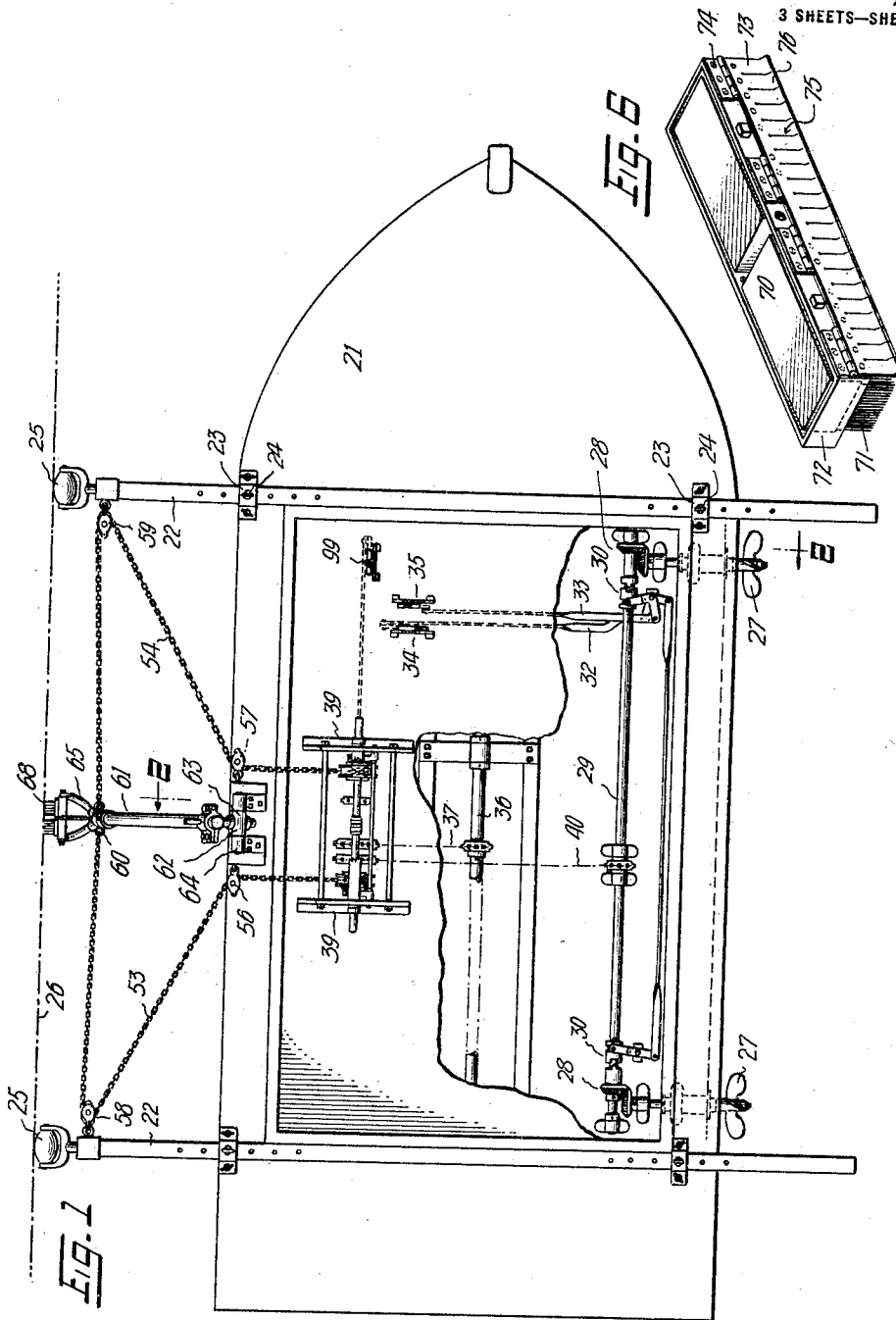


A. F. BROWNE.
 APPARATUS FOR SCRAPING AND BRUSHING THE HULLS OF FLOATING SHIPS.
 APPLICATION FILED SEPT. 28, 1920.
 1,368,692. Patented Feb. 15, 1921.

