April 10, 1928. 1,665,885

H. E. LE MESURIER

INTERNAL COMBUSTION ENGINE

Filed April 7, 1925 2 Sheets-Sheet 1

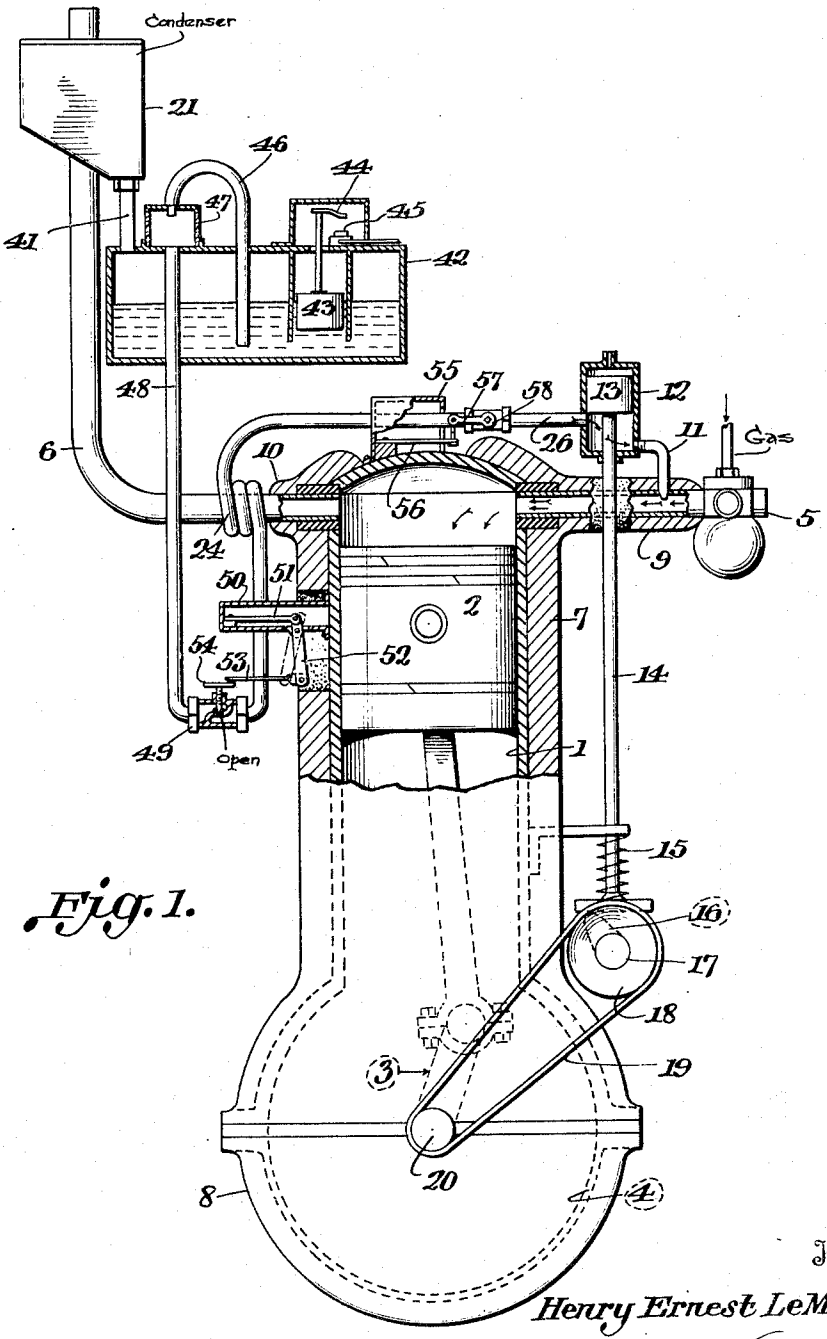


Fig. 1.

