No. 762,448. PATENTED JUNE 14, 1904.

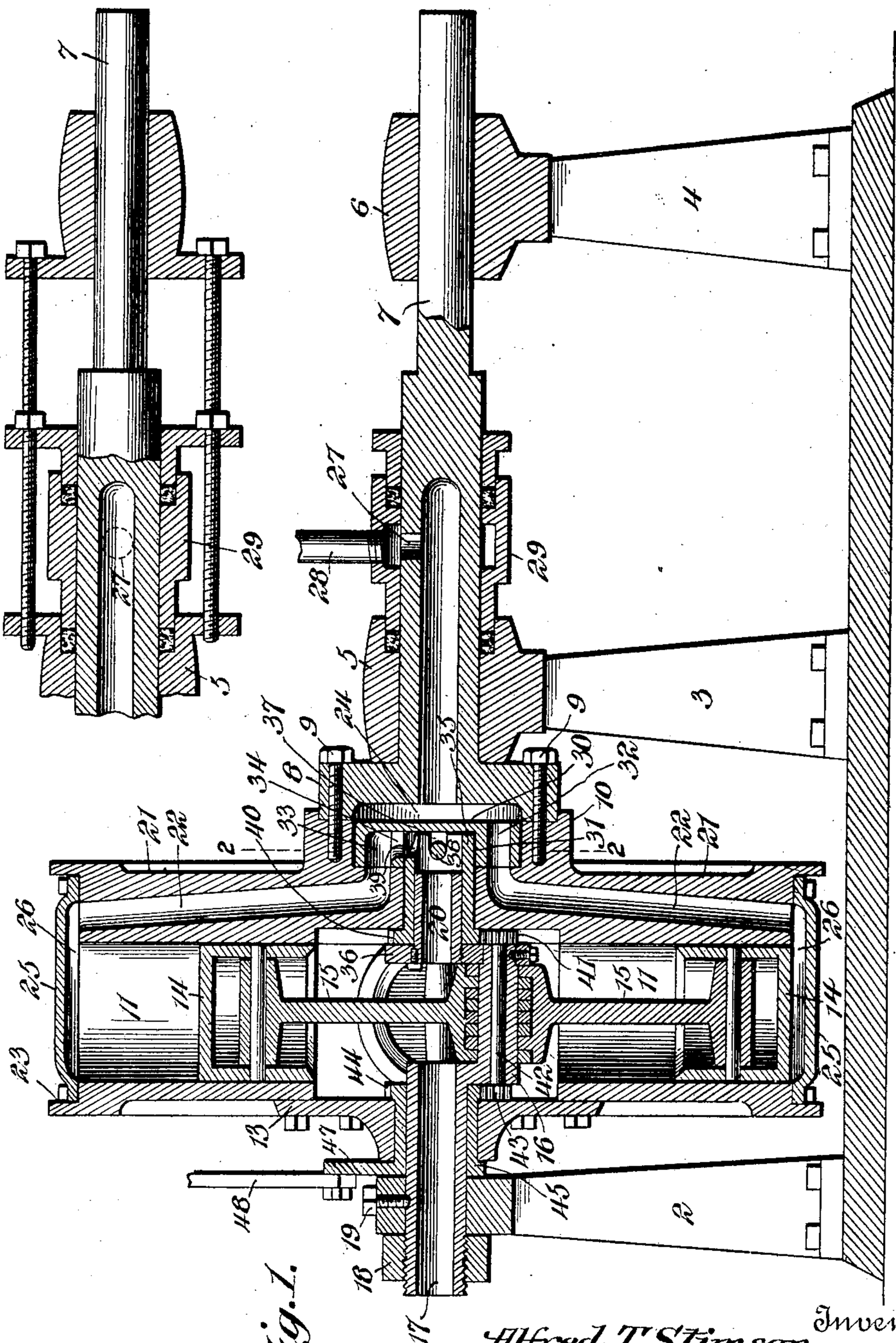
A. T. STIMSON.

