The Hutchinson's Buildings Nail

A short report into the probable cause of the deformity to the nail

Colin Meddes

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INTRODUCTION

Whilst de-nailing a timber baulk for re-use during the recent restoration of *Hutchinson's Buildings* in Sunderland, one particular nail proved difficult to extract. It was only by destroying the surrounding timber that extraction became possible. The nail thus removed was found to have an un-usual and interesting distortion which could not be readily explained.

Advice was consequently sought from various organisations and individuals with experience in the field of restoration plus academics with historical knowledge of early timber fastenings as to what may have caused the distortion. Their findings and observations have been condensed into this short report which is aimed at the layperson with a general interest in the nail referred to therein. It is not, therefore, to be regarded as a technical publication.

HUTCHINSON'S BUILDING

The building in which the nail was found is known as *Hutchinson's Buildings* which occupies the site comprising 1 & 1a Bridge Street and 101 to 109 High Street West in the city of Sunderland and having a footprint of approximately 1,080m². The site is on the north-east corner of a major road junction known affectionately as *Mackie's Corner* with High Street running east / west, Bridge Street running north and Fawcett Street running south, the latter two being, originally, the main route from Teesside to Tyneside.

By the mid-Victorian period, the commercial aspect of Sunderland had begun to move westwards from the then overcrowded and squalid Old Sunderland (now known as the East End) to a new business and up-market residential district in what is now the northern end of the City Centre. The corner shop was originally taken by hat maker Robert Mackie whose employees could be seen through the windows making silk top hats. Being the first shop on the road junction, the junction became known as *"Mackie's Corner",* a name that is still affectionately used to denote the junction even though Mackie moved out in 1879.

The site of *Hutchinson's Buildings* was, at the time, occupied by the home of Dr William Reid Clanny (1776-1850), the inventor of the miner's safety lamp. Clanny was a doctor by profession and served in that capacity in Sunderland for some 45 years, which included the 1831-32 cholera outbreak. When Clanny died in 1850, the house and surrounding land were put up for auction and purchased by Ralph Hutchinson, a prominent local shipbuilder of wooded vessels, shipowner and timber merchant. He soon embarked upon the development of the site comprising eight shops at ground level with domestic accommodation above.

Hutchinson appointed as his architect, George Andrew Middlemiss (1815-1857) to design what was Sunderland's first purpose-built row of shops.

Middlemiss was a local builder, surveyor and auctioneer who, despite being a part-time and self-taught architect, had designed many buildings including schools and other large buildings. He had a reputation of being an inspirational architect and designed the building in the Giant Corinthian Order style which today stands impressively amidst the modern plain architecture of the area. Hutchinson used Craigleith Sandstone for his building which was well known for its pinkish colour and durability. With the quarry being close to the Forth of Forth, transport by sea was an obvious choice especially as Hutchinson was a shipowner.

Hutchinson named his building *"Hutchinson's Buildings"* and the name is still visible over the entrance to the upper storeys.

Hutchinson's fortunes declined to such an extent that he was declared bankrupt in 1854, only four years after work on the building started. His shipyard was taken over by S P Austin & Son Ltd who already had a successful shipyard on the opposite north bank.

Figure 1 – Hutchinson's Buildings circa 1900

HAVELOCK HOUSE FIRE

In July 1898, a disastrous fire started in *Havelock House, a* large drapery store, directly opposite *Hutchinson's Buildings*. The fire completely destroyed *Havelock House* together with 48 adjoining business premises. The cost of the damage was estimated at up to £500,000 or £52m today. Fortunately, the fire started about 10pm when the premises were virtually vacant so there was no loss of life.

The flames spread across High Street West and destroyed the eastern part of *Hutchinson's Buildings.* Most of the south façade had to be shored up to prevent collapse. However, the eastern part was in such a precarious state that it had to be demolished within four days of the fire so that the road could be re-opened for pedestrians and traffic.

Joseph Potts & Son, a well-established local architectural practice, was appointed to re-build the fire-damaged part of the building. This was entrusted to Henry Miller Potts, a Senior Partner of the firm, who was later to become Agent for the Seaton Delaval Estate.

