No. 803,177. PATENTED OCT. 31, 1905.

S. LAKE.

ENGINE EXHAUST FOR SUBMARINE VESSELS.

APPLICATION FILED FEB. 17, 1905.

Fig. 1.

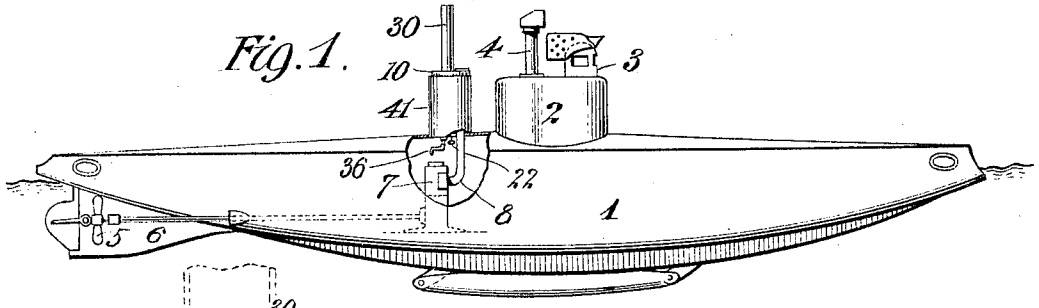


Fig. 2.

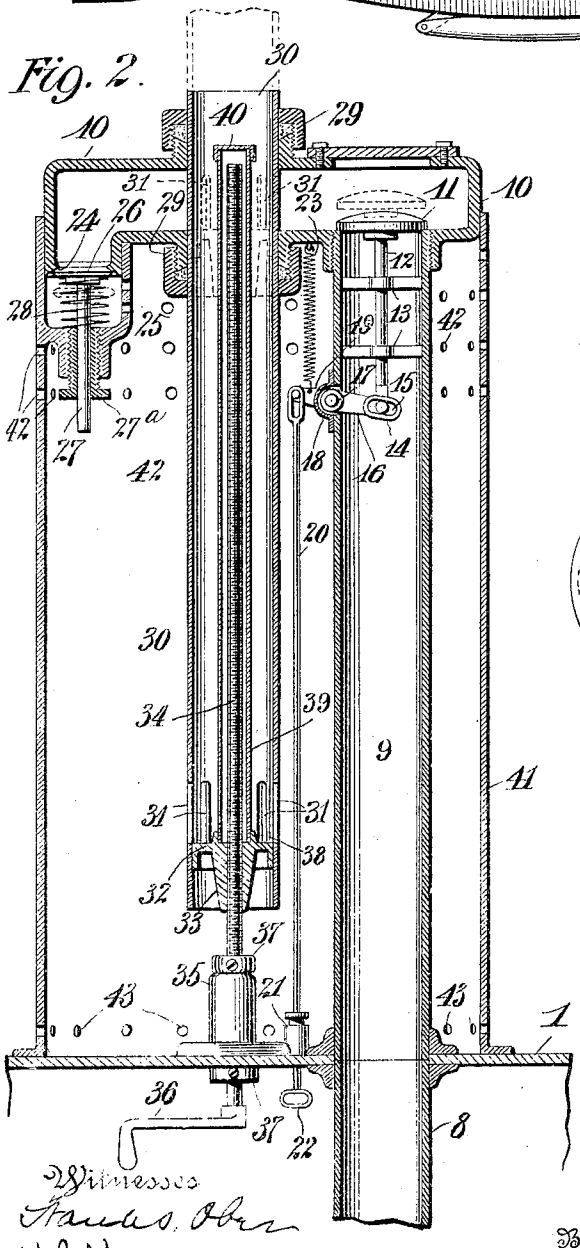


Fig. 3.

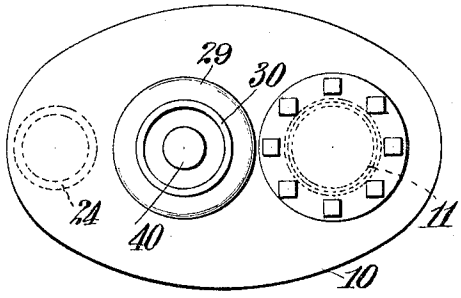
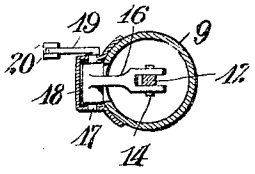


Fig. 4.