3 SHEETS—SHEET 1.



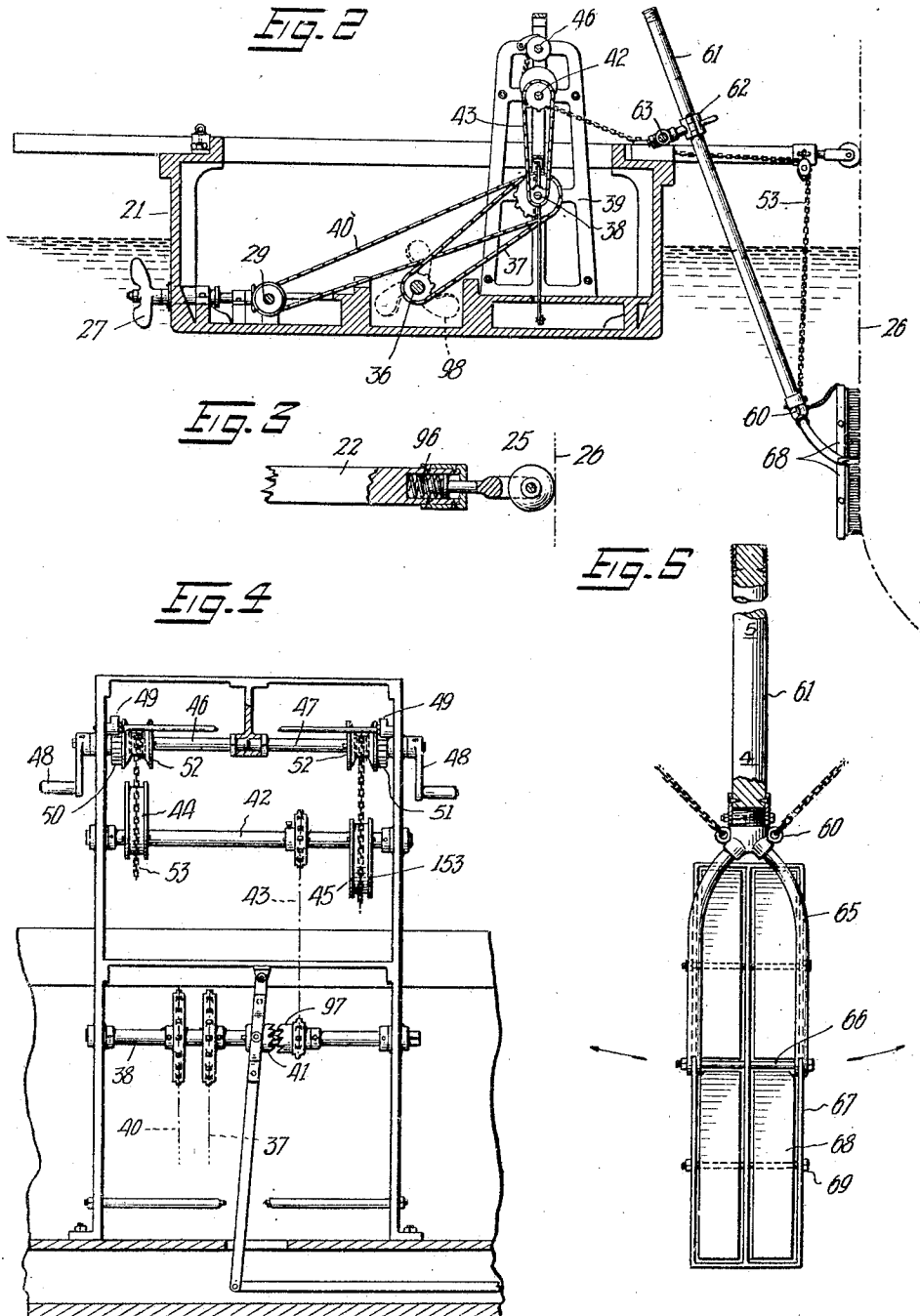
INVENTOR:
 Arthur F. Browne.
 By Mrs. Wallace White
 ATT'Y.

A. F. BROWNE.
 APPARATUS FOR SCRAPING AND BRUSHING THE HULLS OF FLOATING SHIPS.
 APPLICATION FILED SEPT. 28, 1920.

1,368,692.

Patented Feb. 15, 1921.

3 SHEETS—SHEET 2.



INVENTOR:
 Arthur F. Browne
 By Wm Wallace White
 ATTY.

