No. 826,630. PATENTED JULY 24, 1906.

C. H. VEEDER.

TACHOMETER.

APPLICATION FILED JULY 17, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

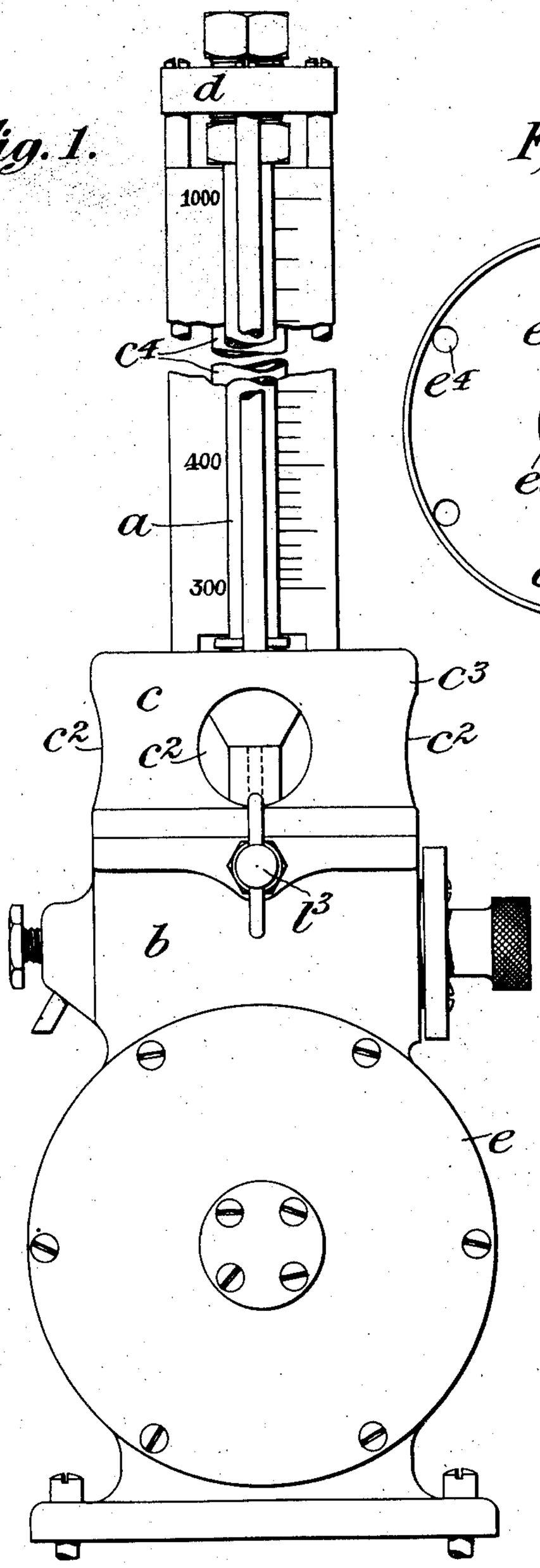
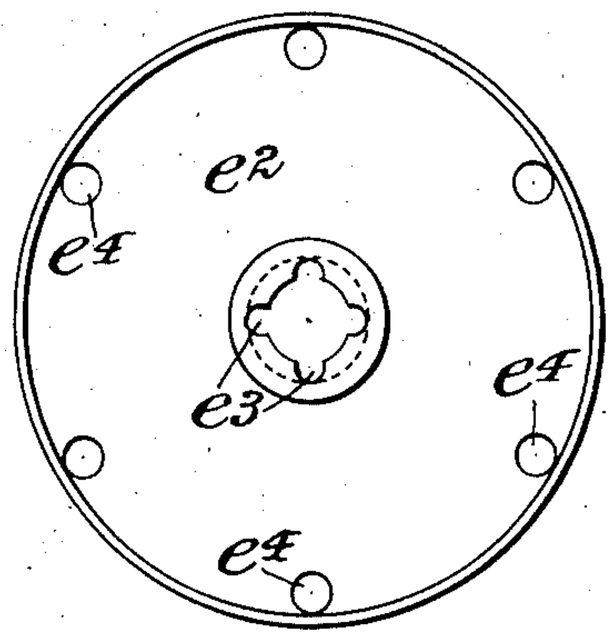


Fig. 4.



