No. 839,162. PATENTED DEC. 25, 1906.

F. M. LEAVITT.

AUTOMOBILE TORPEDO.

APPLICATION FILED JAN. 20, 1906.

FIG. 1.

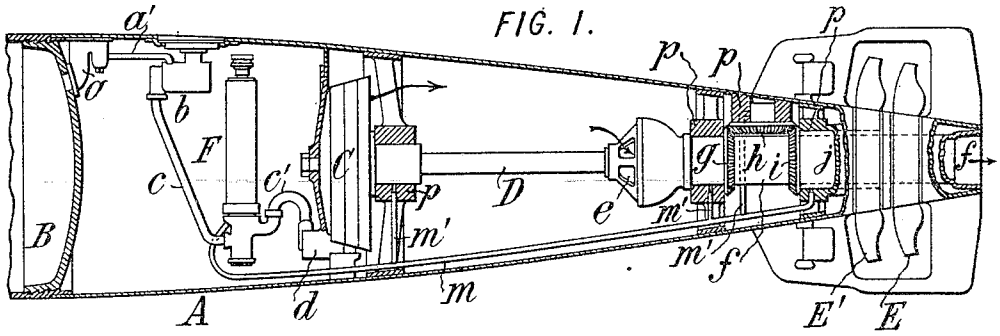


FIG. 2.

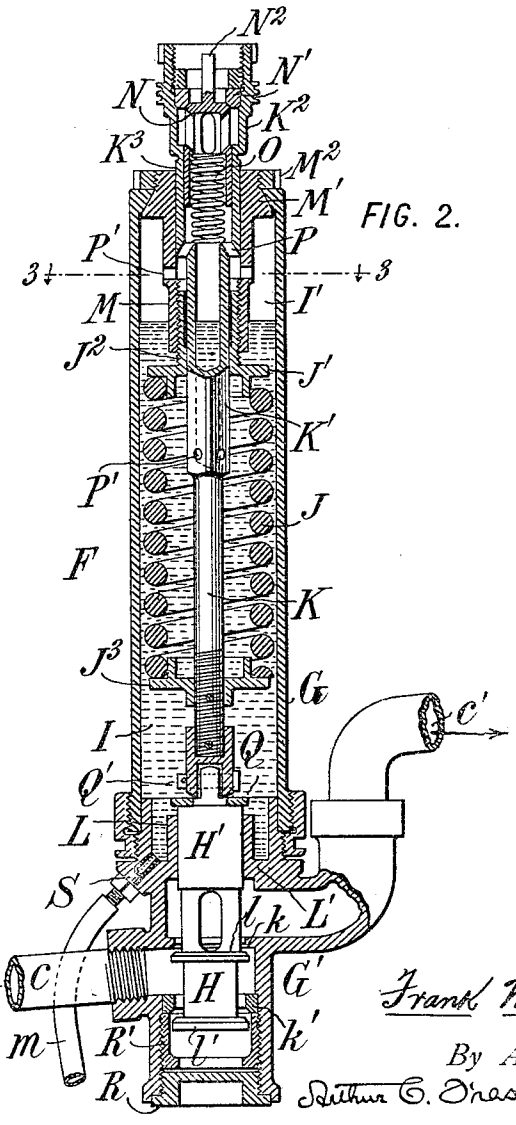
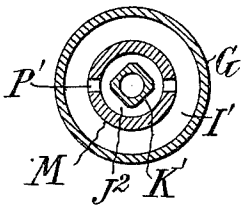


FIG. 3.



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AUTOMOBILE TORPEDO.

No. 839,162. Specification of Letters Patent. Patented Dec. 25, 1906.

Application filed January 20, 1906. Serial No. 296,993.

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 Automobile Torpedoes, of which the following is a specification.

This invention relates to automobile torpedoes driven by compressed air which is conducted from a storage reservoir or flask to a suitable engine which drives the propeller-shaft carrying the propelling-screws.

It is necessary to reduce the high and gradually-diminishing pressure of the stored air to a lower and uniform pressure before admitting the air to the engine, and for this purpose a reducing-valve is provided. Owing to the high pressures used, approximating two thousand two hundred pounds per square inch, difficulty is experienced in the construction of such valves. Such a reducing-valve is required to deliver the air to the engine at a determined pressure, which in practice may vary from about four hundred to about six hundred pounds per square inch, as may be desired. Such torpedoes are driven either by a multiple-cylinder reciprocating engine or by a turbine, and in either case the problem of lubricating the wearing parts of the motor and of the propeller-shaft and of the miter-gears through which reverse motion is communicated to the second propeller-screw involves serious difficulty.

My invention aims to improve the means for reducing and regulating the air-pressure and at the same time provide superior means for lubrication.

