(No Model.) 2 Sheets—Sheet 1.

P. REILLY.

APPARATUS FOR CLEANING SHIPS' BOTTOMS.

No. 560,646. Patented May 26, 1896.

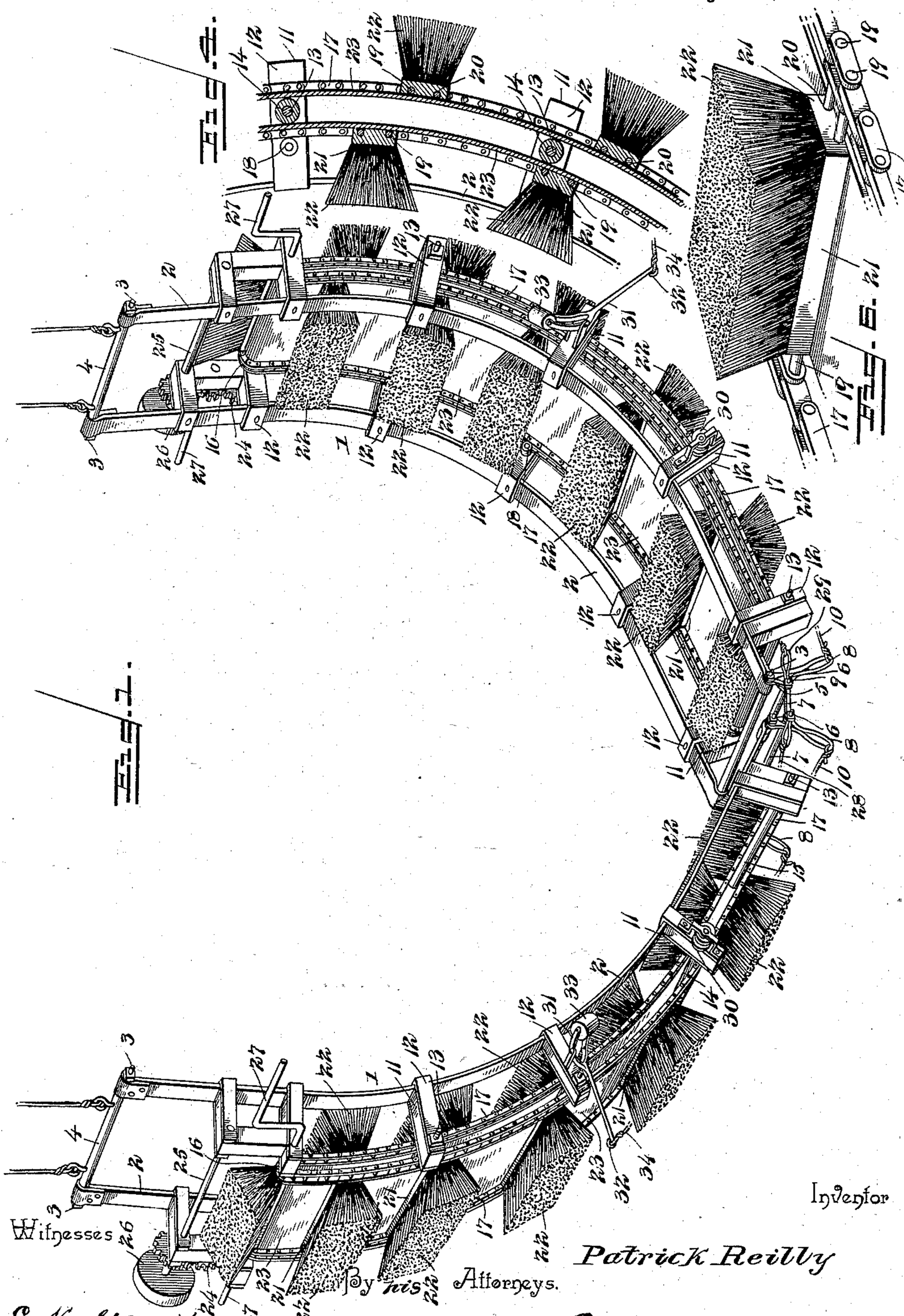

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FIG. 2.

