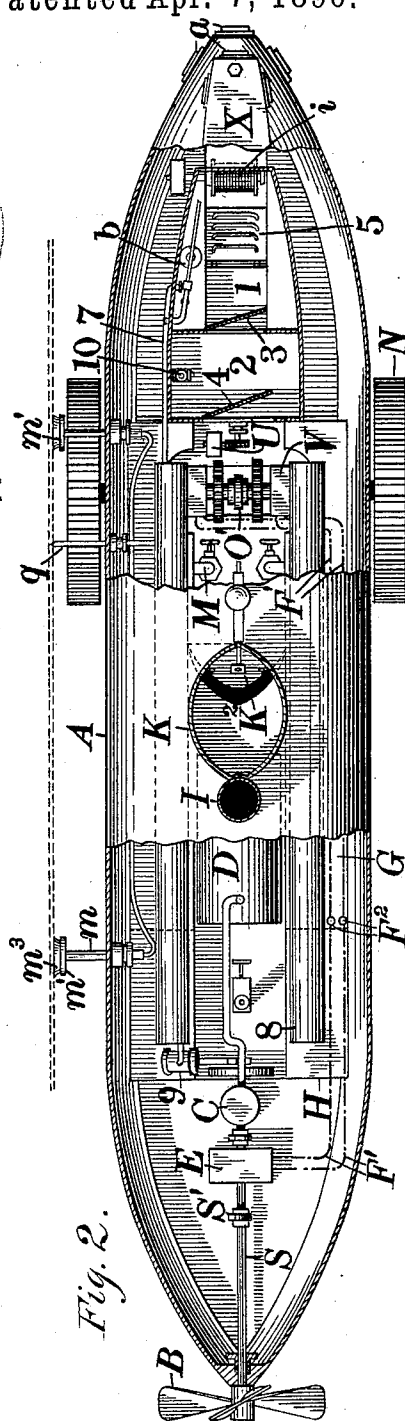
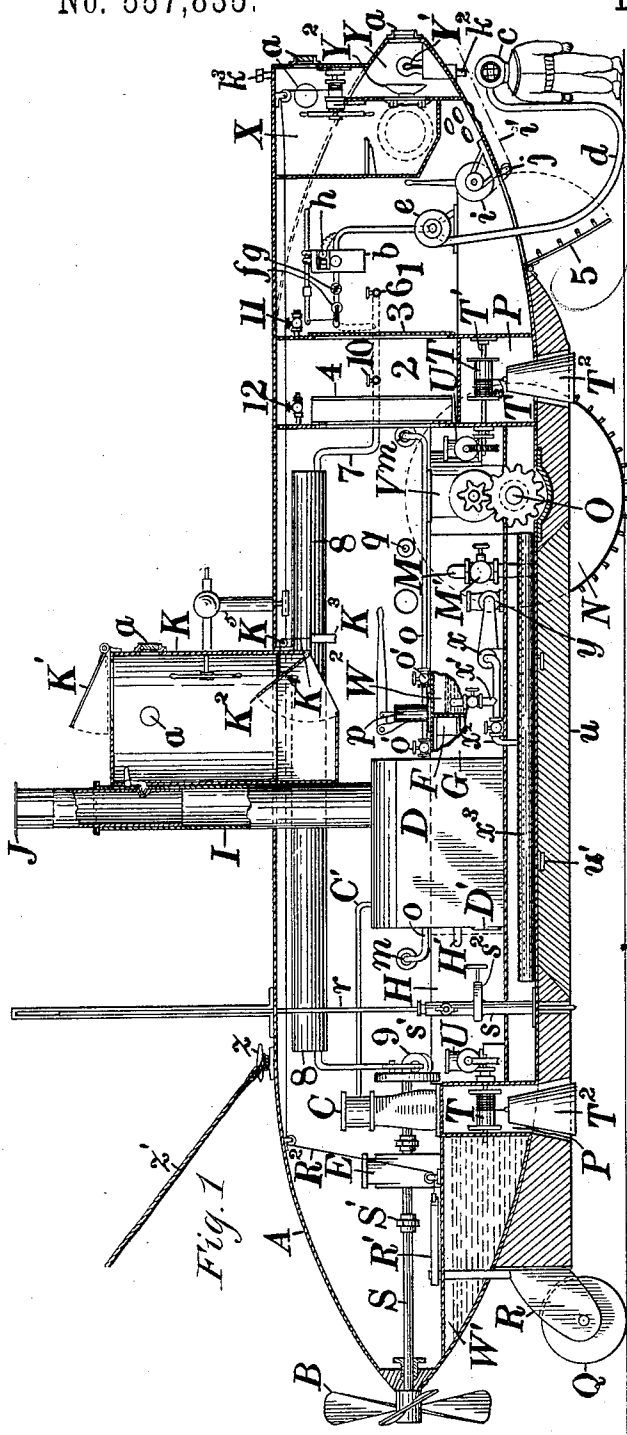


