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PATENTED OCT. 1, 1907.

J. A. KENNEDY-McGREGOR.  
SHIP CLEANING APPARATUS.  
APPLICATION FILED JULY 7, 1906.

3 SHEETS-SHEET 1.

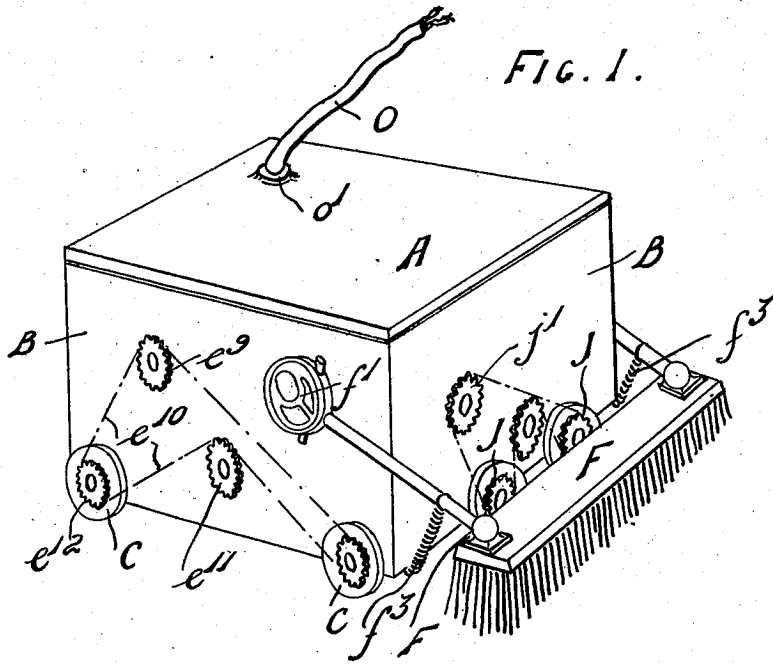
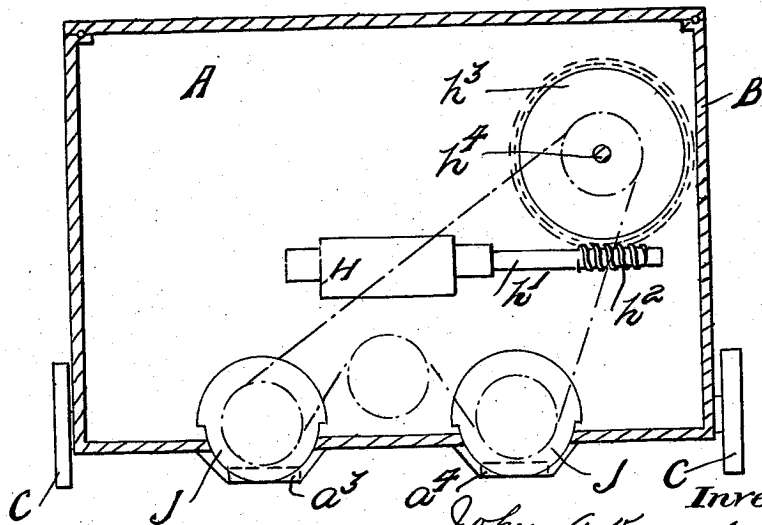


FIG. 1.

FIG. 4.



Witnesses.  
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FIG. 2.