A. F. BROWNE.
 APPARATUS FOR SCRAPING AND BRUSHING THE HULLS OF FLOATING SHIPS.
 APPLICATION FILED SEPT. 28, 1920.

1,368,692.

Patented Feb. 15, 1921.

3 SHEETS—SHEET 3.

Fig. 7

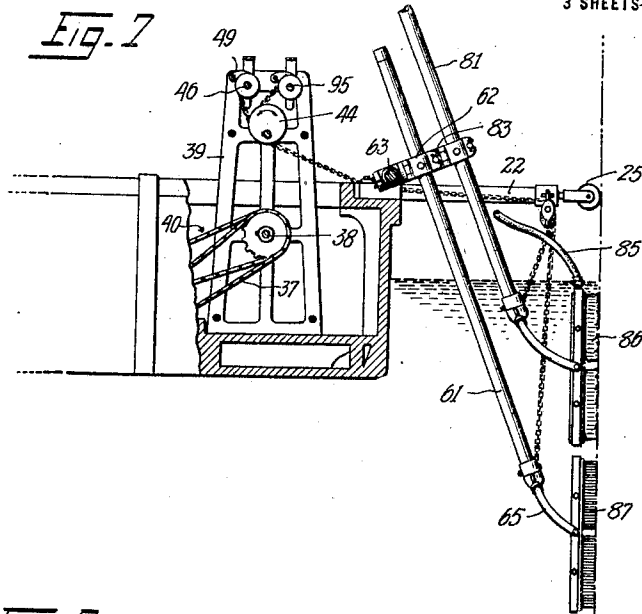
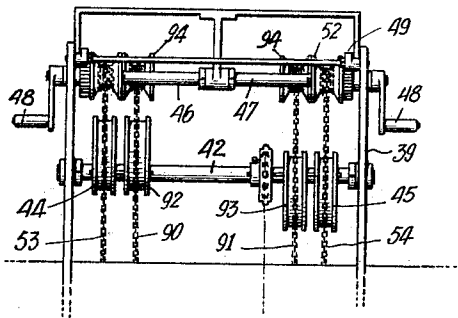


Fig. 8



INVENTOR:

By *Arthur F. Browne*
Wm Wallace White
 ATT'Y

UNITED STATES PATENT OFFICE.

ARTHUR FREDERICK BROWNE, OF DARLING POINT, NEAR SYDNEY, NEW SOUTH WALES, AUSTRALIA.

APPARATUS FOR SCRAPING AND BRUSHING THE HULLS OF FLOATING SHIPS.

1,368,692.

Specification of Letters Patent. Patented Feb. 15, 1921.

Application filed September 28, 1920. Serial No. 413,390.

To all whom it may concern:

Be it known that I, ARTHUR FREDERICK BROWNE, subject of the King of Great Britain and Ireland, residing at 143 Darling Point road, Darling Point, near Sydney, New South Wales, Australia, have invented new and useful Improvements in Apparatus for Scraping and Brushing the Hulls of Floating Ships, of which the following is a specification.

This invention consists in an apparatus installed on a floating stage or other floating support for scraping and brushing the submerged portion of the hulls of floating ships. It has for its object to facilitate the removal of marine growths from the hulls of ships afloat and the application of paint thereto, thereby to obviate the delay and cost which are involved in the placing of ships in dock for the cleaning and painting of their hulls below the water line.

In the accompanying drawings, Figure 1 is a plan view of the apparatus;

Fig. 2 is a sectional elevation of same;

Fig. 3 is a detail of the construction of the buffer heads of the fender beams by which the floating stage is maintained at the desired working distance from the hull of the vessel to be operated on;

Fig. 4 is an elevational view of winch mechanism by which lateral motion and frontal pressure is applied to the scraping and brushing heads;

Fig. 5 is a rear elevational view with portions in section showing certain detail of a brush head;

Fig. 6 is a perspective view showing a combined scraper and brusher head;

Fig. 7 is a fragmentary sectional elevation showing the apparatus adapted for operating with two brush heads, one of which performs a cleaning operation and the other effects painting of the cleaned surface;

Fig. 8 is an elevational view showing portion of modified winch mechanism by which lateral motion and frontal pressure is applied to two brush heads working simultaneously.

