

Aug. 19, 1930.

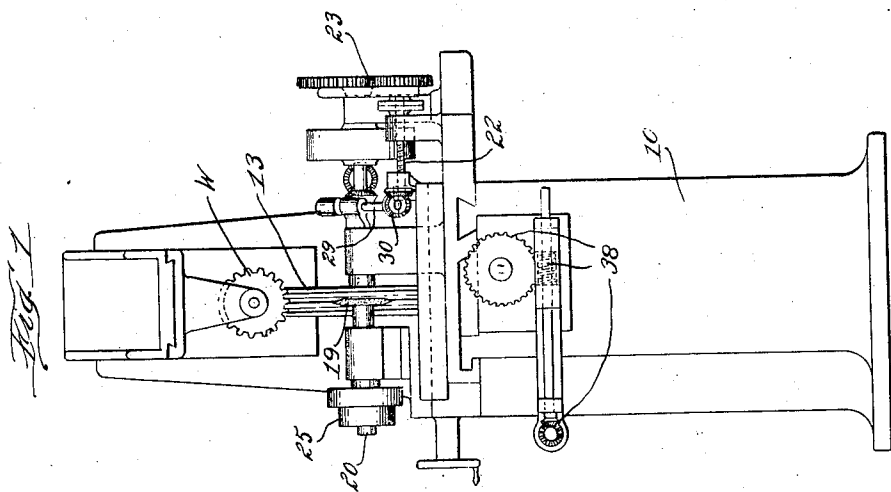
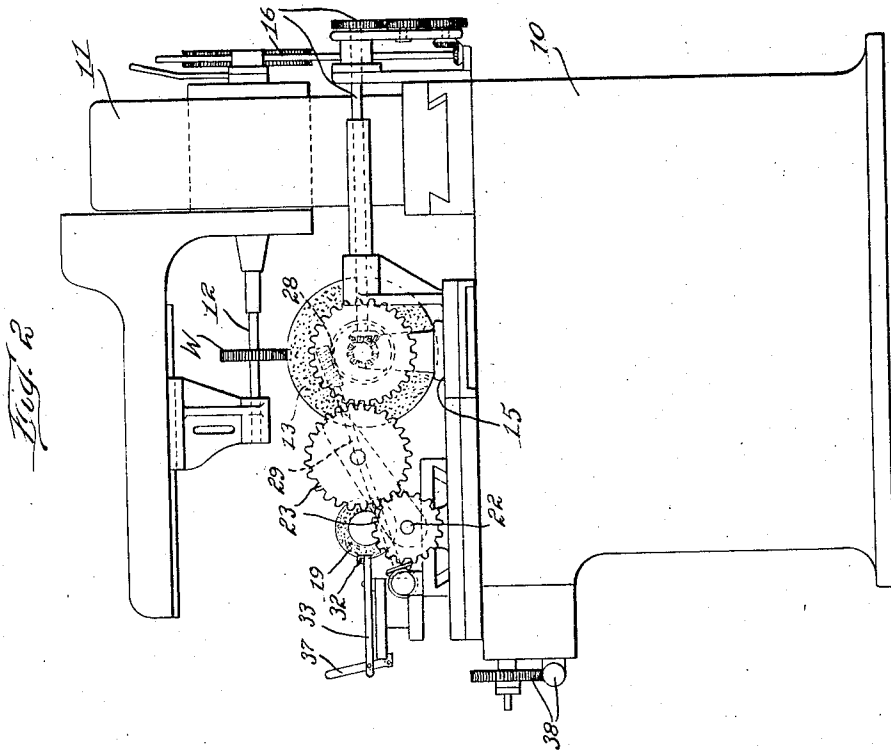
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APPARATUS FOR GEAR GRINDING

