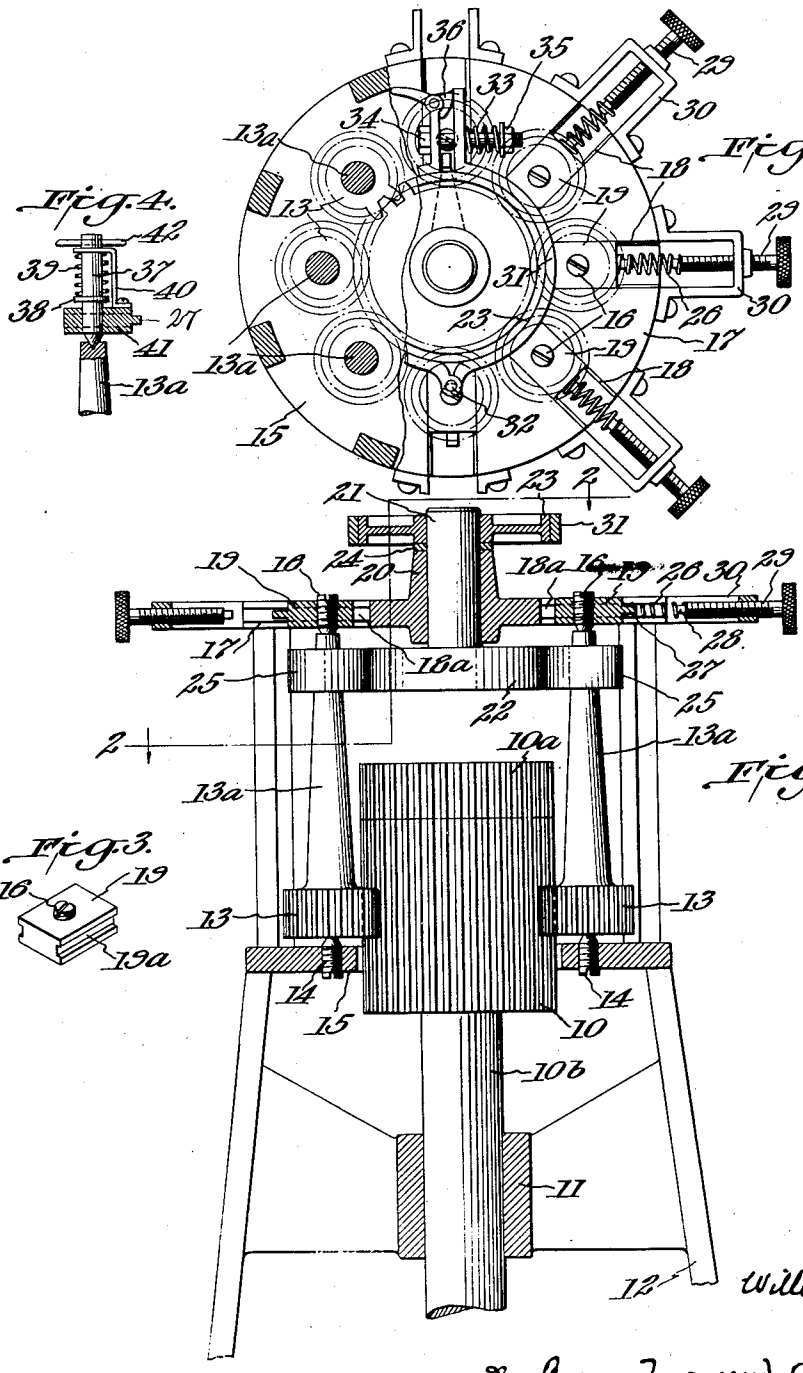
March 4, 1930. W. E. HOKE 1,749,704

APPARATUS FOR FINISHING GEARS

Filed Jan. 11, 1924 2 Sheets-Sheet 1




Inventor:
William E. Hoke

By Byrnes Townsend & Brickenstein

Attorneys.

March 4, 1930. W. E. HOKE 1,749,704

APPARATUS FOR FINISHING GEARS

Filed Jan. 11, 1924 2 Sheets-Sheet 2

Fig. 6.

