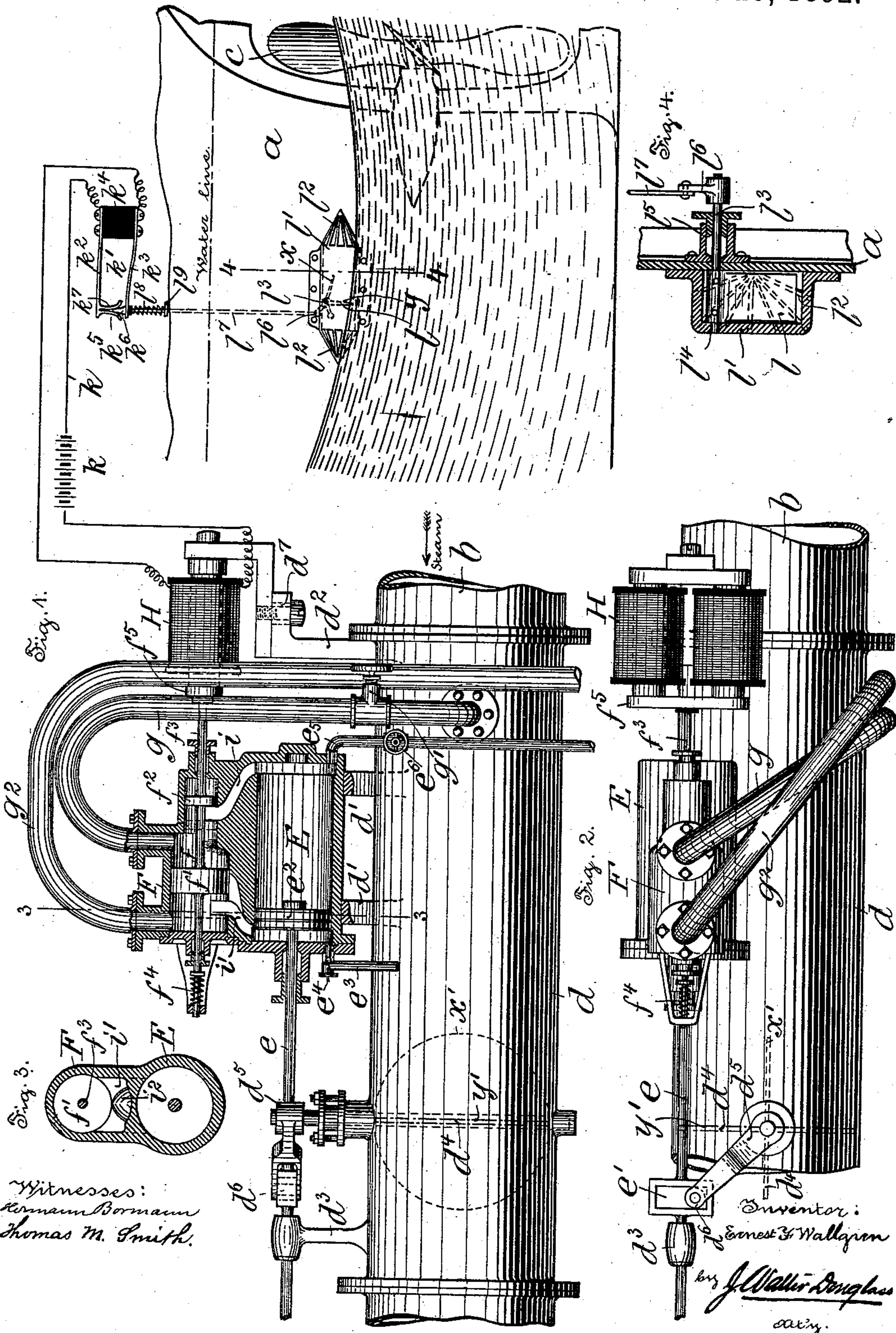


(No Model.)

E. F. WALLGREN.  
GOVERNOR FOR MARINE ENGINES.

No. 471,725.

Patented Mar. 29, 1892.





# UNITED STATES PATENT OFFICE.

ERNEST FRITZ WALLGREN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR  
OF ONE-HALF TO AXEL H. ENGSTRÖM, OF SAME PLACE.

