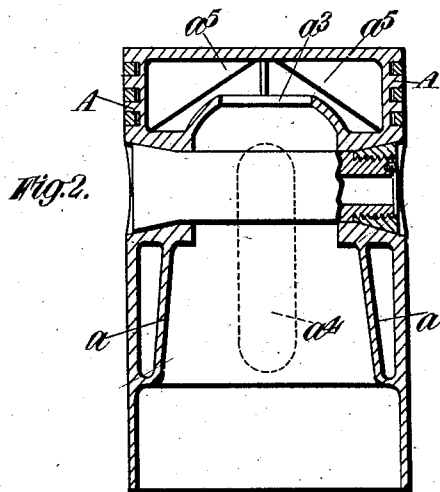
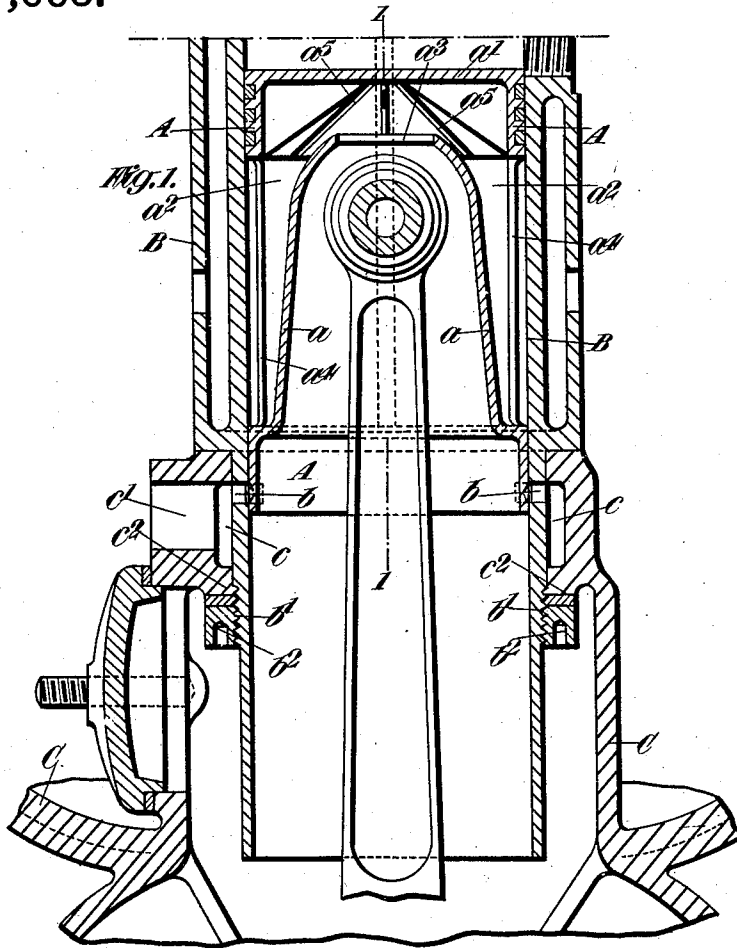


H. KNUDSEN.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED NOV. 18, 1911.

1,057,063.

Patented Mar. 25, 1913.



Witnesses:
Frank Hennessey
B. G. Colyer.

Inventor:
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By
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UNITED STATES PATENT OFFICE.

HANS KNUDSEN, OF LONDON, ENGLAND.

INTERNAL-COMBUSTION ENGINE.

1,057,063.

Specification of Letters Patent.

Patented Mar. 25, 1913.

Application filed November 18, 1911. Serial No. 660,976.