S. LAKE.
SUBMARINE LOCOMOTIVE.

No. 557,835.

Patented Apr. 7, 1896.



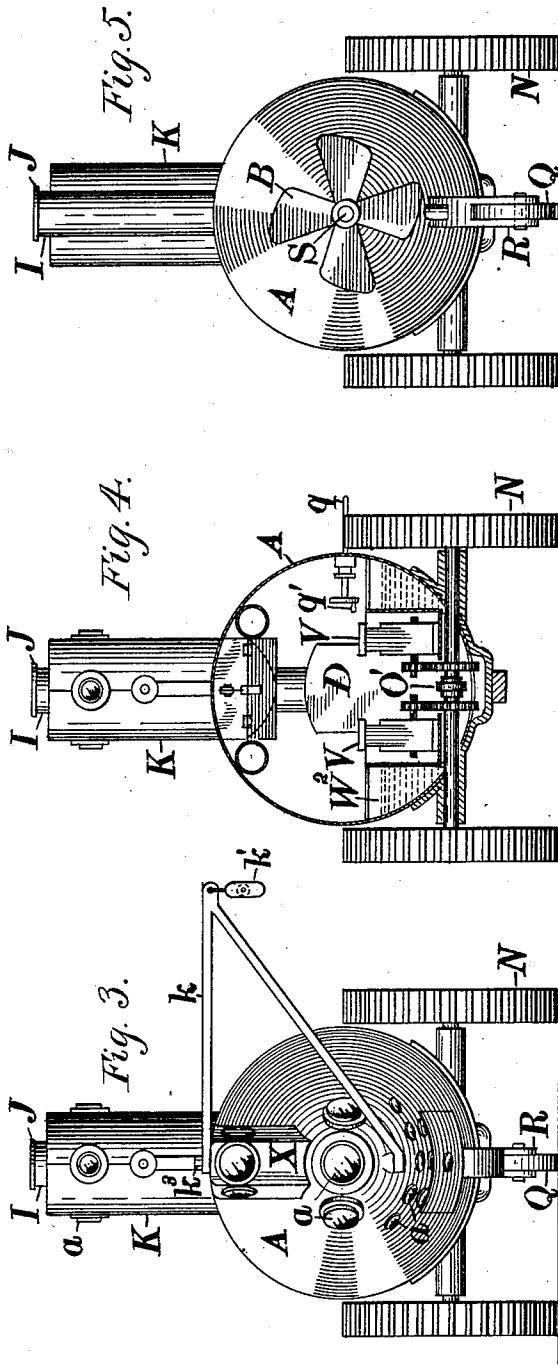
Attest.
Theodore Ferris
William H. Connor

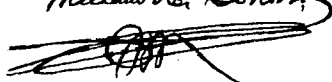
Inventor
Simon Lake, per
Henry J. Miller, Atty.

