G. M. FAIRFIELD.

INTERNAL COMBUSTION ENGINE.

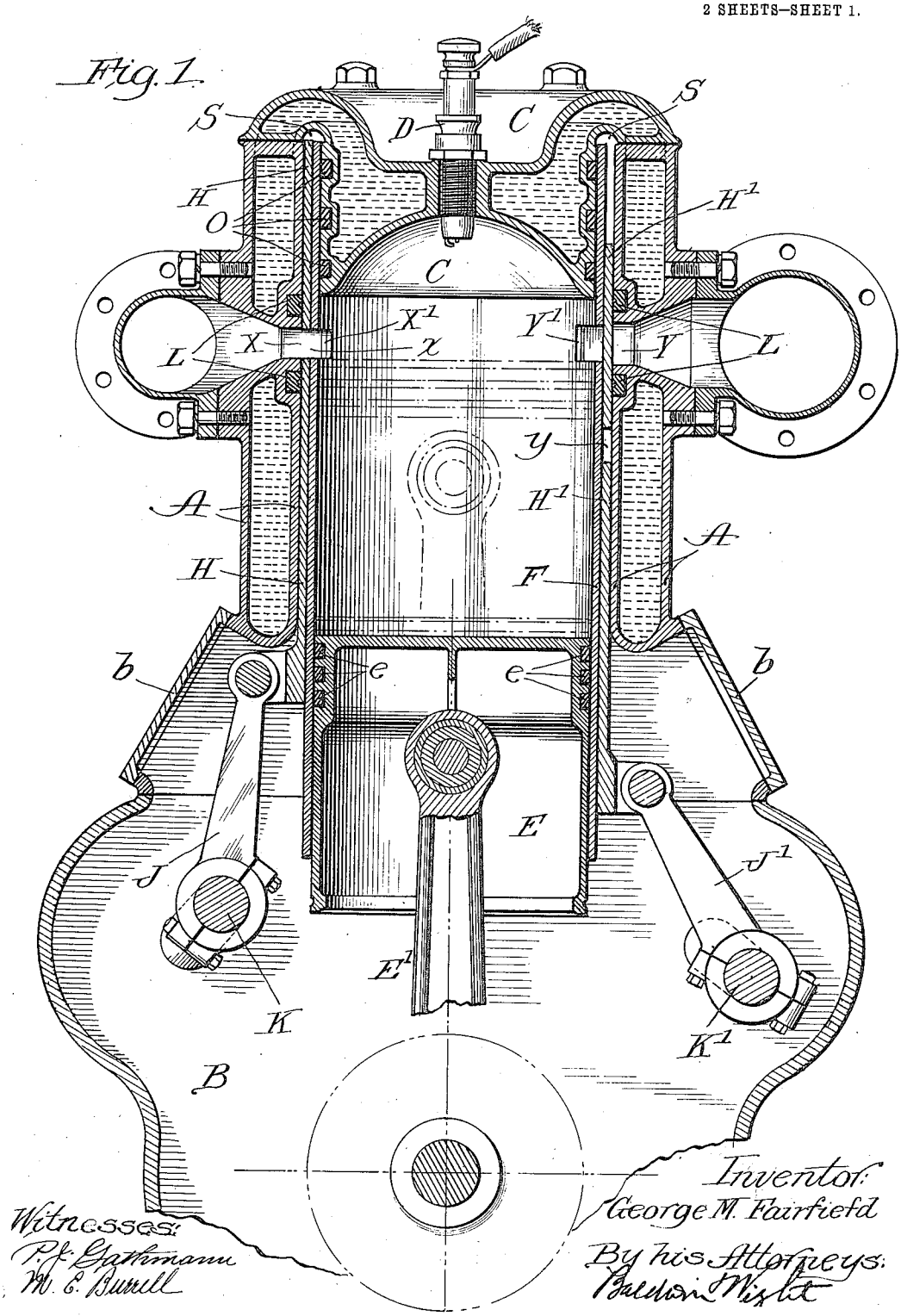
APPLICATION FILED JAN. 9, 1912.

1,031,991.

Patented July 9, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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2 SHEETS—SHEET 2.

