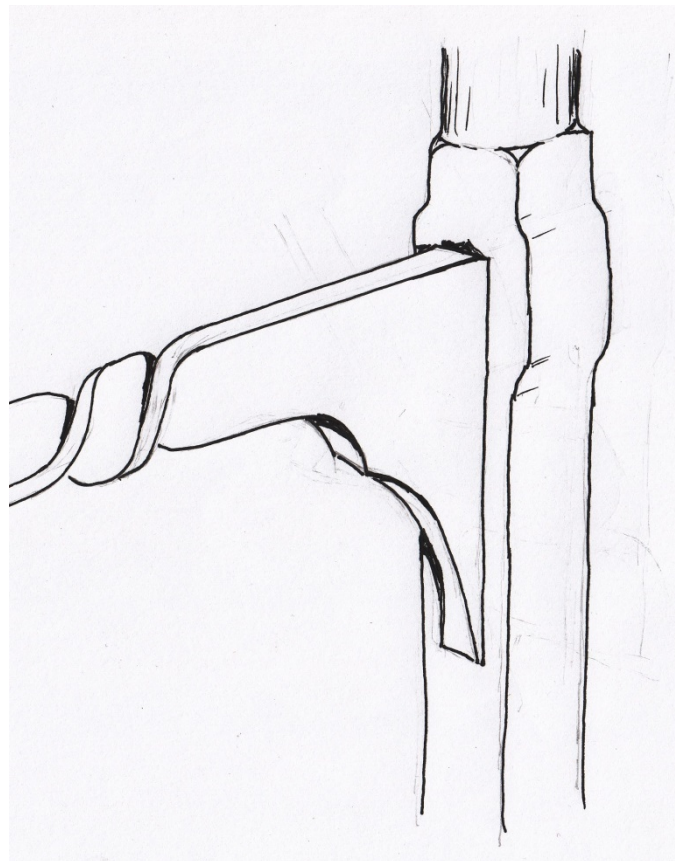




Guide to the Best Practises for the Restoration of Irish Historic Ironwork.



Compiled by the Heritage Ironwork Steering Committee of
The Irish Artist Blacksmiths Association (I.A.B.A)

Revision	Date	Description
A	27/09/2013	Released PDF
B	8/10/2013	Revisions to title, text & sketches

This is a live document; as the area of heritage ironwork conservation and restoration advances, this document will be updated to reflect current best practices.

Introduction.

This guide has been compiled for everybody working or who has an interest in the field of restoration of period and heritage ironwork in Ireland. While everybody has their own views on the restoration of period, vernacular and heritage ironwork, this guide sets out “Best Practise Guidelines” which we hope you find helpful.

1. Legal Protection of Heritage Ironwork.

Before any work is undertaken on period, vernacular or heritage ironwork, research must be carried out to establish if the building that the ironwork is part of is either from a protected building or from a listed building.

The legal protection of heritage ironwork is included in the Monuments Acts 1930 to 2004 and work must be closely monitored by the local authorities and / or the OPW. Further information is available from www.archaeology.ie

Protected Structures are listed in every County and City Development Plan. Heritage ironwork attached to a structure or being part of the curtilage ensures protection. Protection extends to the interior of the structure & any significant works and / or changes which affect the character of the structure must be approved in advance.

Architectural Conservation Areas or ACA's are also part of the Development plan of each County and City Council. Again, protection is by attachment or curtilage but it is confined to the exterior of the structure. Protection includes every structure within the ACA.

As stated in the Monument's Act, protection is such that any item of heritage ironwork whether architectural or not cannot be removed from the State for repair except by license.

2. Wrought Iron.

This leaflet is to help raise awareness of the importance of our national heritage ironwork collection.

The work we refer to dates mainly from the 15th Century to the early 20th Century. The majority of that work was hand forged in genuine wrought iron which is a mixture of iron and slags produced by direct reduction in a charcoal furnace or by puddling in a reverberatory furnace.

The work after this period changed due to technological advancements including the introduction of mild steel. Sadly, most of the knowledge, innovation and skill required for the restoration of this national collection was lost due to the introduction of new working methods.

Thankfully, this situation has now changed and this booklet has been produced to help working smiths, conservation architects and heritage officers plan, implement and oversee the correct restoration of our national ironwork collection.

3. Survey of Ironwork.

Prior to the dismantling of any ironwork, a photographic survey must be undertaken followed by the tagging of all the individual elements. Once completed, a drawing of these elements and their locations must be carried out and this drawing can then be used as a reference point later on.

The drawing must also include all dimensions including materials sizes, construction techniques and types of materials used and on larger projects, a survey must be undertaken using an agreed datum point.

Photographic records of all the work carried out at every stage including before photographs, the process's undertaken and photographs of the completed project must also be taken of every project.

Method Statements and Safety Statements for the proposed work must be prepared, understood by all and adhered to at all times with agreed and practical time scales.

A blacksmith nominated to work on heritage ironwork must have a proven track record in this area and possess a good working knowledge of the techniques and materials used on the original piece. A list of previous restoration projects and good photographic records will give a very good indication of just how experienced a blacksmith is with this type of work.

