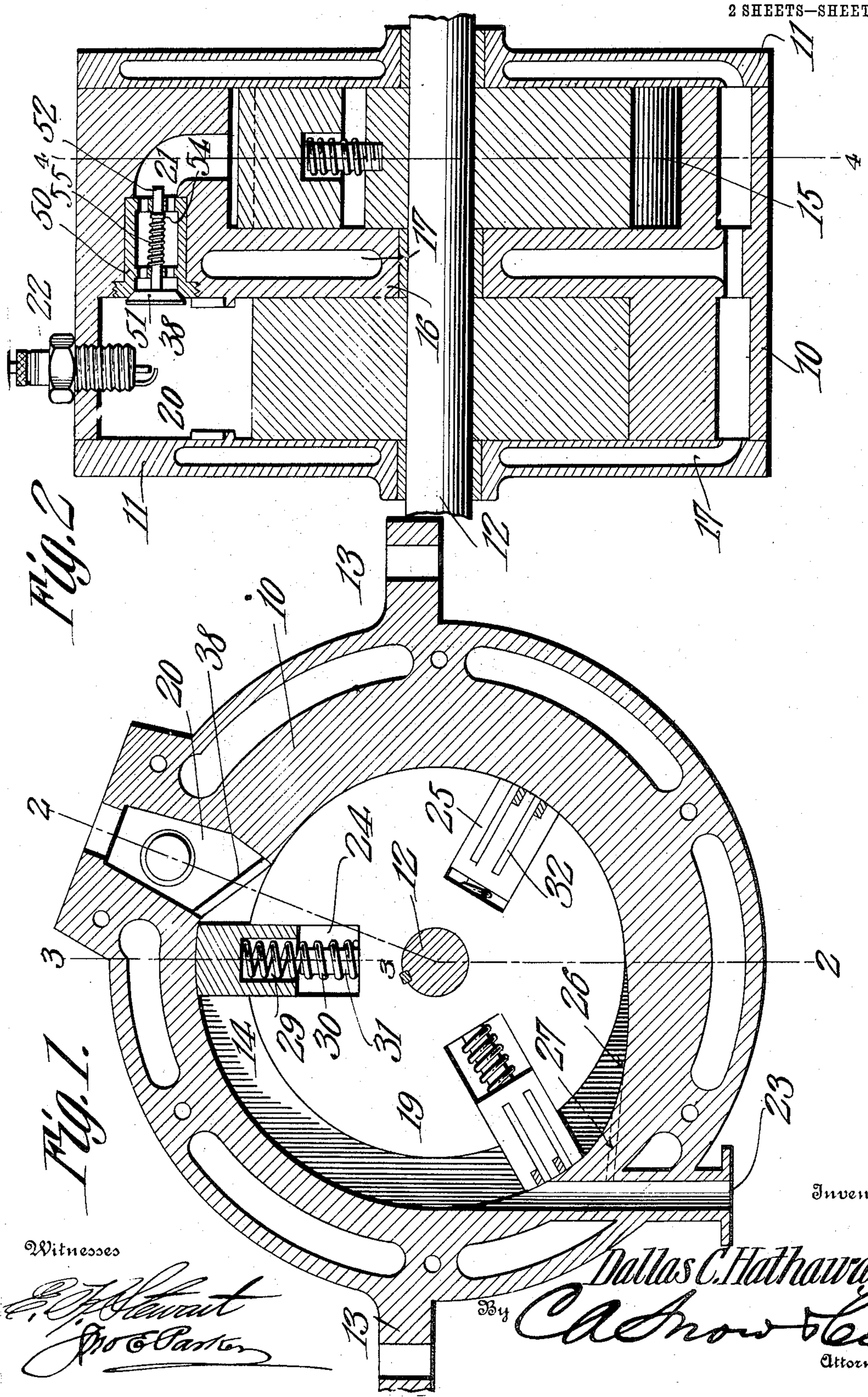
D. C. HATHAWAY.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED OCT. 2, 1908. RENEWED OCT. 6, 1909.

944,362. Patented Dec. 28, 1909.

