Aug. 2, 1938. G. J. DEEB 2,125,606

METHOD OF TREATING PISTON RINGS

Filed Jan. 23, 1936

Fig. 1.

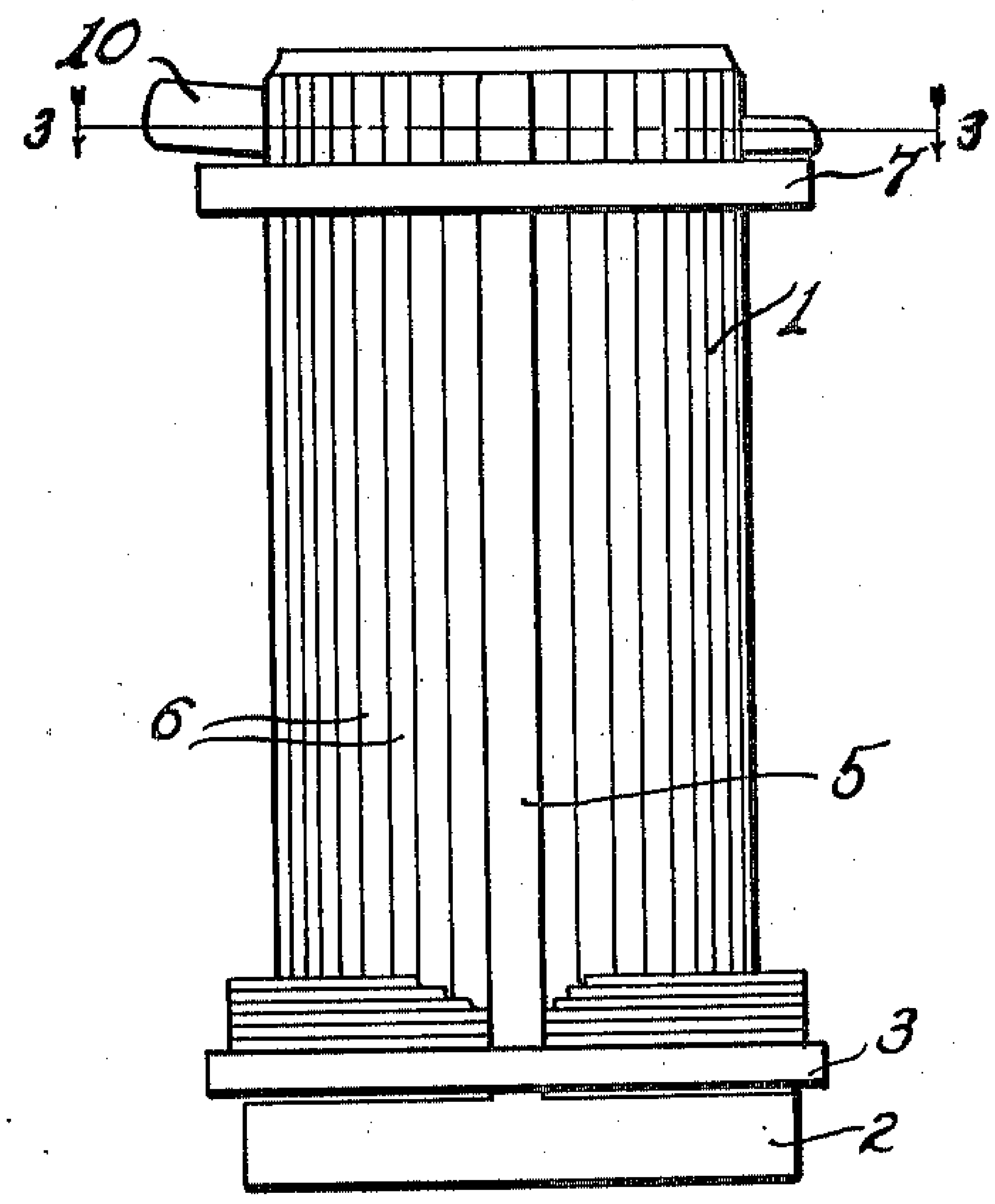


Fig. 2.