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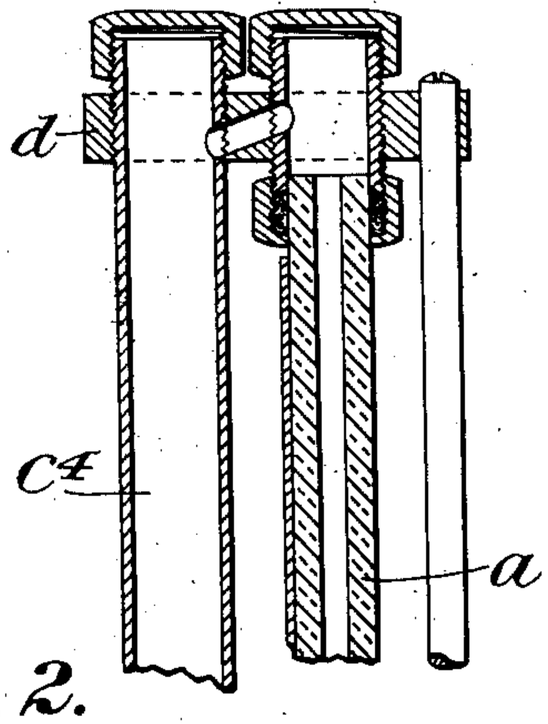
2 SHEETS—SHEET 2.

Fig. 2.