ROTARY ENGINE.

APPLICATION FILED OCT. 22, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 3.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.

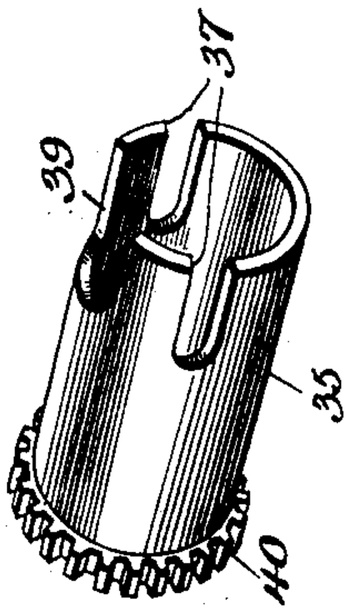

Fig. 5.

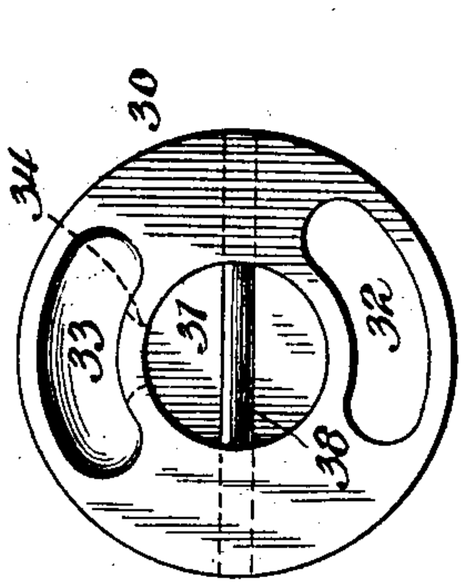

Fig. 6.

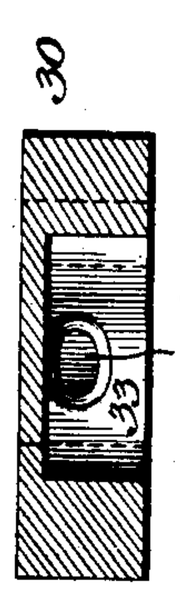

Fig. 7.

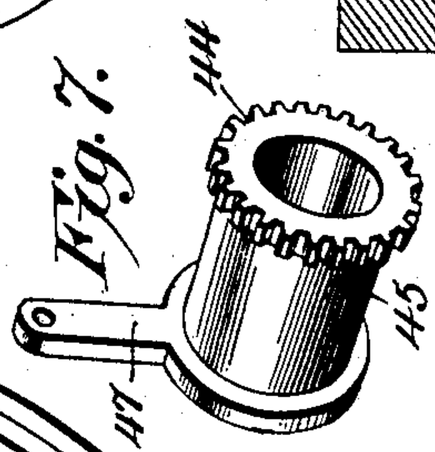

Fig. 2.

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No. 762,448. Patented June 14, 1904.

UNITED STATES PATENT OFFICE.

ALFRED THOMAS STIMSON, OF EUREKA, CALIFORNIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 762,448, dated June 14, 1904.

Application filed October 22, 1903. Serial No. 178,139. (No model.)

To all whom it may concern:

Be it known that I, ALFRED THOMAS STIMSON, a citizen of the United States, residing at Eureka, in the county of Humboldt and State of California, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to a rotary engine of the multiple-cylinder type exemplified in my Patent No. 704,280, and has for its object to simplify the patented construction and particularly the valve mechanism by means of which the operation of the engine is controlled. Subordinate to this general object the present invention contemplates the control of the motive fluid of a plurality of cylinders through the medium of a single valve wholly incased within the engine structure for complete protection and capable of being shifted to effect the reversal of the engine by means of a valve-lever located in an exposed position and readily accessible to the operator.

The invention also resides in certain other features of the construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and succinctly defined in the appended claims.