## GOVERNOR FOR MARINE ENGINES.

SPECIFICATION forming part of Letters Patent No. 471,725, dated March 29, 1892.

Application filed December 8, 1891. Serial No. 414,381. (No model.)

*To all whom it may concern:*

Be it known that I, ERNEST FRITZ WALLGREN, a subject of the King of Sweden and Norway, but now residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric Governors for Marine Engines, of which the following is a specification.

My present invention relates in general to governors for automatically throttling or diminishing the full or normal supply of steam to a marine engine whenever the screw or propeller of the ship is out of water and for admitting the full supply or head of steam to the engine whenever the propeller or screw is again immersed; and it relates more particularly, first, to means for cutting off the supply of steam to the engine rapidly and for admitting the full head of steam slowly into the cylinder of the engine, and, second, to a sensitive appliance located upon the exterior of the ship and adjacent to the screw or propeller for automatically operating the steam-controlling mechanism.

The principal objects of my present invention are, first, to provide a steam ship or vessel with a simple, durable, sensitive, and reliable governor for automatically diminishing or throttling the supply of steam to the engine whenever the screw or propeller emerges from the water and for admitting the full head of steam to the cylinder or cylinders of the engine whenever the screw or propeller is again immersed; second, to construct and arrange the parts of the governor for operation in such manner that the supply of steam is rapidly and positively cut off from the engine before the screw or propeller emerges from the water and before the screw or propeller and engine have had an opportunity to "race" or move at an abnormally-high rate of speed due to the removal of the resistance of the water upon the blades of the screw or propeller, and, third, to cause the governor to admit steam slowly to the engine when the screw or propeller is again immersed, whereby undue straining or overloading of the engine in starting is avoided.

My invention consists of an electric gov-

ernor for marine engines comprising a throttle-valve for regulating the admission of steam to the engine, a vane held out of normal position by the resistance of the water and returning to normal position by the cessation or removal of said resistance, and connections interposed between said vane and valve for causing the movements of the former to actuate the latter.

My invention further consists of an electric governor for marine engines comprising a throttle-valve for regulating the admission of steam to the engine, a steam-cylinder and piston connections for operating said valve, an unevenly-balanced slide-valve tending normally to admit steam to said cylinder to cause said piston connections to open said throttle-valve, electrical appliances for shifting said slide-valve out of normal position into position for admitting steam to said cylinder to cause said piston connections to close said throttle-valve, a vane held out of normal position by the resistance of the water and returning to normal position by the cessation of said resistance, and circuit connections between said vane and electrical appliance.

My invention further consists of an electric governor for marine engines provided with a throttle-valve for controlling the admission of steam to the engine, piston connections for operating said valve, and a complementary steam-cylinder having an unevenly-balanced slide-valve and provided with a funnel-shaped admission-port for causing the travel of said slide-valve toward its normal position to admit steam to said cylinder in gradually-increasing quantities to effect the gradual opening of said throttle-valve; and my invention further consists in the improvements in electric governors for marine engines hereinafter fully described and claimed.

The nature and characteristic features of my present invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a view, partly in section and partly in elevation, of an electric governor for marine engines embodying features of my in-

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vention and showing parts of the governor drawn to an enlarged scale in order to fully illustrate certain details of construction and arrangement. Fig. 2 is a top or plan view of the steam-cylinder and its accessories for operating the throttle-valve. Fig. 3 is a section taken on the line 3 3 of Fig. 1 and illustrating a funnel-shaped admission-port formed in the steam-cylinder; and Fig. 4 is a section on the line 4 4 of Fig. 1, illustrating the detail construction of the vane and its accessories.

In the drawings, *a* is a portion of the hull of a ship adapted normally to be immersed in water up to the dotted line (shown at the right-hand side of Fig. 1) and indicated by the words "water-line."

*c* is a screw or propeller suitably supported by the stern-post of the vessel.

*b* is the main steam-pipe for conveying steam from the boiler or boilers (not shown) to the cylinder or cylinders of the engine. (Not shown.)

Having thus briefly indicated certain of the well-known accessories of a steamship, a description will now be given, having reference to the drawings, of an improved electric governor embodying features of my invention.

