

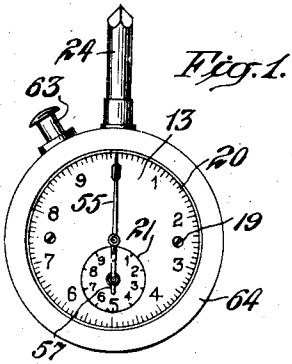
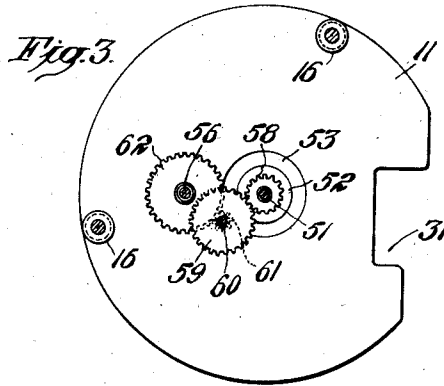
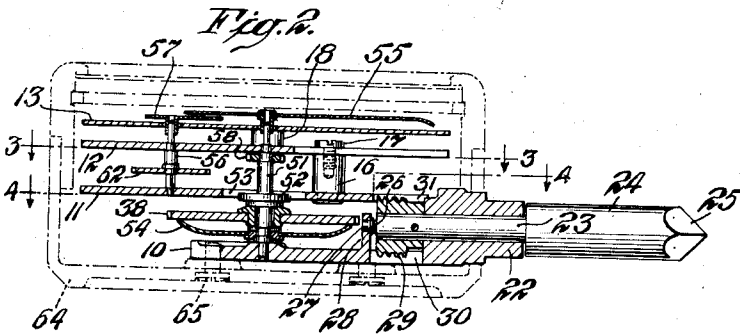
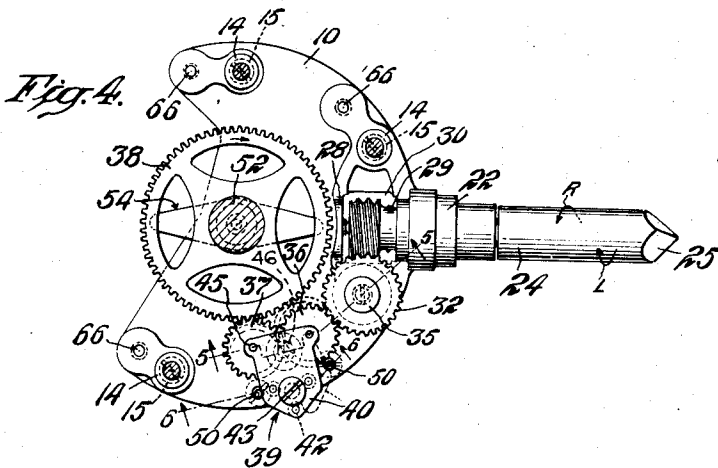
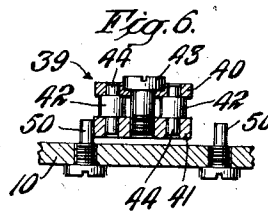
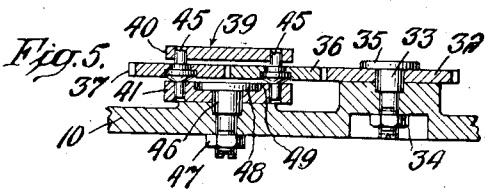
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TACHOMETER

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TACHOMETER

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2 Claims. (Cl. 235-103)

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This invention relates to indicators, and more particularly to the type known as tachometers which are employed for determining the number of revolutions per minute of a driven shaft or the like.

One object of the present invention is to provide a novel tachometer mechanism of strong and compact construction which simplifies manufacture and, in addition, provides a more rugged mechanism which is adapted to withstand hard use without loss of accuracy.

Another object is to provide a novel tachometer mechanism wherein all the component parts thereof may be assembled and adjusted prior to mounting and enclosing said parts within the usual casing.

