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F. E. WOLF.

SPEED INDICATOR.

APPLICATION FILED JULY 5, 1904.

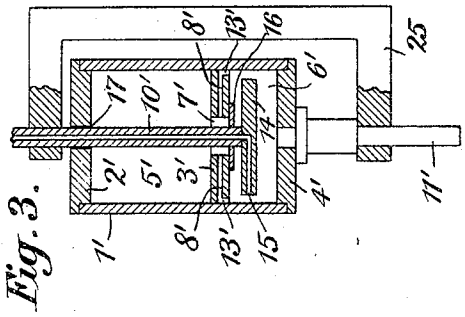

Fig. 3.

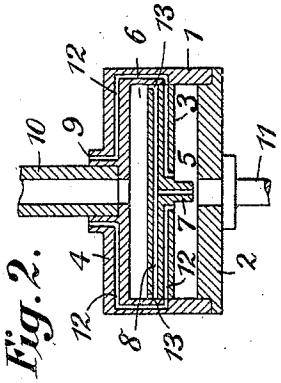

Fig. 2.

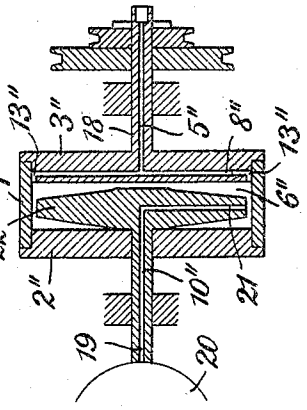

Fig. 4.

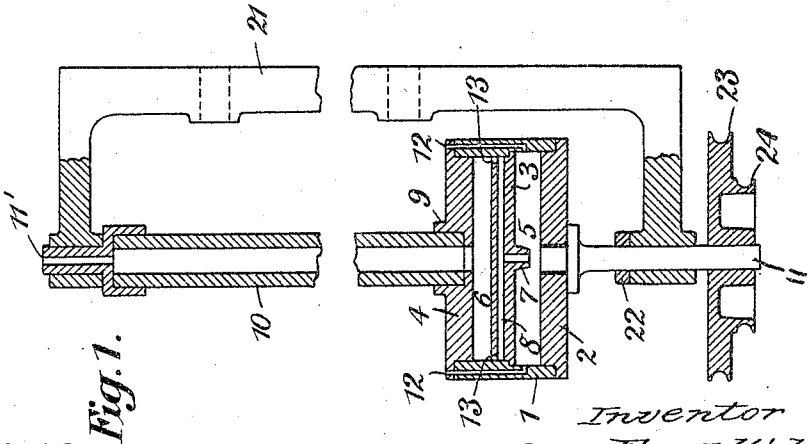

Fig. 1.

Witnesses
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No. 779,059. Patented January 3, 1905.

UNITED STATES PATENT OFFICE.

FRANZ EMIL WOLF, OF CHARLOTTENBURG, GERMANY, ASSIGNOR TO HEINRICH TROOST, OF WESTEND, NEAR BERLIN, GERMANY.

SPEED-INDICATOR.

SPECIFICATION forming part of Letters Patent No. 779,059, dated January 3, 1905.

Application filed July 5, 1904. Serial No. 215,353.

To all whom it may concern:

Be it known that I, FRANZ EMIL WOLF, a citizen of the Empire of Germany, residing at Charlottenburg, in the Empire of Germany, have invented a new and useful Speed-Indicator, of which the following is a specification.

There are known tachymeters working with liquids and provided with radial channels which are put into rotation so that the centrifugal force of the liquid contained in the channels produces a certain pressure upon the liquid and causes the latter to rise in a tube to a height that can be read off a convenient scale. The hitherto-known constructions of such tachymeters are, however, complicated, and therefore comparatively expensive, and, moreover, they present the disadvantage that their scales cannot be calculated, but are simply impirical. Even when their scales are adjusted to a standard errors are unavoidable, for the reason that stuffing-boxes cannot be dispensed with in the connections between the sucking space or room communicating with the atmosphere and the pressure-space, it being immaterial whether the one space is stationary and the other rotates, or vice versa.

My invention relates to improvements in such speed-indicators whereby their construction is exceedingly simplified, their manufacture rendered cheap, and the speed-indicators are made so exact that their scales can be calculated in each case, while all sources of errors due to stuffing-boxes in the connections are avoided.

