Université catholique de Louvain

LOCI Faculté d'Architecture, d'Ingenierie architecturale, d'Urbanism

Historic Nail Development and Morphology as a way of developing dating methods, with case studies for British and Australian nails in the period 1680 - 1890

VOLUME II: APPENDICES

Thesis submitted towards the requirements for the award of the degree of Doctor of Architecture & Engineering by

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KEY:	Z 1	Z 2	Z 3	Z 4	Z5
	Roof cladding	Roof inside	Walls	Floor	Linings

Nail provenance table

REF	NAIL TYPE	DATE	SOURCE/LOCATION	ZONE	PAGE
Fig 98	Rafter nail	1324	Salisbury Cathedral Muniment	2	
N 1	Backing nail	c1818	WH	1 + 2	139
N 2	Batten nail	C1520	Hampton Court Palace	2	140
	Ditto	1732	Bowlish House, Darshill	2	
N 3	Bracket nail	1818	WH	5	141
N 4	Brad headless	1805	Newcomen St. Dartmouth	4	142
	Brad spur head	1835	Lower Fort St. Sydney NSW	4	
	Brad joiners	1842	Major Newman's, Pontville. Vic.	5	
	Brad joiners	1730	Tower House, Wells, Som'set	5	
	Brad lining	1730	Tower House, Wells, Som'set	5	
N 5A	Clasp unused	C1880	W&D. Singleton. Sussex. UK	5	143
	long	1786	Robert Adam St. Westminster	3	
	strong	1758	Pantheon portico, Stourbridge	2	
	long	1686	Queen Anne Apts. Hampton Ct	2	
	strong	1686	Queen Anne Apts. Hampton Ct	2	
N 5B	Clasp (German)	1650	Schloss Wolfegg, O' Schwaben	2	144
N 6	Clout fabric x2	1680	Wheatsheaf Inn, Brecon Powys	5	145
	fine & best	1930s	Unused	Nsh	
	best	1686	Queen Anne Apts. Hampton Ct	2	
	roofing	1730	Riga Dom roof	2	
	ship hull Portus shipyard	3rd C		2	
N 7	Common (rosehead)	1730	Tower House, Wells, Som'set	5	146
		1835	Lower Fort St. Sydney NSW	4	
			Unused	Nsh	
N 8	Counterflashing (Paw head)	1732	Bowlish House, Darshill	1	147
		1867	Airlea, Henna St. Warrnambool	1	
		1888	Christ Church tower, W'bool	1	
N 9	Countersunk clout	1818	Woolmers House, Tasmania	3	148
		1838	Woolmers Cottage	3	
	Double-countersunk *unused*	c1930	Naish collection, Salisbury. UK		
N 10	Dog nail (Die-dog) hollow	1854	Moorabool Street, Geelong. Vic.	1	149
	Ditto - hollow head	18??			
	Ditto – solid head	1864	Glenelg St. Portland	1	

KEY:	Z 1	Z 2	Z 3	Z 4	Z5
	Roof cladding	Roof inside	Walls	Floor	Linings

REF	NAIL TYPE	DATE	SOURCE/LOCATION	ZONE	PAGE
N-11	Fence nail *unused*	c1875	Farm, Garvoc		150
	Galvanised *unused*	c1870	W&D bins, Singleton. UK		
	unused	c1930	Naish collection, Salisbury, UK		
N 12	Flashing nail	1864	6 Glenelg Street, Portland	1	151
		1875	SA Govt offices, Nth Tce, Adelaide	1	
N 13	Gate nails – *unused x2*	c1930	Naish collection, Salisbury, UK		152
	unused		W&D bins, Singleton. UK		
	Possibly unused	1828	Woolmers House bins		
N 14	Hob (Door) *unused x2*	c1930	Naish collection, Salisbury, UK	4	153
		c1460	St Mary's Saffron Walden, Essex, UK	4	
		c1445	St John Baptist, Thaxted, Essex	4	
N 15	Hurdle nails unused	1838	Woolmers Cottage	161	154
	Sussex hurdle - unused	c1910	Blacksmith, Marsden, Sussex		
	Essex hurdle - unused	c1930	Naish collection, Salisbury		
	Rafter version - roof framing	1732	Bowlish House, Darshill, Som'set	2	
N 16	Jobent - Door	c1818	Woolmers original house, Tas.	5	155
	Cupboard	c1630	English Heritage, Stuart house	5	
	Cupboard?	c1730s	Found in Wales, R Jones	5	
	Church pew	c1680	Oakham, Leicestershire, TATHS	5	
	Side chapel lock	1520	Kings College Chapel	5	
N 17	Lath nail				156
	Internal walls	1680	Cottage, Hanham Mills, Bristol	5	
	Coved ceiling	1381	Bishop's Camera, Farnham, Surrey	2	
	Internal walls	c1785	High Street, Wells, Somerset	5	
	? ditto	c1720	Glastonbury recycling	5	
	Ceiling	1831	Lower Fort Street, Sydney, NSW	2	
	Ceiling	1842	Female Convicts attic, Woolmers	2	
	Ditto	Ditto	Ditto	2	
	Ditto	Ditto	Ditto	2	
	Ditto	Ditto	Ditto	2	
N 18	Lead head	c1842	Woolmers Cottage	2	157
N 19	Lead clout				158
	Tudor lead roof	1520	Hampton Court Palace	1	
N 20	Lining nails				159
	Window reveal	c1690	Wheatsheaf Inn, Brecon Powys	5	
	Ditto	1730	Tower House, Wells, Somerset	5	
	Window sill	1784	Westminster, UK	5	
	Door lining brad	1846	6 Princes Street, Port Fairy, Vic	5	
	Door lining	1880	Lord Cottage, Yankalilla, SA	5	
	Misericord rose	1351	Chapter House, Ely Cathedral, UK	5	

KEY:	Z 1	Z 2	Z 3	Z 4	Z5
	Roof cladding	Roof inside	Walls	Floor	Linings

REF	NAIL TYPE	DATE	SOURCE/LOCATION	ZONE	PAGE
N-21	Hook nails				160
	Kitchen hook	1828	Woolmers House, Tasmania	5	
	Vestry gas pipe hook	1856	Christ Church, Warrnambool. Vic.	5	
	Tenter hook	c1930	Naish collection, Salisbury, UK	1	
	Netting hook	c1890	R. Jones collection: from Hereford		
	Forged staple	1828	Woolshed, Woolmers. Tas.	5	
	Water pipe hook	1848	Old Museum, Warrnambool	3	
N 22	Pipe nail				161
	Downpipe bracket	c1810	Art Gallery, Hobart. Tasmania	3	
	Billycock pipe nail	c1890	Jones collection. Site unknown	3	
N 23	Pound/Square				162
	Oak roof extension	c1690	Dolgellau, North Wales	2	
	Square, oak barn	c1710	Blakeney, Gloucestershire. TATHS	2	
	Plate (double)	c1930	Naish collection, Salisbury, UK	4	
	Tudor pound spike	c1530	Hampton Court Palace	2	
N 24	Scarf nails – none found	1811	RE tender for Halifax. NS	5	163
N 25	Scuttle/scupper - Unused	c1930	Naish collection, Salisbury, UK		164
	Scuttle nails in door fittings	1231	Thaxted church, Essex. UK	5	
	Scupper square head - unused	c1930	Naish collection, Salisbury, UK		
	Pail nail - unused	c1930	Naish collection, Salisbury, UK		
	Pail nails in medieval chest	c1350	Ely Cathedral apse		
	Granary door latch plate	1820	Brickenden barns. Tasmania	5	
N 26	Shingle nails (x2)	1801	Headcorn. Kent. UK	1	165
N 27	Sign hook - unused	c1930	Naish collection, Salisbury, UK - facade		166
N 28	Slating nails	1732	Bowlish House, Darshill. Somerset	1	167
		c1760	Glastonbury recycling	1	
		1838	Brickenden farmhouse. Tasmania	1	
		1861	Christ Church north nave. W'bool	1	
		1856	Christ Church vestry. W'bool	1	
		1856	Christ Church vestry. W'bool	1	
N 29	Glazing sprigs (x3)	1732	Bowlish House, Darshill. Somerset	5	168
	Gads	c1690	Hanham Mills, Bristol	3	
N 30	Tacks				169
	Rosehead	1680	Wheatsheaf Inn. Brecon Powys	3	
	Roundhead	c1805	Newcomen St. Dartmouth. Devon	3	
	Flemish	1828	Woolmers House bins. Tasmania		
	Flemish	c1870	Crossley cottage, Koroit	3	
	Ditto (x7)	c1930	Naish collection, Salisbury, UK		

KEY:	Z 1	Z 2	Z 3	Z 4	Z5
	Roof cladding	Roof inside	Walls	Floor	Linings

REF	NAIL TYPE	DATE	SOURCE/LOCATION	ZONE	PAGE
N 31	Spikes				170
	Round head**,** spade	c1759	Glastonbury recycling. Somerset	2?	
	Peak-head, sharp	ditto	ditto	ditto	
	ditto	ditto	ditto	ditto	
	Clasp-head	c1780	Greyhound Farm, Shepton Mallet	2	
	Clasp-head	c1745	Bowlish House extension	2	
	Clasp-head	ditto	ditto	2	
	Round-clasp	1732	Bowlish House, Darshill. Somerset	2	
	Die-head	1875	Municipal abattoirs, Warrnambool	5	
N 32	Rivets - plate (x4)	c1828	Woolmers House bins. Tasmania		171
	Plain end	c1445	St Mary Virgin, Saffron Walden. Essex	5	
	Split	c1445	St Mary Virgin, Saffron Walden. Essex	5	
	Split tail	c1450	St Stephen, Herne Hill, Kent	5	
N 33	Die-formed - Peak-head	1875	Motang Barn, Warrnambool	3	172
	Square head	c1880	Farmhouse ruin, Yankalilla. SA	2	
	Round head, round shank	1905	St Annes Convent, Warrnambool	4	
	Round head, round shank	1894	91 Lava Street, Warrnambool	1	
	Round head, round shank	1880	Mt Shadwell Inn stables	1	
N 34 (fixing)	Roves	c1445	St Mary Virgin, Saffron Walden. Essex	5	173
		1231	Thaxted church, Essex. UK	5	
		c1445	St Mary Virgin, Saffron Walden. Essex	5	
N 35 (fixing)	Holdfasts	c1690	Hampton Court Palace	3	174
		1856	Correagh, Hamilton. Victoria	3	
		c1740	Glastonbury recycling	3?	
		1905	6 Princes Street, Port Fairy. Vic	3	
		c1720	Abbey Street. Faversham. Kent	3	
N 36 (fixing)	Forged insertions	c1868	Stables. Murndal. Tahara. Victoria	3	175
		c1820	Woolshed, Woolmers. Tasmania	1	
	Waling bracket	1868	Telegraph hut ext'n. Post Fairy. Vic.	2	
		1838	Stables gutter. Woolmers Cottage	1	
		1842	Coachman's house. Brickenden	4	
		1820	Woolshed, Woolmers. Tasmania	3	
	Waling bracket	1838	Woolmers Cottage. Tasmania	2	

KEY:	Z 1	Z 2	Z 3	Z 4	Z5
	Roof cladding	Roof inside	Walls	Floor	Linings

REF	NAIL TYPE	DATE	SOURCE/LOCATION	ZONE	PAGE
N 37	Cast lath nails	1780	Robert Adam Street. Westminster	3	176
		1784	Harley Street, Westminster	3	
		1825	Oakham. Leics. TATHS	3	
		1835	Manse. Glebe. Sydney. NSW	3	
	Unused (x2)	c1880	R. Jones collection: TATHS		
		c1840	St Aldates. Oxford. UK	3	
N 38	Cast door hobs	c1930	Naish collection, Salisbury, UK		184
N 39	Cast tile pegs		W&D bins, Singleton. UK.		185
N 40	Brass escutcheon nail	c1780	Collection of R Jones, Caerphilly	3	186
N 41	Catenary hook	c1880	Collection of L Vitale, Adelaide, SA	1	187
N 42	Cast door studs	c1750	Collection of R Jones, Caerphilly		188
		c1680	Collection of R Jones, Caerphilly		
		1880	3 Liebig Street, Warrnambool	3	
		c1930	Naish collection, Salisbury, UK	5	
		c1930	Naish collection, Salisbury, UK	5	

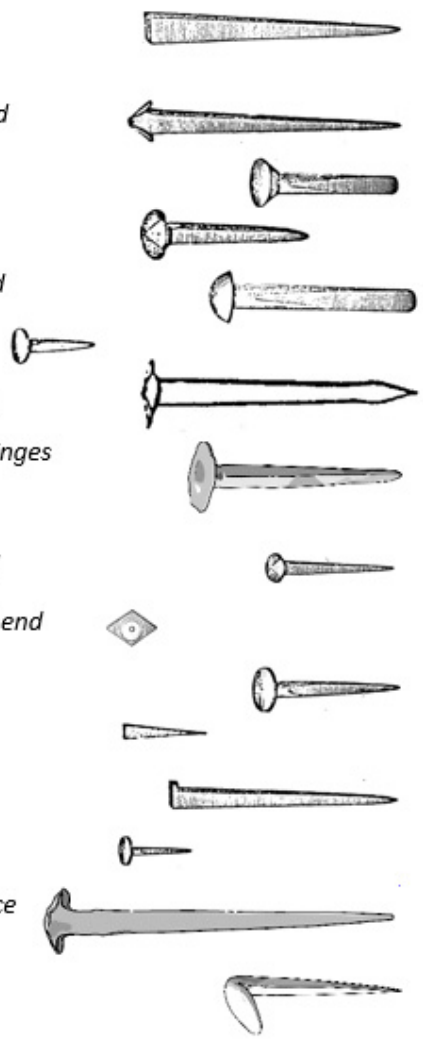
Appendix II

Glossary of names and terms

Glossaire des noms et des termes **Glossar der Namen und Begriffe**

The most commonly encountered historic wrought nails

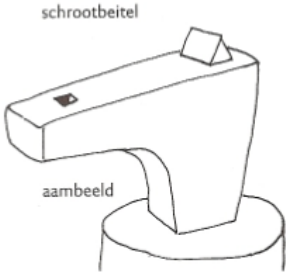
NAME	***CHARACTERISTICS***
Brad	*Headless or spurred shank*
Clasp nail	*Peaked head with wings, often used clenched*
Clout	*Wide, flat headed nail*
Common or rose-head	*Common use nail with 4 facet head*
Die dog	*Hold-down nail with die formed domed head*
Flemish tack	*Flat headed tack with sturdy shank*
Hurdle nail	*Flatish head & shank intended for clenching*
Jobent nail	*Thick shank & ultra-thin head for securing hinges*
Lath nail	*Small rosehead nail. Spurred sprig also used*
Rove	*Square or diamond washer over riveted nail end*
Slate nail	*Flat head with rounded neck*
Sprig	*Simple headless pin with triangular shank*
Spur head brad	*Brad with cocked head on one side*
Tack	*A light flat head, thin shank & sharp point*
T- head nail	*Head often peaked, - a true T-shape in France*
Tenter head (Coopers hooks)	*Shank with side cog in lieu of a head*



Glossary of names and terms:

Glossaire des noms et terminologies des clous en fer forgé
Glossar der Namen und Begriffe: Schmiedeeisennägel

Part 1. Wrought (wrot) iron nails



Anvil (*enclume,* **Amboss**) – an iron block with a hardened or steel top surface. In the Anglo-American tradition nail anvils had a 100mm square top surface. They had a peg projection for it to be set onto a vertical log of hardwood and they varied across Europe and time. Dutch nail anvils were developed from one such type and Janse illustrates this later combination. Sloane shows an American version of the same.

Bloc de fer dont la partie supérieure est acier trempé. Dans la tradition anglo-américaine, les enclumes à clous avaient une surface supérieure carrée de 100 mm. Elles comportaient une excroissance afin d'être fixées dans une buche en bois dur, posée verticalement, et varièrent à travers l'Europe comme au fil du temps. Les enclumes à clous néerlandaises ont été développées à partir d'un de ces types et Janse illustre cette combinaison postérieure. Sloane montre des versions américaines similaires.

Eisenblock mit gehärteter oder stahlbeschichteter Oberfläche. In der anglo-amerikanischen Tradition Nagel amboss war es eine 100mm quadratische Oberfläche. Sie hatten eine Peg-Projektion, damit es auf einen vertikalen Holzstamm von Laubholz gesetzt werden kann und sie variierten in ganz Europa. Niederländische Nagelambosse wurden daraus entwickelt, Hermann Janse illustriert diese spätere Kombination von Amboss und Obore.

Arris – a sharp edge to two plain surfaces as on square, hexagonal, or octagonal sectioned nails.

Arête vive composée par deux surfaces planes à l'instar des clous à section carrée, hexagonale ou octogonale.

Arris – eine scharfe Kante zu zwei glatten Oberflächen wie auf quadratischen, sechseckigen oder achteckigen Schnitt Nägeln.

Aufschiebling (tilting-sprocket, *coyau,)*– these are a standard nailed-on feature of German *Fachwerk* roofs from around 1450, or possibly earlier.

Éléments communs aux toitures Fachwerk allemandes des environs de 1450, voire plus anciens.

Ein Standard-Feature der deutschen Fachwerkdächer ab etwa 1450, oder früher.

Backing nail (*Clou à dos,* **Rückennagel**) – a nail used for fixing timber spacers or battens into a masonry wall having a low facetted head.

Clou utilisé pour fixer des entretoises en bois ou des lattes dans un mur de maçonnerie et dont la tête facettée est abaissée.

