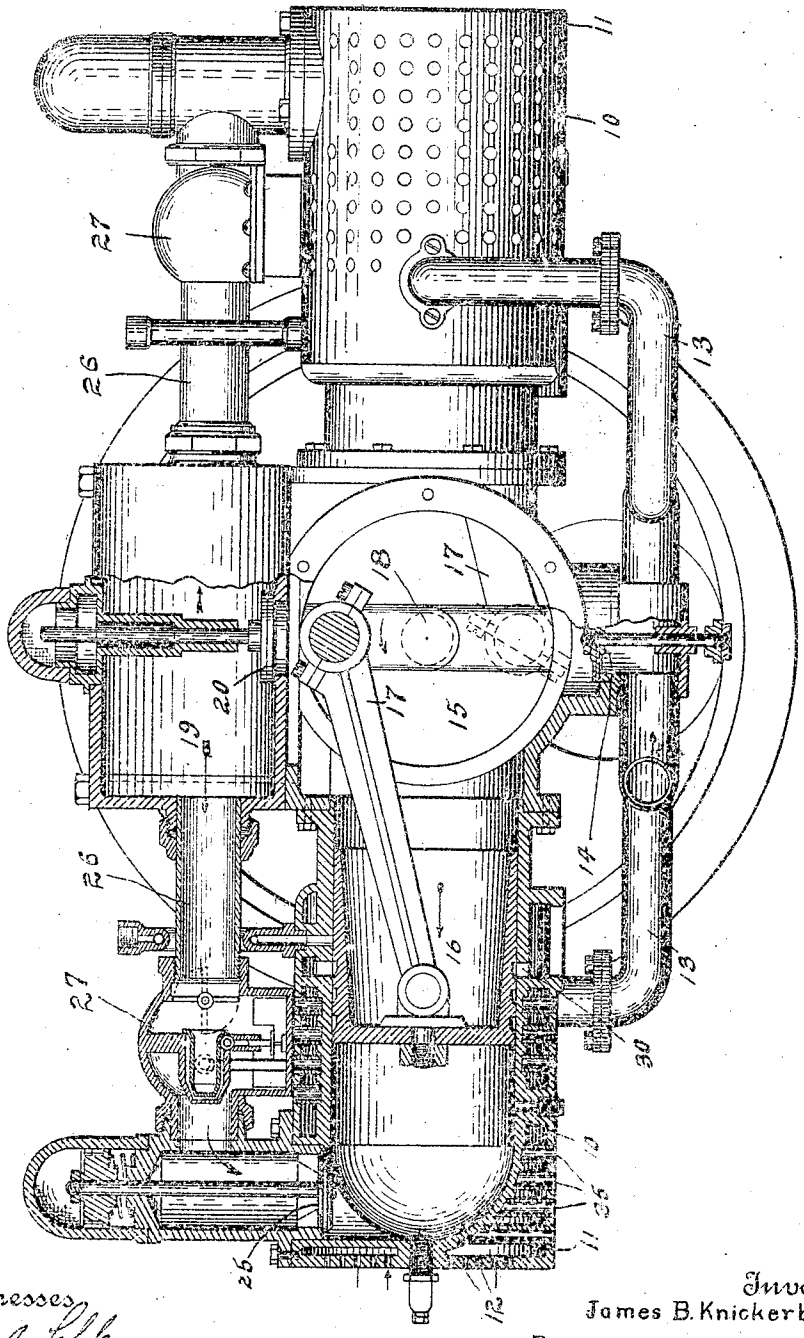
No. 886,519. PATENTED MAY 5, 1908.

J. B. KNICKERBOCKER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAY 31, 1905.



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UNITED STATES PATENT OFFICE.

JAMES B. KNICKERBOCKER, OF INDIANAPOLIS, INDIANA, ASSIGNOR OF ONE-HALF TO THOMAS A. CONLEE, OF INDIANAPOLIS, INDIANA.

INTERNAL-COMBUSTION ENGINE.

No. 886,519. Specification of Letters Patent. Patented May 5, 1908.

Application filed May 31, 1905. Serial No. 263,056.

To all whom it may concern:

Be it known that I, JAMES B. KNICKERBOCKER, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

In the operation of gas engines considerable difficulty is experienced in keeping the cylinder properly cooled and this is especially true in automobile engines where water-cooling is objectionable owing to the difficulty of maintaining an adequate supply of cool water for the jacket.

The object of my invention is to produce a structure in which the cylinder is surrounded by a jacket through which the entire air supply for the charges shall be drawn under a slight vacuum, the air current thus established and properly distributed serving to maintain a proper and even temperature of the cylinder. The arrangement being such as to avoid the expensive and heavy construction now ordinarily used.

