

June 10, 1958

F. SCHULTE

2,838,145

METHODS AND MEANS FOR REPAIRING CRACKED CASTINGS

Original Filed April 10, 1950

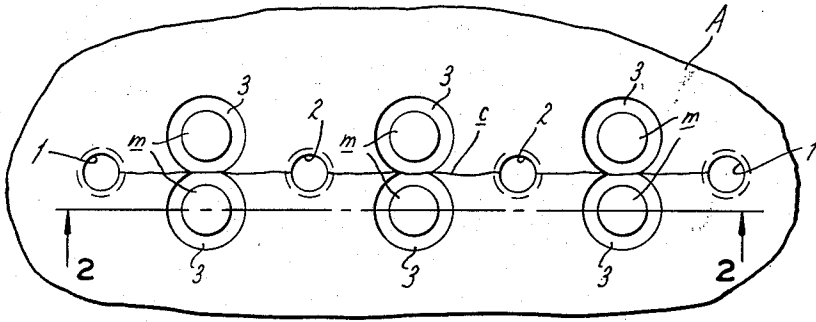


FIG. 1.

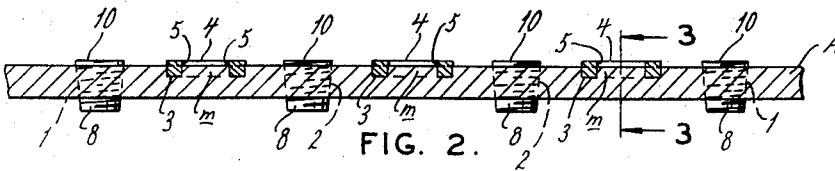


FIG. 2.

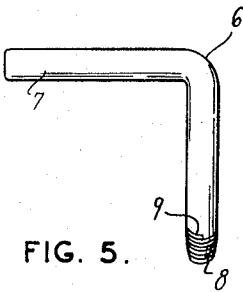


FIG. 5.

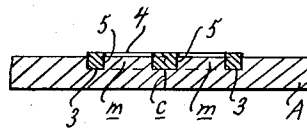


FIG. 3.

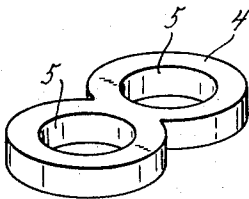


FIG. 4.

INVENTOR.
FRANK SCHULTE
BY *Depe W. Patchett*
ATTORNEY

1

2,838,145

METHODS AND MEANS FOR REPAIRING CRACKED CASTINGS

Frank Schulte, St. Louis, Mo., assignor to H & H Machine & Motor Parts Co., St. Louis, Mo., a corporation of Missouri

Continuation of application Serial No. 155,053, filed April 10, 1950. This application December 24, 1956, Serial No. 630,420

10 Claims. (Cl. 189—36)

This invention relates in general to certain new and useful improvements in methods and means for repairing cracked castings and, more particularly, to cracked cylinder blocks and cylinder heads for automotive engines. This application is a continuation of my copending application Serial No. 155,053, filed April 10, 1950, now abandoned.

At the present time it has become fairly widespread practice to repair, rebuild, and recondition automotive engines, and, in the process of so doing, the engine is completely disassembled. The various component parts are reconditioned or replaced and the engine is reassembled to restore it to a condition which is as nearly new as possible. In the course of these reconditioning operations one of the first steps is to inspect the cylinder block because most used cylinder blocks will be found to have developed one or more cracks which would seriously impair the future life of the entire reassembled engine if the crack were allowed to remain. Experience has shown that a large percentage of used cylinder blocks are in this cracked condition and it would be impossible to operate a plant for rebuilding and reconditioning automotive engines, without employing some method of repairing these cracked cylinder blocks. A number of such methods have been proposed but, for the most part, cracks which have heretofore been repaired tend to reappear in subsequent use thereby shortening the life of the reconditioned engine. Furthermore, methods which are presently in use are complicated and expensive in terms of materials and labor.

It is, therefore, one of the primary objects of the present invention to provide a method and means for repairing cracked castings, such as, automotive cylinder blocks and the like, which is simple and economical in terms of time and materials, and results in a complete and durable repaired area, which will not later tend to open up or become further damaged due to expansion and contraction and other normal operating characteristics of the automobile engine.

It is a further object of the present invention to provide a simple and completely satisfactory method for repairing automotive cylinder blocks and similar types of castings, which method will result in a repair that does not tend to open up later under vibration and shock normally encountered in automobile operation.

With the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawing—

Fig. 1 is a fragmentary elevational view of a section of an automobile cylinder block, which has been drilled as a first step in the method of the present invention;

Fig. 2 is a longitudinal sectional view of line 2—2 of Fig. 1;

Fig. 3 is a transverse sectional view taken along line 3—3 of Fig. 2;

2

Fig. 4 is a perspective view of the repair insert forming a part of the present invention; and

Fig. 5 is a perspective view of the insertable plug element also forming a part of the present invention.

Referring now in more detail and by reference characters to the drawing, which illustrates a preferred embodiment of the present invention, A designates a section of an automobile cylinder block in which a long hair-like crack c has been located by any available method of inspection and crack location.