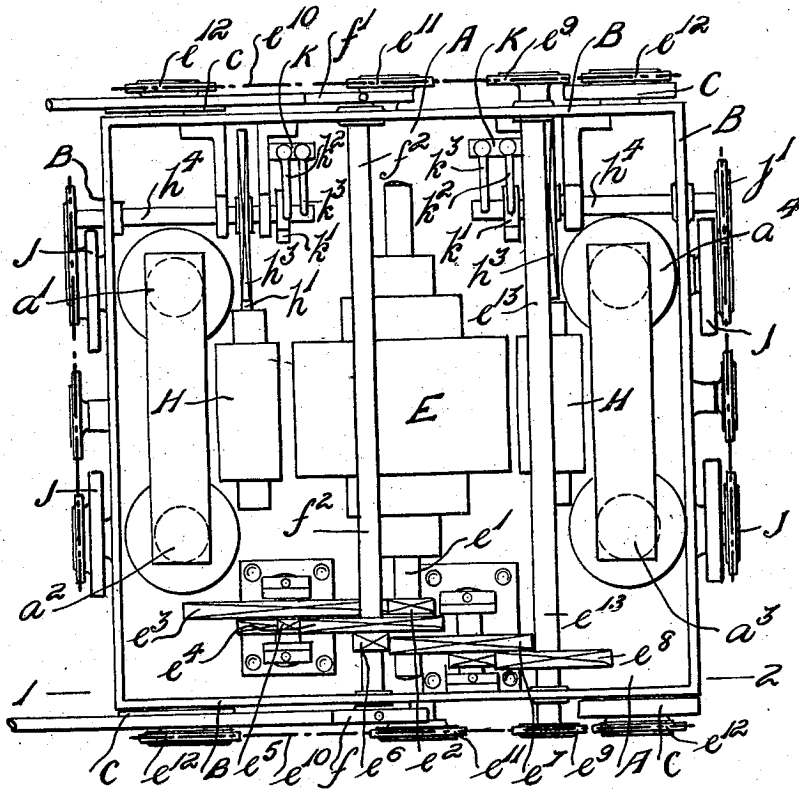
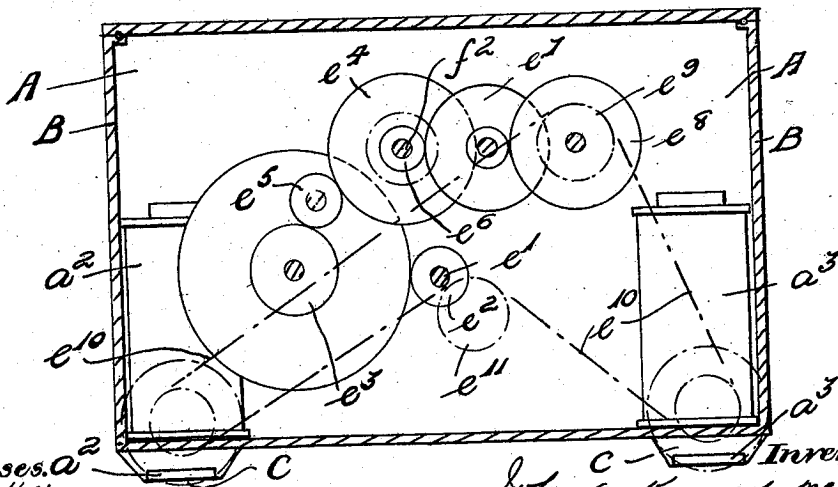


FIG. 3.



Witnesses. *a2*  
*a3*  
H. P. Drumble

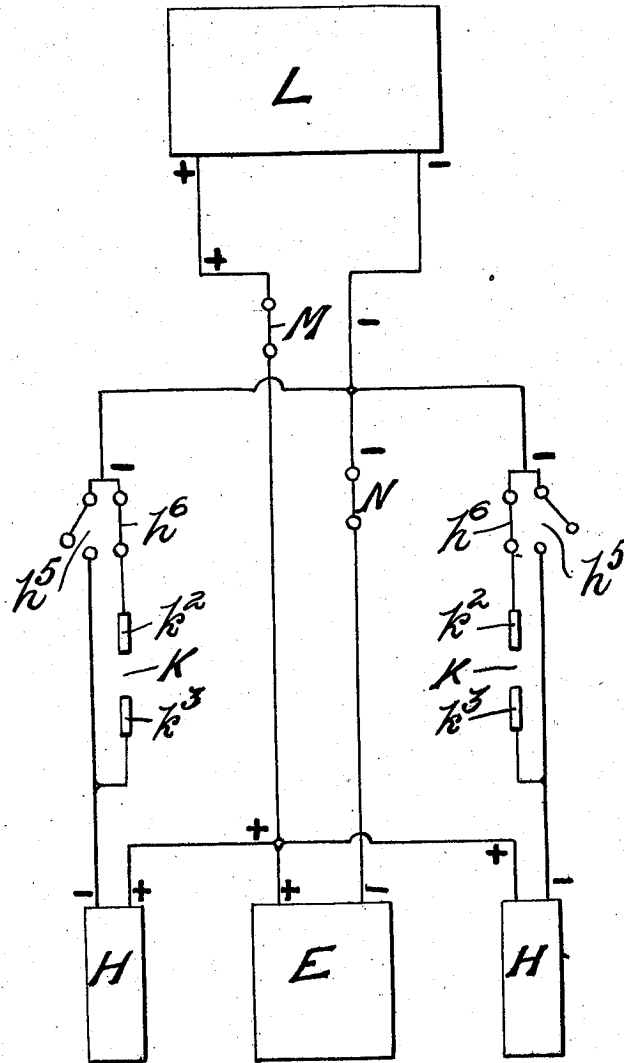
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SHIP CLEANING APPARATUS.

