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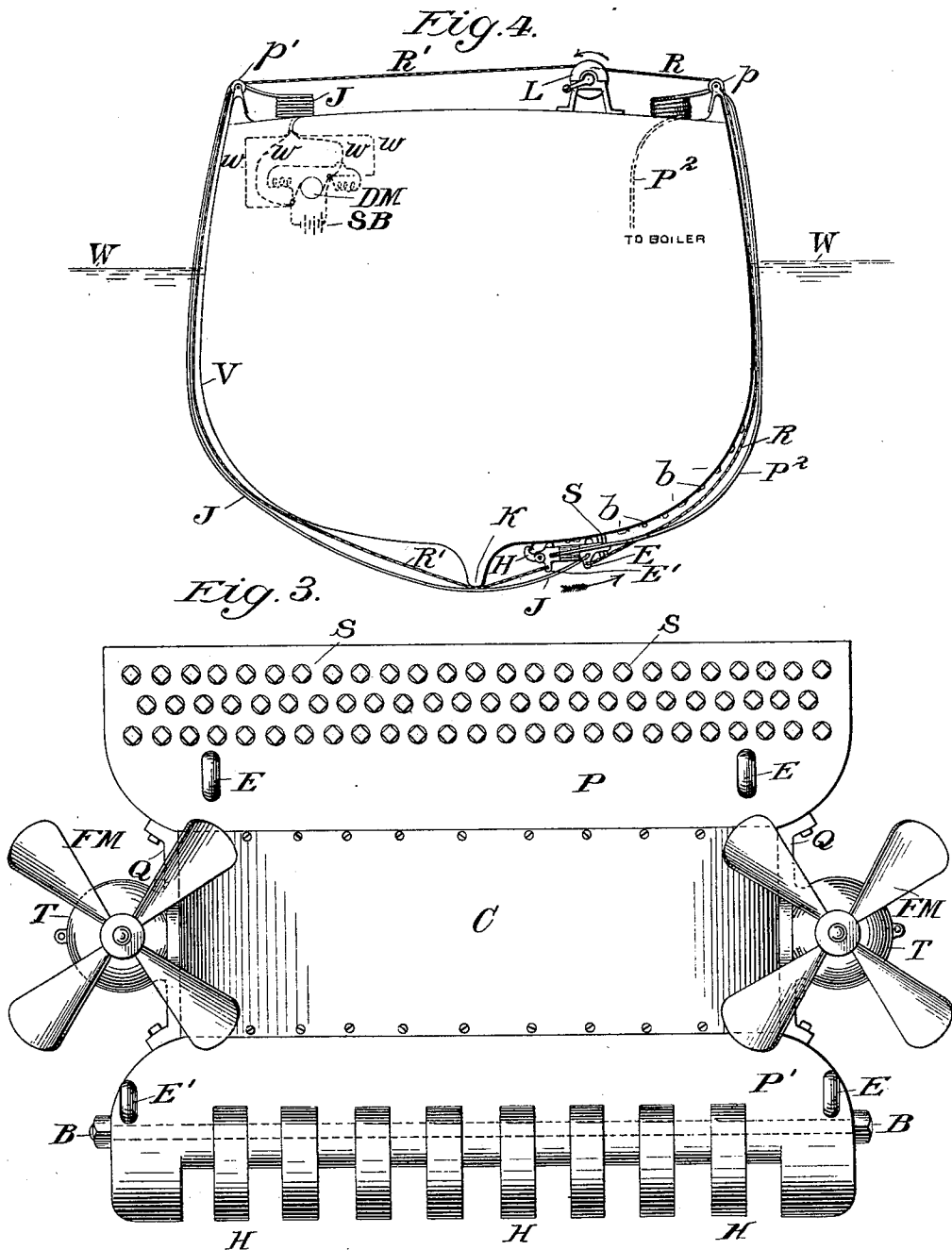
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MEANS FOR CLEANING HULLS OF VESSELS.

(Application filed Nov. 11, 1898.)

(No Model.)

2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

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MEANS FOR CLEANING HULLS OF VESSELS.

SPECIFICATION forming part of Letters Patent No. 635,938, dated October 31, 1899.

Application filed November 11, 1898. Serial No. 696,144. (No model.)

To all whom it may concern:

Be it known that I, DAVID MASON, a citizen of the United States, residing at New York, in the county of New York and State of New York, have made a new and useful Improvement in Means for Cleaning the Bottoms of Vessels, of which the following is a specification.

In order to remove barnacles, sea-grass, and such other substances or materials as usually cling to and foul the bottoms of vessels, it has heretofore been found necessary to dry-dock the vessel and carefully scrape its bottom in a well-known manner. Although many attempts have heretofore been made to accomplish this result without docking a vessel, I am not aware that any one has yet devised means for successfully attaining the result sought.

My invention has for its accomplishment this object, and I effect the same by first subjecting the foul portion of the bottom of the vessel to the influence of steam, heated oil, or the vapors of such liquids as will naturally suggest themselves to the user in such manner as to loosen the barnacles or other substances which ordinarily become attached thereto. I then provide means for scraping, abrading, or otherwise mechanically removing such barnacles or other substances, said means being of such a flexible nature that it will readily follow the contour of the vessel under all conditions of usage and effectually accomplish the result sought.

