

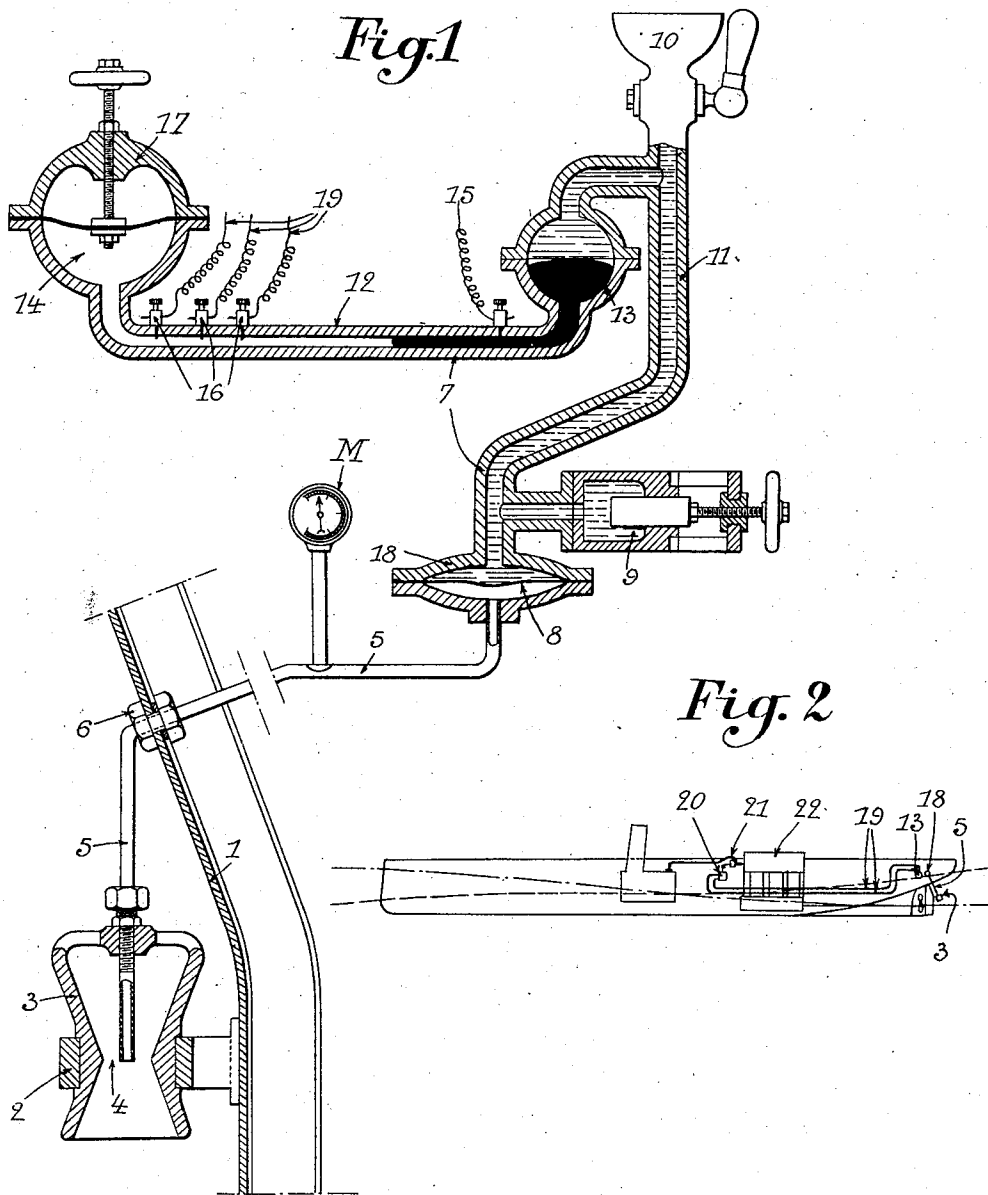
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AUTOMATIC GOVERNOR FOR MARINE ENGINES

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AUTOMATIC GOVERNOR FOR MARINE ENGINES.

