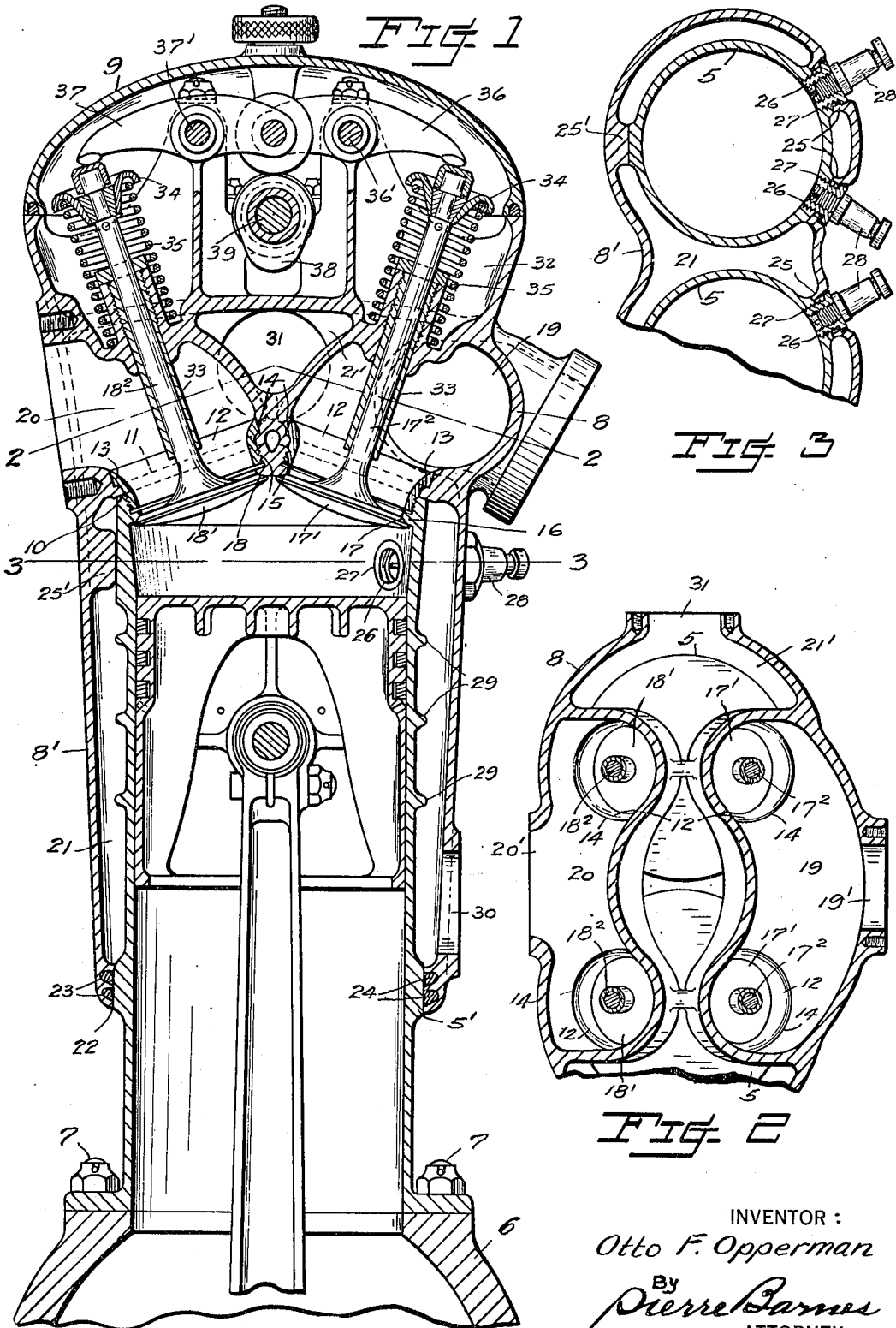


O. F. OPPERMAN.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED OCT. 20, 1917.

1,292,634.

Patented Jan. 28, 1919.



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OTTO F. OPPERMAN, OF SEATTLE, WASHINGTON.

INTERNAL-COMBUSTION ENGINE.

1,292,634.

Specification of Letters Patent.

Patented Jan. 28, 1919.

Application filed October 20, 1917. Serial No. 197,570.

To all whom it may concern:

Be it known that I, OTTO F. OPPERMAN, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines. Its object is to improve the construction of light-weight engines of this character to increase their durability, strength and general efficiency.

I attain these ends by employing individually removable cylinders of steel or other suitably hard metal in a casing formed of a metal or composition of metals such as aluminum or alloys thereof, having a greater conductivity for heat than afforded by the cylinder metal; said casing being chambered to provide water jacketing spaces about the several cylinders, thereby enabling the walls being made much thinner than would otherwise be practicable.

The invention further consists in the novel manner or means by which the cylinders are connected to the casing to compensate for differences in the expansibility of the metals from which the engine cylinders and casing are formed.

