

March 31, 1942.

L. B. SCOTT

2,278,334

REPAIR LOCK

Filed Nov. 28, 1940

2 Sheets-Sheet 1

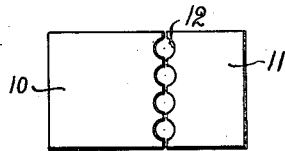


Fig. 1

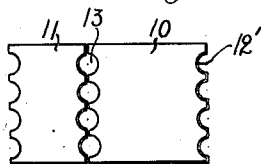


Fig. 2

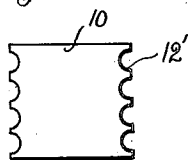


Fig. 3

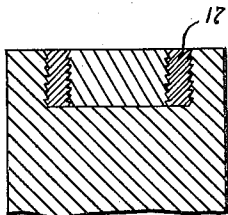


Fig. 7

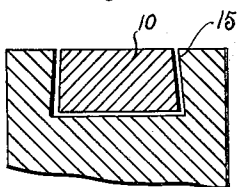


Fig. 8

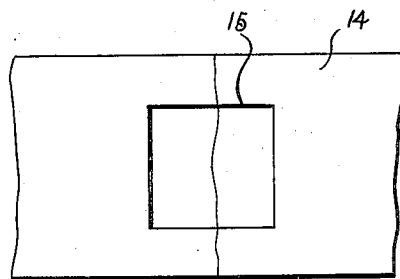


Fig. 4

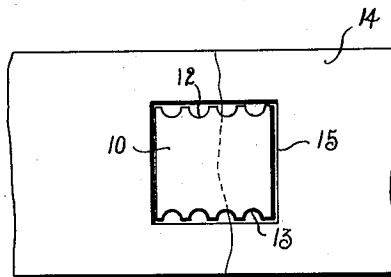


Fig. 5

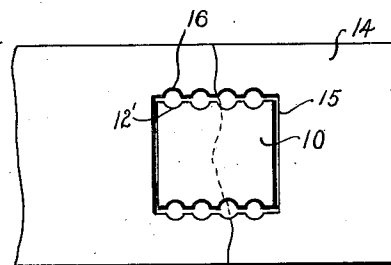


Fig. 6

Inventor
Lawrence B. Scott

By *Jack H. Shley*

Attorney

March 31, 1942.

L. B. SCOTT

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2 Sheets-Sheet 2

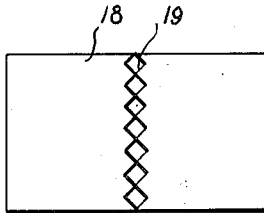


Fig. 9

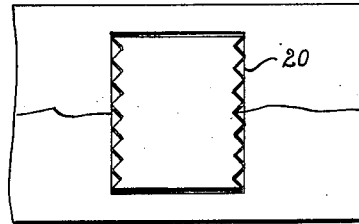


Fig. 11

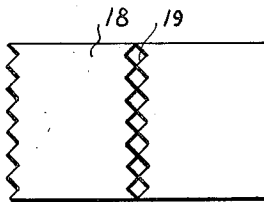


Fig. 10

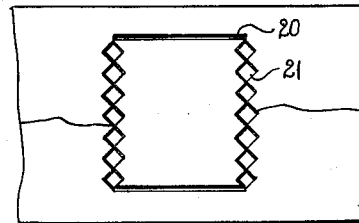


Fig. 12

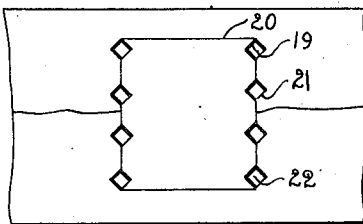


Fig. 14

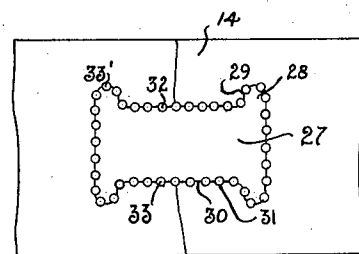


Fig. 13

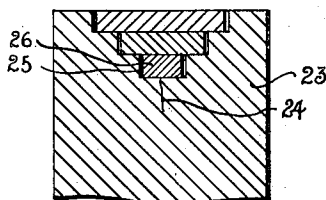


Fig. 15

Inventor
Lawrence B. Scott

334 *Jack H. Ashley*

Attorney

UNITED STATES PATENT OFFICE

2,278,334

REPAIR LOCK

Lawrence B. Scott, Houston, Tex.