In said drawings, Figure 1 is a longitudinal section through the engine complete. Fig. 2 is a sectional elevation of the engine, the section being taken on the line 2 2 of Fig. 1. Fig. 3 is a transverse section showing in detail the arrangement of the double stuffing-box surrounding the engine-shaft adjacent to the induction-port. Fig. 4 is a detail perspective view of the valve-sleeve. Fig. 5 is a detail elevation of the valve. Fig. 6 is a sectional view thereof, and Fig. 7 is a detail view of the reversing-sleeve.

Like numerals are employed to designate corresponding parts throughout the views.

Upstanding from a heavy base 1 are three stanchions 2, 3, and 4, the two latter being provided with alined bearing-boxes 5 and 6 for the reception of engine-shaft 7. At one end of this shaft is cast an enlargement or head 8, to which is rigidly bolted, as by bolts 9, the hub 10 of a rotary-engine structure, comprising in addition to said hub a plurality of radially-disposed cylinders 11, cast integral with the hub and connected at their outer ends by an integral rim 12. The cylinders are located in a plane parallel with the hub, and at the side opposite the latter their inner ends are connected by a circular hub-plate 13, bolted or otherwise rigidly secured in place. Within the cylinders are mounted reciprocating pistons 14, having pivotal connection with piston-rods 15, which are connected at their inner or proximate ends to an eccentric pin or wrist 16. This wrist is designed to remain stationary and is cast integral with a hollow stationary shaft 17, disposed concentric with the engine structure and having one end extended through the stanchion 2 and secured, as by a nut 18, screwed upon the end of the shaft 17 and bearing against the outer side of the stanchion. In order to further secure the shaft against rotation, a pin 19 is preferably carried by the upper end of the stanchion and has its extremity seated in a recess in the shaft. The opposite end or portion 20 of the shaft 17 is extended into an axial bore in the hub 10 of the engine structure, it being understood that that portion of the shaft 17 opposite the wrist 16 is cut away to avoid the obstruction of the pitman-rods 15. It will now be apparent that since the engine structure is mounted for rotary movement it must necessarily revolve, as the pistons connected by the oscillatory rods 15 to the stationary wrist reciprocate in the cylinders. It is therefore next in order to describe the means whereby steam or other motive fluid is admitted to and exhausted from the outer ends of the cylinders for the purpose of effecting the reciprocation of the pistons and consequent rotation of the engine.

Integral with each of the cylinders and extending from the hub 10 to the rim 12 are cast enlargements 21, designed to accommodate ports 22, each of which opens at its outer end through the bottom wall of a countersink or recess 23 in the rim 12 and communicates at its inner end with a valve-chamber 24, formed conjointly in the hub 10 of the engine structure and in the head 8 of the engine-shaft. (See Fig. 1.) The recesses or depressions 23 in the rim 12 of the engine are designed for

the reception of removable cylinder-heads 25, bolted in place, as shown, and provided at their inner sides with concavities 26, which serve to establish communication between the ports 22 and the outer ends of the cylinders 11. That portion of the engine-shaft 7 which is adjacent to the engine structure is hollow, as shown, and is utilized as a conduit leading from a supply-port 27 in the wall of the shaft to the valve-casing 24, steam or other fluid being supplied from a pipe 28, located opposite the port 27 and screwed into one of the glands of a double stuffing-box 29, the latter being constructed and arranged as described in my patent hereinbefore identified. It will now appear that the motive fluid passes into the hollow engine-shaft from the pipe 28 and is received by the valve-chamber 24, whence it escapes to the outer ends of the several cylinders. The passage of the fluid to the cylinders must obviously be regulated, and for this purpose a disk valve 30 is mounted in the chamber 24, with one side thereof opposed to that wall of the chamber which is pierced by the proximate ends of the ports 22.

