

No. 751,609.

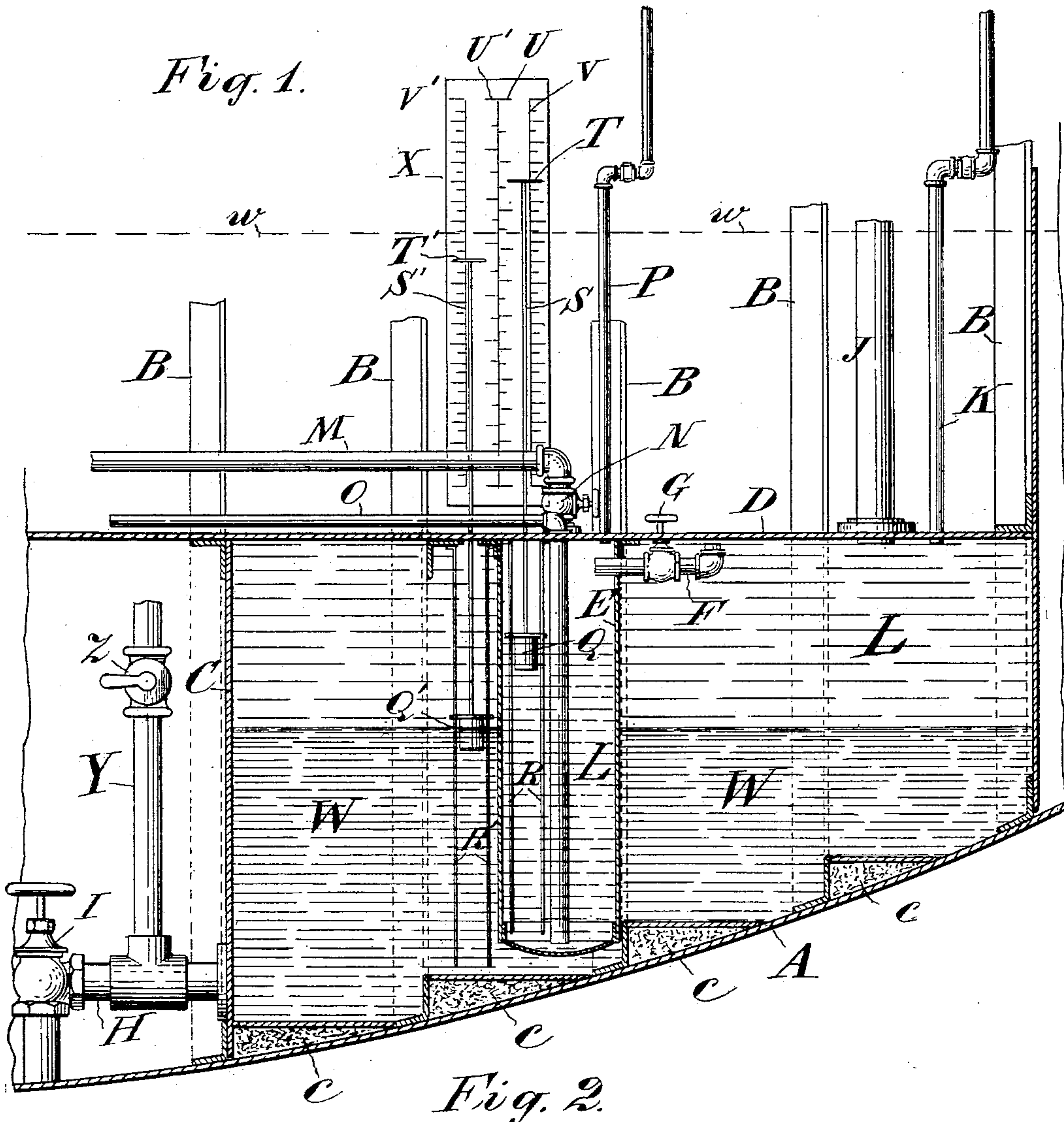
PATENTED FEB. 9, 1904.