POST-FIRE USAGE OF THE BUILDING

Whilst the re-built façade was to be in a similar style as the 1850 original, the interior was much different. Progress in building techniques meant that a steel framework and load-bearing brick walls could be used thus enabling the upper storeys to be opened up as office accommodation rather than be used for domestic use due to the increased demand for such facilities in the developing town. In subsequent years various extension were built at the rear of the premises to provide storage and warehousing facilities. Alterations were also made internally to suit changing occupiers, the largest being in 1987 to accommodate a nightclub on the ground and first floors.

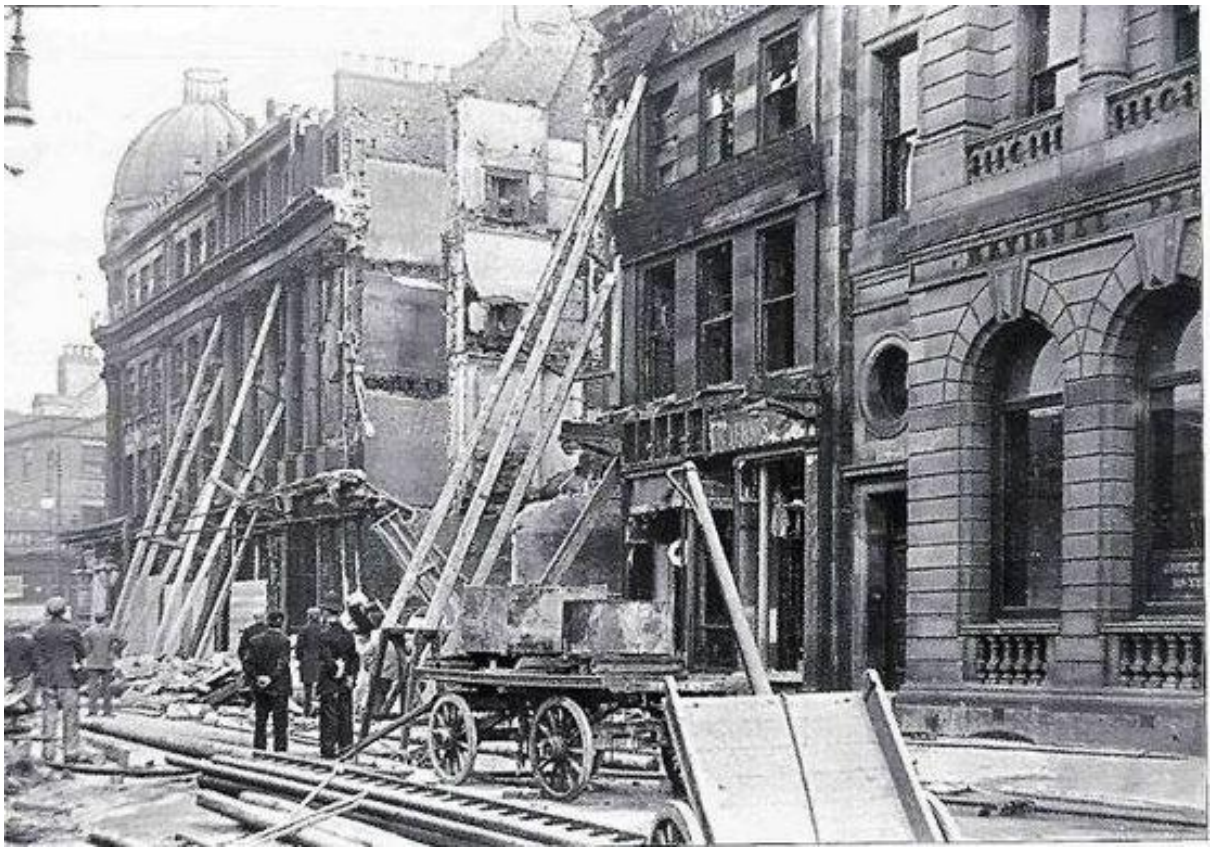

Figure 2 – Hutchinson's Building after the Havelock House fire of July 1898

Occupancy gradually declined leaving the third and fourth floors un-used and when the nightclub closed in 2008, much of the building became vacant and neglected. Dereliction gradually began to take over and by 2017 it was in a sorry state. Fortunately, Kirtley & Co, a local development company, saw an opportunity to restore the building as a viable commercial enterprise and purchased it in 2017. Crosby Granger Architects of Kendal were appointed to design the restoration and this work is now virtually complete with various units already occupied by tenants.

