No. 688,566. Patented Dec. 10, 1901.

S. M. WILLIAMS.

ROTARY EXPLOSIVE ENGINE.

(Application filed July 24, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

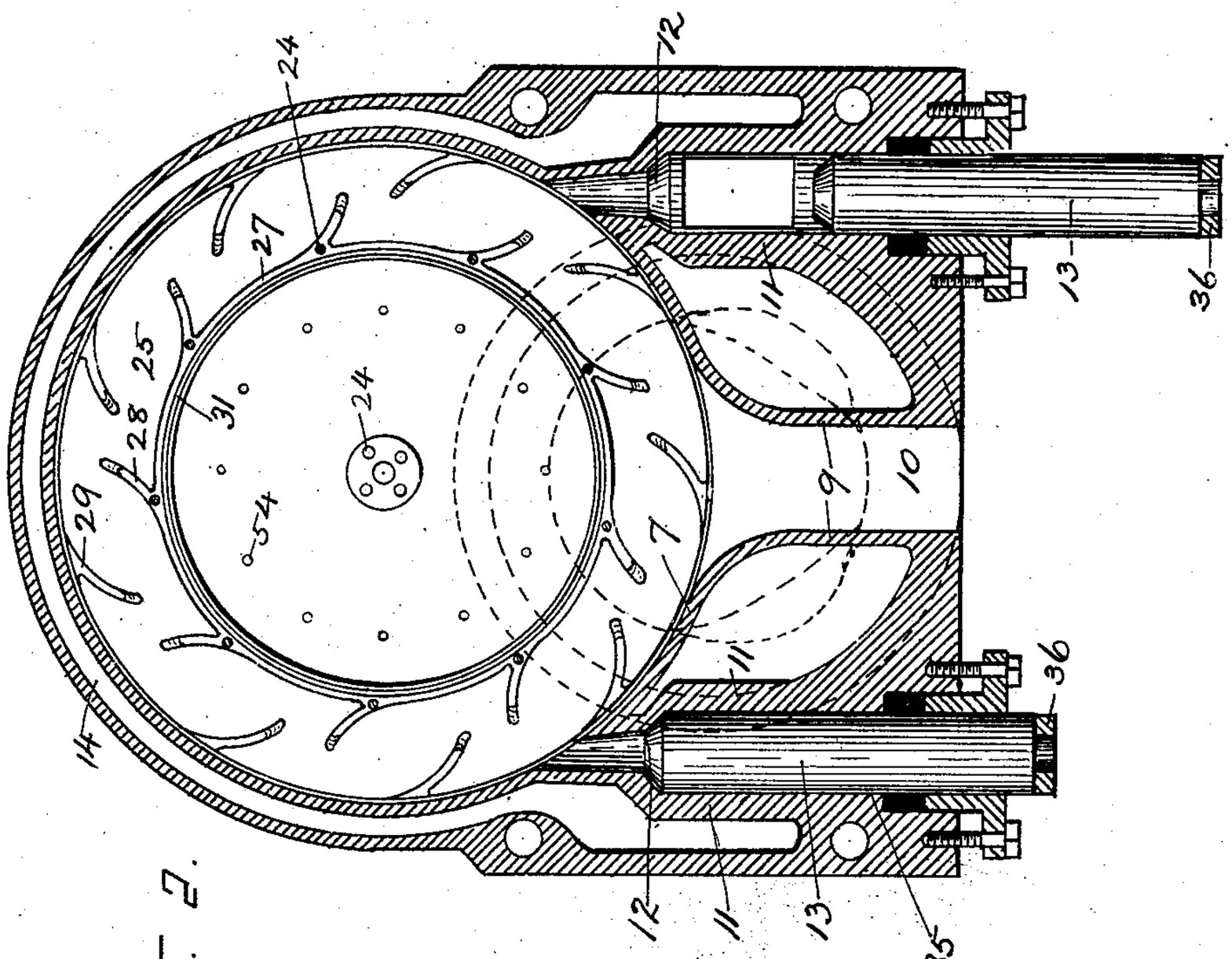


Fig. 1.

WITNESSES:

W. R. Daniels

F. A. Daniels

INVENTOR.

S. M. Williams

By Francis M. Wright

ATTORNEY.

No. 688,566. Patented Dec. 10, 1901.

