

J. H. KLASSEN.
METHOD OF REPAIRING CYLINDERS.
APPLICATION FILED JUNE 6, 1918.

1,322,245.

Patented Nov. 18, 1919.

Fig. 1.

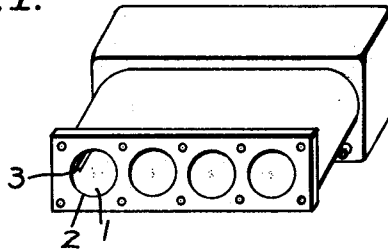


Fig. 2.

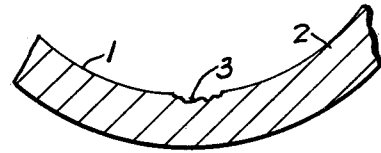


Fig. 3.

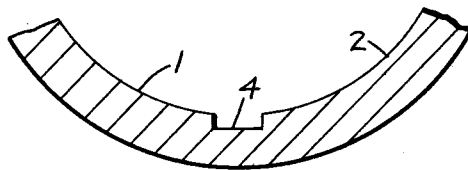


Fig. 4.

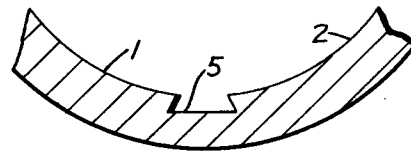


Fig. 5.

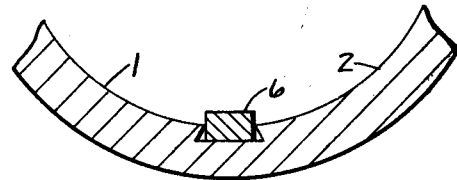


Fig. 6.

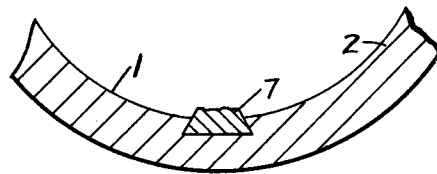


Fig. 7.

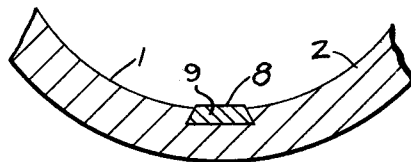
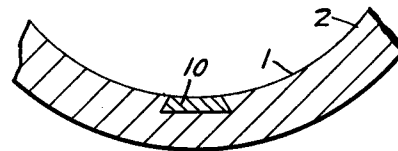


Fig. 8.



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METHOD OF REPAIRING CYLINDERS.

1,322,245.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JACOB H. KLASSEN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Methods of Repairing Cylinders, of which the following is a specification.

My invention relates to repairing cylinders and especially cylinders of internal combustion engines.

When a spot is worn in the cylinder of an internal combustion engine, the common practice is to rebore the cylinder, thereby making the same larger and adding to the weight of the piston. The result is that, owing to the increased weight of the piston and the greater power generated in the cylinder, due to its increase in size, the balance of the engine is destroyed. Consequently, in order to maintain an engine having balanced working parts and to generate substantially equal power in each cylinder, it becomes necessary to rebore all the cylinders of the engine, although but one may have been worn or "scored."

I have invented a method of repairing the cylinder having the worn spot on its inner face without increasing the size of the cylinder, thereby avoiding the expense of reboring or changing in any way the other cylinders of the engine which are in good condition.

Specifically, the object of my method is to take a cylinder having a worn spot in its inner face, remove the spot, and insert an inlay so as to make the inner face of the cylinder smooth and round without boring the cylinder out and making it larger.

My invention consists in the novel features herein shown, described and claimed.

Figure 1 is a perspective view showing a plurality of internal combustion engine cylinders having spots which it is desired to remove and inlay in accordance with my method.

Fig. 2 is a fragmentary cross-section of the wall of one of the engine cylinders upon an enlarged scale and showing the worn spot which is to be removed and inlayed.