THE TIMBER BAULK

The timber baulk in which the nail was embedded was part of a floor joist that had been used in an extension at the rear of the building that was erected within some two decades of the original construction of *Hutchinson's Buildings* in 1850. It showed no signs of fire damage and was in such good condition that it has been shortened and used as an internal door lintel as part of the current restoration work. The joist is a sizable 280mm x 103mm and from its density is more than likely to be of Norwegian Spruce.

The age of the timber is un-known as it could have been either new or re-used for use in the extension of *Hutchinson's Buildings.*

At the time of the original construction of *Hutchinson's Buildings,* Ralph Hutchinson was a major importer of timber from the Baltic states which would have included Norwegian Spruce. Timber from the Baltics was relatively cheap due mainly to the low transport costs across the North Sea compared with the much higher cost of transporting timber across the globe from the Colonies. It is highly probable, therefore, that he supplied the timber for the original work. However, by the time that the extension was built, Hutchinson was no longer in business having been declared bankrupt in 1854. There were, however, other timber importers in Sunderland that could have supplied new timber for the extension.

It is possible that the timber for the joist may have been salvaged from a wooded sailing ship. Whilst the hulls and frames of wooded ships were normally made using a hardwood such as oak, softwoods were used elsewhere on a ship as they were easier to work and replace.

When *Hutchinson's Buildings* were being erected, *The British Timber Duties* were still in force. These were introduced in 1815 to safeguard the timber interests of the British Colonies by levying duty on imports from foreign countries. This, effectively, doubled the cost of cheap Baltic timber. In order to keep costs down, the re-use of timber from salvaged or broken-up vessels became common. This was aided by the numerous wrecks that littered the difficult entrance to the river.

The off-cut from the joist when it was cut to size to use as a lintol was recently located. Interestingly, despite being only 560mm long, it contained the mortice and tenon parts of a joint known as a "soffit (or tusk) tenon joint with haunched shoulder" which was a fairly common joint used as a corner joint or a spliced joint in large section timbers. It was developed from a medieval joint and used in its new form from the late 17th century through to around 1900. The remains of three broken nails were found in the off-cut, vis two tail ends and one head end. The head end was extracted and found to a 90mm section of a wrought iron nail with a head shape that was used from the 1850's to the 1870's which would tie in with the construction of the extension to *Hutchinson's Buildings*.

The joints appear not to be very well made with a rough finish and an over-run on some of the saw cuts on the tenon. This could be attributed to being cut by an apprentice carpenter. Surprisingly, the timber appears not to be of the best quality as the carpenter has had to cut the mortice between two knots. This could indicate that the timber was being re-used or that the standard of timber being used as Hutchinson was no longer involved in the project.

Figure 3 – The tenon

Figure 4 – The mortice

THE NAIL

Wrought Iron

Wrought iron, from which this nail was made, is a two-part metal consisting of high purity iron and iron silicate, which is an inert and non-rusting glass-like slag. These two materials remain separate and do not have a chemical reaction that exists in alloys. Whilst hot, the two materials are hammered or rolled to expel excess molten slag. The resultant product is tough, malleable, ductile and corrosion resistant and can be easily worked and forge-welded when hot. The slag content is low (1% to 3%) and is distributed throughout the iron as layers of fibres. Wrought iron is the only ferrous metal that contains these fibres which are responsible for giving it a tough and fibrous nature. These fibres will play an important part in the fate of this nail as described later.