Ein Nagel, der zur Befestigung von Holzabstandhaltern oder Latten in eine Mauer mit niedrigem Facettkopf verwendet wird

Bellows nails, (*Clous à soufflets,* **Balgen-nagel**) – were shown by Agricola to have a wide narrow flanged head in order to keep an airtight edge-seal on leather and wood bellows.

Clous, décrits par Agricola, dont la tête large à rebord étroit permet de garantir un joint d'étanchéité entre les parties en cuir et en bois des soufflets.

Einige wurden von Agricola gezeigt, dass sie einen breiten schmalen Flanschkopf haben, um eine luftdichte Kantendichtung auf Leder und Holzbalg zu halten. Eine spätere Entwicklung ist in Abb. 46 dargestellt.

Black trade (*cloutier noir*, **Schwartzen teils**) – relating to common wrought iron.

Relatif au fer forgé ordinaire.

Bezogen auf gewöhnliches Schmiedeeisen.

Block (*billot,* **Bloc**) – a section of hardwood tree trunk stood vertically into which anvils, hardies, and other tools can be mounted.

Section de bois dur dressée verticalement, sur laquelle peuvent être montés des enclumes et d'autres outils.

Ein Abschnitt aus Hartholzbaumstamm stand vertikal in, in dem Amboss, Meissen und andere Werkzeuge montiert werden können.

Bloom (*Masse brute de réduction/Masset, Massiau,* **Eisenluppe**) – a mass of iron and silica formed in the furnace by direct reduction method.

Masse brute composée de fer et de silice produite dans le fourneau par la méthode de réduction directe.

Eine Masse von Eisen und Kieselsäure im Ofen durch direkte Abzugsmethode gebildet.

Box. Godfrey – a Fleming, described as a mechanic on his wife's death certificate, who ran the slitting mill at Dartford, Kent.

Flamand, décrit comme un mécanicien sur le certificat de décès de sa femme, qui dirigeait le fenderie à Dartford, dans le Kent.

ein Flame, der auf der Sterbeurkunde seiner Frau als Mechaniker beschrieben wird und die Schlitzmühle in Dartford, Kent, leitete.

Broad arrow (*Grande flèche,* **Breit-pfeilspitze**) – a mark adopted in 1330 for English Crown or government property and used on items of Royal Navy or British military origin. The same mark is used in Australia today for government property.

Marque adoptée en 1330 pour les biens de la Couronne ou du gouvernement anglais et utilisée sur des articles de la Marine Royale ou d'origine militaire britannique. Aujourd'hui, la même marque est utilisée en Australie pour les biens du gouvernement.

Eine Marke, die 1330 für die englische Krone oder bei Regierungseigentum verwendet wurde und auf Gegenständen der Konigliche Marine oder britischen militärischen Ursprungs. Die gleiche Marke wird in Australien heute für Regierungseigentum verwendet.

Bulmer. Bevis - a mining engineer, was granted a patent for the slitting 'engine' in 1588. His partner and mentor was the Saxon metallurgist Christopher Schütz, co-developer of the machine.

Ingénieur des mines ayant obtenu un brevet pour le "fendage" en 1588. Son associé et mentor était le métallurgiste saxon Christopher Schütz, co-développeur de la machine à fendage.

Ein Bergbauingenieur, erhielt 1588 ein Patent für den Schneidemachine. Sein Partner und Mentor war der sächsische Metallurg Christopher Schütz, Mitentwickler der Maschine.

Burrs (*barbes ou bavures,* **Graten**) – shreds of metal left by shearing action, sometimes found on un-worked lengths of nails forged from slitter made rod. Burrs are common to downward sides of cut nails.

Lambeaux de métal laissés par l'action de cisaillement, parfois trouvés sur des longueurs non travaillées de clous forgés à partir de tige fabriquées par fendage. Les barbes – ou bavures - se retrouvent régulièrement sur les parties inférieures des clous taillés.

Metallfetzen, die durch Scherwirkung zurückbleiben, manchmal auf unbearbeiteten Längen von Nägeln gefunden, die aus Schneidestangen geschmiedet wurden. Grate sind üblich, bei Nägeln von nach unten geschnittenen Seiten.

'Canada' nails (*Clous à tige minces,* **Dünnenagel**) – first made by Canadian nailors, had slender shanks and were copied for export from Britain to countries using mainly softwoods.

Clous initialement fabriqués par les cloutiers canadiens, à tige mince et copiés pour être exportés de Grande-Bretagne vers des pays utilisant principalement des bois résineux.

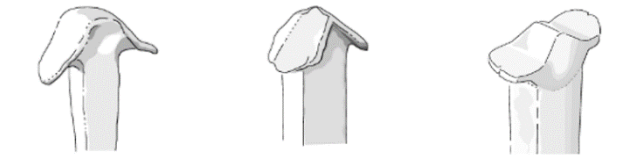
Zuerste im Kanada geschmeidet mit dünnen Flansch, die war copiert bei die Englischer nagel Fabriken fuer export in dieses Laender wer hattet meistlich gleichholtz.

Classes (of nails) - these relate to the shank thickness and robustness of the finished item, and the terms vary through history. The four main classes for common nails were 'Long or Fine', 'Bastard or Middle', 'Strong or Stout, and 'Stone or Masonry'. A fifth grade, 'Canada' was extra thin, (see above).

Catégories relatives à l'épaisseur de la tige et la robustesse du clou. Les termes employés varient au fil de l'histoire. Les quatre principales catégories pour les clous courants étaient "long ou fin", "bâtard ou moyen", "fort ou robuste" et "pierre ou maçonnerie". La cinquième, "Canada", était très fine (voir ci-dessus).

Diese beziehen sich auf die Schaftdicke und Robustheit des fertigen Artikels, und die Begriffe variieren durch die Geschichte. Die vier Hauptklassen für gemeinsame Nägel waren 'Long or Fine', 'Bastard or Middle', 'Strong or Stout, and 'Stone or Masonry'. Eine fünfte Klasse, "Kanada", war extra dünn (siehe oben).

Clasp nails (*Clous à ailettes/aile de mouche,* **Klammernägel**) – were designed to grasp the timber fibres when driven below the wood surface. Wrought versions have been found in medieval settings in England, Belgium and Germany. There was also a cut nail version made in Britain.



German clasp nail, 1665 British wrought clasp nail, 1784 British cut clasp nail 1870

Clous conçus pour s'agripper aux fibres du bois lorsqu'ils sont enfoncés sous la surface. Des versions forgées ont été trouvées dans des contextes médiévaux en Angleterre, en Belgique et en Allemagne. Il existe également une version à clous taillés fabriquée en Grande-Bretagne.

Klammernägel haben dünne Flügel, damit sie besser in den Holzfasern halten. Die älteste Sammlung solcher Nägel wurden ca. 1180 in Riga in einer deutschen Siedlung gefunden.

Clenched nails: single-clenched, left: double-clenched, right.

(*clous à un et deux plis,* **Gebogene/Doppeltgebogene nägel**)

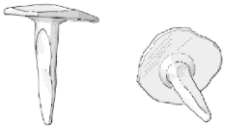
Clous à pli : simple, à gauche : double, à droite

Single-gebogene, links: doppelt gebogene, rechts.

Clout nail (*clous a tête plate,* **Reissnägel**): – a short nail with a wide, thin flanged, head:

Clou court à tête large, dont l'épaisseur s'affine vers le bord.

Ein kurzer Nagel mit einem breiten, dünnen Flansch, Kopf.



Cog (*ergot*, **Zahnrad**) – a bend of the nail shank used in lieu of a formed head. See also tenter head.

Pli dans la tige du clou utilisé à la place de la tête.

Biegung des Nagelschafts, die anstelle eines geformten Kopfes verwendet wird.

Commons (*Clous communs*, **Fastnägel**) – rose-head nails with square or rectangular shanks suitable for most common purposes.

Clous à tête de rose et à tige carrée ou rectangulaire, adaptés aux usages les plus courants.

Rosenkopfnägel mit quadratischen oder rechteckigen Schaften geeignet für die häufigsten Zwecke.

Cold-shut (*Repli de forgeage*)– a join in nail rod carried out below 'red heat' in which part of the iron fails to weld properly.

Joint dans la tige d'un clou façonnée à «rouge » où une partie du fer ne se soude pas correctement.

Eine Verbindung in Nagelstange unter "roter Hitze" durchgeführt, in dem ein Teil des Eisens nicht richtig geschweißt ist.

Countersunk, Contra-counter sunk, (*Clou à tête fraisée*, **Senkkopf Nagel**) - a nail head designed to fit into a sunken V-rebate in thick iron straps or plates. First referred to as 'synck-head'. The iron rims of a Celtic chariot found at Joncherry-sur-Suippes, Marne, circa 5th century BC, were fixed with countersunk head, single-clenched, iron nails, (Musée de St-Germain–en-Laye).

Tête de clou conçue pour s'insérer dans une fente en V ménagée dans des bandes ou des plaques épaisses en fer. Les jantes en fer d'un char celtique retrouvées à Joncherry-sur-Suippes, dans la Marne, daté du 5ème siècle av. J.-C. environ, étaient fixées avec des clous en fer à tête fraisée, à pli simple, (Musée de St-Germain-en-Laye). .

Der Nagelkopf, der entworfen wurde, um in einen versunkenen V-Rabatt in dicke Eisenbänder oder Platten zu passen. Die eisernen Felgen eines keltischen Wagens, der in Joncherry-sur-Suippes, Marne, um das 5.th Jahrhundert v. Chr. gefunden wurde, wurden mit Senkkopf, single-geballt, Eisennägel neriert.

Cramp (also Crampon), (*Agrafe ou Broche,* **Fessel***)* – a wide, thinner form used in latches was termed a 'keeper'. In the Baltic much larger versions often served to join abutting ends, such as top plates supporting roof framing.

Forme large et appointée utilisée dans les verrous et désignée sous le terme « 'agrafe ». Dans les pays baltes, des versions beaucoup plus grandes servaient souvent à joindre des extrémités contiguës, comme les sablières supportant du toit.

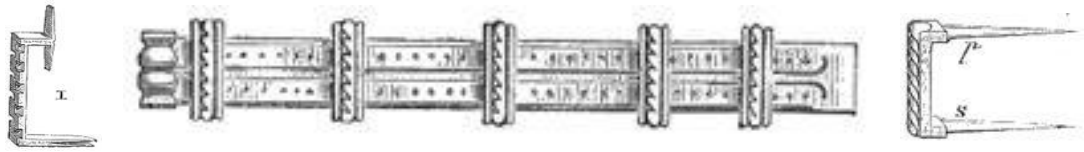
Eine breite, dünnere Form, die in Riegeln verwendet wurde, wurde als "Krampe" bezeichnet. In der Ostsee Staten dienten oft dazu, an butting enden, wie obere Platten, die Dachrahmen stützen.

Narrow cramps of iron in a U-shape with two pointed ends and squared corners can be described as '**bridle-staples'**, (*brides,* **Zaunklammern**). These were used to anchor or to reinforce hinges on heavy doors and in England were mostly plain. Repair straps were often re-used felloes:

Brides de fer étroites en forme de U avec deux extrémités pointues et des coins carrés peuvent être décrites comme des « agrafes de bride ». Elles étaient utilisées pour ancrer ou renforcer les charnières des portes lourdes et, en Angleterre, étaient pour la plupart simples. Les bandes de réparation étaient souvent composées de matériel de réemploi.

Schmale Krampen aus Eisen in U-Form mit zwei spitzen Enden und quadratischen Ecken können als "Zaunklammern" beschrieben werden. Diese wurden verwendet, um Scharniere an schweren Türen zu verankern oder zu verstärken sie waren meist glatt. Reparaturgurte wurden oft wiederverwendet.

Violet le Duc shows how in the French tradition these were often decorative, forming part of the door features and how some bridle-staples had split ends enabling bi-clenching:



Violet le Duc *montre que, dans la tradition française, elles étaient souvent décoratives, faisant partie des caractéristiques de la porte et que certaines brides avaient les extrémités fendues (fourchées) permettant un double pli de serrage.*

Violet le Duc zeigt, wie diese in der französischen Tradition oft dekorativ waren und dieTürelemente bildeten und wie einige Zaumklammern geteilte Enden hatten, die das Doppeltgebogene ermöglichten.

Diagnostics (*Éléments diagnostics,* Diagnosticien) - features exhibited by marks or material left on nails acting as clues to identification or helping establish original use are described further below.

Caractéristiques qui rassemblent les marques ou les matériaux laissés sur les clous et qui servent d'indices à l'identification ou aident à établir leur utilisation originale. Ces éléments sont décrits plus loin.

Merkmale, die durch Marken oder material links aufNägeln dargestellt werden, die als Hinweise auf die Identifizierung oder Hilfe bei der Feststellung der ursprünglichen Verwendung dienen, werden unten beschrieben.

Die-dog (*Clou à tête martelée,* Stempelnagel) – a thick rounded nail usually with a 'sharp' point, used to fix metal plates or lead flashings. 'Dogs' - are U-shaped metal bars with sharp points used to hold logs during hewing, also known as cramps or crampons when used in masonry, first mentioned in 1338. 'Die' refers to the hollow punch or 'trussel' used to form the raised domed head. A larger form was used to fix medieval lead pipes and this is confusingly know as a 'lead' nail – the term first appears in 1226.

Clou épais et arrondi, généralement terminé par une pointe effilée, utilisé pour fixer des plaques de métal ou des solins en plomb. Les « fers de tailles » sont des barres métalliques en forme de U, à pointes acérées, utilisés pour maintenir les rondins durant le débitage. Ils sont également connus sous le nom de crampons ou d'agrafes quand ils sont utilisés dans la maçonnerie. Ils sont mentionnés pour la première fois en 1338. Le terme "matrice" fait référence au poinçon creux ou au « treillis » utilisé pour former la tête bombée. Une forme plus grande a été utilisée pour attacher les tuyaux de plomb médiévaux et est connue sous le nom ambigu de « clous de plomb », dont la première mention apparaît en 1226.

Ein dicker abgerundeter Nagel, der in der Regel mit einem "scharfen" Punkt verwendet wird, um Metallplatten oder Bleiblitze zu fixieren. "Hunde" - sind U-förmige Metallstäbe mit scharfen Punkten verwendet, um Stämme während des Hauen zu halten, auch bekannt als Krämpfe oder Steigeisen, wenn in Mauerwerk verwendet, zum ersten Mal im Jahre 1338 erwähnt. Ein hohlen Stempel ("Trussel"), der verwendet wird, um den erhöhten Kuppelkopf zu bilden. Eine größere Form wurde verwendet, um mittelalterliche Bleirohre zu reparieren und dies ist verwirrend als "Blei" Nagel bekannt.

Dogs (*fers de taillage*, **Haüneisen**). Usually used in pairs, are like clamps except they are sharply pointed and used temporarily in hewing timbers. (Photo: Fiona Keith-Lucas).

Pièces généralement utilisées par paires. Ils ressemblent à des pinces, à l'exception de leurs extrémités appointées et sont utilisés temporairement lors de l'équarré du bois.

Wie Klammern, sie sind scharf und spitz im hauen Hölzer.

Eastern School – the method used in China, Japan, in which nail heads are formed by folding of the iron shank on the anvil without recourse to a heading tool (obore). The method is best explained by classical Japanese nails:

TECHNIQUE	HEAD	FULL NAIL	COMMENT
SINGLE FOLD-OVER *Wakugi Kia-ore (Orekugi)*			Tenter head shape
DOUBLE; FOLD-DOWN *Nijuu-orekugi*			Spur head shape
FLATTENED & ROLLED TOP *Maki-goshira*			T-heads & fancy heads

Méthode utilisée en Chine et au Japon, selon laquelle les têtes de clous sont produites par pliage de la tige de fer sur l'enclume sans recours à un outil pour façonner la tête (clouiere). Les clous japonais classiques en sont les meilleurs exemples.

Der Methode in China angewandte, Japan, beide Nagelköpfe durch Falten des Eisenschafts auf dem Amboss ohne Rückgriff auf ein Nagelstab (Obore). Die Methode lässt sich am besten durch klassische japanische Nägel erklären:

Facet (*facete/pan*, **Flach**) – a flat surface on the nail head, normally formed with one blow of the hammer. A 'common' nail would usually have four facets and the head was then called a 'rosehead'.

Surface plane sur la tête de clou, normalement formée d'un seul coup de marteau. Un clou « commun » avait habituellement une tête à quatre facettes, appelée « tête de rose ».

Eine flache Oberfläche auf dem Nagelkopf, normalerweise mit einem Schlag des Hammers gebildet. Ein "gemeinsamer" Nagel hätte in der Regel vier Facetten und der Kopf wurde dann als "Rosenkopf" bezeichnet.

Flemish (tack) – a tack with extra thick, tapering shank.

Pointe à tige très épaisse et effilée.

Ein Tack mit extra dickem, verjüngendem Schaft.

Forelock bolt (*Boulon à clef*, **Verschlossschraube**) – a threadless bolt with an end slot in which a thin triangle of iron passes through to be bent over. Photo David Wilkins.

Boulon non-filé avec une fente distale dans laquelle un mince triangle de fer est inséré pour être plié·

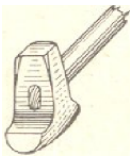
Ein fadenloser Bolzen mit Endschlitz, in dem ein dünnes Dreieck aus Eisen durchläuft, um sich zu beugen.

