T. LANE.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAR. 20, 1914. RENEWED OCT. 23, 1915.

1,187,343.

Patented June 13, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

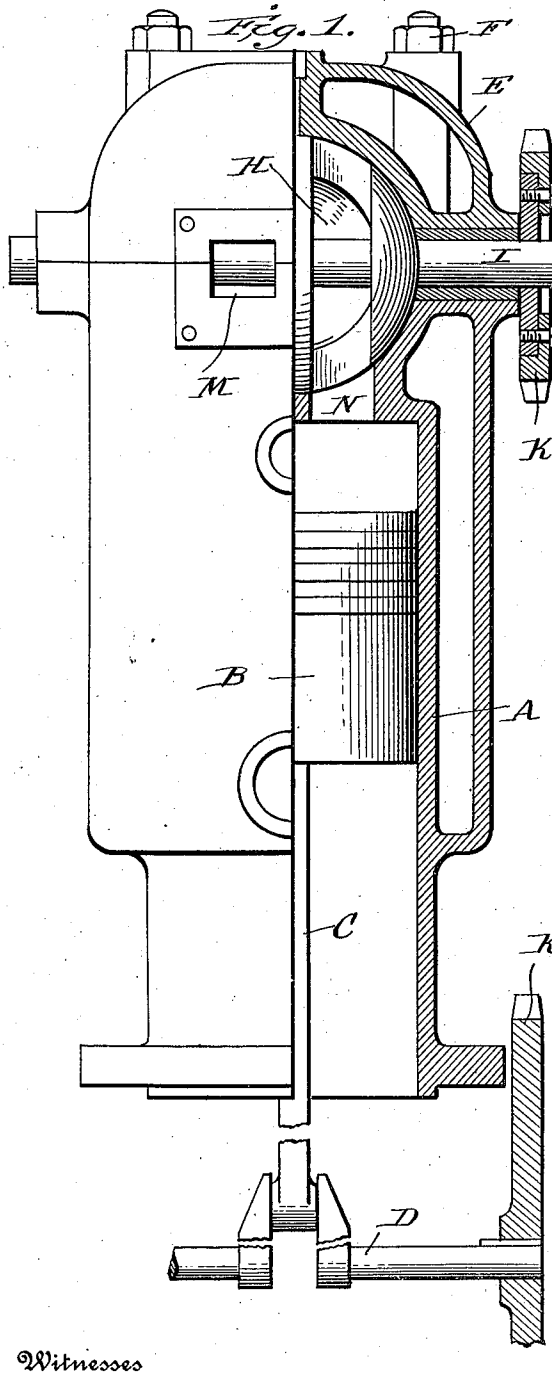
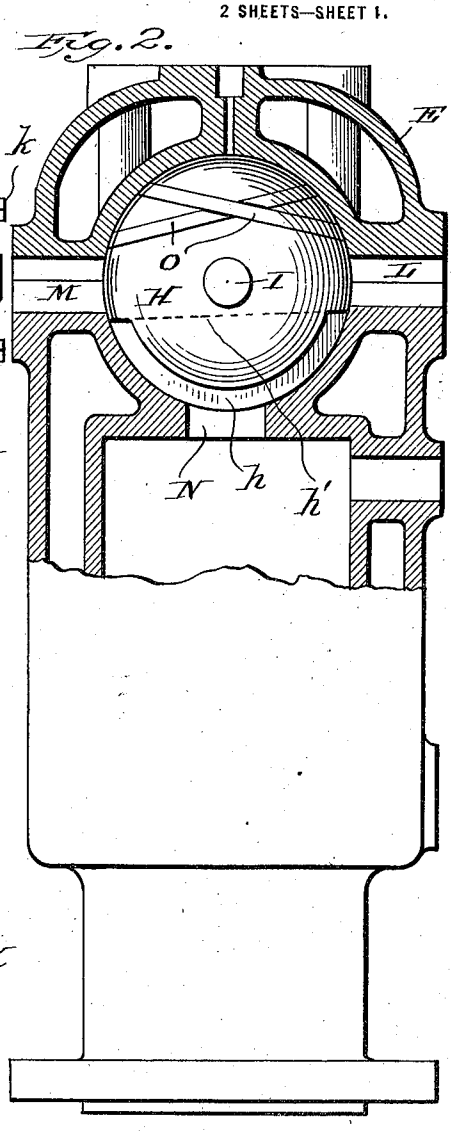