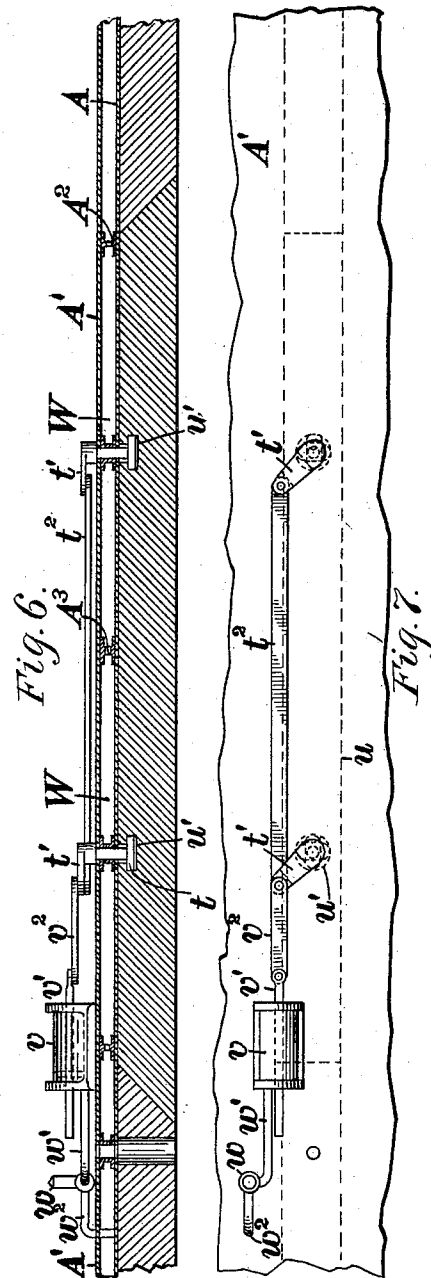
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Attest:
Theodore Ferris
Notary Public, Boston.




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Henry J. Miller, Atty.

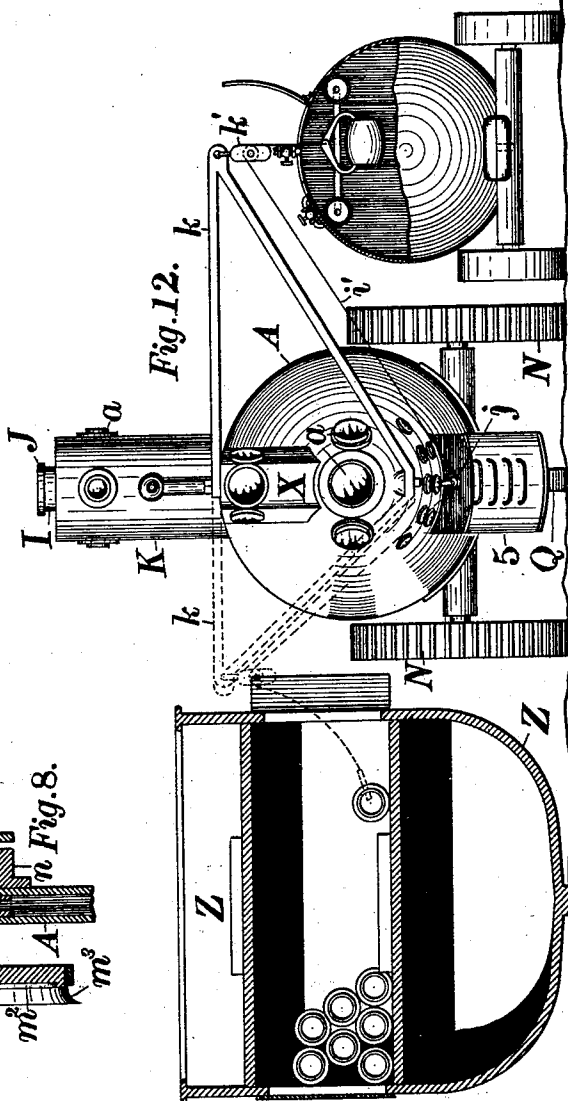
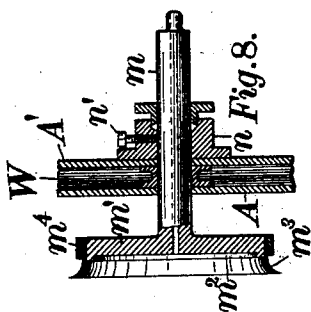
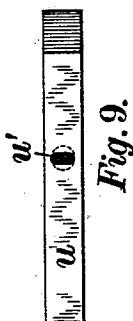
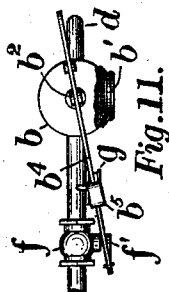
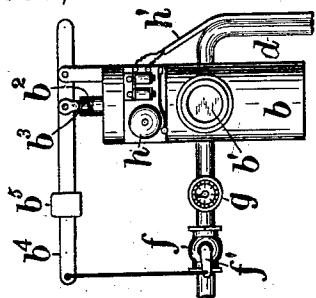
(No Model.)