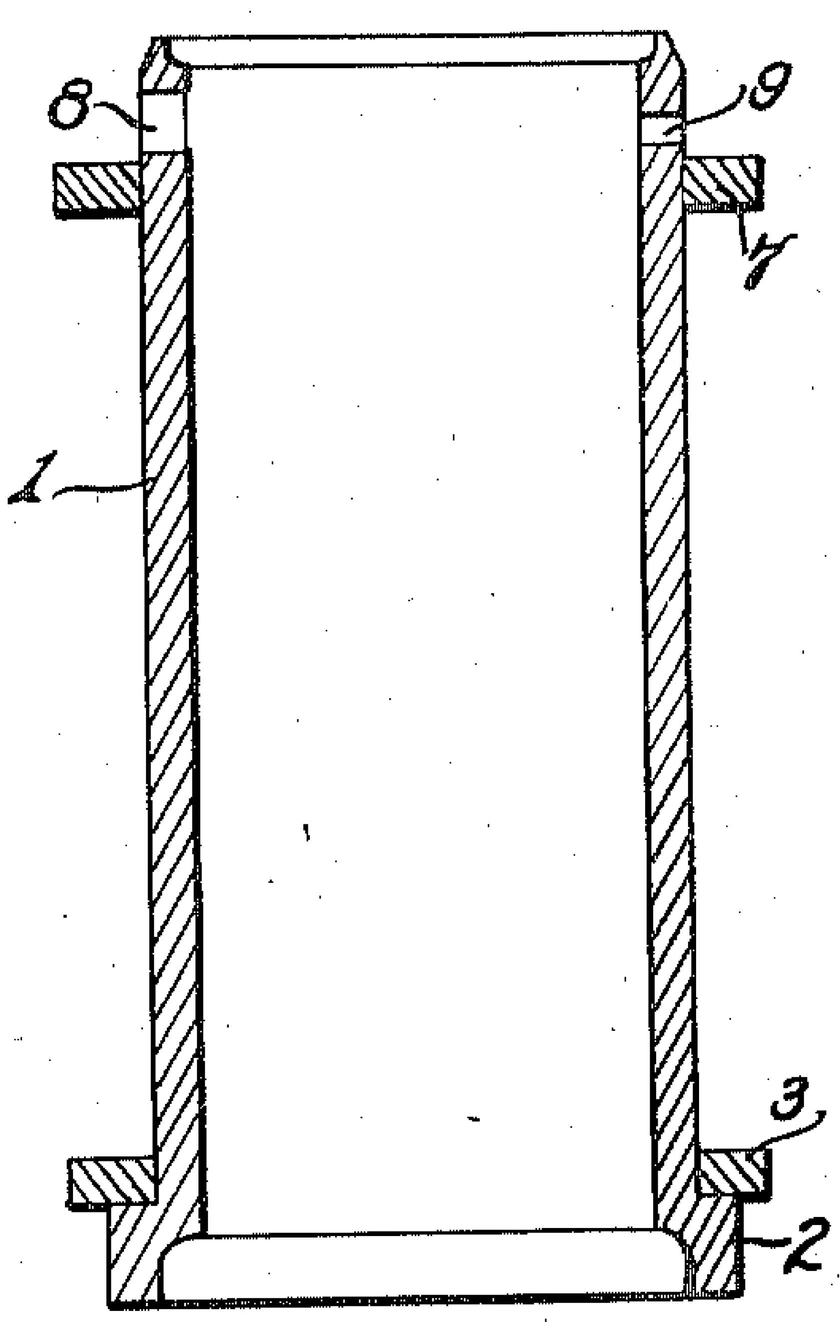


Fig. 3.