The objects of my improvement are, first, to provide in a rotating casing a partition-wall at right angles to its axis, with several radial channels which communicate with the sucking-chamber or chamber open to the atmosphere by a central opening and with the pressure-chamber by several openings close to the periphery, and, second, to provide means for transmitting the pressure in the pressure-chamber to a measuring device. I attain these objects by the constructions illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section through a speed-indicator, the bracket being partly shown in elevation and an intermediate part omitted. Fig. 2 is a part of Fig. 1 to show a modification of the rotating casing. Fig. 3 is a vertical longitudinal section through a further modification of the speed-indicator, the bracket being partly shown in elevation; and Fig. 4 is a vertical longitudinal section through a modified speed-indicator combined with a manometer, which latter is merely indicated by an arc.

Similar characters of reference refer to similar parts throughout the several views.

The speed-indicator (shown at Fig. 1) comprises a wall-bracket 21, in which the shaft 11 and the top pivot 11′ of the cylindrical casing 1 are mounted to turn. The shaft 11 may be prevented from longitudinally shifting by a convenient loose collar 22 with set-screws, and it may carry the driving means, which are here shown to be two lace-pulleys 23 and 24 of unequal diameter. The cylindrical casing 1 is closed by its bottom 2 and cover 4 and is provided with a conveniently-secured partition-wall 3, whereby its cavity is divided into two chambers 5 and 6. In the central opening of the cover 4 a tube 10, of transparent material—such as, for instance, glass—is suitably fastened the same as its upper end is fastened in the preferably hollow top pivot 11′. The one chamber, 5, below may be called "sucking-chamber" and is put into communication with the atmosphere by several vertical narrow or capillary channels 12 12 in the wall of the cylinder 1 and terminating in its top face. The other chamber, 6, above may be called "pressure-chamber" and communicates with the cavity of the tube 10. The partition-wall 3 is shown as provided with two radial channels 8 in a common axis, and these two channels 8 communicate on the one hand with the sucking-chamber 5 through a central opening 7 and on the other hand with the pressure-chamber through two openings 13 13 close to the internal surface of the cylinder 1. The tube 10 may be provided with scale-lines engraved thereon, or a scale (not shown) may be disposed close to the tube and secured on the bracket 21.

The speed-indicator described so far is operated as follows: The casing 1 is filled up to

a convenient point—say, for instance, just above the bottom face of the cover 4—with a suitable liquid, such as mercury. As is well known, the mercury has the property that it does not rise in the capillary channels 12 12 up to its level in the casing, but remains much below that. Of course the two radial channels 8 are filled with mercury. When by a lace put around either of the two pulleys 23 24 the shaft 11, with the casing 1 and the tube 10, is put into rotation, the centrifugal force of the mercury in the two channels 8 will exert a pressure upon the mercury in the pressure-chamber 6, whereby this liquid is caused to rise in the tube 10, while mercury is sucked from the chamber 5 and air from without into the latter through the capillary channels 12 12. As the magnitude of the centrifugal force depends upon the number of revolutions per unit of time or, in other words, upon the angular velocity, the height of the column in the tube 10 can be exactly calculated and made to show the speed. The tube 10 may also be replaced by a stationary manometer or other measuring device, in which case the nave 9 may be replaced by a convenient stuffing-box.

The speed-indicator shown at Fig. 1 is suitable for measuring moderate speeds only, as for a greater speed the mercury in the chamber 5 might be forced out through the capillary channels 12 12 to without by reason of its centrifugal force. To adapt the speed-indicator for higher speeds, the several capillary channels 12 12 require to be bent and to lead through both the partition-wall 3 and the cover 4 inwardly and to terminate on the one hand near the central opening 7 and on the other hand in the nave 9 close to the tube 10, as is clearly shown at Fig. 2. In this case the liquid cannot be forced so much into the capillary channels 12 12 by its centrifugal force, even for higher speeds, as to escape to without. For similar reasons it is best to construct the speed-indicator in the manner shown at Fig. 3. The casing formed of the cylinder 1′, the cover 2′, and the bottom 4′ is divided by the partition-wall 3′ into the sucking-chamber 5′, (in this case above instead of below, as before,) and the pressure-chamber 6′. The radial channels 8′ 8′ in the partition-wall 3′ communicate with the sucking-chamber 5′ through the central opening 7′ and with the pressure-chamber 6′ through the openings 13′ 13′ close to the internal surface of the cylinder 1′. A stationary tube 10′ is secured in the wall-bracket 25 and made in one piece with a disk 14, provided with one or several radial channels 15. The upper end of the tube 10′ may be connected with a transparent gage-tube or a manometer or other measuring device. (Not shown.) The shaft 11′ is mounted to turn in the bracket 25 and adapted to carry a driving means. (Not shown.) The casing rigidly connected with the shaft 11′ is made to turn on the tube 10′, suitable narrow channels or a narrow space being left in its opening 17 for the admission of the air. The central opening 7′ is shown as passing right through the partition-wall 3′ and may be covered with a disk 16 to divide the two chambers 5′ and 6′ from each other; but this is not absolutely necessary. This speed-indicator operates in a similar manner as before. On its casing being put into rotation the mercury will be forced by its centrifugal force from the sucking-chamber 5′ through the radial channels 8′ 8′ into the pressure-chamber 6′ and thence through the radial channels 15 in the disk 14 and the cavity of the tube 10′ upward to the measuring device. It will be seen that the mercury is taken up by the radial channels 15 at points where the pressure is the greatest.