S. M. WILLIAMS.

ROTARY EXPLOSIVE ENGINE.

(Application filed July 24, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

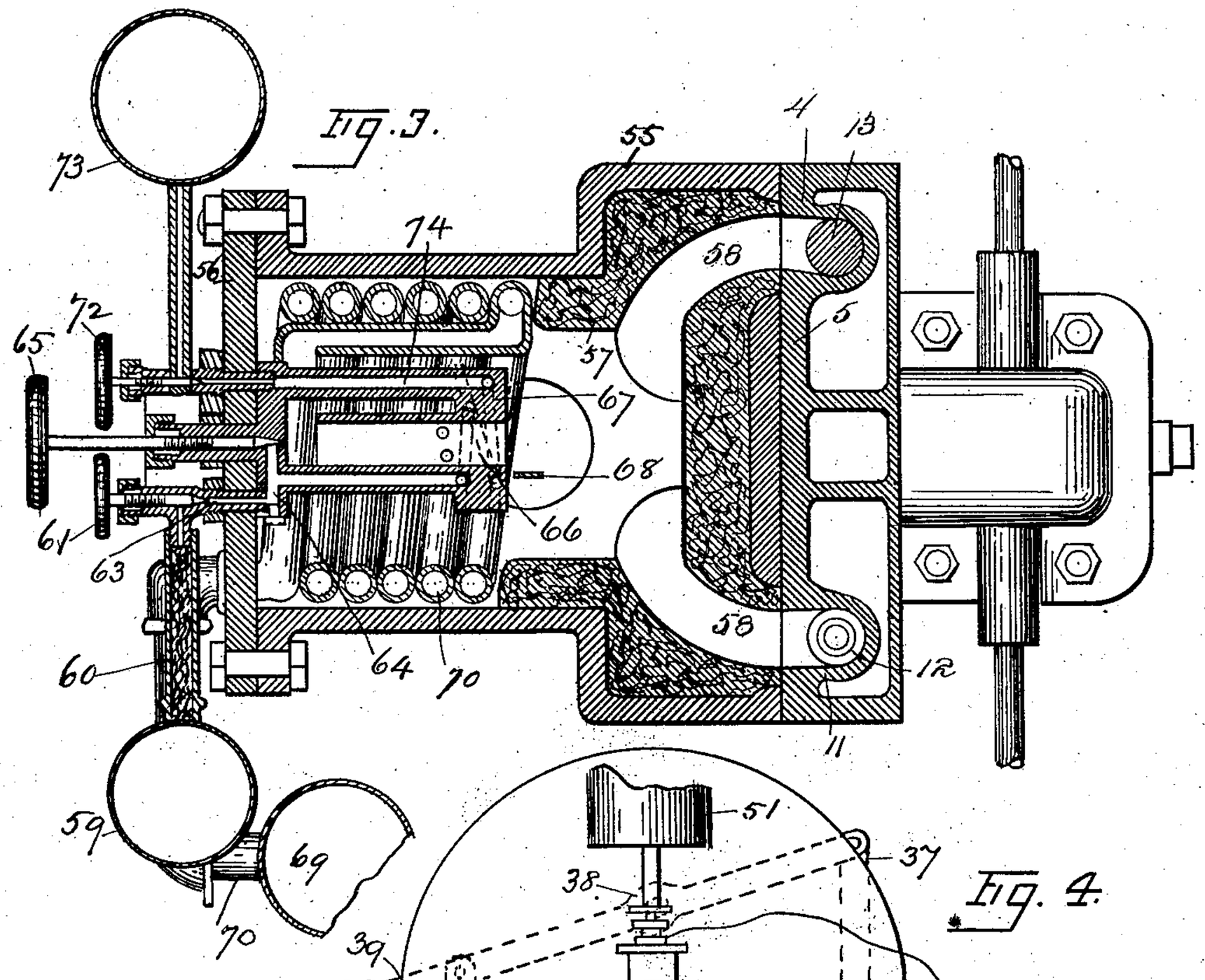


Fig. 4.