Filed June 1, 1925

2 Sheets-Sheet 1



Inventor:
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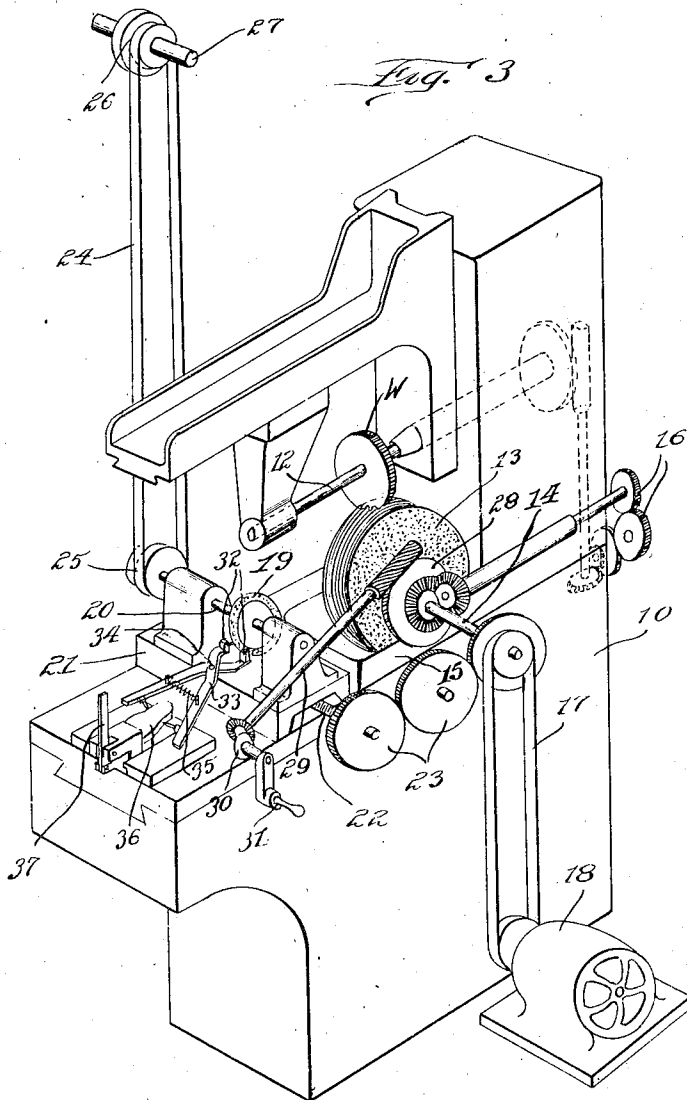
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UNITED STATES PATENT OFFICE

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APPARATUS FOR GEAR GRINDING

Application filed June 1, 1925. Serial No. 34,056.

This invention relates to apparatus for trueing hardened gears by grinding them with the use of an emery or like hob device. The trueing and finishing of hardened gears by the use of a grinding hob of emery or the like has marked advantages in the way of accuracy and rapidity of operation, with continuous indexing, that are well recognized in the art, but the emery hob itself requires frequent dressing and attention to keep the same trued up and in proper working condition, and has also involved large expense in the initial roughing out and trueing up of the same from the emery blank of which it is composed. Such trueing up of the emery hob has ordinarily been accomplished by the use of diamond cutters which has involved great, and almost prohibitive expense for the diamonds which are rapidly used up in operating directly on an emery hob, which it will be understood is usually of relatively substantial size, e. g., about fourteen inches in diameter.

I have found that by employing an intermediate instrumentality, such as a formed disc of carborundum or the like for direct action upon the grinding hob to dress and true the same, and by employing diamonds only to dress and true the carborundum wheel, that the dressing and trueing of the emery hob is made much easier and quicker, and that a great economy is effected in the use of diamonds since there is only a comparatively small wear of the diamonds involved in keeping the intermediate carborundum wheel in proper operative condition. While I refer herein to the intermediate wheel or disc as of carborundum, this reference is to be understood as illustrative and not restrictive, and intended to include a wheel or disc made of any suitable substance intermediate in hardness between the emery hob and the diamonds.

In accordance with my invention I provide in a single combined and organized machine, in conjunction with the emery hob, work mounting and operative connections, a mounting for a formed carborundum disc equipped with operative connections including change gears for moving the same later-

ally in timed relation to a rotation of the emery hob so as to obtain a correct lead of the carborundum disc causing it to follow the threads of the emery hob; the machine organization also including a mounting for a trueing device holding diamond points in position to act upon the carborundum disc when required.

