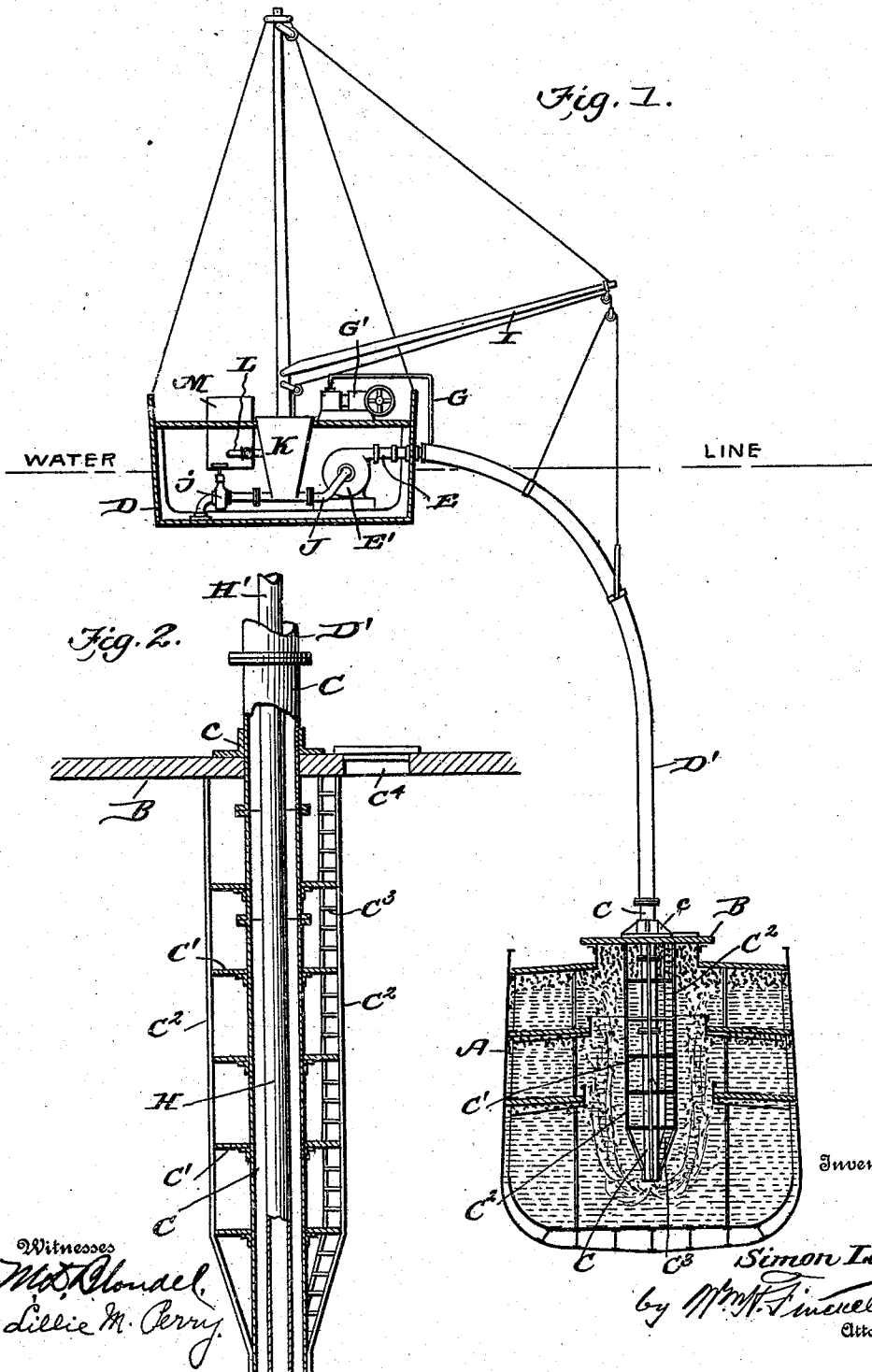


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METHOD OF RAISING SUNKEN VESSELS.
APPLICATION FILED JULY 6, 1907.