Franchimont (Theux) hammer – a form of tilt hammer predating the *Zeinhammer* used to split off thin elements of iron in rod form from a ribbon of wrought iron. First mentioned in 1449 it has been brought to attention by Paul Bertholet and Professor Patrick Hoffsummer after discovery of an extant hammer head at Theux church belfry.

Forme de marteau à bascule, antérieur au Zeinhammer, utilisé pour découper de minces éléments de fer sous forme de tige à partir d'un ruban de fer forgé· Mentionné pour la première fois en 1449, il a été mis en évidence par Paul Bertholet et le Professeur Patrick Hoffsummer suite à la découverte d'une tête de marteau ayant survécu dans le beffroi de l'Eglise de Theux·

Eine Form von Kipphammer vor dem *Zeinhammer* verwendet, um dünne Elemente aus Eisen in Stangenform von einem Band aus Schmiedeeisen zu trennen. Erstmals 1449 erwähnt, wurde von Paul Bertholet und Professor Patrick Hoffsummer nach der Entdeckung eines erhaltenen Hammerkopfes am Glockenturm der Theux-Kirche auf ihn aufmerksam gemacht

Fuller (*marteau fullage*, **Reckhammer**) – a heavy, snub-nosed chisel or hammer used to spread iron bar. The term has often been misapplied to a die stamp, or 'trussel'.



Ciseaux ou marteau lourd, à nez retroussé, utilisé pour étendre la barre de fer· Le terme a souvent été appliqué à tort à un poinçon ou à un « treillis »·

Ein schwerer, Meißel oder Hammer verwendet, um Eisenstange zu verbreiten. Der Begriff wurde oft falsch auf eine Die-Marke oder "Trussel" angewendet.

Gate nail (*Clou à porte de champs*, **Feldtornagel**) – a rectangular or square section nail with a wider than average flattened head. They vary according to the type of timber used in any particular location.

Clou de section rectangulaire ou carré avec une tête aplatie plus large que la moyenne. Ils varient selon le type de bois utilisé dans un lieu donné.

Ein rechteckiger oder quadratischer Schnittnagel mit einem breiteren als durchschnittlich abgeflachten Kopf. Sie variieren je nach Holzart, das an einem bestimmten Ort verwendet wird.

Galvanised nails (*Clous galvanisés*) – early wrought iron nails in exposed locations were sometimes dipped into liquid zinc and first appear in numbers around 1840.

Les premiers clous en fer forgé utilisés dans des endroits soumis aux intempéries ont parfois été trempés dans le zinc liquide. Ils apparaissent pour la première fois de manière récurrente vers 1840.

frühe schmiedeeiserne Nägel an exponierten Stellen wurden manchmal in flüssiges Zink getaucht und erscheinen erstmals in Zahlen um 1840.

Gold nails (Clous en or) – used in upholstery of royal seats since Roman times, and mentioned by Christoff Weigel in 1698, and by Diderot c 1760. A solid gold, one inch (27mm) version, found at Draguignan in Provence, and a hollow head upholstery nail recovered from the Rhone, courtesy Dr Claude Sintès, Arles Regional Museum. Photos Arturs Lapins.

Clous utilisés par les tapissiers garnisseurs pour les sièges royaux, depuis l'époque romaine. Ils sont mentionnés par Christoff Weigel en 1698 et, vers 1760, par Diderot. Sur la photo, une version en or massif, d'une longueur d'un pouce (27 mm), retrouvée à Draguignan en Provence, et un clou d'ameublement à tête creuse récupéré dans le Rhône. Photos Arturs Lapins.

Nägel verwendet in der Polsterung der königlichen Sitze seit der Römerzeit, und erwähnt von Christoff Weigel in 1698, und von Diderot c 1760. Eine massive Gold-Version mit einem Zoll (27 mm), die bei Draguignan in der Provence gefunden.

Greenstick fracture (rupture greenstick, **Grünholtzfractur**). Partial fracture which leaves a structural member in an impaired condition.

Fracture partielle qui laisse un élément structurel dans un état altéré.

Medizinischer Ausdruck z.B. für einen unvollständiges Knochenbruch der nicht getrennte Teile hinterläßt.

Holdfast (*Clou à patte,* Befestigung)

Hack iron (*Ciseau à clous,* Nagelmeissel) – a fixed, vertically set chisel, either in an anvil or in a block.

Ciseau fixé verticalement, dans une enclume ou dans un bloc.

Ein fester, vertikal gesetzter Meißel, entweder in einem Amboss oder in einem Block.

Holding power *(Puissance de d'accroche,* Haltekraft) – data relating to the withdrawal force needed for certain nail types in different timbers. Best known are nail tests by the US Army at Waterford Arsenal in 1884. See tests below).

Données relatives à la force nécessaire au retrait de certains types des clous dans différents bois. Les plus connus sont les clous testés par l'armée américaine à l'arsenal de Waterford, Boston, en 1884.

Daten über die Entnahmekraft, die für bestimmte Nageltypen in verschiedenen Hölzern benötigt werden. Die bekanntesten Nageltests beziehen sich auf Versuche der US Army im Waterford Arsenal im Jahr 1884.

Hurdle nail (*Clous de haies,* Hürdennägel) –similar to a gate nail (see above), but usually of rectangular section used, mainly used to make sheep hurdles of split chestnut.

Clous similaires à ceux de barrière (voir ci-dessus), mais habituellement de section rectangulaire et utilisés principalement pour faire des haies en chatignier pour garder les moutons.

Nagel ähnlich wie ein Feldtornagel (siehe oben), aber in der Regel von rechteckigem Abschnitt verwendet, vor allem zur Herstellung von gespaltenen Kastanien, Schafe Hürden.

Jobent nail (*clou à gonds,* Kürisnagel) – a nail used in lieu of a countersunk head, usually having a thin flanged head and an extra thick neck. They were used to secure hinges on furniture and fittings.

Clou utilisé au lieu d'un clou à tête fraisée, ayant généralement une tête mince et un cou très épais. Ils étaient utilisés pour fixer les charnières et les ferrures sur les meubles.

Ein Nagel, der anstelle eines Senkkopfes verwendet wird, der in der Regel einen dünnen Flanschkopf und einen extra dicken Hals hat. Sie wurden verwendet, um Scharniere auf Möbeln und Armaturen zu sicher.

Krausseisen (curvy iron) - cut wands from off a heated iron strip done by the *Zeinhammer.* Also termed *Zahneisen* and *Stabeisen* in the various German texts.

Pièce en fer chauffée et découpée à l'aide d'un Zeinhammer afin de produire des baguettes. Cet élément est également appelé Zahneisen et Stabeisen dans les différents textes allemands.

Kurviges Eisen - Stäbe aus einem beheizten Eisenstreifen vom *Zeinhammer geschnitten.* Auch *Zahneisen* und *Stabeisen* in den verschiedenen deutschen Texten genannt.

Lath (Reparation) nails (*Clous de latte.* **Lattenägel**) – either small sprigs or small commons, used to fix laths to wall framing. From around 1820 they were progressively replaced by a cut version which by 1845 was used almost exclusively.

Petits brins ou petits clous communs, utilisés pour fixer les lattes à la charpente. À partir de 1820 environ, ils ont été progressivement remplacés par une version taillée utilisée presque exclusivement dès avant 1845.

Entweder kleine Zweige oder kleine Festnagel, verwendet, um Latten an Wandrahmen zu fixieren. Ab etwa 1820 wurden sie nach und nach durch eine Schnittversion ersetzt, die 1845 fast ausschließlich verwendet wurde.

Lining nails (*Clous d'encadrement*, **Verschalungsnägel**) – flattened commons used to fix softwood linings to window reveals from 1700 or so. Later versions were wrought or cut.

Clous communs aplatis utilisés pour fixer des garnitures de bois tendre aux fenêtres. Ila apparaissent vers 1700. Les versions ultérieures ont été forgées ou taillées.

Abgeflachte Fastnägel verwendet, um Weichholz-Futter auf Fenster zu fixieren zeigt von 1700 oder so. Spätere Versionen wurden geschmiedet oder geschnitten

Magic nails, (*Clous votifs*, **Magische Nägel**/**Opfernägel**), also called **Votive nails, Oblation nails, Curse nails** and ***Defixiones,*** – are often of high value, gold or electrum plated as appropriate gifts to a deity. They were left at specific locations, especially springs and rivers. They are identified by being distorted to be made dysfunctional. This sample, ragged in reverse, suggests a malign intent and falls into the group called '*defixinones*'. Photo Arturs Lapins.

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Clous utilisés à des fins rituelles, ils ont souvent de grande valeur, plaqués or ou d'électrum, et sont des cadeaux destinés à une divinité. Ils ont été placés à des endroits précis, en particulier en relation avec les sources et les rivières. Déformés, ils

sont rendus inutilisables. Cet échantillon, entaillé à rebours, suggère une intention malveillante et appartient au groupe des « Defixiones ». Ce clou est l'un des nombreux retrouvés dans le Rhône et est ici photographié par Arturs Lapins, grâce à Dr Claude Santés directeur, Musée Régional d'Arles.

Sind oft von hohem Wert, gold or electrum als geeignete Geschenke. Sie wurden an bestimmten Orten zurückgelassen, insbesondere an Quellen und Flüssen. Sie werden dadurch identifiziert, dass sie verzerrt werden, um dysfunktional gemacht zu werden. Dieses Beispiel, umgekehrt zerrissen, deutet auf eine bösartige Absicht hin und fällt in die Gruppe namens "*Defixinones*".

Mushroom head (Clou à *tête de champignon,* **Pilskopfnagel**) – usually a die-formed head made with a special obore such that the perimeter edge hangs down. Diderot uses the analogy of a skull cap (*calotte*).

Clou dont la tête est habituellement moulée à l'aide d'une clouiere spéciale qui replie le bord extérieur vers le bas. Diderot fait l'analogie avec la calotte crânienne.

In der Regel ein eingeformter Kopf mit einem speziellen Obore, so dass die Umfangskante nach unten hängt. Diderot verwendet die Analogie einer Schädelkappe.

Neck (*encolure /collet,* **Hals**) – the section of shank swelled out by heading which took up the shape of the tapered hole of the obore and is a precursor to providing a haunch to reinforce the head.

Section de la tige, dilatée lors du façonnage de la tête, qui a pris la forme effilée du trou de la clouiere et est un précurseur d'un épaulement de renfort pour la tête.

Der Teil des Schafts schwillte durch Überschrift, die die Form des verjüngten Lochs des Obore nahm und ist ein Vorläufer für die Bereitstellung eines Haufens, um den Kopf zu verstärken.

Obore, 'Header' USA, (*clouiere,* **Nagelstab**) – an iron baton with one or more holes of different sizes, usually square, used to hold the hot nail shank during heading.

Bâton de fer comportant un ou plusieurs trous de différentes tailles, généralement de forme carrée, utilisé pour maintenir la tige chauffée du clou lors du façonnage de la tête.

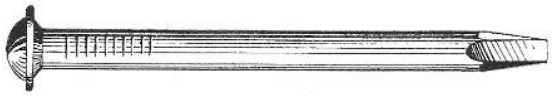
Ein Eisenstab mit einem oder mehreren Löchern unterschiedlicher Größe, meist quadratisch, verwendet, um den heißen Nagelschaft während der Überschrift zu halten.

Oliver – a pedal activated heavy hammer usually associated with flattening nails or heading them with a pre-set die but also used for other purposes.

Marteau lourd activé par une pédale, généralement associé à l'affinage des clous ou au façonnage de leur tête par le biais d'une matrice montée sur le marteau· Ils sont également utilisés à d'autres fins.

Ein Pedal aktiviert schwere Hammer in der Regel mit abflachenden Nägeln verbunden oder Überschrift sie mit einer voreingestellten Matrize, sondern auch für andere Zwecke verwendet.

Pipe nail – nails driven into masonry in order to fix downpipes. Pipe nails and die dogs are conventionally made with rounded shanks. Later versions came with a fixed washer and were known as 'Billycock hat nails'.



Clous enfoncés dans la maçonnerie afin de fixer les tuyaux de descente· Les clous à tuyau et les clous « à tête martelée » sont traditionnellement fabriqués avec des tiges arrondies· Les versions ultérieures sont équipées d'une rondelle fixe et ont sont connues sous le nom de « clous à chapeau Billycock·

Rohrnagel – Nägel in Mauerwerk getrieben, um Fallrohre zu fixieren. Rohrnägel und Diehunde werden konventionell mit abgerundeten Schaeften hergestellt.Rohrnagel spätere Versionen kamen mit einer festen Scheibe und wurden als "Billycock Hut Nägel" bekannt.

Plaster nails (Clou à plâtre , **Kreuz Nägel**) – wrought iron nails with a broad head and stout shank used to anchor wet render coatings to buildings and to attach decorative plaster work. (Sample from Noisy grotto of 1580. Courtesy Dr Bruno Bentz).

Clous en fer forgé à tête large et tige robuste utilisé pour ancrer les enduits humides sur les bâtiments et fixer les plâtres décoratifs· (Échantillon de la grotte de Noisy, 1580, avec l'aimable autorisation du Dr Bruno Bentz)

Schmiedeeiserne Nägel mit einem breiten Kopf und stout Schaft verwendet, um nassen Raenderbeschichtungen an Gebäuden zu verankern und dekorative Putzarbeiten zu befestigen. Zuerste nach der Entdeckung von Christoff Weigel, in Regensburg notiert im 1698.

Points – the most common terms used are; 'Fine or Sharp, Spear, Spoon, & Chisel'.

Les termes les plus couramment utilisés sont « Fin ou pointu, pique, cuillère, ciseaux »·

Die gebräuchlichsten Begriffe sind; Fein oder scharf, Speer, Löffel & Meißel.

Protective coatings – nails prone to rust, such as wrought slate nails, were boiled in linseed oil. The Romans were familiar with the tinning process which was used for ceiling nails and for those used

to fix fabrics and tapestries to walls during medieval times. A preventive paint used plumbago mixed with sulphates of lead and zinc in a linseed oil. Early iron wire nails are often found varnished in a brown-gold colour. See also tinning and galvanising.

Les clous sujets à la rouille, tels ceux forgés pour fixer les ardoises, ont été bouillis dans l'huile de lin. Les Romains connaissaient le procédé d'étamage, utilisé pour les clous de plafond, mais également, à l'époque médiévale, pour ceux destinés à fixer les tissus et les tapisseries aux murs. Un traitement préventif utilisait le plumbago mélangé à des sulfates de plomb et de zinc dans une huile de lin. Les premiers clous de fil de fer sont souvent retrouvés avec un vernis dans une couleur brun-or. Voir aussi étamage et galvanisation.

Rostanfällige Nägel, wie z. B. schmiedeeiserne Schiefernägel, wurden in Leinöl gekocht. Die Römer waren mit dem Verzinnungsprozess vertraut, der für Deckennägel und für diejenigen verwendet wurde, um Stoffe und Wandteppiche an Wänden während des Mittelalters zu befestigen. Ein vorbeugender Paint verwendet Plumbago mit Sulhatesvon Blei und Zink in einemLeinöl gemischt. Frühe Eisendrahtnägel werden oft in braun-goldener Farbe lackiert gefunden. Siehe auch Verzinnung und Verzinkung.

Ragged/Barbed shank (*Tige barbelée,* **Hakenes-steil**)

Reckhammer – a tilt-hammer with rounded end head used to extend metal ribbon.

Marteau basculant à extrémité arrondie, utilisé pour étaler le ruban métallique.

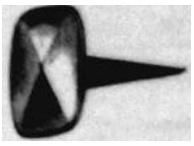
Rosehead – the four facetted head usual to commons and most other nails.

Tête à quatre facettes, habituelle pour les clous communs et la plupart des autres clous.

Vier facettierte Köpfe üblich zu Commons und die meisten anderen Nägel.

Rove, (*Plaquette, ou Patte de fixation,* **Reeve**)

Scupper nail –



Scuttle/hod nail (*Clou a seau,* **Eimernagel**) – the head shape is similar to a large clout but with a smooth top surface and with rounded edges; used for hods and scuttles.

Morphologie de la tête semblable à une large calotte, dont la surface supérieure lisse et les bords arrondis. Elle est utilisée pour les seaux et les hublots.

Die Kopfform ist ähnlich wie ein großer Reissnägel, aber mit einer glatten Oberfläche und mit abgerundeten Kanten; für Schiffschen usw verwendet.

Schütz (Christopher) – a pupil of Georgius Agricola, was a Saxon mining engineer and metallurgist. He was a co-developer of the slitting machine with his younger English partner, Bevis Bulmer.

Elève de Georgius Agricola, il était un ingénieur des mines et métallurgiste saxon. Il a été le co-développeur de l'engin à fendage avec son jeune partenaire anglais, Bevis Bulmer.

Ein Schüler von Georgius Agricola, war ein sächsischer Bergbauingenieur und Metallurgen aus St Annaberg. Zusammen mit seinem jüngeren englischen Partner Bevis Bulmer war er Mitentwickler der Schneidemaschine, der ‚Schlicter'.

Shingling nails (*Clous à galets,* **Schidelnägel**) – those used to fix split timber shingles onto roofing battens comprising small rose-head commons with a reduced spread to the head.

Clous utilisés pour fixer des bardeaux de bois fendus sur des lattes de toit. Ils comprennent de petits clous communs à facettes dont la tête est de dimensions réduites.

Jene, die verwendet werden, um gespaltene Holzschindeln auf Dachlatten zu fixieren, die aus kleinen Rosenkopf- Fastnägel mit einer reduzierten Ausbreitung auf den Kopf bestehen.

