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G. J. MURDOCK.

CIRCULATING APPARATUS FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED FEB. 12, 1903.

NO MODEL.

Fig. 1.

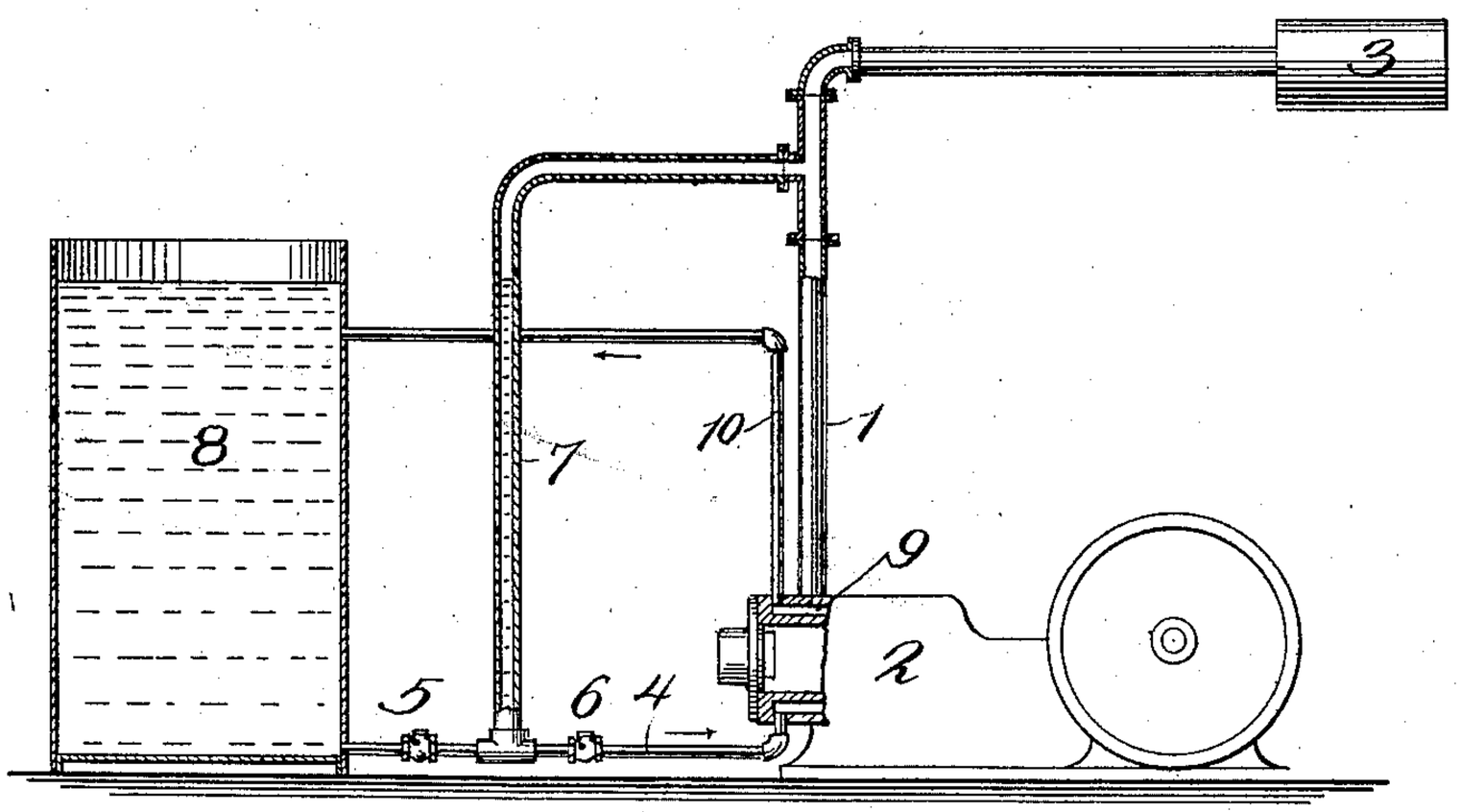
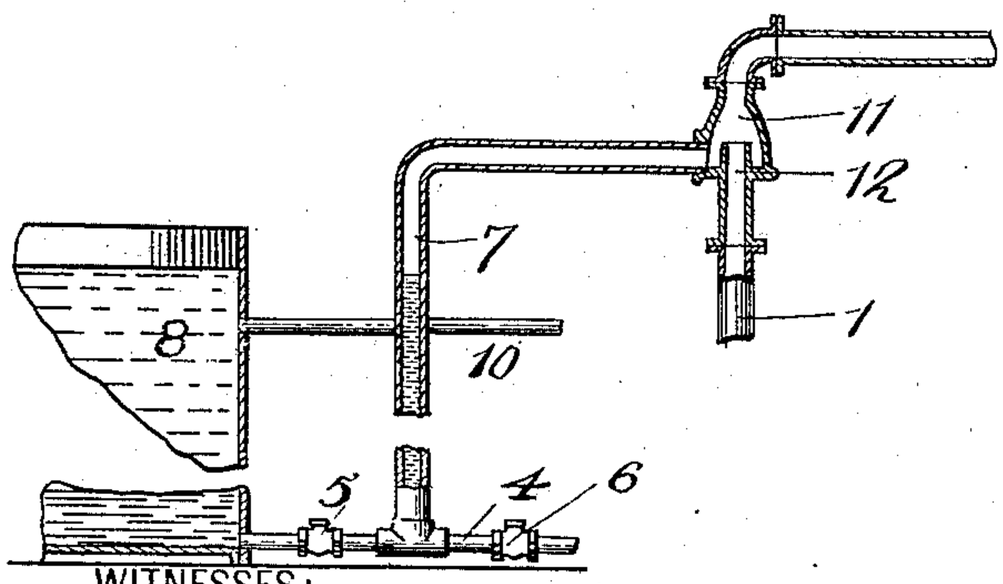