A blacksmith nominated for this type of restoration or conservation work must also have the appropriate insurance cover and the cover must extend beyond the expected and agreed completion date.

The most important part of conserving or restoring a piece of period or historic ironwork is to agree with all the parties involved if the item of ironwork is to be conserved or restored and once agreed, the appropriate plan of action must then be discussed and drawn up. The ethics of conservation and restoration must be discussed fully and decisions taken on such things as minimum intervention, non-use of irreversible techniques and materials to be used. The “watchword” in both conservation and restoration is that all work must be reversible. As much of the original material must be retained and there must be minimal disturbance of the item so when possible, all conservation and restoration work should be undertaken in situ if possible. These points must be discussed fully and agreed on at an early stage.

Conservation in this context is defined as:

The conservation of a piece of ironwork consists of halting the corrosion, making the ironwork structurally safe, undertaking very limited restoration work if necessary and applying a protective layer of single or two pack anti-rust primer, top coat, oil or wax.

Restoration in this context is defined as:

The restoration of a piece of ironwork consists of restoring the item of ironwork to its original condition or to a certain point as discussed with the client. Like for like materials must be used if possible and the same blacksmithing and metal working skills used by the original craftsmen must only be used in the proposed restoration work.

The standards used to restore, repair or conserve any item of ironwork are to be found in the study of that item and from within the item of ironwork to be worked on.

4. Removal of Ironwork.

Period Ironwork was generally erected on or in stone work with molten lead although other fixing methods were used.

The removal of ironwork from its foundations must be undertaken with extreme caution as the stone may be cracked or brittle. Lead can be drilled out successfully but the heating of lead is not advisable as the heating process may cause the stone to crack. When working with lead, head shields, aprons, protective gloves and chemical dust masks must be worn as lead is poisonous and with period ironwork, the lead could have been mixed with arsenic, salt peter or sulphur making these substances particularly toxic. We would also recommend that protective boards and / or fencing is used to protect surrounding stone work, walls, floors, other contractors and the general public while this work is undertaken.

5. Cleaning of Ironwork.

Before any cleaning work is undertaken, paint samples from different areas of the ironwork should be removed and analysed so that the original paint colours can be recreated if requested.

The following techniques are considered “best practise” by the Heritage Committee of I.A.B.A for the cleaning of period, vernacular and historic ironwork:-

- Manual scrapping and Abraiding using wire brushes or attached to power tools
- Blast Cleaning to include the following:-

Dry Blast Cleaning using Low Pressure Air /Abrasive System

Wet Blast Cleaning using High Pressure Air/Water/Abrasive System

Soda blasting using Sodium Bicarbonate with a Low Pressure Air System

Dry Ice blasting using High / Low Pressure Air System

Please note that for health reasons, blasting with silica sand is no longer permitted.

- Grinding and filing
- Needle Guns using High Pressure Air System
- Flame Cleaning; Lead paint fumes are extremely toxic and chemical dust masks must be worn and adequate ventilation must be provided when this process is undertaken.

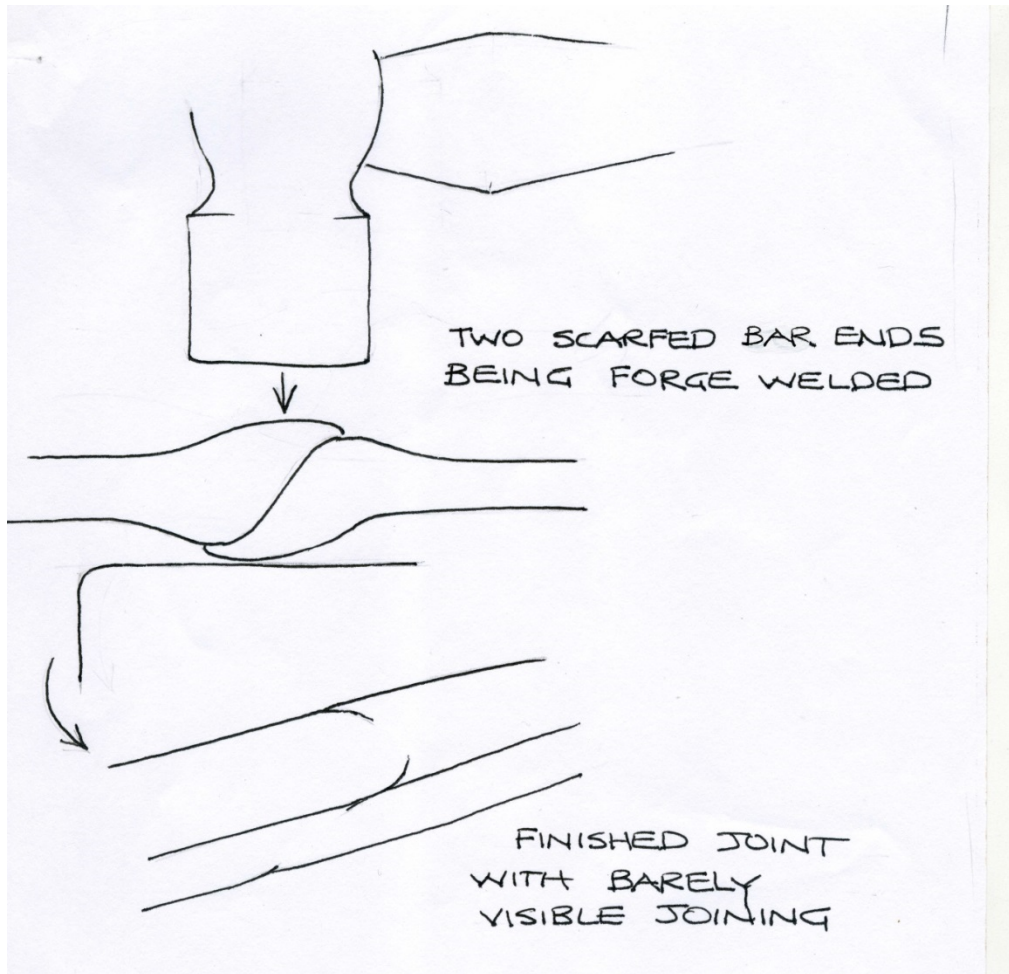
Please note that ACID Cleaning is no longer approved or recommended as the acid becomes trapped in the joints of the ironwork and passivation of the acid is impossible to guarantee.

