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A. W. MORTON

METHOD OF GRINDING PISTON RINGS

Filed Dec. 30, 1927

Fig. 1.

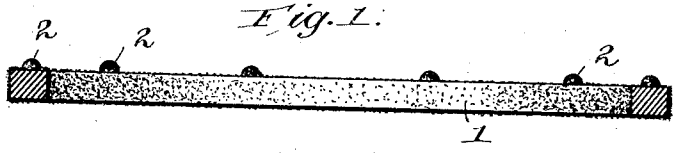


Fig. 2.



Fig. 3.

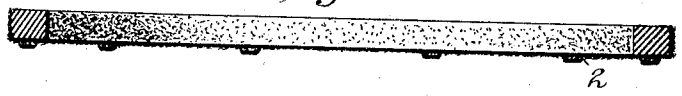


Fig. 4.

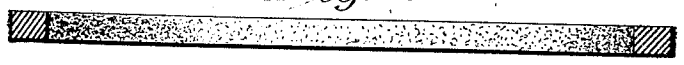
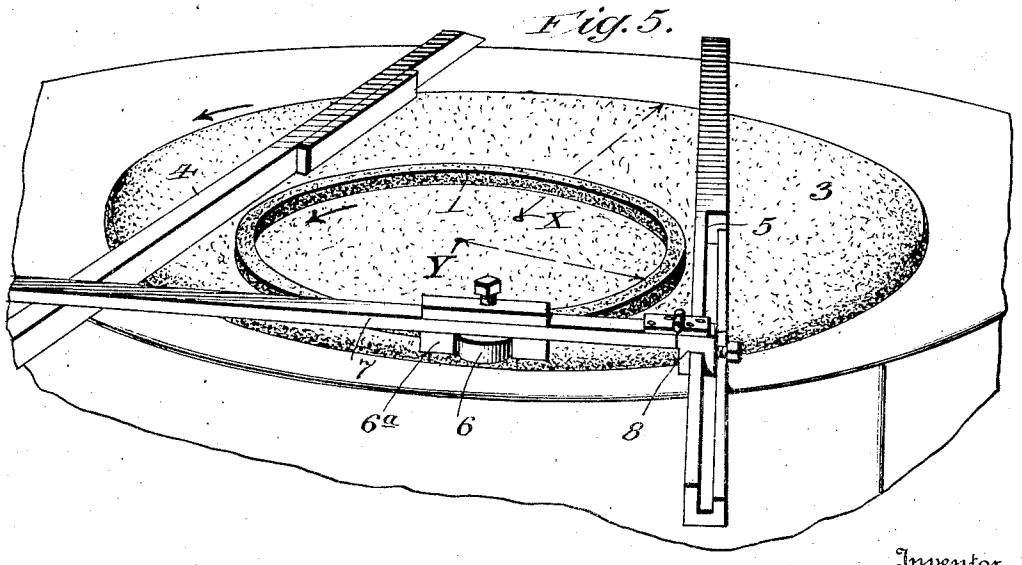


Fig. 5.



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UNITED STATES PATENT OFFICE.

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METHOD OF GRINDING PISTON RINGS.

Application filed December 30, 1927. Serial No. 243,671.

This invention pertains to an improved method of grinding piston rings.

Piston rings are commonly produced from single castings of iron and as is well appreciated by those skilled in the art such castings warp and as a consequence it is difficult to produce a ring therefrom which is absolutely flat upon each side.

The present invention has to do with a method of producing a ring and thereafter grinding or machining the same upon opposite faces so that said faces are flat and lie in parallel planes.

In order that the method may be fully understood reference will be had to the annexed drawings wherein,

Figure 1 is a sectional elevation of the casting in the rough with a series of projections or teats extending outwardly from one face thereof;

Figure 2 a similar view showing the same ring with the projections ground off so that their ends all lie in a common plane;

Figure 3 a similar view showing the ring with one side face ground to a flat plane;

Figure 4 a like view showing the ring having both sides ground; and

Figure 5 a perspective view of so much of a disk grinder as is employed to produce the initial grinding of the projections or teats.

It is essential, as will be appreciated, that the opposite faces of a piston ring be flat and that said faces lie in planes parallel to each other throughout. Small castings as well as large ones warp as the casting cools and the warpage is, of course, accentuated as the size of the rings increase.

In carrying out my method there is initially produced a cast ring such as is shown in Figure 1 and the body 1 thereof is provided on one face with a series of outwardly extending teats or projections 2. A ring thus produced is then positioned upon a grinding disk 3, Figure 5, with the teats or projections resting upon the face of the disk.

As will be seen upon reference to said figure, the ring is placed off center with reference to the grinding disk. That is to say, the center X of the grinding disk is not in alignment with the center of the ring, denoted by Y. The ring is held in this position upon the disk by suitable guide and positioning elements as the bars 4 and 5 and a roller 6 mounted in a carrier 6^a adjustably secured to a bar 7, which latter extends transversely of the bars 4 and 5. The carrier 6^a for the roller may be adjusted lengthwise of the bar 7 and the latter may be adjusted toward and from the center X of the grinding disk by suitable clamping mechanism 8 secured to the bar 7 and cooperating with the bar 5.

As will be seen, upon reference to the drawing, and more particularly Figure 5, the diameter of the grinding disk is relatively large as compared to the diameter of the ring placed thereon hence when the disk is rotated a rotary motion will be imparted to the ring about its axis or center, such motion being allowed to readily take place by the bearing of the ring upon the roller 6. This relative rotation or movement of the disk with reference to the rotary or spinning movement of the ring causes the disk to grind off the outer ends of the projections 2 on the ring and to grind them off so that their ground ends lie in a common plane.