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3 SHEETS—SHEET 3.

FIG. 5.



Witnesses.

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# UNITED STATES PATENT OFFICE.

JOHN ALEXANDER KENNEDY-McGREGOR, OF BIRMINGHAM, ENGLAND.

## SHIP-CLEANING APPARATUS.

No. 867,513.

Specification of Letters Patent.

Patented Oct. 1, 1907.

Application filed July 7, 1906. Serial No. 325,048.

To all whom it may concern:

Be it known that I, JOHN ALEXANDER KENNEDY-McGREGOR, a subject of the Kingdom of Great Britain, residing at 311 Albert road, Aston, Birmingham, in the county of Warwick, England, engineer, have invented a new and useful Improvement in Ship-Cleaning Apparatus, for which I have applied for a patent in Great Britain, Patent No. 23,169, dated November 11, 1905, of which the following is a specification.

This invention relates to an appliance for cleaning the hulls of ships while under way, in which a brush is operated by a motor in such a manner as to clean the side of the ship, the motor being contained in a water tight casing which is held to the side of the ship by electromagnets, and has for its object the movement of the appliance in any direction by means of motive power which may be obtained from the motor which actuates the brush or cleaning tool. Such an apparatus renders the cleaning operation far more effective and complete than has before been the case and while its main object is to provide a means for cleaning when the ship is under way, it can also be applied with advantage to the cleaning of the hulls of vessels when in dry dock.

In order that this invention may be clearly understood and more easily carried into practice, I have appended hereunto two sheets of drawings upon which I have illustrated the nature of my said invention, and on which,—

Figure 1 is a perspective view of the appliance when resting upon a horizontal plane. Fig. 2 is a plan of the appliance with the cover plate removed. Fig. 3 is a section on the line 1—2 of Fig. 2. Fig. 4 is a section showing the means for actuating the end wheels. Fig. 5 is a diagram showing one method of connecting the respective motors to the dynamo for the operation and regulation of the appliance.

In carrying this invention into effect the apparatus A consists of an electromagnet or magnets  $a^1$ ,  $a^2$ ,  $a^3$ ,  $a^4$  arranged in a watertight casing or compartment B.

The end pieces or poles of the magnets may be in the form of iron disks or wheels C which are mounted upon the outside of the compartment B in such a manner as to be capable of rotation but preferably they are independent of the wheels C in which case the latter are so adjusted as to prevent the magnets from actually touching the iron of the ship side and allow a certain amount of clearance which varies accordingly to the state of the surface under operation.

A motor E worked by air, steam, water or electricity is suitably contained in the watertight casing or compartment B and has for its object to rotate the wheels C and thereby propel the appliance A in either a forward or backward direction.

The wheels C are preferably geared from the motor shaft  $e^1$  through the medium of the spur wheel  $e^2$  which

gears into the larger diameter of a compound spur wheel  $e^3$  the smaller diameter of which gears with the spur wheel  $e^4$  through the medium of pinion  $e^5$ . Compound with the spur wheel  $e^4$  is a pinion  $e^6$  which gears into the larger diameter of a compound spur wheel  $e^7$  the smaller diameter of which gears into the spur wheel  $e^8$ . The spur wheel  $e^8$  is locked to a shaft  $e^{13}$  which is mounted in suitable stuffing boxes in the sides of the casing B and extends completely across the appliance. This spindle  $e^{13}$  carries at each end a similar chain wheel  $e^9$  from which the wheels C are driven in the manner shown in the drawings the chain  $e^{10}$  being also carried by a loose chain wheel  $e^{11}$  and engaging the toothed wheels  $e^{12}$  on the wheels C.