6. Conservation and Restoration of Ironwork.

The restoration of wrought iron work is a commercial undertaking which must be economically viable and due to the high price of puddled wrought iron and pure iron, the use of other materials such as forged mild steel may have to be considered. Some would argue that the replacement material should be distinguishable from the original material and any replacement material should be joined by brazing or the material in question should be stamped with the name of the blacksmith and dated. Others would argue that introducing different material will cause unnecessary galvanic corrosion. These considerations must be discussed fully and agreed before the work commences.

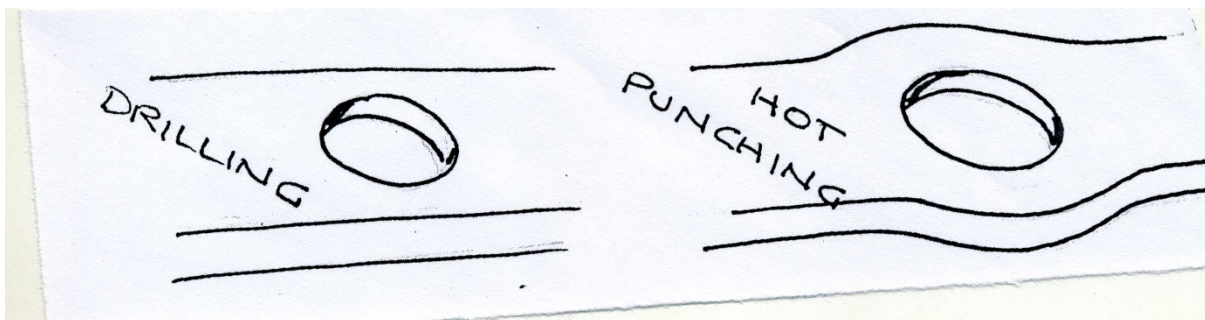
Conservation and restoration techniques used by qualified blacksmiths with a proven track record in the conservation and restoration of heritage ironwork can be summed up with the following techniques:

Forge Welding.



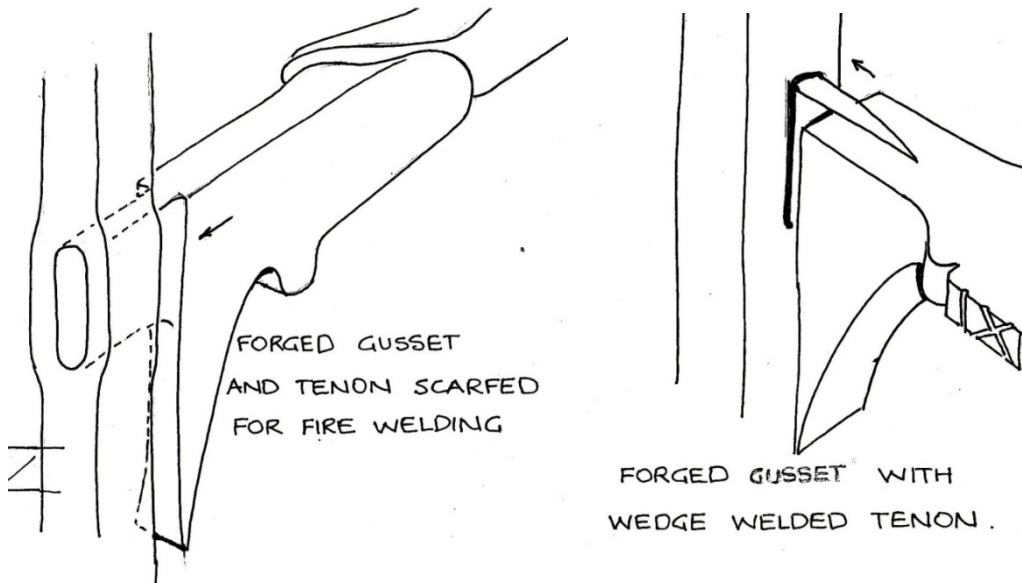
Forge welding is the original method of welding two or more pieces of wrought iron together by heating the iron to a welding heat in the forge and then hammering the two sections together.