2 SHEETS—SHEET 1.



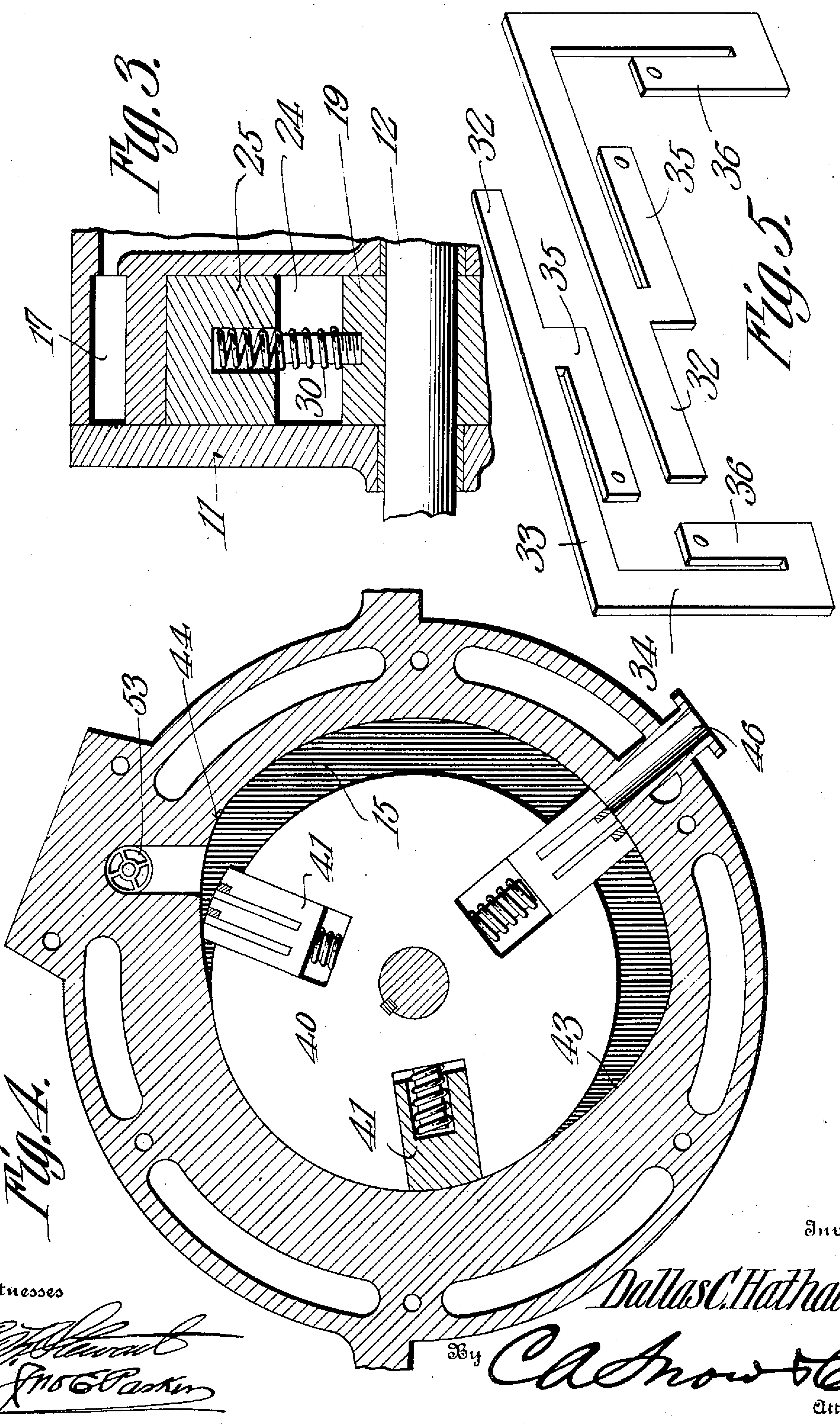
D. C. HATHAWAY.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED OCT. 2, 1908. RENEWED OCT. 6, 1909.

944,362. Patented Dec. 28, 1909.

2 SHEETS—SHEET 2.



Witnesses

Inventor

Dallas C. Hathaway.

By C. A. Snow & Co.

Attorneys

UNITED STATES PATENT OFFICE.

DALLAS C. HATHAWAY, OF SHELDON, ILLINOIS.

INTERNAL-COMBUSTION ENGINE.

944,362. Specification of Letters Patent. Patented Dec. 28, 1909.

Application filed October 2, 1908, Serial No. 455,846. Renewed October 6, 1909. Serial No. 521,184.

To all whom it may concern:

Be it known that I, DALLAS C. HATHAWAY, a citizen of the United States, residing at Sheldon, in the county of Iroquois and State of Illinois, have invented a new and useful Internal-Combustion Engine, of which the following is a specification.

This invention relates to rotary internal combustion engines, and has for its principal object to provide a novel form of engine in which the piston wings are driven under the impulse resulting from the explosion of the charge.

A further object of the invention is to provide a rotary engine of this type which shall be self clearing for the purpose of positively driving out all of the exploded gases.

A still further object of the invention is to provide a rotary compressor so arranged as to supply a charge of gas under pressure behind each of the piston wings as soon as the wings pass beyond the entrance port.

