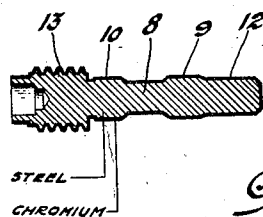
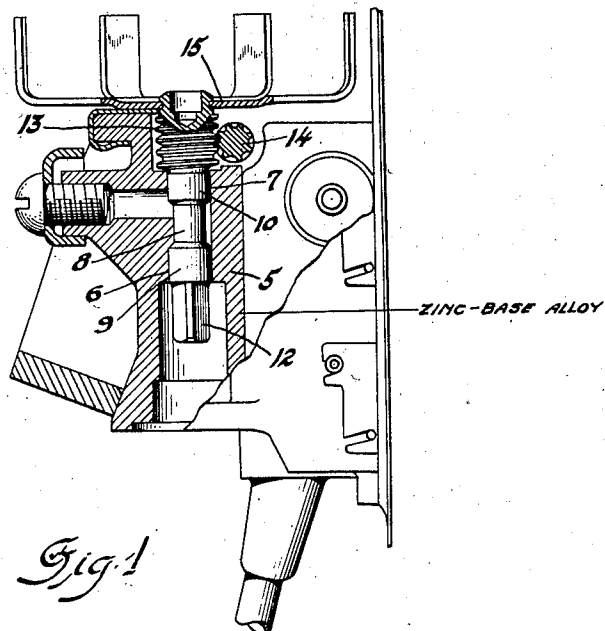


April 8, 1930.

A. CHAMPION
CHROMIUM PLATED WORM SHAFT
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CHROMIUM-PLATED WORM SHAFT

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The invention relates to a drive shaft construction which, while in some respects of more general application, has been especially designed for, and will be herein described as applied to, the driving mechanism of a magnetic speedometer. The object of the invention is to provide means for reducing friction between engaging metal parts and thereby to increase their durability, also to practically eliminate the losses in such parts as hitherto produced due to distortion resulting from the usual processes of hardening.

In the manufacture of steel shafts, gears and the like, in accordance with usual practice, it has been customary to machine the article to the desired form, then to subject it to suitable heat treatment to produce the hardened surface necessary to provide for resistance to wear. This treatment results in more or less distortion of the articles so that a large percentage, amounting in some cases to more than 50%, had to be discarded. In accordance with the present invention I machine the part in the usual manner and then provide a hardened surface thereon by coating with chromium, thus wholly eliminating the step of heat-treatment together with the attendant waste, and with greatly superior results as to durability and reduced friction.

Another difficulty has hitherto been encountered in the use of steel parts mounted in bearings of certain alloys which have a tendency to adhere to or alloy with the steel under the influence of friction. This effect is particularly noticeable in the use of mechanism where steel parts engage with parts composed of zinc base alloys such as are commonly employed for die-casting. This difficulty I have found can be avoided by applying chromium to the surface of the steel part which contacts with the alloy metal. The chromium seems to have no affinity for the softer metal and acts in engagement with the alloy almost as if it were a lubricant. By the use of the chromium coating I find it possible to form bearings for the steel directly in the alloy metal and still avoid any attack of the zinc upon the steel such as has hitherto occasioned the roughening of the steel and resultant rapid wear of the bearing.

In the accompanying drawing showing one embodiment of the invention, Figure 1 is a vertical section through a portion of a speedometer and Figure 2 is a longitudinal section showing the drive shaft of the speedometer on an enlarged scale.

Referring to the drawing, 5 indicates a portion of the frame of the speedometer. This frame is formed preferably by die-casting from an alloy which contains a large percentage of zinc. Bearings 6 and 7 are formed in the frame to support the drive shaft 8, the latter having journals 9, 10, arranged to rotate respectively in the bearings 6, 7. At one end the shaft may be provided with means, as the squared portion 12, for engagement with any suitable coupling. At the other end is a worm 13, constituting preferably an integral part of the shaft, and arranged to engage a worm wheel 14, which may be a part of an odometer mechanism. An armature 15 may be secured to the end of the shaft to be rotated thereby. The worm wheel 14 as well as the shaft 5 and worm 13 are preferably of steel for strength and cheapness. To reduce the wear between the steel parts, however, and to eliminate the tendency of the steel journals to become alloyed with the metals of the frame, I coat the shaft and worm with chromium. This coating is applied preferably by electrodeposition and may be of very slight thickness. In practice I find that the chromium layer between the steel parts and between the steel and alloy parts reduces the adhesion or friction and interaction of one metal upon another to such an extent that wear is substantially negligible throughout the normal life of the instrument.

While I have herein described by way of illustration a specific embodiment of the invention I do not desire to be restricted thereto except as required by the terms of the annexed claims in view of the prior art.

I claim:

1. The combination with two parts having frictional engagement with each other, one of said parts having an ingredient tending to alloy with the other, but not with chro-

mium, under the influence of friction, of a coating of chromium on one of said parts.

2. The combination with a frame containing zinc, of a steel shaft journalled in said frame and a coating of chromium on the journals of said shaft.

3. In a speedometer, the combination of a frame, a worm wheel, said frame being of die-cast metal having a zinc base, a shaft journaled in said frame and having a worm thereon engaging with said worm wheel, and a coating of metallic chromium on the journal portions and the worm wheel portions of said shaft.

In testimony whereof I affix my signature.
ALBERT CHAMPION.

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