Hot Punching.



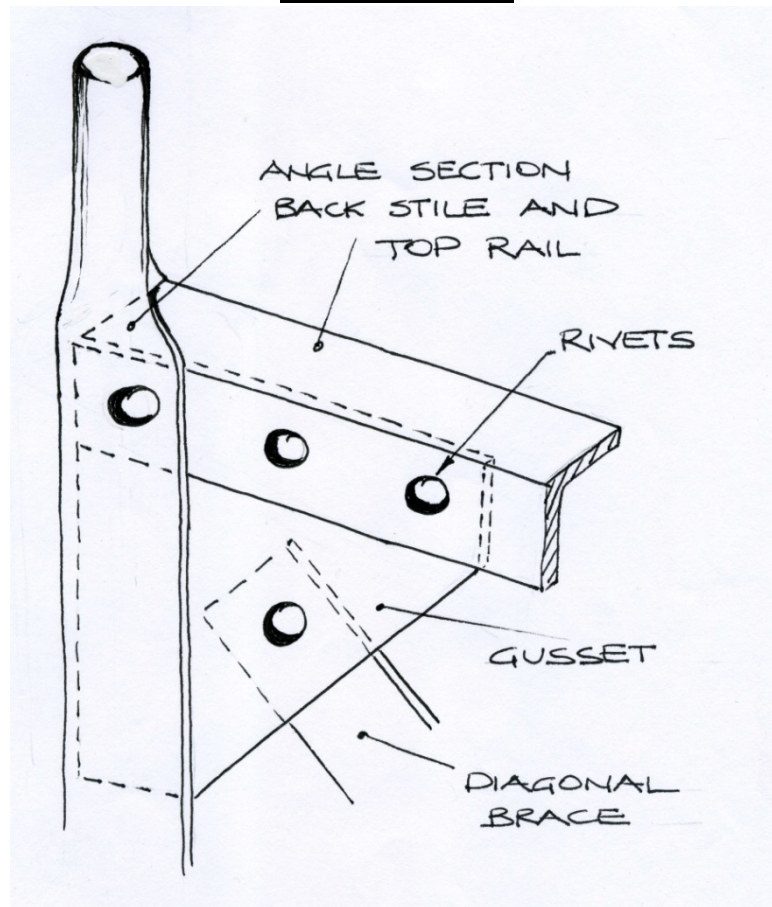
Before hand powered drilling machines were invented, holes were hot punched through the wrought iron

Mortise and Tennon Joints.

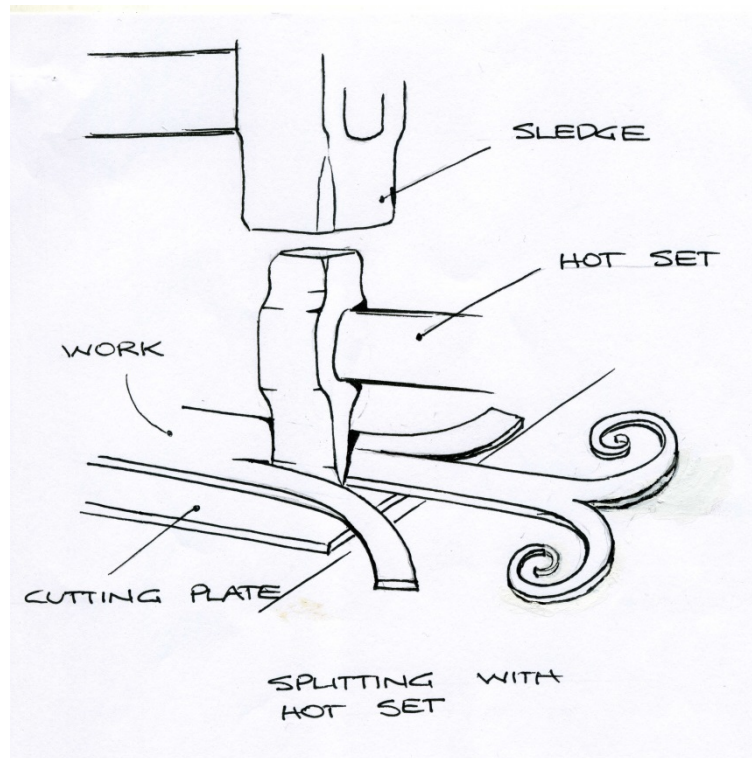


Mortise and tennon joints (there are many different types to be found in Ireland).