Fig. 3 is a view analogous to Fig. 2 showing the spot routed out, thereby forming a straight sided slot.

Fig. 4 is a view analogous to Fig. 3 and showing the slot dove-tailed.

Fig. 5 is a view analogous to Fig. 4 and showing an inlay rectangular in cross-section and in position in the slot ready to be operated upon.

Fig. 6 is a view analogous to Fig. 5 and showing the inlay hammered to fit it into the dove-tail slot.

Fig. 7 is a view analogous to Fig. 6 and showing the rough part of the hammered inlay removed.

Fig. 8 is a view analogous to Fig. 7 and showing the finished inlay.

Referring to Figs. 1 and 2, where an engine has been running with a loose wrist pin it frequently happens that the end of the wrist pin bears against the inner face 1 of the cylinder 2 and produces a longitudinal worn spot 3, and heretofore it has been the practice to bore out the cylinder to remove the spot; and boring out the cylinder enlarges its diameter and it is necessary to make a larger piston or a set of thicker piston rings.

My object is to remove the spot 3 without enlarging the diameter of the piston chamber, and in carrying out my method I form a preferably straight sided slot 4 so that in forming the slot the spot 3 is removed. Then I continue the operation upon the cylinder to change the straight sided slot 4 to a dove-tail slot 5. I take a strip of copper and heat the same red hot, just below the melting point, and plunge it in cold water to anneal the same. This operation may have to be repeated three or four times until the copper is of the proper degree of flexibility. I now take the strip of copper and hammer the same edgewise with an iron hammer to condense the metal and close the pores. Then I place a rectangular bar 6 of the copper inlay material, prepared as just described, in the dove-tail slot 5, said bar 6 being as large one way as will go in the slot and being thicker the other way than the depth of the slot. Then I hammer the bar 6 to produce the unfinished dove-tailed inlay 7. The hammering operation is continued until the copper inlay is practically as hard as the metal of the cylinder. Then I remove the hammered surface of the bar 6 until its inner face 8 is nearly flush with the inner face 1 of the cylinder, thus producing the partly finished inlay 9. Then I grind or buff off the inner face 8 until it is smooth and flush with the inner face 1,

thus producing the finished dove-tailed inlay 10.

By thus preparing the copper inlay and hammering the same in position, I obtain
5 an inlay having practically the same coefficient of expansion and contraction as the metal of the cylinder and consequently the inlay will stay permanently in place and for all intents and purposes forms an integral part of the cylinder.
10

Other metal strips, or strips of metal alloys having substantially the same degree of hardness and the same coefficient of contraction and expansion as the metal of the
15 cylinder, may be used in place of copper.

Various changes may be made without departing from the spirit of my invention as claimed.

I claim:

20 1. A method of inlaying cylinders of internal combustion engines which consists of forming a slot having recessed side walls in position to remove the damaged spot of the cylinder, preparing a strip of copper by
25 heating the same below the point of fusion and immersing the same in water to anneal it to the proper degree of flexibility, condensing said strip of copper to close its pores, hammering the strip into the slot and
30 continuing the hammering operation until

the inlay is of substantially the same degree of hardness as the metal of the cylinder, and finishing the inlay strip flush with the inner face of the cylinder.

2. A method of inlaying cylinders of internal combustion engines which consists of
35 forming a straight sided slot in position to remove the worn spot of the cylinder, continuing the operation to dove-tail the slot, inserting a rectangular bar of metal having
40 substantially the same coefficient of expansion and contraction as the metal of which the cylinder is made in the slot, hammering the bar to fill the dove-tailed slot, removing the hammered face of the bar and finishing
45 the face of the bar flush with the inner face of the cylinder.

3. A method of inlaying cylinders of internal combustion engines, which consists
50 of forming a slot in position to remove the damaged spot of the cylinder, hammering a piece of metal having substantially the same coefficient of expansion and contraction as the metal of which the cylinder is made into
55 the slot, and finishing the piece of metal flush with the inner face of the cylinder.

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

JACOB H. KLASSEN.