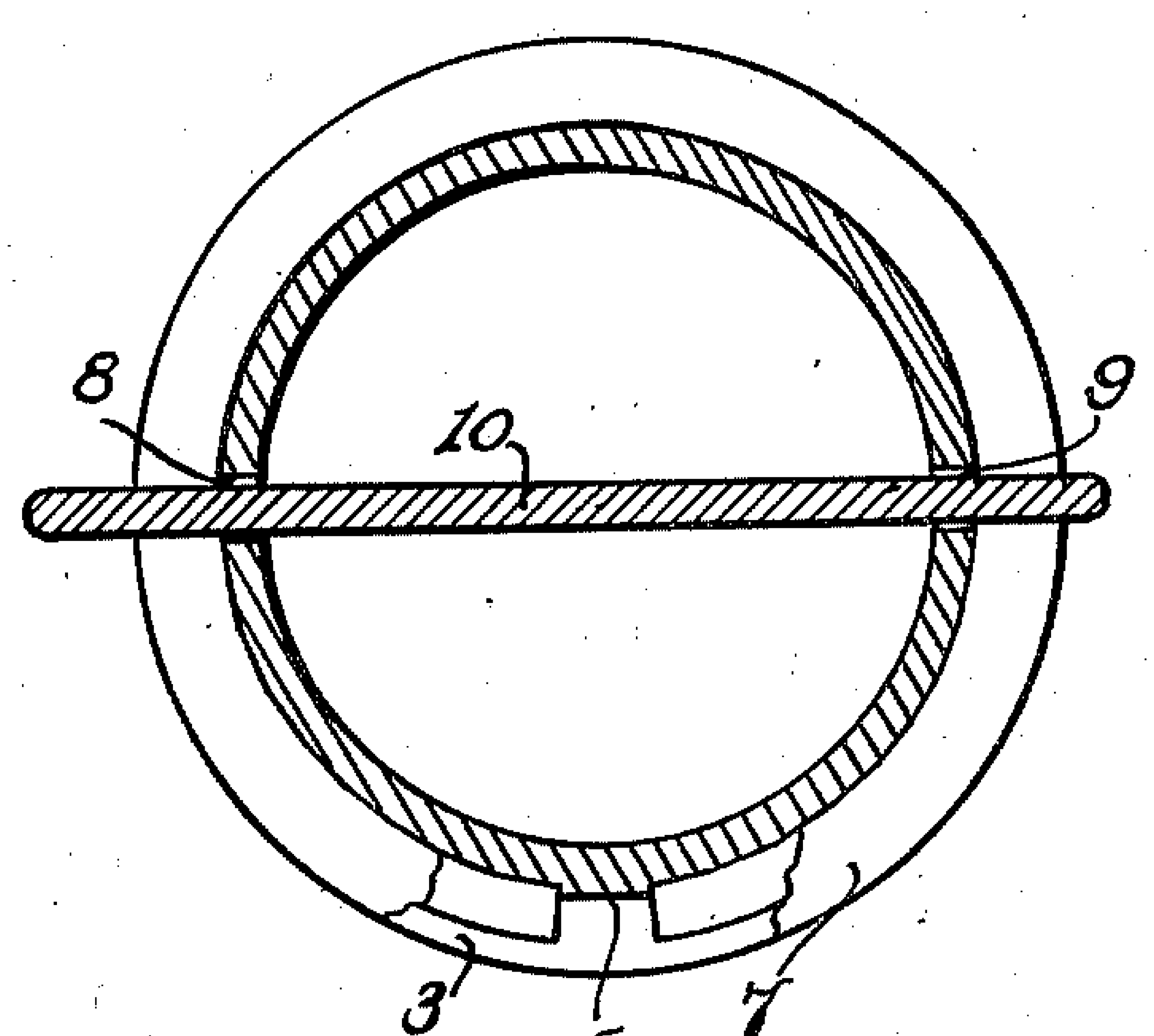
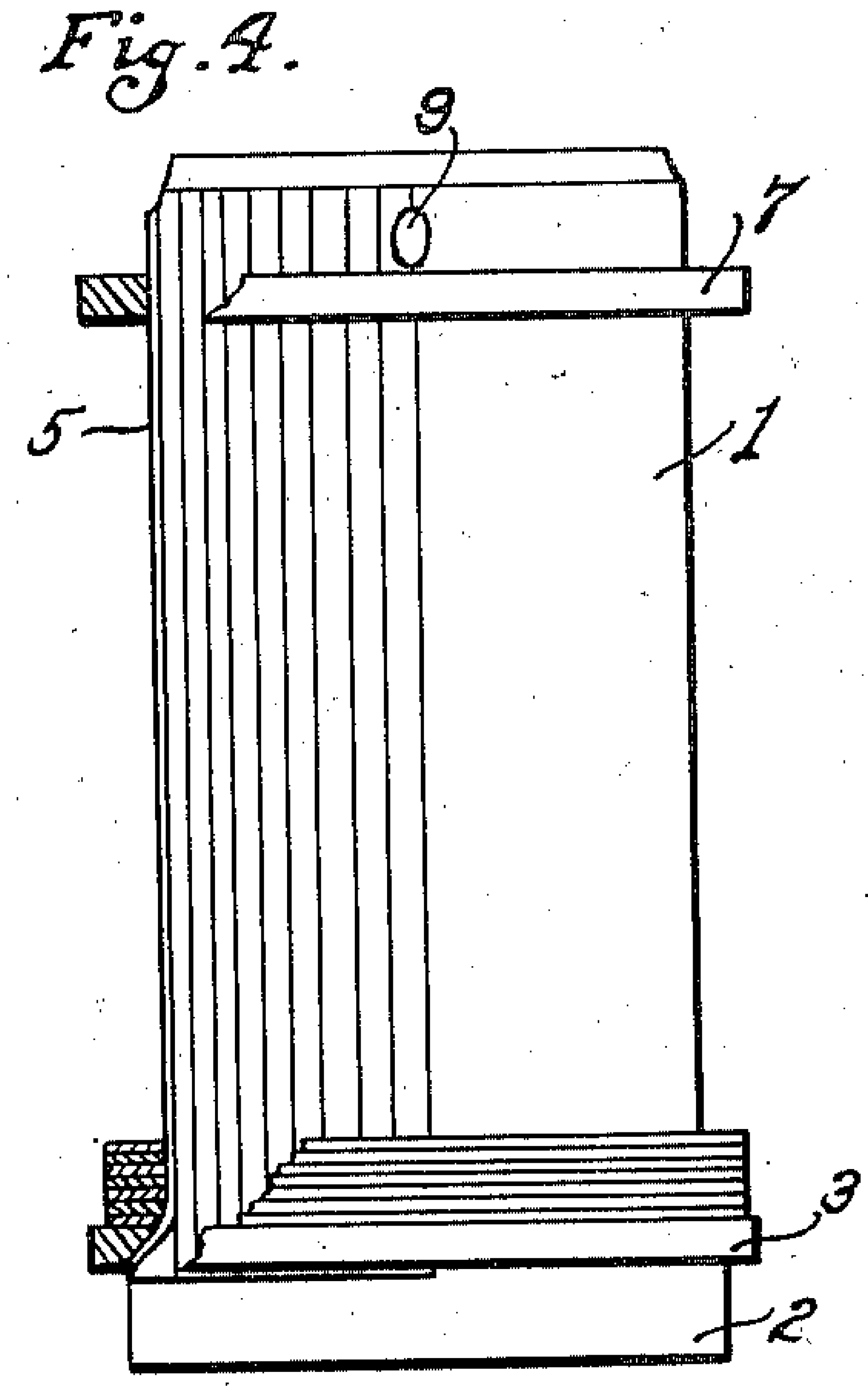


