No. 825,914. PATENTED JULY 17, 1906.

F. M. LEAVITT.

IGNITION DEVICE FOR AUTOMOBILE TORPEDOES.

APPLICATION FILED SEPT. 11, 1905.

FIG. 1.

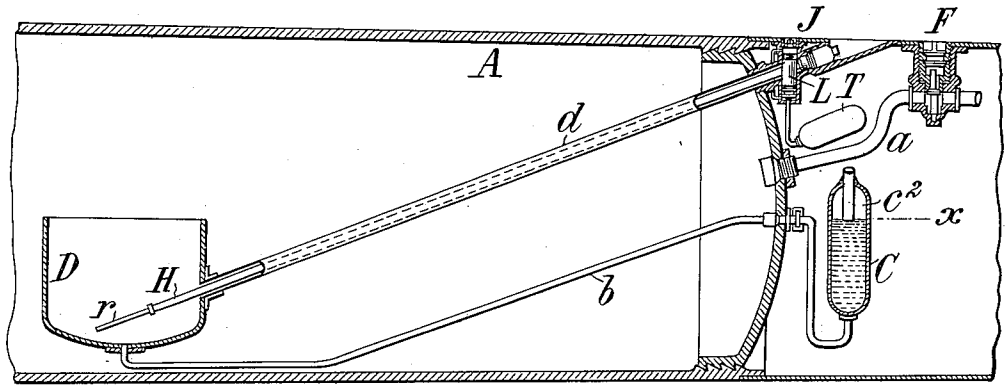


FIG. 2.

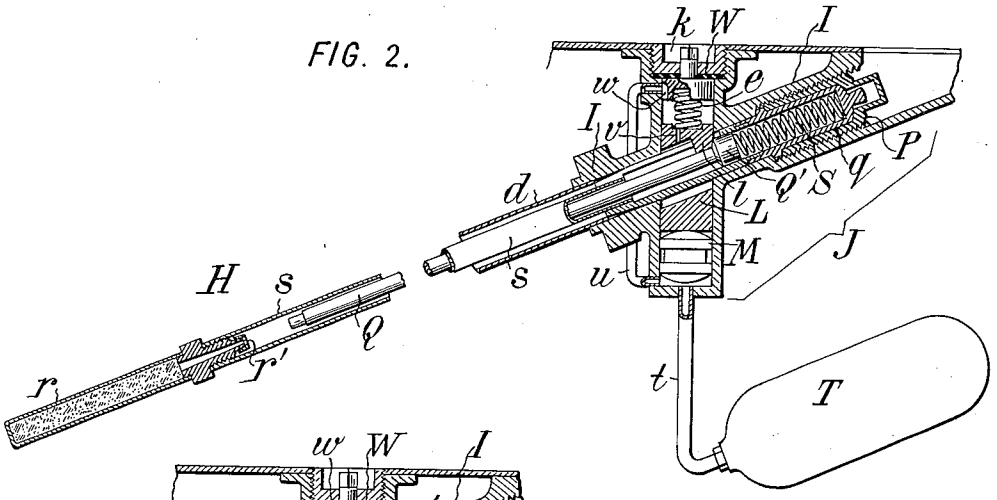


FIG. 3.

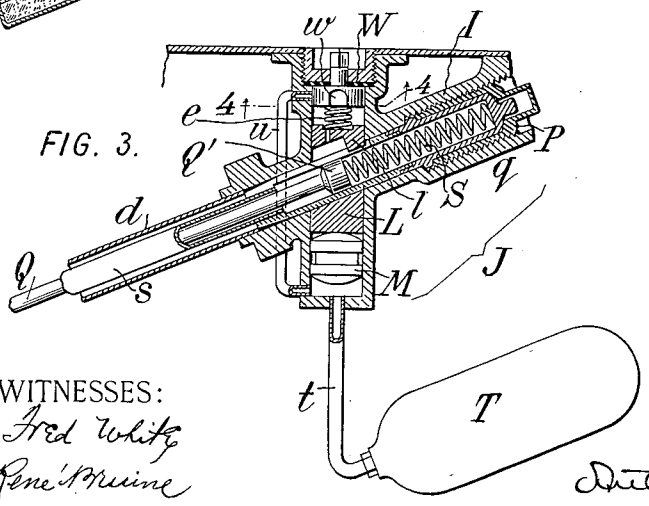
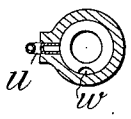


FIG. 4.