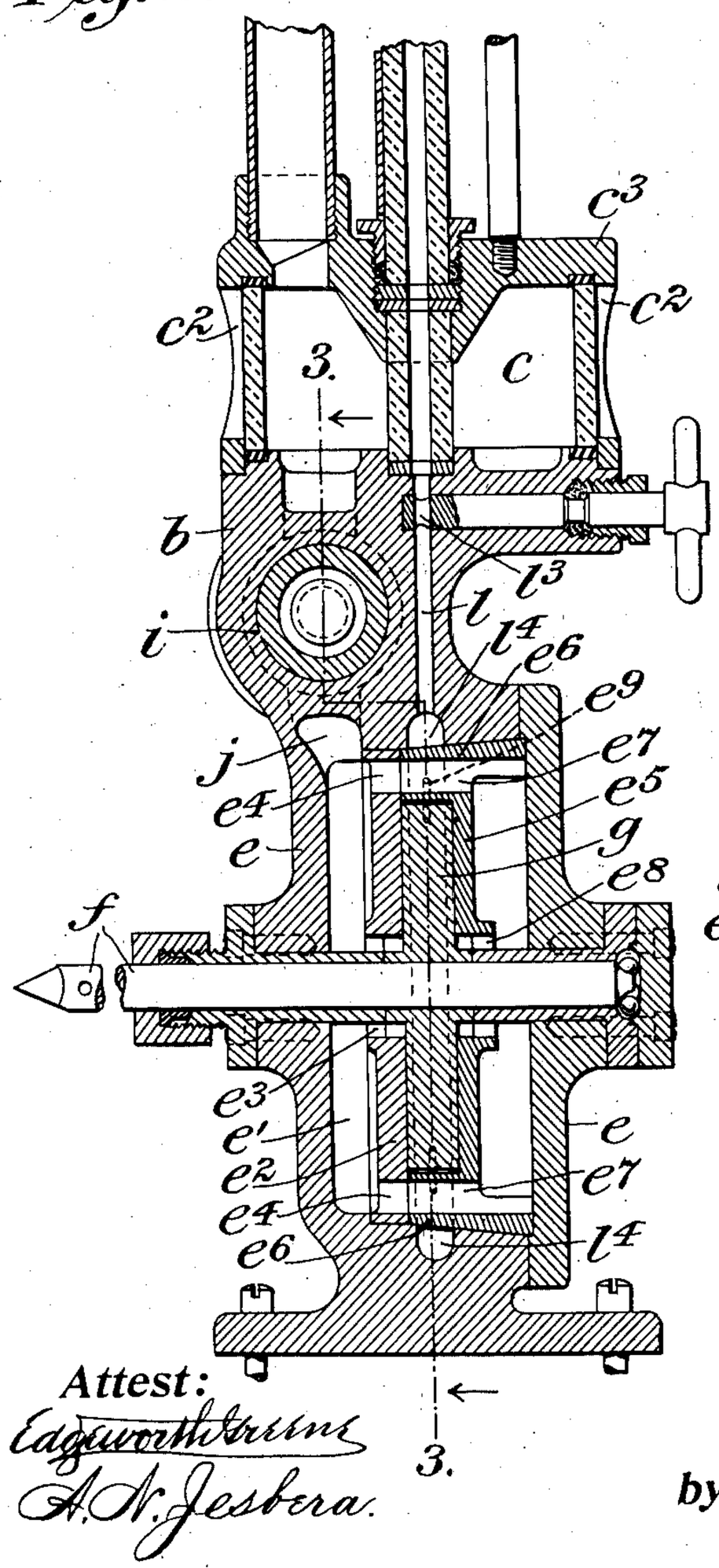


Fig. 5.