My invention will be fully understood by referring to the accompanying drawings, in which—

Figure 1 is an elevational view of my preferred form of means for scraping or abrading the foul bottom of a vessel, a broken sectional portion being illustrated on the right-hand side of the figure to better show the interior structure. Fig. 2 is a vertical sectional view taken through Fig. 1 on the line *x x* and as seen looking in the direction of the arrows from the right toward the left-hand side of the drawings. Fig. 3 is an elevational view of the device illustrated in Fig. 1, said figure illustrating also additional means for securely holding the scraping or abrading apparatus against the side or bottom of the vessel when in operation; and Fig.

4 is a cross-sectional view of a vessel afloat, illustrating one form of my invention in actual use.

Referring now to the drawings in detail and first to Figs. 1 and 2, M represents a core of magnetic material, such as iron, provided at its opposite ends with enlarged pole-pieces P and P', and *w w* windings of a number of insulated conductors around such magnetic core, the same being thoroughly insulated and protected from the surrounding water by a waterproof casing C, secured to the pole-pieces by screws *e e*, as shown.

J represents the insulating cable, composed of the conductors *w w*, the individual windings being illustrated in the present instance as composed of two coils, the arrangement of the windings being such that they may be united in multiple or in series relation in a well-known manner for the purpose of varying the magnetic effect upon the magnetic core M and pole-pieces P P'.

N N (see Fig. 2) represent two or more pairs of diamagnetic studs, and *w' w'* detachable diamagnetic washers therefor, the arrangement being such that said studs and washers are secured to the inner faces of the pole-pieces P and P' by diamagnetic screws *s s*, so that when the device is located adjacent to the side of an iron or steel vessel V and fully magnetized it will not become stuck or attached thereto when the magnetism is discontinued in the magnetic core M.

It is apparent that the number of diamagnetic washers *w' w'* may be varied to suit the magnetic conditions desired, or they and the studs N N and the screws *s s* may be omitted, if desired.

To the lower end of the pole-piece P' is pivotally secured in sockets, by an iron bolt B, extending entirely through said pole-piece and sockets, a series of hooks H H H, made also of magnetic material, their lower ends having each attached to it by a screw a steel scraper or abrader D. In the upper pole-piece P is drilled a number of holes, which are afterward screw-threaded, so as to admit of the insertion of scraping or abrading pins S S in such manner as to bring their sharpened or abrading ends into contact with the side or bottom of the vessel V.

E E are ears or lugs integral with the up-

per pole-piece P, to which are attached two ropes R R for drawing the device forward and upward, as will be described in connection with the description of the mode of operation. E' E' are corresponding ears or lugs integral with the lower pole-piece P' for moving the device in a reverse direction through the agency of the ropes R' R'.

F F represent two tubular openings running longitudinally in the bodies of the pole-pieces P and P' and joined together by a similar opening F' in the magnetic core M. G G represent numerous smaller lateral jet holes or openings running from the two openings F F transversely thereto, and P² represents a steam-pipe, screw-threaded at its lower end and entering the lower opening F, the function of said pipe and opening being to supply steam, heated oil, or heated vapors of other liquids under pressure from a boiler against the surface of the vessel to be cleaned.

Referring now to Fig. 4, V represents a cross-section of the vessel, and L represents a double winch on the deck thereof. D M represent a dynamo-electric machine driven by any suitable source of power, and S B a storage battery connected thereto, both of said sources of electrical energy being connected directly to the conductors w w w w, running through the cable J to the coils around the magnetic core M, the arrangement being such that so long as a sufficient current of electricity is flowing through the coils the magnetic core M and pole-pieces P P' will be sufficiently magnetized to firmly hold the apparatus against the bottom or face of the vessel to be cleaned. The two sets of conductors w w are shown in Fig. 4 as connected directly to the storage battery and the dynamo in multiple; but it is obvious that any type of switching apparatus might be utilized in such manner that the dynamo, the battery, and the conductors may be connected in any desired way or arranged so as to obtain the result which the particular condition requires, the arrangement shown being preferred in that if either source of electrical energy should suddenly momentarily fail the other will maintain the device in its operative position.

The operation of the apparatus is as follows: It having been lowered over the side of the vessel V beneath the water W and drawn into the position shown by the agency of the pairs of ropes R R, R' R', and double winch L, and the generators of electricity having been operatively connected with the conductors which magnetize the core M and pole-pieces P P', the electrical effect is such that magnetic lines of force are set up from the pole-pieces P and P' through the body of the iron or steel vessel V in the direction of the curved arrow, Fig. 2, causing the device to be firmly held against the side of the vessel in whatever position it may be located. The same action causes the pivoted hooks H to be drawn forward, so that the