To all whom it may concern:

Be it known that I, HANS KNUDSEN, a citizen of the United States of America, residing at "Langholm," Clairview Road, Streatham Park, in the county of London, England, 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, and has for its chief object to prevent the deposit of carbon upon the inner end of the engine piston, which deposit is principally due to the carbonization of the lubricating oil occasioned by the latter coming into contact with the hot surface of the piston. This deposit accumulates in time to a considerable extent, and in addition to its liability of producing pre-ignition, portions of the carbon are liable to become detached from the piston and to be lodged between the valves and their seatings with the result that the working of the engine is detrimentally affected. According to this invention in order to obviate these objections means are provided for causing a current of air to circulate around the interior of the piston at each stroke of the latter, the said air being caused to pass from the exterior of the cylinder through the interior of the piston into the crank case at each in stroke of the piston, and from the crank case against the central portion of the inner end of the piston to the exterior of the cylinder at each out stroke of the piston. To direct the current of cooling air in an efficient manner against the inner end of the piston I provide the latter with an inner wall extending from the outer end of the piston and converging toward the inner end, where it has a central opening through which the air passes to and fro. The outer piston wall is preferably made with longitudinal ports arranged to communicate with air ports in the cylinder during part of the piston stroke.

In order that the said invention may be clearly understood and readily carried into effect I will describe the same more fully with reference to the accompanying drawing in which:—

Figure 1 is a vertical section of part of an engine cylinder and crank casing, and illustrates a convenient construction embodying my invention. Fig. 2 is a vertical section of the piston on the line 1—1.

A is the piston, and B is the cylinder secured to the crank case C. The piston is made with the inner wall a extending from near the outer end of the piston toward the inner end a' and tapering to form an annular chamber a^2 of increasing thickness toward the inner end, where the wall is formed with a central hole a^3 . The outer piston wall has the air ports a^4 extending longitudinally throughout the greater portion of its length and arranged to permit the circulation of air through the piston for a considerable part of each stroke, during which the ports b in the cylinder B are uncovered and the cooling air flows through an annular chamber c at the upper end of the crank case C. The annular chamber c is provided with the opening c' , leading to the atmosphere or to any suitable source of air supply. The air chamber c or equivalent air passage may of course be provided in the cylinder itself instead of at the top of the crank case. The cylinder is conveniently secured in the crank case by means of a screw threaded portion b' receiving nuts or rings b^2 which bind against the under side of a flange c^2 of the crank-case immediately below the air chamber c . The inner end a' of the piston, which is the part especially requiring to be cooled, is made as thin as is consistent with safety and may be strengthened by the internal ribs a^5 , which also serve to provide an increased cooling surface.

The cooling operation is effected as follows:—The piston on its in stroke draws air from the exterior into the crank case C through the ports b and a^4 , the air passing through the annular piston chamber a^2 and striking the piston end a' , which deflects it into the central hole a^3 of the inner piston wall a , whence it flows into the crank case. On the outward stroke the flow is reversed and the air passes through the central hole a^3 , again striking the piston end a' , and escaping through the annular chamber a^2 and the ports a^4 and b . The piston (together with the gudgeon pin and the working parts within the crank case) is thus subjected to a strong cooling air current at each stroke and its temperature is prevented from reaching an excessive height.

The invention can advantageously be applied to high speed internal combustion engines such for example as are employed for propelling aeroplanes and the like, and par-

particularly to that type of engine in which supplementary exhaust ports adapted to be uncovered by the piston at the outer end of its stroke are arranged in direct communication with the atmosphere.

Although in the arrangement above described the circulation of air between the inner and outer walls of the piston is effected by the reciprocation of the latter it is to be understood that I do not intend to confine myself solely to this method of producing the circulation.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In an internal combustion engine, a cylinder having ports around its circumference open to cooling atmospheric air, a piston having longitudinal air ports adapted to register throughout the greater part of each stroke with the cylinder air ports, and an inner piston wall forming an annular chamber in the piston, said inner wall having a central opening at its outer end so that

cooling air flows freely to and fro through the piston in a radial manner during each stroke.

2. In an internal combustion engine, a cylinder having air ports around its circumference, an annular chamber surrounding said air ports and in communication with a supply of cooling atmospheric air, a piston having longitudinal air ports adapted to register throughout the greater part of each stroke with the cylinder air ports, and an inner piston wall forming an annular chamber in the piston, said inner wall having a central opening at its outer end so that cooling air flows freely to and fro through the piston in a radial manner during each stroke.

In testimony whereof I affix my signature in presence of two witnesses.

HANS KNUDSEN.

Witnesses:

T. SELBY WARDLE,
WALTER J. SKERTEN.

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