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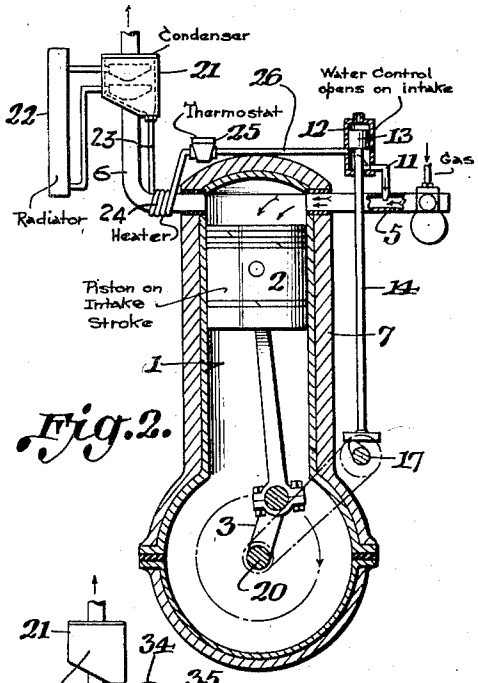


Fig. 2.

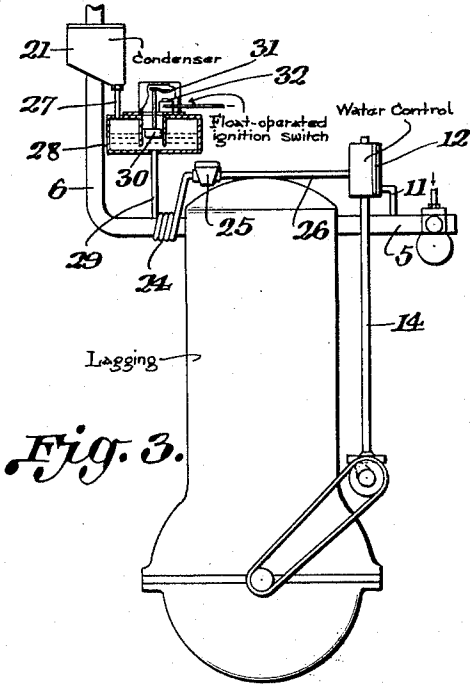


Fig. 3.

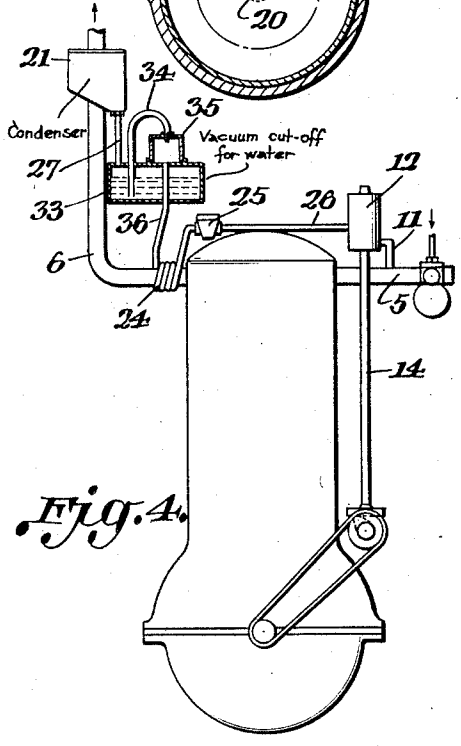


Fig. 4.

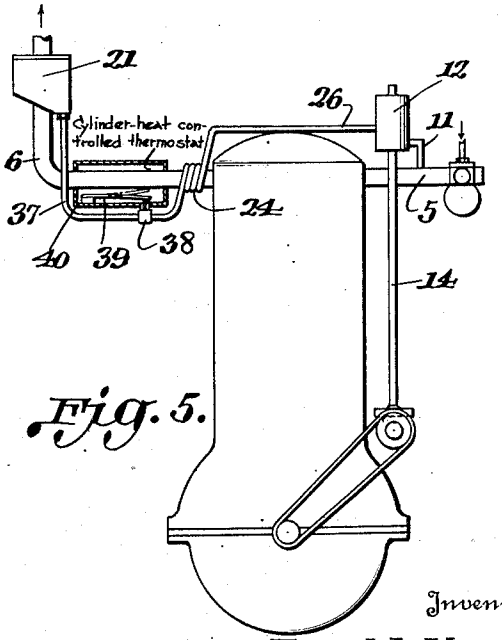


Fig. 5.