*d*, Figs. 1 and 2, is a section of pipe of bronze or other preferred material interposed in the main steam-pipe *b* and provided with brackets *d'* and *d''* and with a bearing *d'''*, for purposes to be presently described.

*d<sup>4</sup>* is a valve for throttling or regulating the passage of steam through the main steam-pipe *b* from the boiler to the engine. This valve *d<sup>4</sup>* is not intended to completely cut off or check the supply of steam to the engine, and hence may not be steam-tight. In the present instance the valve *c* is constructed like an ordinary damper or butterfly-valve. The spindle of the valve *d<sup>4</sup>* is provided with a crank-arm *d<sup>5</sup>*, having a roller *d<sup>6</sup>* journaled thereto.

*e* is a piston-rod adapted to slide in the direction of its length in the bearing *d'''* and provided with a transversely-ranging slot *e'*, engaging the roller *d<sup>6</sup>*.

*e<sup>2</sup>* is a piston-head connected with the rod *e* and adapted to work in a steam-cylinder *E*, supported upon the brackets *d'*. This cylinder *E* is provided at its rear end with a drip-pipe *e<sup>3</sup>*, having an automatic relief-valve *e<sup>4</sup>* for controlling the discharge of the "water of condensation" and a portion of the exhaust-steam from the cylinder *E*. The forward extremity of the cylinder *E* is provided with an exhaust-pipe *e<sup>5</sup>*, leading to a condenser and having a hand-valve *e<sup>6</sup>* for regulating the rate of discharge of exhaust-steam from the cylinder *E*.

*F* is a steam-chest and valve-box supported upon or formed integral with the cylinder *E*. This steam-chest is preferably of circular cross-section and is of larger internal diameter for a portion of its length than it is for the remaining portion of its length, for a purpose to be presently described.

*g* is a steam-induction pipe communicating

with the central portion of the valve-box *F* and with the main steam-pipe *b* and is provided with a hand-valve *g'*.

*g<sup>2</sup>* is an exhaust-pipe communicating with the rear portions of the valve-box *F* and with a condenser or waste-pipe. (Not shown.)

*i* is an admission-port for admitting steam from the front portion of the steam-chest to the front portion of the cylinder *E*.

*i'* is an admission and exhaust port for conveying steam to and from the rear portions of the cylinder *E*. The lower portion of the interior side wall of the steam-chest is hollowed out or cut away at and near the line of union between the cylinder *E* and port *i'*, as shown at *i<sup>2</sup>*, Figs. 1 and 3, so that the port *i'* is funnel-shaped and tapers outward from the cylinder *E* to the steam-chest *F*, for a purpose hereinafter fully described.

*f* is a slide-valve comprising a spindle *f<sup>3</sup>* and two pistons *f'* and *f<sup>2</sup>* of unequal areas and corresponding, respectively, to the portions of the steam-chest that are of unequal internal diameters, so that the effective pressure of live steam upon the adjacent faces of the pistons *f'* and *f<sup>2</sup>* causes the equilibrium or balance of the valve *f* to be disturbed, so that the valve is normally shifted toward the left in Fig. 1—i. e., toward the rear of the valve-box *F*. The valve-rod *f<sup>3</sup>*, appertaining to the valve *f*, projects outward beyond the respective ends or extremities of the steam-chest *F*, and one of these projecting ends of the valve-rod *f<sup>3</sup>* is provided with a spring-buffer *f<sup>4</sup>*, adapted to prevent undue shocks or recoils of the working parts, and the other of these projecting ends is provided with an armature *f<sup>5</sup>*.

*H* is an electro-magnet supported by the bracket *d<sup>2</sup>* and adapted when energized to attract the armature *f<sup>5</sup>*, and thus shift the slide-valve *f* toward the right in Fig. 1—i. e., toward the front of the cylinder *E*. The bracket *d<sup>2</sup>* is preferably made in two sections united by a set-screw, whereof the shank works in a slot *d<sup>7</sup>* in order to permit of the adjustment of the electro-magnet *H* with reference to its armature *f<sup>5</sup>*.

*k* is a battery-circuit for energizing the coils of the electro-magnet *H*.