If it were not for this relative movement or spinning action of the ring perfect grinding of the projections to bring them in a common plane would not inhere; hence the presence of the roller 6 is important to allow the ring to spin about its own center and also relatively to the grinding disk.

When this operation has been effected, which takes but a relatively short interval of time, the ring is removed from the grinder and the same is placed upon a magnetic chuck with the ground ends resting upon the face of the chuck. Thus the ring is held in position and evenly supported throughout its length. While thus held the exposed face is subjected to a grinding action which brings said face into a common plane throughout, or in other words any waves or projections in said surface are ground away.

The ring is then removed from the chuck and the flat face which has been produced is placed upon the chuck where of course it will have a fair and even bearing throughout the entire ground surface just produced. The ring is then brought into contact, while thus held, with a grinder or cutter which removes the remaining portions or teats 2 and likewise cuts away the then exposed face of the ring so as to produce a flat surface thereon. Of necessity the last ground surface or face of the ring will lie in a plane parallel to

the plane of the previously ground face;—this by reason of the fact that the ring during this last grinding step or operation is held firmly to place without the possibility of any distortion throughout its length. In other words the previously ground face, which is perfectly flat, takes a full and fair bearing against the face of the magnetic chuck without any possibility of distortion which would produce waves when the ring was released from the chuck.

A ring produced as above set forth will always lie flat on a surface plate and the side faces of the ring will not only be parallel but will lie wholly in one plane. That is the ring will be free from warpage or waves.

As above noted, the process is applicable to both small and large diameter rings. Such warpage or wave in the castings is very slight in small rings but becomes very pronounced as the size of the ring increases. If a large size individual castings, say 20 inches in diameter, is placed on a surface plate it will be found that the sides of the ring casting will only touch the surface plate at three or four points. The spaces between these points of contact will vary from a few thousandths to possibly a thirty-second of an inch in height away from the surface plate. In other words the castings will have a wave several inches large, the intensity or ordinate varying in height from a few thousandths to more than a thirty-second of an inch in some instances. This inequality or wave in the individual ring casting does not appear to follow any definite law and consequently it appears to be impossible to devise a method in foundry practice that will eliminate or even regulate the intensity and number of these waves or curvatures.

When such a wavy casting is placed on the magnetic chuck of a rotary surface grinder in order to clean the sides of the casting and remove the necessary amount of metal to obtain the proper face width of the ring, the magnetic action of the chuck is in many instances sufficiently strong to pull the casting down on the chuck or to distort it from its normal cast position as the pull takes place. Consequently when the casting is ground on its side faces the side faces will be flat while the ring remains upon the chuck.

When the casting is removed from the chuck it will again assume its normal position and the side faces of the casting will be perfectly parallel but not flat. In other words, they will be wavy but still in parallelism.

With the present method this distortion of the ring is obviated or, in other words, I produce upon one side of the ring a perfectly flat surface which is produced at a time when the ring is not subjected to magnetic distortion. Thus the first face grinding of the ring is effected while the ring is evenly supported throughout upon the ground or surfaced teats or projections 2 at which time the magnetic pull cannot have any effect upon the body of the ring owing to its being held away from the surface of the chuck by such projections.

It may be stated that in making ordinary size rings the teats or projections will be spaced about 1 to 2 inches apart and the height of these projections should be about $\frac{1}{8}$ inch in diameter and about $\frac{3}{32}$ of an inch in height. On larger size rings the projections can be somewhat larger and spaced further apart but on small rings the sizes of the teats or projections are reduced and the spacing is likewise reduced. It is not essential that the projections be regularly spaced or the same in size. It is only necessary that they be close enough together so that the action of the magnetic chuck can have no influence on the metal in the ring between the projections or, in other words, cannot deflect the body of the ring under maximum magnetic pull or action of the chuck.

It is conceivable in the broader aspect of the invention that instead of employing a magnetic chuck to hold the ring in place upon the teats which have had their ends brought to a common plane, such ring may be held upon said teats by suitable clamps and the exposed face machined off to produce the initial plane face. The ring would then be reversed and held in place upon said flat machined face and the then exposed rough face subjected to a machining operation to produce the second finished face which latter would necessarily lie in parallelism to the first finished face.

In the claims the term machining is to be given a broad interpretation and is to be considered as including grinding or a strictly machining operation.

What is claimed is:

1. That method of producing piston rings from individual castings having a series of spaced projections extending outwardly from one face thereof which consists in bringing the ends of said projections into a common plane; placing the casting upon a magnetic chuck with the ends of the projections resting thereon; removing the opposite face of the casting while thus supported to produce a plane surface thereon; placing such treated face upon a magnetic chuck; and thereafter removing the projections and the underlying body to such extent as to produce a ring of the desired thickness.

2. That method of producing piston rings which consists in first forming a ring casting having a series of spaced projections extending outwardly from one of the side faces thereof; thereafter removing the ends of said projections so that the outer faces of said treated projections lie in a common plane; supporting the ring upon such faces

and machining away the opposite face of the ring while the ring is thus supported; thereafter supporting the ring upon said flat machined face; and removing the projections and the underlying portion of the ring body until the body has been reduced in thickness to the required dimension.

3. That step in the method of finishing piston rings which consists in grinding one face thereof while the ring is sustained upon a magnetic chuck by a series of projections extending outwardly from the opposite ring face whereby distortion of the ring body, due to magnetic pull, is obviated.

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

ALLEN W. MORTON.