F. T. CABLE & L. Y. SPEAR.

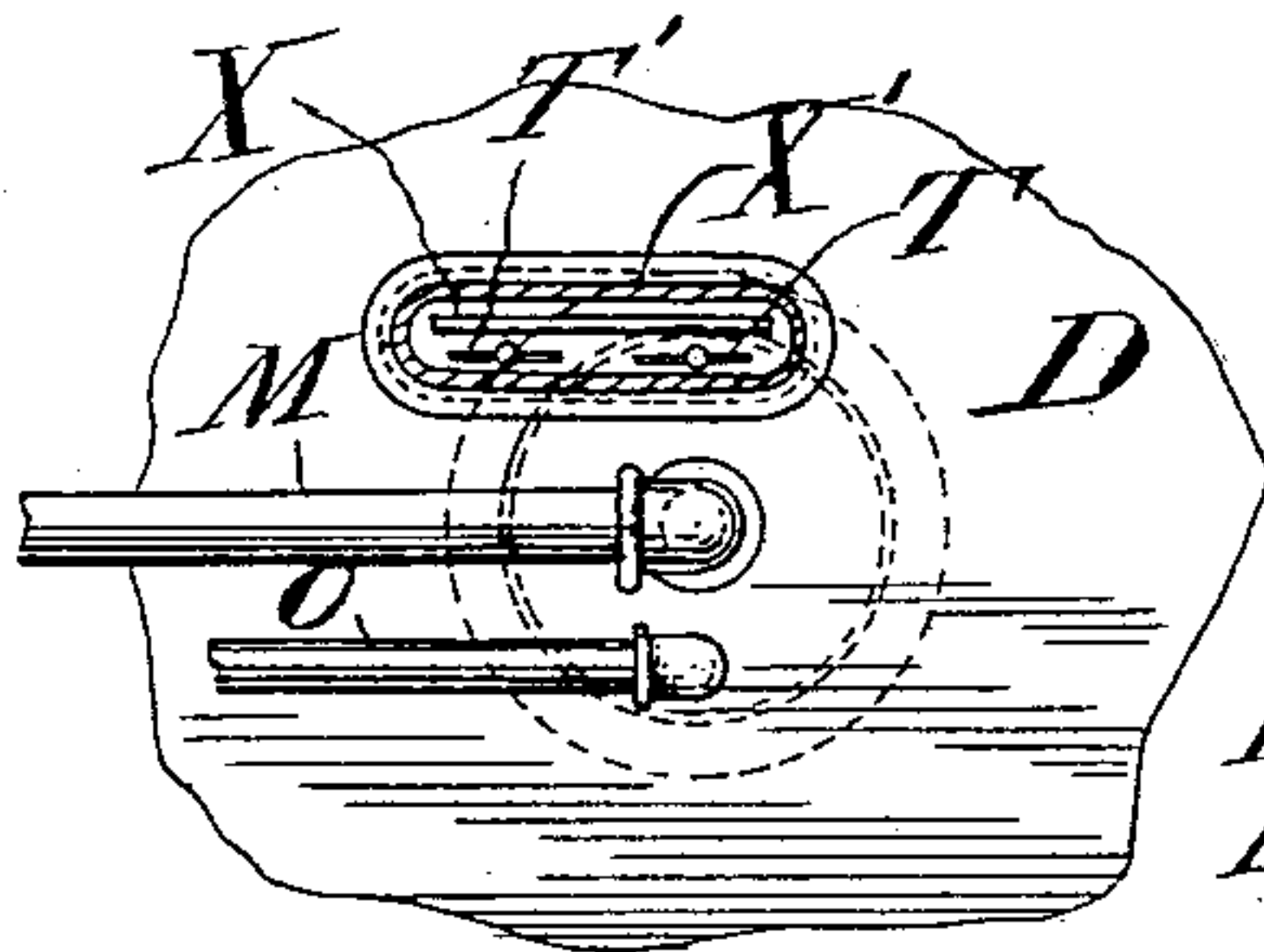
TANK FOR LIQUID FUEL.

APPLICATION FILED JUNE 6, 1903.

NO MODEL.



*Fig. 2.*



Witnesses.

*J. H. Aliman*  
*J. A. Cornell*

Inventors.  
*Frank T. Cable*  
*Lawrence Y. Spear*

*by Henry Connell*  
Attorney



# UNITED STATES PATENT OFFICE.

FRANK TAYLOR CABLE, OF NEW SUFFOLK, AND LAWRENCE Y. SPEAR, OF GREENPORT, NEW YORK, ASSIGNORS TO ELECTRIC BOAT COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

## TANK FOR LIQUID FUEL.

SPECIFICATION forming part of Letters Patent No. 751,609, dated February 9, 1904.

Application filed June 6, 1903. Serial No. 160,363. (No model.)

*To all whom it may concern:*

Be it known that we, FRANK TAYLOR CABLE, residing at New Suffolk, and LAWRENCE Y. SPEAR, residing at Greenport, in the county of Suffolk and State of New York, both citizens of the United States, have jointly invented certain new and useful Improvements in Tanks for Liquid Fuel and the Like, of which the following is a specification.