The apparatus is installed on a barge or other floating structure 21. The barge is provided with two transversely disposed fender beams 22 which are adapted to run through slide cleats 23 and to be chocked therein by drop keys 24 or otherwise. The ends of these fender beams are armed with

roller buffers 25 which are slidably mounted with spring abutments 96 in the end of the fender beams 22. The roller buffers 25 are adapted to bear against the hull 26 of the ship to be operated on. They serve the purpose of holding the barge 21 at a predetermined distance from the hull 26. The barge is kept up to its position with the buffers 25 contacting with the hull 26, by one or more lateral propellers 27 or equivalent device which may be driven by gearing 28 from a way-shaft 29, 30 being dog couplings which are controlled through linkage 31—32—33 by hand levers 34 and 35. A main shaft 36 is driven by a prime mover (not shown) as for instance, a steam engine or a gas engine. This shaft may be fitted with coupling means to drive a shaft (not shown) passing through a gland in the stern of the barge 21 to carry the propeller 98 by means of which the barge 21 may be navigated from place to place in a harbor in which the machine is operated. The fore-and-aft propeller shaft and propeller form no part of the invention. The shaft 36 is geared by a chain belt 37 to a counter-shaft 38 having its bearings in the rigger framing 39. The shaft 29 is driven from the shaft 38 by means of a chain belt 40. The sleeve coupling 41 on the shaft 38 when engaged with its counterpart 97 gears the shaft 38 to the cam shaft 42 by a chain belt 43. The cam shaft 42 is also carried in bearings in the frame 39 and it is armed with two cams or eccentrics 44—45 oppositely disposed. 46—47 are shafts preferably arranged in alinement and each provided with a hand crank handle 48 on the outer side of the framing 39; spring pawls 49 are carried on the framing 39 and adapted to engage the detent wheel 50—51 on the shafts 46—47 respectively. These said shafts each carry a barrel 52. To these barrels the ends of sweep chains or lines 53—54 are secured. Said chains or lines pass around the cams or eccentrics 44—45 which are shrouded on either side as shown at 153 to insure that the chains or lines 53—54 which run over them will not slip off laterally. The chains or lines 53—54 are respectively led through fair lead blocks 56—57, thence over other fair lead blocks 58—59, the latter blocks being hung on the out-board ends of the fender beams 22 just rearward of the buffer heads 25. The outer ends of the chains or lines 53—54 which have

been so reeved through the fair lead blocks 56—59 are connected to the eyes 60 on the wrist of the sweep arm 61. The sweep arm is marked appropriately to indicate length and it is carried in a clamp sleeve 62 through which it may be slid endwise to provide any required length below said sleeve. The sleeve is carried on a universal joint bracket 63, the cross pin of which is supported in foot lugs 64 fixed to the gunwale portion of the barge. The brushing or scraping heads are carried on the lower end of the sweep rod 61. The sweep rod 61 is preferably made in sections connected together by screw sockets so that any required length may be obtained. Below the wrist where the chains 53—54 are connected to it at 60, yoke arms 65 carry a yoke bolt 66 which passes through the rectangular frame 67 in which the brush or scraper members 68 are mounted on rock bolts 69. As the frame 67 is supported centrally it is balanced and self adjusting and the brushes 68 are individually balanced and self adjusting on their rock pins 69. Consequently when the brush frame is forced up toward the hull of a ship (see Fig. 2) the frames as a whole and the brushes contained within it adapt themselves to the surface of the hull and the brush faces set squarely against it.

A preferred method of constructing the brush head is shown in Fig. 6. There the brush members consist of a wooden back 70 armed with the spring wire teeth or heavy cane spines 71 and one side of the frame 72 (which corresponds with the frame 67 shown in Fig. 5) carries hung upon it a blade of spring steel 73. This blade is hung by means of hinges 74 which permit it to flap freely in one direction but not in the other direction; it is slitted at intervals as shown at 75 to form its edge into a large number of independent scraper teeth, the ends of which are outwardly bent as shown at 76 to augment the scraping and detaching action of the teeth 71 when the instrument is moved to and fro laterally of its length over a surface such as the befouled skin of a ship's hull. The split blade 73 may be made in two sections one for each brush, and these sections hingedly fixed to the sides of the brush backs instead of to the sides of the frame 72; thereby the blades are better located for acting on the foul skin of the ship as they will be self-adjusting with the brushes in relation to the curved parts of the hull.