Another object is to provide a tachometer mechanism having novel indicator driving means whereby said indicator is rotated always in the same direction regardless of the direction of rotation of the shaft engaging spindle of said mechanism.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended to define the limits of the invention, reference for this latter purpose being primarily had to the appended claims.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a top plan view, on reduced scale, of a tachometer embodying the present invention;

Fig. 2 is an enlarged vertical sectional view of the tachometer illustrated in Fig. 1, with the casing thereof shown in dotted lines;

Fig. 3 is a horizontal sectional view on the line 3-3 of Fig. 2;

Fig. 4 is a horizontal sectional view on the line 4-4 of Fig. 2;

Fig. 5 is an enlarged fragmentary sectional view on the line 5-5 of Fig. 4; and,

Fig. 6 is an enlarged fragmentary sectional view on the line 6-6 of Fig. 4.

The novel tachometer contemplated by the present invention comprises a main base plate or frame member 10, spaced back and top plates 11 and 12, respectively, and a dial 13 (Fig. 2). Back plate 11 is secured to frame member 10 in spaced relation by a plurality of spacers 14 (Fig. 4) having corresponding ends thereof riveted or

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otherwise suitably secured to plate 11. The opposite ends of spacers 14 engage the upper surface of frame member 10 and are provided with suitable threaded openings to receive screws 15 which project upwardly through suitable openings in said member. Plate 12 is secured to back plate 11 in spaced relation by spacers 16 (Figs. 2 and 3) having corresponding ends thereof riveted or otherwise suitably secured to plate 11. The opposite ends of spacers 16 support plate 12 and are provided with threaded openings to receive screws 17 which project downwardly through openings in plate 12. Dial 13 is secured to top plate 12 in spaced relation by spacers 18 (Fig. 2) having corresponding ends thereof riveted or otherwise suitably secured to plate 12. The opposite ends of spacers 18 support dial 13 and are provided with threaded openings to receive screws 19 (Fig. 1) which project downwardly through suitable openings in said dial. Dial 13, as herein shown, is provided with graduations 20 to indicate the number of revolutions per minute in "hundreds," and with other graduations 21 to indicate the number of revolutions per minute in "thousands."

The base plate or frame member 10 has secured thereto or formed integrally therewith an upwardly projecting and radially extending boss 22 (Figs. 2 and 4) which provides a substantial bearing in which is journaled the reduced portion 23 of a shaft engaging spindle 24. The outer end of spindle 24 is pointed as indicated at 25 to secure proper engagement of said spindle with a rotating shaft for rotation thereby to accurately indicate the speed of said shaft. The inner end of spindle 24 is preferably provided with a hemispherical projection 26 which engages a hardened steel stud 27 supported by plate 10 to hold said spindle against inward movement upon engagement of the latter with a rotating shaft, thus eliminating drag and frictional contact of the spindle on the outer end of the boss 22, and providing, through point contact of said ball with said stud, a freely rotatable spindle. As shown, stud 27 is carried by an upwardly projecting lug or ear 28 secured to or formed integrally with frame member 10. The bearing 22 and lug 28 on frame member 10 thus provide a substantial support for spindle 24 to always hold said spindle in proper axial alinement and against inward thrust without frictional drag on the spindle, thereby maintaining accurate operating relationship between the spindle and other parts of the tachometer mechanism to be hereinafter described. Ball 26 may be formed on the stud 27,

or said ball may be a separate ball bearing rotatably mounted in a suitable opening in the end of spindle 24, while stud 27 may be a pad or disc formed integrally with lug 28.

Pinned or otherwise suitably secured to the inner end of the reduced portion 23 of spindle 24 for rotation thereby, and disposed between the boss 22 and lug 28, is a worm 29 (Figs. 2 and 4). Frame member 10 and back plate 11 are provided with windows 30 and 31, respectively, to provide sufficient clearance for the worm 29.

