

UNITED STATES PATENT OFFICE.

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CYLINDER-COOLING SYSTEM FOR INTERNAL-COMBUSTION ENGINES.

SPECIFICATION forming part of Letters Patent No. 774,752, dated November 15, 1904.

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To all whom it may concern:

Be it known that I, CHARLES W. HART, a citizen of the United States, residing at Charles City, county of Floyd, and State of Iowa, have
 5 invented new and useful Improvements in Cylinder-Cooling Systems for Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in
 10 cylinder-cooling systems for internal-combustion engines.

Heretofore two methods of cooling have been employed, the same being known as the "direct" and "indirect" methods. In the direct
 15 method the engine-cylinder itself is formed to present a large heat-radiating exterior surface to the action of the cooling agent, while in the indirect method the cylinder is inclosed by a jacket which forms a liquid-chamber be-
 20 tween it and the cylinder and which is connected with a radiator in a manner to secure a circulation of the liquid, which is also permitted to evaporate, the heat being thus disposed of by latent absorption, radiation, and
 25 evaporation.

The object of my invention is to provide means for using a circulating medium less volatile than water in a hermetically-sealed circulatory system and in combination with
 30 means for accelerating the heat radiation to such a degree as to render the use of oil or other comparatively non-freezable and non-volatile liquids practical, the supply being kept permanent and the heat radiation so
 35 rapid that such radiation alone will be sufficient to dispose of the heat without evaporation of the circulating medium and without requiring such an extensive system as to exceed the limits of practical economy.

In the following description reference is
 40 had to the accompanying drawings, in which—

Figure 1 is an illustration in elevation of the application of my invention in an indirect system of radiation, only the general features
 45 of the engine being shown. Fig. 2 is a similar illustration of the application of my invention in a direct system. Fig. 3 is a transverse sectional view on line *xx* of Fig. 2.

Like parts are identified by the same reference characters in each view.

The drawings show the cylinder 1 of an ordinary gas-engine, with piston 2, rod 3, crank 4, shaft 5, fly-wheel 6, exhaust-port 7, and cylinder-jacket 8 for the reception of cooling liquid, all of which, together with other parts
 55 (not shown) necessary or desirable in such engines, may be of any ordinary construction. A radiator, composed of a vertical cylinder 9, with tubular air-passages 10, is connected with the jacket 8 by suitable pipes 11
 60 and 12, which communicate, respectively, between the upper and lower portions of the jacket-space 13 and the space between the tubes 10 of the radiator to provide for circulation of the cooling liquid from the jacket-
 65 space 13 through the radiator in a well-known manner.

The upper end of the cylinder 9 is in the form of a tapered hood 14, having a stack 15 discharging to the exterior. A pipe 16 leads
 70 from the exhaust-port 7 of the engine to the interior of the cylinder and discharges therein, the pipe being preferably provided with an elbow 17 and nozzle A, so arranged that the exhaust will be discharged upwardly in the
 75 tapered portion 14 directly underneath the stack. The hood and stack are of a larger diameter than the pipe 16, and the discharges of gas from the latter cause a strong suction of air through the pipes 10.
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18 is a valve controlling the exhaust of the gases from the engine-cylinder. This valve is operated from the engine in any ordinary manner. (Not illustrated, but well known in the art.)
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It will be understood that any desired form may be given to the liquid-retaining receptacle and air-passages. In any case the liquid-receptacle may be hermetically sealed, thus keeping the liquid-supply constant. Oil
 90 is preferably used in the liquid-chambers.

In Fig. 2 the cylinder 1 of a gas-engine is shown with heat-radiating projections 20, and a hood 21 is used to inclose the same and form a passage through which the air is drawn by
 95 the discharge of the exhaust-gases through an auxiliary reservoir 22 at the side of the engine. The reservoir 22 is similar in form to the upper portion of the radiator-jacket shown in Fig. 1 and communicates with the upper
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portion of hood 21 by a large pipe 24. The hood 14 of the radiator and the auxiliary reservoir 22 and hood 21 also serve as muffling-chambers.

5 Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

10 The combination with the cylinder of an internal-combustion engine, of a jacket partially inclosing said cylinder; a radiator comprising an oil-chamber having its upper and lower portions connected with the jacket and provided with a series of tubular air-passages; a hood connecting the upper ends of said air-

passages and provided with a discharge-passage leading to the exterior; and a duct leading from the exhaust-port to, and discharging into, the hood in the direction of said discharge-passage, said radiator oil-chamber and cylinder-jacket being filled with oil and hermetically sealed substantially as described.

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

CHARLES W. HART.

Witnesses:

M. E. ARKILLS,
GEO. H. PUTNAM.