Feb. 7, 1928. 1,658,089

H. C. MALLORY

POWER SYSTEM

Original Filed April 23, 1921 2 Sheets-Sheet 1

Fig. 1.

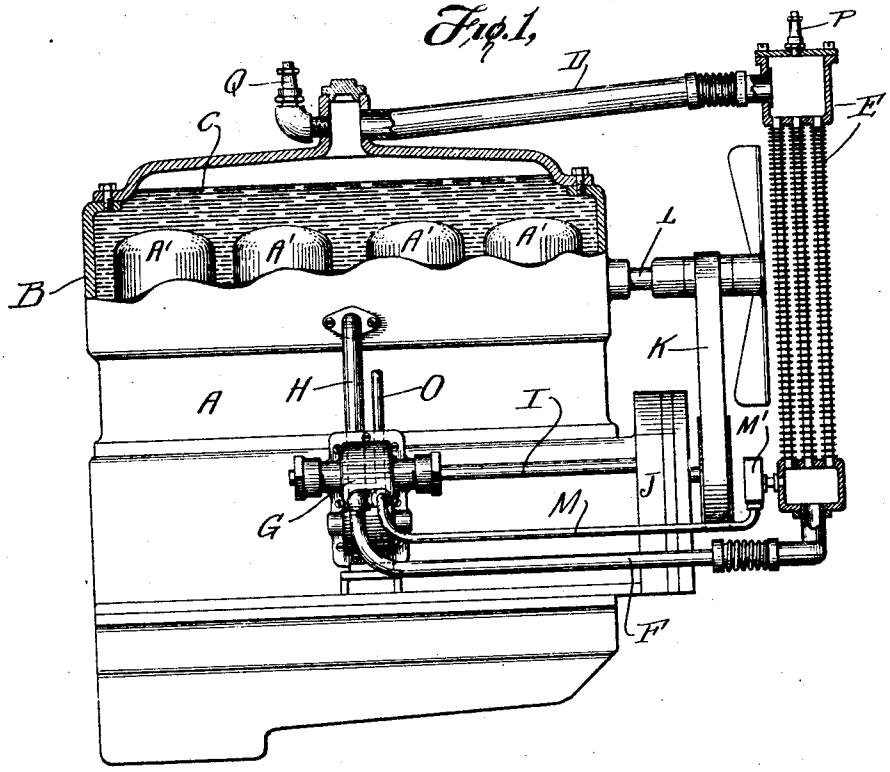
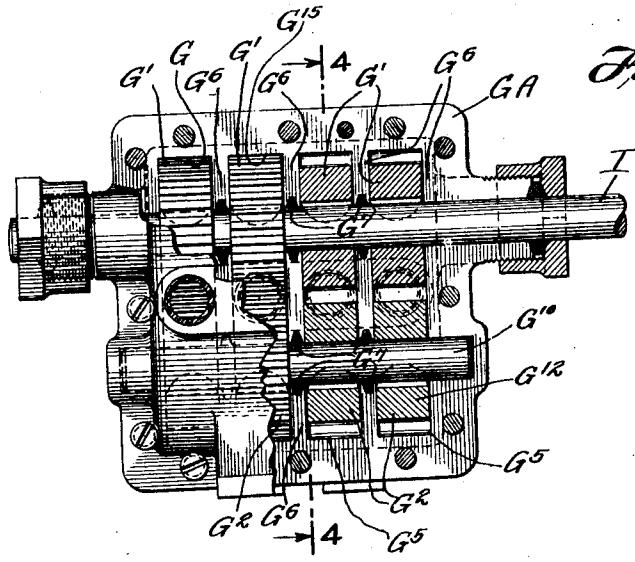


Fig. 3.



