

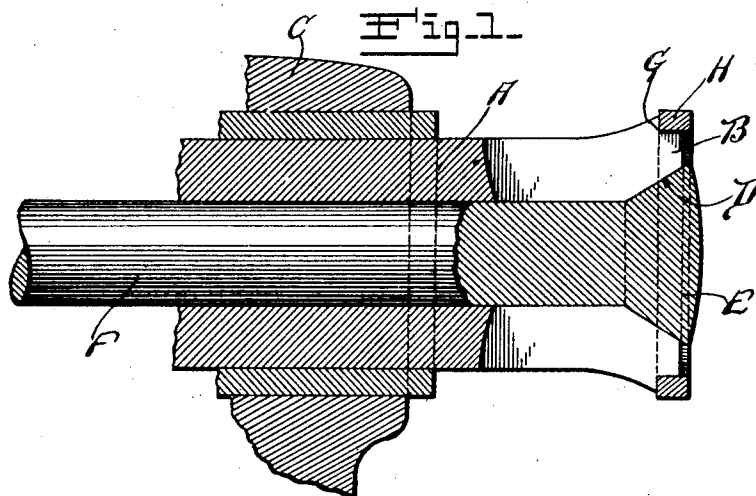
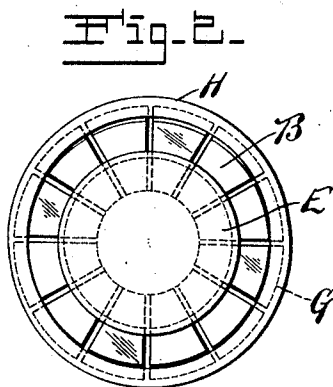
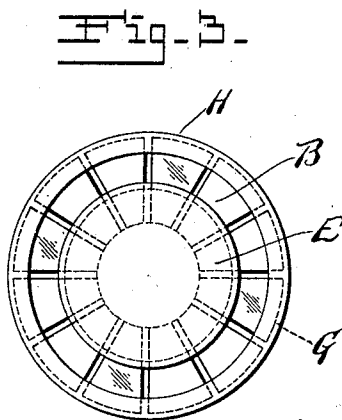
April 23, 1929.

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1,710,064

METHOD OF MANUFACTURING PISTON RINGS

Filed July 14, 1927



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METHOD OF MANUFACTURING PISTON RINGS.

Application filed July 14, 1927. Serial No. 205,671.

My invention relates to methods of manufacturing piston rings and more particularly to methods of manufacturing resilient rings such as are used on reciprocating pistons of internal combustion engines, air compressors, steam engines, and other like devices and which are manufactured from cast rings which are of a predetermined out-of-round shape.

10 This cast ring is as stated of an out-of-round shape larger in circumference than is the finished ring to be produced so that a section, representing the difference in circumference of the cast ring and the finished ring
15 may be cut from the cast ring when it is split. Then when the ring with the section cut therefrom is closed, that is, when the two ends of the split ring are brought together, the ring thus formed will be a perfect circle and the
20 radial stress throughout the closed ring will be approximately uniform at all points on the circumference of the ring and there will be a resultant approximate uniform radial pressure of the ring upon the cylinder wall.
25 If a concentric ring was cast and then split and no section of the ring was removed the radial pressure of the finished ring at points nearest the split would be substantially greater than at points away from the split along
30 the circumference of the ring. Also, if the ring was cast in a circular shape and then a section was removed the finished ring would not be a perfect circle when closed.

Since the cast rings are not round it is
35 difficult to machine them in that shape, and therefore, in most cases the ring castings are split before the ring is machined and this practice often results in great waste since sometimes during the machining a defect will
40 be encountered in the ring and the ring will have to be discarded and returned to the foundry to be melted and recast. When this happens the labor of splitting the rings is lost and this labor is costly especially when the
45 rings are split so that the adjacent ends form a scarf or lap joint.

Several attempts have been made to machine the casting before it is split so that if defects are encountered during the machining the ring may be scrapped without losing
50 the cost of the splitting operation. Such at-

tempts have consisted in forcing the continuous or unsplit ring into circular shape by wedging it on the frustrum of a cone. However, when the unsplit cast ring is forced into circular shape by this wedging operation the ring is distorted so that the outer and inner faces thereof are tilted somewhat to follow the inclination of the sides of the frustrum of a cone since the pressure created by the wedging is exerted against one corner of the ring only. The outer and inner faces of the ring at their sides nearest this corner are forced slightly outwardly into a position at a greater radial distance from the axis of the ring than the portions of the outer and inner faces nearest the edge of the ring at which no pressure is exerted. When the casting is machined while held in circular shape in this manner a different amount of metal
55 is taken off of the outer face at different points in its width. At points close to the edge of the ring upon which the pressure is exerted by the cone a comparatively great amount of metal is taken off and at points
60 farther away from the edge of the ring against which the wedging is effected less metal is taken off. As a result when the ring has been machined it is in cross-section somewhat wedge shape and is thinner at one side
65 than at the other. Consequently the ring loses much of its efficiency and effectiveness to maintain compression when placed in use in an engine.