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This application, which is a continuation in part of my copending application 537,302 of Feb. 17, 1922 for "Controlling devices for marine engines," relates to an improved automatic governor for marine engines. Marine engines are subject to racing or over-speeding which is a source of serious accidents, and this takes place when the propeller, usually a screw, is not sufficiently immersed to take up the whole power of the engine. To obviate the racing effects, the engine power should be limited according to the actual immersion of the propeller.

My invention relates to an arrangement whereby this result can be automatically obtained in an instantaneous and reliable manner.

In the accompanying drawing showing by way of example an embodiment of the invention:

Fig. 1 is a diagrammatic vertical section of the device and

Fig. 2 is an elevation of a ship provided with the said device and showing diagrammatically how the various parts thereof are disposed relatively to the engine.

In Fig. 1, 1 represents a portion of the vessel's hull, situated near the propeller which is to be placed under control, and somewhat below and in front of the axis of propeller shaft.

To the hull 1 is secured at the exterior, by any suitable support 2, a receiving and amplifying device consisting of a double-tapered sleeve 3 having the shape of a venturi which is open at both ends, the total cross-sections of the upper and lower openings having like or unlike areas, but these areas will in all cases exceed the area of the restricted middle part 4; at the level of this latter part, and coaxially with the same, is disposed the mouth of a pressure gauge tube 5 which extends through the hull through a tight sleeve 6, and ends in a manometric receiver 7 which is placed in the tunnel containing the shafting, as close as possible to the rear stuffing box and preferably somewhat above the axis of the propeller shaft.

In these conditions, the manometric tube 5 will serve during calm weather to transmit to the receiver 7 the actual immersion pressure, and during rough weather to transmit this pressure with the addition or subtraction of the auxiliary corrective pressure set up by the displacement of the sleeve or

venturi 3 relatively to the surrounding medium.

The speed of this relative displacement, in the planes of the cross section 4, being multiplied by the ratios of the inlet section and the middle or restricted section, the corrective pressure will be increased according to the square root of the said ratio.

The receiver 7 consists essentially of a diaphragm 8, having a free or a limited movement, which receives the pressure variations transmitted by the tube 5 and converts them into variations of volume of the chamber 18 one of whose walls is the diaphragm 8 which receives on its opposite face the pressures transmitted through the tube 5.

The said chamber 18 which may have any suitable shape and has the minimum size, contains a liquid—for instance water—and is provided at 9 with a device for regulating the total volume, consisting for instance of a diaphragm or a piston, and at 10 with a filling cock. A constant indication of the pressure in the tube 5 is given by the pressure gauge M mounted on the said tube.

The chamber 18 is connected with a current distributor 12 by the tube 11; said distributor is made of insulating material and is shown in the horizontal position in the figure, but it may have any suitable inclination. At 13 is a recipient whose capacity at least equals that of the tube 12; at 14 is another recipient closed or opening into the atmosphere—whose volume can be regulated for instance by the regulator 17 analogous to the regulator 9; at 15 is a leading-in terminal for the current, and at 16, 16 leading-out terminals for the same current.

The recipient 13 and a part of the tube 12 contain mercury, as shown in the full black part; the remainder of the said recipient, the tube 11 and the capacity 18 are entirely filled with water, all the air having been removed. The rest of the tube 12, and the recipient 14, are in communication with the atmosphere or contain a volume of air which can be regulated for instance by the said device 17.

The apparatus being in operative conditions, any variation in the immersion pressure will be accurately transmitted by the tube 5 to the diaphragm 8 and will result in a variation in the volume of the chamber 18. This variation will be integrally transmitted into the tube 12, so that the mercury will be displaced therein.

The end of the mercury column will thus have in the tube 12 a series of determined positions corresponding to the different pressures transmitted through the tube 5, and the current brought by the terminal 15 will be broken or will pass successively or simultaneously through the terminals according to the position of the mercury in the tube 12. Due to this motion of the mercury, I may use one or more currents corresponding to various selected values of the actual immersion of the propeller. Such currents, transmitted by lines 19 (Fig. 2), may be employed to control—either directly or by relays, or by servo-motor 20—the steam throttle valve 21 or a device adapted to vary the power of a steam or an internal combustion engine 22, or an electric motor, and I thus vary the power of the engine or motor according to the amount of the actual immersion of the propeller, whereby all racing of the engine or motor will be obviated.

