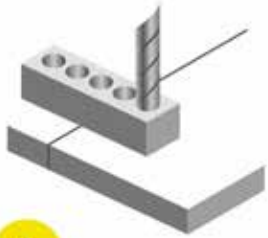


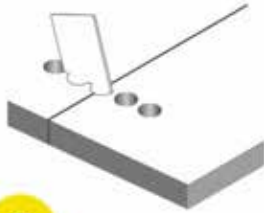


Heritage Repairs using the  
Cold Metallock Process

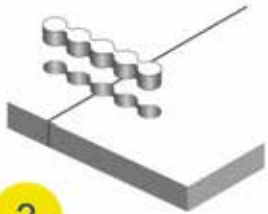
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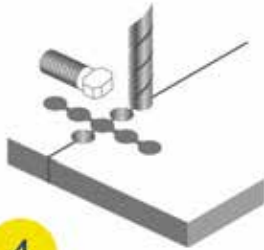
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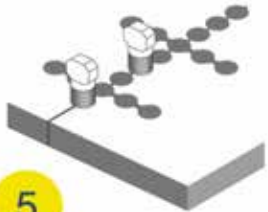
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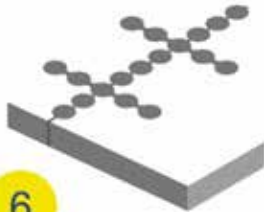
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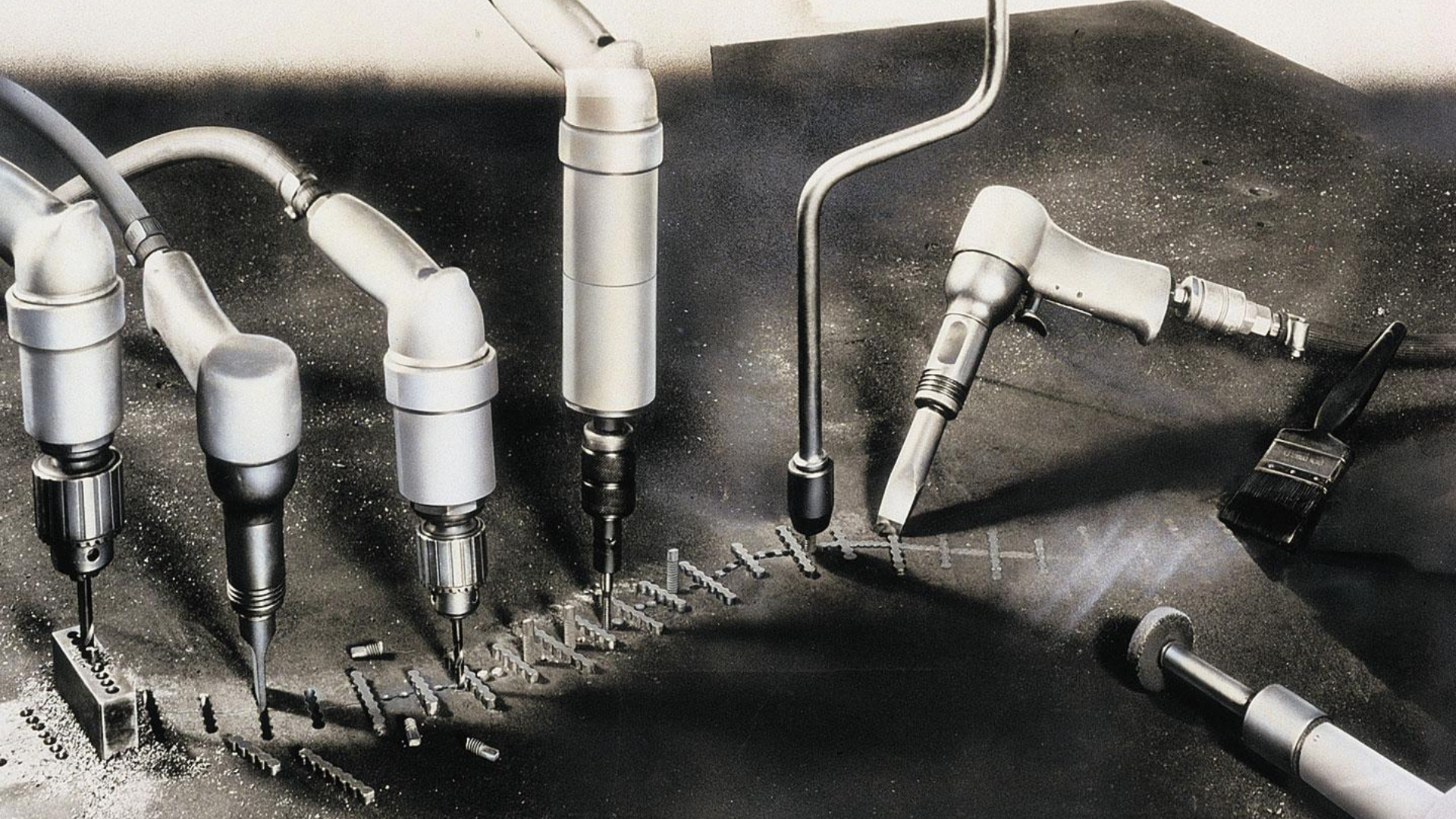
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## Metallock Casting Repair Process