In the construction hitherto shown the mercury was assumed to be visible in a measuring-tube, and for this reason rather a large quantity of this liquid was necessary. In case the speed is to be measured by a manometer connected with the speed-indicator the sucking-chamber—that is, the chamber open to the atmosphere—can be made exceedingly small, as is shown at Fig. 4. The construction herein illustrated is similar to that in Fig. 3, only that the sucking-chamber 5′ is replaced by a bore 5″ in the shaft 18. There is no partition-wall at all, and the several radial channels 8″ are disposed in the bottom 3″ of the casing and communicate with the bore 5″ and with the pressure-chamber 6″ through the openings 13″ 13″. The cover 2″ is made to turn on the stationary tube 10″, which latter is made in one piece with the disk 22 and connected with a manometer 20 of any known construction. The chamber 6″, the radial channels 21, the cavity 19 of the tube 10″, the respective vessel in the manometer, the radial channels 8″, and part of the bore 5″ are filled with mercury, and on the casing 1″ being put into rotation a very small scarcely-perceivable displacement of the liquid will suffice to cause the manometer to show the corresponding speed. The sucking-chamber is thus reduced to almost *nil*.

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

1. In a speed-indicator, the combination with a rotating casing comprising a sucking-chamber and a pressure-chamber, of a plurality of radial channels in said casing and communicating with the sucking-chamber through a central opening and with the pressure-chamber through openings at its greatest radius, a measuring device connected with the pressure-chamber of said casing, and mercury or the like filling the sucking and pressure chambers of said casing and said plurality of radial channels, the sucking-chamber of said casing communicating with the atmosphere through a plurality of capillary channels.

2. In a speed-indicator, the combination with a cylindrical casing divided by a partition-wall into a sucking-chamber and a pressure-chamber, of a plurality of radial channels in the partition-wall of said cylindrical casing and communicating with the sucking-chamber through a central opening and with the pressure-chamber through openings close to the internal cylindrical surface, a measuring device connected with the pressure-chamber of said cylindrical casing, means rotating said cylindrical casing, and mercury or the like filling the sucking and pressure chambers of said cylindrical casing and said plurality of radial channels, the sucking-chamber of said cylindrical casing communicating with the atmosphere through a plurality of capillary channels.

3. In a speed-indicator, the combination with a cylindrical casing divided by a partition-wall into a sucking-chamber and a pressure-chamber, of a plurality of radial channels in the partition-wall of said cylindrical casing and communicating with the sucking-chamber through a central opening and with the pressure-chamber through openings close to the internal cylindrical surface, a measuring device connected with the pressure-chamber of said cylindrical casing, means rotating said cylindrical casing, a plurality of capillary channels in the walls and partition-wall of said cylindrical casing and terminating both in the sucking-chamber and to without near the axis, and mercury or the like filling the sucking and pressure chambers of said cylindrical casing and said plurality of radial channels.

4. In a speed-indicator, the combination with a cylindrical casing divided by a partition-wall into a sucking-chamber and a pressure-chamber, of a plurality of radial channels in the partition-wall of said cylindrical casing and communicating with the sucking-chamber through a central opening and with the pressure-chamber through openings close to the internal cylindrical surface, a shaft rigidly connected with the one bottom of said cylindrical casing, means driving said shaft, and a measuring device connected with the pressure-chamber.

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

FRANZ EMIL WOLF.

Witnesses:

JOHANNES GOSSLAU,

LUDWIG TROOST.