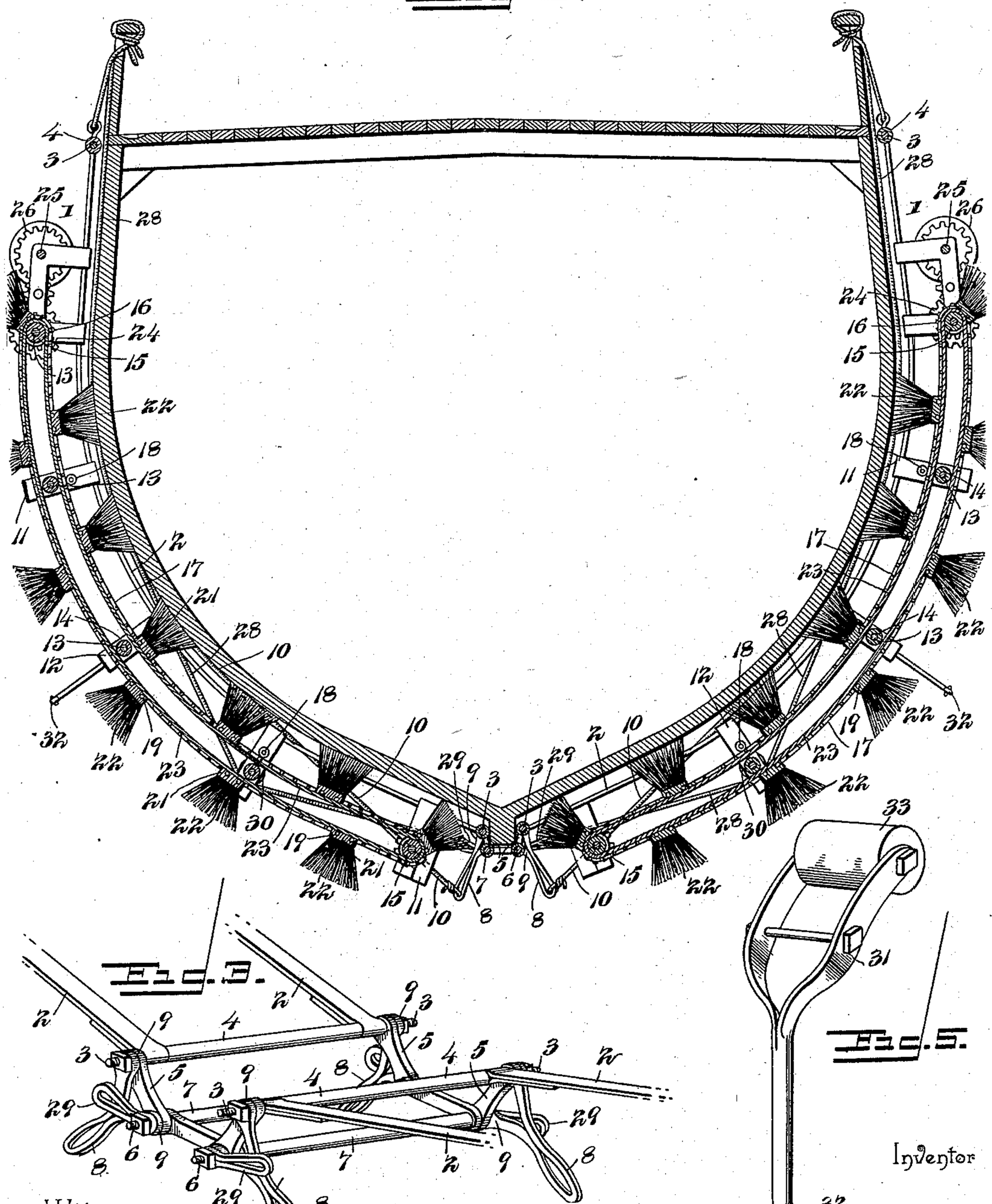

FIG. 3.

FIG. 5.

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UNITED STATES PATENT OFFICE.

PATRICK REILLY, OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR CLEANING SHIPS' BOTTOMS.

SPECIFICATION forming part of Letters Patent No. 560,646, dated May 26, 1896.

Application filed October 12, 1895. Serial No. 565,502. (No model.)