By means of my said receiving and amplifying device 3, I am further enabled to obtain an advance in time upon the recording of the actual pressure by the diaphragm 8, this advance depending upon the rapidity of the movement of immersion or emersion of the device 3.

In fact, when the body 3 of the receiver descends into the water, due to the passage of the water through the throttled part 4, a certain additional pressure p' , or dynamic pressure, in addition to the static pressure p , is exerted at once by the water upon the water column contained in the piping 5, so that the diaphragm 8 will be moved and act upon the engine, before the propeller reaches the depth of immersion corresponding to the total pressure $p + p'$. On the contrary, should the propeller, together with the receiver, happen to rise, a depression p'' is produced immediately in the throttled part 4, so that the resulting pressure upon the diaphragm 8 is $p - p''$, smaller than p which latter corresponds to the original immersion of the propeller. Thus, in both cases, the device will control the engine in advance, with respect to the variation in the depth of immersion of the propeller.

By the use of the aforesaid arrangement of apparatus which affords the constant control of the actual immersion of the propeller and which proportions the engine power to this actual immersion, all racing or dangerous excess of speed of the engine will be prevented in time.

It is evident that the aforesaid construction is given solely by way of example, and the same are susceptible of various modifications or of the use of equivalent parts, without departing from the principle of the invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. On a ship the combination with a propeller and the engine, of an automatic governor comprising a bell adapted to be immersed into the water in close vicinity to said propeller, said bell being open at both ends and having substantially the shape of a Venturi nozzle, means for registering the water pressure in the restricted part of said bell and means for regulating the speed of said engine and adapted to be controlled by said pressure registering means.

2. On a ship the combination with a propeller and the engine, of an automatic governor comprising a bell adapted to be immersed into the water in close vicinity to said propeller, said bell being open at both ends and having substantially the shape of a Venturi nozzle, pressure registering means, a pipe coaxial with said bell and normally full of water, said pipe opening at one end substantially into the restricted part of said bell and at the other end into said pressure registering means and means for regulating the speed of said engine and adapted to be controlled by said pressure registering means.

3. On a ship the combination with a propeller and the engine, of an automatic governor comprising a bell adapted to be immersed into the water in close vicinity to said propeller, said bell being open at both ends and having substantially the shape of a Venturi nozzle, pressure registering means, a pipe coaxial with said bell and normally full of water, said pipe opening at one end substantially into the restricted part of said bell and at the other end into said pressure registering means, a movable mercury column the motion whereof is controlled by said pressure registering means, and a plurality of electric circuits adapted to be successively closed by said mercury column and to control the speed of said engine in accordance with the motion of said mercury column.

4. On a ship the combination with a propeller and the engine, of an automatic governor comprising a bell adapted to be immersed into the water in close vicinity to said propeller, said bell being open at both ends and having substantially the shape of a Venturi nozzle, pressure registering means, a pipe coaxial with said bell and normally full of water, said pipe opening at one end substantially into the restricted part of said bell and at the other end into said pressure registering means, a movable mercury column, a liquid column interposed between said pressure registering means and said mercury column and whereby the motion of the latter is controlled by the former, a regulating chamber of an adjustable capacity,

said chamber being in communication with said liquid column and constantly filled with the same liquid and a plurality of electric circuits adapted to be successively closed by
5 said mercury column and to control the speed of said engine in accordance with the motion of said mercury column.

5. On a ship the combination with a propeller and the engine of an automatic governor comprising a bell adapted to be immersed into the water in close vicinity to said propeller said bell being open at both
10 ends and having substantially the shape of a Venturi nozzle pressure registering means a pipe coaxial with said bell and normally full
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of water said pipe opening at one end substantially into the restricted part of said bell and at the other end into said pressure registering means, a movable mercury column one end of which is adapted to be acted upon
20 by said pressure registering means, means for varying the pressure upon the other end of said mercury column and a plurality of electric circuits adapted to be successively closed by said mercury column and to control the speed of said engine in accordance
25 with the motion of said mercury column.

In testimony whereof I have signed my name to this specification.

EUGÈNE FRANÇOIS JOSEPH BRELAND.