

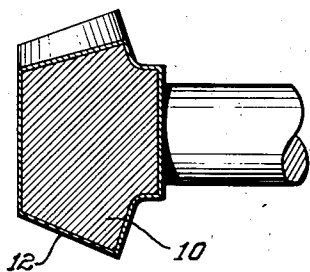
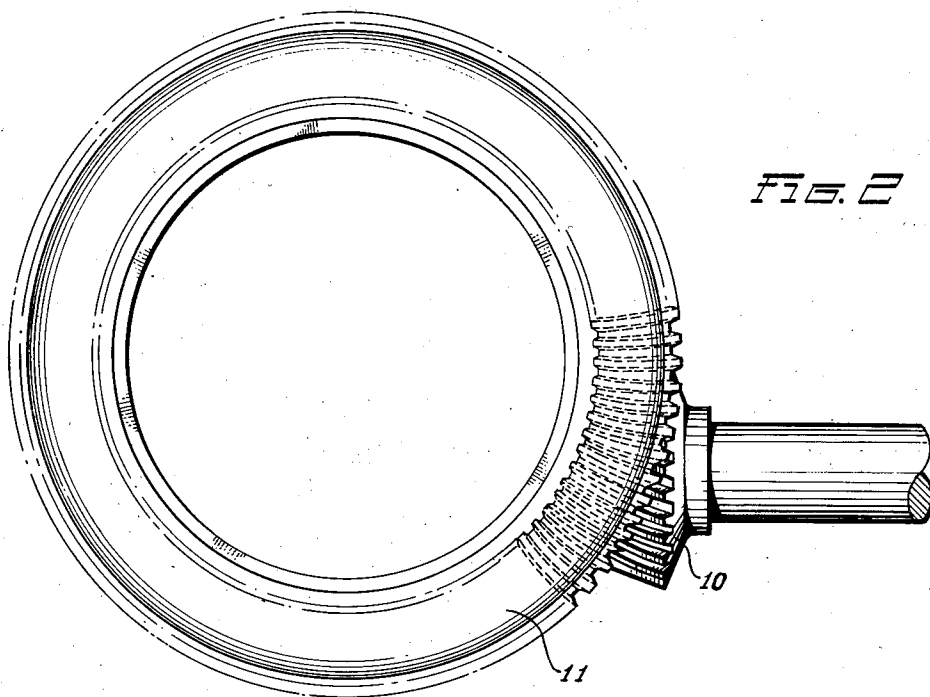
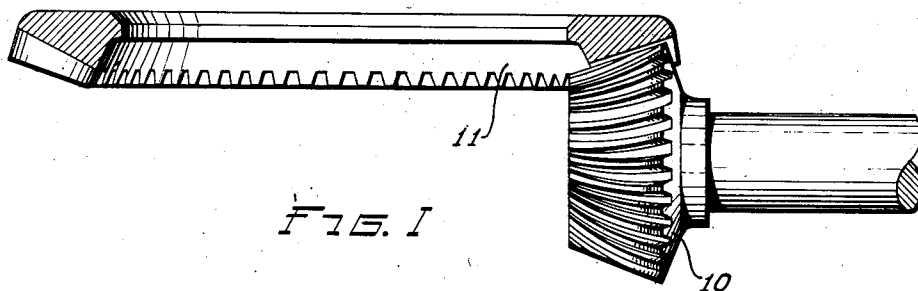
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METHOD OF LAPPING GEAR SETS

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METHOD OF LAPPING GEAR SETS

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This invention relates to the finishing of gears and more particularly to methods for lapping gear sets.

In the present method employed for lapping hardened steel gear sets, a pair of gears are first selected which mate and then run together with an intermittent application of an abrasive fluid compound. Due to the hardness of the gear material and the relation of the abrasive with the teeth tending to move from between the teeth, considerable time is required for the required lapping. Furthermore, when the gears of the sets are different sizes, for example a ring gear and pinion, the pinion will be ground faster than the ring gear which often results in undue lapping and in some instances, such as with hypoid gears, the faces of the pinion teeth are not uniformly finished and the finished portion is ground too much.

An object of this invention resides in a new and improved method of lapping hardened steel gear sets which requires considerably less time than the methods now being employed.

Another object of the invention is to provide a method of lapping gear sets, in which the gears have a different number of teeth, so that the gear with the least number of teeth will be finished with a very slight removal of material.

A further object of the invention is to provide a method of lapping a hardened steel hypoid gear set so that the faces of the teeth of the pinion are ground regularly lengthwise and with a minimum removal of metal.

Other objects of the invention will appear from the following description taken in connection with the drawing, which form a part of this specification, and in which:

Fig. 1 is an elevational view of a gear set, with the ring gear in section, associated in relation for lapping in accordance with my invention;

Fig. 2 is a plan view of the same;

Fig. 3 is a sectional view of the pinion coated with copper for the first lapping operation.