The cleaning tool F shown in Fig. 1 of the drawings is of the reciprocating form but a rotary tool or brush may be substituted if so desired. The brush F receives its reciprocating motion from eccentrics  $f^1$ , the sheaves of which are mounted upon and receive their rotary motion from the shaft  $f^2$  which carries the compound spur wheel  $e^4$ ,  $e^6$ . This shaft  $f^2$  has suitable stuffing boxes in the casing B and extends completely across the appliance and consequently gives a similar action to each end of the brush F. Suitable springs  $f^3$  are provided to retain the brush F against the ship side.

The appliance is so arranged as to be capable of a side way movement so as to enable the operator to effect its movement in every possible direction by a combination of forward or backward and sideway movements. For the sideway movement the wheels J are provided, and it is necessary for the even running of the appliance that the wheels C shall be away from the ship side when it moves in a sideway direction, and for the same reason the wheels J must be clear when moving in a forward or backward direction. This function is obtained by shaping the wheels J in the manner shown in Fig. 4, the diameter for one half of the circumference being larger than that of the wheels C and the diameter of the other half being smaller. Thus the wheels J are only effecting the movement of the appliance during one half of each revolution and consequently the sideway movement is not continuous but at short intervals the appliance resting on the wheels C during such short intervals and upon the larger diameter of the wheels J when in movement. The wheels J are driven by motive power obtained from small motors H which are independent of each other and the motor E, and each motor H drives the wheels J at one end of the appliance. For this purpose the motor shaft  $h^1$  carries a worm  $h^2$  which gears into the worm wheel  $h^3$  on the shaft  $h^4$  carrying the driving chain pinion  $j^1$  for the wheels J at the one end. For the reason hereinafter set forth it is necessary that the chain wheels on the wheels J should be of the same diameter as the chain wheel  $j^1$ . The provision of sepa-

rate motors enables the operator to rotate the wheels J at the ends of the appliance independently in either direction, and it is by this means that the variety of movements is obtained.

- 5 In order that the wheels J shall always stop exactly or approximately in the position shown in Fig. 4, *i. e.* with the appliance resting upon the wheels C the cut off arrangement K is provided. This preferably consists of a metal drum  $k'$  which is mounted upon the shaft  $h^4$  and is insulated for a particular half of its circumference. A contact brush  $k^2$  impinges upon the circumference of the drum  $k$  and another brush  $k^3$  is in contact with the shaft  $h^4$ . It may thus be readily understood that if the current driving the motor is passed through these brushes  $k^2$   $k^3$  it will be cut off and the motor stopped when the brush  $k^2$  comes into contact with the insulated half of the drum  $k'$  and this insulated half is arranged to correspond with the half of the wheels J which has the larger diameter in such a manner that this half will be away from the ship's side when the half insulated drum cuts off the current in which position it will remain until it receives further motion from the motor H and it is this action which necessitates the similarity in the diameters of the chain wheels on the wheels J and the chain wheel  $j'$ .

- Fig. 5 shows diagrammatically one method of connecting up the parts to the driving dynamo L the switch M being for the regulation of the forward and backward movement and when the operator desires to rotate the wheels J he closes the switch  $h^5$  corresponding with the end at which the wheels are to rotate and the current passes through the motor H. On opening the switch  $h^5$  the current passes through the brushes  $k^2$   $k^3$  until the insulated half of the drum K cuts off the current and stops the wheels J in the required position. The switch  $h^6$  is always closed and the current for all three motors may be obtained from the one driving dynamo L in the manner shown, only one switch M being necessary for the positive wire which branches to the positive terminals of the three motors after it has left the switch. The three switches  $h^5$ , N  $h^5$  are necessary in the case of the negative connections for the independent operation of the three motors and the wires are independently insulated and pass through the casing of the appliance A in the form of one cable O, a suitable stuffing box  $o'$  being provided to prevent leakage.

- The whole appliance A is preferably provided with a chain or other cable by means of which it can be hauled up if any working part should get out of order, but in the ordinary course of events the operator directs it to the top of the ship side from which it may readily be detached.

- The present improvements are not confined to the particular details set forth in the foregoing specification and numerous variations may be made without departing from the nature of this invention.

What I claim as my invention, and desire to secure by Letters Patent is:—

- 60 1. A ship cleaning apparatus comprising, a casing, a cleaning means carried thereby, self contained means for selectively moving said casing lengthwise or laterally, and means for holding said casing against the surface of the ship.
- 65 2. A ship cleaning apparatus comprising, a casing, a cleaning means carried thereby, self contained means for

selectively moving said casing lengthwise or laterally and a magnet for holding said casing against the surface of the ship.