scrapers or abraders D assume the position shown in that figure of the drawings. The flexible steam-pipe P² is connected to a boiler A or other source of supply for superheating steam or for intensely heating oil or liquids under pressure and the same allowed to flow through said pipe and ultimately be ejected under enormous pressure, as shown in Fig. 2, against the side of the vessel, thereby "cooking," so to speak, all animal and vegetable matter attached thereto and putting it into condition to be readily removed by the scraping or abrading device, the operation of which will now be described. The attendants rotate the two parts of the winch L in the proper directions to move the device in the direction of the curved arrow near the bottom of Fig. 4, and as it advances the scraping-pins S thoroughly disintegrate the substances b b, which have been previously subjected to the action of the heated steam or oil. As the device moves upward the scrapers or abraders D complete the cleaning action. It will be noted that by reason of the magnetic action of the device it will adapt itself to the curvature of any form of vessel, so that the curved portion near the bottom of the keel K, as shown in Fig. 4, may be readily cleaned, and the individual pivotal nature of the hooks H H and independent scrapers or abraders D carried thereby is such that the device will thoroughly scrape or abrade all of the irregular surfaces of the vessel. As the device moves upward under the action of the ropes R R the ropes R' R' are simultaneously released and the entire apparatus is advanced until the surface of the water W is reached by it. The circuit through the coils w w is then broken at the switch and the device is released and restored to its lower position, then advanced or retracted to the proper position, and the action repeated until the entire surface of one side of the vessel is cleaned, after which the apparatus is reversed in its operation by transferring the ropes R R and R' R' to reverse sides of the vessel, when the opposite side is cleaned in like manner.

In a vessel where there is no projecting keel K and the bottom thereof is sufficiently round the apparatus may be started at the surface of the water upon one side and moved downward and under the bottom, and thence upward on the other side, after which it may be returned to its starting position and the action repeated, the apparatus of course having been advanced or retracted the proper distance.

In Fig. 3 of the drawings I have illustrated additional means for holding the scraping or abrading device against the bottom of a vessel as it is being drawn forward, said additional means consisting of two water-tight electric motors T T, provided with screw-propellers F M F M and held in position by brackets Q Q, the current for propelling said motors being provided, of course, by the same

source of electrical energy which supplies the current for the magnetizing-coils surrounding the core M, or, if preferred, they may be run by an independent source of current or by rotary steam-motors and controlled by the same supply of steam which aids in the removal of the material from the bottom of the vessel, it being obvious that said steam may be utilized for this purpose after it has passed through the motors proper.

It is apparent that where it is desired to clean the bottoms of wooden vessels other means than magnetic must be utilized for holding the device in position, in which event it may be constructed as shown in Fig. 3 of the drawings and the electrical coils and core M dispensed with. Under the latter condition the screw-propellers F M would be rotated by the steam or any other equivalent mechanical agency.

I do not limit myself to the means hereinbefore described and illustrated in the accompanying drawings for accomplishing the result sought, as many of the details of construction may be materially departed from and still come within the scope of my claims hereinafter made.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. Mechanism for cleaning the bottoms of vessels afloat consisting of means for heating a liquid, such as water or oil, to the desired temperature, in combination with means for conveying the same to a point beneath the water, and additional means for releasing it at one or more points adjacent to the bottom or sides of the vessel, substantially as described.

2. Mechanism for cleaning the bottoms of vessels afloat, consisting of a scraping or abrading device provided with means for holding it in any position beneath the bottom or upon the side of the vessel, in combination with means for moving it from place to place, together with means for heating a liquid, such as water, and a pipe operatively connected therewith and adapted to convey steam under pressure to said scraping device and to the hull of the vessel, substantially as described.

3. Mechanism for cleaning the bottoms of

vessels afloat, consisting of means provided with one or more jet holes or openings operatively connected by a flexible steam-pipe to a liquid-heating source, as a boiler located on board the vessel, in combination with means for moving said device at will beneath the surface of the vessel, substantially as described.

4. Mechanism for cleaning the bottoms of vessels afloat, consisting of means provided with one or more jet holes or openings operatively connected by a flexible steam-pipe to a liquid-heating source, in combination with scraping means and additional means for moving said device at will beneath the bottom of the vessel, substantially as described.

5. Mechanism for cleaning the bottoms of vessels afloat, consisting of means provided with one or more jet holes or openings operatively connected by a flexible steam-pipe to a liquid-heating source, in combination with electromagnetic means for causing said means to adhere to the bottom of an iron or steel vessel, substantially as described.

6. Mechanism for cleaning the bottoms of vessels afloat, consisting of means provided with one or more jet holes or openings operatively connected by a flexible steam-pipe to a liquid-heating source, in combination with electromagnetic means for causing said device to adhere to the bottom of the vessel, and additional means for moving it at will, substantially as described.

7. Mechanism for cleaning the bottoms of vessels afloat, consisting of an electromagnet scraping device provided with pivoted hooks and scrapers or abraders, and circuit connections running to a source of electrical energy on the vessel for causing said device to adhere to the bottom thereof, in combination with one or more jet holes or openings and a flexible steam-pipe running to a liquid-heating source, together with means for moving said device at will, substantially as described.

In testimony whereof I have hereunto subscribed my name this 4th day of November, 1898.

DAVID MASON.

Witnesses:

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