Referring now to the drawing, I have illustrated a hypoid gear set, as one type of gear-

ing to which the invention can be applied, consisting of a pinion 10 and a ring gear 11. The invention applies equally well to other types of gear sets, however it applies more particularly to gear sets formed of hardened metal such as steel. The pinion illustrated has fewer teeth than the ring gear with which it is to mesh when finished, and while the invention applies particularly to gear sets in which the gears have different numbers of teeth, still it can be utilized to an advantage when the gear teeth are the same in number. In selecting the gear set before the lapping operation, care should be taken to mate the gears so that undue finishing will not be required.

It is the usual practise, as above described, to run the gear set in with an intermittent application of fluid abrasive, generally of an emery type. Under such circumstances the abrasive substance is not particularly confined and is free to roll or slide along between the meshing gear teeth without grinding the same, and as a result the grinding efficiency is so poor that a relatively long time is required in properly lapping the hardened steel gear teeth faces. When the pinion has fewer teeth than the ring gear, the faces of its teeth will be lapped much faster than the faces of the ring gear teeth and this is an undesirable condition. With hypoid gearing there is a rolling and sliding action of the meshing teeth relatively and the lapping of the faces of the pinion teeth is not uniform throughout their length with the present methods.

In carrying out my invention, I coat one of the gears of the set with a relatively soft metal covering 12, such as copper. The copper is preferably applied to the gear by an electro-plating process, so that it can later be stripped through a reversal of the current in the same bath, and thus the covering can be quickly applied and removed. After coating one of the gears, and preferably the gear of the set having the least number of teeth, the set is then driven in mesh by suitable equipment and a fluid abrasive is intermittently applied between the copper coated pinion teeth and the ring gear teeth. After lapping the gear set in this manner a rela-

tively short period of time, the copper is stripped from the pinion and the gears are again run together and lapped a still shorter period with the abrasive fluid application to finish the pinion.

If desired, a master pinion could be utilized for the first lapping operation of the ring gear of the gear set, and the pinion of the gear set could be finished in the relapping operation so that the plating of the pinion with copper would be eliminated.

When the gears of the set have the same number of teeth, one gear could be plated for the first lapping operation and then stripped while the other gear of the set could be plated for the second lapping operation and then stripped. Such method of lapping would save considerable time compared to the methods now employed.

By coating the gears with copper, the abrasive substance in the lapping fluid will become imbedded in the copper covering the gear teeth faces and in such fixed relation will have a definite grinding effect upon the faces of the teeth of the other gear while meshing therewith, and thus the faces are lapped in a very materially shorter time than that required when the abrasive substance is substantially unrestricted to roll or be pushed ahead of the abutting faces of the teeth as they mesh.

The relapping operation need be only sufficiently long to take the high spots off of the faces of the pinion teeth. I have found that the copper coating need to be only .002 inch in thickness to serve as the base for securing the abrasive during the lapping operation.

While I have herein described in some detail a specific embodiment of my invention, which I deem to be new and advantageous and may specifically claim, I do not desire it to be understood that my invention is limited to the exact details of the construction, as it will be apparent that changes may be made therein without departing from the spirit or scope of my invention.

What I claim is:

1. The method of lapping gear sets comprising coating one of the gears with a relatively soft metal, running the gears in mesh, applying a grinding compound between the teeth of the coated gear and the other gear, stripping the coating from the gear, again running the gears together uncoated, and applying a grinding compound between the teeth while the uncoated gears are running together.

2. The method of lapping gear sets comprising coating one of the gears with copper, running the gears together with one coated, applying a fluid grinding compound to the gear teeth while running, stripping the copper from the gear, running the gears together uncoated, and applying a fluid grind-

ing compound to the uncoated teeth while they are running together.

3. The method of lapping gear sets comprising plating one of the gears with copper, running the gears together while the one is plated, applying a fluid grinding compound to such gears while running, stripping the plating from the gear when the lapping of the unplated gear is substantially finished, running the unplated gears together, and applying a fluid grinding compound to such unplated gears while they are running together.

4. The method of grinding one gear of a gear set comprising coating another gear with an abrasive retaining material, running the gears together with the one coated, and applying an abrasive material to the gear teeth during rotation together.

5. The method of lapping the teeth of a reduction drive gear set comprising plating the gear with the least teeth with copper, running the gear set together with the one gear plated, applying a fluid abrasive compound to the gear teeth while running together, stripping the copper from the gear, again running the gear set, and applying a fluid abrasive compound to the gear teeth while again running together.

In testimony whereof I affix my signature.
JOHN M. CHRISTMAN.

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