C. F. ROPER.

SPEEDOMETER FOR VESSELS.

APPLICATION FILED NOV. 21, 1910.

**1,048,212.** Patented Dec. 24, 1912.

Fig. 1.

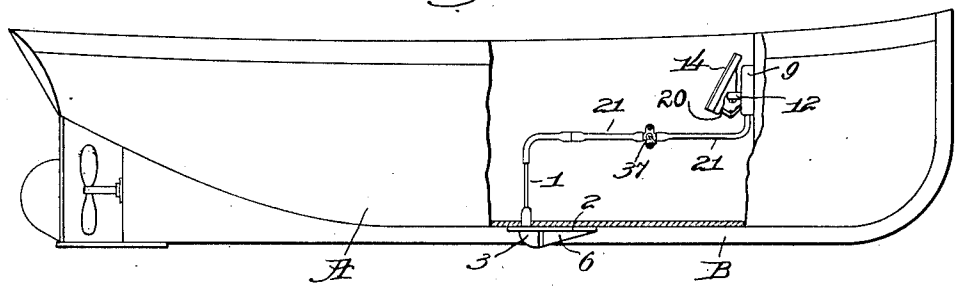



Fig. 2.

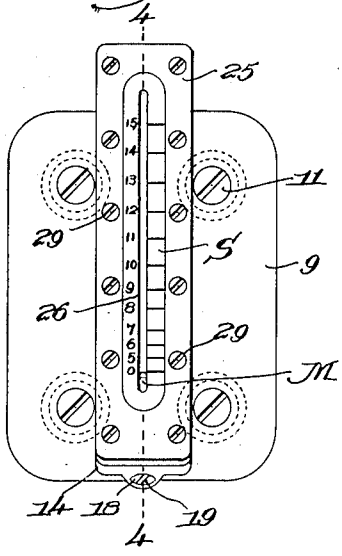



Fig. 3.

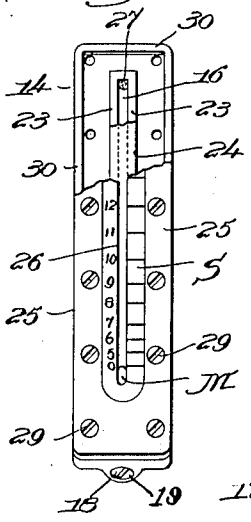



Fig. 4.

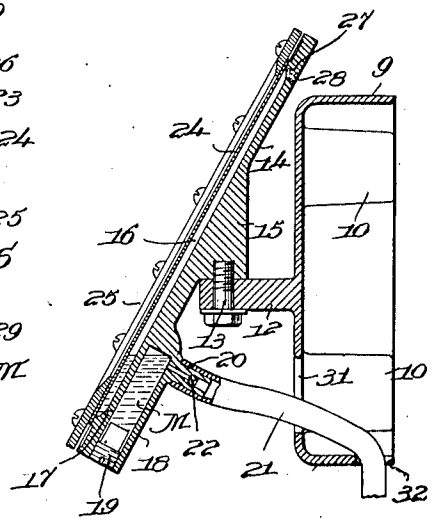



Fig. 6.

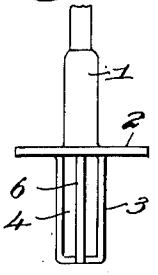



Fig. 5.

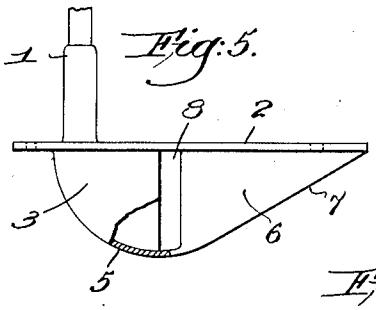



Fig. 7.

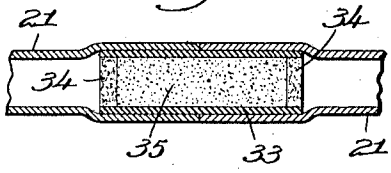
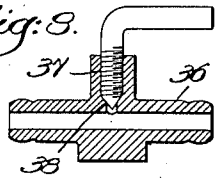



Fig. 8.

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# UNITED STATES PATENT OFFICE.