908,016.

Patented Dec. 29, 1908.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 3.

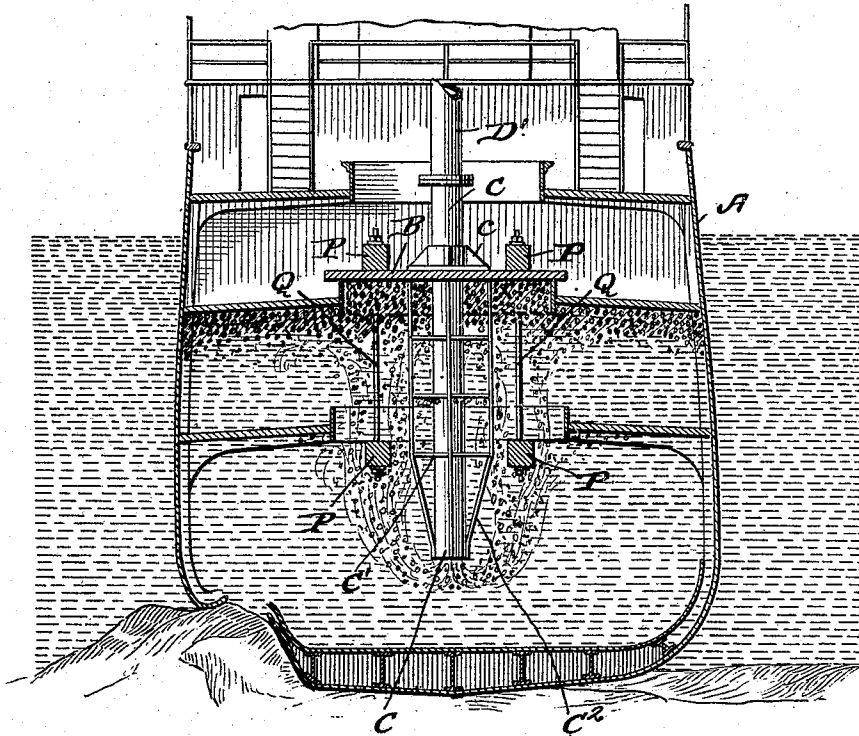
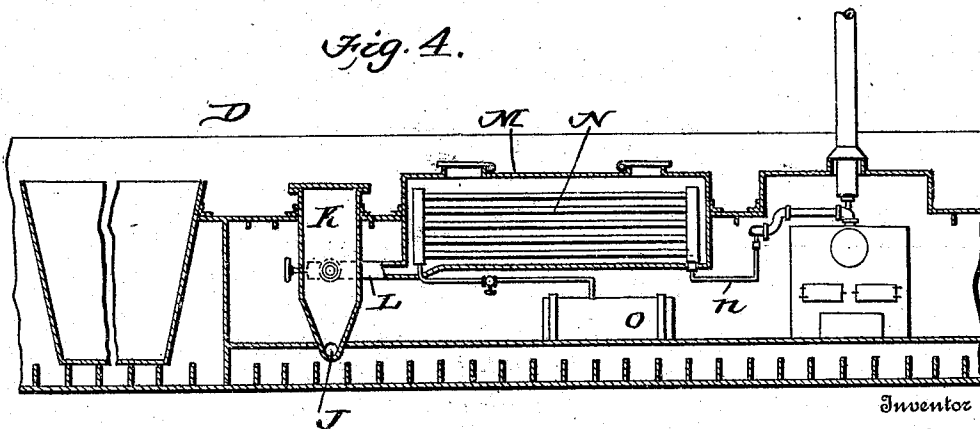


Fig. 4.



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UNITED STATES PATENT OFFICE.

SIMON LAKE, OF BRIDGEPORT, CONNECTICUT.

METHOD OF RAISING SUNKEN VESSELS.

No. 908,016.

Specification of Letters Patent.

Patented Dec. 29, 1908.

Original application filed December 12, 1906, Serial No. 347,566. Divided and this application filed July 6, 1907. Serial No. 382,470.