Fig. 2.



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No. 746,358. Patented December 8, 1903.

UNITED STATES PATENT OFFICE.

GEORGE J. MURDOCK, OF NEWARK, NEW JERSEY.

CIRCULATING APPARATUS FOR INTERNAL-COMBUSTION ENGINES.

SPECIFICATION forming part of Letters Patent No. 746,358, dated December 8, 1903.

Application filed February 12, 1903. Serial No. 143,003. (No model.)

To all whom it may concern:

Be it known that I, GEORGE J. MURDOCK, a citizen of the United States, residing in the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Circulating Apparatus for Explosive and Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in circulating apparatus for explosive and internal-combustion engines, such as gas or oil engines; and it consists in means for combining thermosiphon and forced circulation of cooling-water without the use of piston or rotary pumps and in other features hereinafter pointed out in the claims.

The objects of my invention are to improve the circulating apparatus of explosive and internal-combustion engines, to increase the efficiency of circulating apparatus depending for operation on the exhaust of the engine, to avoid failure in operation of the circulating apparatus, and to make the circulating apparatus simple, compact, and inexpensive.

I will now proceed to describe my invention with reference to the accompanying drawings, in which two embodiments of my invention are illustrated, and will then point out the novel features in claims.

In the said drawings, Figure 1 shows diagrammatically the application of my invention to a gas-engine, certain of the parts being shown in section. Fig. 2 is a sectional view illustrating an alternative construction.

Referring now to the said drawings, and at first to Fig. 1, the apparatus there shown comprises a main pipe or passage 1, which in the particular apparatus shown is the exhaust-pipe of an internal-combustion engine 2 of the explosive type, said pipe being provided at its end with a muffler 3, such as is commonly used on the ends of exhaust-pipes. The apparatus further comprises a main water pipe or passage 4, in which are check-valves 5 and 6, arranged to permit flow of water in the direction of the arrows shown, but to prevent flow in the opposite direction, and a stand-pipe 7, connected to the main water-pipe, between the check-valves thereof, and also connected to the exhaust-pipe 1. Water is supplied to pipe 4 under a slight head from any convenient source. I have shown for the purpose a tank 8. When such a tank is used, water will stand normally in stand-pipe 7 to the height of the water in the tank, and in any case the normal level of the water in the stand-pipe will correspond to the head at which water is supplied to pipe 4, and the stand-pipe should be connected to the exhaust-pipe 1 at a point somewhat above such normal level of water in the stand-pipe, so that water may not be drawn over into the exhaust-pipe.