10 This invention relates to holders mainly for combustible liquids—such as gasoline, for example—to be used on vessels for fuel for operating internal-combustion engines and for similar purposes; and the invention has for its object, in part, to provide any vessel, and particularly a submergible or submarine boat, with means for safely carrying and controlling the delivery of any liquid to be utilized or consumed which has a specific gravity different from that of water, in part to provide means for automatically compensating with water the weight of such liquid expended, whereby the center of gravity and total weight of the boat will not be changed, and 25 in part to provide means whereby the compensating water and the supply of liquid in the tank will not be mechanically commingled when the boat or vessel rolls or pitches in a seaway.

30 In the accompanying drawings, which illustrate the adaptation of the invention to a submarine boat and which show the main tank structurally built into the hull of the boat and intended to contain a liquid lighter than water, Figure 1 is a vertical section through the main and inner tanks, the plane of the section being along the longitudinal axis of the boat. Fig. 2 is a fragmentary plan of a part of the tank. In Fig. 1 the gages are represented somewhat diagrammatically for convenience of illustration, their casing being omitted.

45 In Fig. 1, A designates the bottom plates of the hull of the boat, which is here supposed to be a submarine boat of the well-known spindle shape, and B represents transverse structural members of the boat's frame. The main tank C is built into the boat, as here-

in shown, and its top or cover D is below the water-level, (indicated by the dotted line *w*.) 50 Within the tank, W designates water, and L designates the liquid of less specific gravity than water—as gasoline, for example. Between the frames B in the tank the bottom is represented as partially leveled up with concrete *c*; but this is not an essential to the present invention. In the main tank C is a lesser tank E, which may be called the “delivery-tank.” This lesser tank will be located, preferably, so that its center of gravity coincides 55 with the center of gravity of the main tank C, excluding the tank E; but where delicate adjustment is not required this particular location is not very important. The capacities of the tanks C and E are such that the sum 60 of the volumes of the tanks C and E bears the same proportion to the volume of the tank C alone that the specific gravity of the water of flotation W bears to the specific gravity of the liquid L to be consumed or expended. The tanks C and E are connected 65 at their tops by a pipe F, controlled by a stop-cock G from above the cover D, and the tank C is connected with the water of flotation by a pipe H, controlled by a sea-valve I. 70 75

J is the pipe for filling the tank C with the liquid L, and K is the vent of said tank.

M is a pipe extending nearly to the bottom of the tank E, through which pipe the liquid L is drawn by a pump or other means to the 80 point of consumption, and N is a stop-cock therein.

O is an overflow-pipe to return to the tank E any excess of liquid drawn off through the pipe M. The tank E is provided with a vent-pipe P to supply air to the tank E as the liquid is drawn therefrom. 85

The tanks C and E are provided with gages to indicate visually the quantity of the liquid L therein at any given time. These consist, 90 as herein shown, each of a guided float in the tank, said float having a stem which plays through an aperture in the tank-cover and carries an indicator or pointer traversing a suitably-calibrated upright scale. The gage for 95 the tank E consists of a float Q, guided on



rods R and having such specific gravity that it will just float in the liquid L in the tank. This float has a stem S, carrying a pointer T, which traverses two scales U and V on an upright plate X. The scale V is calibrated from the bottom upward, so as to show at all times by the pointer T the volume—say in gallons—of the liquid L in the tank E. The gage for the main tank C is constructed similarly. It comprises a float Q' in the tank guided on rods R' and having such specific gravity that it will just float on the water W that may be on the tank. This float has a stem S', carrying a pointer T', which latter traverses two scales U' and V' on the plate X. The scale V' is calibrated from the top downward, so as to show at all times the volume of the liquid L in the tank C as the float Q' rises or falls with the water W in the tank. It will be noted that the two middle scales U and U' are traversed by the respective inner ends of the pointers T and T', and these middle scales will be so calibrated and have their numbered divisions so arranged that when the pointers indicate the same numbers on these respective scales the total weight of the system of liquid L and water W is the same as the total weight of the combined capacity of the two tanks C and E of the liquid L. The exact calibration will of course depend upon the shape of the main tank C.