In the accompanying drawings, Figure 1 is a longitudinal vertical mid-section of the after-body of a torpedo, illustrating the application of my invention. Fig. 2 is a vertical mid-section, on a larger scale, showing the combined reducing-valve and lubricator. Fig. 3 is a transverse section on the line 3 3 in Fig. 2.

Referring to Fig. 1, let A designate the hull or shell of the torpedo; B, the compressed-air reservoir or flask, a fragment only of which is shown; C, the engine or motor, which in this case is a turbine; D, the propeller-shaft, and E E′ the propellers. The compressed air is fed from the flask B through a stop-valve *a* by pipe *a′* to the starting-valve *b*, thence by pipe *c* to the reducing-valve F, thence by a pipe *c′* to the admission port or nozzle *d* of the engine or turbine, from which it exhausts through any suitable channel. The exhaust may be into the after-body of the torpedo and out through openings *e* into the hollow tail portion *f* of the propeller-shaft, as set forth in my United States Patent No. 748,759, dated January 5, 1904, or it may be otherwise provided. It is customary to mount the rear propeller E directly on the shaft and to drive the propeller E′ in the contrary direction through miter-gears *g h i*, the latter being on a tubular shaft *j*, to which the propeller E′ is fixed. All these parts are movable in suitable bearings, which require very perfect lubrication.

Referring to Fig. 2, the pressure-regulator F comprises an outer shell or casing G, the lower part G′ of which is formed with one or more valve-seats *k k′*, against which seat one or more flanges or faces *l l′* of a moving valve H. Preferably the valve is balanced and has two seating-faces seating against two seats, as shown, the admission from pipe *c* being between these seats and the discharge to pipe *c′* communicating with the opposite sides of the seats from one directly and from the other indirectly through a hollow or tubular portion of the valve H, as shown.

Within the shell G is a chamber I, in which is inclosed a heavy spring J, the pressure of which is communicated to the valve H in such direction as to tend constantly to open it, while the pressure on the outlet side of the valve tends constantly to close it. The spring J is preferably a helical spring and may act by compression or distention, its stress being such as to correspond with and oppose the desired pressure on the outlet side of the valve. The spring is shown as arranged to act by compression and to communicate its stress to the valve through a stem K, which connects with a cylindrical portion or neck H′ of the valve. This neck moves with a close working fit through a sleeve L, forming part of a partition L′, separating the passage through the valve-shell G′ beneath from the chamber I above. The neck H′ of the valve is of any suitable diameter, it being understood that the pressure on the outlet side *c′* of the valve acting

against this diameter must be resisted by the stress of the spring J. The fit of the neck H′ in the sleeve L is not so close as to prevent leakage of compressed air into the chamber I, and from the instant the compressed air is admitted by the opening of the starting-valve *b* this leakage occurs until the pressure in the chamber I is equal to that on the outlet side of the valve at *c*′. The chamber I is at starting filled nearly full of oil, leaving, however, an air-space I′ above the oil, and the air which leaks into the chamber beneath bubbles up through the latter into this air-space. The spring J is wholly immersed in the body of oil, whereby it is effectually protected against rusting.

For adjusting as desired the stress of the spring J, I provide means for raising or lowering the abutment J′, against which the spring reacts. This abutment is shown as a flange formed on a screw-threaded collar J^2, which may be turned in a stationary threaded sleeve M, the upper part of which is shown as having a ground cone-joint M′ with a top opening through the shell G and drawn to a leak-tight fit therewith by a nut M^2. By this or any suitable construction the sleeve M is locked fast to the shell, so that by turning the collar J^2 the latter may be screwed up or down to vary the stress of the spring. For so turning the collar J^2 a connection is provided with the exterior. The connection, as shown, comprises a squared stem K′, fitting a square hole in the collar, and extending up through the sleeve M to the exterior at K^2, where it may be turned by engaging it in any suitable manner—as, for example, by means of a key or wrench. In the construction shown the part K′ and the external part K^2 are formed in one piece with the stem K, to which latter is fixed the disk J^3, forming the lower abutment for the spring. Hence the turning of the upper portion K^2 turns the entire stem, and with it the spring J, and incidentally in the construction shown turns also the valve H, although this is inconsequent. Where the stem K K′ K^2 passes out at the top of the shell, it is formed with a cylindrical neck K^3, which makes a close working fit with the cylindrical inner surface of the sleeve M, so that this portion may rise and fall with the movements of the valve. No packing is needed for this neck K^3 of the stem, because the duration of the run of the torpedo (usually not over two minutes) is so short that the quantity of air which can escape by leakage is insignificant. It is important, however, to neutralize the effect upon the valve of the fluid-pressure within the chamber I, and to this end the neck K^3 should be made of precisely the same diameter as the neck H′, so that the fluid-pressure will exert itself to equal effect in the two contrary directions. Thus the necks H′ and K^3 are cylinders presenting surfaces of equal area and working through openings of equal area through the sleeves L and M at the top and bottom of the oil-chamber.