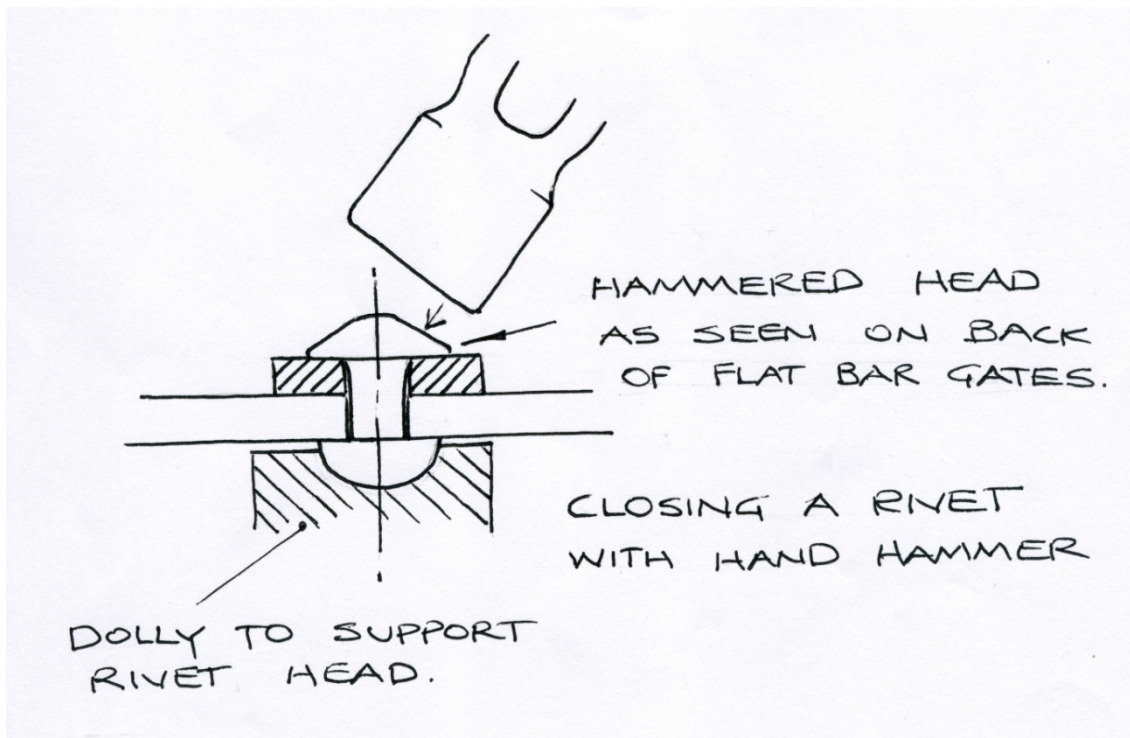
Riveted Gusset.



Splitting

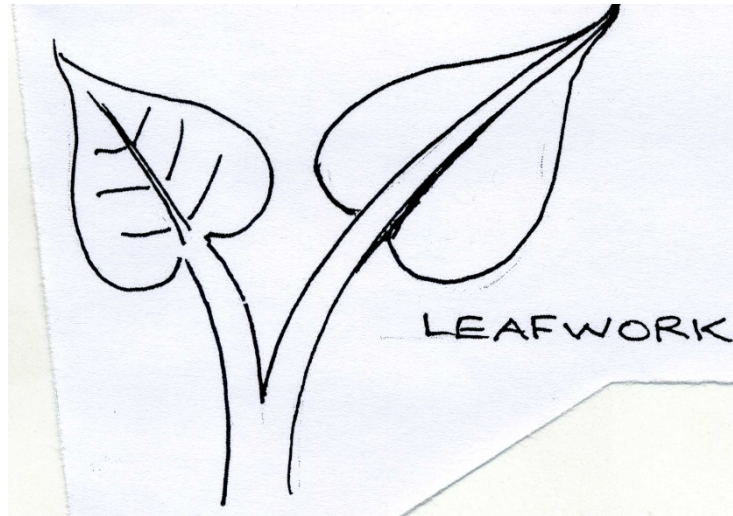


Riveting.



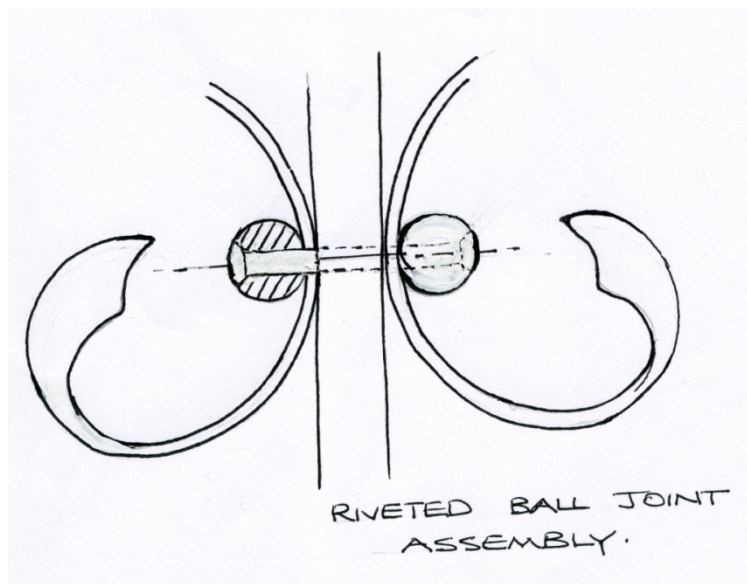
Riveting is another method of joining sheets of iron and bars together.

