# UNITED STATES PATENT OFFICE.

MELVIN L. WILCOX, OF FLINT, MICHIGAN.

## METHOD OF MAKING METAL PACKING-RINGS.

1,116,776. Specification of Letters Patent. Patented Nov. 10, 1914.

Application filed April 15, 1913. Serial No. 761,223.

*To all whom it may concern:*

Be it known that I, MELVIN L. WILCOX, a citizen of the United States, residing at Flint, in the county of Genesee and State of Michigan, have invented certain new and useful Improvements in Methods of Making Metal Packing-Rings; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention is a method of making metal packing rings for use in engines and similar machines and is especially adapted for the making of piston rings for internal combustion engines. In this class of engines it is of importance that the piston rings shall fit the cylinder accurately and that all points around the periphery of the ring shall exert equal outward pressure against the cylinder. To produce this result, rings, to the making of which my improved method applies, are commonly made of cast metal and turned on the outside to a diameter slightly larger than the bore of the engine cylinder. The ring is then bored either eccentrically or axially, as the case may be, the bore being slightly larger in diameter than the bottom of the piston groove in which the ring is to be used. A ring is thus produced, assuming it to have been bored eccentrically, that is thinnest at the extremity of one diameter and thickest at the other extremity of the same diameter. Such a ring when split at the thinnest part will, if of uniform density and elasticity throughout its periphery, tend to exert a pressure against the cylinder wall approximately equal at all points around the circumference, when sprung into place. It has been found in practice, however, that such rings if made of ordinary iron are seldom of uniform density and elasticity, and if made of alloy that imparts sufficient elasticity to produce the desired resilience, the ring is likely to be so hard as to damage the cylinder.

Various methods have been devised for producing split piston rings of variable thickness, to impart the desired degree of elasticity, but usually such methods are very expensive, because of the fact that the rings are made one at a time.

My improved method provides for the making of a number of rings at one operation and insures a uniform degree of elasticity and consequent even pressure against the cylinder wall clear around the periphery. My method also corrects any defects such as "soft spots" in the metal of the ring, thereby saving for use many rings that would otherwise have to be thrown out. My method further enables rings to be made of gray iron or iron containing only a small percentage of alloy, and yet to be of smaller cross-section than would otherwise be permissible. The advantages of smaller cross-section of piston rings for explosive engines are, first, less rubbing area against the cylinder wall, second, less outward pressure of the ring against the cylinder wall at the instant of explosion, because of less area exposed to the gases at the back or inner bore of the ring.

My improved method consists in the steps set forth and claimed and the equivalents thereof.

The accompanying drawings illustrate diagrammatically the devices and steps employed.

Figure 1 is a plan view of a split ring of the kind to which my method is applicable; Fig. 2 is a side view of the same; Fig. 3 is a longitudinal section of a "pot" or shell from which the rings are made, the pot being mounted in a container, ready for the application of the blast of projectiles by which the interior of the shell is treated.

My method consists in a number of steps which may be followed in various sequence although I prefer the following order: First, to produce by casting or otherwise a "pot" or shell 1 open at both ends and of length sufficient to yield any convenient number of piston rings, say six or more. Second, to shape by turning, grinding, or otherwise, the outside surface 20 of the shell, to cylindrical form—the outside diameter being preferably slightly larger than the bore of the engine cylinder in which the ring is to be used. Third, to bore the interior 3 of the shell, the bore being slightly eccentric so as to make the wall of the shell thinner on one side as at 4. Fourth, to mount the shell in a cylindrical container 5 that fits and supports the outside wall of the shell. Fifth, to direct against the interior surface of the shell, a stream 6 of projectiles, as for instance, small steel balls propelled by an air blast, the stream being directed so as to successively impinge against the shell surfaces until the entire interior area of the shell has been uniformly treated throughout. It is not essential that steel balls be used, or that air be the propelling medium, but any suitable gas may be used instead and any kind of projectile that is capable of producing a swaging or hammering action like that of hard steel balls may be used. Sixth, to sever the swaged shell to produce a plurality of piston rings (shown in Fig. 2). Seventh, to split each ring in the ordinary way as at 7. Eighth, to draw together the split ends of the ring and grind or otherwise finish the compressed ring to the proper size for the cylinder. By this method of first producing an eccentrically bored shell comprising a number of rings and then swaging the entire inner surface of the shell by means of a blast of steel balls or their equivalent, almost perfectly uniform results as to tension are produced, and in a small fraction of the time that would be required to swage each ring separately. Since the shell is thinner on one side, no care need be exercised to vary the intensity of the blows of the projectiles, thereby further increasing the speed of operation. Handling is reduced to a minimum, and the cost of production is cut to a very small fraction of the cost of producing similarly shaped rings one at a time. The intensity of the swaging action is easily controlled by varying the force of the air blast, although once set, it requires very little regulating. Another advantage of this method is that the outward pressure exerted by the ring against the cylinder wall is practically uniform and the pressure is about twenty per cent. in excess of that of the ordinary ring of the same design that has not been swaged as above described. Consequently rings made by my method may be twenty per cent. narrower and will exert correspondingly smaller pressure against the cylinder wall at the moment of explosion. A considerable saving of material is also effected by this permissible reduction in width of the ring.