The accompanying drawing illustrates my invention, the figure illustrating in a partial vertical section an engine of an opposed twin-cylinder, two-cycle type.

In the drawings, 10 10 indicate a pair of opposed cylinders the work end of each of which is surrounded by a jacket 11. The head of the jacket is arranged closely adjacent the head of the cylinder, is perforated with a large number of holes 12 which lead toward the head of the cylinder, the holes 12 thus directing a large number of small streams of air directly upon said cylinder head. The two jackets 11 11 are connected by pipes 13 13 through a check valve 14 with the chamber 15 which lies between the two cylinders and, in the present case, serves as a crank shaft chamber. Mounted in each cylinder is a piston 16 connected by a pitman 17 with a crank 18. Communicating with chamber 15 is an air reservoir 19, a check valve 20 being arranged between the chamber 15 and the reservoir 19. Leading into each cylinder 10 is an admission valve 25 and a passage 26 forms a communication between the air reservoir 19 and the chamber of each admission valve 25, a suitable carbureter 27 being interposed.

In operation, supposing the crank shaft to be rotating in the direction indicated by the arrow, the pistons 16 will be moved simultaneously outward thus creating a vacuum in chamber 15 and thereby causing an inrush of fresh air through the small openings 12 to be jetted against the head of cylinders 10 into and through jackets 11 and from thence through pipes 13 past check valve 14 into the chamber 15. In this operation a great number of small jets of air are projected upon the head of each cylinder 10 and I have found by experiment that a current of air sucked through a series of small openings at a suitable vacuum into the jacket is capable of absorbing a greater number of heat units from the cylinder walls, thus maintaining them at a more uniform temperature, than the same number of cubic feet of air forced through the chamber by a blast or by the ordinary method of air cooling through radiator fins. Upon the return stroke of the pistons the air within the chamber 15 is forced through passages 26, carbureters 27 and admission valves 25 into the two cylinders, this taking place as soon as the pistons reach the exhaust openings 30. Upon the next outer stroke of the pistons the charges within the cylinders are compressed and another current of air under slight suction is established through the air jackets.

It will, of course, be understood that in order to obtain the vacuum in the jacket the total area of the inlet openings 12 must be somewhat less than the area of the inlet valve.

In order to increase the radiation from cylinder 10 I find it advisable to insert a plurality of tubes 35 through the walls of the air jacket and into (or at least in contact with) the walls of the cylinder, the inner ends of these tubes being closed by the wall of the cylinder and the outer ends being open. It is not essential that the joint between the tubes 35 and the jacket walls be tight but it is probably preferable. By this arrangement the effective area of the cylinder walls, so far as incoming air is concerned, is materially increased, thus facilitating the radiation of a large number of heat units from the cylinder.

In arranging the holes 12 care must be taken to evenly distribute them over the area of the head and to make them of such size that the total area will be such as to give an adequate supply of air under a vacuum preferably of from one to three pounds.

I claim as my invention:

1. In an internal combustion engine, the combination with a cylinder and piston, of an inlet valve leading into the cylinder, a jacket surrounding the cylinder, and a communicating passage between said jacket and the inlet valve, said jacket being provided with a plurality of inlet openings through which the air supply for the engine will be sucked, the area of the inlet valve being greater than the total area of the openings leading into the air jacket.

2. In an internal combustion engine, the combination of a cylinder, an air jacket surrounding the cylinder and having its end arranged adjacent the end of the cylinder and provided with a plurality of perforations leading toward the cylinder head, a piston in said cylinder, an inlet valve leading into the cylinder, a communicating passage between the air jacket and the inlet valve, and a check valve in said passage, the said inlet valve having a greater area than the total area of the perforations leading into the air jacket.

3. In an internal combustion engine, the combination of a cylinder, an air jacket surrounding the cylinder and having its end provided with a plurality of perforations leading toward the cylinder, a piston in said cylinder, an inlet valve leading into the cylinder, said inlet valve being of greater area than the total area of the perforations leading into the air jacket, a communicating passage between the air jacket and the inlet valve, and a plurality of radiating members across the air jacket and engaging the cylinder walls.

4. In an internal combustion engine, the combination of a cylinder, an air jacket surrounding the cylinder and having its end adjacent the cylinder walls and provided with a plurality of perforations leading toward the cylinder head, a piston in said cylinder, an inlet valve leading into the cylinder, said inlet valve being of greater area than the total area of the perforations leading into the air jacket, a communicating passage between the air jacket and the inlet valve, and a plurality of tubular members extending across the air jacket and engaging the cylinder walls at their inner ends the outer ends of said tubular members being left open.

In witness whereof, I have hereunto set my hand and seal at Indianapolis, Indiana, this 26th day of May, A. D. one thousand nine hundred and five.

JAMES B. KNICKERBOCKER. [L. S.]

Witnesses:
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