INVENTOR
Harry C. Mallory
BY
John E. Hubbell
ATTORNEY

Feb. 7, 1928. 1,658,089

H. C. MALLORY

POWER SYSTEM

Original Filed April 23, 1921 2 Sheets-Sheet 2

Fig. 2,

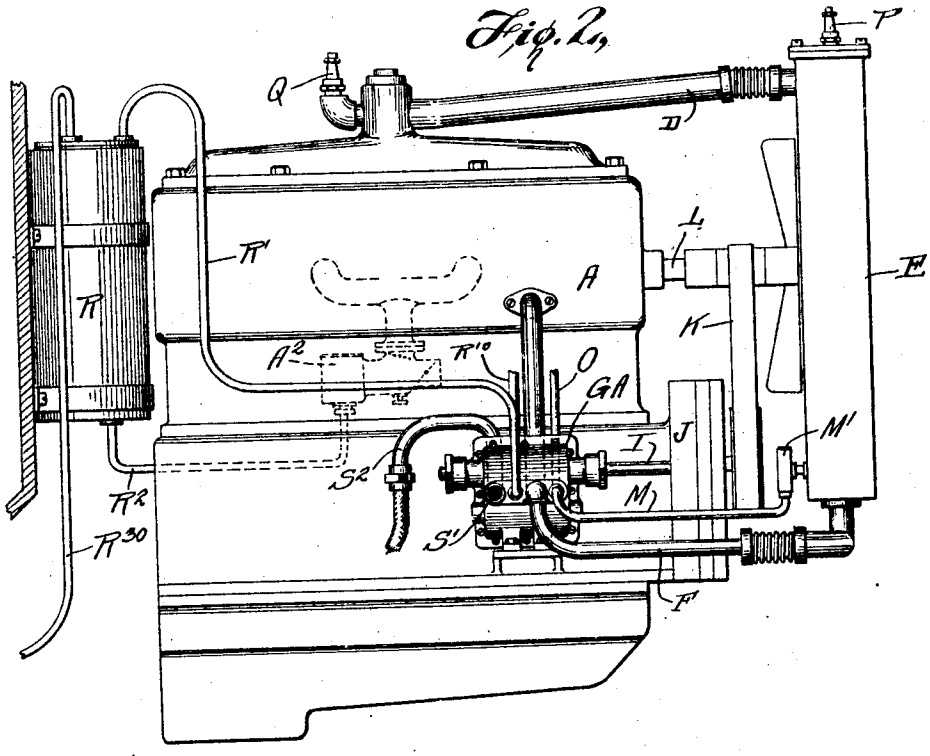


Fig. 4,

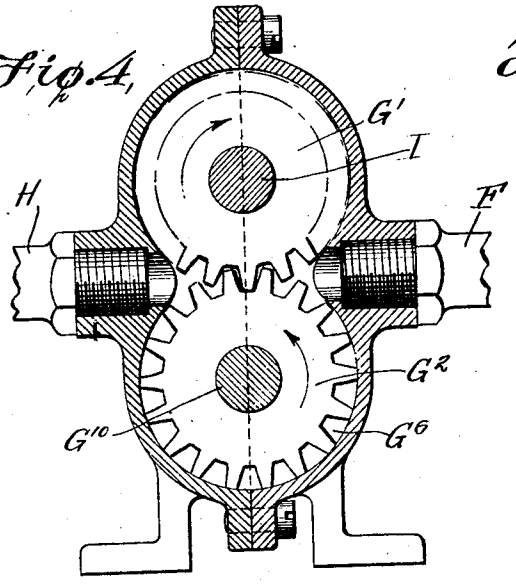
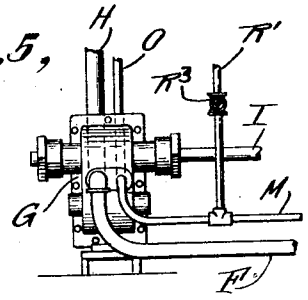


Fig. 5,



INVENTOR

Harry C Mallory

BY

John E. Hubbell

ATTORNEY

Patented Feb. 7, 1928. 1,658,089

UNITED STATES PATENT OFFICE.

HARRY C. MALLORY, OF NEW YORK, N. Y.; SUE R. MALLORY ADMINISTRATRIX OF SAID HARRY C. MALLORY, DECEASED.

POWER SYSTEM.

