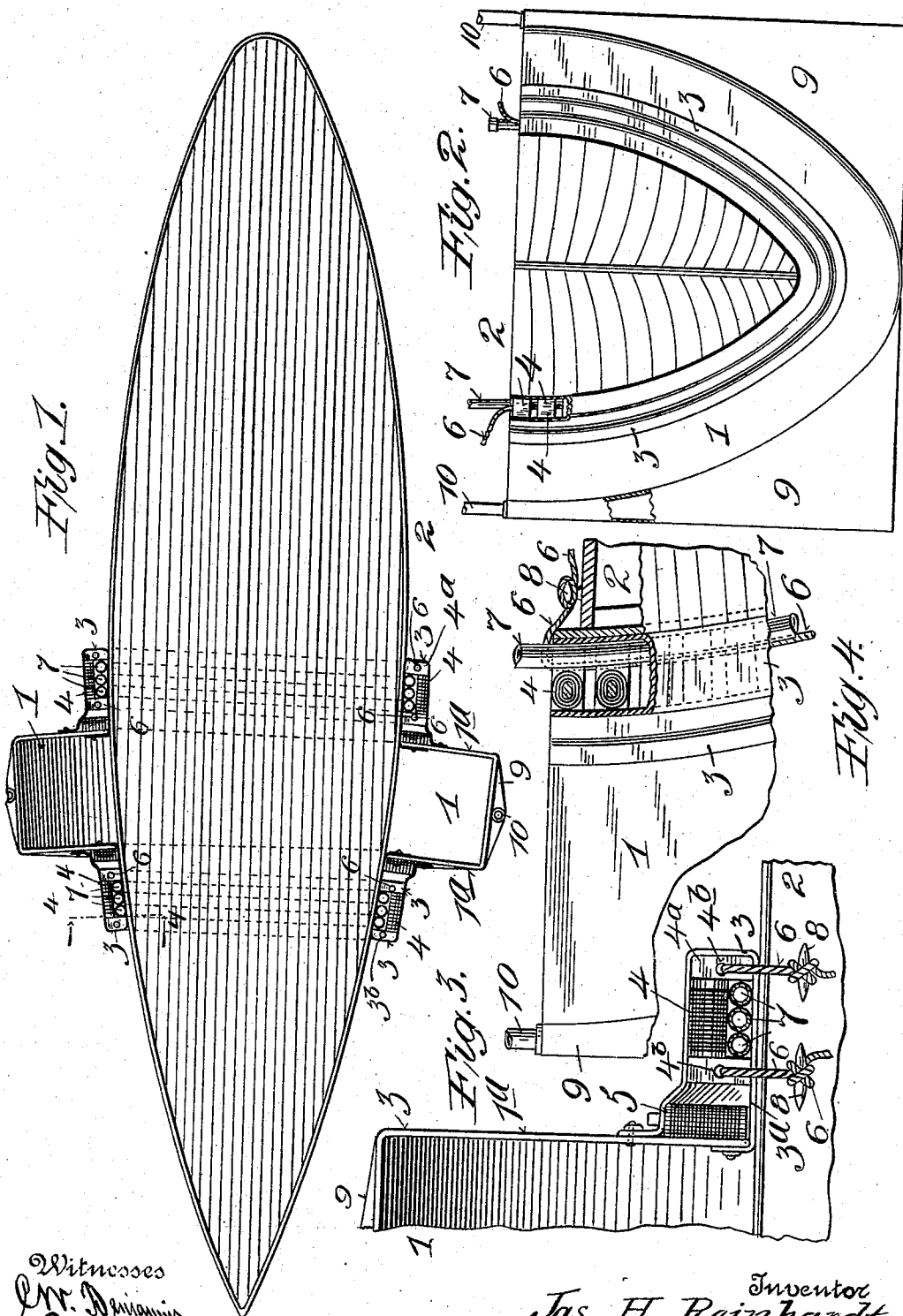


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SHIP REPAIR APPARATUS.  
APPLICATION FILED JUNE 28, 1906.

Patented Aug. 31, 1909.



Witnesses  
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# UNITED STATES PATENT OFFICE.

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## SHIP-REPAIR APPARATUS.

932,719.

Specification of Letters Patent.

Patented Aug. 31, 1909.

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*To all whom it may concern:*

Be it known that I, JAMES H. REINHARDT, a citizen of the United States, and resident of East Orange, Essex county, New Jersey, have invented certain new and useful Improvements in Ship-Repair Apparatus, of which the following is a specification.

The object of my invention is to provide an apparatus or mechanism by means of which portions of a vessel or ship can be repaired while the ship is afloat and without requiring it to be placed in a dry dock.

