

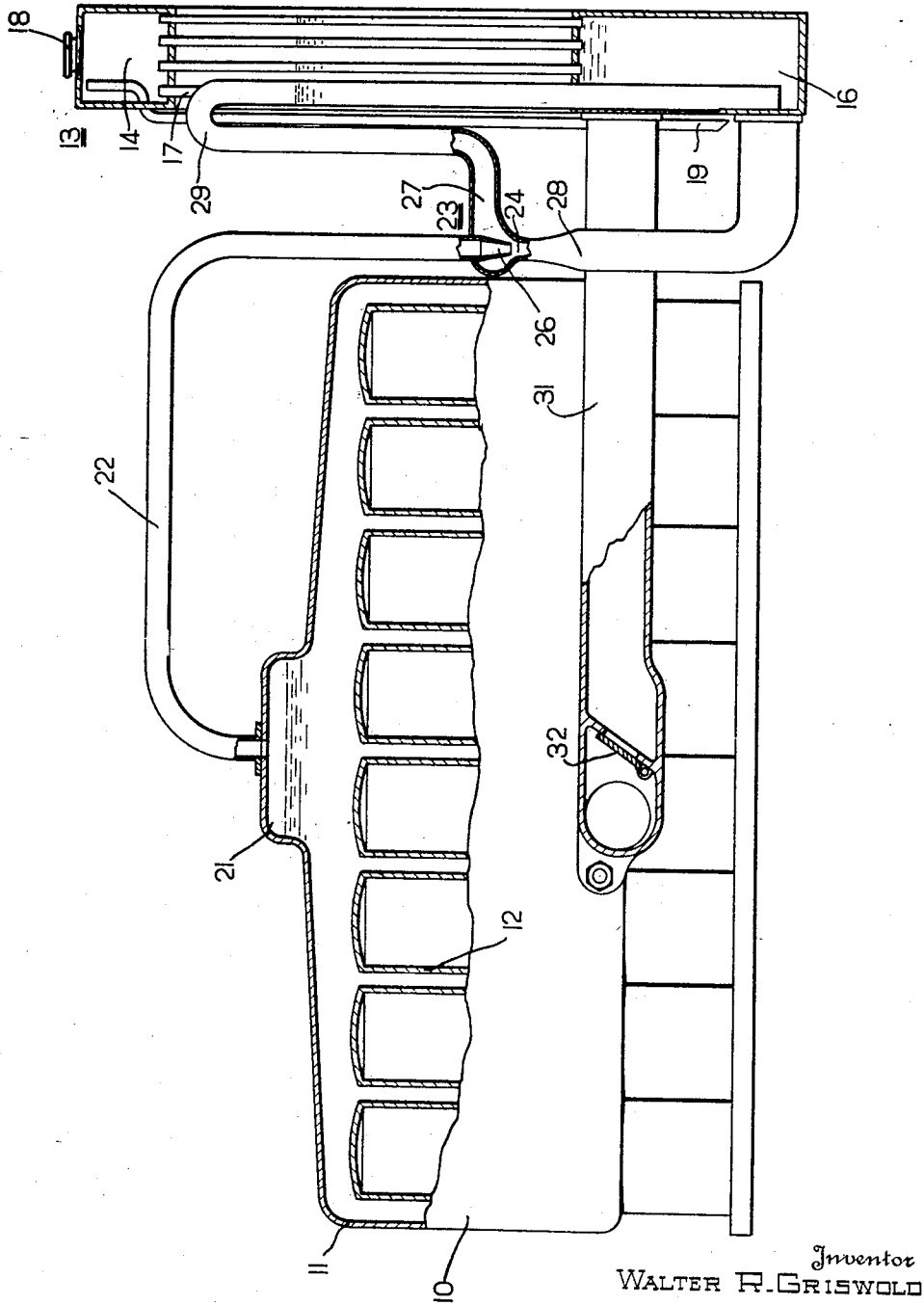
Aug. 4, 1931.

W. R. GRISWOLD

1,817,187

INTERNAL COMBUSTION ENGINE

Filed April 20, 1928



Inventor
WALTER R. GRISWOLD

By *William T. Harts*
Attorney

UNITED STATES PATENT OFFICE

WALTER R. GRISWOLD, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN

INTERNAL COMBUSTION ENGINE

Application filed April 20, 1923. Serial No. 271,563.

This invention relates to internal combustion engines and particularly to the cooling means therefor.

One of the objects of the invention is to provide a simple and efficient system for cooling an internal combustion engine by the alternate formation and condensation of steam or vapor from a suitable cooling fluid.

Another object of the invention is to provide such a steam cooling system which shall dissipate heat in a radiator not subjected to varying pressures or depressions, but operable at a substantially constant pressure, preferably atmospheric pressure.

Another object of the invention is to provide a cooling system for internal combustion engines in which an intermittent flow of cooling fluid is secured by the periodic condensation of accumulated steam or vapor, the condensing means being operated by the flow of steam.

Other objects of the invention will appear from the following description taken in connection with the drawing, which forms a part of this specification and in which the single figure is a view, partially in elevation and partially in longitudinal section, of an internal combustion engine and cooling means made in accordance with the invention.

It has been previously proposed to cool an internal combustion engine by the intermittent circulation of water or other cooling fluid through jackets around the engine cylinders, the flow being maintained by the periodic condensation of steam or vapor formed from said fluid. In systems of this nature previously proposed, the water is cooled in a radiator or cooling tank connected in the circulatory system and subjected to the varying pressures thereof. The radiator must therefore be constructed to prevent the escape of steam under pressure, and also sufficiently tight to prevent the entrance of air during periods when the system is under a vacuum. In the present invention is provided a system wherein the radiator is not exposed to variable pressure but is operated at a substantially constant pressure, preferably atmospheric pressure.