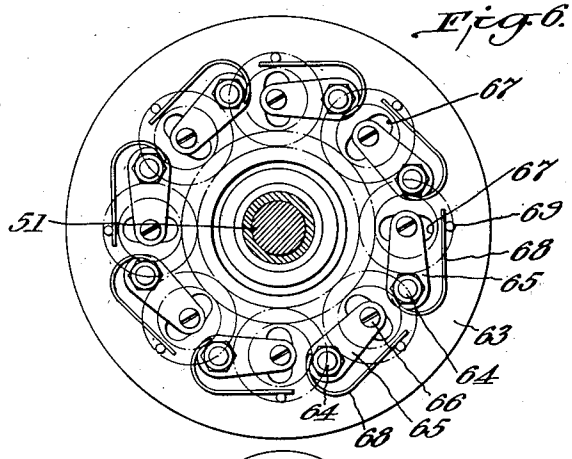



Fig. 7.

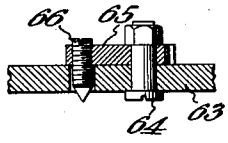
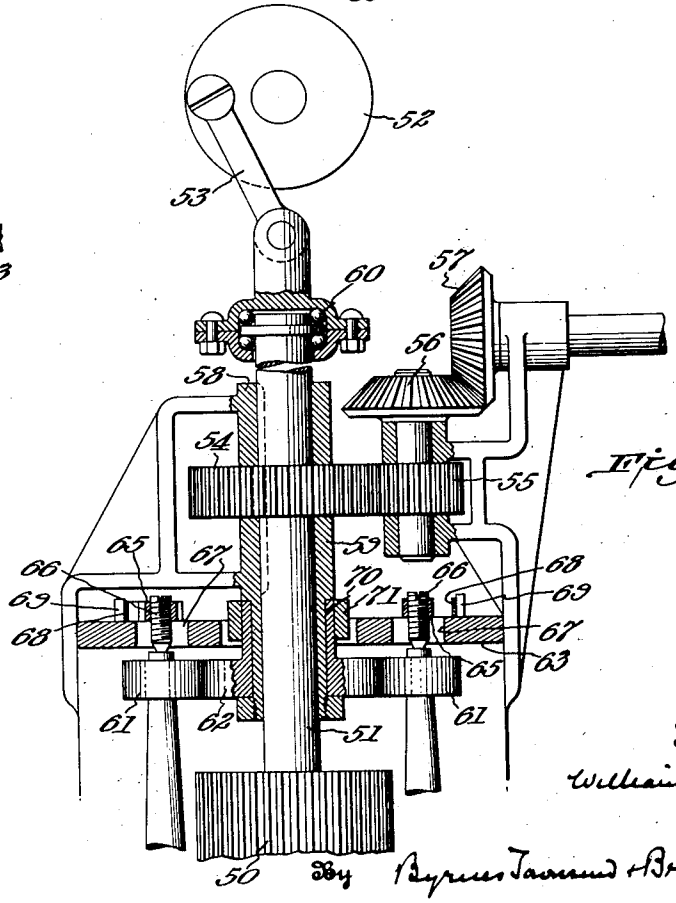



Fig. 5.




Inventor:
William E. Hoke

By Byrnes Townsend & Brickenstein

Attorneys.

Patented Mar. 4, 1930 1,749,704

# UNITED STATES PATENT OFFICE

WILLIAM E. HOKE, OF BALTIMORE, MARYLAND

## APPARATUS FOR FINISHING GEARS

Application filed January 11, 1924. Serial No. 685,684.

This invention relates to apparatus for accurately finishing gears and more in particular transmission gears of motor vehicles.

Transmissions of the type referred to include as one member a gear mounted on a stub-shaft.

It is the principal object of this invention to expeditiously finish gears of this character and it is a more special object to finish a larger number of such gears at the same time or in one operation.

For a more comprehensive disclosure of the invention and the principle of operation upon which it is based, reference is made to the accompanying drawings in which—

Fig. 1 is a vertical section through an apparatus embodying the invention;

Fig. 2 is a plan view thereof, partly in section;

Fig. 3 is a perspective view of one of the carriages in which the stub-shafts are supported;

Fig. 4 is a vertical section of a modified form thereof;

Fig. 5 is a fragmentary vertical section of mechanism showing modifications of the apparatus shown in Figs. 1 and 2;

Fig. 6 is a plan view thereof, parts being removed; and

Fig. 7 is a vertical section through one of the shaft-supporting pivot screws.