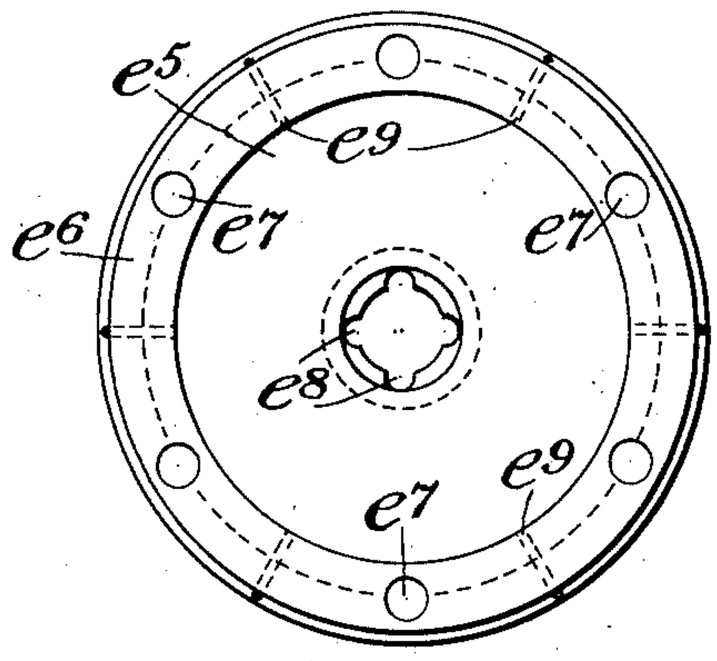
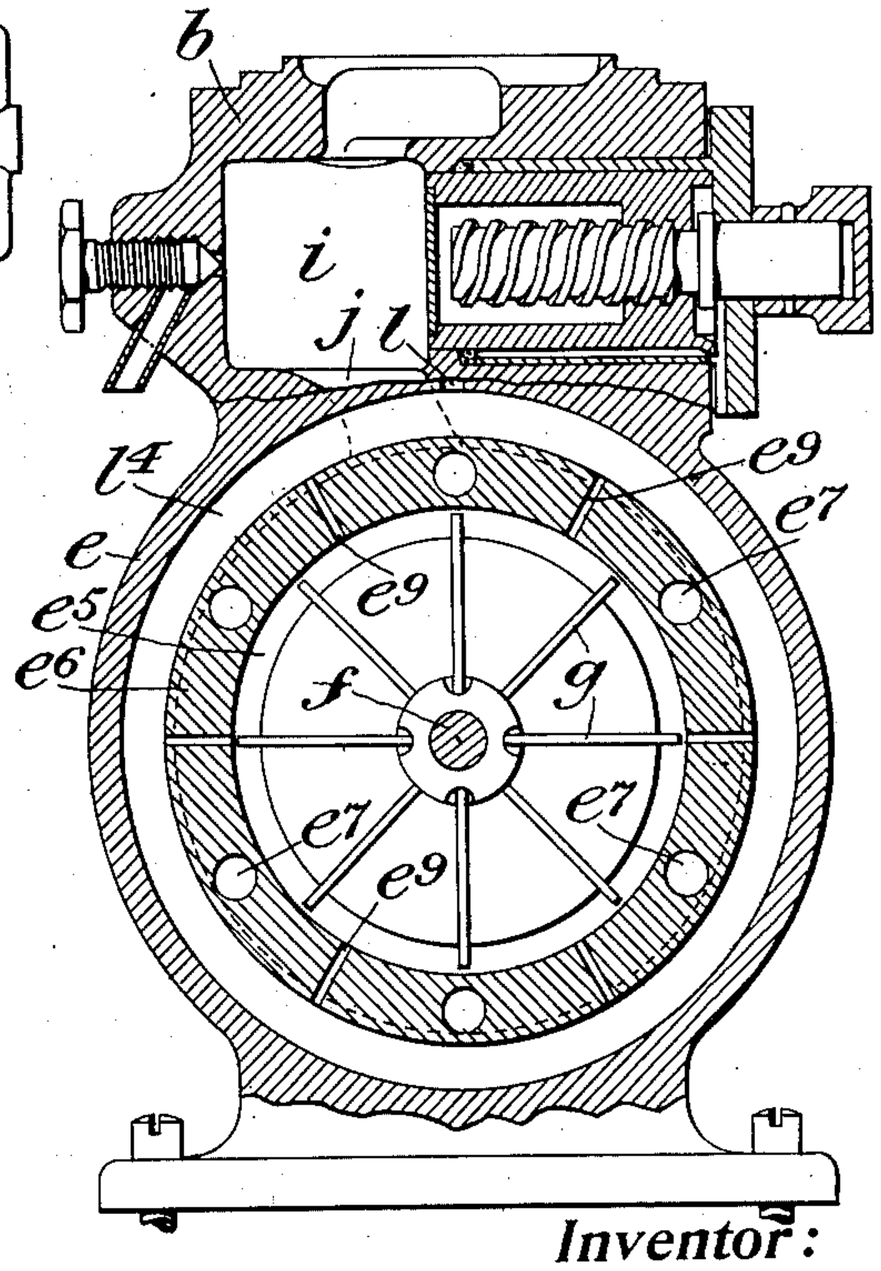


Fig. 3.



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UNITED STATES PATENT OFFICE.

CURTIS HUSSEY VEEDER, OF HARTFORD, CONNECTICUT.

TACHOMETER.

No. 826,630. Specification of Letters Patent. Patented July 24, 1906.

Application filed July 17, 1905. Serial No. 270,124.

To all whom it may concern:

Be it known that I, CURTIS HUSSEY VEEDER, a citizen of the United States, residing in Hartford, in the county of Hartford, in the State of Connecticut, have invented certain new and useful Improvements in Tachometers, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to devices or instruments for measuring the speed of shafts, wheels, &c., and of machines of various classes of the general character of the instruments shown and described in Letters Patent of the United States Nos. 732,975 and 733,358, both dated July 7, 1903, in which the speed is indicated by the difference in level of two communicating columns of liquid, or rather since reference is made to but one column, by the height of a column of liquid.