Description

The nail was guillotined from a wrought iron sheet some 5mm thick made up of 3 fibres (see Figure 7). It is a large nail having a length of 125mm. Originally, it would have been much longer (by possibly some 50mm) to protrude into the joining piece of timber but the tip would have broken off when the two pieces of timber were separated. The nail is 8mm wide at the head tapering to 3mm at the current tip. The original tip would have been tapered when first cut.

The nail shows severe signs of distress with de-bonding of some of the fibres and the formation of an un-usually large corbel. The length of the corbel is 3.5mm (or 10%) longer than the straight section.

Figure 5 – The nail showing corbel and de-bonding of fibres

Manufacture and Age

Originally, wrought iron nails were made by hand-forging, a task normally given to an apprentice blacksmith to gain experience with the forge and the anvil. With the introduction of wrought iron sheets, nails were manually cut using a hand-bolster which, no doubt, would have speeded up the nail-making process. By 1790, machines had begun to appear to replace the manual cutting of sheets. These continued to develop until steel began to replace wrought iron sheets from the early 1900's when the wire nail that is in use today began to appear.

Originally, wrought iron could only be rolled in narrow sheets therefore the machine cutting of nails could only be made in the direction of the roll resulting in the fibres going across the shank (see Figure 6). This made the nail susceptible to fracture if bent and could not, therefore, be used in clinching. (Clinching was predominantly, although not exclusively, used in the construction of wooden ships. The nail would be longer than the thickness of the timber and its additional length would be bent through 180º and hammered back into the wood to produce a permanent fixing). Rolling techniques developed to enable the manufacture of wide sheets of wrought iron as shown in Figure 7. These wide sheets could then be cut transversely therefore nails could be cut with the fibres in line with the shank which produced a much stronger and flexible nail.

The initial cut from the sheet produced a tapered blank to give a wide head end and a sharp tip. It has been suggested that due to the size of this nail, it was cut with the square end it now exhibits. This, however, would made it difficult to hammer into the wood unless a hole had been pre-drilled. Pre-drilling, however, seems unlikely due to the additional time required to mark out and drill the holes. It is highly likely, therefore, that the nail originally had a pointed or tapered tip and this had broken off through usage or corrosion.