The invention further consists in various other novel features in the construction, adaptation and combination of the engine parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical section of an engine embodying my invention. Figs. 2 and 3 are sectional views taken through 2-2 and 3-3 of Fig. 1. Referring to said drawings, the numeral 5 designates the power cylinders of steel rigidly secured upon a base or crank casing 6, as by means of bolts 7, and extending up into chambers provided in a casing 8 of aluminum or the like, which is surmounted by a cap 9. The upper end of each of said cylinders fits against a shoulder, such as 10, formed on the underside of a partition 11 provided in said casing, and is rigidly secured thereto by screw-threaded tubular couplings 12 having peripheral flanges 13 adapted to seat in annular recesses 14 of said partition and engaging screw-threads 15 formed in sockets therefor in the respective cylinder end 16. There are two of such couplings employed for each

of the cylinders, and arranged to have their axes in a plane extending diametrically through the latter and transversely of the engine.

Within a cylinder and concentric to the axes of the respective recesses 14, a cylinder end 16 is machined to afford seats 17 and 18 for inlet and exhaust puppet valves 17¹ and 18¹.

Provided above the cylinders in the casing are manifold chambers 19 and 20 which communicate with each cylinder through ports provided by said tubular couplings. The chamber 19 is provided with an inlet 19¹ whereby connection is had by means of a pipe, not shown, with a carbureter for supplying an explosive mixture to the engine. The other chamber 20 is provided with an exhaust opening 20¹ for the discharge of spent gases from the engine.

The lower portion 8¹ of said casing is chambered to provide water space 21 surrounding each cylinder and having openings, as 22, through which the several cylinders are inserted.

Interiorly of the mouth of an opening 22 I provide grooves 23 for the reception of gaskets 24 engaging against a peripheral ridge 5¹ provided on the associated cylinder to furnish a water-tight joint thereat.

25 and 25' represent spacing lugs protruding inwardly from the casing in proximity to the underside of the respective partition 11 for the purpose of retaining the cylinders in positions to be secured by the aforesaid couplings to the casing. The lugs 25, as shown in Fig. 3, are made hollow to receive bushings 26 which are externally screw-threaded to engage screw-threaded apertures 27 provided in the peripheral wall of a cylinder, said bushings being internally threaded for engagement by the threaded ends of sparking plugs 28 of any usual or suitable type. The cylinders are desirably provided with external ribs 29 extending into said water space 21 to increase the surface exposed to the cooling water. The water space within the casing communicates by means of pipes connected to openings 30 and 31 located adjacent to the lower end of casing part 8¹ and to the space 21¹ in the head portion of the casing above the cylinders.

The stems 17² and 18² of said valves extend into a chamber 32 above water space 21¹ through guide tubes 33. Said

valve stems have secured thereto collars 34 to receive the ends of helical springs 35 tending to yieldingly hold the respective valves against their seats.

5 36 and 37 represent levers fulcrumed at 36¹ and 37¹ and actuated by means of cams, such as 38, provided on a cam shaft 39 to effect the opening of the valves in oppo-

10 sition to said springs.
The advantages of this invention reside principally in the peculiar manner of employing individually removable cylinders extending into the water jacket casing of cast aluminum alloy, and the manner of
15 securing the same together. By such devices the cylinder walls may be conveniently made thinner than hitherto, and admit of the heat generated within the cylinder being more quickly removed therefrom being
20 either carried away by the cooling water or radiated therefrom through the casing wall.

By such heat reduction, greater piston speed may be had, and the life of the cylinders materially increased. The cylinders
25 may, moreover, be formed of high carbon steel in place of gray iron, as now most commonly used.

30 Unlike other aluminum and cased engine cylinders known to me, the cooling water in the jacket or casing of the present invention is in direct contact with the cylinders.

According to this invention, the valve seats are provided on the relatively hard
35 cylinder heads, thereby obviating the necessity of frequent grinding which is necessary

in other engines to prevent leakage. The cylinders are furthermore secured to the casing by tubular couplings passing through
40 alined ports on the cylinder head and the casing so as to obviate leakage troubles resulting from the unequal expansion and contraction of the different characters of
metals employed in the casing and cylinders.
45

What I claim, is—

In apparatus of the class described, the combination with the engine cylinders, having inlet and exhaust ports in their upper
50 ends, of a casing for the upper portions of said cylinders, said casing being chambered to provide a water space above and surrounding each of the cylinders, means to
provide a water-tight joint between the
55 lower end of the casing and each of the cylinders, tubular couplings extending into said ports for detachably securing the respective cylinders to the casing, gas inlet and exhaust passages extending through the
60 water space above the cylinders and communicatively connected through said couplings and ports with the interiors of the cylinders, valves arranged to seat against the cylinder ends to close said ports, and
65 means for operating the valves.

Signed at Seattle, Washington, this 10th day of October, 1917.

OTTO F. OPPERMAN.

Witnesses:

PIERRE BARNES,
E. PETERSON.