Slating nails (*Clou d'ardoisier,* **Schiefernägel**) – used to fix roof slates. To limit the chance of fracturing the stone the shank necks were carefully rounded. Their heads were flat with minimal thickness flanges.

Clous utilisés pour fixer les ardoises sur les toits. Pour éviter d'endommager la pierre, les cous des tiges sont soigneusement arrondis. Leurs têtes étaient plates avec des brides d'épaisseur minimale.

Verwendet, um Dachschiefer zu fixieren. Um die Wahrscheinlichkeit zu begrenzen, den Stein zu brechen, wurden die Schäfte sorgfältig abgerundet. Ihre Köpfe waren flach mit minimalen Dickenflanschen.

Spike (*Pointe,* **Spitze**) – term used for nails in excess of 5 inches (125 mm) or so long. Headless floor brads are sometimes referred to as floor spikes due to their square, thicker shanks.

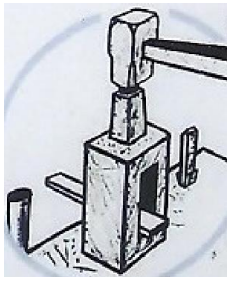
Terme utilisé pour les clous de plus de 5 pouces (125 mm) de long. Les pointes sans tête sont parfois appelés pointes de parquet en raison de leurs tiges carrés et plus épaisses.

Begriff für Nägel von mehr als 125 mm Länge. Kopflose Boden-Brads werden manchmal als Bodenspitzen aufgrund ihrer quadratischen, dickeren Schäfte bezeichnet.

Sprig, (*Clou brin,* **Zwecken**) – a headless or spur-head small brad. *Petite pointe sans tête ou à tête d'épingle.* **Ein kopfloser oder spornköpfiger kleiner Brad**.

Spur head floor nail (*Clou à tête de bec,* **Abgeflachte fussbodennagel**)

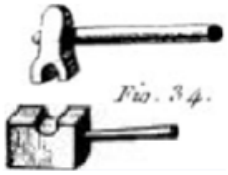
'Stiddy' – a vertical mould, add-on extension to the top of a standing obore, which had an internal form shaped to take a heated offcut of nail rod. A blunt chisel point and die formed head would be struck with the same blow of the Oliver hammer. Used in Britain and in Belgium.



Moule vertical, extension ajoutée au sommet d'une clouiere fixe, dont la forme interne était conçue pour recevoir un bout de la tige chauffée du clou. Une pointe de ciseau émoussé et un moule pour la tête étaient frappés par un même coup de marteau de type Oliver. Utilisé en Grande-Bretagne et en Belgique.

Eine vertikale Form, Add-on-Verlängerung an der Spitze eines stehenden Nageleisen, die eine innere Form geformt hatte, um einen erhitzten Ausschnitt von Nagelstabchen zu nehmen. Ein stumpfer Meißelpunkt und ein abgestorbener Kopf würden mit dem gleichen Schlag des Oliver-Hammers getroffen. Wird in Großbritannien und Belgien verwendet.

Swages – normally come in two parts, bottom swage and top swage, by means of which roughly rounded nail rod was finished to an accurate round section by hammering.



Normalement composé de deux parties, une matrice inférieure et supérieure, au moyen desquelles la tige de clou grossièrement arrondie est terminée par martelage afin d'obtenir une section ronde soigneuse.

In der Regel kommen in zwei Stuck, Boden- und Oberstaus, mit denen grob abgerundete Nagelstange zu einem genauen runden Abschnitt durch Hämmern beendet wurde.

Tilt-hammer, (*Martinet/marteau mécanique/Maka***, Streckhammer/Raffinierhammer**):

A large hammer set on a pivoting beam, with one end often activated by water wheel.

Grand marteau monté sur une poutre mobile, dont une extrémité est activée, généralement par la roue à eau.

Ein großer Hammersatz auf einem schwenkbaren Balken, dessen entgegengesetztes Ende durch ein Wasserrad aktiviert wurde.

Tinned nails, 'white nails', (*Clous en fer blanc,* **Verzintennägel**) – were common in the Middle Ages were for use with tapestry and for high quality ceiling work. Nails used in external doors and in furniture were also often tinned. The process is described by Diderot and mentioned by Weigel.

Clous communs au Moyen Âge, ils étaient utilisés pour la tapisserie et les plafonds de grande qualité. Les clous utilisés dans les portes extérieures et les meubles étaient aussi régulièrement en étamés. Le procédé est décrit par Diderot et mentionné par Weigel.

Waren im Mittelalter üblich für den Einsatz mit Wandteppich und für hochwertige Deckenarbeiten. Auch Nägel, die in Außentüren und Möbeln verwendet werden, wurden oft verzinnt. Der Prozess wird von Diderot beschrieben und von Weigel erwähnt.

'Tommy hammer' – a slang term for a die headed hammer arrangement used with a 'stiddy' to produce simple spikes from heated off-cuts of nail rod.

Terme d'argot pour désigner un marteau à moule utilisé avec un « stiddy » pour produire de simples pointes à partir de chutes chauffées issues des tiges de clous.

Ein Slang-Begriff für eine Die-Kopf-Hammer-Anordnung, die mit einem "Stiddy" verwendet wird, um einfache Spitzen aus erhitzten Abschlägen von Nagelstangen zu erzeugen.

Trussel, (Estampe, Stempel**)** – the term for a hand held die or stamp used to form a shaped head.

Terme employé pour désigner une matrice ou un tampon utilisé pour façonner la tête du clou.

Der Begriff für eine handgehaltene Diebin oder Einen Stempel, der verwendet wird, um einen geformten Kopf zu bilden.

Zeinhammer – a dialect word used in Regensburg for *Zahnhammer* or 'Tooth hammer" in which a tilt hammer, with a projecting lip, is used to progressively shear an iron strip in short sections. The sole source image comes from Christoff Weigel in 1698 but it was probably in existence in 1470 or so. See also *Krausseisen*.

Mot dialectal utilisé à Ratisbonne pour désigner le Zahnhammer ou « marteau à dents », où un marteau à bascule, avec une lèvre saillante, est utilisé pour cisailler progressivement une bande de fer en courtes sections. L'unique image originale provient de Christoff Weigel en 1698, mais ce marteau existait probablement aux environs de 1470. Voir aussi Krausseisen.

Eine Dialektbezeichnung, wird in Regensburg Bayern/Deutschland für *Zahnhammer* oder "Zahnhammer" verwendet, bei dem ein Kipphammer mit einer projizierten Lippe verwendet wird, um nach und nach einen Eisenstreifen in kurzen Abschnitten abzuschneiden. Das einzige Quellbild stammt von Christoff Weigel im Jahre 1698, aber es existierte wahrscheinlich schon im Jahre 1470. Siehe auch *Krausseisen*.

2. Cast nails and casting: (*Clous moulés et moulage*, **Gegossene Nägel**)

Casting from copper and bronze is probably the earliest method used for making nails and cast iron nails do not appear in quantity until after 1764 when a practical method of annealing was first resolved

Casting leaves a distinctive rough surface from the 'greensand' used for moulding, and additional small mould defects can be seen. The entry point for the metal, or 'sprue', usually leaves an irregular high spot showing on an upper surface.

Le moulage à partir du cuivre et du bronze est probablement la première méthode utilisée pour fabriquer des clous. Les clous en fonte n'apparaissent en quantité qu'après 1764, date à laquelle une méthode pratique de recuit a été mise au point.

Le moulage laisse une surface rugueuse caractéristique des « sables de fonderie » utilisé pour le moulage. D'autres petits défauts liés au moule peuvent également être observés. L'orifice d'entrée du métal, ou « descente de coulée », laisse généralement une petite excroissance irrégulière visible sur la partie supérieure de la pièce.

Gießen aus Kupfer und Bronze ist wahrscheinlich die früheste Methode zur Herstellung von Nägeln und Gusseisen Nägel. Sie erscheinen erst nach 1764 in der Menge, als eine praktische Methode des Glühens zum ersten Mal gelöst wurde.

Square hob-nail (*Clou à tête carrée*) used on armoured doors.

Clou à tête carrée, utilisé pour les portes blindées.

Quadratisches Kochfeld nagelt auf gepanzerten Türen verwendet.

Fettling – removal of excess metal from the sprue feeds and vent tubes, and cleaning the remaining cast items of sand. This starts with a chipping hammer, which is then followed by a rasp, and lastly fine products were finished by filing to a smooth profile.

Processus d'élimination de l'excès de métal des descentes de coulées et des évents, et de nettoyage du sable de fonderie restant. Il commence par l'utilisation d'un marteau burineur, ensuite d'une râpe, et, pour les pièces d'art, l'utilisation de lime pour obtenir un rendu lisse.

Entfernung von überschüssigem Metall aus den Angussvorschüben und Entlüftungsrohren und Reinigung der restlichen Gussteile von Sand. Dies beginnt mit einem Hackhammer, dem dann eine Raspel folgt, und schließlich wurden feine Produkte durch Ablage zu einem glatten Profil fertig gestellt.

Mould – usually consists of a top box and a bottom box, each filled with compacted casting sand or loam. The shapes of the objects to be cast are formed on a pattern plate which is pushed into the bottom box and any matching, projecting pieces are pressed into the top box, plus tubes for pouring and venting. The outlines of both are given a coat of liquid based on charred oak sap isolates the hot metal from the sand to avoid premature cooling before the top box is inverted and placed over the bottom box. After casting the metal is freed from the sand, excess metal broken off and the pieces cleaned and fettled before being sent for annealing.

***Moule** – se compose généralement d'un châssis supérieur et d'un châssis inférieur, chacun rempli de sable de fonderie compacté ou de terre glaise. Les formes des objets à couler sont composées sur une plaque modèle qui est imprimée dans le sable du chassis inférieur et toutes les pièces en saillies correspondantes, comme les descentes de coulée et les évents, sont imprimées dans le sable de fonderie du châssis supérieur. Avant de placer le châssis supérieur sur la partie inférieur, les contours de chacune des parties sont recouverts d'une couche de liquide à base de sève de chêne carbonisé qui isole le métal chaud du sable pour éviter un refroidissement prématuré. Après la coulée, le métal est débarrassé du sable, l'excès de métal est coupé. Les pièces sont nettoyées et ébarbée avant d'être envoyés au recuit.*

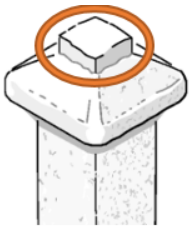
Form – besteht in der Regel aus einer oberen Box und einer unteren Box, die jeweils mit verdichtetem Gusssand oder Lehm gefüllt sind. Die Formen der zu werfenden Objekte werden auf einer Musterplatte gebildet, die in den unteren Kasten geschoben wird und alle passenden, projizierten Stücke werden in die obere Box gepresst, sowie Rohre zum Gießen und Entlüften. Die Umrisse beider erhalten eine Flüssigkeitsschicht auf Basis des verkohlten Eichensaftes isoliert das heiße Metall aus dem Sand, um eine vorzeitige Kühlung zu vermeiden, bevor die obere Box invertiert und über die untere Box gelegt wird. Nach dem Gießen wird das Metall aus dem Sand befreit, überschüssiges Metall abgebrochen und die Stücke gereinigt und gefettet, bevor es zum Glühen geschickt wird.

Malleablizing – the annealing process to soften the cast iron pieces and make them less brittle.

Processus de recuit pour homogénéiser les pièces moulées et les rendre moins cassantes.

Metalablizing – der Glühprozess, um die Gusseisenteile zu erweichen und sie weniger spröde zu machen.

Sprue – the remnant of the metal filled feed channel, left after 'fettling', in which most of the extraneous metal would be removed.



Vestige de l'utilisation de la descente de coulée, laissé après « l'ébarbage », lors duquel l'essentiel des barbelures sont enlevées.

Der Rest des metallgefüllten Zuführkanals, der nach dem "Fettling" zurückgelassen wurde, in dem der größte Teil des Fremdmetalls entfernt würde.

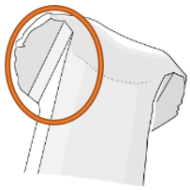
Vent (Évent) – the hole provided in the top casting box to allow air and gases to escape.

Orifice ménagé dans le châssis de coulée supérieur pour permettre à l'air et aux gaz de s'échapper.

Das Loch in der oberen Gussbox zur Verfügung gestellt, damit Luft und Gase entweichen können.

3. Cut nails and processes: *Clous taillés et procédés:* Nägel und Prozesse schneiden.

Bevel (Biseau) – a reinforcement to the underside of a side-pressed, cut nail head.



Renforcement de la face inférieure d'une tête de clou taillé, pressée latéralement.

Abschrägung – eine Verstärkung an der Unterseite eines seitlich gepressten, geschnittenen Nagelkopfes.

Burrs (*Barbes ou bavures*, **Schnittgraten**) – displaced edges of metal caused by the movement of a guillotine blade which are distinctive features of cut nails. Downward facing burrs indicate multiple cut shanks and diagonally opposed burs show that the iron ribbon was flipped over between cuts.

Écartement des bords du métal causés par le cisaillement d'une lame guillotine, traces caractéristiques des clous taillés. Les bavures orientées vers le bas indiquent plusieurs tiges coupées et celles opposées de manière oblique montrent que le ruban de fer a été retourné entre les coupures.

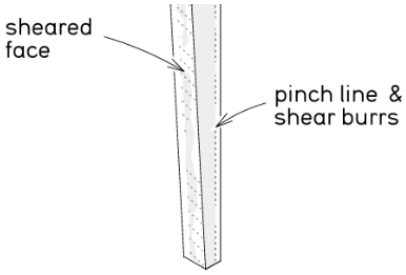
Verdrängte Kanten des Metalls, die durch die Bewegung einer Guillotineklinge verursacht werden, die die Unterscheidungsmerkmale der geschnittenen Nägel sind. Nach unten gerichtete Grate deuten darauf hin, dass mehrere geschnittene Schäfte und diagonal entgegengesetzte Burrs zeigen, dass das Eisenband zwischen den Schnitten umgekippt wurde.

Cross grain, (*grain croisée*, **Kreuzkörnung**) – a result of using narrow rollers for producing iron ribbon. (Refer to rolling diagram). The British had long experience of rolling wide sheet which allowed them to cut iron strips with longitudinal grain and the practice was adopted in America by the 1860s.
(Photo courtesy Edwards and Wells, Historic Louisiana Nails)

Résultat de l'utilisation de rouleaux étroits pour la production de rubans de fer. (Voir le diagramme sur le laminage). Les Britanniques avaient une longue expérience du laminage de tôles larges qui leur a permis de découper des bandes de fer à grain longitudinal. Cette pratique a été adoptée en Amérique dès les années 1860. (Photo reproduite avec l'aimable autorisation d'Edwards et Wells, Historic Louisiana Nails)

Kreuzkorn – ein Ergebnis der Verwendung von schmalen Rollen für die Herstellung von Eisenband. (Siehe Rolldiagramm. Die Briten hatten lange Erfahrung mit dem Rollen von breiten Blech, die ihnen erlaubt, Eisenstreifen mit Längskorn zu schneiden und die Praxis wurde in Amerika in den 1860er Jahren angenommen.

Cut face (shear face) – shows as a grainy effect on most cut nails due their being cut at around 'black heat'. This releases minute beads of silica resulting in a stippled surface and with burrs on one side. A pinch mark shows on the top side of the cut where a second edge held the hot element against rotation during cutting Cold cut nails show a smoother silvery surface from off the guillotine blade.



Face coupé (Face de cisaillement) – Elle correspond à un effet granuleux sur la plupart des clous taillés du fait de leur découpe à faible température. Ceci libère de minuscules perles de silice qui donnent une surface pointillée et des bavures sur un côté.. Une marque de pincement apparaît sur la face supérieure de la coupe, là où un second bord a empêché l'élément chaud de tourner pendant la coupe. Les clous coupés à froid présentent une surface argentée plus lisse provenant de la lame guillotine.

Geschnittenes Gesicht (Schergesicht) – zeigt sich als körnige Wirkung auf die meisten geschnittenen Nägel, da sie bei "schwarzer Hitze" geschnitten werden. Dadurch werden winzige Kieselsäureperlen frei, die zu einer verkrümelten Oberfläche und mit Graten auf einer Seite führen. Eine Pinch-Markierung zeigt auf der Oberseite des Schnitts, wo eine zweite Kante hielt das heiße Element gegen Rotation beim Schneiden Kalt geschnitten Nägel zeigen eine glattere silbrige Oberfläche von der Guillotine Klinge.

Clamping – the way in which machine wrought or cut nail shanks were held prior to being headed.

Manière dont les tiges des clous forgés ou taillés étaient tenues avant le façonnage de la tête.

Klemmen – die Art und Weise, wie Maschinen geschmiedete oder geschnittene Nagelschäfte gehalten wurden, bevor sie geleitet wurden.

Grain (grain, **Körnung**) – in iron nails can be seen after etching with acid to remove silica.
American cut nail, circa 1875 showing longitudinal grain.
(Photo: author).

