(No Model.) 6 Sheets—Sheet 1.

S. P. M. TASKER.

ROTARY ENGINE.

No. 518,635. Patented Apr. 24, 1894.

FIG. 1.

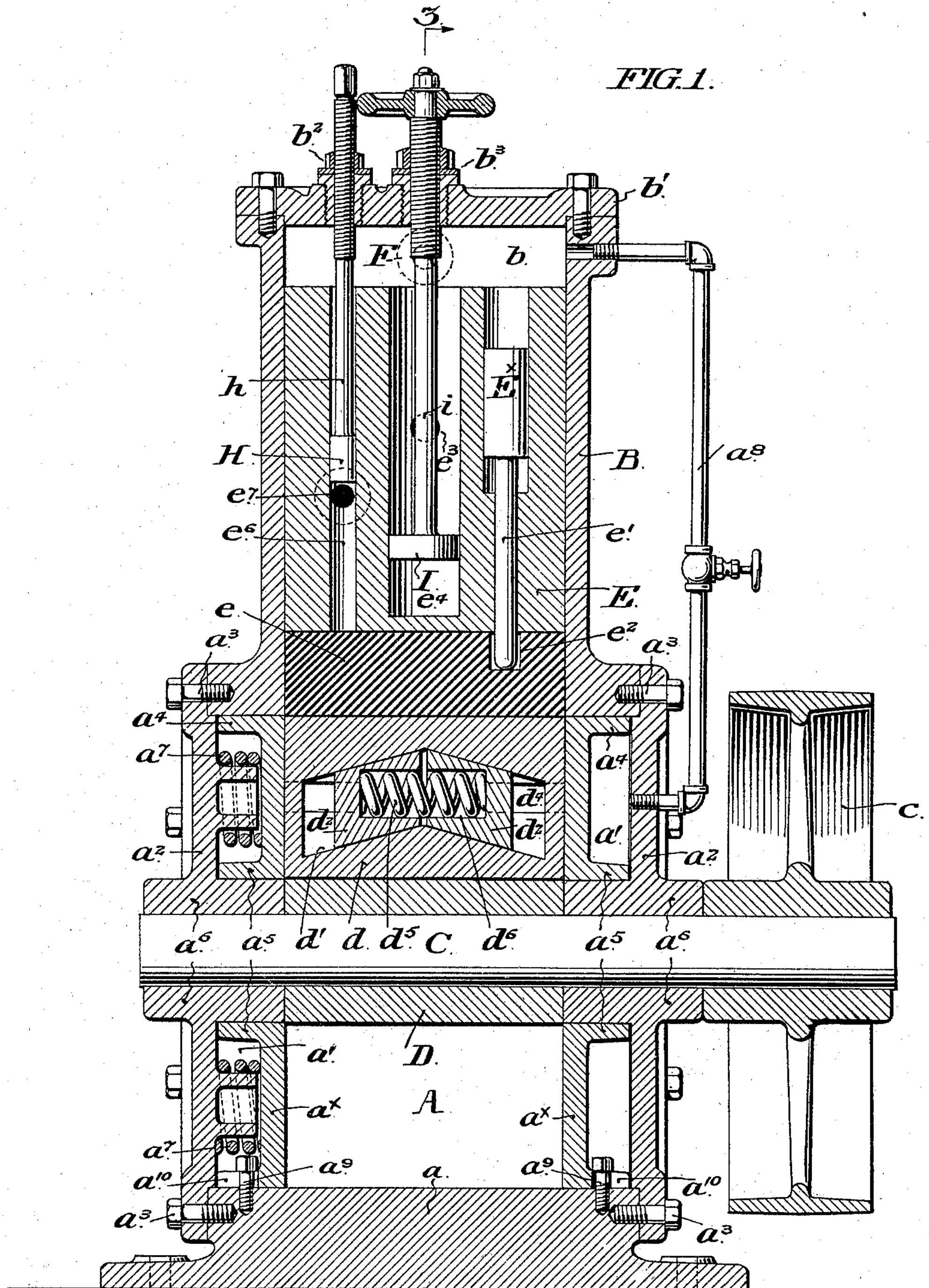

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FIG. 2.

FIG. 3.

FIG. 4.