By reference to Figs. 1, 5, and 6 of the drawings the valve 30 will be seen to be of circular form and provided with an axial recess 31, an induction-port 32 extending entirely through the valve from one side to the other and an exhaust-port 33 in the form of a recess formed in the side faces of the valve and having communication with the recess 31, as by means of a lateral extension 34 of the port. The ports 32 and 33 are preferably of arcuate form and are so disposed with respect to the axis of the valve as to insure their coincidence with the inner ends of the ports 22 as the engine structure rotates. Thus, assuming the valve 30 to be held stationary, the motive fluid will pass from the valve-chamber 24 through the induction-port 32 to one of the ports 22, disposed in coincidence therewith, and escaping thence to the outer end of one of the engine-cylinders will exert sufficient pressure upon the piston therein to effect the rotation of the engine structure. This rotary movement of the cylinders around a common axis will remove the port 22 just referred to out of coincidence with the induction-port of the valve and will establish communication between said induction-port and the succeeding cylinder. Continued rotation of the engine will present the cylinder first supplied with steam in a diametrically opposite position, which will present the inner end of its port 22 in coincidence with the eduction or exhaust port 33 of the valve, thereby permitting the exhaust of the motive fluid from the cylinder to the axial recess 31 of the valve, whence it escapes to the outer air through the hollow stationary shaft 17. If desired, the exhaust may be conveyed to any point by attaching a pipe or conduit for its conveyance to the end of the stationary shaft.

The structure thus far described constitutes a complete embodiment of my invention in one aspect thereof, since it will be seen to embrace a multiple-cylinder rotary engine directly connected to a hollow engine-shaft for movement in unison therewith and equipped with a single controlling-valve governing the supply and exhaust of motive fluid to and from the several cylinders. It is desired, however, to provide simple and efficient means for effecting the reversal of the engine, and I shall therefore proceed to describe the arrangement whereby the valve may be moved to transpose the induction and eduction ports thereof.

Extended into the axial recess 31 in the valve is what may be termed a "valve-sleeve" 35, fitted within the bore of the engine-hub and encircling the inner end of the shaft 17, attention being called at this point to the fact that the end portion 20 of the shaft 17 is formed in a separate section, secured to one end of the wrist 16 by a plate 36. At the end of the valve-sleeve 35 which is received by the valve are formed diametrical recesses 37 for the reception of a pin 38, extending diametrically across the recess 31 of the valve and serving to compel the rotary movement of the valve in unison with the valve-sleeve, the recesses being preferably elongated in the direction of the axis of the engine in order to permit more or less lateral movement of the valve. This lateral movement of the valve 30 within the chamber 24 is provided in order that the pressure exerted by the motive fluid upon the rear face of the valve will tend to urge the latter securely against its seat, and thus prevent the possible divergence of the stem from its proper course. As the extremity of the valve-sleeve extends nearly if not quite to the bottom of the recess 31, said sleeve is also provided with an opening 39, coincident with the extension 34 of the exhaust-port, to permit the unrestricted escape of the motive fluid from the exhaust-port of the valve to the hollow shaft 17 of the engine. The valve-sleeve 36 constitutes an element of the reversing mechanism, and upon the end thereof opposite the valve is formed a toothed rim or gear-wheel 40, meshing with a pinion 41, keyed or otherwise secured to a shaft 42, extending axially through the wrist 16 and provided at its opposite end with a second pinion 43, meshing with a toothed rim or gear 44, formed at the inner end of a reversing-sleeve 45. The sleeve 45 fits within an axial bore in the hub-plate 13 of the engine and surrounds the shaft 17. The outer end of the sleeve 45 is provided with a laterally or radially extended lug 47, to which is secured a reversing-lever 48, provided with a retaining device or latch 49, accommodated by and cooperating with a fixed slotted segment 50, preferably secured to the base 1 and disposed concentric to the engine, as shown in Fig. 2.

