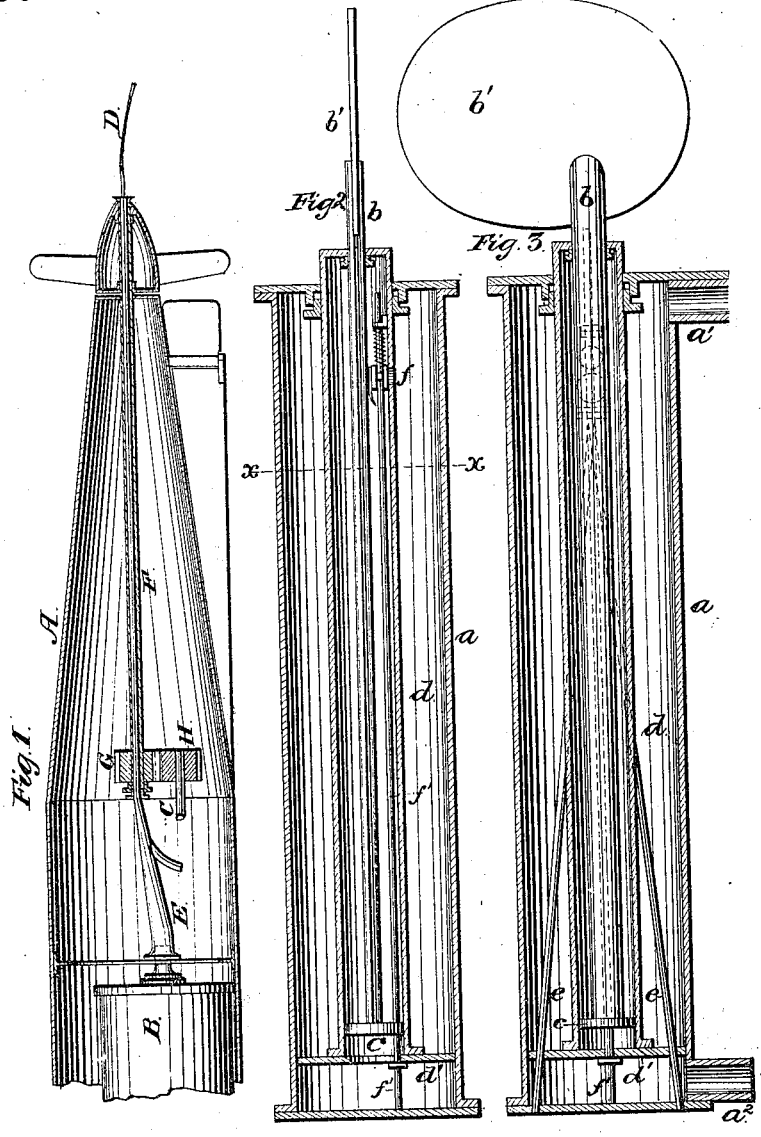
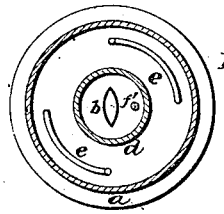
9 Sheets—Sheet 1.

J. L. LAY.

Torpedo-Boat.

No. 211,302. Patented Jan. 14, 1879.





Attest:
F. B. Brock
D. G. Stuart

Inventor:
John L. Lay
per H. D. Hinman
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J. L. LAY.
Torpedo-Boat.

No. 211,302. Patented Jan. 14, 1879.

Fig. 4.

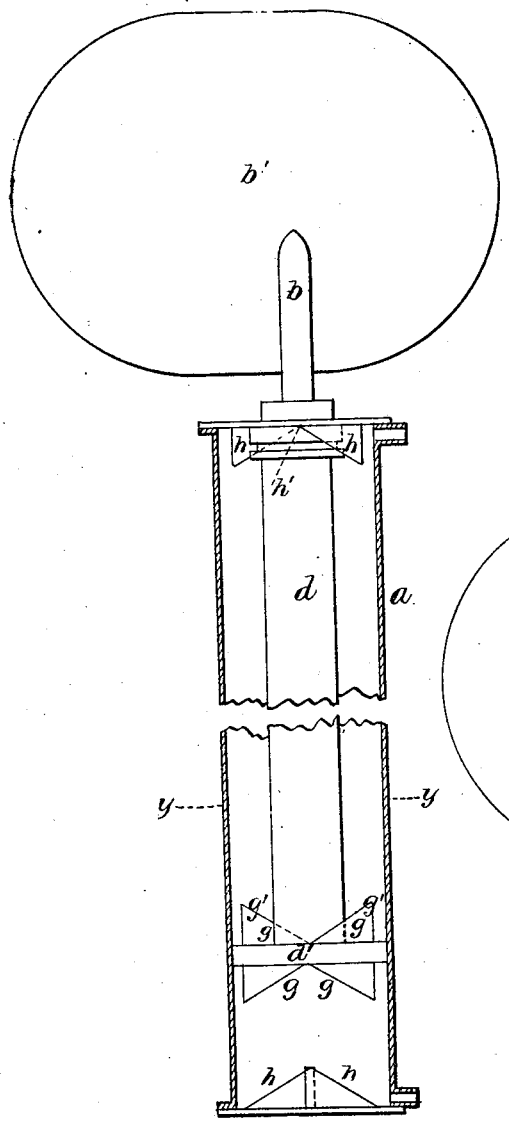


Fig. 6.