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

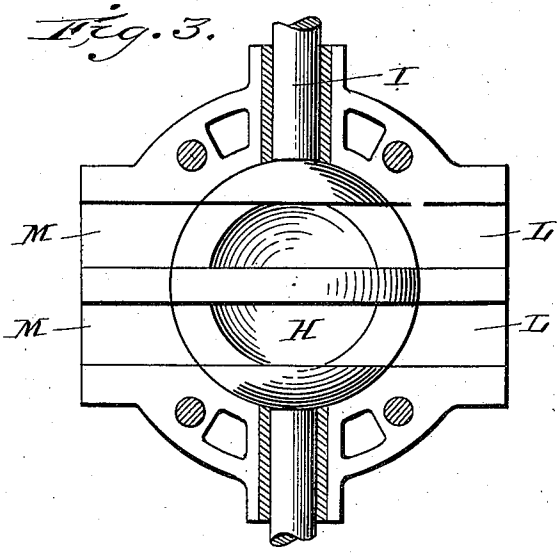


Fig. 4.

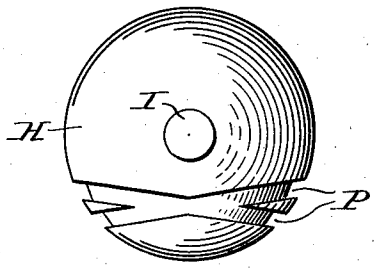


Fig. 5.

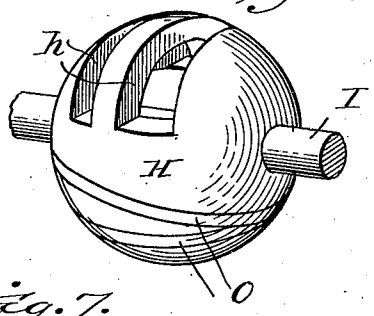


Fig. 6.

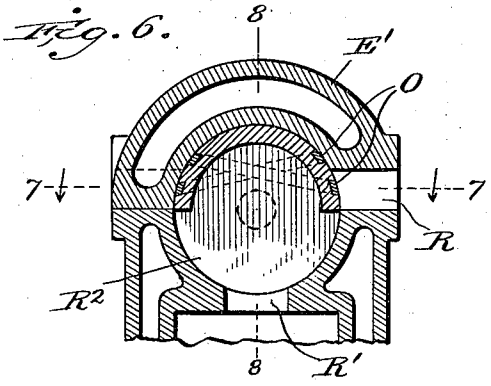


Fig. 7.

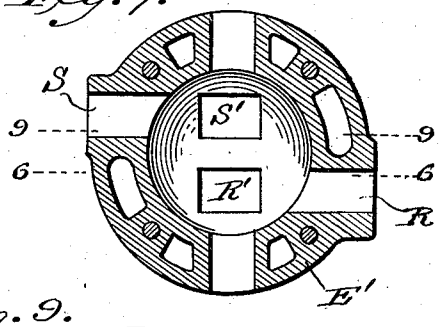


Fig. 8.