In carrying out my invention I provide a casing having one side open and adapted to fit against the exterior of the hull of a ship or other vessel, and upon opposite sides or walls of said casing I attach flexible bands or pockets adapted to be pressed against the hull of the vessel, and within said bands or pockets I provide series of magnets or solenoids that are adapted by magnetic action, when the electric current is passed through the same, to cling to the metal hull and thereby serve the double purpose of assisting to hold the casing against the vessel and at the same time force the band or pocket wall against the vessel to make water tight joints thereat, and to further assist in making water tight joints between the casing and the hull I may provide expansible tubes adapted to contain air under pressure and which bear against the band, so that when inflated with air said tubes will force the band against the hull of the vessel.

My invention also comprises the novel details of improvement and combinations of parts that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming part hereof, wherein,

Figure 1 is a plan view illustrating the application of my improvements to a vessel, Fig. 2 is an end view thereof, partly broken, Fig. 3 is an enlarged detail plan view of a portion of Fig. 1, and Fig. 4 is a detail sectional view, enlarged, taken on the line 4, 4, in Fig. 1.

The numeral 1 indicates, generally, a casing or partial caisson which is shown substantially in channel or hollow form, having one side open adapted to fit against a portion of the hull of a ship, boat or other vessel, whereby to permit access to the hull of the vessel from the interior of said casing. The casing 1 on the inner edges of its side

walls will conform as nearly as may be to the contour of the hull of the vessel, either completely around the hull below the water line and for any suitable distance above the same, or partially around the lower portion of the vessel, the upper portion of the casing extending above the water line.

In order to provide water tight joints between the hull of the vessel 2 and the casing 1, I provide flexible bands or pockets 3 along the outer side walls 1<sup>a</sup> of the casing, which pockets may be made of rubber and may be secured to the walls of the casing by rivets or bolts, so as to lie against the hull of the vessel. Within the pockets 3 are series of magnets 4 located at suitable distances apart, but preferably close together, the pole pieces of which magnets lie against the inner walls 3<sup>a</sup> of the pockets 3 and face the hull of the vessel, and I also, by preference, provide within the pockets 3 series of magnets or solenoids 5 which are shown secured close to the walls 1<sup>a</sup> of the casing 1. In order to assist in placing the casing 1 and its magnets 4 in position, I have shown the pole pieces 4<sup>a</sup> of the magnets as provided with holes 4<sup>b</sup> through which ropes 6 pass, and which ropes also pass under the hull of the vessel, and may be fastened at opposite ends to the deck, as by cleats 8, so that when the ropes are drawn tight and fastened the magnets and the flexible pocket 3 as well as casing 1 will be held close to the hull of the vessel. When the electric current is passed through the magnets or solenoids the magnetic attraction at the poles or cores thereof will cause the magnets to forcibly be held against the metal hull of the vessel, and thus the inner walls 3<sup>a</sup> of pockets 3 will be firmly pressed against the vessel hull to provide water tight joints thereat. The current for the magnets 4 may be supplied from any suitable source of electric power. In order to assure the action of the magnets or solenoids during use, the electric current may be supplied from two separate sources simultaneously, so that if one current should cease the other will continue.

In order to prevent leakage of water into the casing 1 at the parts of the pockets 3 lying between the pole pieces or cores of the adjacent magnets or solenoids I provide one or more flexible pneumatic pipes or tubes 7 which pass through the pockets 3 and lie against walls 3<sup>a</sup> thereof, being shown

located between the magnets 4 and the walls 3<sup>a</sup>, which tubes when expanded by pneumatic pressure will swell out against the walls 3<sup>a</sup> being resisted by the magnets 4, which act as abutments, and forcibly press the walls 3<sup>a</sup> against the vessel hull to make water tight joints all around pockets 3 against the hull. The pneumatic tubes or pipes 7 may be provided with valves in any well known manner for retaining air pressure therein, and may be pumped to the desired air pressure by any suitable means.

As the casing 1 is open on the side that is applied to a vessel hull it would sink when being towed to position at the vessel, or when lowered adjacent thereto, and in order to cause the casing to float it may, if preferred, be provided with one or more suitable air-tight compartments 9 (see Fig. 2) on its exterior, of such capacity when exhausted from water as to cause casing 1 to float. Said compartments 9 may be provided with suitable pipes 10, which may be above the water line, and by means of which water can be admitted to or emptied from said compartments as required, by any suitable pump or other means.