Repoussé and hand forged Leaf Work.



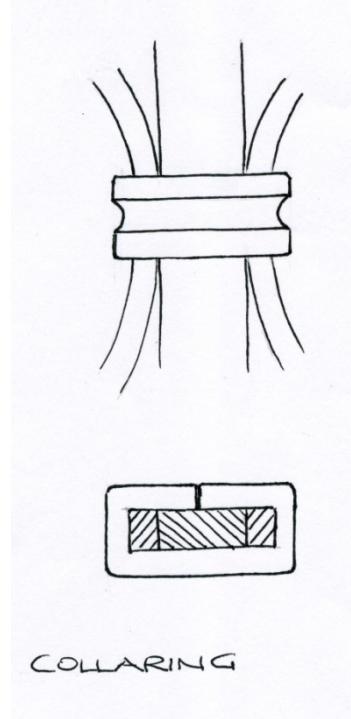
Decorative hand forged leaf work can often be found on period gates from large acanthus type leaves to small flowers or leaves. Often these are the first items to corrode as they are quite delicate.

Ball Nuts



A common and decorative way of joining scrolls and bars together with the use of ball nuts.

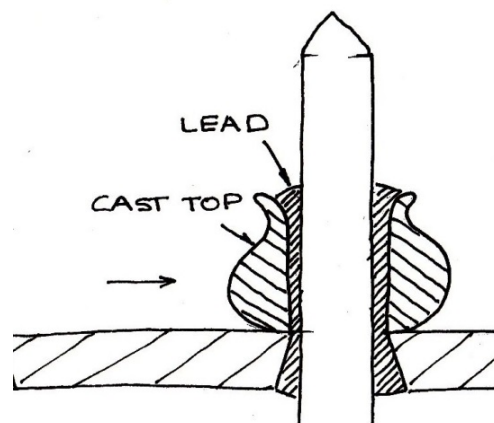
Decorative Collars.



Collaring of bars with a decorative strip of wrought iron.

Cast Iron.

The earliest cast iron artifacts date from the 5th century BC and were discovered by archaeologists in what is now modern Jiangsu in China. During the 15th Century, cast iron became utilized for artillery in Burgundy France and in England during the Reformation. The first example of architectural cast iron was a bridge built during the 1770's by Abraham Darby in England. Since then, the use of cast iron in architectural ironwork has become very common especially from the beginning of the 19th Century. Much architectural ironwork from that period onwards combined both wrought and cast iron elements. Cast iron finials, collars and indeed complete panels were incorporated in wrought iron frames. The castings were fitted using molten lead which was caulked afterwards or the panels were screwed or pinned in place.



Replacement cast iron decorative castings are still available today and many blacksmith's working in the area of restoration would have many different examples available. If the cast iron finials, collars or panels are unusual, new patterns can be made and castings poured as required.

Cast iron castings should be cast in green sand and any new patterns that have to be made should be made slightly larger than the original casting to allow for shrinkage.

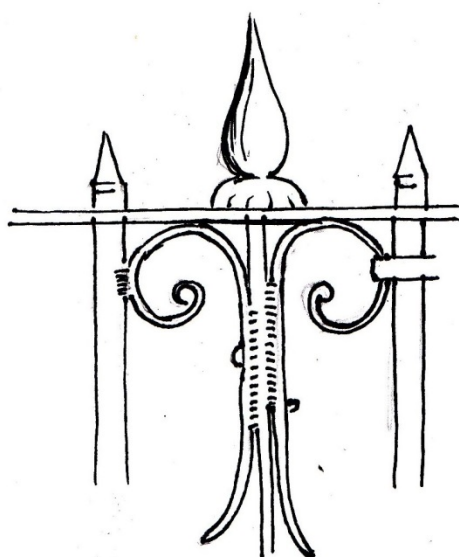
Castings must be fitted using molten lead and the lead must be caulked as mentioned above. Welding of replacement cast iron collars and finials to wrought iron is not recommended as the welds are extremely unsightly and welding is rarely successful.

Common and Frequent Mistakes.

Some of the most common and frequent mistakes made by people who are not qualified or who have little interest in preserving and restoring our period, heritage and vernacular ironwork of Ireland include:

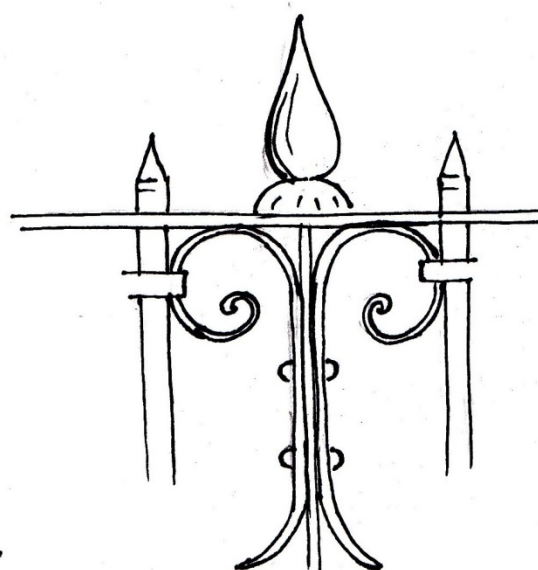
Incorrect Procedure.

