

F. M. LEAVITT.
AIR HEATER FOR AUTOMOBILE TORPEDOES.
APPLICATION FILED AUG. 27, 1907.

943,833.

Patented Dec. 21, 1909.

Fig. 1.

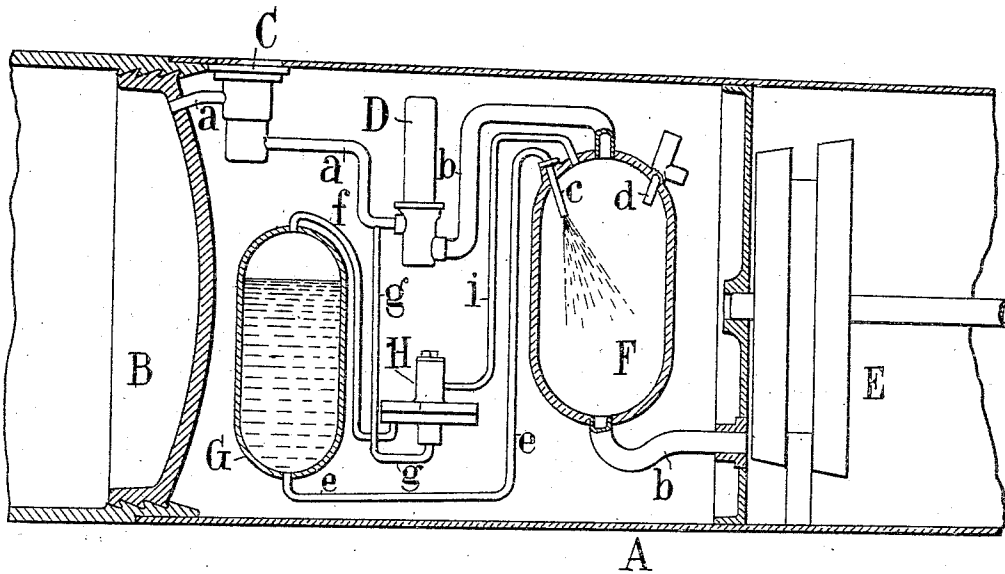
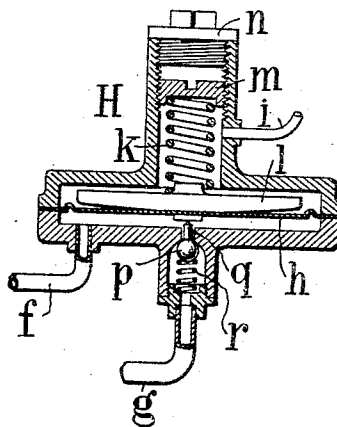


Fig. 2.



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UNITED STATES PATENT OFFICE.

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AIR-HEATER FOR AUTOMOBILE TORPEDOES.

943,833.

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To all whom it may concern:

Be it known that I, FRANK M. LEAVITT, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Air-Heaters for Automobile Torpedoes, of which the following is a specification.

This invention relates to means for heating the compressed air on its way from the reservoir or flask to the engine or motor of an automobile torpedo. The heating of the compressed air in order to increase its working efficiency is performed either in the reservoir or in a special heater or heating chamber through which the air flows usually after being reduced in pressure by traversing the reducing valve. The use of such external heater has certain advantages, but involves difficulty in providing for the proper feeding of the liquid fuel. The fuel (usually alcohol or gasoline) should be sprayed or otherwise injected into the heater at a uniform rate and during the entire period of time constituting the run of the torpedo. The fuel has usually been fed from a closed tank or "fuel pot" by introducing above it air under a pressure somewhat higher than that existing in the heater. When the latter pressure is that on the discharge side of the reducing valve, it is necessary to insure that the pressure in the heater shall be somewhat further reduced, in order to provide the differential pressure which is necessary for forcing over the liquid fuel. The narrow margin of pressures thus available for this purpose renders the feeding operation somewhat uncertain, and constitutes a disadvantage heretofore incident to the heating of the air after its reduction in pressure and while on its way to the engine.

The present invention provides a more positive and certain means for feeding the fuel, by utilizing for that purpose air taken from the reservoir and at high pressure, or a pressure higher than that on the reduction side of the reducing valve.

Referring to the drawing: Figure 1 is a vertical longitudinal section through the middle portion of an automobile torpedo, showing the application of the present invention. Fig. 2 is a vertical mid-section on a larger scale of the feed regulating valve.

Referring to Fig. 1 let A represent the hull or shell of the torpedo, B, the air reser-

voir or flask thereof, C, a valve, which may be the starting valve, D, the pressure reducing valve and E, the engine or motor. From the reservoir B, a compressed air conduit *a* leads as usual to the valve C and thence to the inlet of the reducer D; from the outlet of the latter a low pressure pipe or conduit *b* leads to the engine. In this latter conduit *b*, and constituting an enlargement thereof, is introduced the air heater or "super-heater" F. This is a closed vessel or chamber fitted with a fuel inlet or spray nozzle *c* and an igniter *d*, the latter being actuated in any suitable known way, to set fire to the spray of combustible liquid when the latter is first introduced, at or about the time of launching the torpedo. G, is the fuel tank, from which leads a pipe *e*, conducting the fuel to the nozzle *c*. An air pipe *f* enters the top of the tank to convey air under higher pressure than that in the heater in order to expel the fuel. Heretofore this pipe *f* has led from the pipe *b*, and it has been necessary to introduce a choke valve, or some equivalent means, into the pipe *b*, to lower the pressure of the air which is delivered into the heater. To avoid the disadvantage of such choke valve or other obstruction, the present invention provides for taking the air from the pipe *f* on the high pressure side of the reducer D,—that is either from the reservoir B direct, or from the high pressure pipe *a*.