*k'* is a key interposed in the line *k* and adapted to permit of the opening or closing of the circuit through the coils of the electro-magnet *H*. The key *k* comprises two strips *k<sup>2</sup>* and *k<sup>3</sup>* of spring metal connected with the respective terminals of the line *k* and insulated from each other by means of a hard-rubber or other suitable block *k<sup>4</sup>*.

*k<sup>5</sup>* is a contact device comprising a tongue *k<sup>6</sup>* and socket *k<sup>7</sup>*, connected, respectively, with the strips of spring metal *k<sup>2</sup>* and *k<sup>3</sup>*.

*l* is a vane located upon the exterior of the ship adjacent to the stern thereof and above the center or axis of rotation of the screw or propeller *c*. This vane *l* lies in a plane ranging athwart the ship and is protected from accidental injury by means of a housing *l'*,



provided with open or grill-like extremities  $l^2$  for permitting of the passage of water through the housing. The vane  $l$  is hinged to the side of the ship by means of a spindle  $l^3$ , supported in a bearing  $l^4$  on the housing  $l'$ , and in a stuffing-box  $l^5$ , formed in the side wall of the hull  $a$  of the ship. The portion of the spindle  $l^3$  that extends into the interior of the ship is provided with a crank-arm  $l^6$ , and this crank-arm  $l^6$  is connected with the strip of spring metal  $l^3$  by means of a link  $l^7$ .

$l^8$  is a spring interposed between a bracket  $l^9$ , secured to the interior side wall of the hull  $a$  of the ship, and an insulating-collar  $l^{10}$ , secured to the link  $l^7$ , so that the spring  $l^8$  tends to force the tongue and socket into electric contact, and also assists the operation of the force of gravity in shifting the vane  $l$  normally into a vertical position.

The vane  $l$  is shifted out of its normal position by the resistance of the water when the ship is in motion, and the current or currents of water that flow along the exterior of the hull or skin of the ship from the forward toward the after part thereof to compensate for the displacement of water, due to the operation or revolution of the screw, tend to aid or assist the resistance or inertia of the water in shifting the vane out of its normal position.

However, the vane  $l$  automatically returns again to its normal position as soon as it emerges from the water by reason of the pitching or endwise oscillation of the ship due to the motion of the waves of the sea.

The mode of operation of the hereinabove-described marine-engine governor is as follows: When the ship is proceeding uniformly and properly with the screw or propeller  $c$  immersed in water and in motion, the vane  $l$  is also immersed in water and consequently is shifted and held out of its normal or vertical position, as indicated by the dotted lines  $x$  at the right-hand side of Fig. 1. This movement of the vane  $l$  out of its normal position causes the strip of spring metal  $l^3$  to be drawn downward against the force of the spring  $l^8$ , and thus separates the tongue and socket  $k^5$  and breaks the circuit or cuts out the electro-magnets  $H$ .

The unevenly-balanced slide-valve  $f$  is then propelled by the live steam toward the rear end of the steam-chest  $F$ —i. e., toward the left in Fig. 1—and thus admits steam into the rear portions of the cylinder  $E$  and causes the piston  $e^2$  to occupy a position at the commencement of its stroke—i. e., at the right-hand side of Fig. 1—so that the valve  $d^4$  is normally held in open position, as shown by the dotted line  $x'$  in Figs. 1 and 2, for admitting the full head of steam to the engine.

Whenever the ship is pitching or tossing endwise in such manner that the screw or propeller is occasionally lifted out of the water, the vane  $l$  emerges from the water before the screw or propeller, because the vane is situated nearer to the surface of the water than the screw or propeller  $c$ . As soon as the vane  $l$  emerges from the water it is automatically