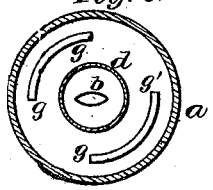
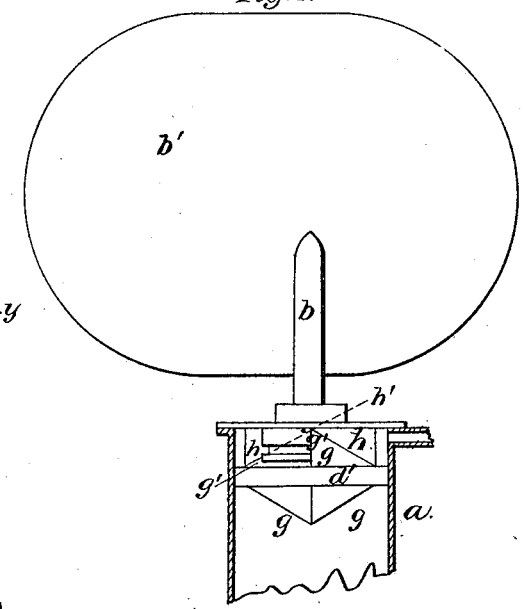


Fig. 5.



Attest:

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9 Sheets—Sheet 3.

J. L. LAY.

Torpedo-Boat.

No. 211,302. Patented Jan. 14, 1879.

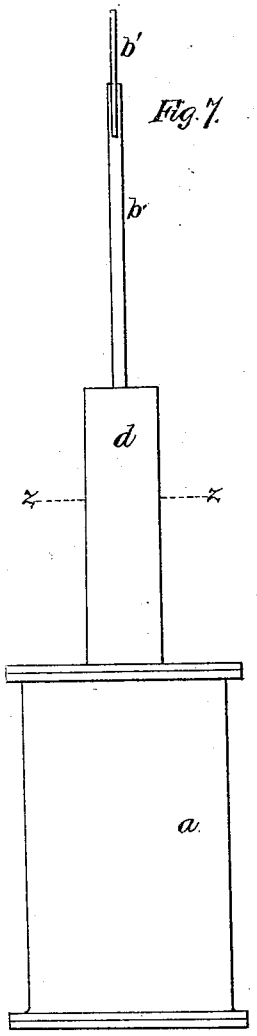

Fig. 7.

Fig. 7'

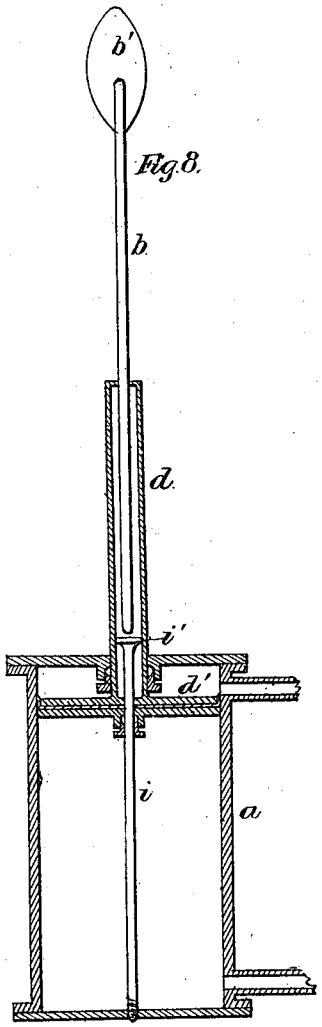

Fig. 8.

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9 Sheets—Sheet 4.

J. L. LAY.

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No. 211,302. Patented Jan. 14, 1879.

Fig. 9.

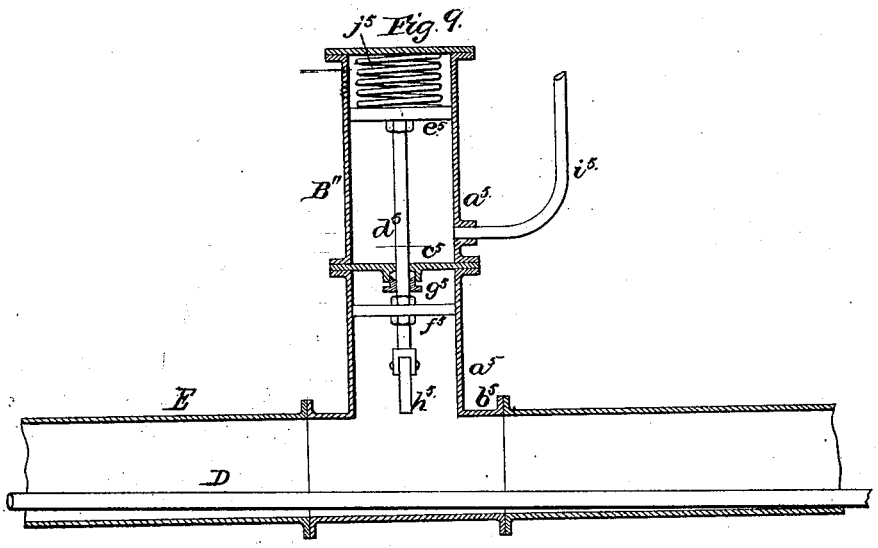
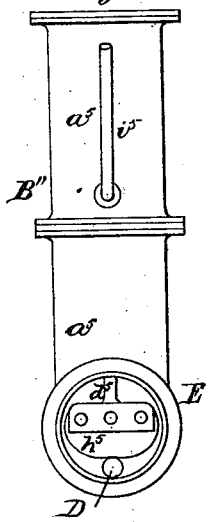


Fig. 10.