A feed regulating valve H, is provided, located as shown in Fig. 1 and constructed preferably as shown in Fig. 2. It consists of a casing inclosing a movable part, preferably a diaphragm *h*, which receives on one side the pressure from the heater, and on the other side the pressure from the fuel tank. For this purpose a pipe *i* leads from the upper part of the heater and enters the valve shell above the diaphragm; and the pipe *f* communicating with the top of the tank enters the valve shell beneath the diaphragm. A spring *k* is arranged to press downward upon the diaphragm, its pressure being transmitted preferably through a disk *l*, and the pressure of the spring being regulated by a screw plug *m* which is accessible by removing a cap plug *n*. Beneath the diaphragm is a valve *p* controlling a port or opening *q* through which the high pressure air from the pipe *g* is admitted to the chamber beneath the diaphragm. The valve *p*

has a small stem which touches the diaphragm in the normal position of the latter, a spring *r* being arranged to press the valve toward its seat.

5 When the flow of compressed air commences upon the launching of the torpedo, the high pressure air admitted through the pipe *g* first presses the valve *p* tightly to its seat; upon the air under reduced pressure
10 reaching the heater *F*, its pressure is communicated through the pipe *i* to the chamber above the diaphragm *h*, until its pressure, plus the action of the spring, overcomes the pressure beneath the diaphragm and presses
15 the latter downward; this movement opens the valve *p* and admits a restricted flow of air at high pressure into the space beneath the diaphragm, and thence out through the pipe *f* to the fuel tank, where its pressure becomes effective to cause an out-
20 flow of the fuel through the pipe *e* to the heater. The higher pressure thus admitted beneath the diaphragm quickly forces it upward, and the valve *p* closes with the
25 flow, thereby shutting off the high pressure air. Whenever the air pressure in the tank falls below a prescribed difference (determined by the adjustment of the spring *h*) or excess over that in the heater, the diminution of the pressure beneath the diaphragm
30 causes it to yield downwardly to the superior uniform pressure above it, and the valve *p* is thus opened, and a new admission of compressed air takes place. This operation continues during the entire period of
35 the run, or until the liquid fluid is all fed over into the heater. The valve *H* thus insures that there shall be maintained in the tank a pressure sufficiently higher than that
40 in the heater to cause a constant and sufficiently forcible outflow of fuel to the heater. Thus the feed is made much more powerful and positive than has heretofore been possible.

45 The engine *E* shown is a fluid pressure turbine of well-known construction, but any other form of engine or motor may be used.

My invention is not limited to the specific construction or arrangement of parts shown
50 and described, as it is susceptible of considerable variation in its mechanical features or details, without departing from the essential spirit of the invention. For example, the high-pressure air may be taken from any
55 other source of air under higher pressure than that in the heater.

I claim as my invention.

1. In an automobile torpedo the combination with the reservoir of air under high
60 pressure, the engine, the conduit leading

from the reservoir to the engine, the reducing valve in said conduit, the heater in communication with said conduit on the low pressure side of said valve, and the fuel tank, of means for feeding liquid fuel from
65 said tank to the heater by air of higher pressure than that on the low-pressure side of the reducing valve comprising a valve controlling the admission of such high-pressure air to the tank.

2. In an automobile torpedo the combination with the reservoir of air under high pressure, the engine, the conduit leading from the reservoir to the engine, the reducing valve in said conduit, the heater in communication with said conduit on the low
70 pressure side of said valve, and the fuel tank, of a valve controlled by the relative pressures in the heater and fuel tank, and controlling the flow of high pressure air to
80 said tank.

3. In an automobile torpedo the combination with the reservoir of air under high pressure, the engine, the conduit leading from the reservoir to the engine, the reducing
85 valve in said conduit, the heater in communication with said conduit on the low pressure side of said valve and the fuel tank, of means for feeding liquid fuel from said tank to the heater by air of higher pressure
90 than that on the low-pressure side of the reducing valve, comprising a pressure-actuated part receiving heater-pressure on one side and tank-pressure on the other, and a valve controlled thereby for admitting high
95 pressure air to the tank.

4. In an automobile torpedo the combination with the reservoir of air under high pressure, the engine, the conduit leading from the reservoir to the engine, the reducing
100 valve in said conduit, the heater in communication with said conduit on the low pressure side of said valve and the fuel tank, of means for feeding liquid fuel from said tank to the heater by air of higher pressure
105 than that on the low-pressure side of the reducing valve, consisting of a diaphragm valve with connections for admitting heater and tank pressures to opposite sides of its diaphragm, and a conduit controlled by said
110 valve for conveying high pressure air from the reservoir to said tank.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:

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THEODORE T. SNELL.