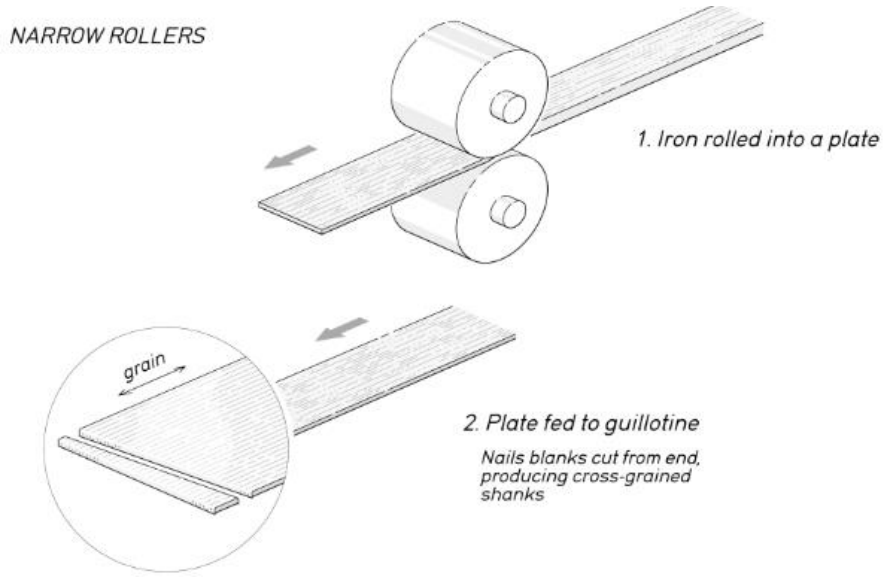
Peut être observé après l'usage d'acide, sur des clous en fer, pour éliminer la présence de silice. Clou taillé américain, vers 1875, montrant le grain longitudinal.

Körnung – in Eisennägeln wird die Körnung nach dem Ätzen mit Kieselsäure entfernt.

Amerikanischer Schnittnagel, um 1875 zeigt Längskörnung.

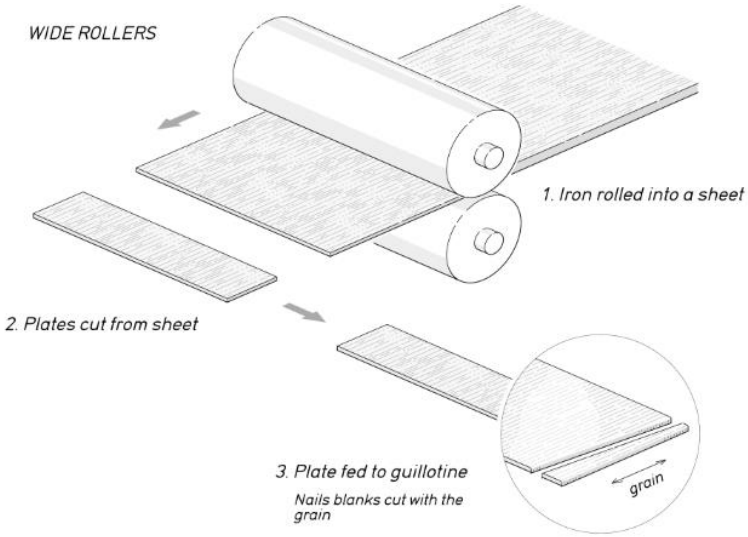
Nail strip (narrow) - ribbon of narrow width iron usually made by water power prior to steam becoming available. This had the disadvantage of the grain of the iron being transverse to the nail shank when cut.

Ruban en fer de faible largeur, généralement fabriqué par la force hydraulique avant l'usage de la vapeur. Cela a eu l'inconvénient d'obtenir un grain du fer transversal par rapport à la tige de clou lorsqu'il était taillé.



Nagelstreifen (schmal) - **Schmales Eisenband in der Regel durch Dampf verbiegbar gemacht. Dies hatte den Nachteil, dass das Korn des Eisens quer zum Nagelschaft ist, wenn es geschnitten wird.**

Wide rolled nail strip – involves cutting strips from off a wide-rolled sheet in order to overcome the cross-grain disadvantage of narrow rolled strip. Both actions were easily done using steam power.

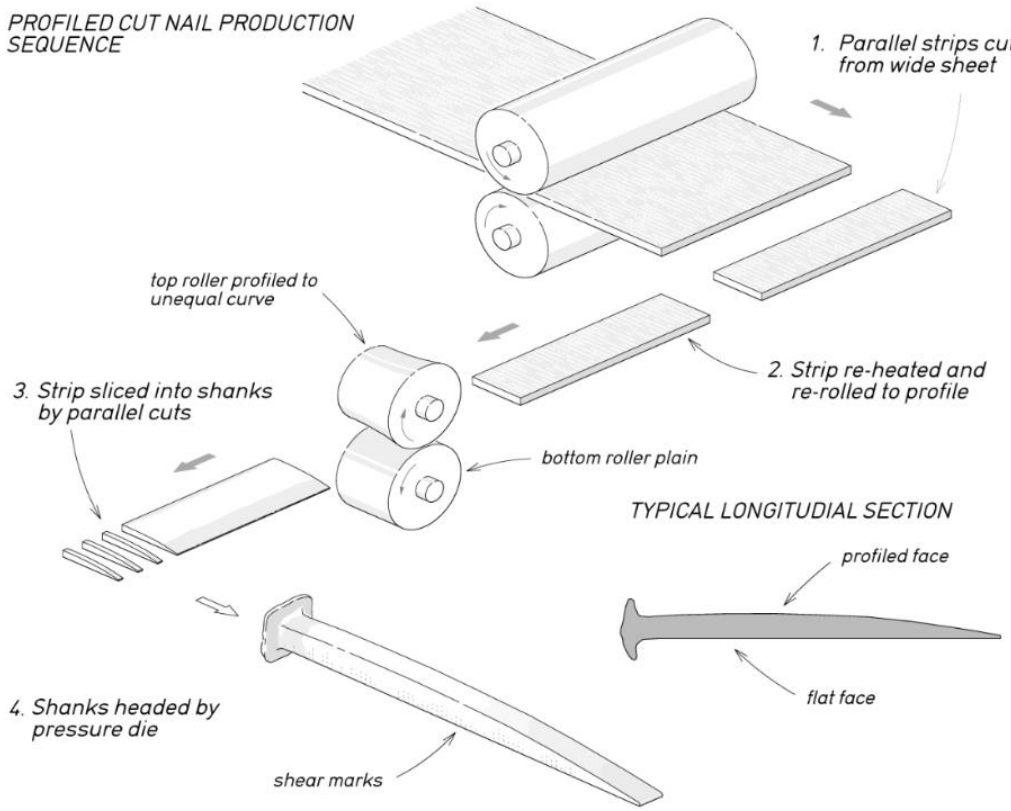


Large bande de fer laminé – Ceci implique de découper des bandes à partir d'une tôle large afin de surmonter l'inconvénient de grain croisé associé à la technique de bande étroite de fer laminé. Ces deux actions étaient facilement réalisées grâce à la puissance de vapeur.

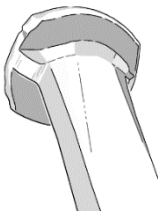
Breitgewalzter Nagelstreifen – umfasst das Schneiden von Streifen von einem breit gewalzten Blech, um den Querkornnachteil des schmalen gewalzten Streifens zu überwinden. Beide Aktionen waren mit Dampfkraft einfach.

Profiled-section nail strip - involved re-rolling the nail strips using profiled rollers.

Consiste à réenrouler les bandes laminées à l'aide de rouleaux profilés.
Profilprofil-Nagelstreifen – erneutes Rollen der Nagelstreifen mit profilierten Rollen.



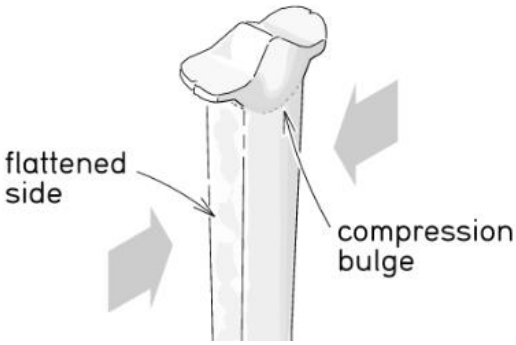
Pressing – (a) **Face pressing** is the result of an ingenious American technique for rotating the hot proto-shank through a right angle before the clamps advanced to hold it prior to heading. It had the effect of consolidating the metal under the head and compensated for the deficiencies of early American side-pressed cut-nails. It was adopted in Britain by Cordes & Co for their Ewbank facsimile, the T-patent.



Le pressage de face *est le résultat d'une technique américaine ingénieuse qui consiste à faire pivoter la proto tige chaude à angle droit avant que les pinces soient disposées pour la tenir lors du façonnage de la tête. Cette technique a pour effet de consolider le métal sous la tête et de compenser les lacunes des premiers clous taillés américains à pression latérale. Elle a été adoptée en Grande-Bretagne par Cordes & Co pour leur fac-similé Ewbank, le brevet T.*

Das Gesichtspressen **ist das Ergebnis einer ausgeklügelten amerikanischen Technik, um den heißen Proto-Schaft durch einen rechten Winkel zu drehen, bevor die Klammern vor der Überschrift vorrückten, um ihn zu halten. Es hatte den Effekt, das Metall unter dem Kopf zu konsolidieren und kompensierte die Nachteile der frühen amerikanischen Seitlich-Cut-Nägel. Es wurde in Großbritannien von Cordes & Co für ihr Ewbank-Faksimile, das T-Patent, angenommen.**

(b) **Side-pressing** – was the original method of clamping which gave the Americans trouble with weak heads, splitting, and longitudinal separation. The method was retained by the British for their cut form clasp nail.



Le pressage latéral *– était la méthode originale de serrage qui a généré des problèmes liés à des têtes de clous trop fragile pour les Américains, mais également déconvenues avec le fractionnement et la découpe longitudinale. Cette méthode a été retenue par les Britanniques pour leur clou à fermoir taillés.*

Seitedrück **– war die ursprüngliche Methode des Spannens, die den Amerikanern Probleme mit schwachen Köpfen, Spaltung und Längstrennung bereitete. Die Methode wurde von den Briten für ihre geschnittene Form der Nägel beibehalten**.

4. Machine wrought nails

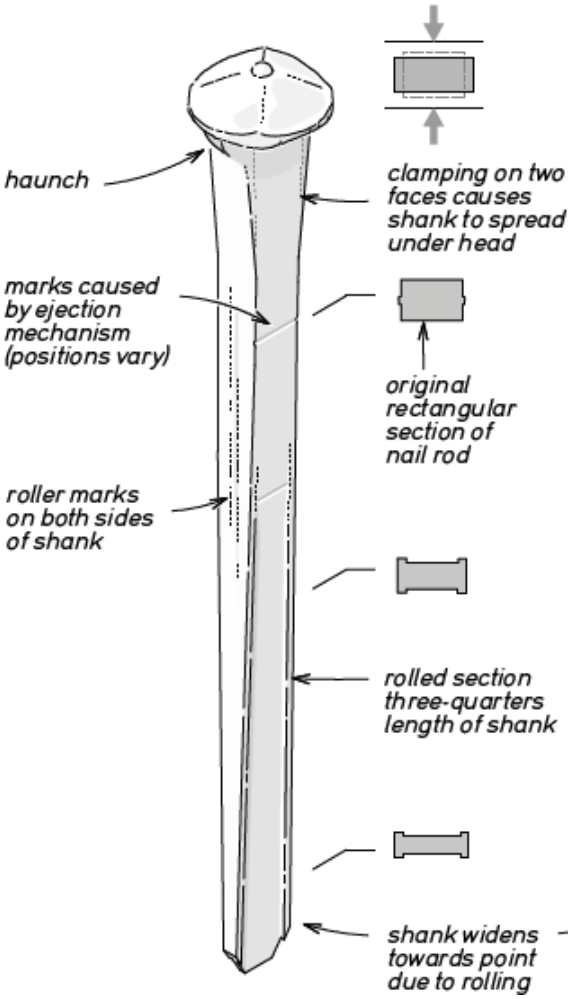
These were made by a combination of rolling and pressure clamping:

Rollers were geared to act on opposing sides of the heated nail rod.

Ceux-ci ont été faits par une combinaison de laminage et de serrage de pression : les rouleaux étaient conçus pour agir sur les côtés opposés de la tige chauffée du clou.

Diese wurden durch eine Kombination aus Walzen und Druckspannen hergestellt:

Die Rollen waren darauf ausgerichtet, auf gegenüberliegende Seiten der beheizten Nagelstange einzuwirken.



Ridges – were raised on each side of the roller travel.

Rollers used to advance the heated rod left behind a side ridge.

Crêtes *– parties soulevées sur les côtés latéraux du rouleau.*

Les rouleaux servaient à faire avancer la tige chauffée, réservée derrière une crête latérale.

Zelten– wurden auf jeder Seite der Walzenfahrt angehoben.

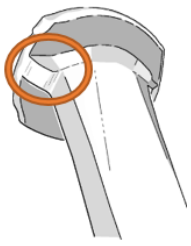
Rollen verwendet, um die beheizte Stange hinter einem Seitenrücken links zu fördern.

Clamping – was first applied to front and rear faces of the rolled length.

Serrage *– Initialement appliqué sur les faces antérieure et postérieure de la bande laminée.*

Klemmung – wurde zuerst auf vordere und rea Flächen der gewalzten Länge aufgetragen.

Haunches – these act as supports to the head, akin to corbel action. By diverting the metal flow the fibres are bent into an arc arresting tendency to head shear.



Épaulement – Servent de soutien pour la tête du clou, semblable aux corbeaux architecturaux. En déviant le flux de métal, les fibres sont pliées en arc de cercle et empêchent le cisaillement de la tête.

Hüfte – diese wirken wie Stützen für den Kopf. Durch umlenkenden Metallstrom werden die Fasern in eine Neigung zur Kopfscherung gebogen.

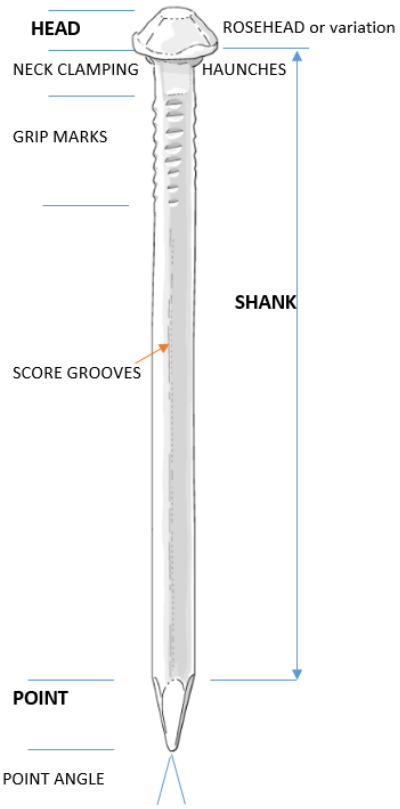
5. WIRE Nails - made by machine. (*Clou de fil*, Drahtnägel)

Fabriqué par une machine· **Hergestellt von Maschinen**

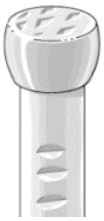
Early iron wire nail features:

Caractéristiques des premiers clous fabriqués à partir d'un fil de fer:

Frühe Eisendraht Nagel Eigenschaften:



Bullet head – the head of a steel or iron nail resembling an inverted bullet. They started as small drum shape headed nails and achieved a bullet shape around 1888.



Tête de balle – Tête d'un clou en acier ou en fer ressemblant à une balle à l'envers· Au départ, il s'agissait de petits clous dont la tête avait une forme de tambour· Celle-ci prit la forme d'une balle vers 1888·

Kugelkopf – der Kopf eines Stahl- oder Eisennägeln, der einer invertierten Kugel ähnelt. Sie begannen als kleine Trommelform kopfüber Nägel und erreichten eine Kugelform um 1888.

Chequer heads – occur in three or four main patterns pressed onto a flat head, and are intended to lessen hammer slip which might lead to bent shanks.

Se retrouve pour trois ou quatre modèles principaux pressés à tête plate· Elles sont destinées à réduire le glissement de marteau qui pourrait faire plier les tiges·

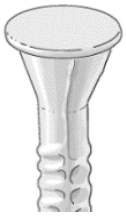
Chequer-Köpfe – treten in drei oder vier Hauptmustern auf einen flachen Kopf gedrückt, und sind dazu bestimmt, Hammerschlupf zu mindern, die zu gebogenen Schäften führen können.

Clamping – this describes how the underside of head was gripped on four sides prior to an iron wire nail being headed. Some two-sided clamping of iron wire nails has been found in Australia circa 1886. Cone heads – appear in early steel wire British nails in fine gauge of circa 1878 but transfer to larger sizes around 1885.

Serrage *– Ce terme décrit la façon dont le dessous de la tête était maintenu par quatre côtés avant le façonnage de la tête d'un clou en fil de fer. Des clous en fer serrés sur deux faces ont été retrouvés en Australie vers 1886. Têtes coniques – Elles apparaissent avec les premiers clous britanniques en fil d'acier de fin calibre, vers 1878, mais sont appliqués à de plus grandes tailles vers 1885.*

Klemmen – dies beschreibt, wie die Unterseite des Kopfes auf vier Seiten gegriffen wurde, bevor ein Eisendrahtnagel geleitet wurde. Einige zweiseitige Klemmen von Eisendrahtnägeln wurde in Australien um 1886 gefunden. Kegelköpfe – erscheinen in frühen Stahldraht britische Nägel in Feinerspur von circa 1878, aber auf größere Größen um 1885 übertragen.

Cone head – one of the different head styles used with iron wire nails resembling an inverted cone.