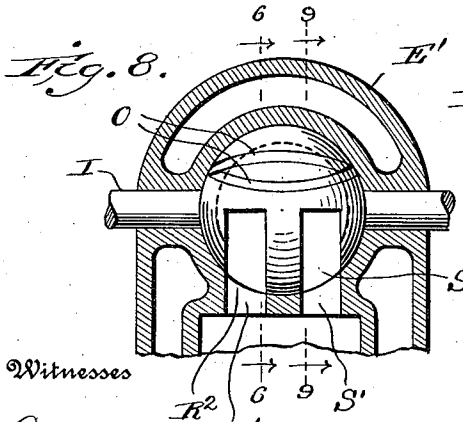
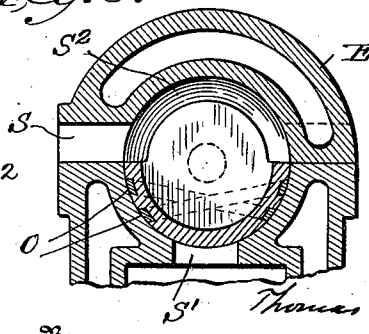


Fig. 9.



Witnesses

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UNITED STATES PATENT OFFICE.

THOMAS LANE, OF ATLANTA, GEORGIA.

INTERNAL-COMBUSTION ENGINE.

1,187,343. Specification of Letters Patent. Patented June 13, 1916.

Application filed March 20, 1914, Serial No. 826,054. Renewed October 23, 1915. Serial No. 57,595.

To all whom it may concern:

Be it known that I, THOMAS LANE, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Internal-Combustion Engines; 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 part of this specification, and to the figures and letters of reference marked thereon.

This invention relates to internal combustion engines of the type set forth in my Patent No. 1,087,499, dated February 17, 1914, the objects of the invention being to improve the construction and arrangement of the valve mechanism, whereby the ports and passages may be more advantageously disposed and the valve more effectually packed to prevent leakage or loss of pressure during the compression and power strokes.

The invention consists in the novel details of construction and combinations and arrangements of parts which will be hereinafter described and pointed out particularly in the appended claims.

Referring to the accompanying drawings,—Figure 1 is an elevation, one-half in section, showing a cylinder, valve mechanism, piston and crank shaft embodying the present improvements. Fig. 2 is an elevation from a point of view at right angles to Fig. 1, with the upper portion of the cylinder and valve chamber in section. Fig. 3 is a plan view of the valve and the cylinder head with the upper portion of the valve chamber removed. Figs. 4 and 5 are views of the spherical valve shown in Figs. 1 to 3. Figs. 6, 7, 8 and 9 are sections in vertical planes, through a slightly different and preferred arrangement of valve, Fig. 6 being a section on the lines 6—6, Figs. 7 and 8; Fig. 7 a section on the line 7—7, Fig. 6; Fig. 8, a section on the line 8—8, Fig. 6; and Fig. 9 a section on the lines 9—9, Figs. 7 and 8.

Like letters of reference in the several figures indicate the same parts.

Certain parts of the engine illustrated are of conventional form, that is to say, there is preferably employed the usual water jacketed cylinder A, piston B, connecting rod C and crank shaft D. Above the cylinder there is formed a spherical valve chamber, such chamber being preferably formed one-half in the head of the cylinder and the other half in a removable head E, which is secured in place by bolts and nuts F of ordinary construction, the arrangement being such that the water jacket around the cylinder communicates with corresponding water jacket passages in the head E, in the well known way.

Fitting within the spherical valve chamber is a spherical valve H mounted on a shaft I journaled in bearings formed between the cylinder head and removable head, so that the valve with its shaft may be lifted out or inspected when the head E is removed. The valve is keyed to its shaft and is adapted to be rotated at one-half the speed of the crank, for a four-cycle engine, by a sprocket chain running over a sprocket wheel K on the crank shaft and over a sprocket wheel K′ adjustably connected with a valve shaft disk by screws *k*, whereby the timing of the valve may be accurately adjusted.

