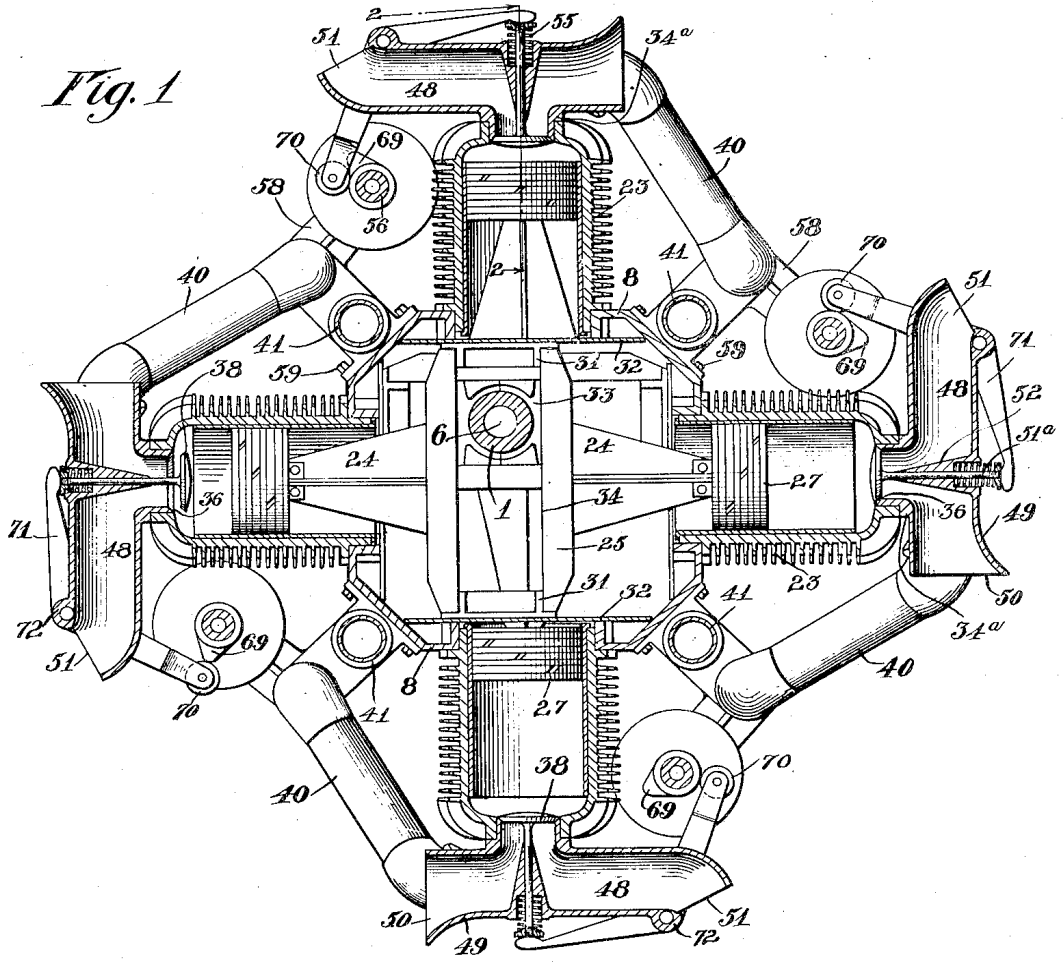
Sept. 30, 1924. 1,509,885

H. L. F. TREBERT

ROTARY ENGINE VALVE

Original Filed Aug. 27, 1917

Fig. 1



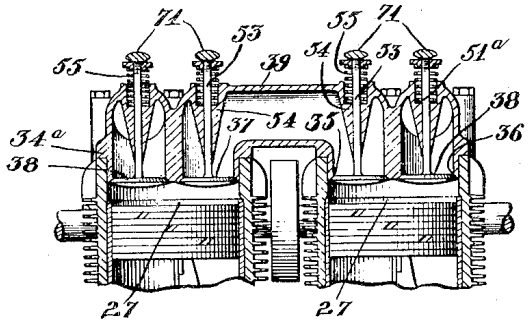


Fig. 2

INVENTOR.
Henry L.F. Trebert.
BY
Frederick S. Church
his ATTORNEY.

Patented Sept. 30, 1924. 1,509,885

UNITED STATES PATENT OFFICE.

HENRY L. F. TREBERT, OF WEST BLOOMFIELD, NEW YORK, ASSIGNOR TO TREBERT AIRPLANE MOTOR COMPANY, INC., OF PENN YAN, NEW YORK, A CORPORATION OF NEW YORK.

ROTARY-ENGINE VALVE.

Original application filed August 27, 1917, Serial No. 188,342. Divided and this application filed July 26, 1921. Serial No. 487,765.

To all whom it may concern:

Be it known that I, HENRY L. F. TREBERT, a citizen of the United States, residing at West Bloomfield, in the county of Ontario and State of New York, have invented certain new and useful Improvements in Rotary-Engine Valves; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference numerals marked thereon.

My present invention relates to internal combustion engines and more particularly to gas engines of the rotary type, and it has for its object to provide a simple and efficient valve gear for such engine so constructed and arranged that the valve will be kept cool by the passage of air current induced by the rotation of the engine. A further object of the invention is to keep down the temperature of the whole cylinder head in which the valves are located. To these and other ends the invention consists in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claim at the end of the specification.