shifted into its normal or vertical position, as shown by the dotted lines  $y$  in Fig. 1, by the combined action of gravity and of the spring  $l^8$ , whereupon the circuit is closed and the electro-magnet  $H$  is energized and attracts the armature  $f^5$ . This motion of the armature  $f^5$  shifts the valve  $f$  toward the front of the steam-chest  $F$ —i. e., toward the right in Fig. 1—and thus admits steam in front of the piston  $e^2$ , so that the latter is shifted rapidly into the position shown in Fig. 1. This motion of the piston  $e^2$  turns the butterfly-valve  $d^4$  into the position indicated by the heavy dotted lines  $y'$  in Figs. 1 and 2, and consequently throttles the supply of steam to the engine before the screw or propeller emerges from the water, so that all tendency of the engine to race, due to the sudden diminution of the resistance upon the screw, is avoided. As soon as the screw or propeller  $c$  and vane  $l$  are again immersed in the water the circuit  $k$  is broken and the unevenly-balanced slide-valve  $f$  is released and travels toward the left in Fig. 1. This valve  $f$  during its travel toward the left opens the port  $i'$  for the admission of steam to the rear end of the cylinder  $E$  in order to shift the piston  $e^2$  toward the right into position for opening the valve  $d^4$  and admitting steam to the engine. However, steam should be admitted slowly to the engine, in order to prevent undue shocks and jars in starting. This object is attained in my governor by means of the peculiar shape of the induction end  $i^2$  of the port  $i'$ , which is gradually uncovered by the valve  $f'$ , and hence admits steam slowly to the cylinder  $E$ , and by means of the valve  $f^2$ , which serves to check the passage of the exhaust-steam from the forward side of the piston  $e^2$ , and hence retards its motion toward the right hand in Fig. 1.

When the sea is calm or the vessel is at rest, the herein-described governor may be thrown out of action by breaking the circuit  $k$  or in any other preferred manner.

It will be obvious to those skilled in the art to which my invention appertains that it may be employed in whole or in part in connection with certain portions of several of the well-known types of marine-engine governors, and also that modifications may be made in details of construction and arrangement without departing from the true spirit of the invention, and hence I do not limit myself to the exact construction and arrangement of the parts hereinabove set forth; but,

Having thus described the nature and objects of my present invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An electric governor for marine engines, comprising a throttle-valve for regulating the admission of steam to the engine, a vane hinged to the hull adjacent to the propeller and water-line and held out of normal position by the resistance of the water and by currents engendered by the revolutions of the



screw and returning to normal position upon withdrawal from the water, and electrical connections interposed between said vane and valve for causing the movements of the former to actuate the latter, substantially as and for the purposes set forth.

2. In a marine-engine governor, a hinged vane normally immersed and shifted from a vertical position by the advance of the ship and by currents engendered by the rotation of the screw and adapted upon emerging to return to vertical position, and appliances controlled by said vane for regulating the supply of steam to the engine, substantially as and for the purposes set forth.

3. In a marine-engine governor, a hinged vane located above the axis of the screw or propeller and normally immersed and shifted out of a vertical position by the advance of the ship and by currents engendered by the screw, a spring tending to return said vane to the vertical position upon emerging, and appliances controlled by said vane for regulating the supply of steam to the engine, substantially as and for the purposes set forth.

4. In a marine-engine governor, a valve for regulating the supply of steam to the engine, an electro-magnet and battery-circuit for operating said valve, a hinged vane projecting from the hull of the vessel beneath the water-line thereof, and a key controlled by said vane for opening and closing said circuit, substantially as and for the purposes set forth.

5. In a marine-engine governor, an admission-valve for the engine, a vane projecting from the hull of the vessel beneath the water-line thereof, a housing for protecting said vane and provided with open extremities for permitting of the circulation of water, a spindle connected with said vane and journaled in said housing and in a stuffing-box in the side wall of the hull of the ship, a crank-arm on said spindle, and means actuated by the crank-arm for controlling said admission-valve, substantially as and for the purposes set forth.

6. In a marine-engine governor, a circuit for controlling the steam-admission valve of the engine, a key for opening and closing said circuit, a vane projecting from the hull of the vessel beneath the water-line thereof, a spindle connected with said vane and extending into the hold of the ship, a crank-arm on said spindle, a link connected with said key and crank-arm, and a spring for normally shifting said link and vane into position for closing said key, substantially as and for the purposes set forth.

7. In a marine-engine governor, a hinged vane ranging athwart the ship beneath the water-line thereof and operating by the resistance of the water upon the engine through the instrumentality of suitable connections to control the admission of steam, substantially as and for the purposes set forth.