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William B. Conover.
C. W. Stoddard

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Simon Lake, per
Henry J. Miller,
Atty.

UNITED STATES PATENT OFFICE.

SIMON LAKE, OF ATLANTIC HIGHLANDS, NEW JERSEY.

SUBMARINE LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 557,835, dated April 7, 1896.

Application filed November 25, 1895. Serial No. 570,043. (No model.)

To all whom it may concern:

Be it known that I, SIMON LAKE, a citizen of the United States, residing at Atlantic Highlands, in the county of Monmouth and State of New Jersey, have invented certain new and useful Improvements in Submarine Locomotives and Wrecking-Cars, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to an improvement in the submarine vessel described in my patent application, Serial No. 469,109, filed in the United States Patent Office April 5, 1893.

The objects of the invention are, first, to furnish means for direct communication and coöperation with divers working upon submerged wrecks, means for supplying them with air under the requisite pressure, and means for relieving them so as to obviate the necessity of going to the surface; second, to provide for securing the apparatus to the side of a sunken vessel when required, and to effect certain other improvements in the details of the apparatus.

The invention consists in the improvements hereinafter described, and specifically set forth in the annexed claims.

I have termed the vessel as embodying the present improvements a "wrecking-car" because of the normal operation in the performance of its several functions when resting firmly upon the water-bed.

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

Figure 1 is a side elevation of the apparatus with the outer shell and certain other parts in section at the center line, where hatched. Fig. 2 is a plan of the same with the end portions of the upper half of said shell and the top of the central pilot-house removed to expose the parts below the same. Fig. 3 is a front elevation of the apparatus. Fig. 4 is an elevation showing the outer shell in transverse section on the center line of the forward traction-wheel shaft, and Fig. 5 a rear elevation of the apparatus. Fig. 6 is a sectional elevation of a portion of the bottom of the shell, showing the keel in section and its sustaining and releasing mechanism in side elevation; and Fig. 7, a plan of the same. Fig. 8 is a longitudinal section of the hollow

sucker-bar and disk with a portion of the shell of the apparatus and the stuffing-box surrounding said bar. Fig. 9 is a plan of one end of the detachable keel. Fig. 10 is an elevation, and Fig. 11 a plan, of the pressure-regulating device for the diver's air-supply and speaking-tube. Fig. 12 is a transverse section of the apparatus at the side of a sunken vessel with a submerged car for receiving the cargo of said vessel. Figs. 6 to 11, inclusive, are upon a larger scale than the remaining figures, in which latter certain details are omitted to avoid confusion on account of the smallness of their scale.

The body of the wrecking-car is shown of cylindro-conoidal shape and is formed preferably of two concentric shells A and A', separated by the ribs A², constructed of I-beams having holes A³ therein at intervals to afford communication between the series of water tanks or compartments W thus formed, as indicated in Fig. 6.

The propeller-shaft S is shown formed in three separate portions, of which the outer section is projected through a stuffing-box at the rear end of the car to receive externally the screw-propeller B, the inner section is coupled to a steam-engine C, communicating with the steam-boiler D by means of the steam-pipe C', and the intermediate section is coupled to the armature-shaft of a convertible electric motor and dynamo E, connected by means of wires F' to the binding-posts F² of a system of storage batteries F, contained in the tanks or casings G therefor. The several sections of the propeller-shaft are connected together detachably by means of the couplings S', or preferably by clutches actuated by suitable shift-levers.

Oil-tanks H are provided adjacent to the boiler D, from which oil is supplied as fuel to the boiler-furnace by means of a suitable pipe, as H'. The boiler is provided in the usual manner with a smoke-stack I, which is adapted to be closed and sealed during submergence by a drop-cap J.