Witnesses.

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9 Sheets—Sheet 5

J. L. LAY.
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No. 211,302. Patented Jan. 14, 1879.

Fig. 11.

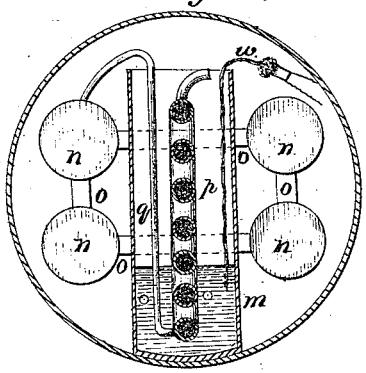
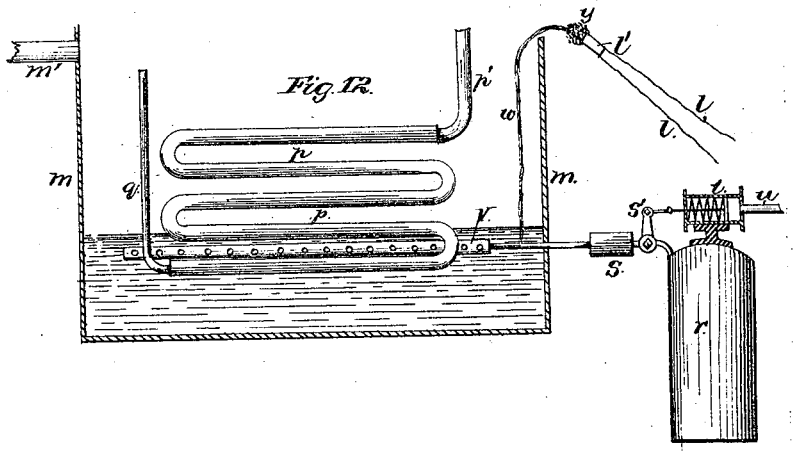


Fig. 12.



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9 Sheets—Sheet 6.

J. L. LAY.
Torpedo-Boat.

No. 211,302. Patented Jan. 14, 1879.

Fig. 13.

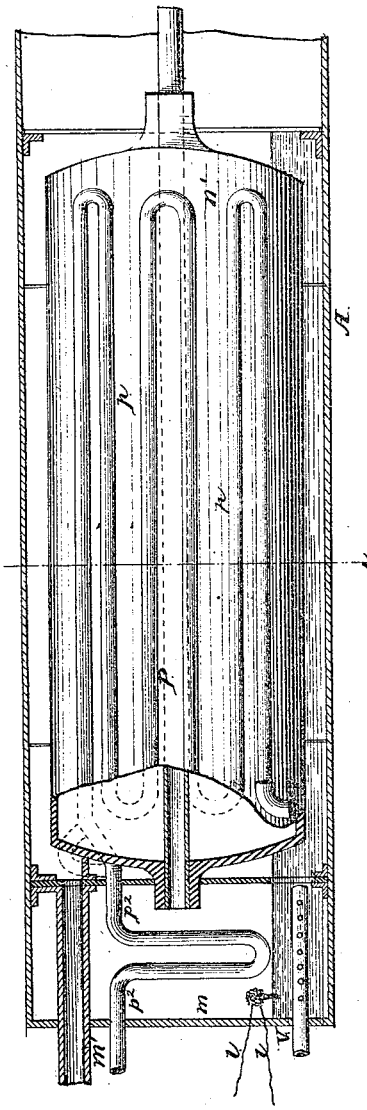

Fig. 14.

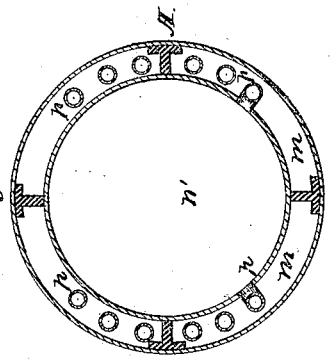

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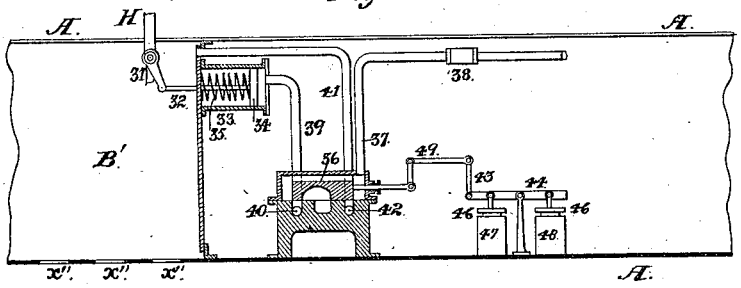
Fig. 15.