Assuming the parts to be in the positions

indicated in Fig. 1 of the drawings, the reversal of the engine may be effected by swinging the reversing-lever 48 for the purpose of shifting the valve to transpose the ports thereof. When the reversing-lever is swung in the manner stated, the reversing-sleeve 45 is partially rotated, motion being thus transmitted to the valve-sleeve through the intermediate gearing and the valve-sleeve in turn effecting the rotary movement of the valve necessary to the transposition of the induction and eduction ports. If a non-reversible engine is required, the reversing mechanism for the valve may be omitted, and in this event the opposite end portions of the shaft 17 would fit within the axial openings in the hub and hub-plate and the end portion 20 of said shaft would be extended into the axial recess of the valve, the recesses 37 and the opening 39 being formed in the end of the shaft instead of in the sleeve, as shown.

Since the operation of the engine has been fully described during the description of its structural features, a reiteration thereof is deemed unnecessary. It should be distinctly understood, however, that while the present embodiment of the invention appears at this time to be preferable, I do not limit myself to the structural details defined, as, on the contrary, I reserve the right to effect such changes, modification, and variations of the illustrated structure as may fairly fall within the scope of the protection prayed.

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 a hollow stationary shaft provided at a point intermediate of its ends with an eccentric wrist; of a rotary-engine structure including radially-disposed cylinders, a valve-chamber located at the axis of the engine, and ports leading from the front wall of the valve-chamber to the outer ends of the cylinders, pistons mounted to reciprocate in the cylinders and having operative connection with the stationary eccentric wrist, a hollow shaft extending from one side of the engine-structure and having communication with the valve-chamber to supply motive fluid thereto, a normally non-rotary valve wholly inclosed within the valve-chamber and movable toward its seat under pressure of the motive fluid, and supply and exhaust ports formed in the valve, the supply-port extending entirely through the valve and the exhaust-port being arranged to place the engine-cylinders successively in communication with the hollow stationary shaft of the engine.

2. In a rotary engine, the combination with a hollow stationary shaft formed intermediate of its ends with an eccentric wrist; of a rotary-engine structure comprising a series of radially-disposed cylinders, a valve-chamber located at the axis of the engine, and ports leading from the valve-chamber to the outer ends of the cylinders, pistons located in the cylinders and operatively connected to the wrist, and a valve within the valve-chamber and movable toward its seat under pressure of the motive fluid within the chamber, said valve having an axial recess in communication with the stationary hollow shaft of the engine and also having supply and exhaust ports, the exhaust-port being in communication with the axial recess in the valve.

3. In a rotary engine, the combination with a series of radial cylinders mounted to revolve around a common axis, of a stationary wrist, pistons in the cylinders, piston-rods connecting the pistons and wrist, a valve located at the axis of the engine and controlling the supply and exhaust of the motive fluid to and from the cylinders, said valve being movable toward its seat under the pressure of the motive fluid, and valve-reversing means loosely connected to the valve to permit the latter to be seated by fluid-pressure within the valve-chamber.

4. In a rotary engine, the combination with a plurality of cylinders, pistons therein, and a stationary wrist operatively connected to the pistons and eccentric to the axis of the engine, of a single valve located at the axis of the engine at one side thereof and controlling the supply and exhaust of motive fluid to and from the several cylinders, and valve-reversing mechanism including an operating member located at the opposite side of the engine.

5. In a rotary engine, the combination with a plurality of cylinders, pistons therein, a stationary shaft provided with a wrist, and piston-rods operatively connecting the wrist with the pistons, of a valve located at the axis of the engine and controlling the supply and exhaust of motive fluid to and from the cylinders, a reversing-lever, and gearing between the reversing-lever and the valve, said gearing including a valve-supporting member having loose connection with the valve to permit the seating of the latter under fluid-pressure.

6. In a rotary engine, the combination with a plurality of cylinders, pistons therein, a stationary shaft provided with an eccentric wrist, and piston-rods operatively connecting the wrist with the pistons, of a valve located at the axis of the engine and controlling the supply and exhaust of motive fluid to and from the cylinders, a reversing-lever, and gearing between the reversing-lever and the valve, said gearing being carried in part by the wrist.