Fig. 4.



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2,125,606

METHOD OF TREATING PISTON RINGS

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Application January 23, 1936, Serial No. 60,411

3 Claims. (Cl. 148—16)

My invention relates to improvements in method of treating piston rings, preferably those formed of steel or steel alloys in order to insure longer wearing qualities on that part of the ring coming in contact with the cylinder walls of an explosive engine.

I have found that steel rings, if properly heat-treated, and if properly case hardened on their outer periphery, or wearing surface, have decided advantages, from the wearing standpoint and efficiency of performance and from other standpoints, over the ordinary commercial type of cast iron rings.

I have found that rings which had had their outer periphery nitrided have particularly fine wearing qualities.

I have also found that rings formed of "nitralloy", when nitrided on their outer periphery, are decidedly advantageous in use over other types of rings.

It is one of the objects of my invention to provide a method for maintaining the piston rings in position and for preventing warping of the rings during the heat-treatment necessary in the nitriding manner of treating, and to insure the proper treatment of the surfaces of the ring. I have found from experience that if the entire ring is nitrided to the same extent as the outer periphery, the ring will be so brittle that it will tend to break and will not stand up under wear. I have found, however, that if the outer periphery of the ring is nitrided to a greater extent than the rest of the ring, this brittleness is reduced to such an extent that there is no danger of the ring breaking and at the same time the wearing surface of the ring is materially hardened.

For the purpose of disclosing my invention, I have illustrated a particular type of supporting member for holding the rings during the nitriding process. In the drawing,

Fig. 1 is a side elevation of the core member, on which the rings are mounted;

Fig. 2 is a longitudinal sectional view thereof;

Fig. 3 is a transverse sectional view thereof; and

Fig. 4 is an elevation, looking in another direction, of the core.