For introducing oil into the chamber preparatory to a run of the torpedo, and at which time there is no pressure or only an insignificant pressure of air therein, a filling-valve N is provided. This is preferably a tappet-valve closing outwardly against a seat N′, formed, preferably, on a ring or bushing screwed into the upper end of the tubular portion K^2 of the stem K. The valve N has an upward projection N^2, which can be pressed down to open it against the stress of a spring O, which presses the valve upwardly and normally holds it closed. The entering oil passes around the valve N, thence through openings into its tubular body, and finally flows through passages P P′ into the oil-chamber.

When the parts are at rest and before the compressed air has been admitted to the reducing-valve, the pressure of the spring J throws the valve wide open, and to limit this movement a disk or washer Q is provided, the rim of which projects over the upper end of the sleeve L and forms a stop-shoulder. As soon as the air-pressure is turned on it acts against the valve H to press it up against the stress of the spring, and thereby to close the valve. The stem K is preferably connected to the valve H or its neck H′ by a shackle or swivel Q′. The valve H is removable through the bottom of the shell by taking out a plug R and unscrewing a sleeve R′, which holds the seat *k*′ in place.

The oil-chamber I serves to hold oil not only for the immersion and protection of the spring J, but also for the lubricating of all the main working parts of the torpedo. This chamber has an oil-outlet (one or more) at its lower part, an example of which is shown at S, Fig. 2, and from which leads a duct or tube *m*, which extends thence, as shown in Fig. 1, rearwardly through the torpedo, and has branches *m*′ *m*′ leading to the several bearings *p p* for the propeller-shaft, propeller-screw, gearing, and motor. The compressed air admitted to the chamber I by leakage around the neck H′ (or it may be through a small special duct, if preferred) establishes instantly a pressure in the oil-chamber I, by which the oil is effectually fed through the duct *m* to all the bearings. Thus these bearings are lubricated in the most efficient manner by means of a forced flood of oil, which continues during the entire run of the torpedo.

The exact construction and the arrangement and proportions of the parts described may be greatly varied, and the described details may be substituted by other expedients to similar effect without departing from the present invention.

I claim as my invention—

1. In an automobile torpedo, a pressure-

reducing valve having a closed oil-chamber with means for admitting compressed air thereto, and a duct leading therefrom to the bearings of the working parts, to conduct oil to such bearings.

2. In an automobile torpedo having a motor, a propeller-shaft and screw, turning in bearings, the combination therewith of a pressure-reducing valve having a closed oil-chamber with means for admitting compressed air thereto, and a duct leading therefrom to said bearings to conduct oil thereto.

3. In an automobile torpedo a pressure-reducing valve comprising a shell having air inlet and outlet passages and a valve-seat, an oil-chamber a partition between said passages and chamber, a movable valve having a neck passing through said partition, affording passage for air into said chamber, a spring in said chamber engaging said movable valve, and an oil-outlet from said chamber.

4. In an automobile torpedo a pressure reducing valve comprising a shell having air inlet and outlet passages and a valve-seat, an oil-chamber, having an opening into said passages and an opening at top, said openings of equal area, a movable valve having a stem passing through said chamber with necks of equal area passing through said openings, and a spring in said chamber engaging said stem.

5. In an automobile torpedo, a pressure-reducing valve comprising a shell having air inlet and outlet passages and a valve-seat, an oil-chamber, a movable valve having a stem entering said chamber, a spring in said chamber engaging said stem, an adjustable screw-abutment for said spring, and an adjusting device for turning said abutment passing through the wall of said chamber and accessible on the exterior thereof for adjusting the stress of the spring, and thereby determining the reduced pressure at the valve-outlet.

6. In an automobile torpedo, a pressure-reducing valve comprising a shell having air inlet and outlet passages and a valve-seat, an oil-chamber, a movable valve having a stem passing through said chamber, a spring in said chamber engaging said stem, a stationary screw-threaded sleeve projecting into said chamber, and a movable abutment for said spring having screw-threads engaging said sleeve, and having a non-rotative connection with said stem, whereby the turning of said stem adjusts said abutment to vary the stress of the spring.

7. In an automobile torpedo, a pressure-reducing valve comprising a shell having air inlet and outlet passages and a valve-seat, an oil-chamber, a movable valve having a stem entering said chamber, a spring in said chamber engaging said stem, and a filling-valve, through which to introduce oil into said chamber, seating outwardly, with a spring for pressing it to its seat.

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

FRANK M. LEAVITT.

Witnesses:
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FRED. H. MCGAHIE.