In the construction shown in Figs. 1 to 5, the inlet port L and the exhaust port M are located approximately at opposite points on each side of the valve shaft, the lower edge of the inlet port being, however, slightly above the level of the lower edge of the exhaust port, and the two ports are formed partly in the cylinder head and partly in the removable head E. They are preferably formed in parallel pairs, as will be readily understood from Fig. 3, for convenience in manufacture and to strengthen the parts of the cylinder and valve, as will be presently understood. In the head of the cylinder and at the bottom of the valve chamber cylinder ports N are formed, and the valve, which in this instance may be a hollow sphere, is formed with transverse slots which constitute the inlet and exhaust passages *h*, extending straight through one hemisphere of the valve, as indicated by the dotted line *h′* in Fig. 2, and as shown in the perspective view, Fig. 5. The two slots through the spherical valve communicate in the interior of the valve and thus, in effect, the pairs of ports and passages constitute a single duct. The cylinder port N and the inlet and exhaust ports are approximately 90° apart, but this, it will be understood, is subject to variation within limits, according to the particular design of the engine.

The opposite hemisphere of the valve from that through which the passages extend, is surrounded by packing rings, such packing rings being located in the same hemisphere of the valve and preferably in intersecting planes. The packing rings are indicated by the reference letter O and they are mounted in grooves P, which it will be seen from Fig. 4, intersect at an acute angle, the points of intersection being on opposite sides of the valve, preferably in proximity to the axis or valve shaft. This arrangement leaves a very large area in which the passages may be formed and also a very large area which is completely surrounded by the packing rings and may be utilized for presentation to the cylinder ports during the compression and power strokes.

In Figs. 6 to 9, inclusive, the arrangement is one in which separate and independent inlet and exhaust ports and passages are employed, both in the cylinder and in the valve, but the arrangement of packing rings may remain the same as that heretofore described. Referring particularly to said figures of the drawings, the inlet port is indicated at R, the cylinder inlet port at R′, the exhaust port at S and the cylinder exhaust port at S′. The inlet passage in the valve is indicated at R^2 and the exhaust passage at R^3, the valve in this case being provided with a diaphragm or partition through the same to separate the two passages R^2 and S^2 and divide the internal chamber into inlet and exhaust chambers. In this instance the exhaust and inlet ports R and S are formed entirely in the removable head E′, their lower edges therefore being substantially level with the axis of the valve, and the passages in the valve preferably extend through approximately 180° of the circumference of the valve. As shown in Fig. 6, the inspiration stroke is about to commence, and as shown in Fig. 9, the power or explosion stroke is about to commence. From this last mentioned figure of the drawing it will readily be appreciated that upon the closure of the cylinder port and before the piston has reached a point where the compression begins to materially increase the packing rings will have moved across the cylinder ports and the escape of pressure around the valve will be effectually prevented, during the completion of the compression stroke and during the power or explosion stroke, the last of the rings moving into the area of the cylinder ports only as the piston reaches the limit of its downward movement in the power stroke.

Obviously with the arrangement of the packing rings in the opposite hemisphere of the valve from that in which the passages are formed, a very considerable latitude for the location of said passages is permissible, and in Figs. 6 to 9, above referred to, the intake ports and passages and the exhaust ports and passages are located in different transverse planes longitudinally of the axis of the valve, as will be understood from an inspection of Fig. 7, thus permitting of all of the advantages of separate inlet and exhaust ports and passages, without in any wise complicating the problem of packing and keeping the valve tight against loss of compression or power.

Packing rings of ordinary construction having spherical outer surfaces are employed, the ends of each ring being cut diagonally to fit against the sides of the complemental ring at the point of intersection.

The spherical valve which is hollow forms a chamber having the greatest cubical capacity possible in a valve of given size. The chamber acts as an expansion chamber into which the gaseous fuel will expand, and in accordance with the well known law governing the absorption of heat by expanding gases, the action will assist materially in keeping the valve walls cool.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In an internal combustion engine, the combination with a cylinder head, of a rotary spherical valve, there being complemental ports and passages in the cylinder head and valve controlling admission and exhaust of motive fluid, and a plurality of yielding packing rings, all extending around the valve in the same hemisphere.

2. In an internal combustion engine, the combination with a cylinder head, of a rotary spherical valve, there being complemental ports and passages in the cylinder head and valve controlling admission and exhaust of motive fluid, and a plurality of yielding packing rings located in different planes in the valve and in the same hemisphere.