1. Using a drill jig, rows of blind holes are drilled perpendicular to the direction of the crack, each row to act as a key.
2. The intermediate partitions are removed with pneumatic chisel.
3. Metallock keys are driven into the opening and caulked.
4. Holes for Metallock screws are drilled along the crack between the keys.
5. The screws are fitted to ensure they overlap, effecting a seal along the fracture.
6. Finally, the entire installation is caulked to ensure stability and pressure tightness.



## Main Structure Damage

























# Preservation and protection of our rich architectural heritage

When a piece of history needs repair, you can count on our experience and specialist skills...

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High Level Bridge, Newcastle (Photograph by Patana Rattananavathong)



# Protecting Britain's Heritage

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One word - **Metalock** - has become synonymous with a complete service for the cold mechanical repair of cast iron and other metals.

Initially developed to give new life to invaluable and sometimes irreplaceable industrial machinery, the process proved highly successful.

Further research and refinement of the technique was undertaken which increased the scope of the process, most significantly in the application of repairs and restoration to cast iron structures.

Much has been written about Britain's industrial and architectural heritage and in recent years the Metalock cold repair process has been used extensively and very successfully in restoring and repairing many famous landmarks and historic buildings, both large and small.

This presentation shows a selection of these, illustrating the contribution an accepted, unique, modern engineering remedy has made to 'Protecting Britain's Heritage'.



Worthing Pier, Worthing (Photograph by Robert Luff)



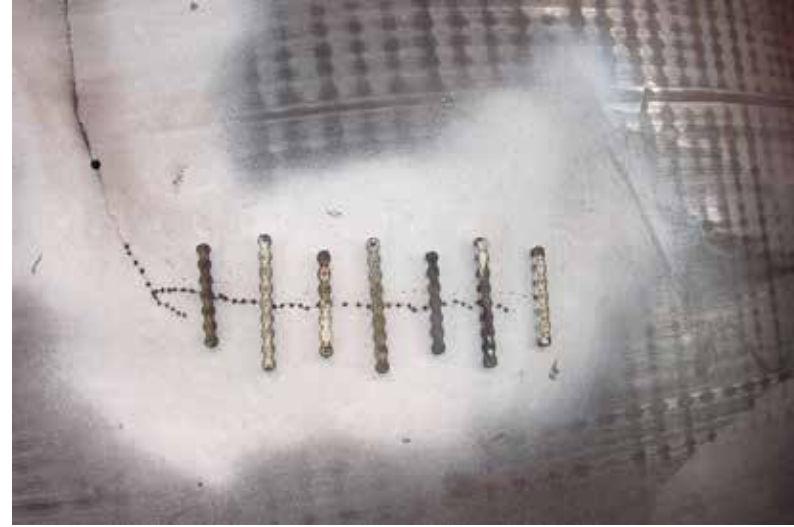
Albert Memorial, London (Photograph by Antonio Campoy)



Metal stitching repairs on cast iron canal bridge.

# Metal Stitching Repair Process

The Metalock repair consists of peening into prepared apertures layers of multi-dumbbell shaped keys. These keys are manufactured from a special highly ductile alloy (MN211) specifically developed by Metalock's own engineers and unobtainable outside the Metalock organisation.



# Metal Stitching Repair Process

Breakages usually occur because of overloading, accidents, equipment misuse or flaws in the casting.

The illustration of the Metallock repair system, is a basic repair to a flat surface. Damage to more complex fractures and castings requires the Metallock Engineer to draw on his skills and knowledge in coping with both the difficulties of the component's shape, its operation and its environment.