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## SPEEDOMETER FOR VESSELS.

1,048,212. Specification of Letters Patent. Patented Dec. 24, 1912.

Application filed November 21, 1910. Serial No. 593,305.

*To all whom it may concern:*

Be it known that I, CHARLES F. ROPER, a citizen of the United States, and resident of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Speedometers for Vessels, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention has for its object the production of a simple and efficient speedometer adapted for use on power or other vessels to indicate the speed at which the vessel is moving.

By reason of its simplicity and moderate first cost my invention is particularly adapted for use on the smaller motor boats having speeds of from say three to fifteen or twenty miles per hour.

In accordance with my invention the speedometer comprehends a water column the height of which is variable in an approximately fixed ratio to the speed of the vessel, (substantially as the square of the speed); an indicator consisting of a column of a suitable liquid, such as mercury, and an adjacent graduated scale, and a fluid transmitting medium connecting said water column and the indicating column, whereby variations in the height of the water column due to changes in the speed of the vessel will cause corresponding changes in the height of the indicating column.

These and other novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a side elevation, partly broken out, of a power boat provided with a speedometer embodying one practical form of my present invention; Fig. 2 is an enlarged front elevation of the speed indicating device and its support; Fig. 3 is a like view of the speed indicating device, but partly broken out to more clearly show the construction thereof; Fig. 4 is a vertical section taken on the line 4—4, Fig. 2; Figs. 5 and 6 are enlarged side and front elevations, respectively, of the intake end of the stand-pipe for the water column; Fig. 7 is a longitudinal sectional view, enlarged, of a cushioning or retarding device interposed between the water and indicating columns; Fig. 8 is a similar view of an equalizer which is arranged to control the transmitting medium between the water and indicating columns, as will be described.

In Fig. 1 a power boat A of any suitable character is herein provided with an upright metal tube or stand-pipe 1 having a relatively small diameter, and provided at its lower end with an elongated flat plate 2 which is attached to the outside of the vessel's bottom, preferably at one side of the keel B. A segmental intake chamber 3 is formed on the bottom of the plate 2, open at its forward end, toward the bow of the vessel, at 4, the rear wall and bottom 5 of said chamber preferably being curved to facilitate the passage of the water through the intake chamber and thence upward into the foot of the stand-pipe 1. A triangular blade or fin 6 depending from the plate 2 ahead of the chamber and equi-distant from its side walls serves to prevent the entrance of weeds or other obstructions into the chamber, the inclined lower edge 7, which leads from the plate downward to the bottom 5 of said chamber, serving to shed such obstructions from the inlet 4 of the chamber, as will be manifest. I leave a clearance 8, Fig. 5, between the inlet 4 and the after end of the fin, so that if the inlet at one side of said fin should be clogged the water rushing into the other side of the inlet will also traverse the clearance 8 and throw out the obstruction to thereby clear the clogged side of the inlet. This construction of the intake of the stand-pipe is an important feature of my invention, for to secure the most efficient operation of the speedometer it is absolutely necessary that the water shall at all times have free entrance to the stand-pipe, in order that the column of water therein may rise and fall in accordance with variations in the vessel's speed. While the vessel is at rest the water in the stand-pipe rises to the height of the water-level of the vessel, but when the vessel begins to move and thereby produces pressure upon the water column in the stand-pipe said column rises at a ratio which is approximately as the square of the speed of the vessel. Changes in the depth of immersion of the vessel, by loading and unloading, will of course vary the height of the water column when the vessel is at rest, but as

will be explained this variation is provided for so that it does not interfere with the speed indications.

