substantially as and for the purposes set forth.

5. In a rotary engine, the combination, with the reversely-set cams having cam projections and sets of slide-valves, of automatic holders adapted to hold the valves from operative engagement with the cam, substantially as set forth.

6. In a rotary engine, the combination, with the reversely-set cams having cam projections and sets of slide-valves, of pistons backed by springs, said pistons being held from engagement with said valves by steam-pressure against the power of the springs, substantially as and for the purposes set forth.

7. In a rotary engine, the combination of reversely-set cams having inclines or tangential bearings to engage the valves and steam-bearings, said bearings facing in one direction in one cam and in an opposite direction in the other, and valves having valve-ducts, one in each set having a clear-through extension and in the other a one-sided duct, whereby the steam will be directed oppositely on each side of the cam, and the said ducts being reversed to correspond with the reversed disposition of the cams, substantially as set forth.

8. In a rotary engine, a cylinder having a main chamber and offsets at the sides, each provided with a steam-chamber *q*, a valve-chamber *f'*, a partition *f''*, and passage *t*, exhaust-pipes leading from the rear of the valve-chambers and provided with tappet-valves 5, passages *t*, providing communication between said chambers *q* and *f'*, supply-pipes connecting with the chambers *q*, valves arranged in the valve-chambers and projecting inward toward and into the main cylinder-chamber and having ports or ducts adapted to receive steam from steam-chamber and transmit the same to the main chamber, and a rotary cam arranged in said main chamber having cam projections which with the valves separate the main chamber into parts, and exhaust pipes or ports leading from said main chamber.

9. In a rotary engine, the combination of a rotary cam having cam projections, a cylinder having a main cylinder-chamber and an offset, the latter having a steam-chamber *q*, valve-chamber *f'*, partition *f''*, communication *t*, valve *u*, valve 5, closing an exhaust-opening, and sliding valve *n*, adapted to engage the cam, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 7th day of October, 1890.

PERCY BELL TAYLOR.

Witnesses:
CHARLES H. PELL,
OSCAR A. MICHEL.