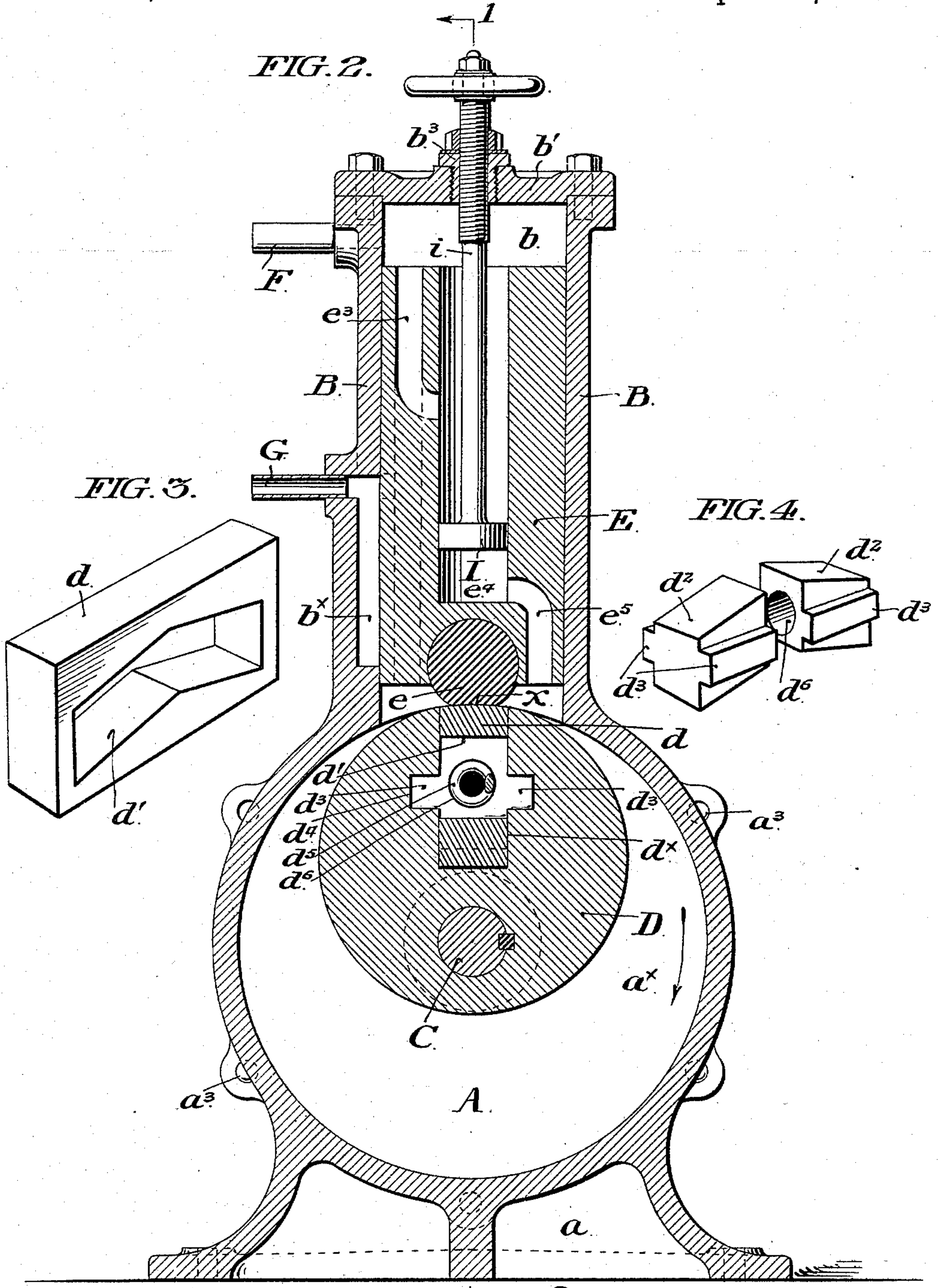

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FIG. 5.