The object of the present invention is to so improve the construction of such instruments as to reduce the possibility of error under different conditions. Thus in the operation of the instruments referred to it has been found that the indication thereof was liable to vary when the paddle-wheel or shaft became eccentric or when there was any inequality or variation in the edges of the outlet-orifice of the pump-chamber or when there was endwise motion of the shaft. The liability to error from eccentricity of the shaft or paddle-wheel and from a change in the direction of rotation and from inequality in the edges of the outlet is largely reduced or avoided altogether by providing a plurality of outlets from the pump-chamber, and the liability of error from endwise movement of the shaft is largely reduced by providing for the admission of fluid to the pump-chamber through openings on both sides of the paddle-wheel. These new features of construction involve substantial reconstruction of the pump and the devices immediately correlated therewith, all as will be more fully explained hereinafter with reference to the accompanying drawings, in which the invention is illustrated.

In the drawings, Figure 1 is a view in front elevation of a tachometer constructed in accordance with the present invention. Fig. 2 is a vertical central section thereof in the plane of the pump-axis. Fig. 3 is a view in transverse vertical section on the irregular plane indicated by the line 3 3 of Fig. 2. Figs. 4 and 5 are detail views of the plates which form the walls of the pump-chamber.

The construction of the indicating devices other than the pump and its correlated parts is substantially the same as shown and described in said Letters Patent No. 733,358, and only brief reference thereto need be had herein. The glass indicator-tube *a* is mounted upon a base *b* and centrally with respect to the reservoir *c*, the sides of which are preferably of glass and symmetrical with the axis of the indicator-tube, sight-holes c^2 being provided in the exterior metallic casing c^3. The filling-tube c^4 communicates at its lower end with the reservoir *c* and at its upper end through a bracket *d* with the indicator-tube *a*.

Obviously the indicating devices may be mounted either directly upon or be connected indirectly with the pump-casing, and in the accompanying drawings they are shown as mounted directly thereon. The pump in the present case also is shown as comprising a shell or casing *e*, a shaft *f* mounted therein, and blades or paddles *g* mounted on the shaft, the shaft being adapted to be connected mechanically in any suitable manner with the moving or actuating part. In the construction shown and described in said Letters Patent No. 733,358 the pump-chamber communicates through a single peripheral outlet with the indicator-tube *a* and through an inlet at one side only with the reservoir *c*. In the present instance, however, the casting *e*, which forms the body of the pump-casing, is formed with a chamber *e'*, which communicates with the reservoir *c* through a channel *j* and a regulating-chamber *i* and is separated from the pump-chamber proper by a disk e^2, which is seated in the chamber of the casting *e* and is provided centrally with an opening e^3, which communicates with the central portion of the pump-chamber, forming the suction-inlet, and near its periphery with openings e^4, this plate forming one wall of the pump-chamber proper. A plate e^5, forming the other wall of the pump-chamber proper, is flanged, as at e^6, to bear upon the plate e^2 and hold it in its seat, being itself held in its seat by the cover-plate of the pump shell or casing *e*. The plate e^5 is provided near its periphery with openings e^7 to register with the openings e^4 of the plate e^2 and centrally with

an opening e^8, which forms the suction-inlet of the pump on the corresponding side. The liquid from the reservoir *c* is thus admitted to the pump-chamber proper on both sides thereof without interfering with the outlet, as will more clearly appear hereinafter. As will be observed, the plate e^5 preferably has a tapered seat in the shell or casing *e* to form a tight joint.

The passage *l*, which conducts the liquid from the pump to the indicator-tube *a*, is provided, as in the instrument described in Letters Patent No. 733,358, with a regulating-valve l^3; but in the present instance the passage *l* does not communicate directly with the interior of the pump-chamber proper, but with an annular chamber l^4, which is formed in the main part of the casing *e* and completely encircles the plate e^5 and its flange e^6. Through the flange e^6 between the openings e^7 are formed holes e^9, distributed about the periphery of the pump-chamber proper and communicating with the annular chamber l^4 at many different points, so that the liquid which enters the pump-chamber on both sides through the suction-openings e^3 and e^8 escapes from the pump-chamber at many different points into the annular chamber l^4, from which it passes through the passage *l* to the indicator-tube *a*.