The pilot-house K is provided at the top with a door K', which may be held in the raised position indicated in Fig. 1 by any suitable means, and is provided in the bottom, immediately below the same, with a trap-door K², sustained in its open position, as shown in

said figure, by means of a counterbalance-weight K^3 , suspended by the cord K^4 , running over the pulley K^5 to said trap-door.

As the car is capable of floating upon the surface of the water when not performing the functions for which it is specially designed the propeller-shaft is ordinarily driven by the steam-engine C, the necessary ventilation and draft for the boiler-furnace being derived from the pilot-house K through its normally open doors K^1 and K^2 . It may be incidentally observed that in case of the shipping of a sea through the upper door K^1 in rough weather the weight of the water upon the inclined door beneath would counteract the weight of its counterbalance, and thus automatically close the door to prevent the further penetration of the water within the car.

During the propulsion of the car directly by the steam-engine the dynamo-electric machine E is permitted to run idly with the propeller-shaft; but in order to supply the storage batteries F the outer section of the propeller-shaft is disengaged from the adjacent intermediate section by means of the coupling S' when the machine E is driven as a dynamo by means of the steam-engine for generating electricity for such batteries.

When it is desired to submerge the car, its water-tanks W, W', and W'', which are preferably in direct communication with one another, are filled to the necessary extent by means of the cocks M' in the pipes M, connecting the tank W'' with the exterior of the car, the door K^1 of the pilot-house K closed, the cap J dropped to close the mouth of the smoke-pipe I, the furnace-door closed, and the steam-engine C uncoupled from the propeller-shaft, when the dynamo-electric machine E may be run as a motor for driving the propeller-shaft, the car then resting upon the forward traction-wheels N, carried by a transverse shaft O, and steering-wheel Q, journaled in a recess for the same in the rudder R.

In order that the car may preserve its trim during the process of submerging, its bottom is provided adjacent to each end with an external recess or chamber P, provided with a transverse rotary drum T', mounted upon a shaft T, projected through the wall of said chamber into the interior of the car and connected by suitable worm-gearing with an electric motor U, whereby the said drum is actuated to lower a weight T'', suspended therefrom by means of a suitable cable T³. Such weights being deposited upon the bottom, the valves M' are opened and the tanks filled sufficiently to nearly destroy the buoyancy of the car, when such cocks are closed and the drums T' rotated to wind up the cables T³ and thereby draw the car downward to the bottom. The final withdrawal of the weights from the bottom into their respective chambers imposes a sufficient load upon the car to render its traction-wheels efficient when positively driven.

The traction-wheel shaft O is preferably

formed in two independent sections connected together detachably at the center line of the car by means of a coupling O' or other suitable clutching device, each section being connected by suitable gearing with an electric motor V. Both sections of said shaft are normally coupled together and driven by one or both motors, depending upon the power required and the speed to be attained, the second motor running idly when only one is supplied with power from the storage batteries F; but in cases wherein it is desired to make a sharp turn with the car the two sections of the shaft may be uncoupled and driven independently in opposite directions.

The car is constructed with a second pilot-house X at the extreme forward end, immediately above and in the rear of the compartment Y, containing the electrical search-light Y'. The pilot-houses K and X are provided each with suitable inspection-windows α and with a steering-wheel connected to the tiller R' of the rudder R by means of a suitable rope or chain R². The search-light compartment is provided also upon the front and sides with windows or dead-lights α and at the rear with a door for access thereto, sustaining the reflector Y².