This all has to be completed, often with a minimum downtime, frequently involving 24/7 working.

Whilst the tried, tested and unique repair system is a repetitive operation, the application is as varied as the plant and machinery for which it is designed. This extends from ship's engines to power presses and petro chemical refineries to heritage buildings.

Over the 75 years since the inception of the process, Metallock Engineering has developed special tools, jigs, fixtures and materials to facilitate the repair which enables the restoration of machines and structures to their owner's satisfaction.

## Advantages of the Metallocking process

1. Dampens and absorbs compression stresses
2. Provides a good 'expansion joint' for such castings
3. Distributes the tension load away from fatigue points
4. Maintains relieved conditions of inherent internal stresses where rupture occurred
5. Maintains alignment and original surfaces, since lack of heat produces no distortion
6. The vast majority of repairs can be done in situ, with consequent savings in time with little or no dismantling.



**Albert Memorial**

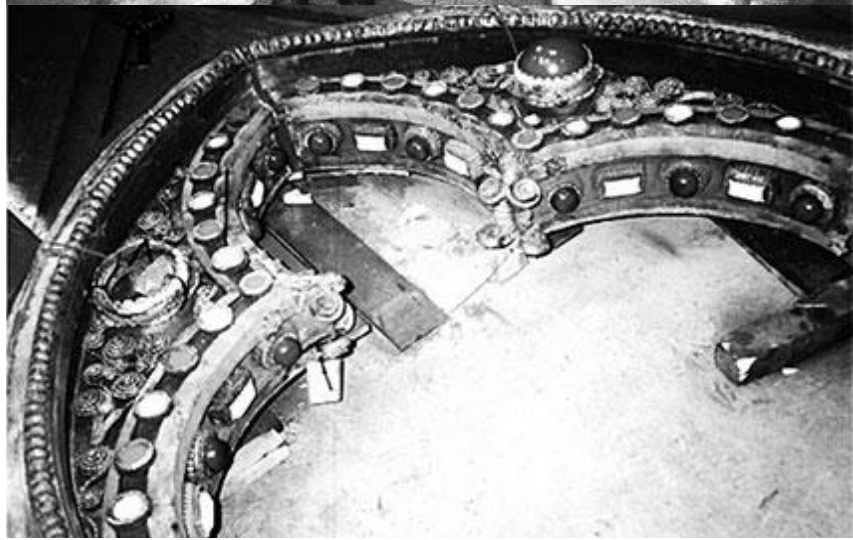
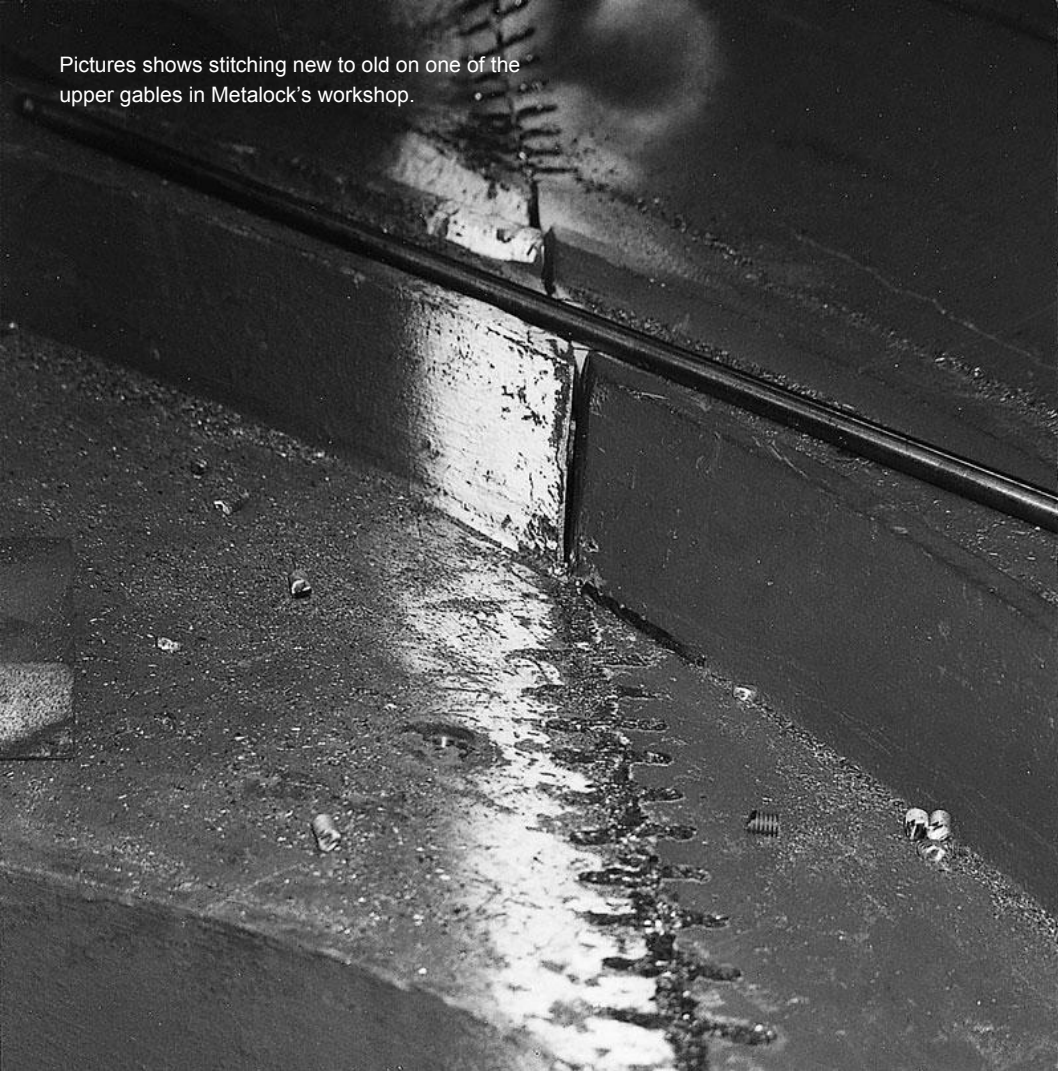
# Albert Memorial