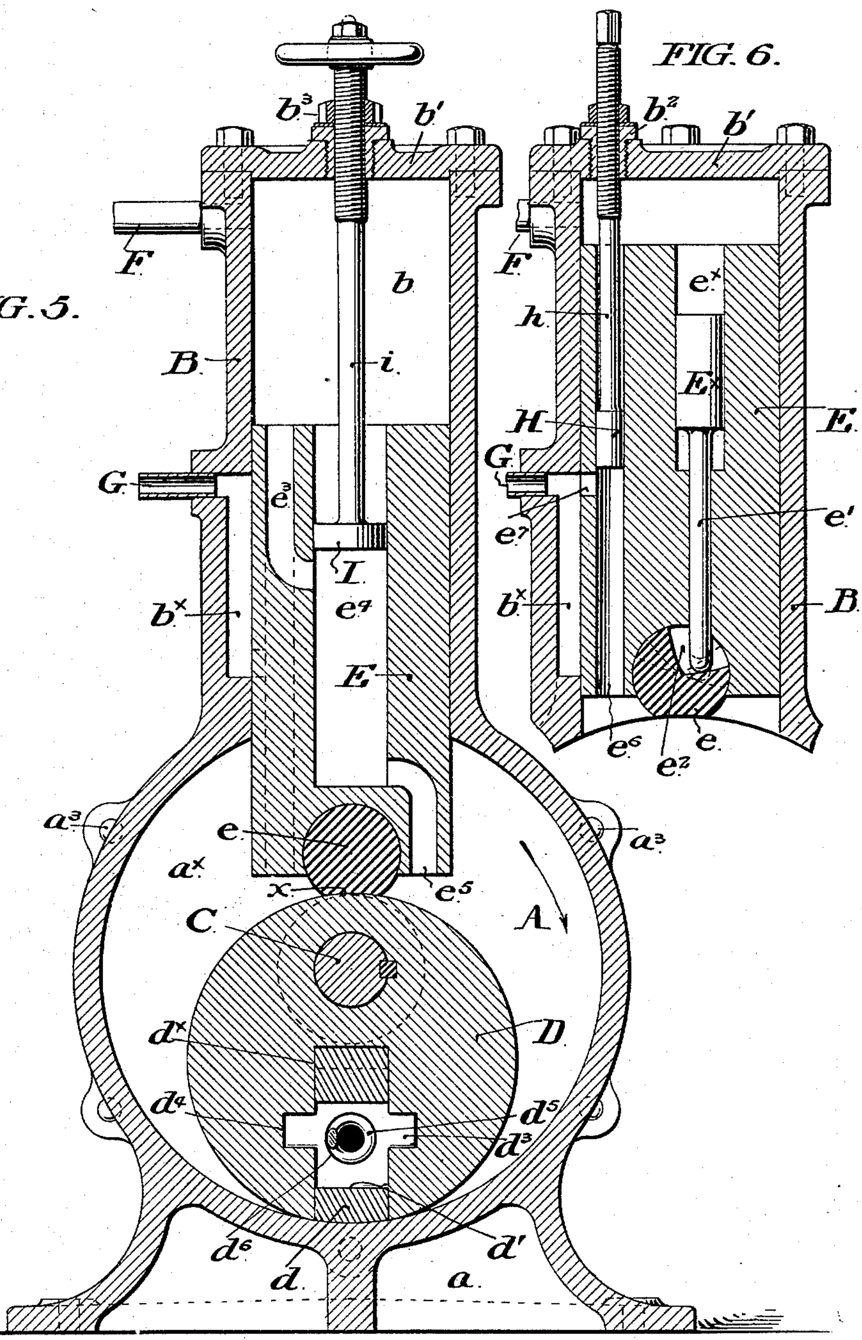

FIG. 6.

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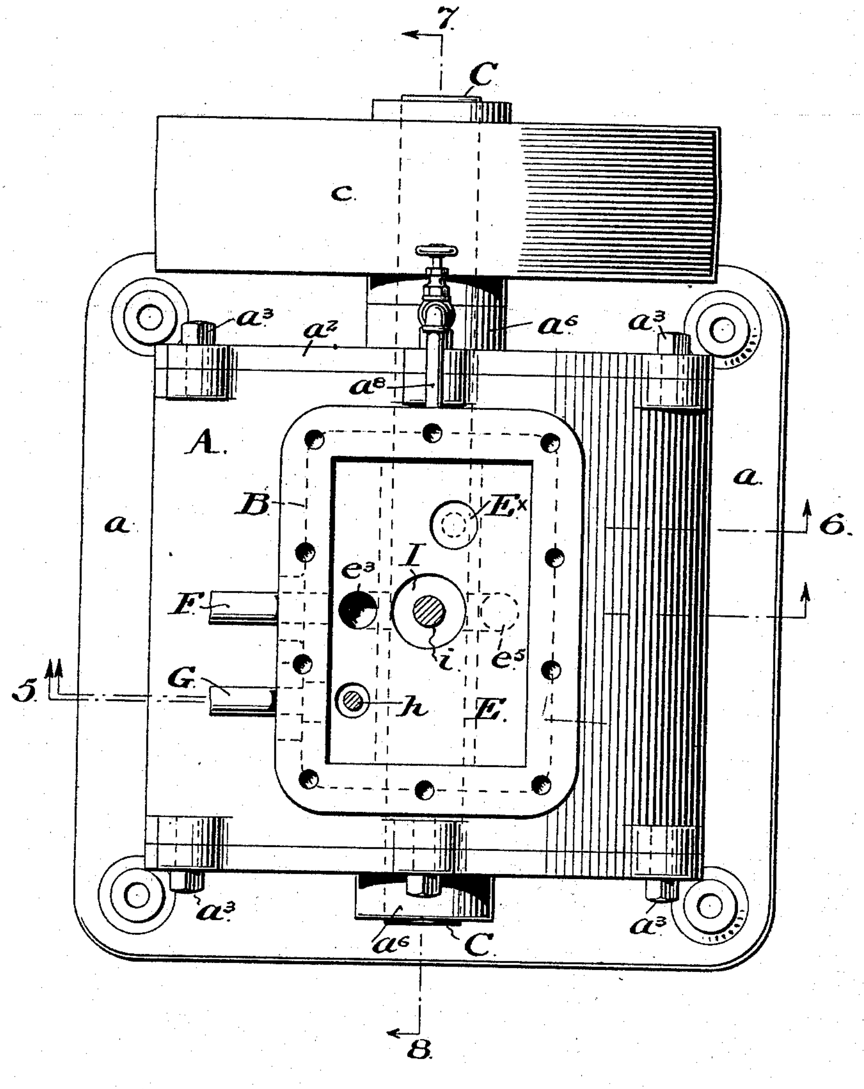
FIG. 7.