The invention, briefly expressed, comprises a central lapping gear, means for supporting a number of gears to be finished around the central lapping gear in mesh engagement therewith, means for operating the lapping gear and mechanism whereby the gears may be lapped under load conditions.

In Fig. 1 the lapping gear 10 is shown as mounted in a bearing 11 upon a frame structure 12. Suitable means may be provided for vertically reciprocating and revolving the lapping gear. Such means have been omitted, for the sake of simplicity, in Fig. 1, but may consist of any one of many arrangements well known in the art, one of which will be specifically referred to in connection with Figs. 5 and 6.

A plurality of gears 13 together with their stub-shafts $13^a$ are mounted upon stationary pivots 14 carried by the ring portion 15 of frame 12. The upper ends of the stub-shafts $13^a$ are pivotally held by pivot screws 16 which are movably supported as will be more particularly pointed out.

The frame 12 is upwardly extended to provide an upper platform or table 17. The table 17 has radial recesses 18 in vertical alignment with the gears 13 and their stub-shafts $13^a$. These recesses define slideways for carriages 19 supporting the pivot screws 16. The carriages 19 have lateral grooves $19^a$ co-operating with corresponding tongues $18^a$ on the lateral walls of the recesses 18 for movably supporting and guiding the carriages in the recesses.

Centrally upon the table 17 is provided a bearing 20 in which is mounted a shaft 21 carrying at its lower end a roller 22. The roller 22 has a diameter corresponding to the pitch line diameter of the lapping gear 10 and the shaft 21 is in vertical alignment with the shaft $10^a$ of the lapping gear. The shaft 21 and the roller 22 may be supported in any suitable way. As indicated, the shaft 21 carries at its upper end a wheel or pulley 23 which is secured to the shaft 21 and is supported upon the bearing 20 by an antifriction disk 24.

Upon the upper end of the stub-shafts $13^a$ are mounted rollers 25 whose diameter corresponds exactly to the pitch line diameter of the gears 13. The rollers 25 thus normally contact with the roller 22.

The carriages 19 are acted upon by springs 26 centered upon journals 27 and 28 on the carriages 19 and screws 29 respectively. The latter are supported upon yokes 30, which are secured to the table 17 at opposite sides of the recesses 18, and may be screwed forwardly or backwardly to adjust the pressure of the springs upon the carriages.

The rollers 25 are thus forced into frictional contact with the roller 22 and since the latter and the rollers 25 correspond exactly to the lapping gear 10 and the gears 13, they have the same relative movement.

The wheel 23 is engaged by a brake shoe 31 composed of two halves joined at one end by a hinge connection 32 and forced toward

each other at the opposite end by means of a spring 33 carried upon a bolt 34 and held in operative position by a nut 35. Intermediate the free ends of the brake shoe is disposed a cam member 36 by which the free ends of the brake may be forced apart against the tension of the spring 33 to make the latter ineffective. By the operation of the cam element 36 the brake may thus be made operative or inoperative at will and by regulating the degree of compression of the spring 33, the degree of the braking action may be varied as desired. In consequence the gears 13 may be subjected at will to load conditions of any desired degree.

If desired, instead of pivot screws 16 may be used pivot pins 37 normally held in engagement with the stub-shafts by springs. As indicated in Fig. 4, a pin 37 may have a collar 38 for taking the thrust of spring 39, the outer end of which may bear against an abutment 40 secured to or forming part of the carriage 41. A grip portion 42 at the outer end of the pin may serve the purpose to facilitate retraction of the pin. By the arrangement described a gear 13 may be quickly placed in position or taken out of it.

The form of construction illustrated in Figs. 5 and 6 does not essentially differ from the form shown in Figs. 1 and 2 so far as the principle of operation is concerned. It is to indicate merely that there is considerable room for changes and modifications as to details of construction.