The foregoing and other objects and advantages of the invention will more fully appear from the following detailed description taken in connection with the accompanying drawings, and the distinctive features of novelty will be pointed out in the appended claims.

Referring to the drawings:

Fig. 1 is a front elevation of a machine embodying my invention with the diamond trueing device removed;

Fig. 2 is a side elevation thereof with the diamond trueing device in place; and

Fig. 3 is a perspective view showing the essential features of the invention in a large diagrammatic form.

10 indicates the base and frame work of the machine having an upright column 11 at the back thereof in which is adjustably mounted a work arbor 12 on which a hardened gear constituting the work piece W is mounted. 13 indicates the emery hob which may be of relatively large dimension, e. g., about 14 inches in diameter. This emery hob is mounted on a shaft 14 journaled on a carriage 15 fitted to slide on the base 10. The shaft 14 is connected through suitable shafting and change gears 16 with the work holding arbor 12 so that the work is rotated in proper timed relation with the rotation of the hob for continuous indexing. The driving impulse may be imparted to the shaft 14 in any suitable manner as by a belt connection 17 from a motor 18. 19 indicates a disc wheel of carborundum or other suitable substance harder than the emery hob 13. This carborundum disc has its periphery formed in accordance with the grooves in the emery hob 13 so that when engaged in such grooves it is adapted to finish accurately the sides of the spiral tooth rib of the hob. This carborundum disc is mounted on a shaft 20 journaled

in a carriage 21 fitted to slide transversely of the base 10. The provision of this lateral slide carriage is to permit the carborundum disc to be moved transversely so as to follow precisely the lead of the spiral thread of the hob 13. To effect such movement the carriage 21 is engaged by a screw 22 which is operated by a train of change gears 23 from the shaft 14. It is desirable to provide a two speed driving connection to the carborundum disc 19 so that it may be operated at a relatively high speed for finishing and dressing the hob 13 to effect such operation as rapidly as possible, and at a relatively lower speed when the carborundum wheel is itself refinished and trued by the diamond trueing device as presently described. As I accomplished this two speed drive of the shaft 20 by a belt connection 24 which engages stepped pulleys 25, 26 on the shaft 20 and a driving countershaft 27 respectively. When the grinding hob is to be acted on by the carborundum disc to finish and dress the same, it is turned slowly, preferably by a hand operated connection, though it might be turned by power. For turning the hob by hand I show a worm wheel and worm connection 28 therefrom leading through a shaft 29 and bevel gears 30 to a hand crank 31. The turning of this crank thus rotates the grinding hob slowly, while through the described change gears 23 and screw 22 the carborundum disc 19 is at the same time moved slowly laterally so as to follow the lead of the spiral groove of the hob. For trueing the carborundum disc 19 I provide diamond points 32. There are preferably two of these points to engage simultaneously opposite sides of the carborundum disc periphery. These diamond points may be borne by any suitable holder capable of presenting them properly to the carborundum disc surface, but preferably, and as herein illustratively shown, I mount them upon the inner ends of arms 33 which are pivoted together at 34 as a tongs construction with their outer end portions engaged by a tension spring 35 to hold them engaged with a template form 36 which thus determines the shape imparted to the peripheral side portions of the carborundum disc in accordance with the tooth curve required in the grinding hob. The relative movement of this template with respect to the arms 33 is controlled by a suitable operating device 37. Means for feeding the carriage 15 bearing the grinding hob is indicated conventionally at 38, such means constituting no part of the present invention.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The hereindescribed method of finishing and preserving the accuracy in use of grinding elements for truing gears, which consist in finishing and dressing the tooth curve of

such element by means of a disc adapted to be moved in one direction into contact therewith and having a formed periphery of relatively harder material, and in truing and preserving the accuracy of such finishing disc by the use of still harder members controlled by a template form when said disc is moved in the opposite direction from contact with said grinding element.

2. The hereindescribed method of finishing and preserving the accuracy in use, of grinding hobs for truing gears which consists in finishing and dressing the tooth curve of the hob by means of a disc contacting therewith and having a formed periphery of relatively harder substance, and in moving said disc free from contact with said hob and then truing and preserving the accuracy of such finishing disc by the use of a diamond controlled by a template form.