In the drawings:

Figure 1 is a transverse sectional view through a rotary gas engine constructed in accordance with and illustrating one embodiment of my invention, the plane of the section being centrally of the exhaust valve of the engine, and

Figure 2 is a fragmentary section on the line 2—2 of Figure 1.

Similar reference numerals throughout the several views indicate the same parts.

The engine illustrated as an embodiment of my invention has been designed particularly for aeroplane use, and I will first briefly recite some of its main characteristics as disclosed in my pending application, Serial No 188,342, filed August 27, 1917, of which this is a division. It is a sixteen cylinder engine, air cooled. The fixed element is a crank shaft having only two cranks or crank centers and the pistons are constructed in pairs, the units of which are relatively fixed and operate together although no two cylinders are timed exactly the same. The fuel supply reaches the cylinders, ultimately, in the manner of the ordinary stationary engine, there being, in the present instance, a manifold for each four cylinders. There is an individual exhaust for each cylinder, through which an air current is forced by the rotation of the engine to cool the exhaust valve. Puppet-valves are used and they are actuated by cam shafts and rocker arms with one cam shaft to each four cylinders, but the valve gear is so constructed that the valves escape the effect of centrifugal force, hitherto a source of trouble in rotary engines.

Referring more particularly to the drawings, 1 indicates a crank shaft that constitutes a central fixed element of the engine. The crank is enclosed within a crank case 8 that is rectangular and made in halves, as usual, with a seam at 9 in the plane of the axis of the engine. Bolted to the crank case in longitudinal rows of four each and projecting radially at 90° angle from each other are the cylinders 23.

Bolted or otherwise suitably secured on the outside of the case 8 are a plurality of radially disposed cylinders 23 ribbed for air cooling. They are arranged in longitudinal and circumferential rows of four each and in the circumferential rows, as shown in Figure 1, the axes of the cylinders all lie in the same transverse plane. The cylinders are therefore opposed in pairs and the pistons 27 of each pair are relatively immovable and rigidly connected together by connecting rods 24 in conjunction with an intermediate cross head 25. The pistons, on the one hand, and their connecting rods on the other, are therefore relatively offset so that the connections between each two pairs of pistons of the four cylinders whose axes lie in the same transverse plane, can cross each other without interference and be connected to the same crank center 6 as hereinafter described and as shown in Figure 1. The cross heads 25 are fitted with bronze shoes 31 that are adapted to travel upon hardened steel way plates 32 on the interior of the crank case and there is also a relative reciprocation of the crank 1 within the cross head through the medium of sliding journal blocks 33 as will be understood in a general way but the details of this part of the engine structure are not essential to the present invention.

In the practice of the present invention, the cylinder heads 34ª are cast in pairs for

adjacent elements of the longitudinal rows of cylinders and have formed therein the intake ports 35 and the exhaust ports 36, respectively controlled by intake valves 37 and exhaust valves 38. Communicating with the intake ports 35 by means of a head 39 on each pair of cylinders are the branches of a manifold 40. There is one such manifold between each two longitudinal rows of cylinders, or four in all and each manifold is supplied by a longitudinally extending pipe 41 connected to a suitable fuel supply as shown in my said pending application.

The exhaust ports 36 deliver into a chamber 48 that is formed in the present instance by a transverse pipe 49 cast integrally with the cylinder head and open at both ends. Its longitudinal extent is such that as the engine rotates a strong air current will be forced into the preferably expanded end 50 and out at the end 51, together with the products of combustion from the exhaust port. This tends to keep the cylinder head cool and effectively prevents the exhaust valve 38 from over-heating. To this end, the stem 51ª of the valve reciprocates in a bearing 52 disposed transversely across the chamber 48 where it receives the full effect of the blast of air.

Both of the valves 37 and 38 open inwardly toward the center of rotation on radial lines and close in an outward direction, the stem 53 of each intake valve being also guided in a bearing 54 in the cylinder head but being cooled by the current of fuel. Springs 55 tend to close the valves, as usual, but they are opened in a positive manner for the reason that with the arrangement described, centrifugal force is always acting to close the valves and hence should preferably work with the springs instead of against them. This effect of centrifugal action on the valves has always presented difficulties in rotary engines, and I have found it very difficult if not impossible to operate a valve with a spring against centrifugal force in a uniform manner, it being borne in mind that the pressure due to centrifugal action varies with the speed of the engine.

To positively open the valves in an inward direction, I employ a cam shaft 56 for each longitudinal row of cylinders, there being one such cam shaft between each two rows. These shafts are supported in bearings on arms 58 extended from the fuel supply pipes that are secured to the crank case 8 as at 59.

Cams 69 on the cam shafts cooperate with rollers 70 on bell crank rocker arms 71 suitably journaled on the cylinder head castings 34. In the present instance, they turn in bosses 72 on the exhaust tubes 49 and the arms of the levers rest upon the valve stems 51 and 53 in the usual manner.

I claim as my invention:

In a rotary gas engine, the combination with a fixed central element and a plurality of rotatable radial cylinders arranged side by side, axially of the fixed element, in pairs, of cylinder heads cast integrally for each pair of cylinders and each comprising a fuel intake chamber common to both cylinders and individual exhaust pipes for the latter, which pipes are so disposed as to be traversed internally by air currents superinduced by the movement of the cylinders about the fixed element.

HENRY L. F. TREBERT.