WITNESSES:

Fred White

Rene' Muine

INVENTOR:

Frank M. Leavitt,

By Attorneys,

Arthur G. Brown & Co.

UNITED STATES PATENT OFFICE.

FRANK M. LEAVITT, OF NEW YORK, N. Y., ASSIGNOR TO E. W. BLISS COMPANY, OF BROOKLYN, NEW YORK, A CORPORATION OF WEST VIRGINIA.

IGNITION DEVICE FOR AUTOMOBILE TORPEDOES.

No. 825,914. Specification of Letters Patent. Patented July 17, 1906.

Application filed September 11, 1905. Serial No. 278,004.

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 Ignition Devices for Automobile Torpedoes, of which the following is a specification.

This invention relates to automobile torpedoes which are propelled by an engine or motor driven by a charge of compressed air the energy of which is increased by burning a combustible, so as to heat the air. The ignition of this combustible should be effected upon the launching of the torpedo and shortly after the starting of the engine or motor. The igniting mechanism for accomplishing this result is set forth and claimed in the following patents: United States, No. 693,872, dated February 25, 1902; Great Britain, No. 10,126, dated June 1, 1900; France, No. 301,043, dated June 7, 1900; Belgium, No. 150,393, dated June 8, 1900; Germany, No. 130,621, dated June 15, 1900; Italy, No. 55/903, dated June 30, 1900; Denmark, No. 4,130, dated August 12, 1901; Norway, No. 10,132, dated June 13, 1900; Sweden, No. 15,981, dated June 11, 1900; Spain, No. 26,190, dated August 24, 1900; Japan, No. 4,542, dated January 31, 1901.

The present invention provides an improvement upon the igniting device set forth in said patents.

The object of this invention is to avoid the possibility of premature operation of the igniter, such as might fail to accomplish the ignition of the combustible charge.

In the accompanying drawings, Figure 1 is a vertical section of the middle portion of a torpedo, showing generally the parts pertaining to the present invention. Fig. 2 is a vertical longitudinal mid-section of the igniting mechanism, on a larger scale, showing it cocked or ready for action. Fig. 3 is a similar view of part of this mechanism, showing it after having acted. Fig. 4 is a horizontal section on the line 4 4 in Fig. 3.

Referring to Fig. 1, A designates the compressed-air reservoir or flask, from which by a pipe *a* compressed air is conveyed to the motor or engine. (Not shown.) The pipe *a* leads through any ordinary charging-valve F and any suitable starting-valve, and thence to the engine.

C is a chamber containing the combustible material, preferably alcohol or other liquid hydrocarbon, which communicates through a pipe *b* with a receptacle or vessel D within the reservoir A. The chamber C when filled has a space c^2 above the liquid, which fills with compressed air as the latter is forced into the reservoir A, so that its pressure is the same as that in the reservoir.

During the run of the torpedo as the pressure diminishes in the reservoir A the air confined in the space c^2 expands and gradually expels the alcohol from the chamber C through the pipe *b* into the receptacle D. At its first inflow into D it should be ignited, and for this purpose an igniter H is introduced from the exterior through a tube *d*, leading to the receptacle D. At the outer end of the tube *d* a lock or cocking mechanism J is arranged. This is contained within a shell I, having a cap P, which when removed permits the insertion of the igniter H. The shell I is formed with a chamber closed exteriorly by a screw-plug *k*, within which chamber moves a plunger L and beneath it a piston M, both being pressed down by a spring *e*. The plunger L has an opening through which the igniter passes and has a tooth *l*, which acts as a trigger-sear to hold back the hammer or firing-pin Q against the stress of its spring S. The igniter has a tube S which at its lower end carries a slow-burning cartridge *r*, having a percussion-cap *r'*. Within the tube *s* is the firing-pin Q, and above it within a cap *q* is its spring S. When the igniter H is inserted through the tube *d*, the firing-pin head Q' catches against the tooth *l*, and the screwing down of the cap P compresses the spring S. (See Fig. 2.) The pressing up of the plunger L by the piston M withdraws the tooth *l* and permits the spring S to throw forward the firing-pin Q, (see Fig. 3,) so that it strikes and explodes the cap *r'* and fires the cartridge *r*, which in turn ignites the alcohol in the receptacle D.