Metalock Engineering UK Ltd were asked by English Heritage to repair the 135-year old Albert Memorial, which stands opposite The Albert Hall in London. Upon completion of a thorough inspection it was decided to retain as much of the original castings as possible with Metalock cutting away major damage and supplying new sections, these were then secured into position using the Metalock cold repair process.





Pictures shows stitching new to old on one of the upper gables in Metallock's workshop.





The memorial is constructed from elaborate cast iron sections, up to 75mm thick, clad in lead and decorated with bronze and mosaics. There is also wrought iron, early mild steel, copper and gold. The lead in places is 20mm thick.

In the original design there was no provision for the lead to expand, and being constrained it buckled in hot weather. Eventually, the buckled areas cracked and split and let water into the cast iron core leading to corrosion over the years. Corrosion jacked up the lead even more which increased the cracking. Parts of the cast iron core were severely corroded and in some areas there were cracks. These might have been the result of settlement over the years.

Following casting repairs, all components were cleaned and red lead painted before the lead claddings were put back with improved slip joints enabling expansion and contraction without causing splits.

***Nearly 100 metres of “Metalocking” was used to repair broken and badly cracked core castings comprising the elements London’s Albert Memorial.***



Photograph by Edwin. 11



Ha'penny Bridge

# Ha'penny Bridge

The Ha'penny bridge, Dublin was opened to the public in May 1816 and spans 42 metres across the river Liffey. Metalock Engineering UK were asked to undertake all repairs to the cracked cast iron sections.

Metalock carried out a series of magnetic particle inspection checks on various critical components and, using its Metalock metal stitching techniques repaired the damaged parts.