Novel means are provided for transmitting the rotation of spindle 24 to speed indicating means hereinafter described, whereby said indicating means are always rotated in the same direction regardless of the direction of rotation of said spindle. In this manner a single set of graduations on dial 13 is only required, thus facilitating reading of the indicated speeds. As herein shown, said transmitting means are preferably constructed, mounted and operated as follows:

Worm 29 meshes with and drives an idler gear 32 (Figs. 4 and 5) journaled on a stud 33 that is threaded and fixed in the frame member 10 by a nut 34, said stud being provided with an enlarged head 35 to prevent displacement of said gear from said frame member. Gear 32 meshes with and drives an idler gear 36 which, in turn, meshes with and drives a similar idler gear 37. Gears 32, 36 and 37 are continuously in mesh with each other, the gears 36 and 37, however, being adapted to independently and automatically mesh with a large gear 38 through rotation of gear 32 dependent on the direction of rotation of spindle 24. Accordingly gears 36 and 37 are journaled on a swing-arm indicated broadly at 39 (Fig. 4) which, as shown herein, is preferably constituted by a pair of plates or arms 40 and 41 (Figs. 5 and 6) that are secured together in spaced relation by spacers 42 and screw 43. Spacers 42 are provided with reduced ends 44 which are engaged in suitable openings in plates 40, 41 to hold said spacers in position, and screw 43 projects downwardly through a suitable opening in plate 40 and is threaded in a suitable threaded opening in plate 41 to securely clamp said plates together.

Gears 36 and 37 which are mounted between the plates 40 and 41 have secured thereto in any suitable manner, pins 45 which are journaled in suitable bearings in said plates (Fig. 5). Swing-arm 39 is pivotally mounted on the frame member 10 by a stud 46 which extends downwardly through suitable openings in plate 41 and said frame member and is threaded on the lower end thereof to receive a nut 47 for securing said stud to said frame member. Stud 46 is also provided on the upper end thereof with an enlarged head 48 to prevent displacement of swing-arm 39 from frame member 10, said head being disposed within a counterbore 49 formed in the plate 41 to prevent interference of the head with gears 36 and 37.

It will thus appear that when the spindle 24 is rotated in the direction of the arrow R (Fig. 4), gear 32 will be rotated in a counter-clockwise direction, as viewed in Fig. 4, by the worm 29. Under these conditions, swing-arm 39 will first be rocked about the pivot 46 in a clockwise direction, as viewed in Fig. 4, through rotation of gear 32 and engagement of the latter with gear 36, thus moving gear 37 into meshing engagement with gear 38, and moving gear 36 out of meshing engagement with gear 38 as indicated in full lines in Fig. 4. Thereupon gear 37 will be

rotated by gear 36 through continued rotation of gear 32, resulting in rotation of gear 33 in a clockwise direction, as viewed in Fig. 4. When the spindle 24 is rotated in the direction of the arrow L (Fig. 4), the above described operations are reversed, that is, gear 32 will then be rotated in a clockwise direction, whereupon swing-arm 39 will be rocked in a counter-clockwise direction to the dotted line position thereof indicated in Fig. 4, resulting in engagement of gear 36 with gear 38, and disengagement of gear 37 from gear 38 as indicated in dotted lines in Fig. 4. Gear 33 will thus be rotated by gear 36 in a clockwise direction.

Rocking movement of swing-arm 39 in opposite directions is limited by stop means to insure proper engagement of gears 36 and 37 with gear 38. Said stop means may be of any suitable construction, but, as herein shown, preferably comprises a pair of eccentric screws 50 (Figs. 4 and 6) which are threaded in suitable threaded openings in the frame member 10 and project upwardly on opposite sides of the swing-arm 39 and into the path of movement of the plate 41. The rocking movement of swing-arm 39 in opposite directions may be limited and varied by turning the screws 50, thus obtaining proper meshing engagement of gears 36 and 37 with gear 38.

Gear 38 is loosely mounted on a pointer shaft 51 (Fig. 2) extending vertically of the tachometer mechanism and which is journaled at opposite ends thereof in suitable bearings formed in frame member 10 and top plate 12. Shaft 51 is provided intermediate the ends thereof with an enlarged portion 52 which is engaged by gear 38 to hold the latter against upward movement. Back plate 11 is formed with an enlarged central opening 53 to provide sufficient clearance for shaft 51 and enlarged portion 52 thereof. Shaft 51 is rotated by gear 38 through the medium of a friction spring coupling 54 which is engaged with said shaft and said gear and disposed between the latter and the frame member 10. The upper free end of shaft 51 extends through a suitable opening in the dial 13, and has secured thereto in any suitable manner a hand or pointer 55 for the graduations 20 on said dial.