Witnesses
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No. 211,302. Patented Jan 14, 1879.

Fig. 16.

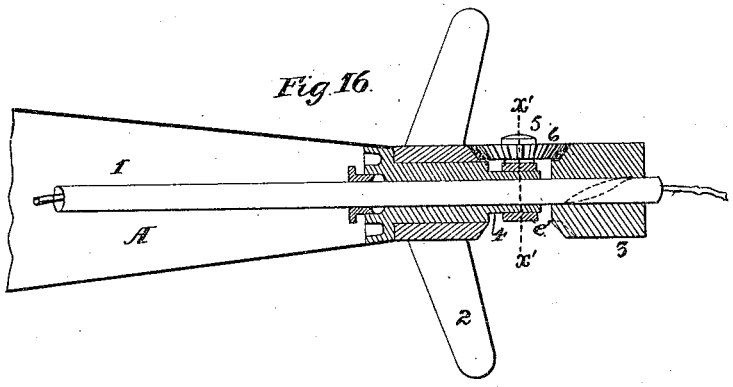

Fig. 17.

Witnesses.
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9 Sheets—Sheet 9.

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Torpedo-Boat.

No. 211,302. Patented Jan. 14, 1879.

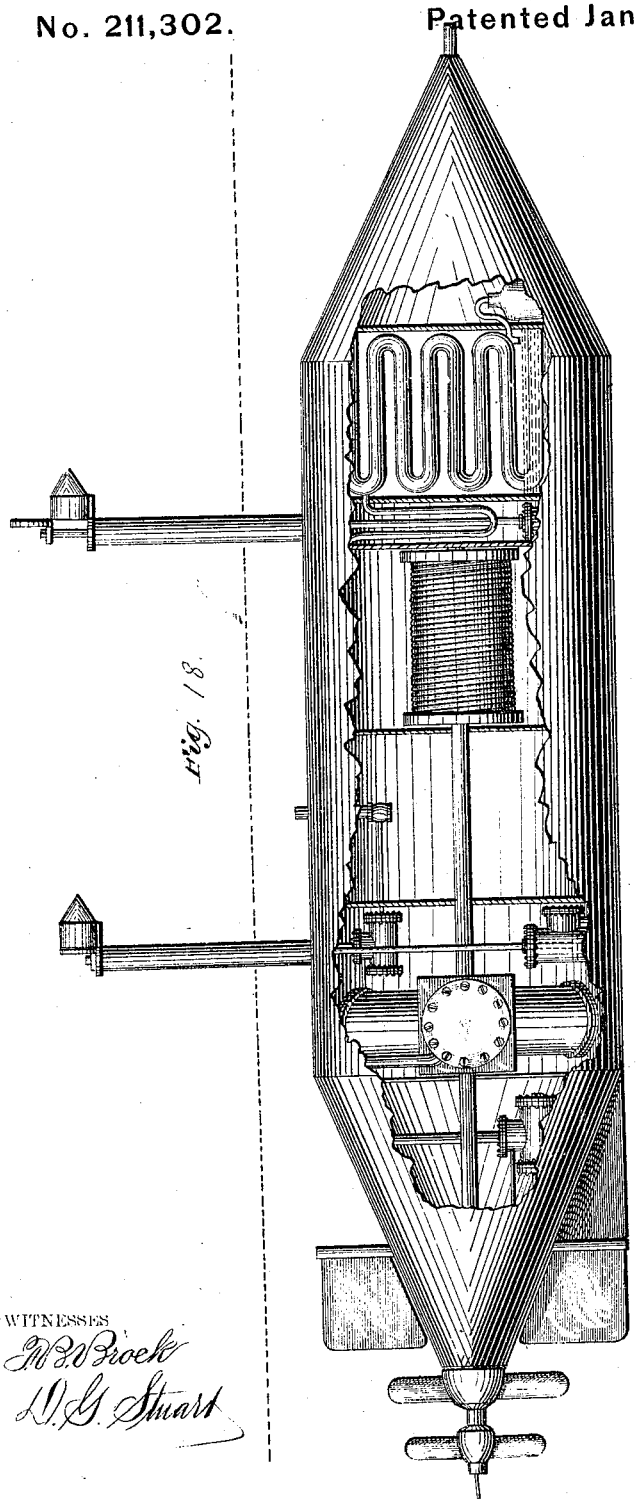

Fig. 18.

WITNESSES

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D. G. Stuart

INVENTOR

John L. Lay

A. D. Hinman

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UNITED STATES PATENT OFFICE.

JOHN L. LAY, OF BUFFALO, NEW YORK.

IMPROVEMENT IN TORPEDO-BOATS.

Specification forming part of Letters Patent No. **211,302**, dated January 14, 1879; application filed December 18, 1878.

To all whom it may concern:

Be it known that I, JOHN L. LAY, of Buffalo, in the county of Erie and State of New York, (temporarily residing at St. Petersburg, Russia,) have invented certain new and useful Improvements in Movable Torpedo-Boats; and I do hereby declare that the following is a full, clear, and exact description of my invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My present invention relates to certain details in the construction of torpedo-boats of the kind that are propelled by an engine or engines inside the boat, and guided or controlled by the operator through the medium of an electric wire or cable paid out from the boat as the latter advances.