The objects of my invention are to provide
85 a method of manufacturing a piston ring from an out-of-round pattern and more particularly to provide a method of machining the outer face of the cast ring before it has been split whereby the ring will be machined
90 to a uniform thickness thereby assuring uniform radial pressure of the finished ring when used in an engine; and to provide a method of manufacturing a piston ring in which the outer face of the ring is machined
95 before the ring is split.

My new and improved method of manufacturing piston rings in its broadest sense includes casting the ring in a predetermined out-of-round shape, then forcing the ring
100 into circular shape by pressure exerted radially outward from within the ring, and

then machining the ring while it is in circular form.

One of the many forms of devices which may be used to exert pressure radially outward from within the ring to change the shape of the ring without distorting it, is shown somewhat diagrammatically in the accompanying drawings wherein similar letters are used to designate similar parts. Fig. 1 is a sectional view of the head stock of the lathe on which the ring is to be machined; Figs. 2 and 3 are front views of the head stock showing, respectively, the ring and collet before pressure is exerted on the ring by expanding the collet and the ring and collet after the collet has been expanded to exert radial pressure against the inner face of the ring.

Referring to the figures the collet A which has its outer end formed by a plurality of segments B is carried by the head stock C of the lathe. The lower faces of the outer ends of the segments B are beveled as at D at an angle to conform with the angle of the flare E arranged on the outer end of the collet pull bar F. Preferably, shoulders G are arranged on the outer sides of the segments B for the purpose more fully hereinafter disclosed. Any suitable means, not shown, may be provided to move the pull bar F inwardly to expand the segments B or to move it outwardly to allow the segments to collapse.

The practice of my new and improved method of manufacturing piston rings using the device shown in the drawings and described above is as follows: The ring is first cast in a predetermined out-of-round shape. This cast ring H is then, preferably, rough ground on its inner face to remove any burrs or other short projections which are due to slight imperfections in the sand mold. The cast ring is then placed on the collet A of the head stock of the lathe with the segments B in collapsed position. If the segments of the collet are provided with the shoulders G one edge of the ring is placed against these shoulders and the ring H will be registered in a plane at substantially right angles to the axis of the collet. The pull bar F is then moved inwardly so that the flare E thereon acting against the beveled lower edges D of the segments B will expand the segments and thereby exert pressure radially from within the ring against the inner face thereof to force the ring into circular shape.

With the ring maintained in this position the head stock of the lathe is turned and the outer face of the ring is machined. Since the ring is forced into circular shape by a pressure exerted radially from within the ring during the machining of the outer face a uniform amount of metal will be removed and the finished ring will be of uniform thickness.

After the machining is completed the pull

bar F of the collet is moved outwardly to allow the segments of the collet to collapse and the ring will resume its out-of-round shape. The ring is then split as described above and is finished in the usual way.

Any one of a number of different devices may be used in the practice of my improved method of manufacturing a piston ring and the details of the practice may be varied within wide limits to suit different forms of manufacture without deviating from the spirit of my invention as embodied in the claims included below. However, in any practice of my improved method I prefer that the pressure to force the ring into circular shape be exerted in a manner so that the ring will not be distorted to carry one side of the ring further outwardly than the other side of the ring.

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

1. A method of manufacturing a piston ring which includes casting a continuous ring in a predetermined out-of-round shape, forcing said continuous ring into circular shape by pressure exerted against the zone of the inner face of said ring, and then machining said ring while it is maintained in circular shape.

2. A method of manufacturing a piston ring which includes casting a continuous ring in a predetermined out-of-round shape, rough grinding the inner face of said ring and then forcing said continuous ring into circular shape by pressure exerted radially outward from within said ring against said zone of the inner face, and then machining said ring while it is maintained in circular shape.

3. A method of manufacturing a piston ring which includes casting a continuous ring in a predetermined out-of-round shape, rough grinding the inner face of said ring, then forcing said continuous ring into circular shape by pressure exerted radially outward against said zone of the inner face, machining said ring while it is maintained in said circular shape, and then splitting and finishing said ring.

4. A method of manufacturing a piston ring which includes casting a continuous ring in a predetermined out-of-round shape, forcing said continuous ring into circular shape by pressure exerted radially outward from within said ring against the zone of the inner face thereof and then machining the outer face of said ring while it is maintained in circular shape.

5. A method of manufacturing a piston ring which includes casting a continuous ring in a predetermined out-of-round shape, rough grinding the inner face of said ring, and then forcing said continuous ring into circular shape by pressure exerted radially outward from within said ring against the zone of the inner face thereof and then machining said ring while it is maintained in circular shape.

6. A method of manufacturing a piston ring which includes casting a continuous ring in a predetermined out-of-round shape, forcing said continuous ring into circular shape by pressure exerted radially outward from within said ring against the zone of the inner face thereof, machining said ring while it is maintained in circular shape, removing said pressure and allowing said ring to resume said out-of-round shape, and then splitting 10 and finishing said ring.

In witness whereof I have signed my name to the foregoing specification.

ARDEN JOHN MUMMERT.