3. A ship cleaning apparatus comprising, a casing, a cleaning means carried thereby, forwarding wheels journaled on said casing, a motor in said casing, connecting means between said motor and said forwarding wheels, means for moving said casing laterally, and a magnet for holding said casing against the surface of the ship.

4. A ship cleaning apparatus comprising, a casing, a cleaning means carried thereby, forwarding wheels journaled on said casing, a motor in said casing, connecting means between said motor and said forwarding wheels, other wheels for moving the casing laterally, driving motors for the last mentioned wheels, means for putting said last mentioned wheels out of operation during the forward movement of the casing and a magnet for holding said casing against the surface of the ship.

5. A ship cleaning apparatus comprising, a casing, a cleaning means carried thereby, forwarding wheels journaled in said casing, a motor in said casing connecting means between said motor and said forwarding wheels, lateral movement wheels of larger diameter than the said forwarding wheels having semi-circumferential recesses of such depth that the radius of the inner periphery so formed is less than the radius of the forwarding wheels, driving motors for said lateral movement wheels and a magnet for holding said casing against the surface of the ship.

6. A ship cleaning apparatus comprising, a casing, a cleaning means carried thereby, forwarding wheels journaled in said casing, a motor in said casing, connecting means between said motor and said forwarding wheels, lateral movement wheels of larger diameter than the said forwarding wheels having semi-circumferential recesses of such depth that the radius of the inner periphery so formed is less than the radius of the forwarding wheels, means for stopping said lateral movement wheels when their recesses are in the lowermost position, driving motors for said lateral movement wheels and a magnet for holding the casing against the surface of the ship.

7. A ship cleaning apparatus comprising, a casing, a cleaning means carried thereby, forwarding wheels journaled in said casing, a motor in said casing, connecting means between said motor and said forwarding wheels, lateral movement wheels of larger diameter than the said forwarding wheels having semi-circumferential recesses of such depth that the radius of the inner periphery so formed is less than the radius of the forwarding wheels, driving motors for said lateral movement wheels, shafts connected to said lateral movement wheels, connecting means between said driving motors and said shafts, electric conducting drums on said shafts, insulating parts on said drums, brushes engaging said drums and a magnet for holding the casing against the surface of the ship.

8. A ship cleaning apparatus comprising, a watertight casing, a cleaning means carried thereby, a motor within said casing, a shaft within said casing and extending outside the same, gearing between said shaft and motor, chain wheels on the ends of said shaft, forwarding wheels journaled outside said casing, chain wheels on said forwarding wheels, chains connecting said chain wheels with the chain wheels on said shaft, lateral movement wheels of larger diameter than said forwarding wheels positioned at right angles to the forwarding wheels and having semi-circumferential recesses of such depth that the radius of the inner periphery so formed is less than the radius of the forwarding wheels, driving motors for said lateral movement wheels, shafts connected to said lateral movement wheels, connecting means between said driving motors and said shafts, electric conducting drums on said shafts, insulating parts on said drums, brushes engaging said drums and a magnet for holding said casing against the surface of the ship.

9. A ship cleaning apparatus comprising, a watertight casing, a motor within said casing, a shaft within said casing and extending outside the same, gearing between said shaft and motor, chain wheels on the ends of said shaft, forwarding wheels journaled outside said casing, chain wheels on said forwarding wheels, chains con-

necting said chain wheels with the chain wheels on said shaft, a second shaft within said casing and extending outside the same, gearing between said second shaft and said motor, eccentrics on the ends of said second shaft, arms connected to said eccentrics, a dirt remover on said arms, lateral movement wheels of larger diameter than said forwarding wheels positioned at right angles to the forwarding wheels and having semi-circumferential recesses of such depth that the radius of the inner periphery so formed is less than the radius of the forwarding wheels, driving motors for said lateral movement wheels, shafts connected to said lateral movement wheels

connecting means between said driving motors and said shafts, electric conducting drums on said shafts, insulating parts on said drums, brushes engaging said drums and a magnet for holding said casing against the surface of the ship. 15

In witness whereof I have hereunto set my hand in the presence of two witnesses.

JOHN ALEXANDER KENNEDY-McGREGOR.

Witnesses:

LEWIS D. GOOBE,  
FREDERICK CRUXTON.