The operation is as follows: Start with the tanks C and E empty and the sea-valve I closed. The vent K is opened and the tank C completely filled through pipe J. The vent K is now closed and the vent P opened. The cock G is also opened, so as to connect the two tanks. The filling is now continued at the inlet J until the tank E is also full of the liquid, when the cock G will be again closed and the sea valve or cock I opened. This puts the contents of the tank C under pressure and assures its being entirely full of the liquid L and water W at all times, and this pressure also insures against the mechanical commingling of the two liquids when the boat or vessel pitches or rolls in a seaway. When it is desired to consume the liquid L, the cock N is opened and the liquid withdrawn through the pipe M by any suitable means, the amount consumed being indicated on the scale V. At proper intervals, the frequency of which depends upon the necessity for fine adjustment, the cock or valve G is opened and liquid under pressure is forced from the main tank C into the tank E until the scales indicate that the total weight of the system is restored. Upon shutting off the supply-pipe M the same operation is performed. Thus at starting the tanks C and E are full of the liquid L. During the consumption of this liquid the main tank C will always be full of either the liquid L or this liquid and water W, and the tank E will be full of the liquid L and air, and when the liquid shall have been completely consumed or expended the tank C

will be full of water and the tank B full of air only. To refill the tanks with the liquid L, the water must be first removed from the tank C, and this may be done by closing the sea-valve I and pumping out the water through a pipe Y, provided with a stop-cock Z, or the water may be blown out by compressed air through the sea-valve.

As the stems of the gage-floats must play freely through the top or cover D of the tanks, the scale-plate X will be inclosed in a strong casing X', (seen in Fig. 2,) fixed tightly to the cover D, so that it may contain the liquid L. This casing may be of glass or be partly of metal and partly of glass. The gage devices are indicated rather diagrammatically in Fig. 1, so that they may be seen clearly in the view; but in order that they may not interfere with the pipes M and O it will be best in practice to arrange the several parts as shown in Fig. 2. This special arrangement, however, has nothing to do with our invention. The pipes and gages will, in fact, vary in position with the disposition of the various parts in the boat.

Obviously the present invention is not limited to the tank C being structurally a part of the boat, nor to the liquid which is to be expended or consumed being lighter than water so long as it differs in its specific gravity from water and is not miscible with water; nor is it material to this invention that the liquid contained in the tanks shall be consumed or expended for any special purpose.

Having thus described our invention, we claim—

1. In means for the purpose specified, a main tank having an inlet for a liquid not miscible with water, and a cock-controlled inlet for water under pressure, a lesser delivery-tank inside of said main tank and having a cock-controlled connection with the latter for supplying the lesser tank, and a cock-controlled outlet-pipe from the inner tank through which the liquid is withdrawn for use.

2. In means for the purpose specified, a main tank having an inlet at its top for a liquid not miscible with water and of less specific gravity than the latter, and having a cock-controlled inlet for water under pressure, a lesser delivery-tank inside of said main tank and having a cock-controlled connection with the latter at the tops of both, whereby the larger tank supplies the lesser with said lighter liquid, and a cock-controlled outlet-pipe from said inner tank through which the liquid is withdrawn for use.

3. In means for the purpose specified, a main tank having an inlet for a liquid not miscible with water and a cock-controlled inlet for water of flotation under pressure, a lesser delivery-tank inside of said main tank and having a cock-controlled connection with the latter for supplying the lesser tank, and a cock-controlled delivery-pipe depending into said inner tank, the relative capacities of the two



tanks being such that the sum of the volumes of the two tanks bears the same proportion to the volume of the main tank alone, that the specific gravity of the water of flotation bears to the specific gravity of the liquid to be expended.

4. In means for the purpose specified, a main tank having an inlet at its top for a liquid to be expended, said liquid being of less specific gravity than the water of flotation and not miscible therewith, and said tank having also a cock-controlled inlet for water of flotation under pressure, an inner and lesser delivery-tank having a cock-controlled connection with the main tank for supplying the inner tank from the main tank, a cock-controlled delivery-pipe connected with the inner tank, and automatic volumetric gages on the respective tanks, to show at all times the volume of the liquid remaining therein.

5. In means for the purpose specified, the combination with the main tank having a filling-inlet for a liquid not miscible with water

and a cock-controlled inlet for water of flotation under pressure, and the inner delivery-tank connected with the main tank at its top for a supply of the said liquid and having an outlet for delivery of said liquid for use, of the gage devices comprising the upright plate X having on it the four scales U, U', and V V', the casing inclosing said plate, the float in the inner tank adapted to float on the liquid to be suspended, its stem, the pointer on said stem traversing the scales U and V, the float in the main tank adapted to just float on the water therein, its stem, and the pointer thereon traversing the scales U' and V', substantially as set forth.

In witness whereof we have hereunto signed our names, this 2d day of June, 1903, in the presence of two subscribing witnesses.

FRANK TAYLOR CABLE.

LAWRENCE Y. SPEAR.

Witnesses:

WILLIAM R. SANDS,

FRANK L. BRAKE.