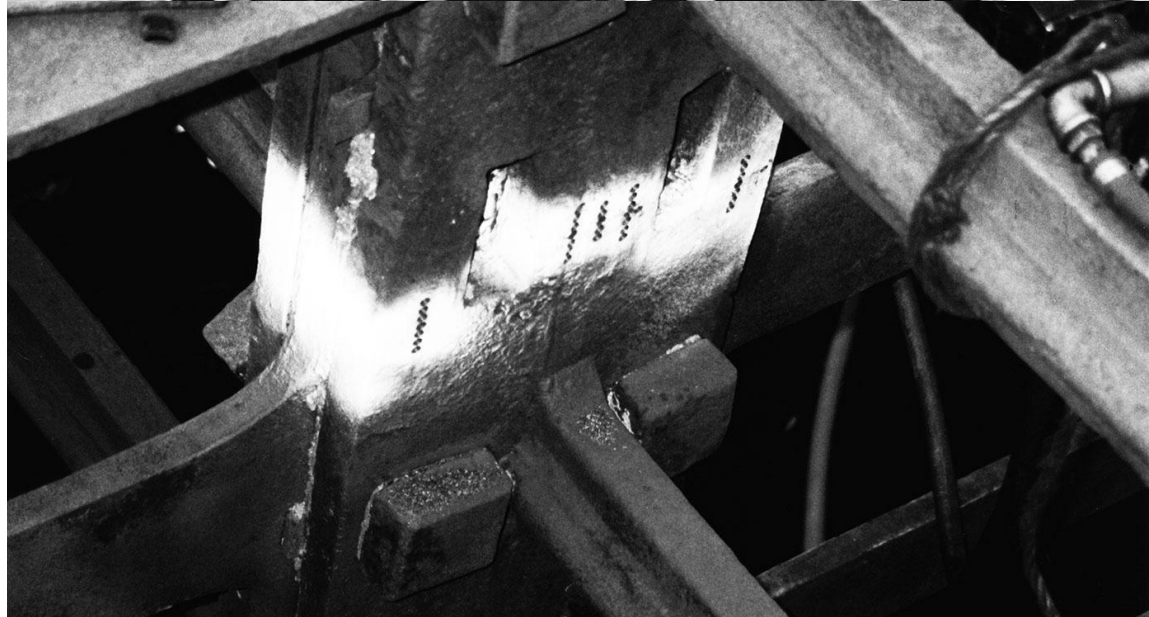
The bridge is a List 1 structure in the Dublin Corporation Development plan and takes its name from the Ha'Penny toll collected between its construction in 1816 to the toll ending in 1915. Although it's present official name is the Liffey Bridge, it was originally the Wellington Bridge and comprises an assembly of elliptical arch ribs. These were most probably cast in the Coalbrookdale Works in Shropshire from a design attributed to Thomas Telford.

Ha'penny bridge was closed for the restoration and a one-piece Bailey bridge located alongside for pedestrian crossing. The deck was removed and new sections fabricated to match the bridge's distorted elliptical shape. New ductile iron ornamental railing sections have also been cast. The project included repainting in its original off-white colour. Most of Metalock's work involved tie-rod end caps, 43 of which had cracks and were repaired, and cracked diaphragm rib plates. Additionally, Metalocking was used to repair construction webs and install new corbel sections to replace those that had broken off over the years.

Most of the damage to the components that needed repair had been caused by expansion due to corrosion from moisture ingress following the breakdown of joint sealing materials.

***Due to the significance of the bridge as an icon of the City, great care and attention was given to the restoration process, as much of the original material as possible was either repaired or refurbished.***





# Other repairs

# Charing Cross Bridge

A famous landmark in Central London, the 100 year old Charing Cross Bridge carries 123,000 commuters across the Thames by rail each day. 720 feet of cracks to the structure's sixteen cast iron columns were successfully repaired by the Metalock process with 108,000 drillings and 36,000 tappings performed on site - without disruption to rail services.



Photograph by Peter Pearson



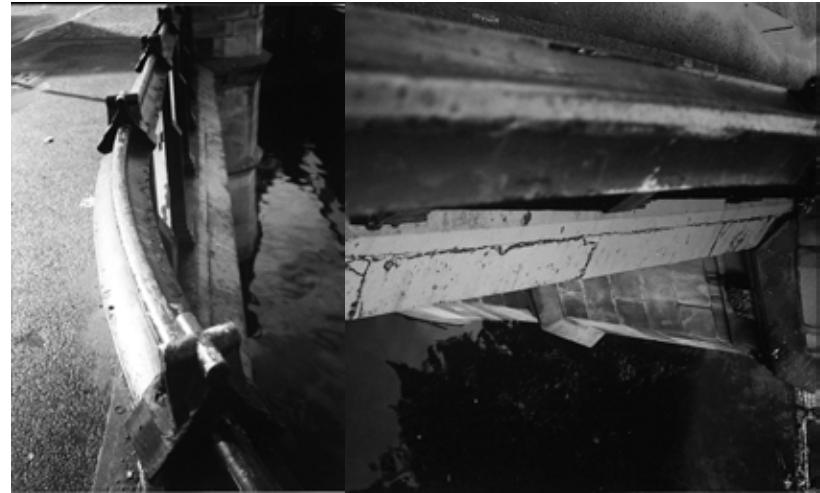
Photograph by Mike T.