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No. 518,635.

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FIG. 8.

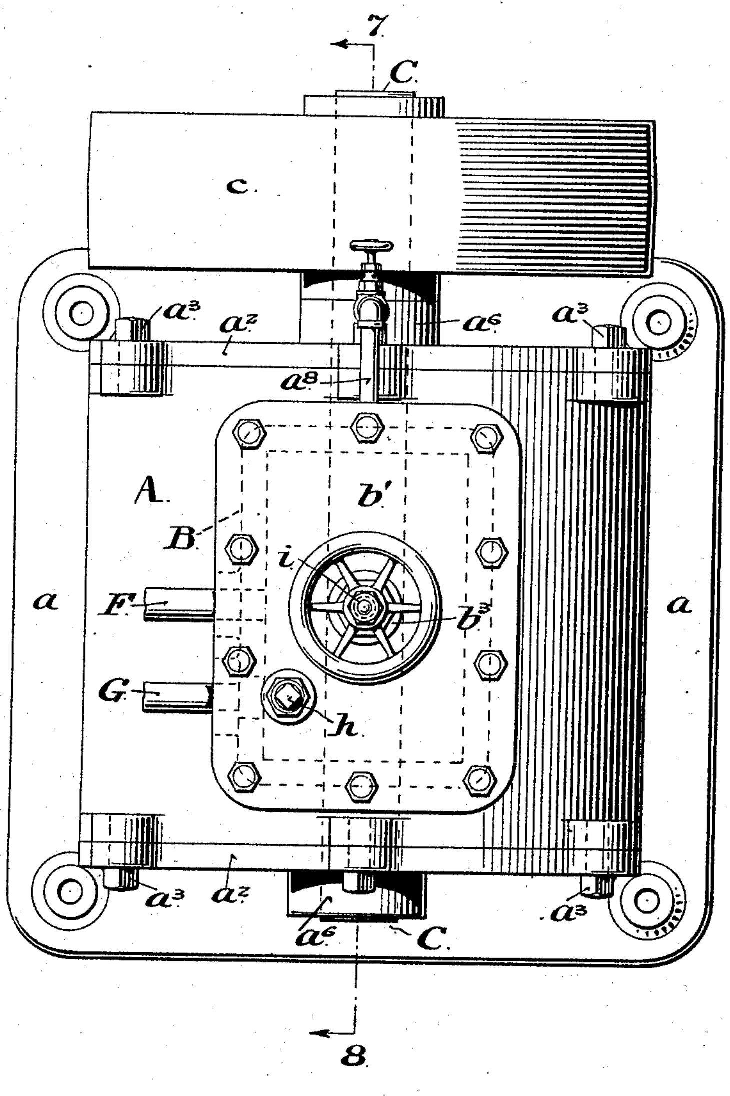

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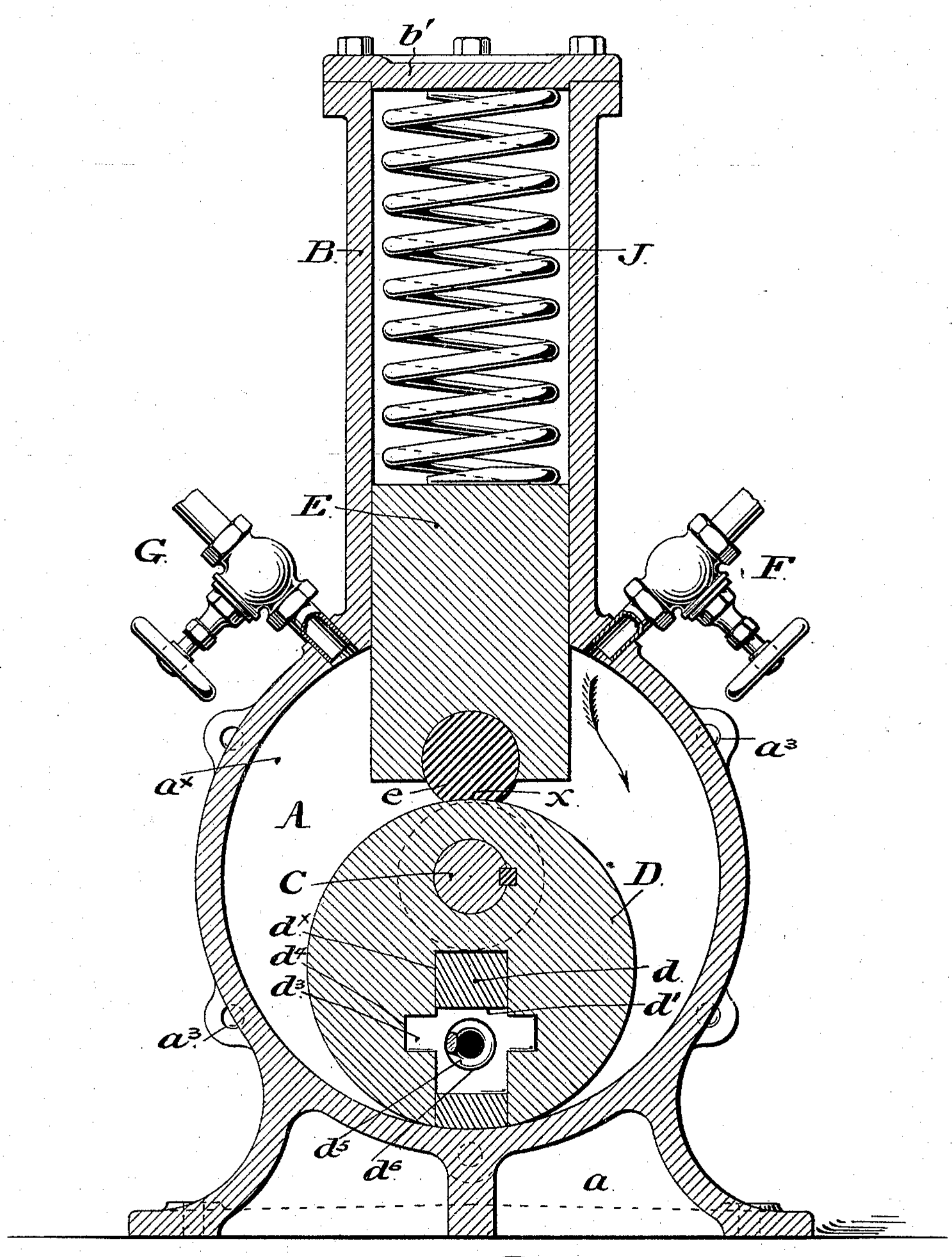
FIG. 9.



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UNITED STATES PATENT OFFICE.

STEPHEN P. M. TASKER, OF PHILADELPHIA, PENNSYLVANIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 518,635, dated April 24, 1894.

Application filed December 26, 1893. Serial No. 494,659. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN P. M. TASKER, a citizen of the United States, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

It is the object of my invention to manufacture a rotary engine of a compact design, the parts of which shall be few, simple, and not liable to get out of order, and which may be actuated by steam, gas, or any preferred liquid or fluid.

An engine embodying my improvements is represented in the accompanying drawings and hereinafter described, the particular subject-matter claimed as novel being hereinafter definitely specified.

In the accompanying drawings, Figure 1 is an approximately central, vertical, side, sectional, elevation, in the plane of the dotted lines 1—2 of Fig. 2, and 7—8 of Fig. 7, of an engine embodying my improvements. Fig. 2 is a central, vertical, end, sectional, elevation of the engine as represented in Fig. 1,—section being supposed in the plane of the dotted line 3—4 of said Fig. 1, and the view being at right angles to that of Fig. 1. Fig. 3 is a view in perspective of the automatically-acting plunger with which the eccentric piston is provided, and the function of which is to maintain the piston fluid-tight with respect to the peripheral walls of the cylinder within which said piston revolves. Fig. 4 is a similar view of the spring-actuated sliders which serve to maintain the plunger in contact with the walls of the cylinder. Fig. 5 is a view similar to Fig. 2, except that the parts are in the position which they occupy when the piston is at the bottom of its stroke. Fig. 6 is a fragmentary, vertical, sectional, elevational detail, through the slide valve and its casing, section being supposed in the plane of the dotted line 5—6 in Fig. 7, and the view being especially illustrative of the devices for maintaining close contact between the slide valve and the eccentric piston. Fig. 7 is a top plan view of the engine represented in Figs. 1, 2, and 5, with the head plate of the valve casing removed. Fig. 8 is a similar view of the said engine with the head plate in place; and Fig. 9 is a view similar to Fig. 2 of an engine embodying a modified form of induction and exhaust ports.

Similar letters of reference indicate corresponding parts.