Journaled in suitable bearings in the back plate 11 and top plate 12 is a second pointer shaft 56 (Fig. 2) the upper free end of which extends through a suitable opening in dial 13 and has secured thereto in any suitable manner a pointer or hand 57 for the graduations 21 on said dial. Shaft 56 is driven from shaft 51 in proper timing to move pointer 57 a single graduation for each complete revolution of pointer 55. For this purpose, shaft 51 has secured thereto in any suitable manner adjacent the underside of plate 12 a gear 58 (Figs. 2 and 3) which meshes with and drives a larger gear 59. Gear 59 is secured in any suitable manner to a stub shaft 60 (Fig. 3) which is journaled at opposite ends thereof in suitable bearings formed in plates 11 and 12. Shaft 60 has secured thereto or formed integrally therewith a pinion 61 which meshes with and drives a gear 62 that is secured in any suitable manner to the shaft 56. Shaft 56 will thus be driven through the described driving connections therefor with shaft 51 in the same clockwise direction as shaft 51 to move pointer 57 a single graduation for each complete revolution of pointer 55. Pointers 55 and 57 are reset in the well known manner after each operation by suitable means (not shown but well known in the

art) associated with shafts 51 and 56 and actuated by a push button 63 (Fig. 1).

The assembled tachometer mechanism unit is enclosed within a case 64 and firmly secured to said case by a plurality of screws 65 which project upwardly through suitable spaced openings in the case and are threaded in suitable threaded openings 66 (Fig. 4) formed in frame member 10, the spindle 24 and a portion of the bearing 22 projecting outwardly through a suitable opening in said case.

There is thus provided a tachometer mechanism of unitary construction wherein all the component parts thereof are carried by a main frame member, thereby enabling assembling and adjusting of said parts as a single unit prior to enclosing and securing said mechanism within a casing, thus eliminating the necessity for two adjustments of said mechanism. Further, the unitary construction of the tachometer mechanism simplifies manufacturing thereof, and at the same time provides a more rigid and compact mechanism which is adapted to withstand hard use without loss of accuracy. The present invention also embodies improved driving means for rotating the pointers of the tachometer in one direction only regardless of the direction of rotation of the shaft contacting spindle, said means making it possible to employ but a single set of graduations which facilitates reading of the indicated speeds.

Although only a single embodiment of the invention has been illustrated and described in the foregoing specification, it is to be expressly understood that changes may be made therein, particularly in the design and arrangement of the parts illustrated, without departing from the spirit and scope of the invention, as will now be clear to those skilled in the art. For a definition of the limits of the invention, reference will be had primarily to the appended claims.

What is claimed is:

1. In a tachometer mechanism of the type having a spindle rotatable in opposite directions, a worm on said spindle, a pointer shaft adapted to be rotated by said spindle, and a gear on said pointer shaft, the combination of means for rotating said pointer shaft in one direction only regardless of the direction of rotation of said spindle, comprising an idler gear engaged with said worm, a swing-arm, a first gear journaled on said swing-arm and engaged with said idler gear, and a second gear journaled on said swing-arm and engaged with said first gear, said swing-

arm being rocked in opposite directions through rotation of said idler gear to move one or the other of said first and second gears into engagement with the pointer shaft gear dependent on the direction of rotation of said spindle, and adjustable eccentric means for limiting the rocking movement of said swing-arm in opposite directions.

2. In a tachometer mechanism of the type having a frame member, a bearing on said frame member and extending radially thereof, a spindle journaled in said bearing and rotatable in opposite directions, a worm on said spindle, a top plate supported by said frame member in spaced relation therewith, a pointer shaft journaled in said frame member and said plate and adapted to be rotated by said spindle, and a gear on said pointer shaft, the combination of means for rotating said pointer shaft in one direction only regardless of the direction of rotation of said spindle, comprising an idler gear journaled on said frame member and engaged with said worm, a swing-arm pivotally mounted on said frame member, a first gear journaled on said swing-arm and engaged with said idler gear, and a second gear journaled on said swing-arm and engaged with said first gear, said swing-arm being rocked in opposite directions through rotation of said idler gear to move one or the other of said first and second gears into engagement with the pointer shaft gear dependent on the direction of rotation of said spindle, and adjustable screw threaded eccentric means carried by said frame member and disposed on opposite sides of said swing-arm for limiting the rocking movement of the latter in opposite directions.

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