The improvements which form the subject-matter of this application will be hereinafter pointed out and specifically claimed.

In the accompanying drawings, in which like letters indicate like parts, Figure 1 is a sectional view of the stern of one of my boats, showing the manner of paying out the cable through the hollow propeller-shaft, which also serves as an exhaust-pipe. Figs. 2 and 3 are vertical sections of my adjustable telescopic sight-rods. Fig. 2^a is a cross-section of Fig. 2 on line $x\ x$. Figs. 4 and 5 are similar sections of a modified form of same sight-rods. Fig. 6 is a cross-section on line $y\ y$, Fig. 4. Figs. 7, 7^1, and 8 are modifications of same. Fig. 9 is a longitudinal section of a retarding-brake for the cable, Fig. 10 being an end view of same. Fig. 11 is a cross-section of a compartment of the boat containing the gas-holder or flask and heating device, Fig. 12 being a side view, partly in section, of same. Fig. 13 is a modified form of heating device. Fig. 14 is a cross section of same on line $z\ z$. Fig. 15 is a longitudinal section of that portion of the boat containing the ballasting or raising and lowering apparatus. Fig. 18 is a side view of a torpedo-boat, showing, in a general way, the location of some of the apparatus with relation to the boat. The figure is relatively much shorter and of greater diameter than the boats are usually made by me. This is for convenience of illustration.

The location of the several operative devices is not arbitrary, but may be changed as circumstances warrant.

The various compartments of the boat are separated from each other by water-tight bulkheads, both for convenience and strength.

A, Fig. 1, is the hull of the boat, only the rear portion being shown. B is a cylinder or chamber containing a coil of telegraphic cable, having one or more wires, which convey the electric current from a battery on shore or at any other station to the operative devices of the boat, which are controlled by electro-magnets. E is a pipe leading from the cable-compartment through the tubular propeller-shaft F. The pipe C conveys the exhaust from the engine through the same pipe E. The effect of this exhaust is to ease the movement of the cable D and facilitate its paying out through the tube.

Motion is conveyed from the engine to the propeller-shaft through the gears G H, or in other suitable manner.

One form of my telescopic arrangement for raising and lowering the sight or guide rods when it is desirable that the targets shall appear above the surface of the water is shown in Figs. 2 and 3, in which a is a cylinder, which is secured in the boat in any suitable manner, and is provided at a^1 a^2 with ports or apertures for the entrance and exhaust of gas.

The sight or indicating rod b is preferably provided with a disk, b^1, and has a piston, c, at its lower end, fitted to slide up and down in the tubular piston rod or sleeve d, whose lower end is provided with a piston, d^1, which works up and down in the said cylinder a. $e\ e$ are rods secured to the top and bottom of the cylinder a, and which pass through the piston d^1 to the upper end of the said cylinder in an inclined or spiral direction, in such a manner that when the said piston moves up or down it will be rotated or turned one-fourth of a revolution on its axis in the said cylinder.

When the said disk, rods, and sleeves are in the position shown in Fig. 2, the disk b^1 stands fore and aft of the boat, and therefore presents practically no surface to view in the line of the boat's movement; but when the operator desires to bring the said disks into view, gas is admitted from the flask or reservoir to the bottom of the cylinder a, and forces up

the piston d^1 and sleeve d, at the same time entering the bottom of said sleeve and raising the rod b and disk b^1, at the same time turning the latter athwart or across the boat, thus affording the means for ascertaining its position or keeping it in view.

In the sleeve d, and near the top of the same, is a small opening covered with a valve, f. When the sleeve is up this valve prevents the entrance of water into the same. This valve is provided with a small spiral spring, and is attached to a valve-rod, f^1, the valve-rod extending down slightly beyond the piston d^1. When this piston d^1 has nearly reached the end of its downward movement the end of the valve-rod f^1 strikes the cylinder-bottom, and thereby the valve is opened against the resistance of the spiral spring. Gas then enters the sleeve d and forces down the piston c and the disk-rod b and disk b^1, and brings the latter again into the position shown in Fig. 3. Then gas is again admitted to the lower side of the pistons, the pistons move, and, the valve-rod being released, the spiral spring brings the valve f again over the port or opening in the sleeve; and as the said sleeve passes into the water through the stuffing-box on the upper end of the cylinder a, the valve f being closed, no water can enter, and the upward movement of the piston d^1 again reverses the position of the guide-disk b^1, and presents its face to the operator.

Instead of using the aforesaid inclined or spirally-arranged rods, I may use V grooves or projections in the cylinder for turning the pistons and disks.

In Figs. 4, 5, and 6 I have shown a modification of the above-described apparatus. In this modified form of the said apparatus the rod b and disks b^1 are turned or reversed in and by the up-and-down movements of the sleeve-piston d, through the agency of inclined surfaces $g\ g$ on the upper and lower sides of the piston, in combination with surfaces h, in the top and bottom of the cylinder, similarly inclined, but arranged transversely or crosswise to those on the piston.