# Old West Bridge

Metalock Engineering UK has used its cold repair expertise to repair and refurbish parapet panels, copings and cornices on the Old West Bridge in Leicester.



## Gas Street Bridge

The scourge of low cast iron bridges are high sided vehicles coming into contact with the structures, causing major damage. Metalock are able to replace these areas with new sections secured into position by the cold repair process, as was done at the Gas Street Bridge in Birmingham.



# Codsall Railway Bridge

Broken cast iron lips that hold parapet panels in place on a Grade II listed railway bridge at Codsall in South Staffordshire have been repaired by Metalock Engineering.



# Chetwynd Bridge

Following an assessment by Metalock engineers of the Grade II\* listed cast iron

Chetwynd bridge in Staffordshire that had developed fractures, it was decided that the company's cold repair process could provide an effective and long lasting repair.

Seventy four metres of cracks were repaired without dismantling the bridge, taking three months to complete.

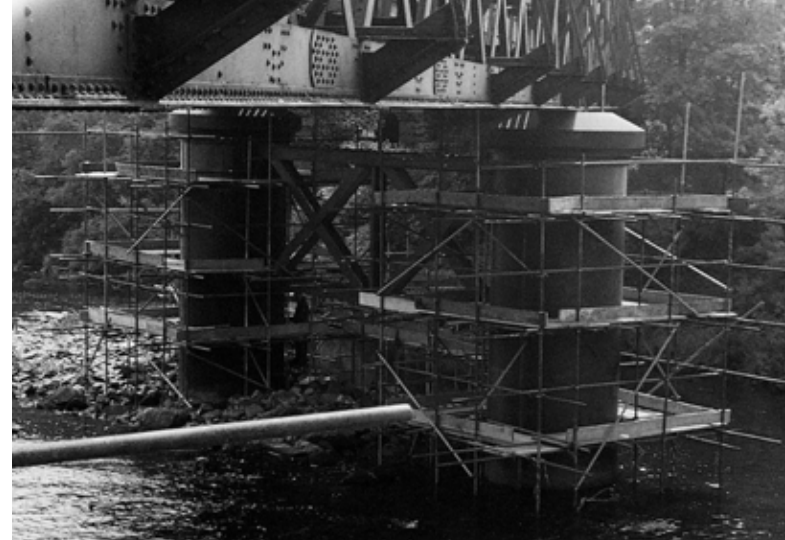


Photograph by Bs0u10e01



# Northumberland Bridge

Metalock Engineers undertaking repairs to cast iron Column supporting a river bridge in Northumberland.



## Notable subjects

Metalock repairs are not confined to large prestige structures. The company is often called upon to carry out restoration and renovations to notable individual subjects of historic or local interest.

A 50 year old double ended oval main posting box in the commercial centre of Leeds.

The Post Office commissioned Metalock to carry out a speedy repair to a 63" fracture in the 11/4" thick casting.

A lamp post architect-designed to blend with the University of London's Senate House Complex, which was shattered after being struck by a lorry.



## Ornate Gate

Irreplaceable gates restored to pristine condition after a damaged lug was repaired using the Metalock repair process.



# Worthing Pier

Following a crack detection survey by Metalock to the cast iron columns of the pier, originally constructed in 1862, Worthing Borough Council commissioned the company to repair the columns under the Southern Pavilion which had been damaged by years of corrosion and erosion.

Conducted with the columns in position, this operation required only 82 man days to complete.





## Head Ashby & Co, Name plate

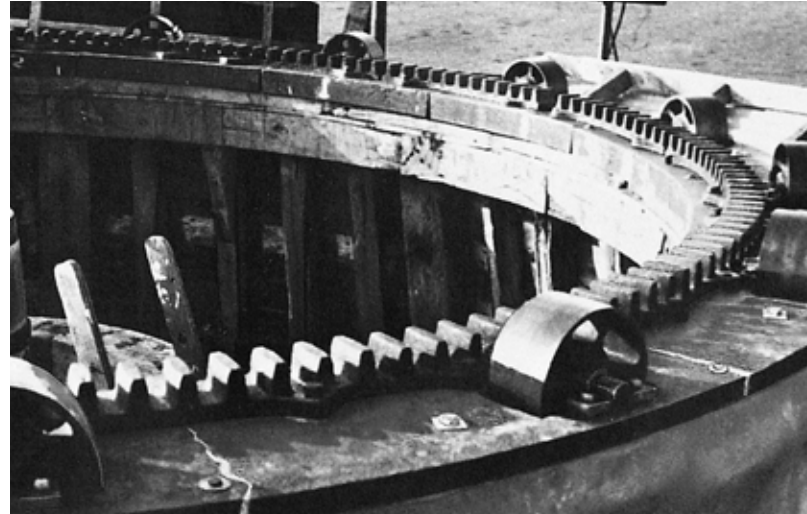
Historical Name Plate suffers damage and is repaired by the Metalock process thus retaining its originality.