While I have described the fifth step of the method as constituting the swaging and the sixth step as the severing of the shell into a plurality of rings, it would be within the scope of my invention to transpose these steps—that is, to first sever the rings and then to pile them into the container and direct the swage blast against them. I prefer, however, to use in practice the steps as first enumerated.

While I have described my improved method as applied to the treatment of eccentrically bored rings that are thinnest at the end of one diameter and thickest at the opposite end of the same diameter, it will be understood that the described method of treating the interior surface of the shell, viz. by a stream of projectiles, is also adaptable to treatment of axially bored rings.

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

1. The method of tensioning packing rings, which comprises assembling the rings end-to-end to form a pot, and directing a stream of loose projectiles against the entire interior of the pot to swage the surface of the bore.

2. The method of making metal packing rings, which consists in producing a pot or shell of sufficient length to comprise a plurality of rings, turning the exterior of said shell to cylindrical form, eccentrically boring the interior of the shell, severing the shell to produce a plurality of rings, assembling the rings end-to-end, directing a stream of gas-propelled projectiles against the entire interior of the assembled rings, to swage the surface of the bore, splitting the rings, temporarily closing the rings by forcing their severed ends together, and finishing the exterior peripheries of the closed rings, which comprises, producing a pot or rings are to be used.

3. The method of making metal packing rings, which comprises, producing a pot or shell of sufficient length to include a plurality of rings, turning the exterior of said shell to cylindrical form, eccentrically boring the interior of the shell, severing the shell to produce a plurality of rings, assembling the rings end-to-end, directing a stream of air-propelled hard metal balls against the entire interior of the assembled rings to swage the surface of the bore, splitting the rings, temporarily closing the rings by forcing their severed ends together, and finishing the exterior peripheries of the closed rings to the size of the cylinder in which the rings are to be used.

4. The method of tensioning packing rings, which comprises assembling the rings end-to-end to form a pot, directing a stream of projectiles against the entire interior of the pot to swage the surface of the bore, splitting the rings, temporarily closing the rings by forcing their severed ends together, and finishing the exterior peripheries of the closed rings to the size of the cylinder in which the rings are to be used.

5. The method of tensioning packing rings, which comprises assembling the rings end-to-end to form a pot, directing a stream of loose projectiles against the entire interior of the pot to swage the surface of the bore, and splitting the rings.

In testimony whereof, I affix my signature in presence of two witnesses.

MELVIN L. WILCOX.

Witnesses:
NELLIE M. ANGUS,
JOSEPH V. CARPENTER.

P126

M. L. WILCOX.

METHOD OF MAKING METAL PACKING RINGS.

APPLICATION FILED APR. 15, 1913.

1,116,776. Patented Nov. 10, 1914.

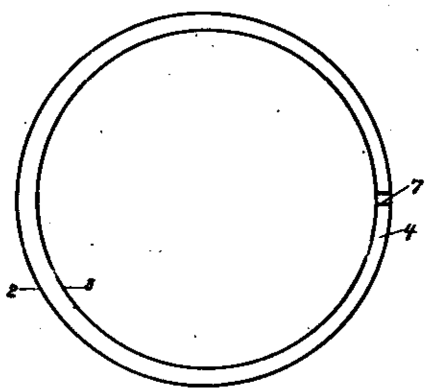


FIG. 1

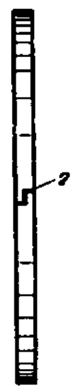


FIG. 2

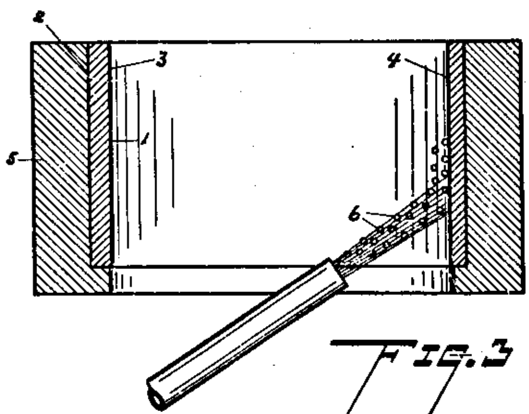


FIG. 3

WITNESSES:

Nellie M. Angus

Roy Wallis

Melvin L. Wilcox INVENTOR

BY

Geo. B. Willcox ATTORNEY