Fig. 2.

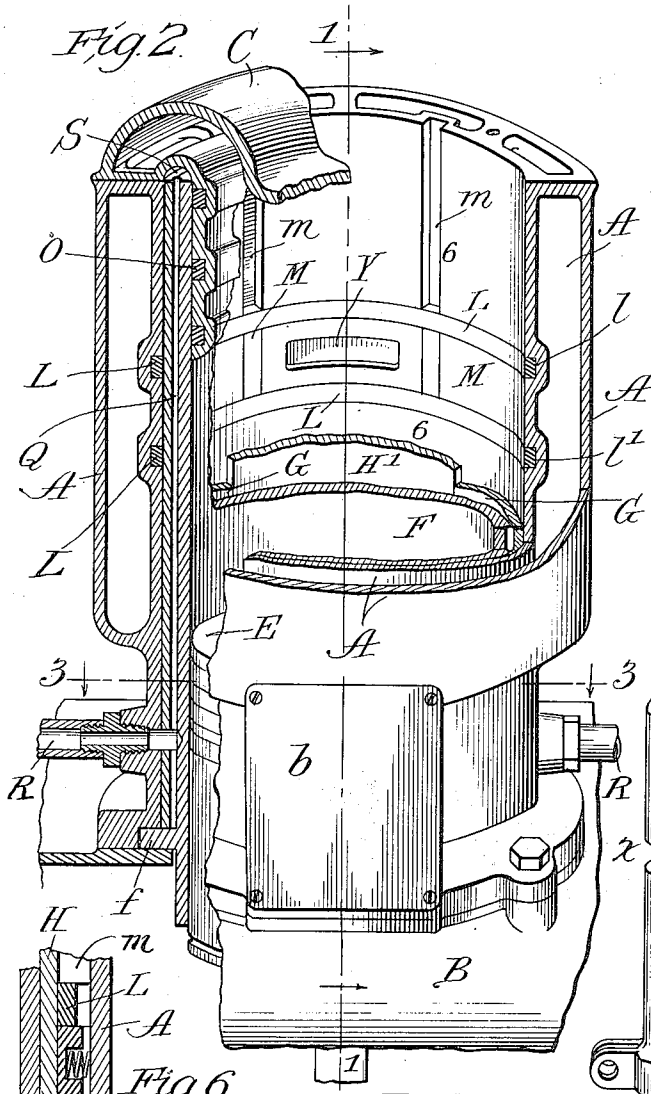


Fig. 4.

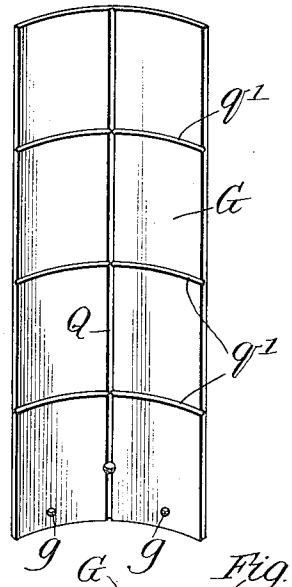


Fig. 5.

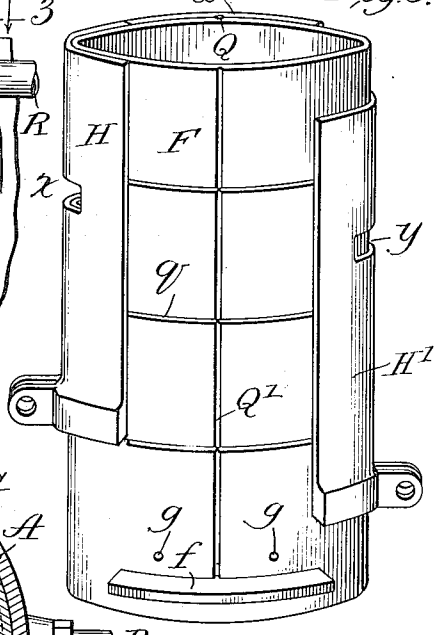


Fig. 6.