In applying my improvements to a vessel the casing may be sunk beneath the part of the vessel to be repaired, and then raised against the hull by pumping the water out of compartments 9 when the latter are used, or by means of the ropes 6, or in any other suitable manner, and held in position by said ropes. The electric current will then be passed through the magnets or solenoids which by magnetic attraction will cling to the metal hull and press the walls 3<sup>a</sup> of the pockets 3 against the hull, and the current will be maintained flowing during use of the apparatus; the air pipes 7 will then be inflated to complete the water tight joints all around the casing against the hull. The casing 1 will then be emptied of the contained water, by pumping the same out of the casing, leaving the hull exposed to the interior of the casing. The workmen may then safely enter the casing and make such repairs as may be required, and thereafter the casing may be removed from the hull by cutting off the electric current from the magnets or solenoids, deflating the pipes 7 and releasing ropes 6.

The shape and dimensions of casing 1 will be such as will approximate the contour of the hull of a vessel, and may be made in sizes as required, and the width of the casing may be such as to accommodate more or less area lengthwise of the vessel as desired, and different casings may be provided to accommodate different portions of the vessel hull. The flexible pockets 3 and the magnets or solenoids 4, which are flexibly supported by the ropes 6, and the flexible pipes 7 will follow the general contour of the hull

in passing around and beneath the same, so that water tight joints between the hull and the casing may be assured.

By having the pockets 3, the magnets, and the pipes 7 on the exterior of casing 1, the interior of the casing is left free and unobstructed for the use of the workmen therein, and they may stand upon any suitable supports provided within the casing in any suitable manner. By making the casing of any suitable shape and dimensions to fit over a hole in a vessel hull, as by being more or less shallow or flat, such as a canvas or rubber sheet, and connecting the magnets therewith substantially as set forth, the same may be applied over the hole and held in position by the magnets as a temporary repair to exclude water.

My invention is not limited to the particular arrangements herein described as they may be varied without departing from the spirit thereof.

Having now described my invention what I claim is:

1. A ship repair apparatus comprising a casing adapted to fit against a vessel hull, flexible bands carried by the casing adapted to bear against the hull, and magnets within the bands adapted to press the latter against the hull by magnetic attraction.

2. A ship repair apparatus comprising a casing adapted to fit against a vessel hull, flexible bands carried by the casing adapted to bear against the hull, magnets within the bands adapted to press the latter against the hull by magnetic attraction, and flexible supports for the magnets to hold them against the hull.

3. A ship repair apparatus comprising a casing adapted to fit against a vessel hull, flexible bands carried by the casing adapted to bear against the hull, magnets within the bands adapted to press the latter against the hull by magnetic attraction, and expansible pipes around the bands adapted to press the latter against the hull.

4. A ship repair apparatus comprising a casing adapted to fit against a vessel hull, flexible bands carried by the casing adapted to bear against the hull, magnets within the bands adapted to press the latter against the hull by magnetic attraction, and expansible pipes around the bands adapted to press the latter against the hull, said pipes lying between the magnets and the bands.

5. A ship repair apparatus comprising a casing adapted to fit against a vessel hull, flexible bands carried by the casing adapted to bear against the hull, expansible pipes around the bands adapted to press the latter against the hull, and abutments without the pipes to resist the expansion of the latter.

6. A ship repair apparatus comprising a casing having one side open adapted to fit against a vessel hull, flexible pockets con-

5 nected with said casing and adapted to fit against the hull, and magnets within said pockets adapted to adhere to the vessel and press the walls of the pockets against the hull.

10 7. A ship repair apparatus comprising a casing having one side open adapted to fit against a vessel hull, flexible pockets connected with said casing and adapted to fit against the hull, magnets within said pockets adapted to adhere to the vessel and press the walls of the pockets against the hull, and flexible supports passing through the pockets for holding the magnets against the hull.

15 8. A ship repair apparatus comprising a casing having one side open adapted to fit against a vessel hull, flexible pockets connected with said casing and adapted to fit against the hull, magnets within said pockets adapted to adhere to the vessel and press the walls of the pockets against the hull, and expansible pipes passing through the pockets and bearing against the inner walls of the pockets to press the same against the hull.

20 9. In a ship repair apparatus a hollow flexible pocket having a flexible, continuous, integral wall adapted to fit against a vessel hull, and magnets within said pocket adapted to press said flexible wall against said

hull to make water-tight connection therewith. 30

10. In a ship repair apparatus a hollow flexible pocket adapted to fit against a vessel hull, and magnets within said pocket adapted to press the latter against said hull 35 to make water-tight connection therewith, and flexible pipes passing along the magnets to bear upon the hull.

11. A ship repair apparatus comprising a casing adapted to fit against a vessel hull, 40 magnets connected with the casing and adapted to adhere to the vessel hull by magnetic attraction, and flexible packing in front of the magnets to make water tight joints between the casing and a vessel hull. 45

12. A ship repair apparatus comprising a casing adapted to fit against a vessel hull, magnets connected with the casing and adapted to adhere to the vessel hull by magnetic attraction, means to flexibly connect 50 said magnets with said casing, and means to make water tight joints between the casing and a vessel hull.

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