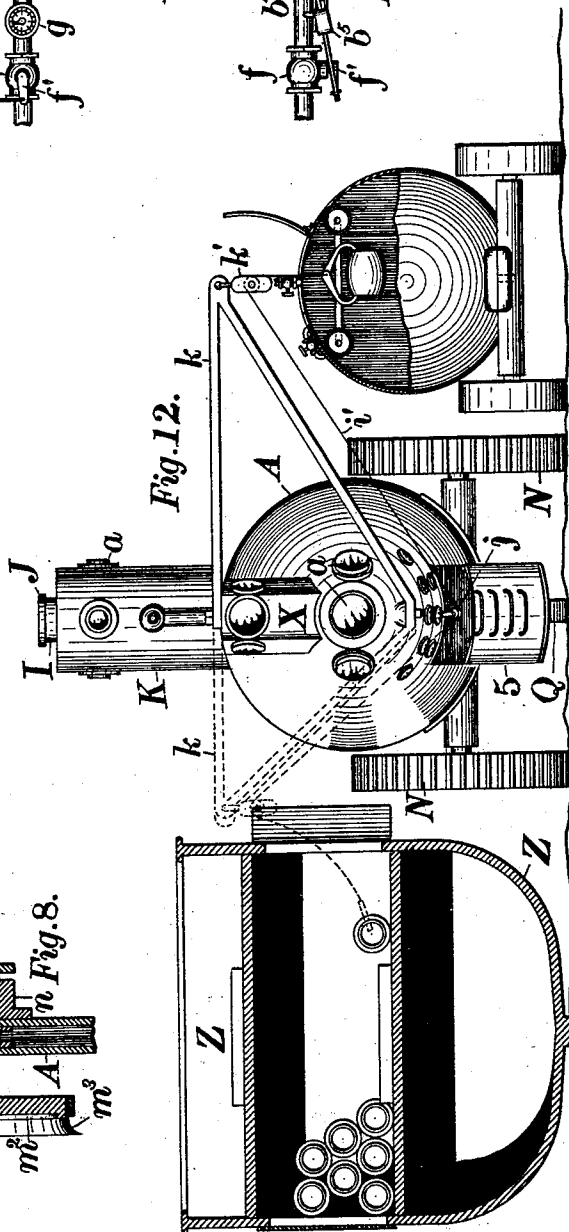
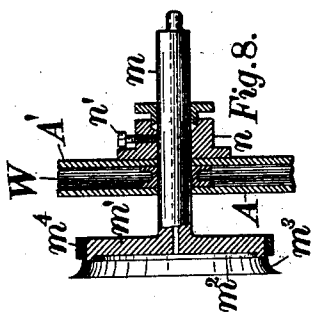
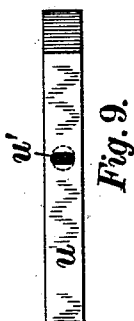
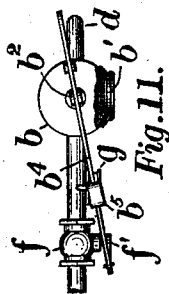
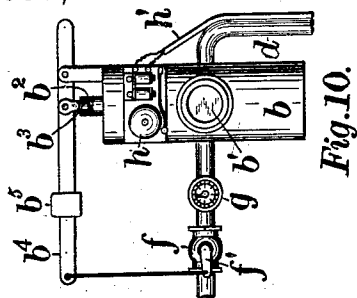
At the forward end of the car, immediately in the rear of the pilot-house X, are the primary and secondary or auxiliary diving chambers or compartments 1 and 2, respectively, the intermediate partition being provided with a door 3 for access from the secondary to the primary chamber, and the rear wall of the chamber 2 being similarly provided with a door 4 for access thereto from the body of the car. A door 5 is provided also in the bottom of the chamber 1 for ingress and egress to and from the said chamber outside the car.

The diver having entered the compartment 1 and closed the door 3, the air-pressure therein is equalized with that of the external water-pressure by opening a cock 6 in the air-supply pipe 7, leading from a compressed-air reservoir 8, which is supplied with air under pressure by means of an air-pump 9, connected with and actuated by the steam-engine C. When such equalization of internal and external pressures is completed, as indicated by suitable gages, (which are omitted from the present drawings,) the outer door 5 is released and allowed to drop open, with the rounds or cross-bars upon its inner side forming a ladder for the use of the diver, as indicated in Figs. 1 and 2. In case the entrance of a second diver or other operator into such diving-compartment is required, the auxiliary chamber 2 is entered and the door 4 closed, when the air-cock 10 is opened to equalize the air-pressure in such chamber with that of the compartment 1. The return from the compartment 1 to the interior of the car is effected by establishing communication with the compartment 2 by means of an air-cock 11 for equalizing their respective pressures, so as to permit the door 3 to be opened,

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Atty.

laterally-projecting release arms or levers l' , connected together by a link l^2 and to the piston-rod v' of a hydraulic cylinder v by a connecting-rod v^2 , as indicated in Figs. 6 and 7.