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ENGINE-EXHAUST FOR SUBMARINE VESSELS.

No. 803,177. Specification of Letters Patent. Patented Oct. 31, 1905.

Application filed February 17, 1905. Serial No. 246,158.

To all whom it may concern:

Be it known that I, SIMON LAKE, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Engine-Exhausts for Submarine Vessels, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an improvement in that class of submersible or submarine torpedo-boats provided with propelling devices driven by means of a heat engine or engines and adapted to travel either upon the surface when in cruising trim or with the hull submerged beneath the surface when in fighting trim; and it has for its object to provide means for discharging the products of combustion of such heat engine or engines materially above the hull when cruising upon the surface and for ejecting the same through a suitable valved discharge-aperture when in submerged condition.

The invention is embodied in its preferred form in a telescopic smoke-pipe leading from the exhaust of the engine or engines and comprising a fixed section, a vertically-movable section disposed substantially parallel therewith, but in a different axial line, and an intermediate chamber provided with a suitable valved discharge-aperture, the fixed section communicating at the top with the said chamber and the movable section being open at the top and closed at the bottom and provided in the lower portion with lateral inlet-apertures adapted to register with the interior of said chamber, through which said section passes when in its raised position, means being provided for raising and lowering said movable section to bring its lateral apertures into and out of register with the interior of the connecting-chamber. It also comprises a normally closed valve in the fixed section of the smoke-stack, with means for maintaining it yieldingly closed and means operated from within the boat for forcibly raising the same from its seat.

The invention further includes certain specific constructive features, which will be hereinafter described.

The invention will be understood by reference to the annexed drawings, in which—

Figure 1 is a side elevation of a submarine boat represented in cruising trim with the movable or extension section of the smoke-stack in its raised position to carry the products of combustion above any occupants of the boat upon the top of the same. Fig. 2 is a sectional elevation of the telescopic smoke-stack, upon a much larger scale, with the movable section in its lower inoperative position; and Fig. 3 is a plan of the same. Fig. 4 is a detail plan view of the controlling means for the check-valve in the top of the fixed smoke-stack section.

As represented in the drawings, the hull 1 is shown surmounted by a conning-tower 2, having the usual sighting-hood 3 and sighting-tube 4 and provided with twin screws 5, carried by the propeller-shafts 6, driven by heat-engines 7, as gasolene-engines, of any suitable type having exhaust-pipes 8 connected with the fixed smoke-stack section 9, extending above the hull and surmounted by and supporting the discharge-chamber 10, with the interior of which the upper end of said fixed section communicates through the check or relief valve 11, whose stem 12 is slidably supported in suitable bearings 13 and is provided at the lower end with a pin 14, embraced by a slot 15 in the inner forked end of a crank-arm 16, entering the section through a suitable slot and carried by a rock-shaft 17, mounted in bearings in a cap 18 and having an external crank-arm 19 loosely connected at its outer end with the forked upper end of an operating-rod 20, passing downwardly through a stuffing-box 21 into the hull and terminating in a handle 22, by which it may be shifted in opposition to the spring 23 for raising the valve 11 from its seat, upon which it is yieldingly maintained by said spring excepting when temporarily forced open by pressure of the products of combustion from the engine or engines.

The discharge-chamber 10 is provided in its rearward end with a downturned hub provided with a conical valve-seat 24, surrounded by a valve-casing 25, containing the conical check-valve 26, whose stem 27 extends downwardly through a threaded bushing 27^a in the lower end of the valve-casing and is surrounded by a spring 28, interposed between the valve and the upper end of said bushing to maintain the valve normally closed, but permitting the same to open under the pressure of the products of combustion from the engines while excluding water. Intermediate the ends of the discharge-chamber 10 are suitable vertical apertures provided with stuffing-boxes 29, embracing the movable section 30 of the smoke-stack, which passes