8. In a marine-engine governor, a throttle-valve for regulating the supply of steam to

the engine, a cylinder and piston connections for operating said throttle-valve, an unevenly steam-balanced slide-valve for controlling the admission of steam to said cylinder, a vane held out of normal position by the resistance of the water and returning to normal position by the cessation or removal of said resistance, and electrical connections interposed between said vane and slide-valve, substantially as and for the purposes set forth.

9. An electric governor for marine engines, comprising a throttle-valve for regulating the admission of steam to the engine, a steam-cylinder and piston connections for operating said valve, an unevenly steam-balanced slide-valve tending normally to admit steam to said cylinder to cause said piston connections to open said throttle-valve, electrical appliances for shifting said slide-valve out of normal position into position for admitting steam to said cylinder to cause said piston connections to close said throttle-valve, a hinged vane operating by the resistance of the water, and circuit connections between said vane and electric appliance.

10. In a governor for marine engines, a valve for regulating the admission of steam to the engine, a steam-cylinder and piston connections for operating said valve, an unevenly steam-balanced slide-valve tending normally to admit steam to said cylinder to cause said piston connections to open said throttle-valve, and means controlled by the motions of the ship and adapted to shift said slide-valve out of normal position into position for admitting steam into said cylinder to cause said piston connections to close said throttle-valve.

11. A governor for marine engines, provided with a throttle-valve for controlling the admission of steam to the engine, piston connections for operating said valve, a complementary steam-cylinder having an unevenly steam-balanced slide-valve and provided with a funnel-shaped admission-port for causing the travel of said slide-valve toward its normal position to admit steam to said cylinder in gradually-increasing quantities to effect the gradual opening of the throttle-valve, substantially as and for the purposes set forth.

12. In a governor for marine engines, a throttle-valve for controlling the admission of steam to the engine, piston connections for operating said valve, a complementary steam-cylinder provided with a steam-chest, having one portion of its length of larger internal bore than other portions thereof, a slide-valve comprising a spindle and two pistons of unequal area, and means controlled by the motion of the ship for shifting said slide-valve toward the piston of smaller diameter, substantially as and for the purposes set forth.

13. In a governor for marine engines, a throttle-valve for controlling the admission of steam to the engine, piston connections for operating said valve, a complementary steam-cylinder provided with an unevenly steam-balanced slide-valve tending to permit the



entering steam to normally cause said cylinder and its accessories to hold said throttle-valve in open position, a spring-buffer for checking the motion of said slide-valve, and  
5 means controlled by the motion of the vessel for shifting said slide-valve into position for closing said throttle-valve, substantially as and for the purposes set forth.

14. In a governor for marine engines, a  
10 throttle-valve for controlling the admission of steam to the engine, piston connections for operating said valve, a complemental cylinder provided at one end with a contracted exhaust-port for checking the operation of the  
15 cylinder and its accessories in closing said throttle-valve, and means controlled by the motion of the ship for operating the admission-valve of said cylinder, substantially as and for the purposes set forth.

20 15. In a governor for marine engines, a throttle-valve for controlling the admission of steam to the engine, piston connections for operating said valve, a complemental cylinder provided at one extremital portion with a funnel-shaped admission-port and at the other  
25 extremity thereof with a constricted exhaust-port for retarding the operation of the cylinder and its accessories in closing said throttle-valve, a slide-valve for said cylinder, and

means controlled by the motion of the ship 30 for operating said slide-valve, substantially as and for the purposes set forth.

16. In a governor for marine engines, a section of pipe adapted to be interposed in the main steam-pipe and provided with a damper 35 or butterfly-valve and with brackets for supporting a steam-cylinder and its accessories for operating said butterfly-valve, substantially as and for the purposes set forth.

17. In a governor for marine engines, a section of pipe adapted to be interposed in the main steam-pipe and provided with a damper 40 or butterfly-valve and with a bracket, a steam-cylinder and its accessories supported by said section of pipe and adapted to operate said 45 valve, an armature connected with the spindle of said slide-valve, an electro-magnet adjustably connected with said bracket, and circuit connections for energizing said magnet, substantially as and for the purposes set forth. 50

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

ERNEST FRITZ WALLGREN.

Witnesses:

THOMAS M. SMITH,  
RICHARD C. MAXWELL.