To all whom it may concern:

Be it known that I, PATRICK REILLY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Apparatus for Cleaning Ships' Bottoms, of which the following is a specification.

This invention relates to an improvement in apparatus for cleaning ships' bottoms; and the object thereof is to provide a simple and efficient device of the character referred to which may be readily carried on shipboard and easily brought into use when required, and adapted to be used either while the ship is afloat or in dry-dock.

The main object of the present invention is to provide such an apparatus with a flexible frame, whereby the same may accommodate itself perfectly to the bilge and curvature of the ship's hull beneath the load water-line.

A further object of the invention is to provide in connection with such frame a series of cleaning-brushes mounted upon endless guide-pins and capable of traveling transversely beneath the hull from the load water-line to the keel, or vice versa.

The invention also has for its object to provide a novel gripping device attached to the cleaning-frame and adapted to be operated from above the surface of the water, so as to grip the keel as in a vise, thus securing the lower end of the cleaning-frame rigidly to said keel.

Other objects and advantages of the invention will appear in the course of the subjoined description.

The invention consists in an improved apparatus for cleaning ships' bottoms, embodying certain novel features and details of construction and arrangement of parts, whereby increased efficiency is attained, as hereinafter fully described, illustrated in the drawings, and finally embodied in the claims.

In the accompanying drawings, Figure 1 is a perspective view of the improved apparatus constructed in accordance with the present invention. Fig. 2 is a cross-sectional view of a ship's hull, showing the application of the improved apparatus. Fig. 3 is an enlarged detail perspective view of the keel-gripping feature. Fig. 4 is an enlarged detail sectional view through a portion of the chain of brushes. Fig. 5 is a detail perspective view of one of the adjustable roller-frames by means of which the apparatus may be adjusted fore and aft. Fig. 6 is a detail view of one of the brushes.

Similar numerals of reference designate corresponding parts in the several figures of the drawings.

For the purpose of carrying out the present invention I employ two flexible and elastic frames, (designated by the numeral 1.) Each of said frames comprises a pair of elastic bars 2, which are arranged in parallelism and spaced in a full-sized machine in the neighborhood of three feet apart, varying, of course, according to the size of the boat upon which the device is to operate. These side bars are connected at their extremities by transverse tie-bolts 3, which pass through terminal eyes in the said side bars and have disposed around them sleeves or spacing-tubes 4, which hold the side bars a sufficient distance apart. Two open rectangular frames are thus obtained, and these frames are connected at their lower ends by a series of links 5, which pass around the extended ends of the adjacent tie-bolts 3 and also around two or more transverse bolts 6, similar and arranged in parallelism to the tie-bolts 3 and also provided with spacing-sleeves 7. The last-named bolts 6 are interposed at regular intervals between the bolts 3 of the frames 1, and each of said bolts is connected with the bolt next adjacent to it by means of independent links arranged one at each end. The frames and the bolts 3 and 6 while thus firmly interconnected are capable of yielding independently, so that they will accommodate themselves to and dispose themselves beneath and upon the sides of the ship's keel in the manner illustrated in Fig. 2. When adjusted into the position just described, the bolts referred to may be caused to firmly grip the keel of the vessel by means of a series of lever-arms 8, four of such lever-arms being shown, two upon each side of the device. Each of said lever-arms is formed with two eyes or bearings 9, which embrace the projecting extremity of one of the end bolts 3 of the adjacent frame 1, and the other the corresponding end of the intermediate bolt 6, next

adjacent thereto. All of the lever-handles are disposed in the same manner and at their outer ends attached to ropes or chains 10, which extend in opposite directions beneath the hull of the boat and upward above the surface of the water, where they may be hauled taut by the deck-hands and made fast to the rails. The apparatus may thus be temporarily clamped to the hull of the boat and caused to grip the keel as in a vise, so that it will be impossible for the apparatus to slip or move longitudinally of the keel in either direction.