# Lacey Green Windmill

Lacey Green Windmill is thought to be the oldest surviving smock mill and the third oldest windmill in the British Isles. The machinery it still contains could be that which was installed when it was originally built in 1650.

Metalock repaired ten segmental castings, six of which were cracked, and four broken in two. In addition, ten circular rack sections were broken in two or three pieces. From patterns Metalock were able to repair these and also produce three additional segmental sections.



# Darlington Market

Restoration of this 100 year old historic covered market was carried out under a preservation order. Inspection showed 24” to 48” fractures in six of the cast iron architectural columns supporting the roof. As it was virtually impossible to replace the columns without a total stripdown, a repair was essential, avoiding the shortcomings of welding.

The Metalock repair required no dismantling, was guaranteed and approved by Lloyd's.



Photograph © Copyright Steve Daniels



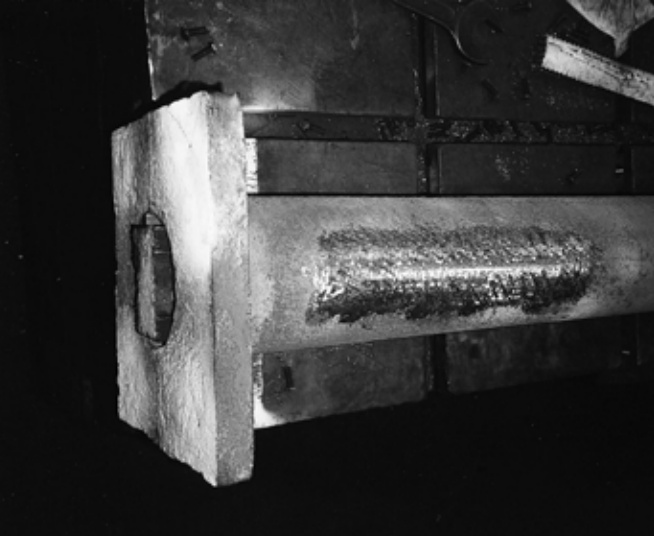
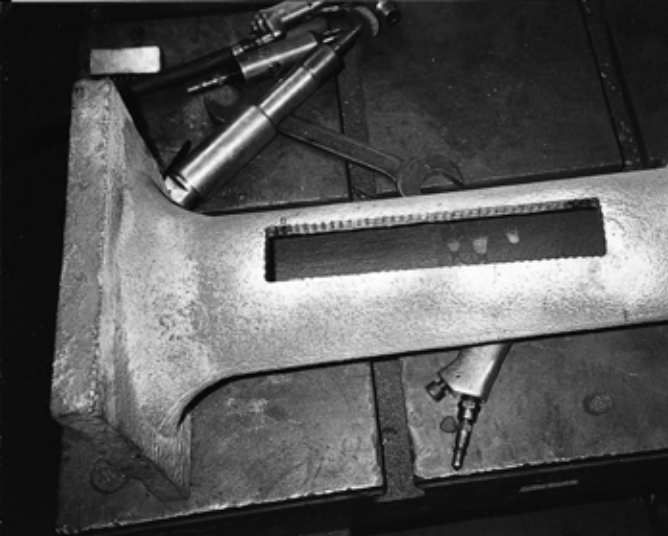
## Support columns

Metalock repairs can be carried out to all sorts of support columns, under workshop conditions or on-site, without the costly need to remove the column. A new section can be cast and split in two halves and cut out of the column to match one of the halves.

The new section can be inserted and secured by the Metalock process, the remaining section can then be removed and replaced with the second new section and finally secured into position.