7. In a rotary engine, the combination with a plurality of cylinders, pistons therein, a stationary shaft provided with an eccentric wrist, and piston-rods operatively connecting the wrist with the pistons, of a valve located at the axis of the engine and controlling the supply and exhaust of motive fluid to and from the cylinders, a reversing-lever, and gearing

between the reversing-lever and the valve, a portion of said gearing being carried by the stationary shaft.

8. In a rotary engine, the combination with a plurality of cylinders, pistons therein, a stationary shaft provided with a wrist, and piston-rods operatively connecting the wrist with the pistons, of a valve located at the axis of the engine and controlling the supply and exhaust of motive fluid to and from the cylinders, a reversing-lever, and gearing between the reversing-lever and the valve, said gearing including sleeves mounted on the stationary shaft and having operative connection with each other and with the valve.

9. In a rotary engine, the combination with a plurality of cylinders, pistons therein, a stationary shaft provided with a wrist, and piston-rods operatively connecting the wrist with the pistons, of a valve located at the axis of the engine and controlling the supply and exhaust of motive fluid to and from the cylinders, a reversing-lever, and gearing between the reversing-lever and the valve, said gearing including sleeves mounted on the stationary engine-shaft, a connection between one of the sleeves and the valve, and a motion-transmitting device carried by the wrist and operatively connecting the sleeves.

10. In a rotary engine, the combination with a plurality of cylinders, pistons therein, a stationary shaft provided with a wrist, and piston-rods operatively connecting the wrist with the pistons, of a valve located at the axis of the engine and controlling the supply and exhaust of motive fluid to and from the cylinders, a reversing-lever, and gearing between the reversing-lever and the valve, said gearing including a pair of sleeves mounted on the stationary shaft of the engine and provided with toothed rims, a shaft extending through the wrist, and provided with pinions engaging said rims, and a connection between one of the sleeves and the valve.

11. In a rotary engine, the combination with a plurality of cylinders mounted to revolve in unison, pistons in the cylinders, and a stationary wrist having operative connection with the pistons, of a valve located at the axis of the engine and controlling the supply and exhaust of motive fluid to and from the cylinder, said valve being provided with an axial recess and valve-reversing mechanism including a rotary valve-supporting element extended into the recess of the valve, and means for rotating said element.

12. In a rotary engine, the combination with a plurality of cylinders mounted to revolve in unison, pistons in the cylinders, and a stationary wrist having operative connection with the pistons, of a valve located at the axis of the engine and controlling the supply and exhaust of motive fluid to and from the cylinder, said valve being provided with an axial recess, and valve-reversing mechanism including a valve-sleeve, a connection between the valve and the sleeve compelling their rotation in unison but permitting slight independent movement of the valve in the direction of its seat, and means for rotating the valve-sleeve to reverse the position of the valve.

13. In a rotary engine, the combination with a hollow rotary-engine shaft provided with a terminal head, of an engine structure comprising a series of radial cylinders, a hub connecting the cylinders at one side of their inner ends and secured to the head of the shaft, a valve-chamber formed jointly in the hub and head, ports leading from one side wall of the valve-chamber to the outer ends of the cylinders, a hollow stationary engine-shaft provided with a wrist, pistons in the cylinders, piston-rods connecting the pistons with the wrist, a circular normally non-rotary valve within the valve-chamber, said valve being provided with an induction-port, an axial recess, and an exhaust-port in communication with the recess, a valve-sleeve surrounding one end of the stationary shaft and having its end extended into the axial recess of the valve, an opening in the wall of the valve-sleeve opposite the exhaust-port to permit the free escape of motive fluid through the valve to the hollow shaft, a connection between the valve and valve-sleeve compelling them to move in unison but permitting slight movement of the valve toward and from its seat, a reversing-sleeve mounted on the opposite end of the hollow stationary shaft, a motion-transmitting shaft carried by the wrist and geared to the sleeves, and a reversing-lever for rotating the reversing-sleeve to effect the reversal of the valve through the intermediate gearing.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ALFRED THOMAS STIMSON.

Witnesses:
M. R. BALDWIN,
A. E. BEAUMONT.