through said chamber. This section is constructed with an open top and laterally-imperforate upper portion and with lateral perforations 31 in the lower portion and is provided with a bottom formed as a cap 32, with internally-threaded boss 33, to which is fitted the externally-threaded lifting-screw 34, extending upwardly into the same and downwardly through a stuffing-box 35 into the interior of the vessel, where it is provided with an operating-crank 36 for turning the same to raise and lower the movable smoke-stack section, thrust-collars 37 being applied to the shank of said screw at opposite ends of the stuffing-box 35 to prevent the vertical shifting of the same under the weight of the movable smoke-stack section. The cap 32 is shown provided upon its inner face with a socket 38, to which is fitted the lower end of a housing-tube 39, surrounding the screw within the movable section 30 and closed on the upper end by a cap 40. The structure as thus described is surrounded by a casing 41, secured by suitable means upon the deck of the vessel and provided near the top with apertures 42 for the release of the gases when discharged from the check-valve 26 and at the bottom with apertures 43 for the release of water entering the same under submergence when the vessel returns to the surface. This casing 41 is provided as a housing to inclose the operative parts of the engine discharge apparatus, so as to protect them from clogging and possible disarrangement in case of the encounter of floating matter when the vessel is traveling submerged or partly submerged, and also serves as a guard to protect the crew from contact with the heated pipes 9 and 30 when the engines are in operation.

In the operation of the vessels the engine discharge apparatus is set for cruising upon the surface, as represented in Fig. 1 of the accompanying drawings, by the rotation of the lifting-screw 34 by means of the crank 36 to bring the lateral apertures 31 of the section 30 into register with the interior of the chamber 10, a free escape for the products of combustion being thus afforded from such chamber through the smoke-pipe, from which they are discharged at a point materially above the hull, the only resistance to such discharge being produced by the check-valve 11 at the top of the fixed smoke-stack section 9, which is of little consequence by reason of the weakness of the spring 23. To adapt the device to conditions of submergence, it is merely necessary to lower the movable section 30, as represented in Fig. 1 of my application, filed simultaneously herewith, Serial No. 246,157, by rotation of the lifting-screw 34 in the reverse direction, which cuts off the communication between the chamber 10 and such section and causes the discharge of products of combustion from such chamber to take place only through the valve 26, the small head of water between such valve and the surface offering still comparatively little resistance to the opening of the same and imposing therefore very little back pressure within the chamber. The air-supply for combination with the fuel to produce the requisite explosive mixture being drawn in the usual manner directly from the interior of the vessel, which is supplied when the hatches are closed through a suitable inlet in the conning-tower or sighting-hood, it is evident that the engine operates not only to force the gaseous products of combustion outboard through the smoke-stack, but to produce a suction within the interior of the boat which insures the introduction of the necessary air-supply through such inlet as may be provided for the purpose from the exterior.

As it is of the utmost importance that the primary check-valve 11 should work with the greatest freedom under all conditions of the vessel, the operating-rod 20 for such valve is provided, so that an occupant of the vessel may by manipulation of the handle 22 forcibly raise the valve from its seat to insure against its sticking, and thereby impairing the action of the engine or engines.

In practice it is desirable in certain cases to insure a free discharge of the products of combustion when in their heated state, in which they have the maximum volume, to provide independent fixed smoke-stack sections for each engine or set of engines employed in the propulsion of the vessel, in which case the section 9 represented in the drawings herein would be merely duplicated and placed in communication with the single discharge-chamber 10 without modifying in any material degree the construction of the device.

From the foregoing description it is evident that the details of construction of the improvement may be widely varied without departure from the spirit of the invention, and it will therefore be understood that the scope of the appended claims is not restricted to the particular embodiment of the improvement herein shown and described.

Having thus set forth the nature of the invention, what I claim herein is—

1. The combination with a submarine boat, of a primary discharge-pipe connected with the interior of the boat, a valved chamber with which said discharge-pipe is connected at the top, an extension discharge-pipe passing through said chamber and provided with laterally-apertured lower end and closed bottom, and means for raising and lowering said extension discharge-pipe.

2. The combination with a submarine boat, of a primary discharge-pipe leading upwardly from the interior of the same, an extension discharge-pipe provided with lateral apertures and having means for raising and lowering it, a chamber having an outlet in the lower side and communicating with the upper end

of said primary discharge-pipe and surrounding said extension-pipe, and a valve in the outlet of said chamber.

