June 3, 1924. 1,496,131

G. R. RICH

TAPPET

Filed Jan. 5, 1924

Fig. 1.

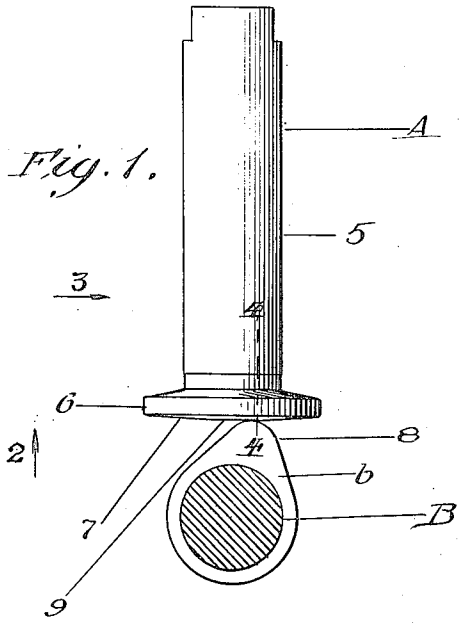


Fig. 3.

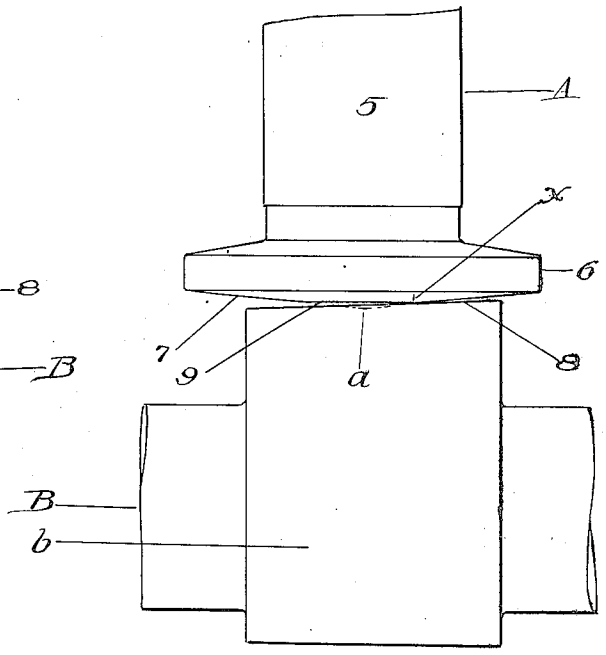


Fig. 2.

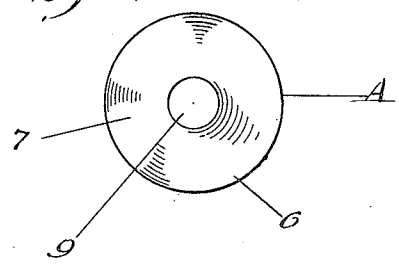
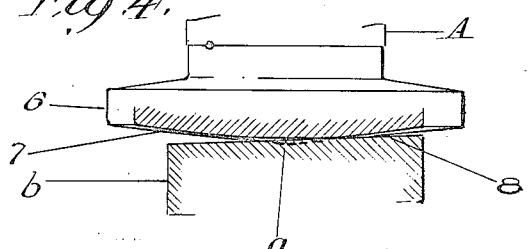


Fig. 4.



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UNITED STATES PATENT OFFICE.

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TAPPET.

Application filed January 5, 1924. Serial No. 684,602.

To all whom it may concern:

Be it known that I, GEORGE R. RICH, a citizen of the United States, and a resident of Battle Creek, Calhoun County, and State of Michigan, have invented certain new and useful Improvements in Tappets, of which the following is declared to be a full, clear, and exact description.

This invention relates to valve tappets for internal combustion engines and its principal object is to eliminate the noise or clicking sound that is occasioned by the action of the cam on the bearing face of the tappet head.

Considerable difficulty has been encountered in cam shaft and tappet assemblies of internal combustion motors, because it is almost impossible to grind the cam shaft and the cams thereon perfectly true, and it is practically impossible to install cam shafts perfectly true, due to slight mis-alignment of the bearings. Another difficulty arises in installing the tappets at a true right angle to the axis of the cam shaft and at a true right angle to the longitudinal lines of the cam face. The cam faces of cams, used in internal combustion engines, frequently do not run precisely parallel with the axis of the cam shaft, because of slight imperfections in the grinding tool used in grinding the cam, or from slight play in the grinding machine and from other causes. In modern motor construction the tappets are usually held in bushings and the latter must have some clearance to enable them to be inserted, and the tappets must have some clearance, from which it is evident that there is no certainty that each tappet is located precisely at right angles to the longitudinal lines of the cam face of its associated cam. The result is that when a cam shaft or a cam thereof is not accurately located at right angles to the tappet only one extreme corner of the cam engages the tappet face and causes the face to wear away rapidly. In case where the bearing face of the tappet is crowned, the line along which the cam bears on the tappet head often is at one side of the axis of the tappet, and as the nose, or high place of the cam approaches the apex or crest of the crowned bearing face, it comes suddenly into contact with the apex portion, making a noise which is extremely objectionable and which is one of the disagreeable features of valve operating mechanism, which motor mechanics, experts and other skilled persons have been attempting to eliminate since the introduction of modern motor valve actuating construction. I have experimented with this end in view for years, and have finally discovered that by removing the apex portion or crest of the crowned bearing face of the tappet head, the noise disappears completely, the cam runs over the bearing face smoothly without any sudden jar, does not rapidly wear away the surface and fulfills a long felt want.