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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

Application filed April 7, 1925, Serial No. 21,371, and in Great Britain April 17, 1924.

This invention relates to various improvements in internal combustion engines.

Heretofore the cylinders of internal combustion engines have usually been provided either with water jackets in which water might be circulated for the purpose of cooling or with radiating fins with which the air comes in contact for the purpose of dissipating or absorbing the heat generated by the explosions of the combustible mixture. This loss of heat, of course, results in a corresponding loss of energy.

The present invention provides means such as a lagging for preventing the loss of heat from the engine cylinder. The lagging may enclose merely the engine cylinder or it may be applied also to the crank chamber and intake and exhaust pipes. The lagging may be of any suitable non-heat conducting material, such as plastic magnesia or the like.

In cases where the invention is applied to existing engines, the lagging may be placed about the fins of an air cooled cylinder so that they are embedded in the same or the fins may be removed and the cylinder lagged. If applied to jacketed cylinders, the jacket may be filled with the lagging or the outside of the jacket may be lagged.

A further object of the invention is the provision of means for supplying to the combustion chamber a sufficient quantity of water to prevent overheating. This water is preferably hot and may be supplied at any temperature under the boiling point. It is preferably added to the mixture entering the engine cylinder by means of a jet located in the induction system. The entering water will be conformed into steam and will absorb the excess heat generated by the explosion of the combustible mixture.

It is obvious that in such construction the engine might become overheated if the supply of water is exhausted. I therefore provide means for automatically stopping the engine whenever the water supply runs low. In the form illustrated this is brought about by short circuiting the magneto or other part of the ignition system.

It is also obvious that it is desirable to stop the supply of water whenever the engine is stopped and a further object of my invention is to provide means for attaining this result.

Since there is no necessity for the admission of water for the purpose of cooling the engine cylinder until it has been heated to a certain degree, the invention provides means for admitting water only after the engine cylinder has reached a certain predetermined temperature.

After the engine has been operating for some time the amount of water which is sufficient in the first instance may not be enough to prevent overheating and a further object of the invention is to provide means for automatically increasing the amount of water supplied to the cylinder whenever the engine becomes overheated or tends to do so.

It is obvious that all of these features may be embodied in a single construction and that the fundamental principles of the invention may be employed without using all of the subordinate features. It is also obvious that the invention may be applied to widely varying types of engines and that such application may involve certain detail changes in the precise physical construction of the device.

The further details of the invention will be more definitely set forth in the following description and recited in the claims.

In the drawings:

Figure 1 is a view partly in vertical section and partly in elevation of an engine cylinder having applied thereto the various features of the invention.

Figures 2, 3, 4, and 5 are similar views showing modifications.

The drawings illustrate an engine cylinder 1 having a piston 2 reciprocating therein and driven by the usual crank 3. The crank case 4, intake pipe 5, and exhaust 6 may be of the usual or any desired construction. The cylinder 1 is provided with a lagging 7 which may be of any desired or suitable non-heat conducting material. As shown in Figure 1, this lagging may also be applied at 8 to the crank case and at 9 and 10 to the inlet and exhaust pipes respectively. This lagging will prevent the loss of heat by radiation from the engine cylinder and connected parts.

The water which is supplied to the engine cylinder is preferably admitted on the intake stroke of the cylinder and may be supplied to the intake by a jet pipe 11. This is shown as communicating with a small cylinder 12 in which reciprocates a piston 13, the

rod 14 of which is extended and is provided with a spring 15 for holding the piston normally in cut off position. A cam 16 on a shaft 17 provided with a pulley 18 driven by a belt 19 from the crank shaft 20 affords a suitable means for opening the admission pipe for water upon the intake stroke of the piston. The source of the water is relatively immaterial and it may be supplied from a tank suitably located. Preferably, however, the invention includes the condensation of the steam in the exhaust and the return of the condensed water to the inlet jet 11.