In applying the repair method of the present invention, the first step is to drill two holes 1 at the opposite ends of the crack c, in such a manner that the center points of the holes 1 are approximately aligned with the terminal ends of the crack c, and the outer areas of the drilled holes 1 extend into clean uncracked metal. Next a series of uniformly spaced additional holes 2 of substantially the same size as holes 1 are drilled along the crack. For convenience it has been found that these holes should be located at approximately an inch to an inch and a quarter from each other, although such distance does not constitute a critical factor.

The holes 1 and 2 are then tapped with a tapering thread. Next a series of shallow recesses 3 are formed in the face of the cylinder block, each recess 3 being located approximately midway between successive holes 2, or at the ends between holes 1, 2, and straddling the crack c. The recesses 3 are formed by drilling two annular recesses with a tubular cutter in an intersecting pattern to form a figure 8, the central or crossover portion of which is located on the crack c, as best seen in Fig. 1.

Provided for snug-fitting insertion within the recesses 3 are insert elements 4 also having the intersecting pattern forming a figure 8, and preferably being slightly larger in dimensions than the recesses 3 so as to fit therein tightly when driven home with a hammer, once such insert element being thus placed in each recess 3. It will be noted that the inner apertures 5 of the element 4 encircle the upstanding circular button-like portions of metal m left within the interior of the recesses 3, so as to hold the metal of the casting A together across the crack c against any extensive or disruptive forces. Preferably the elements 4 are slightly thicker than the depth of the recesses 3 for purposes presently more fully appearing.

Also provided for use in the present invention is an insertable member, which comprises a short section of circular steel rod 6 bent over in L-shaped fashion at its one end to provide a handle 7. At its other end the rod 6 is threaded with a coarse tapering thread as at 8, and inwardly of such thread, is cut partially through, as at 9, by means of a hack saw, file, or any other similar cutting tool. The other end of the rod 6 is then inserted into one of the holes 1 and screwed down tightly in place. Inasmuch as the thread is a very coarse thread and since the rod is preferably made of comparatively ductile material the threaded portion will become tightly jammed in the hole 1, and upon continued turning will twist off in the region of the cut or notch 9 leaving the threaded end in place in the hole 1, in the formation of a wedging plug 10. Similarly, plugs are driven into the other holes 1 and 2, as shown in Fig. 2. It should be noted, in this connection, that the coarse tapered thread has the effect of jamming the holes 1 and 2 so as to tend to stretch the metal in the region of the crack c. This action places the elements 4 under tension and the crack c is, in effect, forced apart by the plugs 10, but at the same time is held together by the elements 4. The forces, in effect, work against each other.

Finally, the exposed faces of the plugs 10, the exposed areas of the crack c, and the exposed faces of the elements 4 are thoroughly peened with a suitable peening tool so that the metal of the casting, the metal of the

3

plugs 10, and the metal of the elements 4 are bonded thoroughly together, and the crack *c* is completely closed. The area may then be buffed or ground off and smoothed down as a final finishing operation.

It will be apparent that when the insert 4 is positioned within the recesses 3, the central waisted portion, which joins the two flat circular annuli forming the insert 4, will extend approximately along the line of the crack *c*. By reason of the fact that the insert 4 is formed of two intersecting circular annuli, when the cylinder block A is subjected to elevated temperatures and expands, the insert 4 will also expand and set up forces acting radially of the annuli and in the direction of the crack *c*. These forces set up components of force crosswise of the crack *c* and also along the length of the crack *c* thereby urging the edges of the crack *c* together. The expansion of the insert 4 also produces a tendency for the inner edges of the annuli to move inwardly, but since the annuli are placed within the conforming recesses 3, the button-like portions *m, m*, of the cylinder block A will also expand so that the forces which urge the inner edges of the annuli inwardly will be counteracted by the forces due to the expansion of the button-like portions *m, m*.

It should be understood that changes and modifications in the arrangement and combination of the several steps of the methods for repairing cracked castings and in the form of construction or arrangement of the means forming a part of and used in said method, may be made and substituted for those herein described without departing from the nature and principle of my invention.

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

1. The method of repairing cracked castings such as automotive cylinder blocks and the like which comprises drilling a series of spaced holes along the crack, forming a plurality of shallow annular recesses, the outer peripheral surfaces of which overlap chordwise so that the crack extends approximately along the chord common to said outer peripheral surfaces, inserting tension-resisting members in each recess so as to oppose forces tending to widen the crack, said tension-resisting members being of substantially similar geometrical shape to the recesses, forcing into each of the holes a wedging member tending to spread the crack, and peening the crack and inserted elements to seal them together.

2. The method of repairing cracked castings such as automotive cylinder blocks and the like which comprises drilling a series of spaced holes along the crack, one of said holes being located around each end of the crack, forming a plurality of shallow annular recesses, the outer peripheral surfaces of which overlap chordwise so that the crack extends approximately along the chord common to said outer peripheral surfaces, inserting tension-resisting members in each recess so as to oppose forces tending to widen the crack, said tension-resisting members being of substantially similar geometrical shape to the recesses, forcing into each of the holes a wedging member tending to spread the crack, and peening the crack and inserted elements to seal them together.