In the drawings the main water-pipe 4 is the pipe which supplies water to the jacket 9 of the engine, and the water overflowing from the jacket is conducted by a pipe 10 back to tank 8. With the pipes arranged as shown when the engine is in operation there is a slight tendency of the water to circulate from the tank through the jacket and back to the tank, because as the water in the jacket becomes heated it tends to rise; but the circulation thus induced is not as a rule sufficient, but must be reinforced by the action of a pump, and for such purpose the usual practice is to use a rotary or piston pump driven from some moving part of the engine.

My pumping apparatus arranged as shown in the drawings acts to supplement the natural circulation due to heating of the water in the jacket, but does not require to be driven from any moving part of the engine.

The operation of the said pumping apparatus is as follows: The engine being in operation, each time the exhaust-valve of the engine opens a charge of exhaust-gases still under considerable pressure passes out through the pipe 1. The pressure in said pipe and in pipe 7 being thereby raised momentarily, the level of the water in the stand-pipe is depressed, water being forced from the stand-pipe through check-valve 6 into the main water-pipe 4 and thence through the engine-jacket back to tank 8. As soon as the exhaust charge in pipe 1 has passed the point of connection of stand-pipe 7 thereto the pressure in said stand-pipe falls, and water from

tank 8 passes through check-valve 5 into the stand-pipe, rising to the former water-level. This operation is repeated as often as the engine exhausts.

If the proportions of the parts are such that immediately after an exhaust charge has passed the orifice of stand-pipe 7 the pressure therein is below that of the atmosphere because of suction action of the rapidly-escaping exhaust-gases, the water may rise in the stand-pipe to a level above that of the water in the tank 8; but such action when it occurs increases the efficiency of the apparatus, since it increases the quantity of water pumped; but the point of connection of the stand-pipe 7 to pipe 1 must be so far above the maximum water-level in tank 8 that water cannot be drawn into the exhaust-pipe by suction action, such as above described, or by suction in the engine-cylinder in case the exhaust-valve should stick open or should be held open in any way—as, for example, by automatic governing mechanism.

Fig. 2 illustrates an alternative arrangement designed to operate more especially by suction action. In such case the connection between stand-pipe 7 and pipe 1 is formed by means of a chamber 11, within which is a nozzle 12, forming a continuation of exhaust-pipe 1, the arrangement being similar to an injector. In the operation of this device an exhaust charge in passing from the nozzle through chamber 11 produces suction in stand-pipe 7, which raises the water therein above its normal level, and as soon as the exhaust charge has passed and the pressure in the stand-pipe returns to normal the level of the water in the stand-pipe falls, the excess passing through check-valve 6 into the engine-jacket.

While some back pressure in the exhaust-pipe is desirable, when the construction shown in Fig. 1 is employed a muffler is not necessary to produce such back pressure. Most exhaust-pipes contain one or more elbows, the back pressure caused by which is quite sufficient to enable my improved pumping device to operate, and even when there are no elbows in the exhaust-pipe my improved pumping device may nevertheless operate successfully, since a very slight change in pressure in the stand-pipe will cause fluctuations in the water-level therein sufficient to force water past the check-valves.

It will be seen that the power utilized for the operation of the apparatus is power that otherwise would be wasted and that the only moving parts of the apparatus are within the check-valves. It is well known that there are on the market many very reliable check-valves, and the absence of all other moving parts makes the device very reliable in operation. It will also be noticed that the device is entirely automatic in operation, requiring no attention whatever.

What I claim is—

1. The combination, with an explosive or internal-combustion engine having a cooling-jacket, a source of water-supply, and conduits for supplying water to said jacket connected to said source of supply below the normal water-level, of a stand-pipe connected to one of said conduits and to the exhaust-pipe of the engine, and means in said conduit preventing backflow of water therethrough to the source of supply.

2. The combination, with an explosive or internal-combustion engine having a cooling-jacket, a source of water-supply, and conduits for supplying water to said jacket connected to said source of supply below the normal water-level, of check-valves in one of said conduits preventing backflow of water therethrough to the source of supply, and a stand-pipe connected to said conduit, between the check-valves, and to the exhaust-pipe of the engine.

3. The combination, with an explosive or internal-combustion engine having a cooling-jacket, a source of water-supply, and conduits for supplying water to said jacket connected to said source of supply below the normal water-level, of means for circulating water through said conduits comprising a nozzle through which fluid in motion may pass, and a chamber surrounding said nozzle and connected to the said conduits.

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

GEORGE J. MURDOCK.

Witnesses:
H. M. MARBLE,
C. F. CARRINGTON.