3. The combination with a submarine boat, of a primary discharge-pipe leading upwardly from the interior of the same, an extension discharge-pipe provided with lateral apertures and having means for raising and lowering it, an intermediate chamber having an outlet in the lower side and communicating with the upper end of said primary discharge-pipe and surrounding said extension-pipe, and an outwardly-opening check-valve within the outlet of said intermediate chamber.

4. The combination with a submarine boat, of a primary discharge-pipe, an extension discharge-pipe disposed parallel with the same and provided with a lateral aperture or apertures, a chamber communicating with the upper end of said primary discharge-pipe and embracing said extension-pipe and provided with a valved outlet, and means for controlling the vertical position of said extension-pipe whereby air and gases may be discharged from said primary pipe and communicating chamber either outwardly through the valve of the latter or through said extension-pipe.

5. The combination with a submarine boat, of a discharge-pipe leading upwardly from the interior of the same, a chamber surmounting said discharge-pipe having a valved discharge-opening, a second vertically-movable pipe passing through said chamber and fitted closely thereto, said movable pipe being open at the top and closed at the bottom and being laterally apertured at the lower end and laterally imperforate at the upper end, and means for raising and lowering said movable pipe to bring its lateral apertures into and out of register with the interior of said chamber.

6. The combination with a submarine boat, of a smoke-pipe leading upwardly from the interior of the hull, a chamber supported by and connected with the upper end of said smoke-pipe, a valved discharge-aperture in said chamber, a vertically-sliding extension smoke-pipe fitted to and passing through apertures therefor in said chamber and formed with open top and closed bottom and with laterally-apertured lower end and laterally-imperforate upper end, a nut in the lower end of said extension smoke-pipe, a lifting-screw swiveled in a fixed bearing and entering said boat, and fitted to said nut, and means within said boat for turning said screw to lift and lower said extension smoke-pipe.

7. The combination with a submarine boat, of a smoke-pipe leading upwardly from the interior of the same, a chamber supported by and connected with the upper end of said smoke-pipe, a valved discharge-aperture in said chamber, a vertically-sliding extension smoke-pipe fitted to and passing through apertures therefor in said chamber and formed with open top and closed bottom and with laterally-apertured lower end and laterally-imperforate upper end, a nut in the lower end of said extension smoke-pipe, a lifting-screw swiveled in a fixed bearing and entering said boat, and fitted to said nut, a housing for the inclosed portion of said screw within said extension smoke-pipe, and means within said boat for turning said screw to lift and lower said extension smoke-pipe.

8. The combination with a submarine boat, of a primary discharge-pipe connected with the interior of the hull, a valved chamber with which said discharge-pipe is connected at the top, an extension discharge-pipe passing through said chamber and provided with laterally-apertured lower end and closed bottom, means for raising and lowering said extension discharge-pipe, and a casing provided with lateral apertures surrounding said parts intermediate said chamber and the hull of the vessel.

9. The combination with a submarine boat, of a primary discharge-pipe leading upwardly from the interior of the same, an extension discharge-pipe provided with lateral apertures and having means for raising and lowering it, an intermediate chamber having an outlet in the lower side provided with an outwardly-opening check-valve and communicating with the upper end of said primary discharge-pipe and surrounding said extension-pipe, and a check or relief valve in the upper end of said primary discharge-pipe.

10. The combination with a submarine boat, of a primary discharge-pipe leading upwardly from the interior of the same, an extension discharge-pipe provided with lateral apertures and having means for raising and lowering it, an intermediate chamber having an outlet in the lower side provided with an outwardly-opening check-valve and communicating with the upper end of said primary discharge-pipe and surrounding said extension-pipe, a check or relief valve in the upper end of said primary discharge-pipe, and means operable from the interior of said boat for forcibly opening the last-named check-valve.

11. The combination with a submarine boat, of a discharge-pipe connected with the interior of the same, a chamber connected with the upper end thereof having a discharge outlet-passage in the lower side of the same, an outwardly-opening check-valve in said discharge outlet-passage, and means for forcing air or gases outwardly from the interior of said boat through said discharge-pipe, chamber, and check-valve.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SIMON LAKE.

Witnesses:
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HENRY J. MILLER.