To all whom it may concern:

Be it known that I, SIMON LAKE, a citizen of the United States, and a resident of Bridgeport, in the county of Fairfield and State of Connecticut, temporarily residing in London, England, have invented a certain new and useful Method of Raising Sunken Vessels, of which the following is a full, clear, and exact description.

The object of this invention is to provide an economical and efficient method of raising sunken vessels.

The invention consists in rapidly pumping into a sunken vessel, after closing the hatchways and other openings in an upper deck thereof, a fluent buoyant material which will adhere more or less tenaciously to the under surface of such deck and its closures and become solidified, and thereby in effect seal the vessel so that the water may be displaced by additional quantities of such buoyant material, or by compressed air, or by pumping the water out, as I will now proceed to describe more particularly and finally claim.

The material is preferably cork in the form of blocks, of a size that can be readily handled in a centrifugal or other force pump, the cork being first coated or boiled in paraffin or other suitable substance to make it more impervious to water, and which solidifies in water. Enough material is forced into the vessel, together with a suitable quantity of air, to displace the water and permit the flotation of the vessel. The cork and paraffin, when first forced into the vessel, will rise to the surface and form a solid mass which serves as a seal to close any openings or rents, especially surrounding the hatches, and after becoming hard, will form a solid body, of light weight, that will adhere to the under sides of the decks and sides of the vessel and seal it for subsequent operations.

As before stated the present improvement consists in the method of raising or removing stranded vessels and is a division of an application filed by me on December 12th, 1906, Serial No. 347,566 and subsequently issued as Patent No. 867,983, dated October 15, 1907.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 illustrates in vertical section and otherwise the practical application of my invention. Fig. 2 is an enlarged sectional elevation of the lower ends of the pipes that are

extended into the sunken vessel, and also illustrates the attachment of the pipes to a supplemental hatch employed for the double purpose of closing the hatch openings and supporting the pipes. Fig. 3 is a vertical cross-section of a submerged vessel, showing the manner of floating a ship where the bottom or side has been torn, and where it is impossible to entirely close or repair the opening. Fig. 4 is a vertical longitudinal section of a portion of a surface vessel equipped with the machinery employed for heating the paraffin and mixing it with the buoyant material.

In the practical application of my invention, and in the case of a vessel having sunk in a considerable depth of water, I employ a suitable surface vessel having the necessary machinery for forcing the material into the sunken vessel which is done through pipes extending to the latter, and which are securely fastened to the sunken vessel by a supplemental hatch cover which is placed in position by divers. After this initial step, the material is forced into the vessel in sufficient quantities to form a lining under the deck which strengthens the latter as well as the sides of the vessel. Should the vessel be of such construction as will permit of the water being forced therefrom, a quantity of air is forced into the hold, together with a suitable quantity of the material to displace enough water to permit of the flotation of the vessel, but, should the vessel be of light construction in which the external pressure would be liable to crush the sides or deck when relieved of the water within the hold, or where the deck is liable to lift through internal pressure, I continue to force enough of the buoyant material into the hold until the necessary amount of water therein has been displaced to allow the vessel to float. In cases where the vessel has been injured by contact with a rock or other hidden object, I force enough of the buoyant material into the hold to completely cover the opening or openings, and this material, after becoming thoroughly hard, will prevent the ingress of water through such opening or openings.

Fig. 1 illustrates the application of my invention to a vessel that has been sunk in a considerable depth of water, in which case one of the hatch openings of the sunken vessel A, is closed by a supplemental or temporary hatch B, to which is secured a pipe C

which is connected to the hatch by a flange or collar *c*.

In practice the hatch is constructed upon the surface vessel *D*, the pipe connected thereto, and both lowered into position upon the submerged vessel so that the pipe *C* will extend down into the lower hold. Before being lowered into position, however, the lower end of the pipe is constructed with a series of, preferably, circular plates or platforms *C*¹, which are braced by stay rods *C*², and which form a series of working platforms for the divers when sent into the hold. The platforms are connected by a suitable ladder *C*³, and entrance into the hold is had through a hatch opening *C*⁴ constructed into the hatch *B*.