Tête conique *– l'un des différents types de tête utilisés pour les clous en fil de fer et ressemblant à un cône renversé.*

Kegelkopf – einer der verschiedenen Kopfstile, die mit Eisendrahtnägeln verwendet werden, die einem invertierten Kegel ähneln.

Dressing marks - consist of two score groove marks on one side of the wire shank and a single score mark on the opposing side. The type of scoring varies from type to type and are difficult to see, even with enhanced viewing. They form part of the straightening process used to re-align the wire from off a coil, into a straight line, prior to it being cut and pointed. The grooves have been misinterpreted in some literature as being a 'rib' raised on the wire surface. See 'Diagnostics (g)' below.

Marques de fendage *- consistent en deux rainures latérale à la tige du fil et une marque unique sur le côté opposé. Le type de marques varie d'un type à l'autre et est difficile à voir, même avec un agrandissement. Elles sont associées au processus de redressement utilisé pour réaligner le fil au sortir de la bobine, avant qu'il ne soit coupé et appointé. Les rainures ont été mal interprétées dans certains ouvrages comme étant une « nervure » projetée depuis la surface du fil. Voir 'Diagnostiques (g)' ci-dessous.*

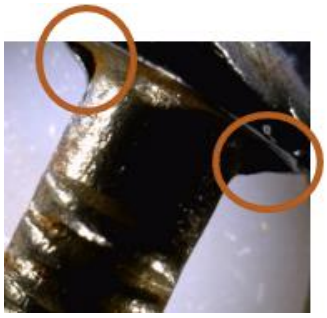
Gerattener Marken - bestehen aus zwei Partitur Nut Marken auf einer Seite des Drahtschafts und eine einzelne Punktzahl auf der gegenüberliegenden Seite. Die Art der Bewertung variiert von Typ zu Typ und ist schwer zu sehen, selbst bei verbesserter Betrachtung. Sie sind Teil des Richtprozesses, der verwendet wird, um den Draht von einer Spule in eine gerade Linie neu auszurichten, bevor er geschnitten und spitz wird. Die Rillen wurden in einigen Literaturen als eine "Rippe" auf der Drahtoberfläche angehoben falsch interpretiert. Siehe "Diagnose (g)" weiter unten.

Grip marks – also called teeth marks or indentations, apply to nearly all metal wire nails. They comprise a means of holding the wire against heading pressure. (See above).

Les marques de maintien – aussi appelées marquent de dents ou indentations, s'appliquent à presque tous les clous métalliques fabriqués à partir d'un fil. Elles constituent la trace du moyen utilisé pour maintenir le fil lors du pressage de la tête du clou. (Voir ci-dessus).

Griffspuren – auch Zahnmarkierungen oder Einbuchtungen genannt – gelten für fast alle Metalldrahtnägel. Sie umfassen ein Mittel, um den Draht gegen Denkdruck zu halten. (Siehe oben).

Haunches – consist of small corbels to the head, usually two major haunches and two minor haunches, sometimes termed 'brackets'.



Épaulement – Ils se composent de petits corbeaux sur la tête, avec généralement deux épaulements majeurs et deux mineurs, parfois appelés « crochets ».

Hauben – bestehen aus kleinen am Kopf, in der Regel zwei große Hauben und zwei kleine Hauben, manchmal auch als " Rändern " bezeichnet.

Ovals – wire nails in which the wire used has first been flattened such that the finished nail has an ovoid cross-section. They were made from a soft steel which enabled them to be clenched but they are seldom found in door construction. They were popular for use in nailing down flooring. They appeared circa 1897 and were still in production after WWII.

Ovales – clous fabriqués à partir d'un fil de métal pour lesquels le fil utilisé a d'abord été aplati de telle sorte qu'il possède une section ovale. Ils étaient faits d'un acier doux qui permettait de les serrer. Ils sont rares dans la construction de portes. Ils étaient très utilisés pour clouer les revêtements de sol. Ils sont apparus vers 1897 et étaient encore en production après la Seconde Guerre mondiale.

Ovale – Drahtnägel, in denen der verwendete Draht zuerst abgeflacht wurde, so dass der fertige Nagel einen eiförmigen Querschnitt hat. Sie wurden aus weichem Stahl hergestellt, der es ermöglichte, sie zu ballen, aber sie sind selten in der Türkonstruktion zu finden. Sie waren beliebt für den Einsatz beim Nageln von Bodenbelägen. Sie erschienen um 1897 und waren nach dem Zweiten Weltkrieg noch in Produktion.

Points – were first pressed on by a burring tool but were later cut by opposing hardened steel cutters. The angle of cut subtended by the facets was around 27 degrees for iron wire nails. It changed to around 50 degrees for steel wire nails.

Les pointes – d'abord pressées par un outil d'ébavurage, (comme décrit par Charles Frémont), elles ont ensuite été taillées par des lames opposées en acier trempé. L'angle de coupe sous-tendu par les facettes était d'environ 27 degrés pour les clous en fil de fer. Il est passé à environ 50 degrés pour les clous en fil d'acier.

Punkte – wurden zuerst von einem Bohrwerkzeug betätigt, aber später durch gegnerische gehärtete Stahlschneider geschnitten. Der Schnittwinkel, der von den Facetten untergeordnet wurde, betrug bei Eisendrahtnägeln etwa 27 Grad. Es änderte sich auf etwa 50 Grad für Stahldrahtnägel.

Pointes de Paris – an alternative name for *clou d'epingles*, apparently first used in the Japy brothers' application for a Brevet in 1806. It came into common use several years later and became a euphemism for wire nails in America and Britain up to 1880 or so. Prior to 1806 the term *pointe* was used for headless forged points (seen here), used in furniture but the MRBA Brussels archives show the term still used for forged "*pointes*" circa 1850.

Autre nom pour le clou d'épingles, apparemment utilisé pour la première fois dans la demande de brevet des frères Japy en 1806. Elle est devenue d'usage courant quelques années plus tard et est devenu un euphémisme pour les clous en fil de fer d'Amérique et de Grande-Bretagne jusqu'à 1880 environ. Avant 1806, le terme « pointe » était utilisé pour les pointes forgées sans tête et mises en œuvre dans le mobilier. (Voir ici). Les archives des M.R.A.H. de Bruxelles montrent que ce terme était toujours utilisé pour les pointes forgées vers 1850.

Pointes de Paris **– dieser Name erscheint als alternativer Name für *clou d'epingles* zum ersten Mal, offenbar, in der Bewerbung der Japy-Brüder für eine Brevet im Jahr 1806. Es kam erst einige Jahre später zur allgemeinen Verwendung. Es wurde ein Euphemismus für Drahtnägel bis 1880 oder so und der Begriff wurde auch als alternativer Name in Amerika und Großbritannien angenommen. Vor 1806 scheint der Begriff *Pointe* für kopflose schmiedende Punkte verwendet worden zu sein, die in Möbeln usw. verwendet werden.(Sehe oben).**

Teeth grip marks – are indentations caused in the section below the head clamps, below neck and haunch level. The shape of the teeth indentation changes from a transverse straight line to upward facing crescents and downward facing crescents. Early wire nail indentations tend to be straight. In early iron wire nails the teeth grip marks are deep and first number around 13, but reduces to 10 indentations prior to iron wire nails being phased out. Steel wire grip marks are less pronounced, fewer in number, and sometimes difficult to see.

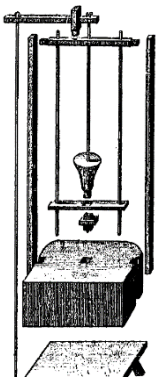
Marques de dents *– sont des indentations laissées dans la partie située sous les serrages de la tête, sous le niveau du cou et de l'épaulement. La forme des dents passe d'une ligne droite transversale à des croissants orientés vers le haut et des croissants orientés vers le bas. Les premières indentations des clous en fil métallique ont tendance à être*

droites· Pour les premiers clous en fil de fer, les marques de maintien laissées par les dents sont profondes et comporte d'abord 13, ensuite réduit à 10 indentations avant que les clous en fil de fer soient progressivement éliminés· Les marques de maintien du fil d'acier sont moins prononcées, moins nombreuses et parfois difficiles à observer·

Zahngriffmarkierungen – sind Einbuchtungen, die durch einen unteren Teil der Kopfklemmen verursacht werden, der sich unterhalb des Hals- und Hauptpegels befindet. Die Form des Zähneindentations ändert sich von zwei quer nach oben gerichteten Halbmonden und nach unten gerichteten Halbmonden. Frühe Drahtnageleinzüge sind in der Regel gerade Linien. In frühen Eisendrahtnägeln sind die Griffspuren der Zähne tief und etwa 13 sind, reduzieren sich aber auf 10 Einbuchtungen, bevor die Eisendrahtnägel auslaufen. Stahldrahtgriffmarken sind weniger ausgeprägt, weniger zahllos und manchmal schwer zu sehen.

6. MISCELLANEOUS TERMS (*Terminologie diverse,* Verschiedenartiger Worten)

Bench header – the British & American version is shown above. A 1761 French version by R**é**aumur shows a pedal operated drop header & operator's stool. This device appears in later French wire nail patents as a heading tool.



Banc de chute *– la version britannique et américaine est présentée ci-dessus· Une version française de 1761 par Réaumur montre un collecteur de chute actionné par une pédale et un tabouret pour l'opérateur· Ce dispositif apparaît dans des brevets français ultérieurs, pour des clous fabriqués à partir de fils, comme outil de façonnage de la tête·*

Bankkopfer – die britische & amerikanische Version wird darüber. Eine französische Version von R**é**aumur aus dem Jahr 1761 zeigt einen pedalbetriebenen Drop-Header & Operatorhocker. Dieses Gerät erscheint in späteren französischen Drahtnagelpatenten als Überschriftenwerkzeug.

Calamine (Zinc) – the name 'zinc' does not appear until 1697. The first European smelter for zinc was at Bristol, England in 1743. Zinc coated nails were in use in the early 1820s.

Calamine *(Zinc) – le nom « zinc » n'apparaît qu'en 1697· La première fonderie européenne de zinc fut établie à Bristol, en Angleterre, en 1743· Les clous recouverts de zinc étaient utilisés au début des années 1820·*

Kalamin (Zink) – der Name "Zink" erscheint erst 1697. Die erste europäische Schmelze für Zink war 1743 in Bristol, England. Verzinkte Nägel waren in den frühen 1820er Jahren im Einsatz.

Copper – has been used in alloys for both cast and cut nails in antiquity. Pure copper was expensive until the mid-1840s but early copper slate nails were available in 1823, together with zinc slate nails.

Cuivre *– a été utilisé durant l'Antiquité pour les alliages pour les clous moulés et taillés. Le cuivre pur coûtait cher jusqu'au milieu des années 1840, mais les premiers clous d'ardoisier en cuivre étaient disponibles dès 1823, mais également ceux en zinc.*

Kupfer – wurde in Legierungen für gegossene und geschnittene Nägel in der Antike verwendet. Reines Kupfer war bis Mitte der 1840er Jahre teuer, aber frühe Kupferschiefernägel waren 1823 zusammen mit Zinkschiefernägeln erhältlich.

Gennin. Georg. (1665 – 1750) – Saxon engineer responsible for the industrial complex at Ekaterinburg with Tatischev. His details of the slitting machine predate those of Diderot.

Ingénieur saxon responsable, avec Tatischev, du complexe industriel d'Ekaterinbourg. Ses informations sur la dégauchisseuse sont antérieures à celles de Diderot.

Sächsischer Ingenieur verantwortlich für den Industriekomplex in Jekaterinburg mit Tatischev. Seine Details der Schneidemaschine war vor dieser von Diderot.

Lead nail – this term can mean an iron nail with head dipped in lead, as found used in wooden launders (1825 sample), or it can also mean an iron clout used to hold down lead sheeting (1690 sample). The migration of lead molecules helps stabilise and protect the iron with which it comes into contact.

Clou en plomb *– ce terme peut désigner un clou en fer dont la tête a été trempée dans du plomb, notamment utilisé dans les blanchisseries en bois (échantillon de 1825). Il peut également renvoyer à une calotte en fer utilisée pour maintenir la feuille de plomb (échantillon de 1690). La migration des molécules de plomb contribue à stabiliser et à protéger le fer avec lequel il entre en contact.*

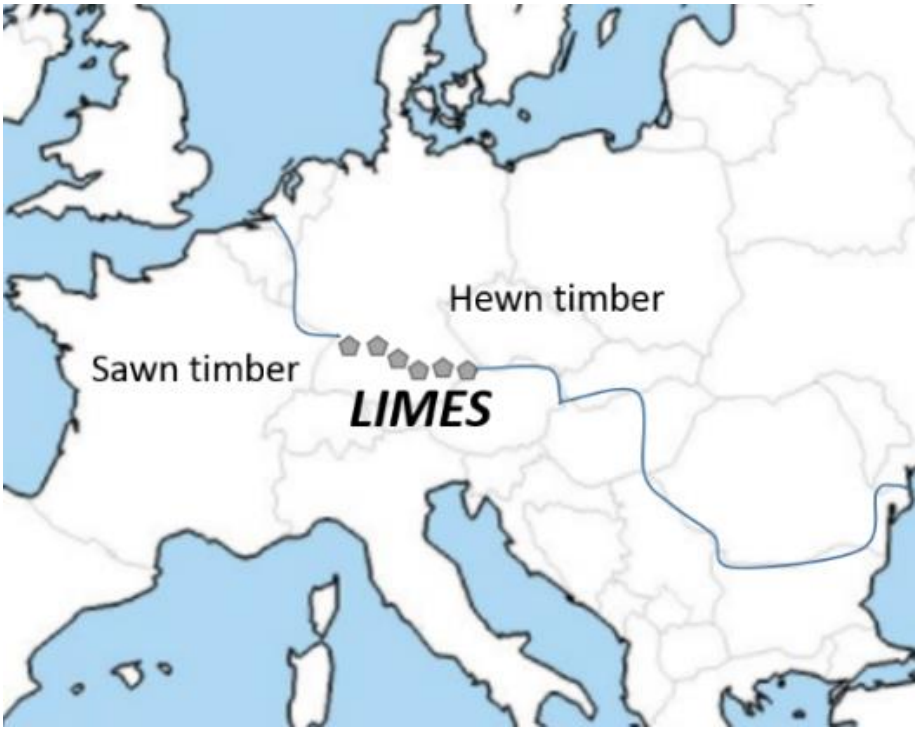
Bleinagel – dieser Begriff kann einen Eisennagel mit in Blei getauchten Kopf bedeuten, wie er in Holzwäschereien (eine Probe aus dem Jahr 1825) gefunden wird, oder ein Eisenschlag, der verwendet wird, um Bleibleche (1690 Probe) zu halten. Die Migration von Bleimolekülen hilft,das Eisen, mit dem es ins contact kommt,zustabilise und zu schützen.

Limes – this comprises the patrolled line of the Roman frontier with palisade and gates joining the Rhine to the Danube. Inside the Empire timbers were sawn and the use of nails was widespread, but outside hewing was the mainstay of timber conversion.

(See also Roman trestle sawing below).

Limes *– il s'agit de la frontière romaine gardée par des patrouilles, composée de palissades et de portes reliant le Rhin au Danube. À l'intérieur de l'Empire, le bois était scié et l'utilisation des clous était répandue, à contrario des régions extérieures où la découpe du bois constituait l'essentiel de son mode de transformation.*

(*Voir aussi le sciage de tréteaux gallo-romains)·*



Limes – dazu gehört die patrouillierte Linie der römischen Grenze mit Palisade und Toren, die den Rhein mit der Donau verbinden. Im Inneren des Imperiums wurden Hölzer gesäht und die Verwendung von Nägeln war weit verbreitet. Siehe auch Römisches Sägen.

Ore types – in order of importance the better quality iron ores were 'Oregrounds', from Dannemore in Sweden, 'Danks', from Danzig, (transhipping Swedish or Russian ores), 'Lukes', from Liège, famous for its 'soft' iron, and 'Ames' from Amiens, or 'Ordemer' from Normandy, in France. Both America and Britain imported Russian iron ore for nail making purposes.

Les types de minerais *– par ordre d'importance, les meilleurs gisements de minerais de fer, en termes de qualité, étaient les affleurements métallifères de Dannemore en Suède, de « Danks » à Gdansk (transbordement de minerais suédois ou russes), les « Lukes » à Liège, célèbre pour son fer « doux », et les « Ames » à Amiens, ou « Ordemer » à Pont Audemer en Normandie· L'Amérique et la Grande-Bretagne ont importé du minerai de fer russe pour la fabrication des clous·*

Erztypen – in der Reihenfolge ihrer Bedeutung waren die qualitativ besseren Eisenerze "Oregrounds", aus Dannemore in Schweden, "Danks", aus Danzig, (Umschlag schwedischer oder russischer Erte), "Lukes" aus Lüttich, berühmt für sein "weiches" Eisen, und "Ames" aus Amiens oder "Ordemer" aus der Normandie. Sowohl Amerika als auch Großbritannien importierten russisches Eisenerz für Nagelherstellungszwecke.

Penny system – a nail classification system set in the early 1300s and still in use in America. Fidler records its last use in Britain was 1879.

Penny size:	2	3	4	5	6	8	10	20
Length (inches):	½	¾	1	1¼	1½	2¼	2¾	3 ½
Ditto (USA):	1	1¼	1½	1¾	2	2½	3	4

Système Penny *– Système de classification des clous établi au début des années 1300 et toujours utilisé en Amérique· Fidler enregistre son ultime usage en Grande-Bretagne, en 1879·*

Penny-System – ein Nagelklassifizierungssystem, das in den frühen 1300er Jahren eingesetzt wurde und immer noch in America. Fidler im Einsatz ist, verzeichnet seinen letzten Einsatz in Großbritannien im Jahr 1879.