11 designates a plurality of outwardly-projecting blocks, which are secured to the elastic side bars of both frames by means of U-shaped straps 12, of metal, the said straps passing around and embracing the said frame-bars and also embracing the blocks 11 upon opposite sides thereof and being riveted or otherwise secured thereto, as shown. These straps 12 hold the blocks 11 firmly in place upon the elastic bars of the frame and at right angles thereto and form the bearings for a series of transverse rods or bolts 13, surrounded by antifriction-sleeves 14, constituting rollers against which the cleaning-brushes have their bearing. Journaled on the end bolts or rods 13 of each frame are enlarged rollers or drums 15, and upon the opposite ends of the upper roller or drum are secured sprocket-wheels 16. Sprocket-chains 17 pass over these sprocket-wheels and extend downwardly to the lower end of the frame, where they pass over the lower roller or drum, the said chains being guided at intermediate points by means of the antifriction sleeves or rollers 14 and short supplemental rollers 18, revolubly mounted upon the inner faces of the blocks 11 and upon the opposite sides of the chains from the sleeves or rollers 14. The chains are thus caused to travel between antifriction guiding-rollers and are thus held properly to their work. The pivots 19 of certain links of the chain, at equal intervals apart, are extended transversely across from one chain to the other. These extended pivots are arranged in pairs and are received in facial grooves 20 in the back 21 of a cleaning or scouring brush 22. Any number of said brushes may be employed and the operative faces of said brushes are preferably made to exceed in area a half-cylinder, so that said brushes may swing freely to accommodate themselves to any unevenness in the ship's bottom and yet present their operative faces thereto. Metal bristles or bass or any other suitable material may be used in the manufacture of the brushes 22. Arranged between the chains and secured to the backs of the brushes is an endless belt of rubber, as indicated at 23. This belt also passes around the end drums or rollers and serves to hold the brushes upon the extended pivots of the chains and also assists in preserving the proper poise of the several brushes and restore the same to their proper working positions.

The shaft of the upper roller or drum is extended beyond the blocks 11, in which it has its bearings, and is provided outside of said blocks with spur-gears 24, which mesh with corresponding gear-wheels on a counter-shaft 25, arranged above and in parallelism to the drum-shaft. This last-named shaft 25 is provided with a drum or pulley 26, from which a belt may be extended to an engine of any description arranged upon the deck of the vessel or other convenient point. In this manner motion may be imparted to the chain of brushes for causing them to traverse the ship's bottom and clean any barnacles or other foul matter therefrom. The opposite ends of the upper-drum shaft are also extended beyond the spur-gears sufficiently to receive oppositely-disposed cranks 27, which are preferably made of a size which will admit of the employment of two men for each crank. Provision is thus made for operating the brushes by hand-power as well as from a driven belt.

28 represents a rope or cable which attaches to a link 29 at the bottom of the frame 1, and extends thence upwardly outside of pulleys 30, journaled upon the outer faces of the blocks 11, and attaches to the rail of the vessel. By means of this arrangement and with the aid of four of such ropes or cables arranged upon the opposite sides of both of the elastic frames 1 the latter may be drawn inward against the submerged hull of the vessel, so as to fit snugly against the same and accommodate themselves accurately and perfectly to the outline and curvature of such hull.

31 designates a pair of pivoted frames which are mounted between laterally-projecting ears extending in opposite directions from an opposite pair of blocks 11, preferably at a point central of the vertical extent or length of each of the elastic frames. Each of said frames 31 is provided at one end with an eye, and the opposite end thereof is forked to embrace a bearing-roller 33, which is journaled therein. These roller-frames are so arranged that they may be connected with ropes or cables 34, running fore and aft and attached to the eyes 32. By drawing upon these ropes or cables the roller-frames may be vibrated upon their pivots in such manner as to project the rollers inside of the inner faces of the elastic frames 1, thereby permitting the apparatus to be moved toward the bow or stern of the vessel, as required. When these ropes are secured at their opposite ends, they serve as additional stays for holding the apparatus in place.