Application filed April 23, 1921, Serial No. 463,993. Renewed July 6, 1927.

The general object of my invention is to simplify and improve a power system such as is used on automobiles comprising an internal combustion engine which is cooled by the vaporization of a suitable cooling liquid in the engine cooling space or spaces and a condenser for condensing the vapors thus generated, the condenser being connected to the engine cooling space or spaces in a closed circulating system in which a pressure less than that of the atmosphere is normally maintained. Ordinarily in a system of this sort provisions must be made for withdrawing air from the circulating system to regulate and maintain the vacuum and a pump is usually required to return liquid of condensation from the condenser to the engine cooling space or spaces.

In accordance with the present invention I employ a single pump for exhausting air from the engine cooling system and for returning water of condensation from the condenser to the engine cooling space. The pump thus used may be of the gear, rotary piston or other known type, suitable for the character of use required and is advantageously provided with separate pumping chambers for exhausting air and for the return of liquid of condensation. In many cases the pump may advantageously be provided with additional pumping chambers for performing the different pumping operations required in the power system. For example, one pumping chamber may be provided to compress air for tire filling and analogous purposes, and another chamber may be provided to draw the necessary vacuum in the vacuum feed tank when the engine fuel feeding mechanism comprises such tank. In certain cases, however, the same pumping chamber may advantageously be employed to draw the proper vacuum in the engine cooling system and in the vacuum feed tank.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, and its advantages, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described preferred embodiments of my invention.

Of the drawings:

Fig. 1 is an elevation with parts broken away and in section of an automobile engine having a single pump for exerting separate pumping effects on the air and water lines forming a part of the engine cooling system;

Fig. 2 is an elevation of apparatus differing from Fig. 1 in that the pumping mechanism comprises two additional air pumping chambers;

Fig. 3 is a sectional elevation of the pump shown in Fig. 2;

Fig. 4 is a section on the line 4—4 of Fig. 3; and

Fig. 5 is a view of a portion of the apparatus shown in Fig. 1 with a slight modification in the piping connections.

In the drawings, and referring first to the construction shown in Fig. 1, A represents an internal combustion engine such as is employed on an automobile having a cooling system comprising a jacket B surrounding the engine cylinders A′ and partially filled with water or other suitable cooling liquid, C representing the free top surface of the liquid in the jacket B. From the vapor space provided in the upper portion of the jacket B, vapor generated in the jacket passes through a conduit D to an air cooled condenser E. The latter is provided with a return line F through which liquid of condensation formed in the condenser E is returned to the interior of the jacket B. Air is exhausted from the cooling system as required through the pipe M connected to the lower header of the condenser through a suitable air valve M′. Q represents a safety valve limiting the maximum pressure in the circulating system and P a vacuum relief valve for admitting air to the system as required to prevent the vacuum in the system from exceeding a predetermined amount.

In accordance with the present invention the return line F and the air line M lead to the respective inlets of separate water and air pumping chambers in a single rotary pump G having the outlet from its water pumping chamber connected by the pipe H

to the interior of the jacket B, and having its outlet from the air pumping chamber discharging into the atmosphere through the pipe O. The driving shaft I of the pump G as shown, is driven from the engine fan shaft L through a belt K and suitable speed reducing gearing J.

The construction shown in Fig. 2 differs from that shown in Fig. 1 in that the pump G^A replacing the pump G of Fig. 1 is provided with two additional pumping chambers, one of which has its inlet connected by the pipe R′ to the vacuum feed tank R and its outlet connection R^{10} discharging into the atmosphere, while the other has an inlet S′ for atmospheric air, and an outlet connection S^2 for delivering compressed air to the tires for filling the latter when this is necessary. The vacuum tank R supplies fuel through the pipe connection R^2 to the engine carburetor A^2 and draws this fuel from a main supply tank (not shown) through a pipe R^{30}. The manner in which the flow of oil through the tank R is produced by pressure variations therein need not be illustrated or described since the details of this mechanism form no part of the present invention, and the mechanism, moreover, is well known to those skilled in the art.