Welding decorative scroll work together and welding scrolls to verticals.

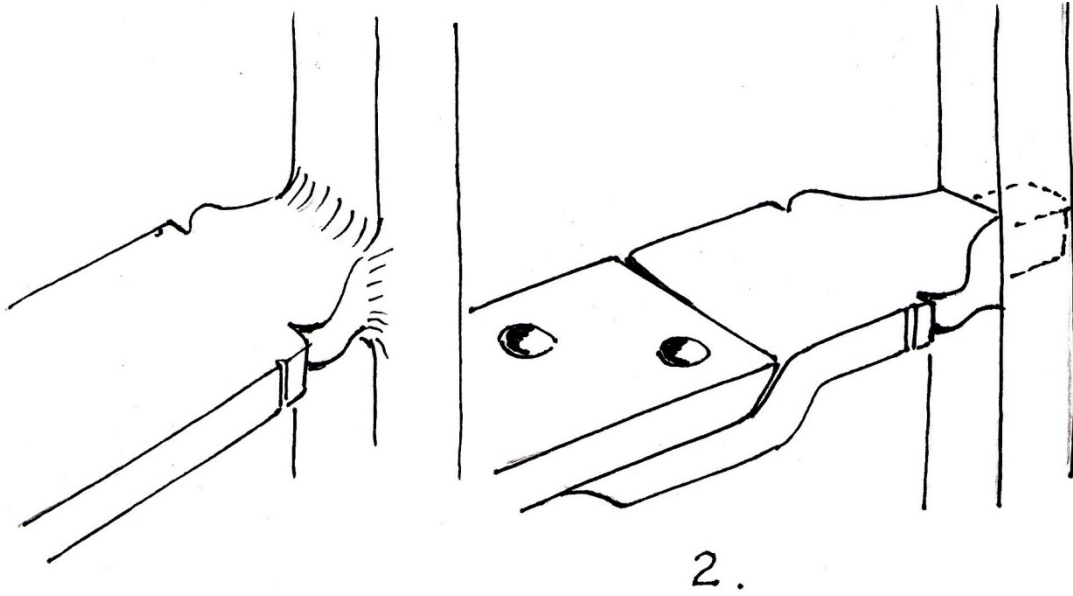


Correct Procedure.