Referring first to the construction represented in Figs. 1 to 8 of the drawings, A is the piston cylinder of the engine, the same being of any preferred mechanical construction, and preferably erected from a suitable base or bed plate, a, in such manner that its axis is disposed horizontally.

B is a valve casing erected preferably vertically and superimposed upon and preferably radiating from the piston cylinder, as part of the same casting with which it may, if desired, be formed.

The mechanical details of the construction of the piston cylinder and of the valve-casing, form no part of my invention. These parts may, however, be conveniently made in the manner represented in the drawings.

The inside end faces of the piston cylinder are preferably made as annular wearing-plates $a^{\times}$ exactly fitted, diametrically, within the ends of the cylinder, and conforming thereto, and inclosed and retained by cylinder end-plates a^2, secured by bolts a^3, or otherwise as convenience of construction may dictate. The wearing plates are preferably cast with horizontal outwardly-extending circular flanges,—one of which a^4 is a peripheral flange, and the other of which a^5 is a central flange,—which are designed respectively to make tight contact with the outer edges of the walls of the cylinder and with the hub-like inwardly-extending surfaces of tubular shaft-bearings a^6 with which the end plates a^2 of the cylinder are respectively provided, and within which is journaled free for rotation the shaft C of the eccentric piston, an end of which protruding beyond one of the bearings is equipped with a pulley c which the shaft in its rotation drives.

It will be apparent that by virtue of the foregoing construction there exist between the flanges and the outer faces of the wearing plates and the inner faces of the end plates of the cylinder, annular interspaces a' which may be utilized for the introduction either of compressed spiral springs a^7, or of steam or other liquid or fluid, to exert force tending to press the wearing plates away from the end plates and in consequence cause said plates to make fluid-tight contact with the respective ends of the eccentric piston, as clearly shown in Fig. 1 in which the springs a^7 are represented upon the left hand end of the cylinder and the introduction of steam through a steam supply pipe a^8 at the right hand end of said cylinder.

The employment of the wearing plates is beneficial, but not of the essence of my invention so far as the same is concerned with the engine proper. Both plates may, therefore, be dispensed with, or only one employed, and any preferred means for pressing a plate or plates toward and against the piston may be resorted to.

When plates are employed it is of advantage to secure them against any possible rotation by the application, for instance, of bolts a^9, or kindred stop devices, projecting radially inward from the walls of the cylinder through horizontal outwardly-extending slots a^{10} in the peripheral flanges a^4 of said plates.

D is the piston of the engine, the same being a preferably solid cylinder eccentrically disposed within the piston cylinder, with its axis in parallelism with the axis of said cylinder, by being mounted at a predetermined distance from its own axis upon the shaft C heretofore referred to, with reference to which it is keyed or otherwise rigidly attached so that in its own eccentric revolution within the cylinder it will occasion the rotation of the shaft. The planes of the ends of this eccentric piston, whether planes proper, or spherically convex or concave surfaces, are, as shown in Fig. 1, disposed at right angles to the axis of the piston, and are consequently in parallelism or coincidence with the planes or spherical surfaces of the ends of the cylinder, tight contact with which they, as stated, make either directly or through the intervention of wearing surfaces. The normal mounting of the piston with respect to its shaft, being conveniently that shown in the drawings, is such as to cause the piston, the diameter of which is considerably less than the interior diameter of the cylinder, to make peripheral contact, linear or curvilinear according to the form of the walls of the cylinder and the peripheral surface of the piston, with the inner surfaces of the walls of said cylinder in the region of that extremity of its diameter which is farthest from said shaft. If, therefore, neither the cylinder nor the piston were subject to wear, tight contact in the continuing revolutions of the piston would be maintained. In order however to prevent the inevitable wear, I equip that peripheral surface of the piston which is farthest from its shaft with an automatically-acting wear-compensating device, conforming as to its acting face to the shape of the walls of the cylinder, which I term a plunger, and which is conveniently of the following construction:

d, Figs. 1, 2, 3, and 5, is the plunger proper, the same being conveniently formed as a block of metal (see Fig. 3) conformed to fit snugly within a recess or plunger chamber $d^{\times}$, being a parallel-sided slot extending inward, preferably radially, from the periphery of the piston longitudinally across its length and to a depth conveniently equal to about half the diameter of the piston. This block or plunger is internally slotted longitudinally to form two oppositely-inclined but continuous parallel-sided angular ways d' within which are fitted and to which are conformed two correspondingly oppositely inclined and parallel-sided sliders d^2, Figs. 1 and 4, which are each provided with lateral tongues d^3 with respect to which the top and bottom surfaces of the sliders possess their inclines, and which tongues are adapted to longitudinally-extending tongue-grooves d^4 channeled out of the substance of the eccentric piston in the region of the side faces of the plunger chamber formed therein, in parallelism with the axis of the piston.