The speed indicating device will now be described, having reference to Figs. 2, 3 and 4. A box-like casting 9, having bosses 10 through which are passed the shanks of attaching screws 11, is secured in an upright position on any convenient part of the vessel, the face of the casting having extended therefrom an ear 12, Figs. 1 and 4. By means of a vertical pivot screw 13 the speed indicating device is connected with said ear, so that it can be swung upon such pivot into position for convenient inspection. An elongated and substantially rectangular plate 14, preferably of cast iron, and thickened at its lower end, has on its back an enlargement 15 which rests on the ear 12 and receives the pivot screw 13, supporting the plate in an inclined position, the face of the plate having formed in it a central longitudinal gutter or groove 16 communicating at its lower end by a small hole 17, Fig. 4, with a liquid reservoir 18. The reservoir is conveniently made by drilling the thickened part of the plate 14, the lower end of the reservoir being tightly closed by a screw-plug 19 after the mercury M is introduced. A tubular nipple 20 communicates with the upper end of said reservoir and has securely attached to it one end of a rubber or other flexible tube 21 connected at its other end to the top of the stand-pipe 1, see Fig. 1. Escape of the liquid through the nipple is prevented by a felt or similar plug 22, the latter, however, being pervious to air, the pressure transmitting medium between the water and indicating columns, mercury being probably the most satisfactory liquid for the indicating column. The groove 16 is flanked by flat-faced ribs 23, Fig. 3, continued around the upper and lower ends of said groove and upon the ribs is laid a sheet 24 of glass or transparent celluloid, preferably the latter because of its freedom from breakage, such sheet being pressed tightly upon the ribs by a cover-plate 25, so that said sheet and the groove 16 form a closed tube having a transparent side and always communicating at its lower end with the mercury reservoir. The cover-plate 25 has a central slot 26 which registers with the sides of the groove and forms a sight opening, and one side of the slot is graduated to form a scale S, while correspondingly placed numbers from zero up indicate the speed in miles per hour, as shown in Fig. 2. The scale is graduated in any suitable manner, the zero being at the bottom and at such a point that when the vessel is at rest the level of the mercury in the reservoir and lower end of the communicating tube will stand opposite the zero mark. A hole 27 at the upper end of groove 16 has a felt plug 28 therein, so that the air in the tube above the mercury column is always at atmospheric pressure, the plug preventing any accidental escape of the mercury. Screws 29 hold the cover-plate 25 in place, and in order that it shall always press tightly upon the transparent sheet or side 24 of the mercury tube the face of the plate 14 is recessed outside the ribs 23 to leave an edge rib 30 the face of which is in the plane of the faces of the ribs 23. The screws 29 pass into the recessed parts of the plate 14, so that when said screws are set up tightly any desired pressure of the cover-plate upon the sheet 24 can be exerted, whereby no mercury can escape between said sheet and its supporting ribs 23. Holes 31, 32, Fig. 4, in the front and bottom of the casting 9 permit the flexible tube 21 to be passed therethrough, supporting the tube at the casting while at the same time permitting pivotal movement of the speed indicating member on the pivot 13.

From the foregoing description it will be apparent that when the vessel is at rest the mercury column 11 will stand at zero in the mercury tube of the speed indicating device, but when the vessel is in motion the water column in the stand-pipe 1 will rise, and through the transmitting body of air confined in tube 21 the pressure upon the mercury M in reservoir 18 will be increased correspondingly. Consequently the mercury will be depressed in the reservoir and forced through the outlet 17 into the mercury tube, rising therein to a height determined by the height of the water column. The greater the speed of the vessel the higher will the water column rise in the stand-pipe, and the higher will the column of mercury rise in its tube, said mercury and water columns falling as the speed diminishes, so that the speed attained by the vessel is indicated by that graduation of the scale S which is opposite the top of the mercury column.

If the body of air between the water and mercury columns is perfectly free and unobstructed the mercury will tend to jump rapidly by pitching or rolling motion of the boat, and to overcome this I interpose a cushion or retarding device in the transmitting medium. To this end the tube 21 is cut and between its severed ends I insert a metal sleeve 33 having a felt stopper 34 at each end, with sand 35 in the sleeve between the stoppers, Fig. 7. The stoppers hold the granular material in the sleeve and permit the pressure to be transmitted from the water column through the transmitting medium to the mercury, but in such manner that quick changes due to irregular movements of the vessel will be retarded or cushioned, so that while speed variations will be properly and promptly indicated by variations in the mercury column the latter will not jump up and down with every tem-

porary change in the water column due to pitching or rolling motions of the vessel. As the transmitting medium in the tube 21 will expand or contract more or less by a rise or fall of the temperature of the outside air the speed indication might be incorrect on a hot day and correct on a cool day, or vice versa, and different loading of the boat might have an undesirable effect on the apparatus. To prevent this I provide an equalizing device, which is merely an air valve, the casing 36, Fig. 8, being inserted in the transmitting tube 21, with a screw-valve 37. By unscrewing the valve off its seat 38 the tube 21 is brought into communication with the outside air and the pressure in said tube is thereby equalized, so that the mercury column will come to the zero point of the scale when the vessel is at rest. The air valve is then closed and the apparatus is ready for use, the equalization of the pressure having been effected.