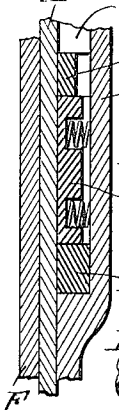
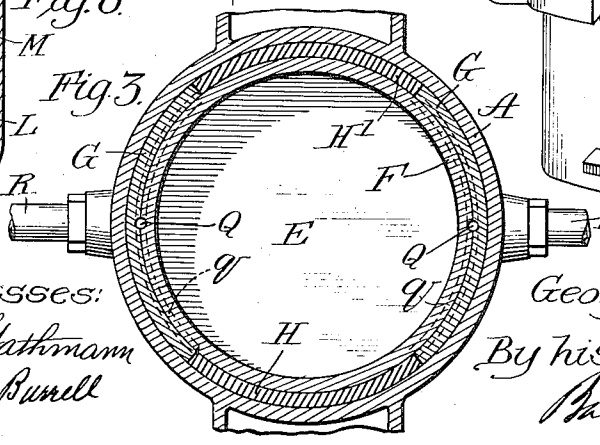


Fig. 3.



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UNITED STATES PATENT OFFICE.

GEORGE M. FAIRFIELD, OF SAN ANTONIO, TEXAS.

INTERNAL-COMBUSTION ENGINE.

1,031,991. Specification of Letters Patent. Patented July 9, 1912.

Application filed January 9, 1912. Serial No. 670,290.

To all whom it may concern:

Be it known that I, GEORGE M. FAIRFIELD, a citizen of the United States, residing in San Antonio, in the county of Bexar and State of Texas, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to internal combustion engines of the class in which the commonly employed puppet valves for controlling the admission and exhaust are replaced by slide valves of novel construction. It has heretofore been proposed to employ in this class of engines cylindrical slide valves or sleeves concentric with and surrounding the piston in order to give large port areas and to obtain a quick opening and closing of the ports. By such construction noise incident to the use of puppet valves is avoided, the use of springs is done away with and very high speed may be obtained.

The object of my invention is to improve engines of this general type in order to render them more efficient in operation and more economical construction. With this in view I have provided a construction in which two segmental slide valves are arranged to reciprocate in slide-ways provided between the engine casing and a cylindrical shell which surrounds the piston, and I have provided novel packing means to prevent leakage and a new system of lubrication which contributes to the efficient operation of the mechanism.

In the accompanying drawings:—Figure 1 shows a vertical central section on the line 1—1 of Fig. 2 through so much of an internal combustion engine embodying my improvements as is necessary to illustrate my invention. Fig. 2 is a view partly in elevation, partly in section, and with parts broken away, showing certain features of construction. Fig. 3 shows a transverse section on the line 3—3 of Fig. 2. Fig. 4 is a perspective view of one of the two spacing segments which are interposed between the inner cylindrical shell and the outer casing and between the ends of which the valves slide. Fig. 5 is a perspective view, showing the inner shell, the segmental valves, and one of the spacing segments, the other segment being removed and being illustrated in Fig. 4. Fig. 6 is a detail view in section, showing certain details of the packing.

The water jacketed casing A is mounted on the crank casing B, which latter may be provided with hand-holes closed by caps *b*. The casing A is formed with elongated admission and exhaust ports X and Y, and is closed at one end by a water cooled head C, carrying the sparking plug D. The piston E carries packing rings *e* and is jointed to a connecting rod E′ operated in the usual way. The diameter of the piston is considerably less than that of the casing and there is a space between the piston and the inner walls of the casing occupied by the cylindrical shell F, the spacing segments G, and the segmental valves H H′. In this way the piston is made to move in contact with a stationary unbroken or smooth surface without undue friction which would be caused if the valves came into direct contact with the piston and moved differentially. The shell F is made thin so that the heat generated may be readily dissipated and the valves H, H′ are also made thin for a similar purpose. The shell F is truly cylindrical and is concentric with the casing and piston. It is formed with horizontal flanges *f* which rest on the crank casing and the shell extends to the top of the casing, as shown in Fig. 1. It is provided with ports X′, Y′ in line with the admission and exhaust ports X and Y. The segmental spacing plates G are preferably each made to occupy slightly more than a quarter of the space between the shell F and the casing A, and they are secured at their lower ends to the shell, as indicated at *g* on opposite sides of the engine, leaving spaces between their vertical edges which are occupied by the valves H, H′. In this way slide-ways are provided for the valves in which they reciprocate vertically and the entire space between the shell and the casing is occupied by the segments and valves.