It is obvious that when the sliders are in place within the ways of the plunger block as shown in Fig. 1, and the plunger block and its contained sliders are in place within the plunger chamber in the piston, any force which tends to separate the sliders or to move them away from each other, will, by virtue of the contact between the inclined surfaces of the sliders and those of the ways within the block, and of the engagement of the radially immovable tongues of the sliders within the grooves in the piston, cause the radial outward movement of the plunger block against the walls of the cylinder. This mutual separation of the sliders may be secured by any device or medium which tends to force them apart. I prefer to resort to the employment of a compressed spiral spring d^5, entered within oppositely disposed spring sockets d^6 formed in the sliders and opening through their meeting ends, as shown in Figs. 1 and 4. Obviously the continuing tendency of this compressed spring to expand, will occasion the constant thrust apart of the sliders, and, consequently, the constant radial outward thrust of the plunger block.

B, as stated, is a valve casing erected vertically above the piston cylinder and opening thereinto, in the manner shown in the drawings, to the full extent of its internal cross-sectional area. The form of the casing is preferably quadrangular, its sides being oppositely parallel. It may, however, be of other form than square in cross-section. Whatever, however, may be its form, it is adapted to contain a slide valve E externally conformed to its interior, and adapted to be reciprocated longitudinally therein and partly into the cylinder.

The lower extremity of the slide valve in the preferred mounting of the engine, is provided with a bearing block e, in the organization and form of parts illustrated, cylindric, conformed to and fitted within a corresponding cylindric recess in the lower extremity of the valve in such position that its axis is in parallelism with the axis of the shaft C. The bearing block is as wide as the piston, and as to a portion of its periphery which projects below the bottom face of the slide valve is cylindrically (linearly or curvilinearly) concaved between the points x and x in Figs. 2 and 5, in order to conform it to the cylindric (linear or curvilinear) surface of the piston. As it is obvious that in the revolution of the piston coincidence between the concaved surface x to x of the block and the convex surface of the piston should, in all positions of the piston, be maintained, the cylindric bearing block as a whole is adapted to be maintained as to its concavity in constant contact with the surface of the piston, by the action of a steam-controlled plunger $E^{\times}$ adapted to a plunger way $e^{\times}$ in the valve, a depending plunger rod e' of which operates in a radial recess e^2 formed within the cylindric bearing block e, as shown in Fig. 6. The steam or other agent admitted to the upper portion of the valve chamber b formed within the valve casing B, acting constantly upon the head of the plunger $E^{\times}$ serves to keep said plunger, whatever may be the position of the valve, under constant downward pressure, with the result that its rod, by continuing thrust upon the radial recess of the bearing block, maintains the latter in such position considered with respect to its limit of rotation as to insure and maintain coincidence between the concavity of the block and the convex surface of the piston.

The slide valve E in the construction under discussion is provided with an induction port composed of the passages e^3, e^4 and e^5, best seen in Figs. 2 and 5, and with an eduction or exhaust port composed of the passage e^6, best seen in Figs. 1 and 6.

The steam, or other motive agent, employed, is admitted to the upper portion of the valve chamber b, conveniently through the steam inlet pipe F, and is permitted to escape from the chamber by the steam exhaust pipe G, which latter, as will be observed, is a port of egress from a longitudinal channel in the wall of the valve casing B, which I term an exhaust chamber $b^{\times}$, and which opens inwardly throughout its length into the interior of the valve chamber, but is closed as to its inward opening by the slide valve, an aperture e^7 from the eduction port e^6, opening laterally through the valve into it.

H is an eduction cut-off valve, fitted steam-tight within the eduction port e^6 as shown in Figs. 1 and 6, the stem of which passes upwardly through the head plate b', with respect to which it is made tight by means of a stuffing box b^2 through the internally threaded bore of which the threaded extremity of the valve stem h is passed.

By a reference to Figs. 1, 2, 5, and 6, it will be apparent that the vertical set of the cut-off valve H can be made such as to regulate the cut-off of the exhaust.

I is an induction cut-off valve, adapted to the longitudinal channel e^4 formed within the slide valve, which constitutes in connection with the lateral channels e^3 and e^5 the induction port. The stem i of the induction valve is extended vertically upward through a stuffing box b^3 in the head plate of the valve casing, and is threaded with respect to the internally threaded tubular bore of said stuffing box as shown in the drawings, in order to permit of the vertical adjustment of the induction cut-off valve to regulate the induction cut-off with relation to the internal port of the channel e^3 in a manner similar to the regulation of the exhaust cut-off.