When the piston is in the position shown in Fig. 4, the disk b^1 stands fore and aft of the boat, as above described; but by admitting gas to the space below the piston, the latter and the rod b are raised; and when the inclines g on the upper side of the piston come in contact with the upper edges of the inclines h at the top of the cylinder a, the former will slide upon the latter, and by so sliding will be caused to turn on the axis of the piston-rods until the points g^1 are brought into the center h^1 of the inclines h, and the wedges of the one fit into the cavities of the other part, as shown in Fig. 5.

By this action of the inclined faces on each other the disk b^1 is turned for a quarter of a revolution, to bring it into view of the operator, as above described; and by admitting gas to the upper end of the cylinder the movements are reversed, and the disk returned to the position shown in Fig. 4.

To keep the rod b from turning loosely or independently in the aforesaid sleeve, and to insure its presenting the least practicable surface to view when raised, I prefer to make the same with an oval transverse section, as shown in Figs. 2^a and 6.

Another modification of this apparatus is shown in Figs. 7 and 8. Fig. 7 is a side elevation; Fig. 8, a vertical section; and Fig. 7′ is a transverse section on the line $z\ z$, Fig. 7.

The rod i is fixed in the bottom of the cylinder a, and the piston d^1 and sleeve d work up and down over the said fixed rod. The said sleeve is preferably made oval in transverse section, as shown in Fig. 7′, for the purposes above stated. In this case the boat would be started with the disks raised, as shown. The lower end of the disk-rod b then rests on a plate, i^1, on the upper end of the fixed rod i in the cylinder a. Gas being admitted to the upper end of the said cylinder, the piston d^1 and sleeve d descend, while the disk b^1 and rod b are held stationary in a vertical position until the top of the sleeve d has descended to the plate i^1 on the said fixed rod i. Then the disk-rod b, having nothing to retain it in position, drops overboard, leaving nothing above the surface of the water for an enemy to see. If at any subsequent time the operator should require to ascertain the position of the boat, he can raise the sleeve d above the surface.

I do not in this application claim, broadly, an adjustable or elevating sight-rod on a torpedo-boat, such being shown and claimed in an application for patent heretofore filed by me. In this application I desire to limit myself to the forms of sight-rods shown, or their mechanical equivalents.

The next part of my invention relates to an improved automatic check or brake apparatus which is designed to be used in connection with my torpedo-boats.

The object of this part of the said invention is to provide an effectual automatic check to the paying out of the cable when the torpedo-boat is at rest, the tendency so to pay out being caused by currents at the spot where the boat may be lying, or arising from other causes.

Fig. 9 is a vertical longitudinal section of the said apparatus, showing, also, part of the paying-out tube. Fig. 10 is an end view.

E shows part of the paying-out tube through which the cable passes in leaving the torpedo-boat. B″ is the apparatus, as shown in, attached to, and forming part of the said paying-out tube, the two ends of the tube at the part where they are united to the said apparatus being provided with annular flanges, which correspond with similar flanges provided on the said apparatus. By means of these flanges this apparatus is securely fastened to the tube, its base forming a section thereof.

a^5 is a vertical cylinder, which is cast in one piece with the longitudinal tubular portion b^5, connecting with the paying-out tube, as above described. c^5 is a diaphragm or division, through which passes the rod d^5, having at its upper end a piston, e^5, and at a part below the said diaphragm a guide-plate or disk, f^5, the latter being provided as a supporting-guide to the rod in its vertical movement. The said rod d^5 passes through the stuffing-box g^5. h^5 is a curved piece of india-rubber or other suitable material, which is attached between jaws to the lower end of the rod d^5. i^5 is a tube leading into the cylinder a^5 above the diaphragm c^5, which tube is connected at its other end with the gas-supply pipe in such a manner that when the engine is working there will be a constant pressure of gas upon the under side of the piston e^5, the gas being cut off when the engine is not at work. j^5 is a spiral spring acting against the piston e^5, and k^5 represents a portion of the cable within the paying-out tube.

The action of this part of the apparatus is as follows: When the engine is working, and the torpedo-boat is consequently in motion, the gas flows through the tube i^5 and forces the piston e^5 upward against the action of the spiral spring j^5, so that the india-rubber piece h^5 is lifted and kept quite clear of the cable, the latter thus being free to pay out without impediment.

The action of shutting off the supply of gas from the engine also closes the communication with the tube i^5, and the pressure of gas is thereby removed from the piston e^5, allowing the spiral spring j^5 to operate against the upper part of the said piston, whereby the latter is forced downward, and with it the rod d^5 and india-rubber piece h^5, which latter thus presses tightly upon the cable k^5, as shown in Fig. 10, and holds it against any tendency to pay out while the boat is at rest.

I will next proceed to describe a means I have adopted to heat the condensed or liquefied gas in the gas flask and pipes.

The liquefied gas is liable to freeze or become sluggish owing to rapid expansion. To obviate this difficulty I may make use of such devices as are shown in Figs. 11 and 12.