Application November 28, 1940, Serial No. 367,539

2 Claims. (Cl. 189—36)

This invention relates to new and useful improvements in methods of and means for repairing and reinforcing structures where fractures have occurred or at points of excessive strain.

One object of the invention is to provide an improved method of repairing cracks and fractures in structures without the use of heat or molten metal and which involves sealing the crack or fracture with cold, hard metal locks and cold, malleable metal.

Another object of the invention is to provide an improved method of repairing cracks and fractures in structures wherein the cold, hard metal lock is used as a guide for forming the recess in the metal to be repaired, so that said lock may be snugly locked into the repaired metal.

A still further object of the invention is to provide an improved method of repairing cracks and fractures in structures, wherein a metal lock is utilized to force the crack or fracture into a closed position.

Still another object of the invention is to provide an improved method of repairing cracks and fractures in structures wherein the lock itself may be utilized to repair the fracture without the use of additional malleable metal.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Figure 1 is a plan view of a plate, constructed in accordance with the invention, and showing one step in the formation of said plate,

Figure 2 is a view similar to Figure 1, showing further steps in the formation of the plate,

Figure 3 is a plan view, showing a plate formed in accordance with the invention,

Figure 4 is a plan view of a cracked structure having a recess cut therein,

Figure 5 is a plan view, showing the plate inserted into the recess of the structure,

Figure 6 is a plan view, showing the structure with the plate in position and holes drilled in the structure to receive locking pins,

Figure 7 is a horizontal cross-sectional view, showing one method of locking the plate in position within the structure,

Figure 8 is a horizontal cross-sectional view, showing another form of the plate which may be used in this method,

Figure 9 is a plan view similar to Figure 1, and showing one step in the formation of a modified form of the plate,

Figure 10 is a view similar to Figure 2, showing further steps in the formation of the plate,

Figure 11 is a view similar to Figure 5, showing a fractured structure with a recess cut into said structure and the plate inserted therein,

Figure 12 is a plan view, showing the completed plate inserted into the recess of the structure, and holes formed in the structure to receive locking pins,

Figure 13 is a plan view, showing a further modification of the plate mounted in a fractured structure,

Figure 14 is a plan view, showing a different manner in which the holes in the plate and the structure may be formed, and

Figure 15 is a horizontal cross-sectional view, showing one method of employing the plates in accordance with the invention.

In the art of repairing fractures and castings, there have been devised numerous locks of both hot and cold metal; however, heretofore, all of these locks have been small in diameter. Previously, there has not been any method of removing a large portion of the surface around the crack or fracture, or the fatigued metal, and inserting a plate in the recess formed by this removal; said plate being sealed or locked into the casting by a cold, malleable metal.

In the drawings, the numeral 10 designates a rectangular-shaped piece of metal. It is pointed out that any suitably-shaped metallic piece could be employed. This metal is preferably very hard and very tough so that it will withstand a great amount of stress. Obviously, any material other than metal that is suitable for the purpose could be used. A similar piece of metal 11 is clamped, or otherwise secured to one lateral edge of the piece of metal 10 so as to have one lateral edge of the piece 11 abutting one lateral edge of the piece 10. Along the line of contact of the two pieces of metal, a plurality of holes 12 are drilled so that a plurality of semi-circles 12' are provided in the abutting edges of each piece of metal. The block of metal 11 is then removed from the edge of the aforementioned metal 10 and the opposite edges of the plates are clamped together, as shown in Figure 2. A plurality of holes 13, similar to the holes 12, are drilled therethrough in the manner described hereinabove. Thus a plate of metal is formed having a plurality of semi-circles in both lateral edges thereof (Figure 3).

The casting 14, which it is desired to repair, has a recess 15 cut therein, contiguous to the crack within said metal. The recess 15 may be of any depth, and if the depth thereof is greater than the thickness of the plate, more than one plate may be employed, as is hereinafter described. The recess is formed in substantially the same shape as the plate 10, so that the plate will fit into said recess.

The plate 10 is placed within the recess 15 (Figure 5), and a drill (not shown) is used to form a plurality of semi-circles 16 in the casting along the lateral sides of the recess. As can be seen in the drawings, the semi-circles 16 within the casting and the semi-circles 12' carried by the plate 10 form continuous circles. Within said complete circles, a suitable pin 17 may be inserted, and there has been shown in the drawings (Figure 7) a screw-threaded pin 17 which locks the plate in the casting 14. It is pointed out that tapered pins or the lock shown in my Patent No. 2,195,741, issued April 2, 1940, or the type of lock as shown in my pending application, Serial No. 259,594, filed March 3, 1939, may be used. Thus said plate can be securely locked in the casting and with the use of a suitable type of lock, such as is shown in my previous applications, said plate may be sealed so as to hold pressure within the casting.