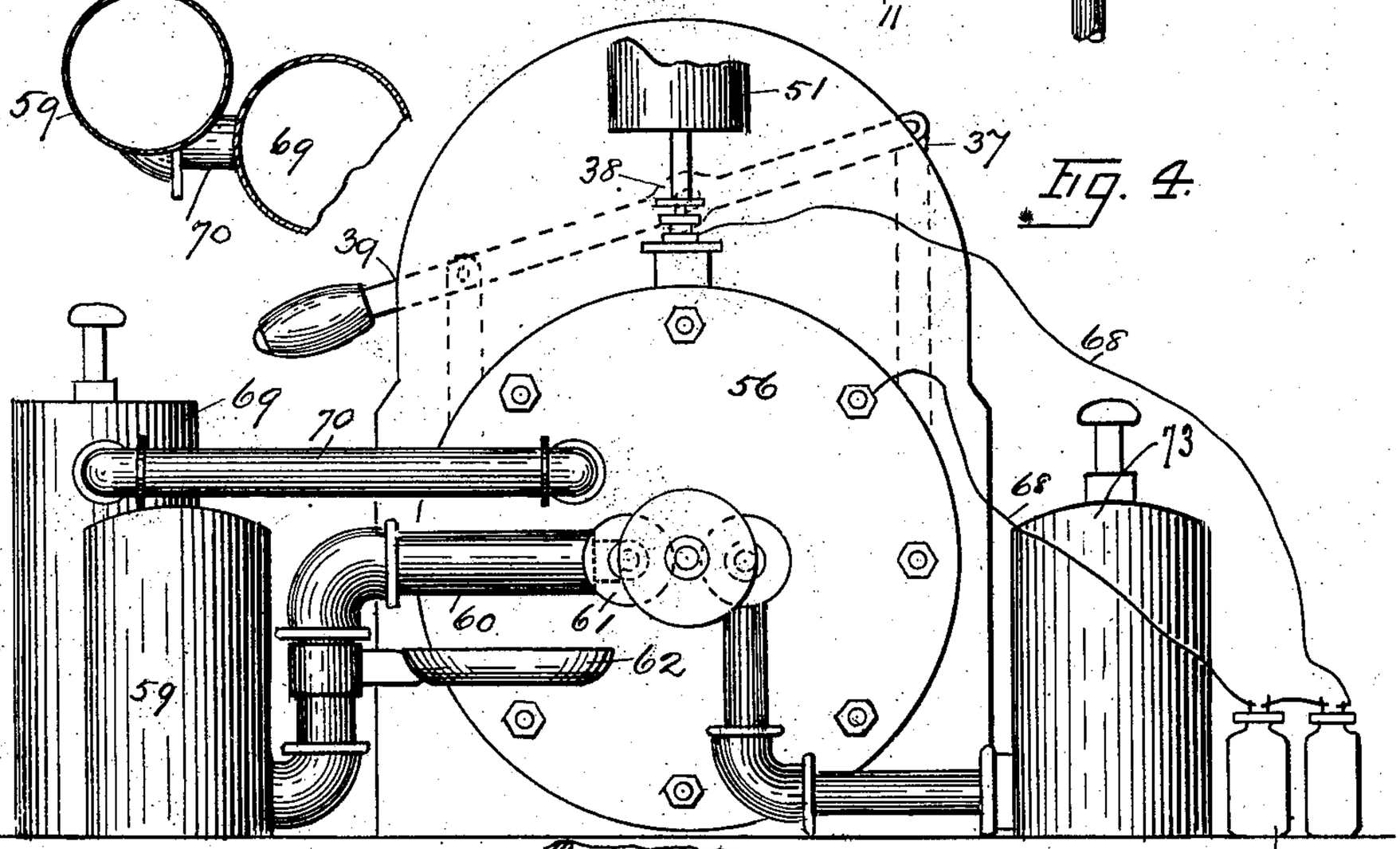
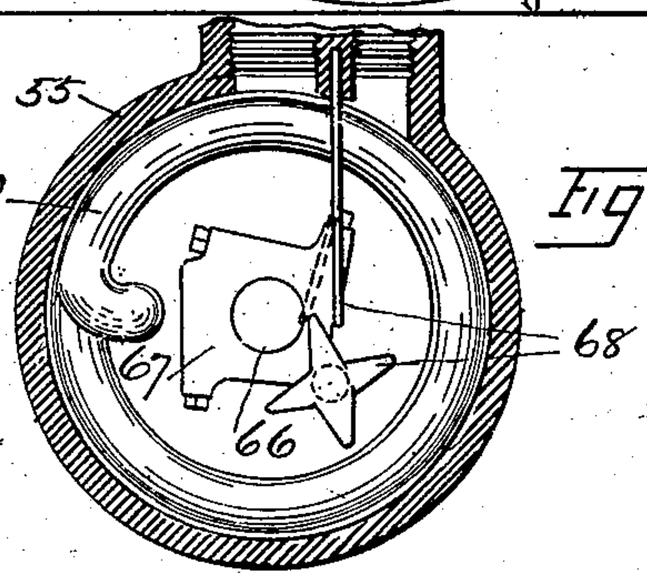


Fig. 5.