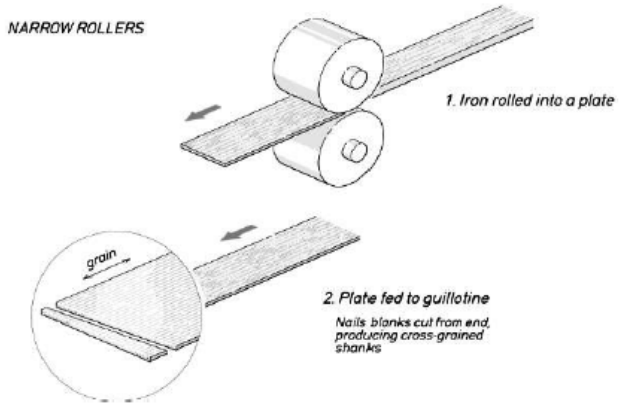

Figure 6 – Forming wrought iron sheet using early narrow rollers

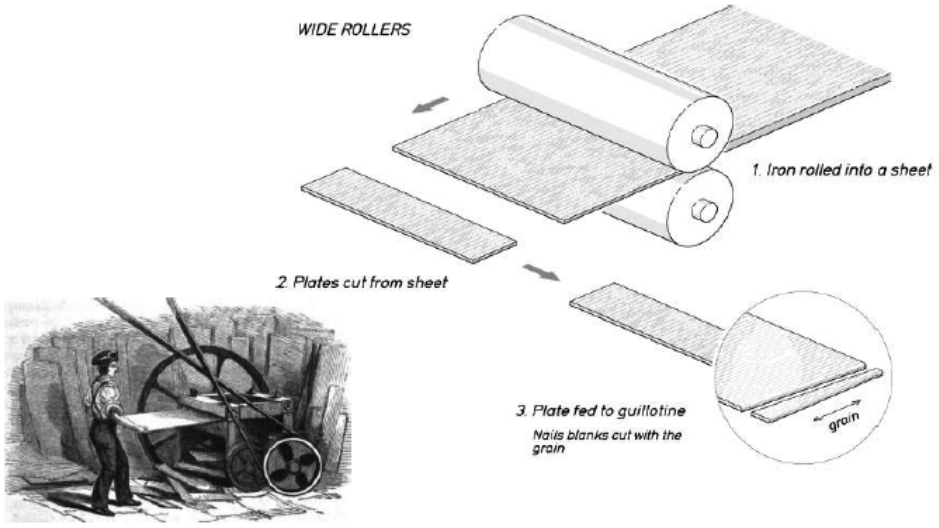

Figure 7 – Forming wrought iron sheet using later wide rollers

The guillotine action of the machines left behind distinctive sheer burrs on the down-cut side of the nail which this nail clearly exhibits. Following cutting, they were side pressed to raise a bulge at the head end and the head then formed under pressure.

From the features of this nail, expert opinion is that it is an early British Cut Clasp Nail dating from circa1812-1817. It therefore pre-dates the building of *Hutchinson's Buildings* and thus had a previous life.

Previous usage and Deformities

What the nail was used for in the years before being used in the building of *Hutchinson's Buildings* is open to conjecture. However, with Hutchinson being in the business of building wooden ships, it is feasible that it may have had a maritime origin, being re-claimed from a salvaged or broken-up vessel.

The vast number of nails required in the construction of a wooden ship or the building of *Hutchinson's Buildings* would be an expensive part of the overall costs therefore the re-use of old nails, especially ones the size of this one, would make a significant cost saving.

Figure 8 – De-lamination of fibres at tip

Figure 7 – The corbel and de-bonding towards the head

The partial de-bonding of the fibres and the large corbel indicate that the nail was clearly distressed at the time that it was extracted from the baulk. The corbelling could only have been created during the final insertion of the nail but the de-bonding could have been on-going from new. This could have been caused by one or a combination of the following factors:-

- Weak wrought iron – As stated above, wrought iron sheets are produced by hammering or rolling a hot mixture of iron and silica. At the time that this nail was produced, rolling techniques were well developed. It was important, however, that the mixture remained hot during the rolling process. If the rollers became cool, the outer faces of the sheet would harden leaving a softer core which was a built-in source of weakness. Slippage of one of the rollers could have a similar affect.
- Previous extraction – As this nail had been used prior to use in *Hutchinson's Buildings,* it would have been extracted at least once from other timber. It is unlikely that the nail could have been extracted squarely therefore the consequent resultant curvature would have been hammered flat to enable it to be re-inserted. This hammering would have weakened the nail by putting immense pressure on the bonds between the fibres as the outer fibre would have been in tension and the inner fibre in compression.
- Wood sap – Once de-bonding becomes apparent in a wrought iron nail, the sap of certain hardwoods, such as oak or hornbeam, can get into the crack and cause it to widen. It is possible that if it had been used in a sailing vessel it could have been inserted in an oak frame or planking.

- Frost damage – If the nail was in timber that was susceptible to dampness and freezing, any de-bonding in the nail could be intensified.
- Insertion – As a nail is being driven, the tip wants to follow the path of least resistance such as through summerwood and around knots. This can cause bending of the nail or de-bonding of the tip as the fibres of the wrought iron de-bond.

A nail the size of this one would require tremendous force to drive it into the timber. These forces would seek out any weaknesses in the nail and thus create deformities.

SUMMARY

The Hutchinson's Building Nail is an early example of a wrought iron British Cut Clasp Nail cut from a rolled sheet of wrought iron between approximately 1812 and 1817.

Deformities, either during manufacture or through usage before being used in *Hutchinson's Buildings,* resulted in de-bonding of some of the wrought iron's fibres so that when it was hammered in for the last time, two of the de-bonded fibres caught on a hard spot and buckled forming the corbel that it exhibits today.

Corbelling in wrought iron nails is a rare occurrence. As far as can be ascertained from the information obtained, the corbelling of this nail is the worst that the experts consulted has seen, so much so that three of the organisations approached have indicated that they wish to include photographs and information on the nail in forthcoming publications.

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