There is shown in Figure 8 another method of forming the recess 15 and the plate 10, which is merely a dovetailed construction, so that when pins or locking means, such as pins 17, are inserted between the casting and the plate, the plate will be more firmly locked in the casting.

There is shown in Figure 9 a plate 18, identical to the plate 10, except that in place of the semi-circles 12' being formed in the sides thereof, a square punch (not shown) is used so as to form triangular-shaped openings 19 along the lateral edges of the plate. Said plate is inserted in a recess 20 formed in the casting, and triangular-shaped openings 21 are cut in the casting in a manner similar to that wherein the semi-circles are cut. Suitable pins 22 are placed in the openings 19 and 21 and forced into position. In this particular form of the invention, the triangular-shaped openings co-act to secure the plate very securely to the casting. As is shown in Figure 14, the triangular-shaped openings 19 and 21 may be spaced apart, and it is pointed out that the semi-circles 12', as previously described, may also be spaced in this manner. Thus it can be seen that various types of indentures along the edges of the plate may be used, and that any suitable spacing of said indentures may be used so long as said plate is securely locked into the casting.

In Figure 15, there is shown a casting 23 having a crack 24 therein. A recess 25 is formed in the casting to receive locking plates 26. The bottom of the recess 25 is smaller in cross-sectional area than the top of said recess, so that the recess is stair-stepped upwardly toward the surface of the casting. The plates 26, which fit into the recess, grow progressively larger toward the surface, as is shown in Figure 15. Obviously, any desirable number of stairsteps and any desirable number of plates 26 may be utilized. This method of repair is very desirable for use in heavy castings wherein stresses of large magnitude occur. The plates 26 may be secured to the casting 23 by any suitable means such as the circular pins 17 or the square pins 22.

Still another modification of the invention is shown in Figure 13. In this form, a plate 27 is used. The plate 27 is substantially rectangular in shape, and is provided with a laterally-extending lug 28 at each end of either side of said plate. Semi-circular recesses 29 are formed about the edges of the plate and the lugs. A recess 30, being substantially the shape of the plate 27, is formed in the casting 14 transverse to the fracture therein, so as to receive the plate. Semi-circular recesses 31 are formed in the walls of the recess 30 so as to complement the semi-circular recesses 29 and form circular openings 32 therewith. The recesses 29 and 31 could be triangular in shape, or have any other suitable or desirable configuration. Pins 33, preferably screw-threaded, engage in the openings 32 and are forced into position so as to lock the plate 27 to the casting 14. The recesses 29 may be formed in the same manner as the recesses 12' described in connection with the first form of the invention. The recesses 31 are formed after the plate 27 is in position within the recess 30 so that the recesses 29 may serve as a guide.

This form of the invention possesses especial utility for use in instances where it is desired to close the fracture in the casting as much as possible. In installing this form of the lock, the pins 33' which are positioned on the inner sides of the lugs 28 are forced into position first. Obviously, this operation forces the fracture together since the casting will tend to move away from the pins 33'. The remaining pins 33 are positioned subsequent to this operation. In this manner, the fracture is first closed and then held closed by the plate 27.

All of the forms of the invention have similar characteristics. Each embodies forming a recess in the fractured casting transverse to the fracture, and securing a relatively large lock plate in said recess by means of locking pins, so that said plate is securely anchored to the casting and prevents subsequent damage thereto.

Various changes, alterations and modifications may be made in the size, shape and arrangement of the herein described elements, within the scope of the appended claims.

What I claim and desire to secure by Letters Patent is:

1. A device for repairing fractured structures including a member formed for insertion in an opening provided therefor in the structure, said opening intersecting the fracture and having a bottom wall upon which the bottom of the member seats, said member having its side walls formed with cut-outs complementary to corresponding cut-outs formed in the adjacent side walls of the opening whereby to form sockets, said sockets being of undulating form axially thereof and pins in the sockets engaged with the undulating walls thereof for locking the member in the opening.

2. A device for repairing fractured structures including a member formed for insertion in an opening provided therefor in the structure, said opening intersecting the fracture and having its side walls formed with cut-outs complementary to corresponding cut-outs that are formed in the side walls of the member whereby to form sockets, said sockets having their walls of undulating form, and pins in the sockets conformably engaging the undulating walls thereof for locking the member in the opening.

LAWRENCE B. SCOTT.