- 5 The opposite end of said hydraulic cylinder is connected to the discharge-pipe w' of a safety-valve w , having its inlet-pipe w^2 in direct communication with the exterior of the car adjacent to the keel. The safety-
10 valve w may be set to blow off at any required external water-pressure, its discharge through the pipe w' into the adjacent end of the hydraulic cylinder v operating to shift the levers l' to drop off the portion u of the
15 keel, the loss of which is designed to restore the buoyancy of the car sufficiently to permit it to rise to the surface.

In the ordinary operation of the apparatus the rotary drums T' are unwound to deposit
20 the weights T^2 again upon the bottom and permit the car to rise to the surface by the buoyancy thus restored upon an even keel, after which the buoyancy is further increased to support the additional weight of the car imposed by the weights T^2 when raised to
25 their normal positions by means of a suitable pump x , connected to an electric motor y and having one branch of its inlet-pipe x' connected to the water-tank W^2 and another
30 branch x^2 connected to a perforated pipe or conduit x^3 beneath the floor of the car. Each of such branches of the inlet-pipe is provided with a suitable valve in order that
35 when not engaged in pumping water from the water-tanks the pump may be employed in expelling the foul air accumulating at the bottom of the car.

In order to illustrate more fully the uses to which the wrecking-car as above described is
40 adapted, the same is illustrated in Fig. 12 at the side of a submerged vessel Z in the operation of transferring the cargo therefrom by means of the crane k to the interior of a submarine freight-car formed of a hollow tank
45 similar in shape to the wrecking-car A and similarly provided with supporting-wheels.

It will thus be seen that the power and apparatus for handling the cargoes of sunken vessels may, by the present invention, be applied
50 directly to the hold of such vessels and the transfer made to the submerged freight-car adjacent thereto under conditions which are invariably similar to those to be met with under cover upon the shore and which
55 are wholly independent of the state of the weather, tides, &c., to which floating wrecking-vessels are liable, and the work upon such wrecked vessels may therefore be carried on to completion without the interruptions which have been invariably met with
60 heretofore in such operations.

I have not claimed, broadly, herein the submarine structure provided with supporting-wheels for sustaining it when moving upon
65 the water-bed, as the same is made the subject of certain claims in my said copending application, Serial No. 469,109.

Having thus set forth the nature of the invention, what I claim herein, and desire to secure by Letters Patent, is—

70 1. A submarine wrecking-car provided with a transverse shaft formed in two sections coupled together detachably and provided each at its outer end with a traction-wheel exterior to said car, a supporting and steering
75 wheel projected from the bottom of said car and operated from within the same, a system of storage batteries contained within said car, and electric motors connected to said storage batteries and coupled independently to the
80 two sections of said transverse traction-wheel shaft and adapted to rotate the same in opposite directions, as and for the purpose set forth.

2. A submarine wrecking-car provided with 85 a detachable keel, a safety-valve having its inlet connected with the exterior of the car, and means operated by the said safety-valve for automatically disengaging the said keel, as and for the purpose set forth. 90

3. A submarine wrecking-car provided with a detachable keel, a safety-valve having its inlet connected with the exterior of the car, a hydraulic cylinder connected at one end with the discharge of the said safety-valve, 95 and a piston within the said cylinder connected to release-levers for the said keel, as and for the purpose set forth.

4. A submarine wrecking-car provided with a detachable keel formed with shouldered recesses in its upper side, buttons projected
100 downward through the car with their heads locked normally within the said recesses in the keel and provided with laterally-projecting release-levers within the said car, a safety-
105 valve having its inlet connected with the exterior of the said car, a hydraulic cylinder connected at one end with the discharge of said safety-valve, and a piston within said cylinder connected to the said release-levers, 110 as and for the purpose set forth.