WITNESSES:

W. R. Daniels

J. A. Daniels

INVENTOR.

S. M. Williams

BY

Francis M. Wright.

ATTORNEY.

UNITED STATES PATENT OFFICE.

SYLVESTER M. WILLIAMS, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF TO OSCAR FOSS, OF SAN FRANCISCO, CALIFORNIA.

ROTARY EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 688,566, dated December 10, 1901.

Application filed July 24, 1900. Serial No. 24,736. (No model.)

To all whom it may concern:

Be it known that I, SYLVESTER M. WILLIAMS, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to improvements in rotary engines, the object of my invention being to provide an engine of this character which can be driven at a very high speed and in either direction at will, my improved engine being especially applicable for use with the combustion of gaseous hydrocarbon by means of compressed air.

My invention therefore resides in the novel construction, combination, and arrangement of parts for the above ends hereinafter fully specified, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a central longitudinal section of my improved engine, a part thereof being broken away. Fig. 2 is a transverse section taken through the center of the turbine or wheel. Fig. 3 is a section on the line A A of Fig. 1 looking in the direction of the arrow. Fig. 4 is an end view of the engine; and Fig. 5 is a transverse section of the combustion-cylinder, on a reduced scale, to show in detail the sparking mechanism.

My improved engine comprises a specially-constructed combustion-chamber, into which gaseous hydrocarbon is admitted and burned with compressed air, and an expansion-chamber, into which the products of said combustion pass from the combustion-chamber at a high pressure and by their expansion and escape to the outer air impart rotation to the turbine or wheel. The expansion-chamber is cylindrical in form, and its casing is cylindrical in its upper portion and oblong in its lower portion. Said casing is formed of plates 1 2 and a casting 3, secured together by screws 4. The casting 3 forms the rear wall 5 of the casing and the lower portion 6 of the front wall thereof, the plates 1 2 comprising the remainder of said front wall, as shown in Fig. 1. The casting 3 also comprises double flanges 7 8, extending for the greater part of the circumference of a circle, and walls 9, extending in a transverse direction between the front and rear walls 6 5 and in a vertical direction between the inner flange 7 and the lower edge of the casting, and thus forming therebetween the exhaust 10 for the expanded gases after they have done their work. Also forming part of the same casting 3 are the walls 11 of the inlet-ports. These walls or conduits extend from the rear wall 5 of the casting inwardly, as shown in Fig. 3, and then upwardly, as shown in Fig. 2, one on each side of the exhaust-opening 10. Said inlet-ports have contracted throats 12, against which abut the ends of piston-valves 13, which, in the manner hereinafter described, are operated to close one or the other of the inlet-ports.

Between the inner and outer flanges 6 7 is formed a water-chamber 14, and said chamber extends also around the walls 11 of the inlet-ports. When the engine is driven by steam, this chamber 14 will not be used as a water-chamber; but the engine is intended, primarily, to be driven by means of gas burned at a high pressure, and therefore also at a high temperature, and under these circumstances the water-chamber is of value in protecting the casting from the action of the great heat.

The plates 1 2 have formed thereon two parts 16 17 of an extension or box 18, and in the upper portion 16 of said box, on the front side thereof, is formed a bearing 19 for the shaft 20 of the engine, the other bearing 21 being formed on an extension 22 of the rear wall 5 of the casting 3. To said shaft 20 is keyed the main driving-wheel 23, which consists of two sections bolted together, as shown at 24. Each section comprises a circular wall 25, a hub-section 26, an annular flange-section 27, and vane-sections 28 29, of which latter the inner vane-sections 28 extend obliquely to the flanges 27 from said flanges to the wall 25, while the outer sections 29 extend from and are supported only by said walls. The corresponding inner sections 28 of the two wheel-sections are fitted together to form an annular series of vanes, the free edge of each vane being concaved or reduced in the middle and extending farther from the base of the vane at the sides than in the mid-

dle, and a similar construction is provided for the outer vane-sections 29. The edges of the flange-sections 27 are grooved, as shown at 30, and these annular grooves receive a ring-packing 31, by means of which water admitted into the inner chamber 32 of the wheel formed between the hub-sections 26 and the flange-sections 27 is prevented escaping outward therefrom.