$n\ n\ n$ are reservoirs containing the gas under pressure, and connected together by pipes $o\ o$. A pipe, q, leads from the reservoirs to the coil of pipes p, which are in a tank, m, partly filled with alcohol or similar combustible fluid. A perforated pipe, v, is placed inside this tank, near the bottom, through which air is admitted to support combustion from the flask of compressed air, as at r. A fuse, w, connects the alcohol with a bit of gun-cotton or similar material at y, which can be ignited by an electric spark sent by the operator through the wires $l\ l$. A piece of wood, l', makes a good support for the ends of the wires. A reducing-valve, s, permits the air to enter the perforated pipe v at a much less pressure than that under which it is stored in the reservoir r. The air is admitted to the perforated pipe by the opening of a cock, s', which opening is effected in the following manner: A cylinder, t, contains a piston, which is forced in one direction by a spring to close the cock s' by means of its connecting-rod. When gas from the gas-flask is admitted to pipe u, (which can be done through suitable electrical connections; or it may be admitted from the engine when the throttle-valve is opened,) the piston will be forced back by the pressure of gas from pipe u, the cock s' will be opened, and air will pass into the alcohol-chamber through pipe v. A spark now sent over the wires l will ignite the fuse, and through it the alcohol, which will burn freely as long as air is admitted, but, being in an air-tight compartment, will become nearly or quite extinguished as soon as the gas-pressure is removed from cylinder t, and the cock s' closed by the action of the spring-piston.

The coil p is supplied from the reservoirs through the pipe q, and the pipe p^1 may lead to the engine.

m' is a pipe, which may convey the products of combustion to the exhaust.

Figs. 13 and 14 show a modification of this heater, in which the coil p is arranged outside a cylindrical gas flask, n', and between it and the shell of the boat A. The flask can be readily secured in this position by means of angle-irons at the sides and end trunnions passing through bulk-heads. The flame, in this case, rises up around the flask and its coils, and the gas is finally superheated in the coil p^2 before it passes to the engine.

Another part of my invention relates to means for causing the boat to rise and sink in the water independently of diving-wings. Fig. 15 shows a manner of carrying out this part of my invention.

B′ is an air-tight chamber in the boat A. H is a pipe communicating with this chamber, and opening at the other end outside the boat.

31 is a cock or valve, provided to close or open the pipe H, the said cock being controlled by the rod 32, which passes into a cylinder, 33, and has at its end a piston, 34, working within the said cylinder.

A spiral spring, 35, within the cylinder, when free to act, keeps the piston pressed to the position shown, and the cock or valve is thereby kept closed, so that there is no communication through the pipe H between the air-tight chamber B′ and the outer atmosphere.

36 is a slide-valve within a suitable casing, gas being supplied to the said valve through the tube 37 and a regulating-valve, 38.

The tube 39 communicates with one of the parts, 40, of the valve-seat, and leads into the cylinder at the end thereof, so that when the said part 40 is uncovered gas enters the cylinder, acts against the piston, and, forcing the rod forward, the cock is opened.

Another tube, 41, is provided, which leads from the port 42 to the upper part of the interior of the chamber B′, and is designed to

convey gas into the said chamber when it is desired to expel the water therefrom, and cause the submerged boat to rise.

The slide-valve is operated by means of a rod, which is connected with a bell-crank lever attached to another lever, 43, which is in communication with a lever, 44, to which are attached the two armatures 45 and 46, which are operated by the two electro-magnets 47 and 48.

The bell-crank lever works on a pivot at 49, and the lever 44 is pivoted in a post or standard.

Apertures x'' are provided in the shell of the boat, as shown, the said apertures serving to admit water into the chamber B′ when it is desired to sink the boat, and as a means of exit for the same when it is desired to raise the boat.

The operation is as follows: The boat being launched with the cock closed and the various parts of the mechanism in the position shown, a small quantity of water will enter the chamber B through the apertures x'', sufficient to compress the air in the said chamber until the air so compressed and the pressure of the water counterbalance each other.

When it is desired to sink the boat a current of electricity is sent through the electro-magnet 48, which causes the armature to descend, carrying with it the end of the bar attachment thereto. The other end of this bar consequently rises, and the bell-crank lever is operated to draw back the valve-rod and valve, so that the port is uncovered, upon which the gas passes up the tube 39 into the cylinder 33, and, overcoming the resistance of the spiral spring, forces the piston and rod forward, thus opening the cock. The air being thus allowed to escape through the pipe H, the compartment B′ becomes filled with water, and the boat sinks. When it is desired to cause the latter to rise an electric current is sent through the other electro-magnet, upon which the other armature will descend, and the slide-valve will be pushed forward, thereby uncovering the port 42, and consequently allowing the gas to pass through the tube into the upper part of the chamber B′. The pressure of gas thus introduced forces the water out of the chamber through the apertures x'', and the boat immediately rises. The gas in the cylinder at the same time escapes through the exhaust-port.

The next part of my invention relates to the construction of a double-screw propeller, as shown in Figs. 16 and 17. Fig. 17 is a transverse section on the line x' x', Fig. 16.

A is part of the hull of the torpedo-boat. 1 is the screw-shaft. 2 3 are the screws or propellers. 4 is a bush or sleeve, riveted or otherwise firmly and solidly fixed on the stern of the boat. The screw-shaft passes through this sleeve, which is provided with a suitable water-tight packing box and gland, and the inner propeller is fitted to turn freely on this sleeve. On the outer end of this sleeve is formed a neck or projection, on which is formed or fixed a stationary stud, 5. On this stud is fitted to turn freely a bevel-wheel, 6, which gears with the propellers 2 and 3 by means of teeth formed around their bases or hubs.