Referring to the construction shown in Figure 2, it will be noted that the exhaust pipe 6 communicates with a condenser 21 which may be connected to the radiator 22 as shown. The particular construction of this condenser is immaterial for the purpose of the invention and it may be of any desired type which will condense all or substantially all of the steam in the exhaust gases and permit the remainder of the exhaust to escape to the atmosphere. If desired, the condenser may be provided with suitable means for filtering or otherwise removing the impurities from the condensed water before it is returned to the inlet jet.

The water pipe 23 leads from the condenser and is coiled at 24 about the exhaust pipe 6 in order that the water may be heated by the heat of the exhaust. There may be provided a thermostat 25 which will preferably be set to open a valve when the temperature reaches a desired limit. The water will then pass freely through the pipe 26 to the cylinder 12 and be admitted to the inlet jet 11 on the intake stroke of the engine piston.

It is obvious that this construction as illustrated in Figure 2 shows the engine cylinder provided with means for preventing the escape of heat therefrom and shows means for admitting to the cylinder on the intake stroke of the piston water in sufficient quantity to prevent overheating of the cylinder. It also discloses means whereby the steam or water contained in the exhaust gases may be condensed and returned for further use, thus obviating the necessity of carrying a supply of water along with the engine.

In connection with the construction thus far described, it is obviously desirable to provide means whereby the engine will be stopped if the supply of water is exhausted or reaches a predetermined minimum. A simple and efficient construction for obtaining this result is shown in Figure 3, in which the return pipe 27 from the condenser opens into a tank 28 and a pipe 29 leads from this tank to the heating coil 24 and thence through the thermostat valve 25 and pipe 26 to the chamber 12. In this tank 28 is located a float 30 which carries at the upper end of its stem a contact 31 which is adapted to engage a cooperating contact member 32 when the water drops to a certain level and thereby short circuits the magneto or other part of the ignition system, thereby stopping the engine and notifying the operator that a further supply of water is necessary.

If the water is fed to the engine from a tank located at a higher level regardless of whether the water in the tank is obtained by condensing the steam in the exhaust gases or otherwise, it is obvious that the supply of water should be stopped whenever the engine stops regardless of the position of the piston in the engine cylinder. The construction shown in Figure 4 provides means for attaining this result. In this case the pipe 27 from the condenser communicates with a tank 33 and a pipe 34 which has its lower end slightly above the bottom of the tank, passes upwardly and is curved, having its other end communicating with a chamber 35 on top of the tank. The supply pipe 36 which communicates with the heating coil 24 communicates with this chamber 35. In this construction the water will be drawn into the intake 11 by the suction stroke of the engine piston and when the engine stops, the construction disclosed will act as a vacuum cut off and prevent further flow of the water.

When the engine is first started and the cylinder is cold, there is no necessity for admitting water thereto and particularly where the water is heated by the exhaust gases from the engine, if water were admitted in the beginning it would be cold and would not be properly vaporized in the engine cylinder. Accordingly there may be provided, as shown in Figure 5, means for admitting water to the cylinder only after a predetermined temperature in the cylinder has been reached. In this construction the pipe 37 leading from the condenser 21 is provided with a valve 38 controlled by a thermostat 39 which is placed in a casing 40 surrounding the exhaust pipe 6. After the engine has been running a short time, the heat of the exhaust gases will cause the thermostat to move to the dotted line position and open the valve 38 admitting water in the usual manner.

While, as shown in the figures thus far described, various features may be used independently in connection with the fundamental principles of the invention, nevertheless, it is possible and desirable to combine the same in one construction. It may also happen that the engine may become overheated at times and it may become desirable to admit an increased amount of water. The construction shown in Figure 1 illustrates how the various devices thus far described may be embodied in a single con-

struction and how additional means may be employed for admitting an increased supply of water if the engine becomes overheated.