3. The combination with apparatus for grinding gears and the like, equipped with a grinding hob, of a disc having a periphery of relatively harder material than the grinding hob, formed to finish the grooves of such hob, a truing device bearing diamond points and having a template controller, a slidable support for said disc, and means for moving said support to position said disc in contact with said hob or in position for said diamond points to true said disc.

4. The combination with mechanism for grinding gears equipped with an emery hob, of a disc for finishing the spiral tooth rib of such hob mounted to be engaged therewith at will, and having connections with the hob to be moved laterally so as to follow the spiral tooth curve thereon, a diamond truing device for truing said disc, a slidable support for said finishing disc and means for moving said support to bring said disc in coacting relation with either the truing device or said hob.

5. The combination with a grinding hob equipped for operation to true a gear or the like, of a finishing disc of carborundum, having its periphery formed to furnish the spiral tooth curve of such hob, means for moving such disc laterally at a rate to cause it to follow the spiral tooth of the hob, a diamond truing device having a template control for truing such finishing disc, and means for operating said finishing disc at a relatively high speed when operating on the grinding hob, or at a relatively low speed when engaged by the diamond truing device at will.

6. The combination with a hob for grinding gears, a finishing disc of carborundum, having its periphery formed to finish the spiral tooth curve of said hob, means for moving the disc laterally at a rate to cause it to follow the spiral tooth of the hob, a diamond truing device for truing said disc provided with a template control, a slidable support for said disc, means for moving said support to bring said disc into coacting rela-

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tion with either said hob or said truing device, and means for rotating said finishing disc at a relatively high speed when operating on said hob or at a relatively low speed when engaged by the truing device.

7. The combination with a hob for grinding gears, a finishing disc of carborundum, having its periphery formed to finish the spiral tooth curve of said hob, means for moving the disc laterally at a rate to cause it to follow the spiral tooth of the hob, a diamond truing device for truing said disc provided with a template control, a slidable support for said disc, means for moving said support to bring said disc into coacting relation with either said hob or said truing device, means for rotating said finishing disc at a relatively high speed when operating on said hob or at a relatively low speed when engaged by the truing device, and means for rotating the grinding hob slowly when said disc is coacting with said hob.

8. The combination with a hob for grinding gears, a finishing disc of carborundum, having its periphery formed to finish the spiral tooth curve of said hob, means for moving the disc laterally at a rate to cause it to follow the spiral tooth of the hob, a diamond truing device for truing said disc provided with a template control, a slidable support for said disc, means for moving said support to bring said disc into coacting relation with either said hob or said truing device, means for operating said finishing disc at a relatively high speed when operating on said hob or at a relatively low speed when engaged by the truing device; and means for manually rotating the grinding hob slowly when said disc is coacting with said hob.

9. The combination with a hob for grinding gears, a finishing disc of carborundum, having its periphery formed to finish the spiral tooth curve of said hob, means for moving the disc laterally at a rate to cause it to follow the spiral tooth of the hob, a diamond truing device for truing said disc provided with a template control, a slidable support for said disc, means for moving said support to bring said disc into coacting relation with either said hob or said truing device, means for operating said finishing disc at a relatively high speed when operating on said hob or at a relatively low speed when engaged by the truing device; means for rotating the grinding hob slowly when said disc is coacting with said hob; and means for rotating said hob rapidly when said disc is disconnected therefrom and operating to true a gear.

10. The combination with a hob for grinding gears, a finishing disc of carborundum, having its periphery formed to finish the spiral tooth curve of said hob, means for moving the disc laterally at a rate to cause

it to follow the spiral tooth of the hob, a diamond truing device for truing said disc provided with a template control, a slidable support for said disc, means for moving said support to bring said disc into coacting relation with either said hob or said truing device, means for operating said finishing disc at a relatively high speed when operating on said hob or at a relatively low speed when engaged by the truing device, a work arbor adapted to support a gear to be ground, means for rotating said hob including a rotatable shaft, and connections between said rotatable shaft and work arbor whereby said work arbor will be rotated in timed relation to the rotation of said hob.

In testimony whereof, I have signed my name to this specification.

FRANK BURGESS.