A still further object of the invention is to provide a compressor of such construction as to effect the formation of a partial vacuum in the chamber into which the explosive mixture is to be introduced from the carbureter, thus insuring the full supply and this gas being subsequently compressed prior to its delivery to the explosion chamber of the engine.

A still further object of the invention is to provide a self closing valve in the inlet port so as to separate the explosion chamber from the compressor.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a sectional elevation of an internal combustion engine constructed in accordance with the invention. Fig. 2 is a transverse sectional view on the line 2—2 of Fig. 1. Fig. 3 is a similar view on the line 3—3 of Fig. 1. Fig. 4 is a vertical section on the line 4—4 of Fig. 2. Fig. 5 is a detail perspective view of one of the piston wings detached.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The engine casing comprises a single piece cylindrical casting 10 and a pair of detachable heads 11, the latter being provided with bearings for the reception of a shaft 12 by which the power of the engine may be transmitted to any device to be operated.

Extending from the opposite sides of the main casting are lugs 13 which may rest on any suitable foundation for the support of the entire structure. The main casting 10 is divided into two cylinders 14 and 15 by a centrally disposed partition 16, that is also provided with a bearing for the shaft 12, and this partition as well as the heads and the circular wall of the main casting 10 is provided with openings or recesses 17 which are connected to permit the free circulation of water or other cooling fluid.

The curved wall of the cylinder 14 is arranged on two arcuate lines of different radii, the arc of smallest radius corresponding to the radius of a piston drum 19 that is secured to the shaft 12, while the arc of largest radius forms with the periphery of the piston a working space in which the force is utilized in operating the engine. At the juncture of the arcs of different radii at one side of the cylinder is an explosion chamber 20 to which leads an inlet port 21 through which the explosive mixture passes into the explosion chamber, and is there ignited by a sparking plug 22 of any ordinary construction, a jump spark plug being shown in the present instance, while at the other side of the cylinder adjacent the juncture of the portions of largest and smallest radii is an exhaust port 23 through which the waste gases may flow to a muffler or other point of discharge.

The revoluble piston drum is provided with one or more radially disposed recesses 24 within which slide piston wings 25, said piston wings moving outward into engagement with the wall of largest radius in order that they may be subjected to the force of the explosion and subsequent expansion of the gases, and being then gradually forced inward and they engage with the cam like

surface 26 which connects the circular walls of different radii at a point slightly beyond the exhaust port. As the exhaust port is located some little distance from the smallest portion of the cylinder, an auxiliary exhaust port 27 is arranged to extend from the main exhaust port 23 and communicates with an opening formed in the cam like surface 26, so that all of the gases will be forced out through the exhaust port by the advancing piston wing.

The central portion of the inner end of each piston wing is provided with a recess 29 for the reception of a helical tension spring 30, the inner end of which bears against the lower wall of the recess 24. A pin 31 is employed to serve as a guide for the inner portion of the spring.

The outer face and side edges of each piston wing are provided with grooves for the reception of spring metal packing strips 32 of the type best shown in Fig. 5, each of these strips having main portions 33, 34 in the form of a bell crank lever, and to each of the arms of the bell crank lever are attached parallel arms 35, 36. The strips are arranged side by side so as to overlap at a number of points and form fluid proof packings which will prevent leakage of any of the gases past the piston wing.

The charges of explosive fluid are introduced into the chamber 20, as will hereinafter appear, and are successively exploded so as to drive the piston wings around in the direction of the exhaust port. In order that the piston wings may pass over the explosion chamber, the walls of the chamber are extended inward to partly bridge the space between the explosion chamber and the arcuate working space of the cylinder without interfering with the free passage of the gas.

Secured to the shaft 12 at a point within the cylinder 15 is a cylindrical piston drum 40 having a plurality of piston wings 41 movable in radial recesses formed in the piston drum and preferably of a construction similar to the wings of the actuating pistons as previously described. The curved wall of the cylinder 15 is divided into two portions having arcs of different radii, the arc of smallest radius corresponding to the radius of the piston drum 40, and these arcuate surfaces are connected at one side by the cam surface 43 and at the opposite side by a cam surface 44, these being so arranged as to permit the gradual outward movement of the piston wing into the working space, and the gradual return of the piston wing from the working space into the body of the piston.

Leading into the working space of the cylinder 15 is a port 46, that is placed in communication with a carbureter or other suitable source of supply, and leading from the working space is the port 21 which communicates with the explosion chamber as previously described.