Referring to the drawing, 10 represents

a cylinder block of an internal combustion engine having a water jacket 11 formed about the cylinders 12 in the usual manner. At 13 is illustrated a radiator of the usual type comprising upper and lower headers or tanks 14 and 16, connected by tubes or other cooling units 17. It is provided with an opening in the upper header 14, closed by a suitable cap 18, through which water may be supplied to the system. The radiator also has an overflow or vent pipe 19, through which it is vented to the atmosphere and maintained substantially at atmosphere pressure.

Connected to or formed in the upper part of the water jacket 11 is a chamber 21 which may be termed a steam chamber, in which steam or vapor formed in the jackets 11 is collected. This chamber is connected at its upper end to a steam discharge pipe 22, which leads to a condensing device shown at 23. This device comprises a condensing chamber 24 preferably formed as a venturi, in the throat of which is a discharge nozzle 26 to which the steam pipe 22 is connected. The device also has a pipe 27 to supply cooling water to the condensing chamber, and a discharge pipe 28 adapted to remove the condensate, or mixture of cooling water and condensed steam.

The cooling water pipe 27 is connected, through an inverted trap or siphon 29, to the lower radiator tank 16, the siphon 29 being above the normal water level of the system. The lower part of the jacket 11 is connected to the lower part of the radiator, preferably at the tank 16, by a pipe or connection 31, in which a one-way valve 32 is placed.

The operation of the system is as follows: With the system filled with water up to its normal water level, and the engine started, the heat of the cylinders 12 will be radiated to and absorbed by the water in the jackets 11 in the usual way. As the engine warms up this heat is sufficient to cause the formation of steam in the jackets 11 which rises therein and collects in the chamber 21. As the heat of the engine increases more steam is formed so that a considerable pressure is built up in the chamber 21 and in the pipe 22.

This pressure forces the water out of the condensing chamber 24 and the pipe 28 into the radiator 13. When sufficient pressure has built up, a flow of steam takes place through the pipe 22 and nozzle 26, into the condenser chamber 24, which thus acts as a jet pump to draw cooling water from the tank 16 over the siphon 29 and through the pipe 27 into the chamber 24. This cooling water condenses the steam issuing from the nozzle 26, the device acting as an ordinary jet condenser, and the condensate, or mixture of condensed steam and cooling water will pass through the pipe 28 into the radiator.

In the radiator the heated water entering from the pipe 28 will rise in the tubes 17 and be cooled therein, the cooled water returning to the tank 16 for use in the engine jackets.

The condensation of steam from the pipe 22 and chamber 21 produces a periodic vacuum or depression in the chamber 21, which draws cooling water from the radiator through the pipe 31 and valve 32 into the jackets 11, thus cooling the cylinders 12. During the formation of steam in the chamber 21 and the building up of steam pressure therein, the valve 32 is held in its closed position by the pressure in the cylinder jackets, thus preventing a return flow of steam or heated water into the radiator 16.

It will be evident that this invention provides a cooling system in which there is a periodic flow of cooling water through the jackets, this water being converted into steam and condensed for recooling at a subsequent period in the cycle of the device. It will also be evident that the circulation of cooling water through this cycle is maintained by the alternate pressure and vacuum caused by the formation and subsequent condensation of steam. The varying pressure in the system is not communicated to the radiator but is confined to the jackets 11, chamber 21, pipe 22 and the condenser 23. In this way the radiator may be of usual construction and operated at atmospheric pressure, no particular care being required to maintain it air tight.

While a specific embodiment of the invention has been herein described, which is deemed to be new and advantageous and may be specifically claimed, it is not to be understood that the invention is limited to the exact details of the construction, as it will be apparent that changes may be made therein without departing from the spirit or scope of the invention.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. The combination with an internal combustion engine, of a cooling system including jackets and a condenser subjected to alternate pressure and vacuum, and a radiator operable at substantially atmospheric

pressure to receive condensate from the condenser and to supply cooling water to the jackets and to the condenser.

2. The combination with an internal combustion engine, of a cooling system including jackets and a radiator operable under substantially constant pressure, a condensing device operable under periodic pressure and vacuum, and means connecting the radiator to both the condensing device and to said jackets.

3. In a cooling system for internal combustion engines, the combination of jackets having means to collect steam formed therein, a nozzle connected to said means to discharge steam therefrom, a condenser to receive steam from said nozzle, a radiator connected to the atmosphere and adapted to supply cooled water to the jackets, means operable by the suction of said nozzle and including a siphon to supply cooling water from the radiator to said condenser, and means to conduct the condensate from the condenser to said radiator.

4. In a cooling system for internal combustion engines having cooling jackets, the combination of a condensing device for steam formed in said jackets, a radiator having an atmospheric connection and adapted to cool the discharge from the condenser and to supply cooling water thereto, and means to supply cooled water from the radiator to said jackets.

5. In a cooling system for internal combustion engines having cooling jackets, the combination of a condensing device having a steam discharge nozzle connected to the jackets, a radiator adapted to receive and cool the condensate from said device, means to supply cooled water from the radiator to the jackets, and suction operated means to supply cooling water from the radiator to the condensing device.

In testimony whereof I affix my signature.

WALTER R. GRISWOLD.