The operation of the improved instrument is substantially the same, except as hereinbefore noted, as that of the instrument described in said Letters Patent No. 733,358 and need not be further described herein. It will be observed that as the pump-chamber proper is provided with a suction-inlet on each side the pump is balanced, and the effect of any endwise movement of the pump-shaft is very much reduced and the error in the instrument due to this cause is practically eliminated. Furthermore, as the pump discharges at numerous points about its periphery the effect of any variation or inequality in any outlet-opening is likewise reduced, together with the chance of error, and the paddle can be considerably out of center and can be rotated in either direction without changing the reading of the instrument. It will be understood that in the operation of the indicator there should be no movement of the liquid between the reservoir and the pump except when the speed of rotation of the impeller is increasing or decreasing and that the liquid in the passage between the reservoir and the pump should not be disturbed or given any rotary movement, lest the pressure should be affected. Moreover, it will be understood that a very slight change in the height of the column of liquid in the indicator-tube must necessarily represent a considerable change in the speed of the pump-impeller. For these reasons it is necessary to guard with great care against any change in pressure and in height of the column of liquid in the indicator-tube except that which is due directly and solely to change in the speed of the pump-impeller. In the use of indicating devices of this character in which the liquid is admitted to one side only of the pump it has been found that the pressure at the periphery varied somewhat when the impeller or wheel was moved axially and that such variation in pressure developed and increased with the wear on the bearings. To overcome this difficulty and to insure the accuracy of the instrument after long continued use, it has been found desirable to provide connections from the reservoir to the pump on both sides thereof through openings e^8 near the axis of the impeller, of restricted area, so that disturbance and rotary motion of the liquid in the passage are avoided, as well as any variation of pressure due to displacement of the impeller through wear.

I claim as my invention—

1. A speed-indicator comprising a rotating liquid-pump, an indicator-tube connected to the discharge of said pump, a reservoir, a connection from the reservoir to the indicator-tube above the liquid-level, and connections from the reservoir to the pump on both sides thereof through openings of restricted area near the axis of the pump whereby variation of pressure through displacement of the pump-impeller is avoided.

2. A speed-indicator comprising a rotating liquid-pump having a plurality of peripheral discharge-openings, an indicating-tube connected to all of said discharge-openings, a reservoir and a connection from said reservoir to the suction of said pump, substantially as described.

3. A speed-indicator comprising a pump shell or casing, walls therein forming a pump-chamber and intercommunicating outer chambers, suction-openings being formed in said walls between the pump-chamber and said outer chambers, a rotating pump-wheel, an indicating-tube connected to the discharge of said pump, and a reservoir connected to said outer chambers, substantially as described.

4. A speed-indicator comprising a pump shell or casing, a rotating liquid-pump disposed within said pump shell or casing and having a plurality of peripheral discharge-openings, an annular chamber being formed in said shell or casing and communicating with said peripheral openings, an indicating-tube connected to said annular chamber, and a reservoir connected to the suction of said pump, substantially as described.

5. A speed-indicator comprising a pump shell or casing, a plate seated therein and having a central opening and openings near its periphery, a second plate set therein and

flanged to form with the first plate a pump-chamber, a rotating pump-wheel in said pump-chamber, said flange having a plurality of peripheral openings therein, said shell or casing having formed therein an annular chamber about said flange communicating with said peripheral openings, an indicating-tube connected to said annular chamber and a reservoir connected to the suction of said pump, substantially as described.

This specification signed and witnessed this 14th day of July, 1905.

CURTIS HUSSEY VEEDER.

In presence of—

E. BARRIE SMITH,

E. G. BIDDLE.