To the upper end of the pipe *C*, is connected a flexible tube *D*¹, whose upper end is connected to a collar secured to the projecting end of the discharge pipe *E*, of a centrifugal or other force pump *E*¹, located upon the surface vessel, and connected to the upper end of the flexible tube *D*¹, is an air discharge pipe *G*, extending from an air pump *G*¹, also located upon the surface vessel.

Arranged within the pipe *C*, is a pipe *H*, of somewhat smaller diameter than the former, which provides an annular space throughout the entire length of the pipe, and to the upper end of this pipe is connected a flexible tube *H*¹, whose upper end is connected to, and communicates with the discharge pipe *E*, of the pump *E*¹, and through which the buoyant material is forced into the vessel.

In practice, suitable devices are employed for supporting the pipes *D*¹ and *H*, the present construction being shown as a crane *I*.

To the pump *E*¹, is connected a pipe *J*, which leads to the open sea, and has a cutoff valve *j*, adjacent the inlet end, and interposed in the pipe between the said valve and pump, is a hopper *K*, designed for the reception of the solid and liquid buoyant material which is pumped into the vessel. Connected to the hopper is a valve pipe *L*, extending from a tank *M*, illustrated most clearly in Fig. 4 of the drawings, which is intended to hold the paraffin or other liquid buoyant material from which it is conducted to the hopper *K*, and thence forced into the vessel through the medium of the pump *E*¹. In order to keep the paraffin or other liquid buoyant material in a liquid state, I supply the tank *M* with a steam coil *N*, which is supplied with steam by a pipe *n*, connected with a suitable boiler, preferably the ship's boiler.

A condenser *O*, is shown connected to the coil *N*, which may or may not be the ship's condenser.

While I have shown and described the machinery for holding and forcing the material

into the sunken vessel, upon the surface vessel, it will, of course, be understood that the latter is employed only when the sunken vessel is below the surface of the water, but in cases where the upper deck of the vessel projects above the water surface, I may then install the necessary apparatus directly upon the upper deck of the vessel to be raised.

Any suitable means of securing the hatches in position may be employed, but, where practical, I prefer to secure them in position as illustrated in Fig. 3 of the drawings, by reference to which; *P*, designates heavy wooden beams which are first weighted and lowered into the hold of the ship and placed in position by divers, the beams being extended under the hatch coamings of the lower decks after which the weights are removed but the beams *P*, will remain in position through the buoyancy of the water. Tie bolts *Q*, are then lowered and connected to the beams by nuts or keys, after which the hatch is lowered in position upon the opening of the adjacent deck and a second set of beams *P* lowered in position upon the top of the hatch and connected to the bolts. This arrangement not only securely holds the hatches in position, but also transmits the strain to the lower deck, which is highly necessary in cases where the ship's upper decks are of light construction and liable to lift by the pressure of the flotative force of the buoyant material put into the ship.

In operation, after the pipes have been secured to the vessel, as described, a sufficient quantity of buoyant material is forced into the vessel through the pipes *H*, and *H*¹, to completely cover the under side of the deck and in cases where the decks of the vessel are weak and liable to lift, I then force a mixture of paraffin and cork or any other suitable liquid buoyant compound which can be readily pumped and which solidifies in water. This compound is represented in Figs. 1 and 3 of the drawings in the denser layers immediately under the decks of the vessel, and is forced into the ship with a current of air which causes currents to be set up within the ship by the displacement of the water therein and forces the water to travel towards the opening which may be the hole that caused the ship to sink, or through a pipe especially provided for its escape. The currents tend to carry the buoyant material first forced into the ship to the surface so that the buoyant material will form a lining upon the surface of the water and immediately adjacent the deck or decks. I then continue to force a quantity of the mixture of liquid and solid buoyant material and air into the vessel until a sufficient amount of water has been displaced to permit the vessel to float. By forcing the air into the vessel at the same time the buoyant material is also being forced in, I utilize the air for the double pur-

pose of preventing the too rapid cooling of the paraffin or other liquid buoyant, by insulating the inner pipe and tube from the surrounding water, as well as a medium to
 5 assist the material to rapidly rise to the surface of the water, and to displace the latter within the hold. Thus the liquid buoyant is forced into the vessel in a liquid state.