Two brush fittings may be used operating simultaneously on near by areas of the hull skin, as shown in Fig. 7. The brush frames may be of the same type, and the mounting of the sweep rods 61 and 81 substantially the same as the mounting of the sweep rod 61 shown in previous figures. As, however, both sweep rods have lateral movement in

unison, the clamp sleeve 82 carrying the rod 81 may be connected to the fore side of the clamp sleeve 62 by a bolt 83 fixed to allow a little freedom between the two sleeves so that the sweep rods 81 and 61 may be separately self-adjusting for angular position. The lower brush head may be the same as shown in Fig. 5 and the upper brush head may be of similar type, but as shown in Fig. 7 the brushes in the upper head are provided with hollow backs from which paint may percolate through perforations therethrough among the brush bristles or tufts; paint is supplied to the hollow brush backs from a reservoir of paint on the floating stage by a flexible feed pipe 85. When the upper system of brushes 86 is required to be used for applying paint to the hull of the vessel the brushes are constructed with hair or fiber bristles or wool tufts and not with wire or cane spines. It will be understood that the nature of the bristles or scrapers to be used will depend upon the condition of the surface required to be operated upon; thus if the ship's hull is befouled with heavy growths positive scraping as by means of an instrument such as shown in Fig. 6 will be necessary to clean it, but in other cases rough brushing with a coarse fiber brush will suffice to remove the growths attached to the hull. When two systems of brushes as shown in Fig. 7 are used, the lower brushes 87 are first brought into action and after the hull has been cleaned thereby for a given range below water level the upper system of brushes is fixed and thereafter cleaning by means of the lower brushes 87 and painting the clean surfaces by means of the upper brushes 86 may be carried on until the whole surface of the hull within reach of the brushes has been dealt with.

It will be understood that expert manipulation of the apparatus involving appropriate length adjustment of the sweep rods 61 and 81, appropriate selection of brushes, and appropriate adjustment of the fender lengths will be required, having regard to the shape of the hull being operated on and its surface condition. The movements of the upper sweep rod 81 are controlled by a separate set of chains or lines 90—91 which like the chains or lines 53—54 are brought over cams or eccentrics 92—93 fixed on the shaft 42, with their ends carried on length adjusting drums 94 which are mounted on separate shafts 95 which may be arranged parallel with the shafts 46—47.

The method of operation is as follows:—

Referring to Figs. 1 to 6: The sweep rod 61 is set for length so that the brush fixed on the wrist on the lower part of it will locate against the hull 26 of a vessel at the depth position at which the operation is required to be performed. The chains or lines 53—54 are now tautened up by turning the

hand cranks 48 and when they are taut the shafts 46—47 are locked by means of the pawls 49. The motor being set in motion to turn the shaft 36, motion is communicated therefrom by the chain belt 37 to the shaft 38, which in turn through the chain belt 40 turns the shaft 29. Meantime, the fender beams 22 have been set out to stand off the barge 21 at the required distance from the hull 26. By means of the hand levers 34—35 the dog couplings 30 are engaged, thereby setting in motion the propellers 27 which act to keep the barge 21 forced up laterally toward the hull 26, the fenders 22 standing the barge off the required clearance distance. Motion from the shaft 38 is transmitted to the shaft 42 when the clutch 41 is engaged by means of the hand lever 99. By rotation of the shaft 42, the cams or eccentrics 44—45, acting alternately against the chains or lines 53—54 which pass around them, pull and relax said chains alternately, with the result that the sweep rod 61 with the brush head on the lower end of it in contact with the hull 26 is caused to sweep pendularly about its mounting 63, thereby effecting brushing of the hull 26. The angular disposition of the sweep rod 61 and the direction of the leads 53—54 to it are such that the tension on the chains or lines operates not merely to apply oscillating motion to the sweep rod 61, but also tends to pull the lower end of said rod upward and thereby causes the brushes to bear inwardly against the hull 26. When the brush heads are constructed as shown in Fig. 6, the blades 76 act as scrapers when the brushes are sweeping in one direction, but these blades are idle in the reverse movements of the brushes. The blades operate effectively to detach heavy marine growths, while the brushes, according to the nature of their fibers or spines, act to clean up the hull. When the upper zone immediately below the water level has been so cleaned up, the second brush head carried on the upper sweep rod 81 (see Fig. 7) may be fixed and adjusted similarly to the lower brush head. The operation being then carried on as before, both brush heads 86—87 are caused to work on the surface of the hull 26 so that if an appropriate paint mixture be served to the upper brush head 86 through the pipe 85, the brushes therein will apply said paint to the cleaned surfaces simultaneously with the cleaning of the lower zone of the hull 26 as the work proceeds. The forward and backward movement of the barge is effected by means of the end propeller 98. In the absence of the propeller equipment 98, the barge 21 is warped or otherwise moved longitudinally as the work progresses, so that substantially the whole area of the hull of a vessel from water line to the bilge and in