Puddling – the method of smelting iron in a shallow depression in a furnace using indirect reflected heat. The molten iron puddle was raked free of impure scum through a side port, and then stirred to burn-off carbon, phosphorus, and magnesium. The invention was made by Henry Cort in 1783 at Fareham in England. It was widely adopted throughout Europe and North America.

Puddlage *– la méthode de fusion du fer dans un creuset peu profond ménagé dans un four qui utilise la chaleur indirecte· La loupe de fer fondu est ratissée à travers un orifice latéral pour éliminer les scories, puis mélangé pour brûler le carbone, le phosphore et le magnésium· L'invention est due à Henry Cort, en 1783, à Fareham, Angleterre· Elle a été largement adoptée dans toute l'Europe et en Amérique du Nord·*

Puddling – die Methode des Schmelzens von Eisen in einer flachen Senke in einem Ofen mit indirekt reflektierter Wärme. Die geschmolzene Eisenpfütze wurde frei von unreinem Abschaum durch einen Seitenport geharkt und dann zu abgebranntem Kohlenstoff, Phosphor und Magnesium gerührt. Die Erfindung wurde in 1783 gemacht. Es wurde in ganz Europa und Nordamerika weit verbreitet.

Quenching – is the opposite of annealing. Rapid cooling of metal results in hardening & brittleness.

Le trempage *– méthode contraire à celle du recuit· Le refroidissement rapide du métal entraîne un durcissement et une fragilité·*

Abschrecken - ist das Gegenteil von Glühen. Schnelle Kühlung von Metall führt zu Härten & Sprödigkeit.

Tatischev. Vasily. 1722-1736 – General of Engineers under Catherine the Great, co-developer of the industrial complex at Ekaterinburg with Georg Gennin.

Général des ingénieurs sous le règne de la Grande Catherine, co-développeur, avec Georg Gennin, du complexe industriel d'Ekaterinbourg·

General der Ingenieure unter Katharina der Großen, Mitentwickler des Industriekomplexes in Jekaterinburg mit der saxisches ingenieure Georg Gennin.

Trade marks – used on nail heads probably started around 1820 as shown by an early wrought nail from Woolmers Cottage, Longford in Tasmania, bearing a hand-stamped head 'W'. Used more on cast nails, cut, and machine wrought nail nails;

Les marques commerciales – utilisées sur les têtes de clous, elles sont probablement apparues vers 1820, comme le montre un premier clou forgé de Woolmers Cottage, Longford en Tasmanie, dont la tête porte la marque estampillée à la main «W ». Utilisé plus sur les clous moulés, taillés, et forgés à la machine.

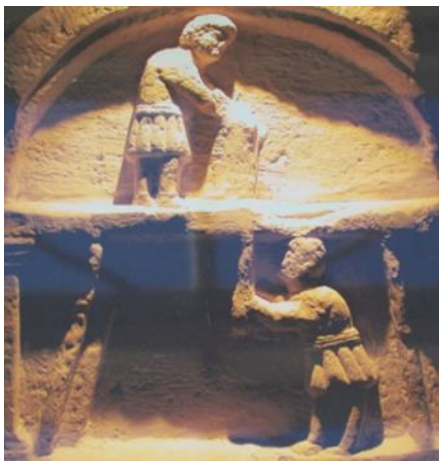
Marken – auf Nagelköpfen verwendet wahrscheinlich begann um 1820, wie durch einen frühen schmiedeeisernen Nagel aus Woolmers Cottage, Longford in Tasmanien, mit einem handgestempelten Kopf 'W' gezeigt. Verwendet mehr auf gegossen nägel, schneiden, und Maschine schmieden Nagelnägel;

Tests – see 'holding power' above. Earlier tests had been carried out in Britain by Bevan & Tredgold in 1828 on the capacities of wrought nails and screws in different woods. Further tests were made in a variety of timbers in 1897, also in America, by G. A. Parker.

***Epreuves** – voir ci-dessus « Puissance d'accroche ». Des tests antérieurs avaient été effectués en Grande-Bretagne par Bevan et Tredgold en 1828, relativement aux capacités des clous et des vis forgés dans différents bois. En 1897, d'autres tests ont été effectués dans différente essence de bois, comme en Amérique avec G. A. Parker.*

Proben – siehe Haltekraft oben. Frühere Tests wurden in Großbritannien von Bevan & Tredgold im Jahre 1828 auf die Kapazitäten von schmiedeten Nägeln und Schrauben in verschiedenen Hölzern durchgeführt. Weitere Tests wurden 1897 in Amerika von G. A. Parker in einer Vielzahl von Hölzern durchgeführt.

Trestle sawing – A Gallo-Roman method of sawing timber into planks using a two-man, down-cut, saw. The sawyers were known as 'top dog' and 'under-dog' respectively. It was the top dog's task to follow the longitudinal soot line. (See 'Limes' above. The use of nails was greater when lighter sawn timbers were used).



Débitage sur tréteaux *– Méthode gallo-romaine de sciage du bois en planches à l'aide d'une scie manœuvrée par deux hommes, selon une coupe longitudinale. Les scieurs de long portent les noms de « chevrier » et de « renard » respectivement pour celui qui se tient sur la chèvre et celui qui est au sol. La tâche du chevrier consistait à suivre la ligne longitudinale tracée sur le tronc.*

(Voir ci-dessus 'Limes'. L'utilisation de clous était plus importante lorsque des bois sciés plus légers étaient utilisés).

Trestle Sägen – Eine gallo-römische Methode, Holz mit einer zweiköpfigen, heruntergeschnittenen Säge in Bretter zu sägen. Die Säger waren als "Top-Hund" bzw. "Unterhund" bekannt. Es war die Aufgabe des Spitzenhundes, der Längsrußlinie zu folgen.

(Siehe "Limes" oben. Die Verwendung von Nägeln war größer, wenn leichteres Schnittholz verwendet wurde).

Trussel – a hand-held stamp or die. (*Poinçon ou moule portative illustrés par Reaumur et Diderot,*. E**ine Stempel utilisiert zum Kopf machen oder marken**).

Van Ghemen (Anthony) – probably a Dutchman, was the most likely originator of the idea for a slitting machine. (*Homme probablement d'origine hollandaise, il a été l'initiateur le plus probable de l'idée de fendage.* **Er war vielleicht ein Holländer und war wahrscheinlich der Urheber der Idee für eine Schlichtermaschine**).

White trade – is used in reference to tinned ironware, a process known the Romans.

Le commerce blanc *– Terme utilisé en référence à l'étamage de la ferronnerie, un procédé connu des Romains.*

Weißer Handel – wird in Bezug auf Konserven mit zinn verwendet, ein Prozess, der die Römer kennt.

Zeinhammer (variously spelt) – this dialect word from Franken baffles most modern Germans. The Zedler Lexicon tells us that the word for the thick iron wands was '*Zein-eisen'* and Zedler links the word '*Zein*' to '*Zahn*' in modern German, and thus; 'Tooth hammer'.

Ce terme issu du dialecte de Franken déconcerte la plupart des Allemands modernes. Le Lexique Zedler nous dit que le mot pour désigner les baguettes épaisses en fer était « Zein-eisen ».Le lexique Zedler relie le mot « Zein » à l'allemand moderne « Zahn », et désigne donc un 'Marteau à dents'.

Zeinhammer **(verschiedend sinpelt) – dieses ist ein Dialektwort aus Franken. Das Zedler Lexikon sagt uns, dass das Wort für die dicken Eisenstäbe*"Zein-eisen"* war und Zedler das Wort "*Zein*" mit *"Zahn"* im modernen Deutschen verknüpfte und damit; "Zahnhammer".**

7. DIAGNOSTICS (*Diagnostiques,* Diagnosticien)

a) Interpreting damage and shapes

Damaged and contorted shaped samples recovered, often from ruinous sites and in poor conditions, were noted early in the research to be of little use in identification, but certain samples were found to carry information of interest. An example arose from a collection of Roman nail samples donated by the author's archaeological colleagues, Fiona Keith-Lucas and Mike Heaton, seen below:

Interprétation des dégradations et des formes. Les échantillons endommagés et , récupérés le plus souvent dans des sites en ruine et dans de mauvaises conditions, ont été jugés en début de recherche comme peu utiles pour l'identification. Toutefois, certains échantillons se sont avérés porteurs d'informations intéressantes. Un bon exemple de clous romains est fourni par les collègues archéologues de l'auteur, Fiona Keith-Lucas et Mike Heaton, voir ci-dessous:

Beschädigte und verzerrte formierte Proben, die oft von ruinösen Stellen und unter schlechten Bedingungen geborgen wurden, wurden früh in der Forschung als wenig nutzbringend bei der Identifizierung festgestellt, aber bestimmte Proben wurden gefunden, um Informationen von Interesse zu tragen. Ein Beispiel stammt aus einer Sammlung römischer Nagelproben, die von den archäologischen Kollegen: seihen darunter:

Although in poor condition they show how sawn timbers were salvaged from doors by the Celts after the Roman withdrawal, leaving damaged boards and ledgers containing nail fragments behind. Door nail ends are either bent back once, after driving, termed ‘single clenched’, or the tip is cogged over with the claws of the hammer before the remaining shank is bent over. This latter condition is termed double clenched and in English is known as ‘dead’, meaning it will not work ‘live’ (loose). Double clenched nails cannot be broken out without severing the head with a chisel, or by wrecking the timber panels. Both shapes tell us that these nails come from a door or shutter, since the bends are unique to these applications.

Bien qu’en mauvais état, ils montrent comment les Celtes ont récupéré le bois scié des portes, après le retrait romain, laissant derrière eux des planches et des traverses endommagés contenant des fragments des clous. Les extrémités des clous de porte sont soit repliées une fois, après avoir été enfoncés, et dites à « pli simple », soit la pointe est courbée avec la panne fendue du marteau avant de replier le reste de la tige. Cette dernière est appelée « double pli », et en anglais « Dead », ce qui signifie que la pièce ne fonctionnera pas « de manière active ». Les clous à double pli ne peuvent être enlevés sans couper la tête avec un ciseau, ou en cassant les panneaux de bois. Ces deux formes indiquent que ces clous proviennent d’une porte ou d’un volet, car elles sont typiques pour ces usages.

Obwohl sie in schlechtem Zustand sind, zeigen sie, wie von den Kelten nach dem römischen Rückzug abgesähte Hölzer aus den Türen geborgen wurdenund beschädigte Bretter und Ledger mit Nagelfragmenten zurückließen. Türnagelenden werden entweder einmal nach dem Fahren nach hinten gebogen, figur oben, als "einzeln geballt" bezeichnet, oder die Spitze wird mit den Klauen des Hammers umgeknickt, bevor der verbleibende Schaft umgeknickt wird. Diese letztere Bedingung wird als doppelt geballt bezeichnet und im Englischen wird sie als "tot" bezeichnet, was bedeutet, dass sie nicht "lebende" (locker) sein wird. Doppelt geballte Nägel könnenausbrechen, ohne den Kopf mit einem Meißelzu trennen, oder indemman die Holzplatten zerzaust. Beide Formen sagen uns, dass diese Nägel von einer Tür oder einem Rollladen kommen, da sie einzigartig für diese Anwendungen sind.

A second interpretive feature worth noting pertinent to corroded samples is how rusting occurs at a higher rate at the interface between two timbers.
There is pronounced necking in the floorboard clasp nail sample from Marktstrasse 23, Beutelsbach (Stuttgart), corresponding to the interface between the floorboards and the floor joists. This same phenomenon can be seen in the Roman nail fragments seen above, where nails 3, 4, and 5 show that a vertical plank thickness of 15 to 18mm was used with a ledger thickness of around 22 to 25mm. The fifth nail from Kenchester shows plank thickness of around 25mm and a ledger of perhaps 32mm thick.

Being aware of this and other similar phenomena, the author was inspired by a paper presented by Berkeley Professor Ted Pena.[1] Pena has brought the analysis of wear on ancient artefacts to a fine art. Using his ideas as a base a secondary search was conducted of samples, looking firstly at those which retained a coating of other materials on their surfaces. These features, exhibited by marks or material left on nails, act as clues to identification or interpretation of production methods and use and can often establish their original uses.

Un deuxième marqueur pour l'interprétative à noter relativement aux échantillons corrodés concerne le développement de la rouille à la jonction entre deux pièces de bois. L'échantillon des clous de fermoirs de lames de plancher de la Marktstrasse 23, Beutelsbach (Stuttgart), correspondant à l'interface entre les planchers et les solives du plancher, met en évidence un col prononcé. Ce même phénomène peut être observé dans les fragments de clous romains vus ci-dessus, où les clous 3, 4, et 5 montrent qu'une planche épaisse de 15 à 18mm a été utilisée avec une latte haute d'environ 22 à 25mm. Le cinquième clou de Kenchester montre l'épaisseur de planche d'environ 25mm et une latte d'environ 32mm.
Conscient de cela et d'autres phénomènes similaires, l'auteur s'est inspiré d'un article présenté par le Professeur Ted Pena, de Berkeley. Pena a porté l'analyse de l'usure sur les objets anciens au rang d'art. Sur la base de ses idées, une recherche secondaire a été menée sur des échantillons, en premier lieu pour les pièces qui ont conservé la trace d'autres matériaux à leur surface. Ces caractéristiques, mise en évidence par des marques ou des traces de matériaux laissées sur les clous, constituent autant d'indices pour identifier et interpréter les méthodes de production et d'utilisation. Ces observations permettent souvent d'établir l'utilisation originale des clous.

Ein zweites interpretives Merkmal, das für korrodierte Proben relevant ist, ist, wie Rost mit einer höheren Rate an der Schnittstelle zwischen zwei Hölzern auftritt.
In der Bodenplattenverschluss-Nagelprobe aus der Marktstraße 23, Beutelsbach (Stuttgart), gibt es eine ausgeprägte Halsverschraubung, entsprechend der Schnittstelle zwischen den Dielen und den Bodenbalken. Das gleiche Phänomen kann in den römischen Nagelfragmenten gesehen darüber gesehen werden, wo Nägel 3, 4 und 5 zeigen, dass eine vertikale Plankendicke von 15 bis 18 mm mit einer Ledgerdicke von etwa 22 bis 25 mm verwendet wurde. Der fünfte Nagel von Kenchester zeigt eine Plankendicke von etwa 25 mm und ein Ledger von vielleicht 32mm Dicke.
Da er sich dieses und anderer ähnlicher Phänomene bewusst war, ließ sich der Autor von einem Papier inspirieren, das von Berkley Professor Ted Pena vorgestellt wurde. Pena hat die Analyse der Abnutzung alter Artefakte zu einer bildenden Kunst gebracht. Anhand seiner Ideen als Basis wurde eine sekundäre Suche nach Proben durchgeführt, die zunächst diejenigen untersuchten, die eine Beschichtung anderer Materialien auf ihren Oberflächen behielten. DieseStoffe, die durch Marken oder Aufnägel hinterlassenes

[1] PENA 2015, ID 318

Material ausgestellt werden, dienen als Anhaltspunkte für die Identifizierung oder Interpretation von Produktionsmethoden und Verwendungen und können oft ihre ursprüngliche Verwendung feststellen.

b) Detritus & bonding.

Plaster & lead bond with iron as seen in the figures below. Plaster attaches to the iron in the zone of contact. We can recognise a lath nail, where only the top is affected [1] or a 'plaster' nail - used to key wet plaster to a wall, when the whole nail emerges 'clad' with a white coating [2]. [2] White lead paint also bonds to iron when used as an undercoat primer on woodwork - identifying the nail as coming from a lining or reveal [3].

Lead is remarkable as not only iron in intimate contact fails to rust, but there is also a migration of lead particles onto the iron of the shank, well away from the lead itself [4].

Oak releases a proactive sap if penetrated [5]. It comprises a mix of phenols & tannins which bond with the iron surface to leave a black, sticky, substance. The secret was known to the ancient Celts who heated their iron ship nails to increase the rate of protective sap release in hot conditions. [3]

From top, nail 1. Liege lath nail c 1360, courtesy Madame Caroline Bolle. Nail 2. Plaster nail, Noisy Grotto 1580, courtesy Dr Bruno Bentz. Nail 3. Former Cathedral school house, window lining nail 1715, Wells. Somerset. Nail 4. From the Tudor apartments of Hampton Court Palace, 1560, Nail 5. Hampton Court Palace rear apartments, 1680, both latter samples courtesy of Fiona Keith-Lucas.

De haut en bas, Clou 1. Clou à latte de Liège c 1360, avec l'aimable autorisation de Madame Caroline Bolle. Clou 2. Clou à plâtre, Grotte de Noisy 1580, avec l'aimable autorisation du Dr Bruno Bentz. Clou 3. Ancienne école de la cathédrale de Wells, Somerset, clou pour revêtement de fenêtre datant de 1715.Clou 4. Provenant des appartements Tudor du palais de Hampton Court, 1560. Clou 5. Appartements arrière du palais de Hampton Court, 1680, ces deux derniers échantillons sont montés avec l'aimable autorisation de Fiona Keith-Lucas.