Hot collaring and the correct use of decorative ball nuts

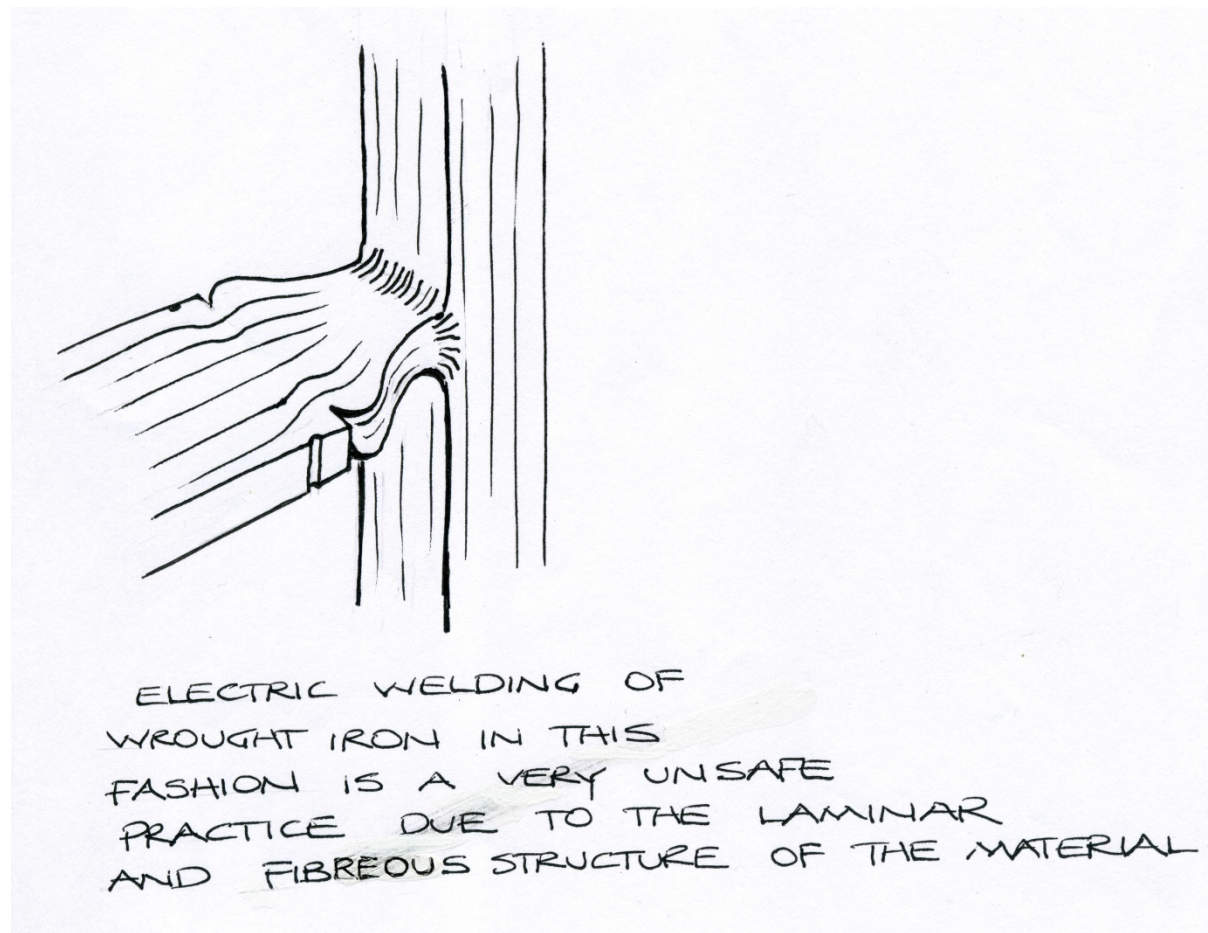


1.



Electric welding of horizontal rail to vertical.

Using the traditional method of mortice and tenon joint.



7. Painting of Restored Ironwork.

Period, historic and vernacular ironwork was normally painted with lead based paints which are no longer available in this country although there are still a small number of manufacturers in the UK who can supply lead paint. Due to the high level of lead found in these paints and the associated health risks involved, we do not recommend the use of such paints especially as there are so many other good paints available including water based anti-corrosive paint in both single and two pack applications.

Suggested painting guidelines for exterior ironwork.

After removal of old paint and rust, we would suggest the following:

Within one hour of cleaning, a single or two pack (depending on item) zinc rich epoxy primer should be applied conforming to BS 4652 to a dry film thickness of 25 microns. Please note that handling gloves should be used on all cleaned material as hand moisture can contaminate the cleaned base material.

High build micaceous iron oxide paint (MIO) should be then applied to a dry film thickness of 75 microns as the undercoat.

Two coats of exterior gloss to a RAL or BS colour of choice should then be applied.

Any cast iron should be painted with a zinc phosphate / chlorinated rubber primer to 70 microns instead of the MIO.

Please note that these are only guidelines as each item of heritage ironwork is so different and the location of the ironwork must be taken into account.

Discussions must always be undertaken with your paint manufacturer and supplier before any painting is undertaken as some paint systems will react with other paints or will not adhere to the previous coat of paint.

As part of the restoration or conservation work, a maintenance programme must be devised and drawn up for the future protection of the item of ironwork based on yearly and five yearly maintenance plans.

As mentioned earlier, the “watchword” in conservation and restoration is “Reversible”. Therefore, period, vernacular and heritage ironwork must not be hot dip galvanised, hot zinc sprayed or powder coated as it is almost impossible to remove these coatings without damaging the original material.

8. Re-erection of restored Ironwork.

If the advice given in sections 2 & 3 of this guide are adhered to, the re-erection of the conserved or restored ironwork should be straight forward.

With conserved or restored ironwork, no drilling should be required unless supporting stone or brick work has been rebuilt incorrectly. A good photographic survey before the removal of the ironwork will insure that no such problem can arise.

Conserved or restored ironwork must always be re-erected using the traditional method of leading unless a conservation or heritage officer recommends a different approach due to unusual or particular circumstances.

When “leading in” conserved or restored ironwork, head shields, aprons, protective gloves and chemical dust masks must be worn as lead is poisonous. When heating lead, the lead must not be allowed to boil as toxic fumes will be released. If heating and pouring lead inside a building is to be undertaken, adequate ventilation must be organised and extreme caution must be taken with the heating source. Fire extinguishers and fire blankets must be to hand and all hot work must cease at least two hours before leaving the building.

When pouring lead into stone work, care must be taken not to overfill the fixing holes and the stone work must be dry or the molten lead will spit back or even explode on contact with the damp or wet surface.

For these reasons, protective boards and fencing must be used to protect any other stone work, surrounding walls, floors, other contractors and the general public while this work is undertaken.

All poured lead must be caulked afterwards to insure a tight fit between the edges of the hole and the wrought iron anchor.

9. Conclusion.

We welcome all to take an interest in our heritage ironwork; many years ago in this country it was said that there was a blacksmith on every crossroads. The legacy of their work is our heritage ironwork of today.

We as blacksmiths are always learning and we hope these guidelines help with your restoration or conservation work of Irish period, vernacular and historic ironwork. Dialogue and good communications are the recipes for success and we welcome feedback from all parties so that we can work as one on the restoration of the historic ironwork of Ireland.

For further information, please feel free to contact
the: heritageofficer@irishblacksmiths.com

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