The two inlet-ports 11, one at each side of the engine, are used one for rotating the wheel in one direction and the other for rotating it in the opposite direction. To shut off the inlet-port which is not required, there are provided piston-valves 13, sliding in cylindrical guides 35, forming extensions of the ports 11, said valves being connected by links 36 to rods 37, extending to the upper part of the engine and being there pivotally connected, as shown at 38, to a valve-operating lever 39. (Shown in dotted lines in Fig. 4.) By shifting said lever 39 one of said ports 11 is opened and the other simultaneously closed.

The shaft 20 has keyed thereon a worm 40, which engages a worm-wheel 41 on a shaft 42, thus reducing the speed from the very high speed at which the shaft 20 is revolved. The extension or box 18 contains a quantity of oil, which is carried around by the wheel 41 and reduces the friction of the parts. To prevent passage of oil along the shaft 20, there is provided on the shaft 20 a disk 45, having a sharp edge, which disk, rotating at a high speed, throws off the oil by centrifugal force and prevents it entering the chamber in which the engine-wheel 21 revolves. A similar disk 46 is employed at the other end of the shaft 20.

When hydrocarbon gases are burned with compressed air in the manner hereinafter described, it is desired to cool the internal parts of the wheel, and for this purpose there is supported on an extension from the rear casting 3 a water-conduit 50, receiving water from a suitable receptacle 51. Water flows from said conduit into and along a passage 52, formed in the shaft 20, being discharged therefrom through an orifice 53 into the interior chamber 32. Small holes 54 are formed in the walls 25 to permit escape of surplus water or steam.

To the rear wall 5 of the casting 3 is secured the casting 55 of the combustion-chamber, to which is bolted the end plate 56. The interior of the combustion-chamber is lined with asbestos or other fire-resisting material, as shown at 57, and in said asbestos lining are formed conduits 58, leading to the inlet-ports 11.

To start the combustion, a fire is first made in the cup 62 of gasolene or any suitable combustible material. Then gasolene is permitted to pass from the gasolene-tank 59 through the pipe 60 by opening the cock 61. The gasolene passing through the pipe 60, a part of which pipe is loosely packed with any suitable fiber or packing, is vaporized, and the gas thus formed passes along the conduits 63 64, and the cock 65 having been opened emerges into the chamber 66 of the vaporizer 67. It is then ignited at the mouth of said chamber by a sparking device 68. A suitable quantity of air is admitted from the compressed-air tank 69 through the coil of piping 70 by opening the cock 71. After the gasolene-vapor has burned for a sufficient length of time the vaporizer 67 becomes highly heated. The cock 61 is then closed and a cock 72 opened from the oil-chamber 73. The oil therefrom passes through the tubes 74 of the vaporizer 67, being admitted into the central chamber 66 of said vaporizer, the cock 65 being open, and is vaporized by the heat of said vaporizer and is burned at the mouth of the vaporizer by compressed air, a sufficient quantity being admitted for this purpose through the coil 70 and discharged opposite to the mouth of the chamber 66. The gases of combustion pass into one or the other of the inlet-ports 11 at great pressure, and in their expansion on their way to the exhaust impinge upon the vanes of the driving-wheel, one set of these valves acting as impact-vanes and the other as director-vanes, according to the direction in which the gases are passing around the wheel, as will be readily understood.

I claim—

1. In a rotary engine, the combination, with a casing, of a turbine or wheel revolubly mounted therein, said wheel having circular walls, an annular base between said walls, and inner and outer series of vanes, the inner series being extended between the walls from the base, and the outer series extending between the walls at a greater distance from the center than the inner walls, the vanes of said outer series having each an edge revolving close to the cylindrical inner surface of the casing, the vanes of both series being oblique to the annular base, substantially as described.