3. The method of repairing cracked castings such as automotive cylinder blocks and the like which comprises drilling a series of spaced holes along the crack, one of said holes being located around each end of the crack so that such hole completely encircles the end of the crack, forming a plurality of shallow annular recesses, the outer peripheral surfaces of which overlap chordwise so that the crack extends approximately along the chord common to said outer peripheral surfaces, inserting tension-resisting members in each recess so as to oppose forces tending to widen the crack, said tension-resisting members being of substantially similar geometrical shape to the recesses, forcing into each of the holes a wedging member tending to spread the crack, and peening the crack and inserted elements to seal them together.

4

4. A repaired cracked casting having a recess consisting of two arcuate annuli overlapping chordwise, and an insert element having the contour of two intersecting arcuate annuli integrally joined together along a short portion of their peripheries in the provision of a central waisted area, the line of juncture between said annuli being a chord common to the outer peripheral circles of both annuli, said insert being substantially similar in geometric shape to the recess of the casting and being inserted therein tightly and self-retentively so that said line of juncture extends approximately along the crack.

5. A repaired cracked casting having a recess consisting of two arcuate annuli of uniform and equal width overlapping chordwise, and an insert element having the contour of two flat circular intersecting annuli integrally joined together along a short portion of their peripheries in the provision of a central waisted area, the line of juncture between said annuli being a chord common to the outer peripheral circles of both annuli, said insert being substantially similar in geometric shape to the recess of the casting and being inserted therein tightly and self-retentively so that the waisted area will extend approximately along the crack.

6. A repaired cracked casting having a recess consisting of two circular annuli overlapping chordwise, and an insert element having the contour of two intersecting circular annuli integrally joined together along a short portion of their peripheries in the provision of a central waisted area, the line of juncture between said annuli being a chord common to the outer peripheral circles of both annuli, said insert being substantially similar in geometric shape to the recess of the casting and being inserted therein tightly and self-retentively so that said line of juncture extends approximately along the crack.

7. A repaired cracked casting having a recess consisting of two arcuate annuli arranged in intersecting relation and extending so that the longitudinal axis between the lobes of the recess will lie crosswise of the crack, and an insert element having the contour of two intersecting arcuate annuli integrally joined together along a short portion of their peripheries in the provision of a central waisted area, the line of juncture between said annuli being a chord common to the outer peripheral circles of both annuli, said insert being substantially similar in geometric shape to the recess of the casting and being inserted therein tightly and self-retentively, said insert being so positioned with reference to the crack that said waisted area will extend approximately along the crack.

8. A repaired cracked casting having a recess consisting of two arcuate annuli arranged in intersecting relation and extending so that the longitudinal axis between the lobes of the recess will lie crosswise of the crack, and an insert element having the contour of two intersecting arcuate annuli integrally joined together along a short portion of their peripheries in the provision of a central waisted area, the line of juncture between said annuli being a chord common to the outer peripheral circles of both annuli, said insert being substantially similar in geometric shape to the recess of the casting and being inserted therein tightly and self-retentively so that said line of juncture extends approximately along the crack.

9. A repaired cracked casting having a figure-8 shaped recess formed therein, said recess having the geometrical shape of two flat circular annuli of uniform and equal width arranged in intersecting relation and extending so that the longitudinal axis between the lobes of the recess will lie crosswise of the crack, and an insert element formed of sheet steel and consisting of two flat circular annuli of uniform and equal radial width arranged in intersecting relation and integrally joined together along a short portion of their periphery in the provision of a central waisted area, the line of juncture between said

5

annuli being a chord common to the outer peripheral circles of both of the annuli so that all portions of the periphery of the insert element conform to circular arcs, said elements being tightly and self-retentively peened into said recess, whereby to hold the crack together against crack-opening forces when the casting tends to expand under conditions of elevated temperature.

10. A repaired cracked casting having a figure-8 shaped recess formed therein, said recess having the geometrical shape of two flat circular annuli of uniform and equal radial width arranged in intersecting relation and extending so that the longitudinal axis between the lobes of the recess will lie crosswise of the crack, and an insert element formed of malleable sheet steel capable of being deformed upon peening, and consisting of two flat circular annuli of uniform and equal radial width arranged in intersecting relation and being integrally joined together along a short portion of their periph-

6

eries, the line of juncture between said annuli being a chord common to the outer peripheral circles of both annuli, said insert having the same peripheral shape and contour as the recess of the casting being repaired and being substantially thicker than such recess so as to be adapted for snug-fitting insertion within the recess and being peened down and thereby adapted for tightly hammered fit within the recess, said recess and insert being so positioned with reference to the crack that the narrow central portion of the recess and insert will extend approximately along the crack.

References Cited in the file of this patent

UNITED STATES PATENTS

154,580	Buckner	Sept. 1, 1874
2,121,692	Hays	June 21, 1938
2,291,162	Kirby	July 28, 1942