The admission and exhaust valves H, H′ are provided with ports *x*, *y* and are connected by rods J, J′ with crank shafts K, K′ which may be actuated in any suitable way to move the valves at the proper times. Horizontal packing rings L are sunk in the casing above and below the admission and exhaust ports in contact with which the valves move, and vertically arranged spring pressed packing strips M are sunk in the casing on opposite sides of the ports. In this way the gases are confined in the casing, leakage in all directions being effectively prevented.

In order to place the packing strips M vertical grooves *m* are cut in the casing walls extending from the top of the casing, past the groove *l* of the upper packing ring L to the groove *l'* of the lower ring so that the packing strips may be conveniently slid into place. The upper portions of the grooves *m* above the top packing ring I also serve to conduct the lubricant to the valves H, H'. The cylinder head has packing rings O. This arrangement of packing has been found to be most efficient in preventing leakage.

In order to thoroughly lubricate the engine, I form each of the spacing segments G on its inner side with a vertical groove Q which connects with a supply pipe R through which lubricating fluid may be supplied by a pump or other suitable means. The lubricant rises through the grooves Q and fills the groove S at the top of the casing from which it passes to the valves. The piston may be lubricated in any suitable way, the most obvious way being to supply it with lubricant from the crank chamber as usual. In order to further distribute the lubricant each side of the shell F may be formed with a vertical groove Q', registering with a corresponding groove Q in an adjacent segment G, and the groove Q' may connect with lateral grooves *q* which may be made to register or coincide with corresponding grooves *q'* formed on the inner side of the corresponding segment G.

While I prefer to employ two supply pipes R, one may be used. In either event, the lubricating fluid will be thoroughly distributed to efficiently lubricate the valves which may be operated at high speed, with great ease of movement and without danger of leakage. By employing segmental slide-valves and spacers in segmental form, I can very economically produce them. The valves and spacers may be cut from cylinders with but little waste of material and can be ground or otherwise machined with great facility to put them in proper condition to fit exactly in the space between the inner cylindrical shell and the inner wall of the engine casing.

I claim as my invention:

1. The combination with the engine casing and piston, of a stationary cylindrical shell interposed between the piston and casing and extending from the top of the casing to the bottom thereof, spacing segments interposed between the shell and the casing having slide-ways between them, segmental slide-valves mounted to reciprocate in said slide-ways, admission and exhaust ports in the casing, shell and valves, packing rings in the cylinder walls above and below the admission and exhaust ports thereof and independently movable spring-pressed vertically arranged packing strips in the casing walls at opposite ends of the ports.

2. The combination with the engine casing and piston, of a cylindrical shell interposed between the piston and the casing, spacing segments interposed between the casing and shell having slide-ways between them and one of which has a vertical groove for conveying lubricating material, an annular groove at the top of the engine casing for distributing the lubricant and, slide-valves mounted to reciprocate in said before mentioned slide-ways which receive lubricant from said distributing groove.

3. The combination with the engine casing and piston, of the stationary cylindrical shell interposed between the piston and casing and having a vertical groove for conveying lubricating material, spacing segments interposed between the casing and piston having slide-ways between them, an annular groove at the top of the engine casing for distributing the lubricant, and slide-valves mounted to reciprocate in said slide-ways.

4. The combination with the engine casing and piston, of a cylindrical shell interposed between the piston and casing and having a vertical groove connecting with lateral grooves for conveying and distributing lubricating material, spacing segments interposed between the casing and piston having slide-ways between them, an annular groove at the top of the engine casing for distributing the lubricant, and slide-valves mounted to reciprocate in said slide-ways.

In testimony whereof, I have hereunto subscribed my name.

GEORGE M. FAIRFIELD.

Witnesses:

LLOYD B. WIGHT,

M. E. BURRELL.