In this construction the pipe 41 leading from the condenser 21 communicates with a large tank 42 in which is provided a float 43 carrying a contact member 44, which cooperates with another contact 45 to close a circuit and short circuit the ignition system when the water drops to a predetermined level. This construction is similar to that shown in Figure 3. This same tank, however, may be provided with an air chamber 47 at the top thereof and a pipe 46 communicating with said chamber reaches nearly to the bottom of the tank. The supply pipe 48 leads from the chamber 47 and this portion of the construction is similar to that shown in Figure 4.

In the pipe 48 and in advance of the heating coil 24 is placed a valve 49 which is normally partially opened and will permit the passage of a sufficient amount of water for ordinary operating conditions. A chamber 50 is positioned with one end in contact with the engine cylinder and has therein a rod thermostat 51 connected to one end of a pivoted lever 52, the other end of which is connected by a rod 53 to an eccentric point on the head 54 of the valve stem. When the temperature of the engine cylinder passes a predetermined limit, the expansion of the rod 51 will move the lever 52, as shown in dotted lines, and open the valve 49 more widely, thus permitting a large amount of water to pass to the inlet jet.

This construction also embodies a chamber 55 mounted in contact with the upper end of the engine cylinder and having therein a thermostat 56 connected by lever mechanism 57 to open a valve 58 in the pipe 26 which communicates with the chamber 12. This thermostat will be arranged to open the valve 58 only after the engine has been started and the temperature of the engine cylinder has reached a predetermined point and this feature is similar to that shown in Figure 5 except that the thermostat is operated directly from the temperature of the engine cylinder while in the construction shown in Figure 5, it is operated from the temperature of the exhaust pipe.

It is obvious that the illustrations are mainly diagrammatic and that the various elements may be modified widely in form without in any way departing from the spirit of the invention. It is also apparent that some features may be used alone or in combination with others. The various parts of the invention may be employed in connection with engines of widely differing types and the necessary changes in the specific construction will be obvious and fall well within the scope of the invention. In general it is to be understood that the invention is limited only by the scope of the appended claims.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. In an internal combustion engine the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, and means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder.

2. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent over-heating of the said cylinder, means for condensing steam in the exhaust gases, means for conveying the said water of condensation to the cylinder, and means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder.

3. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for condensing steam in the exhaust gases, means for conveying the said water of condensation to the cylinder, means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder, and means whereby the water is heated by the exhaust gases.

4. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for automatically preventing the flow of water to the cylinder when the engine stops, means for condensing steam in the exhaust gases and means for conveying the said water of condensation to the cylinder.

5. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for automatically preventing the flow of water to the cylinder when the engine stops, means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder, and means for heating the water.

6. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for automatically preventing the flow of water to the cylinder when the engine stops, means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder, means for heating the water, means for condensing steam in the exhaust gases, and means for conveying the said water of condensation to the cylinder.

7. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder, and means for automatically admitting water only after the cylinder has been sufficiently heated.

8. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder, means for automatically admitting water only after the cylinder has been sufficiently heated, means for condensing steam in the exhaust gases, means for conveying the said water of condensation to the cylinder, and means for heating the water.

9. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for automatically preventing the flow of water to the cylinder when the engine stops, means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder, and means for automatically closing the water jet when the engine has stopped.

10. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder, and means for automatically admitting an increased supply of water if the engine becomes overheated.

11. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder, means for automatically admitting an increased supply of water if the engine becomes overheated, and means for automatically preventing the flow of water to the cylinder when the engine stops.

12. In an internal combustion engine, the combination of a cylinder, means for preventing loss of heat therefrom, means for admitting water to the cylinder during the admission stroke in sufficient quantity to prevent overheating of the said cylinder, means for automatically admitting water only after the cylinder has been sufficiently heated, means for automatically stopping the engine whenever the supply of water is insufficient to prevent overheating of the cylinder, means for automatically preventing the flow of water to the cylinder when the engine stops, and means for automatically admitting an increased supply of water if the engine becomes overheated.

In testimony that I claim the foregoing as my invention I have signed my name this 21st day of March, 1925.

HENRY ERNEST LE MESURIER.