5. In a submarine wrecking-car provided with means for supporting and steadying it when resting upon the water-bed, and a diving-compartment having a bottom door and
115 means for supplying said compartment with compressed air at the pressure of the surrounding water, the combination, with hoisting mechanism fixed within said diving-compartment, and means for actuating the same, 120 of a crane pivoted upon the exterior of said car, and a line leading from said hoisting mechanism through said door of the diving-compartment to said crane, as and for the purpose set forth. 125

6. In a submarine wrecking-car provided with means for supporting and steadying it when resting upon the water-bed, and a diving-compartment having a bottom door and
130 means for supplying said compartment with compressed air at the pressure of the surrounding water, the combination, with hoisting mechanism fixed within said diving-compartment, and means for actuating the same,

of a crane pivoted detachably upon the exterior of the said car, and a line leading from said hoisting mechanism through said door of the diving-compartment to said crane, as and for the purpose set forth.

7. A submarine wrecking-car provided with a diving-compartment having a bottom door and provided with means for supplying the same with compressed air at the pressure of the surrounding water, a combined air-supply and speaking-tube connecting and affording communication between the said diving-compartment and a diver's helmet, as and for the purpose set forth.

8. A submarine wrecking-car provided with a diving-compartment having a bottom door and provided with means for supplying the same with compressed air at the pressure of the surrounding water, a pressure-regulator secured within the said diving-compartment connected with the air-supply pipe, and a combined air-supply and speaking-tube connecting the said pressure-regulator with the diver's helmet, as and for the purpose set forth.

9. A submarine wrecking-car provided with a diving-compartment having a bottom door and provided with means for supplying the same with compressed air at the pressure of the surrounding water, a pressure-regulator secured within the said diving-compartment connected with the air-supply pipe and comprising a cylinder containing a plunger, a lever adjacent thereto and connected to the said plunger, a stop-valve in the air-supply pipe having an actuating-arm upon its stem connected with the said lever, and a flexible tube connecting the said pressure-regulator with a diver's helmet, as and for the purpose set forth.

10. A submarine wrecking-car provided with a diving-compartment having a bottom door and provided with means for supplying the same with compressed air at the pressure of the surrounding water, a pressure-regulator secured within the said diving-compartment connected with the air-supply pipe and provided with means for regulating the flow of air into the same and having an aperture in one side closed by means of a vibratory diaphragm, and a combined air-supply and speaking-tube connecting the said pressure-regulator with a diver's helmet, as and for the purpose set forth.

11. A submarine wrecking-car provided with a hollow bar projected through the wall of the car without the same and formed at its outer end with a disk provided around the edges with a yielding packing, a stuffing-box in the interior of said wall for excluding the water around the said bar, an air-pump, and a connection from the said air-pump to the inner end of the said hollow bar, as and for the purpose set forth.

12. A submarine wrecking-car provided with a hollow bar projected through the wall of the car without the same and formed at its outer end with a disk, a continuous rubber band clamped around the edges of the said disk and provided with flaring thin outer edge, a stuffing-box in the interior of said wall for excluding water around the said bar, an air-pump, and a connection from the said air-pump to the inner end of the said hollow bar, as and for the purpose set forth.

13. A submarine wrecking-car provided with a hollow bar projected through the wall of the car without the same and formed at its outer end with a disk, a continuous flaring rubber band with thin outer edge clamped around the edge of the said disk, a stuffing-box in the interior of said wall for excluding water around the said bar, a transverse set-screw piercing to the body of the said stuffing-box to retain the said bar in position, an air-pump, and a connection from the said air-pump to the inner end of the said hollow bar, as and for the purpose set forth.

14. A submarine wrecking-car constructed with a pilot-house projected from the body of the same, an upper air-door in said pilot-house above the body of the car, and a trap-door in the bottom of said pilot-house beneath said upper door, said trap-door being held normally in an inclined open position by means of a counterbalance and adapted to be automatically closed by the inflow of water through said upper door, as herein shown and described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

SIMON LAKE.

Witnesses:

HENRY J. MILLER,
WILLIAM BATSON.

It is hereby certified that in Letters Patent No. 557,835, granted April 7, 1896, upon the application of Simon Lake, of Atlantic Highlands, New Jersey, for an improvement in "Submarine Locomotives," an error appears in the printed specification requiring correction as follows, to wit: All matter from line 119, page 3, to line 124, same page, both inclusive, should be stricken out, the same having been erroneously printed as a part of the specification; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 14th day of April, A. D. 1896.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

S. T. FISHER,
Acting Commissioner of Patents.

Correction in Letters Patent No. 557,835.

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