In operation the apparatus is lowered from the bow of the vessel, whereupon the weight of the apparatus will carry it to a sufficient depth, so that it may be moved longitudinally and passed underneath the vessel to the desired point. The upper ends of the elastic

frames are now made fast by means of suitable stay-ropes which attach to the frames and to the rail of the vessel. The ropes which connect with the keel-grip levers are now hauled taut, thereby causing the apparatus to firmly grip the keel, as hereinabove stated. After making these ropes fast the ropes 28 are drawn taut and made fast to the rail of the vessel, thus causing the elastic frames to assume a curvature corresponding to the lines of the hull. By now setting the train of brushes in motion the barnacles and other foul or foreign matter which may have accumulated on the hull are removed from the path in which the brushes travel. The apparatus may be readjusted in a similar manner to a different point and the operation repeated until the entire hull of the vessel below the water-line shall have been cleaned. Another valuable function of the elastic frames of the apparatus resides in the adaptability of the same for assisting in the stoppage of a leak in the vessel's hull. Should a hole be stove in the vessel's hull beneath the water-line, one or more thicknesses of canvas or other suitable material may be attached to the elastic bars of one of the frames 1, and thus be lowered beneath the surface and brought into position to cover such hole or leak. Owing to the flexibility and elasticity of such frame the canvas will be pressed firmly against the bottom of the vessel and securely held against escape. The action of the water will be to press this canvas still more firmly around the leak and prevent the inflow of water during the operation of pumping the water from the hold and making the proper repair of the leak from the inside of the vessel.

The apparatus above described is simple and efficient in construction and operation, may be manufactured in any size to suit the particular vessel in connection with which it is intended to be used, and by reason of the elasticity of its framework will readily accommodate itself to hulls of varying shapes.

Various changes in the form, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed as new is—

1. In an apparatus of the character described, a frame comprising substantially parallel flexible and elastic bars adapting the frame to conform to the curvature of the vessel's hull, in combination with an endless train of cleaning-brushes mounted in the frame and traveling between said flexible bars and supported at intervals thereon, and means for imparting motion to said brushes, substantially as described.

2. In an apparatus of the character described, a flexible and elastic frame adapted to conform closely to the curvature of the vessel's hull, in combination with an endless train of cleaning-brushes, and a plurality of guiding and supporting rollers mounted in the frame and arranged at intervals throughout the length of the same, whereby the brushes are supported at numerous points along the path in which they travel, substantially as described.

3. In an apparatus of the character described, a frame comprising parallel flexible bars adapting the frame to conform to the curvature of the vessel's hull, in combination with a series of arms or blocks attached to said flexible bars and projecting outward therefrom, cross stay-bolts connecting said arms or blocks in opposing pairs, antifriction-sleeves surrounding said bolts and an endless train of brushes traveling between the flexible bars of the frame and bearing against said sleeves being guided and supported thereby, substantially in the manner and for the purpose described.

4. In an apparatus of the character described, a flexible frame adapted to conform to the cross-sectional outline of the vessel's hull, in combination with suitable cleaning devices mounted on the frame, a pair of roller-frames having a hinged connection with the main frame at points intermediate the upper and lower ends of the latter and having rollers adapted to bear against the hull between the keel and the water-line, and ropes or cables attached to said roller-frames, whereby the latter may be vibrated for forcing the rollers against the hull and moving the main frame and the cleaning devices out of contact with the hull, substantially as described.

5. In an apparatus of the character described, the combination with a suitable frame adapted to extend upon opposite sides of the keel, of cleaning devices mounted in said frame, and a jointed and folding vise or grip adapted to be adjusted into clamping engagement with the keel, substantially as described.

6. In an apparatus of the character described, a flexible frame adapted to conform to the cross-sectional outline of the hull of the vessel, in combination with an endless train of cleaning-brushes mounted in the frame, the shafts around which the brushes travel having sprocket-wheels fast thereon, endless drive-chains running around said sprocket-wheels and arranged at each side of the brushes, the brushes being attached to said chains by means of cross-rods which connect the opposing chains, substantially as described.

7. In an apparatus for cleaning the hulls of vessels, the combination with a pair of flexible frames, of a series of links connecting the lower ends of said frames, and a series of crank-arms connected to and operating said links and causing them to bind against and grip the keel of a vessel, substantially as described.

8. In an apparatus for cleaning the hulls of vessels, the combination with an elastic frame made in two similar sections, of a se-

ries of links connecting said sections at their lower adjacent ends, a series of transverse bolts or rods connecting said links, and a set of crank-arms each connected with more than one of said bolts or rods, and having an operating rope or cable, substantially as and for the purpose specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

PATRICK REILLY.

Witnesses:

W. C. GORMLEY, Jr.,

C. W. CROASDILL.