The outer propeller, 3, is keyed or otherwise fixed on the extremity of the shaft. Therefore it rotates with the said shaft. By its rotation and through the medium of the bevel-wheel or pinion it imparts rotation in the opposite direction to the propeller 2. I may use a guard or protector of any suitable form for the said mechanism.

By this improved mechanism, it will be obvious from the above description, I am enabled to drive the two propellers in opposite directions by means of one shaft, which I may make hollow for the passage of the cable.

I have not deemed it necessary in this application to show the connecting-wires and all the electro-magnets by which the various devices are operated, such being well known or within the province of the skilled mechanic. Neither have I shown the location of all the devices in the boat, that being a matter of judgment and convenience.

It will be understood that when the use of gas is spoken of as a motive power the gas is obtained from the gas flask or flasks in which the carbonic-acid gas, ammoniacal gas, compressed air, or other gas to propel and operate the boat is stored.

The specifications will be clearly intelligible if read in connection with other patents granted to me for improvements in torpedo-boats.

Having thus described my invention, what I claim is—

1. The combination, with the tubular propeller-shaft, of the exhaust-pipe from engine and the pipe leading from cable-coil, so that the telegraphic cable and the exhaust from the engine both pass through the propeller-shaft.

2. In combination with a torpedo-boat, a sectional or telescopic sight-rod, whereby the target is fitted to the extension of the telescopic tube by gas-pressure, substantially as described.

3. A telescopic sight or guide rod having a cylinder with ports for the admission of gas at or near the ends, a piston propelled in both directions by gas-pressure, and inclined rods or grooves, whereby the piston-rod is partially rotated in rising and falling, substantially as set forth.

4. The combination of cylinder a, tubular piston-rod d and its piston and inclined rods, and the target-rod b and target, as set forth.

5. The combination of the cylinder a, piston-rod d and piston, and the target-rod b, with the valve-rod f^1 and its valve, all substantially as shown.

6. The combination of the elevating and depressing cylinder, the tubular piston-rod, and a detachable sight-rod and target, constructed substantially as described, so that the target may be dropped overboard, as set forth.

7. A torpedo-boat provided with an automatic brake apparatus, substantially as de-

scribed, whereby the cable is permitted to pay out freely when the engine is in motion, but is checked when the engine stops, as set forth.

8. The combination, with the paying-out pipe of a torpedo-boat, of an automatic brake, operated by gas from the engine in one direction and by a spring or similar pressure in the other direction, as shown and described.

9. A friction-brake apparatus having a rubber pad, which is held against the cable by a spring when the engine is at rest, but is removed from the cable by the pressure of gas against a piston when the engine is in motion, substantially as set forth.

10. The combination of the cable-tube, the cylinder B″, constructed as described, the spring-piston and piston-rod, having rubber or equivalent friction-pad, and the gas-pipe *i*, all substantially as shown.

11. In a torpedo-boat, the combination of a tank or other device to contain alcohol in proximity to the gas-containing reservoir, a pipe to admit air to the same, and a receptacle to contain air under pressure and feed it slowly to the combustion-chamber, as shown and described.

12. In a torpedo-boat, the combination of an alcohol-reservoir, a receptacle for compressed air, and an electric device for lighting the alcohol or other combustible, as set forth.

13. The combination of the combustion-chamber and its coils, the compressed-air reservoir, and a pipe having a cock closed automatically, but opened by gas-pressure, so as to supply air to the combustion-chamber, substantially as shown.

14. The combination of combustion-chamber *m*, coil *p*, perforated pipe *r*, reducing-valve *s*, compressed-air reservoir and its pipe, and the cock *s′*, closed by spring-pressure and opened by gas-pressure, as set forth.

15. The combination, in a torpedo-boat, of a water-ballast compartment or chamber, having apertures for the free admission of water, and an air-escape cock, operated automatically in one direction and by gas-pressure in the other direction, substantially as shown.

16. The combination of water-ballast chamber, air-cock operated automatically in one direction and by gas-pressure in the other, and a gas-inlet pipe to expel the water, as described.

17. The combination of water-ballast chamber, air-cock, operated as described, gas-inlet pipe, and the slide-valve, operated by electrical connection with the cable, all substantially as shown.

18. The combination of water-ballast chamber B′, air-pipe H, with its cock, cylinder 33, having piston 34 and spring 35, slide-valve 36, operated by electro-magnets, as described, and the gas-pipes 37, 39, and 41, all substantially as shown.

19. The combination of two screw-propellers centered on the same shaft, one being rigidly and the other loosely attached, with an intermediate gear-wheel, suitably supported, whereby the propellers are driven in opposite directions, substantially as set forth.

20. The combination of propeller 3, rigidly attached to its shaft, propeller 2, revolving loosely on its shaft or sleeve 4, the stud 5, and the gear 6, meshing with both propellers, as shown and set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOHN L. LAY.

Witnesses:
GEORGE E. HAIGHT,
H. D. WINSOR.