The apparatus embodying my invention is very simple, it indicates the speed of a vessel very accurately and with promptness, and the indicating device can be set up at any convenient point to which the casting 9 can be attached. By swinging the scale-carrying plate 14 on its pivot 13 the scale and mercury column can be placed in the best position for inspection. Any surplus length of tubing 21 can be stowed away in the casting 9 by coiling it between or around the bosses 10, so that there is no necessity for cutting the tubing for a vessel wherein the distance between the stand-pipe and indicating member may be less than in another vessel.

Various changes or modifications in details of construction and arrangement may be made by those skilled in the art without departing from the spirit and scope of my invention as set forth in the claims annexed hereto.

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

1. In a speedometer for vessels, the combination with a water column variable in an approximately fixed ratio to the speed of the vessel and means to support the water column, of a mercury column and supporting means therefor and an adjacent speed indicating scale, a tubular container for and to confine fluid transmitting-medium, connecting the top of the water column and the bottom of the mercury column, to cause variations in the height of the latter corresponding to changes in the water column due to variations in the speed of the vessel, and a cushioning device in said container for the fluid medium to prevent rapid fluctuation of the mercury column due to irregular movements of the vessel, said cushioning device presenting a multiplicity of small, irregular and non-continuous passages for the slow travel of the transmitting medium therethrough.

2. In a speedometer for vessels, the combination with a stand-pipe for admitting and confining a column of water varying in height with the speed of the vessel, a graduated mercury tube having a communicating mercury reservoir, an air-tube connecting the reservoir and the top of the stand-pipe, the body of air confined in said tube causing variations in the height of the mercury column corresponding to variations in the height of the water column due to changes in the speed of the vessel, and means slowly pervious to the passage of air, located in said air-tube to prevent fluctuation of the mercury column due to irregular movements of the vessel, said means presenting a multiplicity of small, irregular and non-continuous passages.

3. In a speedometer for vessels, the combination with a stand-pipe for admitting and confining a column of water varying in height with the speed of the vessel, of a graduated mercury tube having a communicating mercury reservoir, an air-tube connecting the reservoir and the top of the stand-pipe, the body of air confined in said tube causing variations in the height of the mercury column corresponding to variations in the height of the water column due to changes in the speed of the vessel, means in the air-tube to prevent fluctuations of the mercury column due to irregular movements of the vessel, said means presenting numerous small, irregular and non-continuous passages to be traversed by the air, and a device to equalize the pressure within and without the air-tube.

4. In a speedometer for vessels, a stand-pipe for admitting a water column variable in an approximately fixed ratio to the speed of the vessel, an intake chamber communicating with the water below the water-line of the vessel, said chamber having an inlet in its end toward the bow of the vessel, and means in front of and spaced from the inlet end of the chamber to maintain the inlet clear of weeds or other obstructions suspended in the water, said means being equidistant from the sides of the intake chamber.

5. In a speedometer for vessels, a stand-pipe having an elongated plate at its lower end, an intake chamber depending from said plate and open at one end, a longitudinal fin depending from the plate in front of the open end of the chamber and spaced therefrom but in the central plane of the chamber, the lower edge of the fin inclining downward from the plate to the bottom of the intake chamber adjacent its open end, said plate, chamber and fin being located outside the hull of a vessel below the water-

line thereof with the open end of the chamber toward the bow of the vessel, to admit a column of water into the stand-pipe, the height of the column varying with the speed of the vessel.

6. In a speedometer for vessels, a stand-pipe to admit a column of water varying in height according to the speed of the vessel, an intake-chamber communicating with the lower end of the stand-pipe outside the vessel below the water-line thereof, said chamber having an inlet at its forward end, and a fore and aft clearing fin adjacent the inlet end of the intake chamber, to keep the inlet thereof clear of weeds and other obstructions.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

CHARLES F. ROPER.

Witnesses:
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CLARE H. DRAPER.