The parts thus far referred to are all shown in the prior patents above named, although in somewhat different form. In the construction of said prior patents upon the launching of the torpedo the opening of the

starting-valve admitted air to the engine and a portion of this air was conducted back through a branch pipe, so that its pressure acted underneath the piston M to lift the plunger L and operate the igniter. There was liability that the igniter would be operated too soon, so that the cartridge *r* would burn out before the combustible liquid would begin to flow over from the vessel C into the receptacle D. Hence there was risk that the ignition of the liquid would sometimes fail.

The present invention avoids this risk by operating the igniter independently of the engine and by means of compressed air stored in an auxiliary air-reservoir T, which connects by a pipe *t* to the shell I beneath the piston M. While air is being compressed into the reservoir A, a communication is afforded by which the air passes also into the auxiliary reservoir T, so that it rises to an equal pressure therein. Before launching the torpedo this communication is cut off, so that the reservoir T is isolated. Consequently the piston M receives on its upper side the pressure from the main reservoir A and on its under side the pressure from the auxiliary reservoir T. Before launching, these pressures are equal, so that the spring *e* suffices to keep the plunger L down. Upon the launching of the torpedo the opening of the starting-valve admits air from the reservoir A to the engine and immediately the pressure in A begins to fall, the pressure in T remaining uniform. This action continues for a short time, perhaps one or two seconds, until the pressure above the piston M becomes only enough less than that below it to lift the piston and plunger, and thereby release the firing-pin Q and operate the igniter. This short delay is sufficient to enable the expanding air in the space c^2 to expel enough liquid from the vessel C into the receptacle D to insure that the liquid combustible shall be ignited before the cartridge *r* shall have burned out.

A suitable way of admitting air from the reservoir A to reservoir T is by means of a tube *u*, connecting the upper and lower parts of the chamber in the shell I. As the pressure increases in A air flows through tube *d* into shell I, through a duct *v* in plunger L, and through a groove *w* in a cock W to the upper end of the tube *u*, and from its lower end into the tube *t*. During pumping up, the cock W is turned with its groove *w* in coincidence with this tube *u;* but after pumping up it is turned out of coincidence therewith, as shown in Figs. 3 and 4.

Any other means of admitting compressed air from the reservoir A to reservoir T may be substituted.

The construction and proportions of the respective parts may be greatly varied.

The present invention is not limited to the use of a liquid combustible.

What I claim is—

1. The combination with a compressed-air reservoir and an igniter adapted to ignite a combustible charge for heating the compressed air, of means for operating the igniter adapted to act upon a fall of pressure in the reservoir, whereby premature operation of the igniter is avoided.

2. The combination with a compressed-air reservoir and an igniter adapted to ignite a combustible charge for heating the compressed air, of means for operating the igniter comprising an auxiliary compressed-air reservoir, and a movable part receiving on one side the pressure from the main reservoir and on the other side that from the auxiliary reservoir, and adapted when the pressure in the former falls below that in the latter to be displaced by the preponderant pressure to operate the igniter.

3. The combination with a compressed-air reservoir and an igniter, the latter comprising a spring-pressed firing-pin and means for restraining it, of means for operating the igniter comprising an auxiliary compressed-air chamber and a piston, the latter receiving on opposite sides the pressures from the main and auxiliary reservoirs, and adapted when displaced by the pressure from the latter to withdraw said restraining means to operate the igniter.

4. The combination with a compressed-air reservoir, an igniter, an auxiliary compressed-air reservoir, a movable part between said reservoirs adapted to be displaced by a preponderant pressure in the auxiliary reservoir to operate the igniter, and means for admitting compressed air from the main reservoir to the auxiliary reservoir.

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

FRANK M. LEAVITT.

Witnesses:
ARTHUR C. FRASER,
FRED WHITE.