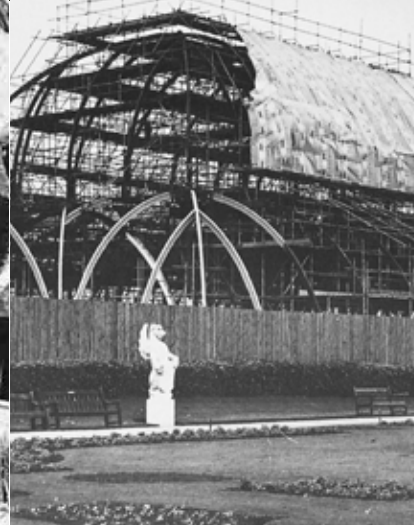




# Kew Gardens

The Palm House forms an integral part of the structure of Kew Gardens, and is being renovated as part of the overall restoration programme. The sills, guttering and floor plates, which are over 100 years old, need to be restored to their original condition.

Metalock are undertaking this work by their cold repair process which restores the inherent strength and is the only way of retaining the authentic appearance of this historic structure.



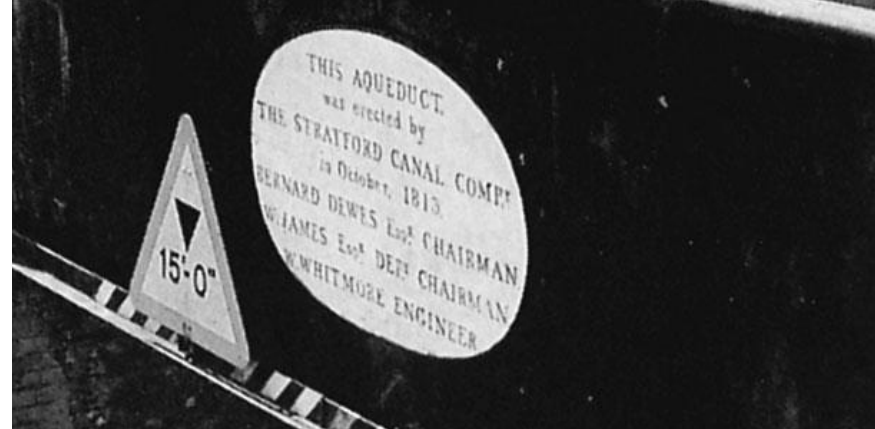
# Wootton Wawen Aqueduct

Built 166 years ago, the Aqueduct at Wootton Wawen was damaged by a heavy road vehicle, causing a 3ft fracture in a cast iron tray. As it carried the busy A34 road from Birmingham time was of the essence.

The watertight repair was successfully completed in four days with minimum disruption to road and canal traffic.



Photograph by Elliott Brown





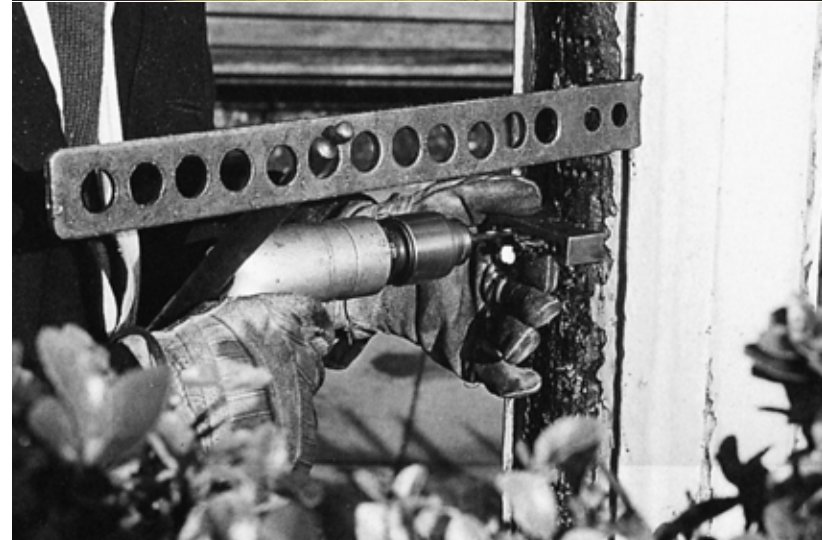
# Madeira Terrace

Visitors to Brighton who will recognise and appreciate the iron terrace built in 1895 will be pleased to learn that Brighton Corporation were able to save the structure with the aid of Metalock.

The repair, accomplished on site, introduced no additional stresses, which would occur if it was conventionally welded, returning the cracked supporting columns to their original strength.



Photograph by Luke Andrew Scowen



## Somerset House

During refurbishment at Somerset House, inspection to the Main Support Girders showed extensive fractures. These fractures were repaired using a combination of Masterlocks and Metallock Keys, giving additional strength to the repair.