Such being a description of what I regard as the best form of engine embodying my improvements, it is apparent that certain modifications with reference to the induction and exhaust of the steam or other motive agent may be made without departure from my invention, and in Fig. 9 I have represented an obvious modification. In the engine illustrated in said figure the ports in the valve casing, and the ports and passage-ways in the slide valve, are dispensed with, and the casing made as a closed chamber, and the slide valve which conforms to its interior made as a solid valve,—both the induction and exhaust ports being applied directly to the cylinder preferably at each side of its periphery in adjacency to the casing. In this construction the cut-off valves applied to the slide valve are dispensed with and cocks or kindred regulating contrivances applied directly to the inlet and outlet pipes of the casing ports. To avoid the possibility of the pressure within the cylinder forcing the solid slide valve out of contact with the piston, between the head plate of the valve chamber and outer end of the piston there is applied a spring J which serves to maintain the valve in constant contact with the piston. The operation is precisely the same as that of the preferred form of engine first described.

Having thus described an engine conveniently embodying my improvements and the construction and relationships of its various parts, its mode of operation will have been sufficiently understood. Suffice it, therefore, to add that the initial introduction of steam to the cylinder will occasion the descent of the slide valve and the simultaneous admission of the steam behind the piston to occasion its revolution in the direction of the arrows applied to it in Figs. 2, 5, and 9.

By the regulation or adjustment of the cut-offs illustrated in the construction of the first eight figures, the lead, automatically given alternately to the induction and to the exhaust, is under exact control, and the predetermined continuous revolution of the piston and reciprocation of the slide valve in consequence secured.

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

1. In a rotary engine, the following elements in combination:—a hollow piston-cylinder;—a revoluble shaft concentrically disposed with respect to the cylinder and extending beyond one of its ends;—a piston eccentrically and fixedly mounted upon the shaft in such manner as to make contact with the walls and ends of the cylinder;—a valve casing extending from the cylinder, opening thereinto, and provided with induction and exhaust ports;—a slide valve conformed to the interior of the valve casing and adapted to reciprocate therein and into the cylinder, provided with induction and exhaust passages, and as to its inner end provided with a bearing block having a concaved surface conformed to and adapted to make close contact with the periphery of the piston;—and a fluid-controlled and automatically operating plunger which acts upon said bearing block and maintains its concaved surface in constant coincidence with the periphery of the piston throughout the revolution of the latter,—substantially as set forth.

2. In a rotary engine, the following elements in combination:—a hollow piston-cylinder;—a revoluble shaft concentrically disposed with respect to the cylinder and extending beyond one of its ends;—a piston eccentrically and fixedly mounted upon the shaft in such manner as to make contact with the walls and ends of the cylinder;—a valve casing extending from the cylinder, opening thereinto, and provided with induction and exhaust ports;—a slide valve conformed to the interior of the valve casing and adapted to reciprocate therein and into the cylinder, having its inner end in contact with the eccentric piston, and provided with induction and exhaust passages;—and adjustable cut-off valves respectively operative in connection with the induction and exhaust passages of the slide valve;—substantially as and for the purposes set forth.

3. In a rotary engine, the following elements in combination:—a hollow piston-cylinder;—a revoluble shaft concentrically disposed with respect to the cylinder and extending beyond one of its ends;—a piston eccentrically and fixedly mounted upon the shaft in such manner as to make contact with the walls and ends of the cylinder;—a valve casing extending from the cylinder, opening thereinto, provided with induction and exhaust passages, and as to its inner end provided with a bearing block having a concaved surface, conformed to and adapted to make close contact with the periphery of the piston;—a plunger under the influence of the steam or other liquid or fluid within the valve casing which acts to maintain constant and automatic contact between the concaved surface of the bearing block and the periphery of the piston throughout the revolution of the latter:—and adjustable cut-off valves respectively operative in connection with the induction and exhaust passages of the slide valve:—substantially as set forth.

4. In a rotary engine, the following elements in combination:—a hollow piston-cylinder;—a revoluble shaft concentrically disposed with respect to the cylinder and extending beyond one of its ends;—a cylindric piston of the length of the cylinder, but of less diameter, eccentrically and fixedly mounted and keyed upon the shaft, and containing a radially disposed plunger adapted to make contact with the peripheral walls of the cylinder and formed with angular ways within which are contained angular sliders conformed to said ways, adapted to be pressed apart by a compressed spiral spring, and formed with lateral tongues adapted to grooves in the piston;—a valve casing extending from the cylinder, opening thereinto, and provided with induction and exhaust ports;—and a slide valve conformed to the interior of the valve casing and adapted to reciprocate therein and into the cylinder, having its inner end in contact with the eccentric piston, and provided with induction and exhaust passages;—substantially as set forth.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 9th day of December, A. D. 1893.

STEPHEN P. M. TASKER.

In presence of—
J. BONSALL TAYLOR,
F. NORMAN DIXON.