The pump G^A as shown in Figs. 2, 3 and 4 comprises a housing containing four separate pumping chambers G^5 separated by partitions G^6, and each containing a pair of gear pumping members G′ and G^2. The gears G′ are mounted on the main shaft I and the gears G^2 are mounted on a countershaft G^{10} journalled on the pump housing. G^7 represents packing around the shafts I and G^{10} held in grooves in the partitions G^6 and preventing leakage along the shafts from one pumping chamber into an adjacent pumping chamber. The pump G of Fig. 1 differs from the pump G^A only that it comprises but two pumping chambers and sets of gears.

Since the vacuum which must be drawn in the engine cooling system and in the tank R are of the same order, the air exhaust line M from the condenser and the air exhaust line R′ from the vacuum tank R may be advantageously connected to the inlet of the same pumping chamber as indicated in Fig. 5 wherein R^3 represents a valve by which the pipe R′ may be closed, if and when this becomes necessary.

The engine cooling system disclosed herein is of the general type disclosed and claimed in my prior application, Serial No. 163,332, filed April 20, 1917, but in the cooling system shown in detail in my prior application, air is exhausted from the system by a connection from the latter to the suction manifold intake of the engine. The provision of separate pumping mechanism for exhausting air from the cooling system tends to make the system more positive in operation and since I obtain the desired air exhausting effect and pumping effect required for the return of the water of condensation from the same simple compact mechanical unit, I achieve this result without adding appreciably to the bulk or cost of the system as a whole, and by simplifying rather than complicating the latter.

Heretofore it has been the common practice to draw the necessary vacuum in the vacuum feed tank by connecting it to the suction intake manifold. The same advantages are obtained here as in the air exhaust line from the cooling system by providing a separate positive pumping effect for drawing air from the vacuum tank. The additional expense or complication involved in doing this by means of a separate pumping chamber as in the arrangement shown in Fig. 2 is insignificant and of course no additional complication or expense is involved when a single pumping chamber is provided for drawing the air from the engine cooling system and from the feed tank as shown in Fig. 5. The provision of an additional pumping chamber for air compressing or analogous purposes in the pump mechanism otherwise required in the power system adds nothing appreciably to the cost, bulk or complexity of the system as a whole.

While in accordance with the provisions of the statutes I have illustrated and described the best form and mode of carrying out my invention now known to me, it will be apparent to those skilled in the art that formal changes may be made without departing from the spirit of my invention as set forth in the appended claims and that certain features of my invention may sometimes be used to advantage without the corresponding use of other features.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. The combination with an internal combustion engine having a cooling system comprising a liquid containing engine cooling space and a condenser connected to said space to condense vapor generated by the heat absorbed in the liquid in said space, of a rotary pump comprising a casing formed with two side by side pumping chambers, one for returning liquid of condensation from said condenser to said space and the other for exhausting air from said cooling system.

2. The combination with an internal combustion engine having a cooling system comprising a liquid containing engine cooling space and a condenser connected to said space to condense vapor generated by the heat absorbed by the liquid in said space, of a rotary pump having a casing formed with one pumping chamber for returning liquid of condensation from said condenser to said

space and an adjacent pumping chamber for exhausting air from said cooling system.

3. In a power system comprising an internal combustion engine having a cooling system including a liquid containing engine cooling space and a condenser receiving and condensing vapor generated by the heat absorbed by the liquid vapor generated in said space, and having engine fuel feeding mechanism including a vacuum tank, of a rotary pump comprising a casing formed with two side by side pumping chambers, one for returning liquid of condensation from said condenser to said space and the other for exhausting air from the engine cooling system and from said tank.

4. In a power system comprising an internal combustion engine having a cooling system including a liquid containing engine cooling space and a condenser receiving and condensing vapor generated by the heat absorbed by the liquid in said space and having engine fuel feeding mechanism including a vacuum tank, the improvement which consists in a single air exhausting device for removing air from the engine cooling system and from said tank.

Signed at New York in the county of New York and State of New York this 20th day of April, A. D. 1921.

HARRY C. MALLORY.