2. In a rotary engine, the combination, with a casing, of a turbine or wheel revolubly mounted therein, said wheel having circular walls, an annular base between said walls, and inner and outer series of vanes, the inner series being extended between the walls from the base, and the outer series extending between the walls at a greater distance from the center than the inner walls, the vanes of said outer series having each an edge revolving close to the cylindrical inner surface of the casing, the vanes of both series having the same oblique direction to the annular base, and each vane having the edges around which the gas passes concaved in the center, substantially as described.

3. In a rotary engine, the combination, with a casing, of a turbine or wheel revolubly mounted therein, said wheel being formed of circular walls connected together, and being open at its circumference, an annular base between said walls, and inner and outer series of vanes, the inner series extending out-

ward from the base between the walls, and the outer series extending between the walls and having each an outer edge flush with the outer edges of the walls, said outer edges of the vanes and walls revolving close to the cylindrical wall of the casing, an outlet from the circumferential portion of the casing, and two inlet-ports from the circumferential portion of the casing, said inlet-ports being directed tangentially to the wheel and in opposite directions, substantially as described.

4. In a rotary engine, the combination, with a casing, of a turbine or wheel revolubly mounted therein, said wheel being formed of circular walls connected together, and being open at its circumference, an annular base between said walls, and inner and outer series of vanes, the inner series extending outward from the base between the walls, and the outer series extending between the walls and having each an outer edge flush with the outer edges of the walls, said outer edges of the vanes and walls revolving close to the cylindrical wall of the casing, and each vane having the edge around which the gas passes concaved in the center, an outlet from the circumferential portion of the casing, and two inlet-ports from the circumferential portion of the casing, said inlet-ports being directed tangentially to the wheel and in opposite directions, substantially as described.

5. In a rotary engine, the combination, with a casing, of a turbine or wheel revolubly mounted therein, said wheel being formed of circular walls connected together, and being open at its circumference, an annular base between said walls, and inner and outer series of vanes, the inner series extending outward from the base between the walls, and the outer series extending between the walls and having each an outer edge flush with the outer edges of the walls, said outer edges of the vanes and walls revolving close to the cylindrical wall of the casing, said vanes being disposed obliquely to the wheel, an outlet from the circumferential portion of the casing, and two inlet-ports from the circumferential portion of the casing, said inlet-ports being directed tangentially to the wheel and in opposite directions, substantially as described.

6. In a rotary engine, the combination of a casing, a turbine or wheel revolubly mounted therein, said wheel being open at its periphery and having inner and outer series of vanes extending obliquely to the radius of the wheel in substantially the same direction, said casing having two inlet-ports, one on each side thereof, and an exhaust-port between said inlet-ports, all of said ports opening into said open periphery of said wheel, valves for closing the inlet-ports, and means for simultaneously closing one of said ports and opening the other, substantially as described.

7. In a rotary engine, the combination of a casting comprising front and rear walls, walls extending transversely between said front and rear walls to form an exhaust-passage, and walls 11 extending from the rear wall to form inlet-ports, one on each side of the exhaust-passage, upper and lower plates closing the front wall, extension-box sections 16, 17, formed respectively on said plates, a turbine or wheel revolubly mounted in the casing formed by said casting and plates, and speed-reducing gearing mounted in the extension-box and connected with said turbine or wheel, substantially as described.

8. In a rotary engine, the combination of a casing, a turbine or wheel revolubly mounted therein, said wheel consisting of two sections, each section comprising a circular wall, a hub-section, an annular flange-section, and inner and outer series of vane-sections, the inner vane-sections extending from the annular flange-sections to the walls, and the outer sections extending from, and being supported only by said walls, substantially as described.

9. In a rotary engine, the combination of a casing, a turbine or wheel revolubly mounted therein, said wheel consisting of two sections, each section comprising a circular wall, a hub-section, an annular flange-section, and inner and outer series of vane-sections, said flanges being grooved at their edges, and a ring-packing in said grooves, substantially as described.

10. In a rotary engine, the combination with a casing having a water-jacket, of a turbine therein, a compressed-air chamber, a combustion-chamber lined with fire-resisting material, inlet-ports from the combustion-chamber to the casing, one on each side thereof, an exhaust between the inlet-ports, and means for supplying carbonaceous fuel to said combustion-chamber, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

S. M. WILLIAMS.

Witnesses:

FRANCIS M. WRIGHT,

Z. A. DANIELS.