In carrying out my invention, the rings, after having been previously formed of steel and I have found that the steel alloy identified as Nitralloy 230 or an alloy having practically the characteristics thereof is particularly advantageous, are assembled on the core member. This core member, as is illustrated, comprises a hollow cylindrical cast iron core 1 provided at its bottom with an annuar flange 2 on which is adapted to rest a bottom ring supporting member 3. This bottom ring supporting member 3 may be formed integrally with the flange or may be a separate ring supporting member and allowed to rest on the flange. Extending in a line parallel with the axis of the core and formed on the outer periphery of the core, is a rib 5 which projects beyond the peripheral surface of the core and provides on either side an abutment or shoulder. That portion of the core extending on the periphery thereof to about half way around from the rib 5 is provided with a plurality of flattened surfaces 6 which provide, in effect, a series of flat surfaces extending parallel to the axis of the core and arranged on the periphery of the core about half way around. In addition to the core, I provide a removable ring 7 which has sufficient inner diameter to slide up and down on the core, and extending through the side wall of the core, a pair of clamping openings 8 and 9 adapted to receive a driving wedge 10, which wedge, when inserted in position and contacting the top of the ring 7, will tend to move the ring downwardly on the core.

After the rings have been formed by suitable mechanism, they are assembled on the core, one on top of the other, the bottom piston ring resting upon the bottom ring 3 of the core with the gapped ends of each piston ring abutting against the shoulders formed by the rib 5. The diameter of the core is such that when the rings are assembled thereon they are in substantial contact at all points around the true portion of the core, that is, the unflattened surface portion of the core, and contact the core around that portion having the flat surfaces 6 with the edges of these flattened surfaces only. The rings are assembled one on top of the other until they are high enough on the core to permit, when the top ring 7 is placed in position and the wedge 10 driven in, considerable pressure to be exerted on the rings to compress them together.

After the rings have been tightly compressed on the core, the core member, with its assembled rings, is then subjected to the nitriding process.

This process briefly consists of a process by which extraordinary hardness is developed on the part subjected to the process by subjecting the parts for a sufficient period of time to an ammonia gas under temperature.

More particularly, it consists in subjecting the parts made of a suitable alloy steel to the ammonia gas treatment.

In carrying out this process, the parts are usually introduced into a furnace in which the temperature can be closely controlled preferably at a temperature of between 950 and 975 degrees F. Although at times the temperatures have been known to run up as high as 1,200 degrees F. The parts to be nitrided are placed in a container which is gas-tight and which, however, has suitable connections with the ammonia system. This gas-tight container is placed in the heating chamber of the furnace and the furnace sealed and during the heating process ammonia gas is caused to flow through the container in which the parts to be treated are placed. After sufficient time has elapsed to obtain the desired case depth the furnace is allowed to cool and a light flow of gas continued through the container until the work has reached a fairly low temperature.

By the above-described method of assembling the piston rings to be nitrided on the above-described core, and maintaining a sufficient pressure upon the rings to compress them to the proper degree, I am enabled to nitride the rings in order to case harden the outer periphery to a greater extent and to subject the rings to the nitriding process and the heat required therefor without the rings being distorted in any direction so that, after the rings have been nitrided, further treatment of the same to true them in any direction is unnecessary.

Furthermore, by this method of nitriding the rings I am enabled to obtain a perfectly true ring without distortions, having an extremely hard wearing surface and at the same time maintain the proper resiliency in the metal of the ring to insure the expansion of the ring against the walls of the cylinder of the explosive engine to insure gas-tight fit between the ring and the walls of the engine at all times.

I claim as my invention:

1. The method of treating piston rings fabricated from steel which consists in assembling a series of rings in a stack in axial alignment compressing said stack, masking at least a portion of the inner circumference of the rings and supporting said rings against inward circumferential distortion and then subjecting the assembled stack, while under axial pressure, to nitriding treatment to harden the outer periphery of the ring.

2. The method of treating piston rings fabricated from steel which consists in assembling a series of rings in a stack in axial alignment, compressing said stack, supporting the rings against inward circumferential distortion continuously throughout a portion of their inner circumference and at spaced intervals throughout the remaining portion of their circumference, masking at least a portion of the inner circumference of said rings and then subjecting the rings, while under pressure, to nitriding treatment to harden the outer periphery.

3. The method of treating piston rings fabricated from steel and having a gap between their ends which consists in assembling a series of rings in axial alignment, maintaining the ends of their rings in their spaced relation, compressing said stack of rings, supporting said rings against inward distortion continuously throughout a portion of their inner periphery and at spaced intervals throughout that portion adjacent the ends of the rings and subjecting said stack, while under pressure, to nitriding treatment to harden the outer peripheries of the rings.

GEORGE J. DEEB.