3. In an internal combustion engine, the combination with a cylinder head, of a rotary spherical valve, there being complemental ports and passages in the cylinder head and valve controlling admission and exhaust of motive fluid, and a plurality of yielding packing rings located in different intersecting planes extending through the valve in the same hemisphere.

4. In an internal combustion engine, the combination with a cylinder head, of a rotary spherical valve, there being complemental ports and passages in the cylinder head and valve controlling admission and exhaust of motive fluid, and yielding packing rings around the valve intersecting each other at acute angles at two opposite points.

5. In an internal combustion engine, the combination with a cylinder head, of a rotary spherical valve, there being comple-

mental ports and passages in the cylinder head and valve controlling admission and exhaust of motive fluid, and yielding packing rings around the valve intersecting each other at acute angles at two opposite points in the same hemisphere of the valve.

6. In an internal combustion engine, the combination with a cylinder head, of a rotary spherical valve, there being complemental ports and passages in the cylinder head and valve controlling admission and exhaust of motive fluid, and yielding packing rings around the valve in planes parallel with the axis of rotation of the valve and intersecting each other at an acute angle on opposite sides of the valve in proximity to the axis.

7. In an internal combustion engine, the combination with a cylinder having separate inlet and exhaust ports, of a spherical valve having separate inlet and exhaust passages located in different planes transverse to the axis of the valve to register respectively with the cylinder inlet and exhaust ports, a valve chamber having separate inlet and exhaust ports located in the planes of the valve passages, and yielding packing rings around the hemisphere of the valve opposite that in which the passages are formed.

8. In an internal combustion engine, the combination with a cylinder having a hemispherical valve chamber in its head, a removable head having a complemental hemispherical valve chamber therein, a spherical valve mounted to rotate on a horizontal axis in said valve chamber and having separate inlet and exhaust passages in one hemisphere thereof in different planes longitudinally of the axis, there being inlet and exhaust ports in the removable head and cylinder head respectively, located in the same transverse plane as are the passages in the valve, and packing rings surrounding the hemisphere of the valve opposite that in which the passages are formed.

9. In an internal combustion engine, the combination with a cylinder having a hemispherical valve chamber, a removable head having a complemental hemispherical valve chamber therein, and a spherical valve mounted to rotate on a horizontal axis in said valve chamber and having separate inlet and exhaust passages located in different planes longitudinally of the axis of the valve, there being inlet and exhaust ports in the removable head and cylinder head respectively, located in the same transverse planes as are the passages in the valve.

10. In an internal combustion engine, the combination with a cylinder having a spherical valve chamber, and inlet and exhaust ports communicating with said chamber, of a hollow spherical valve mounted to rotate in said chamber and having passages in its walls for registering with the inlet and exhaust ports, said passages communicating with the hollow interior of the valve whereby said valve constitutes an expansion chamber for assisting in lowering the temperature of its walls.

11. In an internal combustion engine, the combination with a cylinder having a spherical valve chamber and a water jacket surrounding said cylinder and head, there being inlet and exhaust ports leading to and from the valve chamber for admitting motive fluid to and from the cylinder, of a hollow spherical valve rotatably mounted in said valve chamber and having separate inlet and exhaust passages through the walls thereof adapted to register with the inlet and exhaust ports, said passages communicating with the hollow interior of the valve, there being an internal diaphragm between the passages in the valve for dividing the interior of the valve into two separate expansion chambers.

12. In an internal combustion engine, the combination with a cylinder, of a rotary spherical valve therefor having ports therein confined to one hemisphere, and a packing ring confined to the other hemisphere.

13. In an internal combustion engine, the combination with a cylinder, of a rotary spherical valve therefor having intake and exhaust ports formed in the body of the valve and confined to one hemisphere thereof, and intersecting packing rings for the valve embedded therein and confined to the other hemisphere.

THOMAS LANE.

Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."