With these ends in view, this invention consists in a valve tappet having a head formed with a crowned bearing face whose apex or crest portion is removed. It further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly shown in the accompanyng drawing, in which:

Fig. 1 is a view partly in side elevation and partly in cross-section, of a valve tappet embodying one form of the present invention and an associated cam shaft; Fig. 2 is an end view of the tappet seen in Fig. 1 and looking in the direction of the arrow 2 in said figure; Fig. 3 is an enlarged side elevation of fragments of the tappet and cam shaft looking in the direction of the arrow 3 in Fig. 1, and Fig. 4 is an enlarged diagrammatic view, partly in side elevation and partly in vertical section, taken on the line 4—4 in Fig. 1.

Referring to said drawing, which illustrates one embodiment of the present invention, the reference character A, designates a valve tappet forming the subject matter of this application, and B designates an associated cam shaft which has cams formed thereon, one of which is shown at *b*, that actuate the tappets. The tappet shown has the usual stem 5 which in practice is mounted in a bushing or other bearing (not shown) and slides therein. Its upper end is arranged for engagement with the stem of a poppet valve or with a push rod for operating an overhead valve as is well understood. Upon the lower end of the stem 5 is a disc like head 6 which is formed with a bearing face 7 that contacts with the cam face 8 of the cam *b*. As is well understood the cam shaft rotates and the cams thereof lift the tappets to thereby unseat the valves. In accordance with the usual practice

springs are employed in connection with the valves for reseating them after the high points of the cams have passed the tappets.

The bearing face 7 of the tappet head 6 is crowned and the crown thereof may be of conical, spherical, or convex formation. The apex, or crest portion of the crowned bearing face is removed during the construction of the tappet to leave a flat part 9, thereby making the crowned portion a frustum of a cone in case it is of conical formation as shown.

The tappet is usually formed from a bar or rod of steel, suitable dies being used in the formation of the tappet and afterwards it is finished and hardened. The stem and head are ground and after the convex bearing face has been ground, the tip portion is ground off leaving the flat middle portion 9.

Frequently the cam faces of cams do not run parallel with the axis of the cam shaft and this is often due to the inability to accurately grind the cam faces in true parallel relation to the axis of the cam shaft. In Fig. 3 I have illustrated such a condition of the face 8 of the cam *b* where it will be seen that said face inclines or tapers toward the left instead of running in true parallel relationship to the axis of the cam shaft B. It will be observed from an inspection of Fig. 3 that when this condition arises the line of contact between the cam face 8 and the crowned bearing face 7, instead of being in a plane running at right angles to the axis of the cam shaft and coaxial with the axis of the tappet, it is to one side thereof, namely, at *x*, along a line where the cam face runs tangentially to the convex surface of the bearing face 7. This may be observed more clearly by reference to Fig. 4, which shows a section through the tappet head, taken at one side of its axis, and a cam whose bearing face is not in true parallel relation with the axis of the cam shaft, but runs tangentially with respect to the curved line which defines the bearing face of the tappet at the place through which the section is taken.

It will be observed that as the nose of the cam approaches the apex or crest of the crowned bearing face 7, it continues to bear along a line located at one side of the axis of the tappet, and that as it reaches the flat portion 9 it is free to pass over it without meeting any sudden inclination, which it would meet were not the apex or crest portion removed. The apex or crest portion is illustrated in Figs. 3 and 4 by the dotted lines *a*, and when this apex or crest portion is present in a tappet the nose of the cam meets it suddenly, after having moved along the gradual inclination of the bearing face 7. The noise is occasioned by the nose of the cam suddenly meeting the apex portion after having traveled along a line located alongside of the axis of the tappet. In Fig. 3 the nose or high place of the cam *b* is shown in engagement with the tappet and in Fig. 4 the nose is shown in engagement with the tappet at a place in advance of its axis.

The dotted lines *a* indicate the apex portion of the tappet which ordinarily is struck by the nose of the cam with the usual attendant noise.

Besides the elimination of the noise, the wear is less on the bearing faces of the tappet and cam, and greater efficiency of operation of the motor is obtained.

More or less variation of the exact details of construction is possible without departing from the spirit of this invention; I desire, therefore, not to limit myself to the exact form of the construction shown and described, but intend, in the following claims, to point out all of the invention disclosed herein.

I claim as new, and desire to secure by Letters Patent:

1. A valve tappet having a cam engaging head formed with a crowned bearing face from which the crest is removed.

2. A valve tappet having a cam engaging head formed with a bearing face of frustoconical formation.

3. A valve tappet having a cam engaging head formed with a crowned bearing face flat at its crest.

GEORGE R. RICH.