The lapping gear 50, in the form shown, is not operated from below, but from above. The shaft 51 carrying the lapping gear is reciprocated by any suitable rotary motor means 52 through a connecting rod 53 and may be rotated by means of gear mechanism including gear 54, pinion 55 and bevel gears 56 and 57. The gear 54 may be splined to the shaft and held in position between stationary sleeves 58 and 59 forming also bearings for the shaft 51. The shaft 51 is revolubly connected to the connecting rod through ball-bearing swivel joint 60.

Figs. 5–7 also show a modified form of mechanism for urging the rollers 61 into frictional contact with the central roller 62.

Upon the table 63 are pivotally mounted by means of studs 64 arms 65 which carry at their free ends pivot screws 66. The table has elongated slots 67 in which the pivot screws are free to move. The arms 65 are acted upon by leaf springs 68 which are anchored at one end in the arms 65 and bear at the free ends against pins 69. The pivot screws 66 thus force the rollers 61 against roller 62 which is mounted upon a downward extension of sleeve 59.

A brake band 71 similar to that previously described may operate upon the collar 70 of the roller 62 to provide a load.

While in Figs. 5 and 6 a modified construction for supporting, reciprocating and revolving the lapping gear is shown together with a modified mechanism for urging the rollers into frictional contact, it is obvious that this is done as a matter of expedience only, for purposes of illustration. The two features are entirely separate and independent of each other so far as their function and operative significance is concerned.

As indicated in Figs. 5 and 6, the reciprocating movement and the rotary movement of shaft 51 may be effected by separated means and independently of each other. In practice, the lapping gear is longitudinally moved to one end of its stroke and then rotated for removing burs and for rough finishing. Thereafter the operation takes place by simultaneously reciprocating and rotating the lapping gear to effect the finishing proper. As indicated in Fig. 1, the smaller section $10^a$ of the lapping gear may be used for the rough work while the remaining larger portion may be used for the finer finishing work.

While in the foregoing I have described what I at present consider preferred or advantageous embodiments of the invention, the principle of operation characterizing the invention may be carried out in various other ways and by entirely different apparatus.

I claim:

1. In apparatus for finishing gears, the combination of a central gear of considerable axial extent, means for revolubly supporting a plurality of gears to be finished in mesh relation therewith and means for reciprocating and for rotating the central gear.

2. In apparatus for finishing gears, the combination of a central gear of considerable axial extent, means for revolubly supporting a plurality of gears to be finished in mesh relation therewith, means for reciprocating the central gear and means for rotating the same, the means for reciprocating the central gear and the means for rotating it being operable independently of each other.

3. In apparatus for finishing gears, the combination of a central gear of considerable axial extent, means for revolubly supporting a plurality of gears to be finished in mesh relation therewith, means for reciprocating and rotating the central gear and means including transmission mechanism interconnecting all gears to be finished for putting the same under load conditions.

4. In apparatus for finishing gears carried on stub-shafts, the combination of a central gear of considerable axial extent, means for revolubly supporting the stub-shafts to bring the gears in mesh relation with said central gear, and means for reciprocating and for rotating the central gear.

5. In apparatus for finishing gears carried on stub-shafts, the combination of a central gear of considerable axial extent, means for

revolubly supporting the stub-shafts to bring the gears to be finished in mesh relation with said central gear, means for reciprocating the central gear and means for rotating the same, the means for reciprocating the central gear and the means for rotating it being operable independently of each other.

6. In apparatus for finishing gears carried on stub-shafts, the combination of a central gear of considerable axial extent, means for revolubly supporting the stub-shafts to bring the gears to be finished in mesh relation with said central gear, means for reciprocating and for rotating the central gear and means including transmission mechanism interconnecting all stub-shafts for putting the gears to be finished under load conditions.

7. Apparatus according to claim 6 including a central roller of a diameter corresponding to the pitch line diameter of the central gear and in axial alignment therewith, a roller on each stub-shaft of a diameter corresponding to the pitch line diameter of the gears to be finished, means for pressing the rollers into frictional contact with the central roller and means for braking the central roller.

8. Apparatus according to claim 7 including bearings for the stub-shafts, means for permitting movement of the bearings in radial direction relatively to the axis of the central roller and means for urging the bearings radially toward the axis of the central roller.

In testimony whereof, I affix my signature.

WILLIAM E. HOKE.