The paraffin is first forced into the vessel
 10 without a mixture of cork, so that all the openings or crevices of the deck, especially those surrounding the hatch openings, are sealed air tight, and then the cork or other solid buoyant material, together with the air,
 15 is forced into the hold in sufficient quantities to displace and expel enough water to permit the vessel to float.

When cork is forced into the vessel, the valve *j*, is opened which allows the water to
 20 rise in the hopper to a level equal to the water level outside, the pump is then started which forces the cork and water into the vessel, the cork rising to the surface and the water forced from the hold through the
 25 opening.

In cases where a hole has been made in the hull, the water within the vessel is forced out through the same, but, in cases where a vessel has been stranded and the hull uninjured,
 30 I may then extend a pipe into the vessel through which the water will be forced as the material is pumped into the hold.

Where a vessel is sufficiently strong to permit of the water being pumped out, it
 35 will be only necessary to inject a sufficient quantity of the fluent buoyant material to seal any openings and thus render the pumps efficient.

From the foregoing, the advantages of my
 40 invention will be readily apparent, and it may be stated that the invention, will be found of particular advantage in raising wooden vessels or barges in which the seams are corked from the outside, as the mixture
 45 will prevent the corkings being blown out as pressure is applied in the hold.

What I claim is:—

1. The method of raising sunken vessels, which consists in forcing fluent buoyant
 50 material into the hold of the vessel to close the openings therein, and then relieving the vessel of enough water to permit the vessel to be floated.

2. The method of raising sunken vessels,
 55 which consists in mechanically closing the

upper openings therein and then forcing below such closed openings and into the hold of the vessel fluent buoyant material which rises in the vessel and adheres and solidifies upon the underside of the upper closed portion and the adjacent parts and renders the vessel sufficiently tight to permit of the displacement of its contained water.

3. The method of raising sunken vessels, which consists in pumping into the interior
 65 of the vessel a quantity of fluent buoyant material, solidifiable in water, sufficient to displace enough water to enable the vessel to float.

4. The method of raising sunken vessels, 70 which consists in forcing into the interior of the vessel a quantity of fluent buoyant material of a waxy nature, capable of solidifying in water, and sufficient to displace enough water to enable the vessel to float. 75

5. The method of raising sunken vessels, which consists in forcing into the interior of vessel a quantity of fluent buoyant material containing paraffin and cork, and capable of solidifying in water, and serving to adhere
 80 to the underside of the upper portion of the vessel and adjacent parts to close any openings therein, said material being introduced in sufficient quantities to enable the vessel to float. 85

6. The method of raising sunken vessels, which consists in closing the upper openings in the vessel and then forcing into the interior a fluent buoyant material, capable of solidifying in water, and containing paraffin and cork, said material being admitted
 90 in quantities sufficient to displace enough water to permit the vessel to be floated.

7. The method of raising sunken vessels, which consists in rendering the hatch openings of the vessel tight and then introducing into the vessel a sufficient quantity of fluent buoyant material, solidifiable in water, and in quantity sufficient to seal the openings in said vessel, and introducing air in quantity
 100 sufficient with the buoyant material to displace enough water to permit the vessel to be floated.

In testimony whereof I have hereunto set my hand this 25 day of June A. D. 1907.

SIMON LAKE.

Witnesses:

H. D. JAMESON,
 F. L. RAND.

Corrections in Letters Patent No. 908,016.

It is hereby certified that in Letters Patent No. 908,016, granted December 29, 1908, upon the application of Simon Lake, of Bridgeport, Connecticut, for an improvement in "Methods of Raising Sunken Vessels," errors appear requiring correction, as follows: In line 24, page 3, after the word "water" the word *being* should be inserted; line 44, same page, the word "corked" should read *calked*; line 45, the word "corkings" should read *calkings*, and in line 77, after the word "of" the word *the* should be inserted; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of January, A. D., 1909.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.