In the operation of the compression pump, the piston wings as they pass from engagement with the smallest arc of the cylinder into engagement with the largest arc and from thence on until they are opposite the inlet port 46, tend to create vacuums so that as soon as the port 46 is uncovered by the piston wing, the charge will be drawn quickly into the working space 15 and as the piston continues its movement, the wing will then operate as a suction pump for the purpose of drawing in an additional quantity of the explosive charge, while its forward face will operate to compress the charge previously admitted and to force such compressed charge out through the connecting port 21 and into the explosion chamber of the engine.

That end of the port 21 which communicates with the explosion chamber is substantially parallel with the axis of the main shaft and is bored out for the reception of a valve seat member 50 that preferably is in the form of a tubular casing having one end enlarged and provided with a tapered seat for the reception of a correspondingly shaped valve 51. The valve 51 is carried by a stem 52 that is slidable in bearings formed by spiders 53 and on the stem is a shoulder 54 against which bears one end of a spring 55 tending to maintain the valve in its closed position. The valve is held in closed position so long as the pressure in the explosion chamber is in excess of that in the compression chamber of the pump, and there will always be a closing pressure sufficient to maintain the valve in closed position until after each of the operating piston wings rides outward against the bars 38 into engagement with the largest portion of the cylinder and then the pressure being reduced below that in the chamber of the compression pump, a fresh supply of explosive compound will be forced into the explosion chamber and will be ignited at the proper time by the spark plug.

The engine is of very simple construction and requires no valve operating mechanism, while the speed and power may be readily controlled by controlling the quantity or quality of the explosive compound allowed to enter the pumping cylinder through the port 46.

What is claimed is:—

1. In a rotary internal combustion engine, a pair of cylinders arranged side by side, and each having curved surfaces of different radii, pistons working in the cylinders, a shaft carrying both pistons, wings carried by the pistons, one of said cylinders, and the piston working therein operating as a pump, and the other cylinder having an explosion

chamber in its wall past which chamber the piston of said cylinder travels, and a partition between the cylinders, said partition having a valved passage communicating at one end with the pump cylinder, and at the other end with the explosion chamber.

2. In a rotary internal combustion engine, a pair of cylinders arranged side by side, pistons working in the cylinders, a shaft carrying both pistons, wings carried by the pistons, one of said cylinders and the piston working therein operating as a pump, and the other cylinder having an explosion chamber in its wall past which chamber the piston of said cylinder travels, and a partition between the cylinders, said partition having a valved passage communicating at one end with the pump cylinder and at the other end with the explosion chamber.

3. In a rotary internal combustion engine, a pair of cylinders arranged side by side, pistons working in the cylinders, a shaft carrying both pistons, wings carried by the pistons, one of said cylinders and the piston working therein operating as a pump, and the other cylinder having an explosion chamber in its wall past which the piston of said cylinder travels, a partition between the cylinders, said partition having a passage communicating at one end with the pump cylinder, and at the other end with the explosion chamber, and a valve in said passage, said valve being held in closed position when subjected to the action of the exploded gases.

4. In a rotary internal combustion engine, a pair of cylinders arranged side by side, and each having curved surfaces of different radii, pistons working in the cylinders, a shaft carrying both pistons, wings carried by the pistons, one of said cylinders and the piston working therein operating as a pump, and the other cylinder having an explosion chamber in its wall past which the piston of said cylinder travels, a rib extending over the discharge mouth of the explosion chamber, and a partition between the cylinders, said partition having a valved passage communicating at one end with the pump cylinder, and at the other end with the explosion chamber.

5. In a rotary internal combustion engine, a cylinder provided with curved portions of different radii, inlet and exhaust ports communicating with the cylinder, a piston drum, piston wings projecting from the drum, and an auxiliary exhaust port leading from the main exhaust port to the inner wall of the cylinder and terminating at the latter approximately at the juncture of the surfaces of larger and smaller radii.

6. In an internal combustion engine, the combination with an engine cylinder and piston therein, of a charge pumping cylinder having portions of different radii, a piston arranged in said cylinder, a plurality of piston wings carried by the piston drum, and a suction inlet port communicating with that portion of the cylinder of largest radius, and distant from that portion of the cylinder of smallest radius to thereby permit the formation of a partial vacuum before the opening of the port in the discharge leading from the cylinder and through which the charge is forced under pressure.

7. In a rotary engine of the type described, a piston wing having its ends and outer edge provided with a slot, and a pair of spring strips mounted in said slots, each of the strips extending across the slot at the outer edge, and each being further provided with a single arm fitting within the slot at one end of the wing, the strips being further provided with parallel arms which are disposed in staggered relation to prevent the leakage of the operating fluid.

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

DALLAS C. HATHAWAY.

Witnesses:
WILLIAM H. SOMERVILLE,
PERRY W. MINIER.