some cases below the bilge, according to the section of the hull, may be readily cleaned.

What I claim as my invention and desire to secure by Letters Patent is.

1. Apparatus carried on a floating stage, for brushing the submerged skin of a ship's hull, characterized in that a brush is held on the lower end of an angularly disposed sweep arm which is adjustable lengthwise in a universal joint bracket mounted on said stage, and that said brush is oscillated over and is caused to bear toward the ship's hull by means of hauling lines which are reeved through fair lead sheaves located on said stage laterally of and above the low end of said sweep arm.

2. Apparatus for brushing the hull sides of floating ships, comprising a floating stage, lateral screw propellers on said stage disposed to force it toward said ship, fender beams adjustable on said stage and disposed to hold said stage off from said ship, a sweep rod of adjustable length carried in a universal joint bracket on said stage, a brush head mounted on one end of said sweep rod, flexible lines one from either side of said sweep rod near said brush head, said lines carried over fair lead sheaves located laterally of and above their points of attachment, and means for alternately hauling on and paying out said lines thereby to cause brushes in said head to oscillate laterally over and to bear inwardly against the hull of the ship.

3. In apparatus as set forth in claim 1, means for alternately hauling and paying out the sweep arm lines and adjusting the length of said lines conformably to the length adjustment of the sweep arm, consisting in a frame fitted with separately adjustable end barrels for winding up the slack of said lines, and cams acting alternately on said lines to pull on them alternately.

4. In apparatus as set forth in claim 1, fender beams disposed transversely of the floating stage above water level, a universal joint bracket on the gunwale of the stage midway of said fender beams, a depending sweep arm held adjustably for length in said bracket and disposed angularly outward from the stage, fair lead sheaves on the outer part of the fender beams, and hauling lines from a brush head fitting mounted on the lower end of said sweep arm.

5. Apparatus as set forth in claim 1, having two brush heads carried on separate sweep arms which are mounted in universal joint brackets one above the other, and independent hauling lines reeved through fair lead sheaves located laterally of and above brush heads on said sweep arms and thence to mechanism on the stage adapted for alternately hauling on and paying out said lines.

6. Apparatus for brushing the hulls of floating ships, characterized in that brushes are held on a sweep arm having a laterally swinging and outwardly bearing movement about a universal joint bracket supported on a floating stage and that said stage is provided with means for bearing it toward a ship's side and for fending it at a predetermined clearance distance therefrom.
7. In apparatus as set forth in claim 6, means for applying the lateral swinging and outward bearing movement to the brush sweep arm, and comprising members disposed angularly upwardly and laterally therefrom and adapted to alternately pull on the lower end of the arm.
8. In combination with a sweep arm disposed diagonally outwardly and downwardly from a floating stage, and means for swinging it laterally and bearing it outwardly, of a brush head therefor comprising a plurality of brushes separately mounted on self-adjusting bearings in said head, and a yoke in which said brush head is mounted on self-adjusting bearings, said yoke fixed to said sweep arm.
9. In combination with a sweep arm disposed diagonally outwardly and downwardly from a floating stage, and means for swinging it laterally and bearing it outwardly, of a brush head having a tongued scraper plate hingedly mounted on one side of it and adapted for scraping a surface over which it is moved while it is moving in one direction.
10. In combination with ship brushing apparatus as set forth in claim 5 hereof, means for supplying paint to the upper brush of the pair, said means comprising a flexible paint supply pipe connected into the brush back and perforations therefrom through the brush back adapted to deliver paint therefrom to the brush fibers or tufts.
- In testimony whereof I have signed my name to this specification.
- ARTHUR FREDERICK BROWNE.