[2] LE DANTEC 2019, 313-329
[3] MARLIER 2014, 145

Résidus et adhérences

Le plâtre et le plomb adhèrent au fer comme le montrent les figures ci-dessus. Le plâtre se fixe au fer au niveau de la zone de contact. Nous pouvons distinguer un clou de planche, dont seule la partie supérieure est corrodée [1] d'un clou à « plâtre » - utilisé pour fixer le plâtre humide à un mur, et dont la surface entière est « recouverte » d'un enduit blanc [2]. La peinture blanche au plomb adhère également au fer lorsqu'elle est utilisée comme primaire ou sous-couche pour les boiseries. Ceci permet d'identifier le clou comme provenant d'une garniture ou d'un tableau d'embrasure [3]. Le plomb est remarquable car il permet non seulement le fer qu'il recouvre de ne pas à rouiller, mais également car il se produit une migration des particules de plomb vers la tige de fer, bien loin du plomb lui-même [4].

Lorsqu'il est percé, la sève du chêne interagit avec le clou [5]. Elle se compose d'un mélange de phénols et de tanins qui se lient à la surface du fer pour laisser une substance protectrice noire et collante. Le secret était connu des anciens Celtes qui chauffaient les clous en fer de leurs navires pour augmenter la libération de sève et ainsi protéger les clous.

Gips & Bleibindung mit Eisen, (darüber)

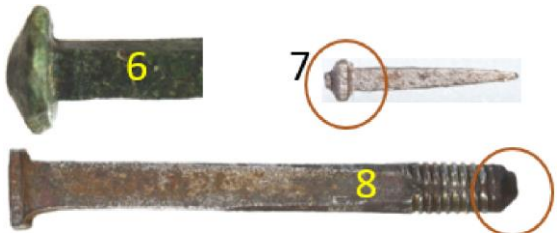
Gips befestigt sich am Eisen in der Kontaktzone. Wir können einen Lattennagel erkennen, bei dem nur die Oberseite betroffen ist [1] oder ein 'Plaster' Nagel - verwendet, um nassen Putz zu schlüsseln, um eine Wand, wenn der ganze Nagel auftaucht "bekleidet" mit weißer Beschichtung [2]. Weiße Bleifarbe bindet auch an Eisen, wenn sie als Unterlackgrundierung auf Holzarbeiten verwendet wird - und identifiziert den Nagel als von einem Futter kommend oder offenbaren [3].

Blei ist bemerkenswert, da nicht nur Eisen in intimem Kontakt nicht rostet, sondern es gibt auch eine Migration von Bleipartikeln auf das Eisen des Schafts, weit weg vom Blei selbst [4].

Eiche setzt einen proaktiven Saft frei, wenn er durchdrungen ist [5]. Es besteht aus einer Mischung aus Phenolen & Tanninen, die sich mit der Eisenoberfläche verbinden, um eine schwarze, klebrige Substanz zu hinterlassen. Das Geheimnis war den alten Kelten bekannt, die ihre Eisenschiffnägel erhitzten, um die Rate der Schutzsaftfreisetzung unter heißen Bedingungen zu erhöhen.

c) Castings.

Castings which used plaster moulds, as for example in antiquity, had to be first broken to release the cast object [6]. The first cast iron lath nails, prior to 1800 or so, show a slick surface but after that the surface changes to a rough sand finish [7]. This is a small change which helps identify the cast iron lath nail to the period 1780, when the first samples appear, and before 1800 or so when a rough surface is presented. Early iron bolts were also cast & annealed [8]. The entry point or 'sprue' (circled) is the clue identifying cast objects.



Roman bronze altar nail, Caparon (Camargue), c250 [6]. Barnes & Co cast lath nail, c 1850, [7], and a cast bolt, Woolmers, Tasmania, 1828. [8].
Clou d'autel romain en bronze, Caparon (Camargue), vers 250 [6]. Clou à latte moulé de Barnes & Co, vers 1850 [7], et boulon moulé, Woolmers (Tasmanie), 1828. [8].

Moulages

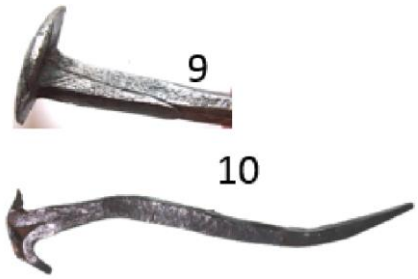
Les pièces à l'aide de matrices en plâtre, comme par exemple durant l'Antiquité, devaient d'abord être brisés pour libérer l'objet moulé [6]. Les premiers clous à lattes moulés, antérieurs à 1800 environ, présentent une surface lisse. Plus tard, l'aspect de la surface change avec l'usage de sable grossier [7]. Cette petite modification permet d'associer le clou à latte moulé à la période comprise entre 1780, lorsque les premiers échantillons apparaissent, et 1800, lorsqu'apparaît une surface rugueuse. Les premiers boulons en fer étaient également coulés et recuits [8]. Le point de contact avec la descente de coulée (entouré sur la photo) est permet d'identifier les objets moulés.

Gussteile

Die Gusobjectene, die Gipsformen, wie z.B. in der Antike, verwendeten, musste zuerst gebrochen werden, um das Gussobjekt freizugeben [6]. Die ersten gusseisernen Lattennägel zeigen vor 1800 oder so eine glatte Oberfläche, aber danach ändert sich die Oberfläche in eine raue Sandoberfläche [7]. Dies ist eine kleine Änderung, die hilft, den gusseisernen Lattennagel auf den Zeitraum 1780 zu identifizieren, wenn die ersten Proben erscheinen, und vor 1800 oder so, wenn eine raue Oberfläche präsentiert wird. Frühe Eisenbolzen wurden ebenfalls gegossen und geglüht [8]. Der Einstiegspunkt oder 'Sprue' (umkreist) ist der Hinweis, der gegossene Objekte identifiziert.

d) Techniques.

Close examination of samples often provides glimpses into the techniques used in the past can be seen in a join in a fold-over nail rod [9] & gap left by first dividing the shank over a hack iron [10].



Plaster nail, Pisa, Italy c 1530 [9], and heavy clasp nail, Esslingen, Germany, c1480 [10].

Clou en plâtre, Pise, Italie, vers 1530 [9], et clou à crochet lourd, Esslingen, Allemagne, vers 1480 [10]

L'examen attentif des échantillons donne souvent des aperçus des techniques utilisées par le passé, comme le montre la jointure d'une tige de clou repliée [9] et l'espace laissé sur la tige par un ciseau en fer [10].

Eine genaue Untersuchung der Proben liefert oft Glimpseses in die Techniken in der Vergangenheit verwendet kann in einer Verknüpfung in einem Klappnagelstab gesehen werden [9] & Lücke links durch zuerst teilen den Schaft über ein Hackeisen [10].

e) Adaption marks (*Marques de déformations*, Anpassungsmarken)

Cinch or 'grip' marks on two 'sacrificial' nails show how the nails were de-functionalised and re-signified as sacrificial offerings [11 & 12] by twisting or bending. These small marks identify the fact that a pristine nail was deliberately bent. The form of curve is another identifying feature, since nails tend to bend in a more even arch when extracted by claw hammer or claw bar.

Nails 11 & 12. Roman sacrificial nails from river Rhone at Arles, circa 100 AD.

Clous 11 et 12. Clous sacrificiels romains provenant du Rhône à Arles, vers 100 après J.-C.

Les marques de pincement ou de « maintien » sur deux clous « votifs » montrent comment les clous ont été rendus inutilisables et désignés comme offrandes sacrificielles [11 - 12] par torsion ou flexion. Ces petites marques identifient le fait qu'un clou intact a été délibérément plié. La forme de courbe est un autre élément d'identification, car les clous ont tendance à se plier selon un arc régulier lorsqu'ils sont extraits par la panne fendue d'un marteau ou un pied-de-biche.

Cinch- oder "Griff"-Markierungen an zwei "Opfernägeln" zeigen, wie die Nägel durch Verdrehen oder Biegen als Opfergaben [11 & 12] defunktionalisiert und neu bezeichnet wurden. Diese kleinen Markierungen identifizieren die Tatsache, dass ein makelloser Nagel absichtlich gebogen wurde. Die Form der Kurve ist ein weiteres Identifizierendes Merkmal, da Nägel dazu neigen, sich in einem gleichmäßigeren Bogen zu biegen, wenn sie durch Klauenhammer oder Klauenstange extrahiert werden.

f) Welded joins in nail rod. Soudure sur la tige du clou

A 24m long spur head lath nail fixing oak laths from Hanham Mills, Bristol 1695. Author.

Un clou à latte à tête d'éperon de 24 m de long fixant des planches de chêne de Hanham Mills, Bristol 1695

The speed with which nailors were required to work, and their relative poverty shows, in this image above. In this attempt to join two pieces of nail rod together as the shorter piece became "too hot to handle", an extreme case of saving a mere 4mm of length of nail rod is seen. Information from exemplars such as this one raises questions as to the wastage rates quoted by Hansotte.[4]

La vitesse à laquelle les cloutiers devaient travailler et leur relative pauvreté sont illustrées dans l'image ci-dessus. Cette tentative de soudure de deux tiges de clou, le morceau le plus court devenant "trop chaud pour être manipulé", montre un un cas extrême d'économie pour seulement 4mm de longueur de clou. Les informations tirées d'exemples comme celui-ci soulèvent des questions quant aux taux de gaspillage mentionné par Hansotte.

Die Geschwindigkeit, mit der die Nagler arbeiten mussten, und ihre relative Armut zeigt in figure darüber. In diesem Versuch, zwei Stücke Nagelstange zusammen zu verbinden, wie das kürzere Stück wurde "zu heiß zu handhaben", ein extremer Fall der Rettung einer nur 4mm Länge der Nagelstange gesehen. Informationen von Exemplaren wie dieser werfen Fragen nach den von Hansotte zitierten Verschwendungsraten auf.

[4] HANSOTTE 1972, 12

g) Dressing marks – wire (*Marques de dégauchissage – fil de fer,* Verbandsmarken – Draht)

Iron wire nails can often be found in a more 'readable' condition than steel ones, due to the way the silica residue forms on all worked surfaces. Detecting the dressing marks is sometimes not easy, but in this 1880 sample the two score marks on the 'outside' of the coil show clearly in this image. On the reverse side is only one score mark. This clue to interpretation was explained in Chapter 5.

Dig- scope view of an 1880 iron wire nail showing the external dressing marks. Author.

Les clous en fil de fer sont souvent plus « lisibles » que ceux en acier, en raison de la façon dont les résidus de silice se forment sur toutes les surfaces travaillées. Il n'est pas toujours aisé d'identifier les marques de dégauchissage mais, sur cet échantillon de 1880, les deux marques laissées sur « l'extérieur » de la bobine apparaissent clairement sur cette image. Au revers est seulement une trace. Cet indice d'interprétation a été expliqué au chapitre 5.

Eisendrahtnägel sind oft in einem "lesbareren" Zustand zu finden als Stahlnägel, da sich die Kieselsäurerückstände auf allen bearbeiteten Oberflächen bilden. Die Erkennung der Verbandsmarkierungen ist manchmal nicht einfach, aber in dieser 1880-Probe zeigen die beiden Noten auf der Außenseite der Spule deutlich in das Bild hier Auf der Rückseite ist nur eine Punktzahl. Dieser Hinweis auf die Auslegung war in Kapitel 5 schon erläutert.

Appendix III

The Dartford Mill Saga

Labelled 'Burchart's furnice' in Cecil's hand.

Burchart Kranich's furnace - DARTFORD MILLS 1578

Source: Anon., Undated, TNA, SP 12/122/63.

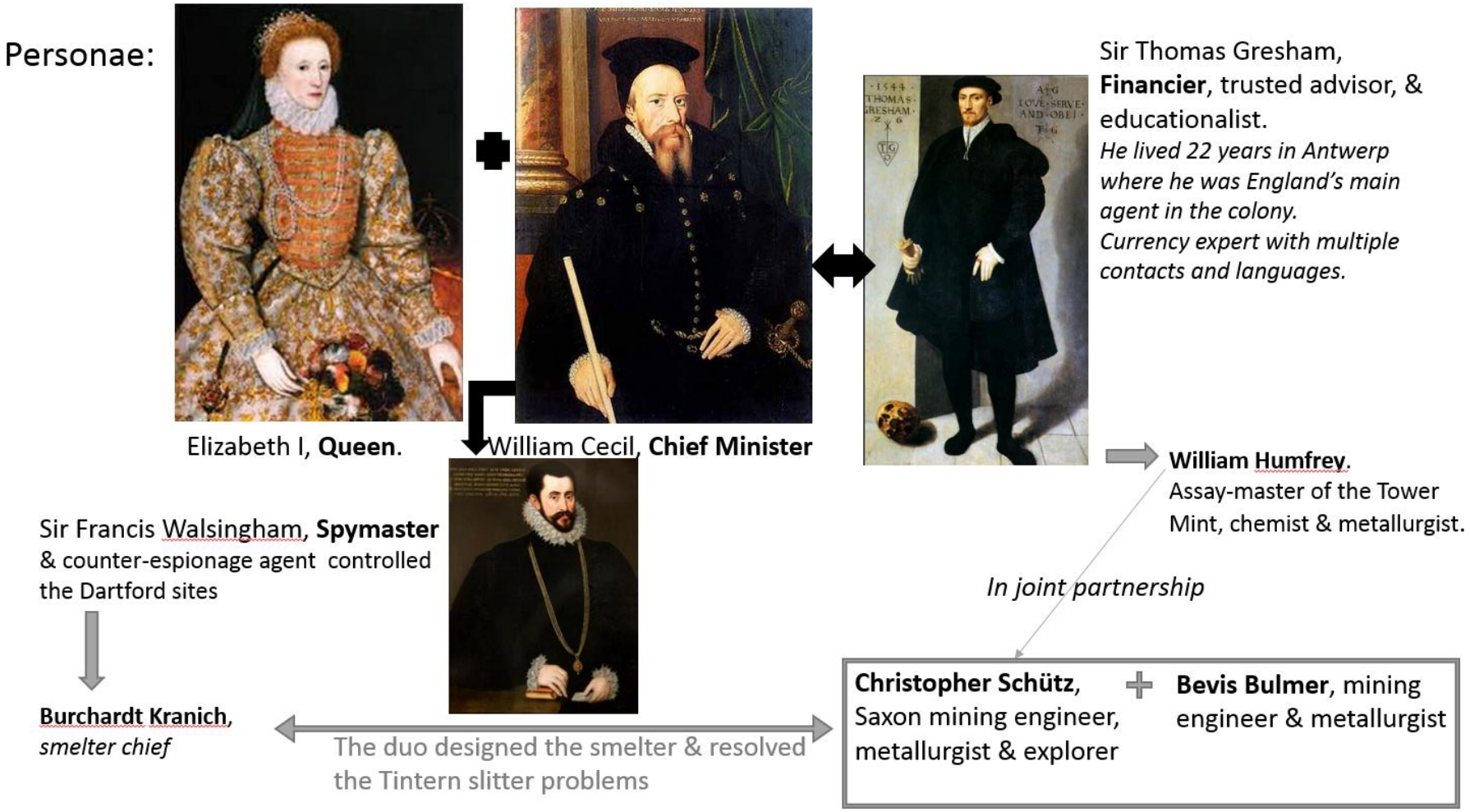


Fig 1. Personae involved in the slitting engine story

The slitter saga

The slitter is the single most important development in the history of nail making and it came about as a result of international effort, albeit most of which took place in Tudor England. Its story has since become so distorted and jumbled that the first big change in nail morphology has become shifted forward by half a century. As part of the study research it was necessary to spend major effort and time to determine the true facts - already sketched out in chapter 1 above. This section provides the critical details of the unfolding of this saga.

The story of the slitting engine begins with a long-hand note, issued under the Queen's 'placarde', introducing one Peter Anthony van Ghemen with his company.[5] He may have been from Brabant and was described in the placarde as being a subject of the King of Spain. The stories which have developed since are a quagmire of myths and false leads which have taken years of difficult research to untangle. There still exists an active tug-o-war between protagonists supporting the eminent Welsh writer on engineering history, Rhys Jenkins, whose researches were first published in 1915, and opposing factions .Most of the opposing factions are locked in to Howe's 1631 edition of Stowe's Annuls, which first set out the idea that a Flemish refugee, Godfrey Box (*Geofroy Buchs* or *Godefroi Boche?*), built a slitting mill at Dartford in Kent: '[Box} – *set up the first mill for that purpose neeere Dartford in Kent.*'

This is the main piece of jig-saw used by the opponents ever since. Peter King, now of some eminence in the Historic Metallurgy Society, and a supposed authority on the subject of English slitting, writes: "A mill **was built** on the River Darent at Dartford by Godfrey Box of Liege". He then goes on "--- after Box's death without sons in **1604**".[6]

Similarly, Hugh Bodey writes "The preparation of iron rods was accelerated by **an idea** imported from Liège, the slitting mill. The first one in Britain was set up by Godfrey Box in Kent in 1590".[7] Lewis adds to this: "The circumstances of its invention (slitting) are unknown but a **mill was exported from Liège** to England towards the end of the sixteenth century".[8] This last factoid is now locked into place in a French translation.

There are numerous other claims, many of which are patently spurious, and others often laughable, which will not be given light here.

The Gorhambury placard, fig. 2, sets out a series of claims by Van Ghemen to expertise and inventions in a wide range of fields. Because of its historical importance the note is shown in full. A transcription of the curious Tudor shorthand, commissioned by the author, and made by historical script experts from the Dartford Historical Society, then follows in transcribed form below:

[5] Calendar of Public Rolls Elizabeth I 1566-1569
[6] KING 1999, 71
[7] BODEY 1983, 11
[8] LEWIS 2008, 67

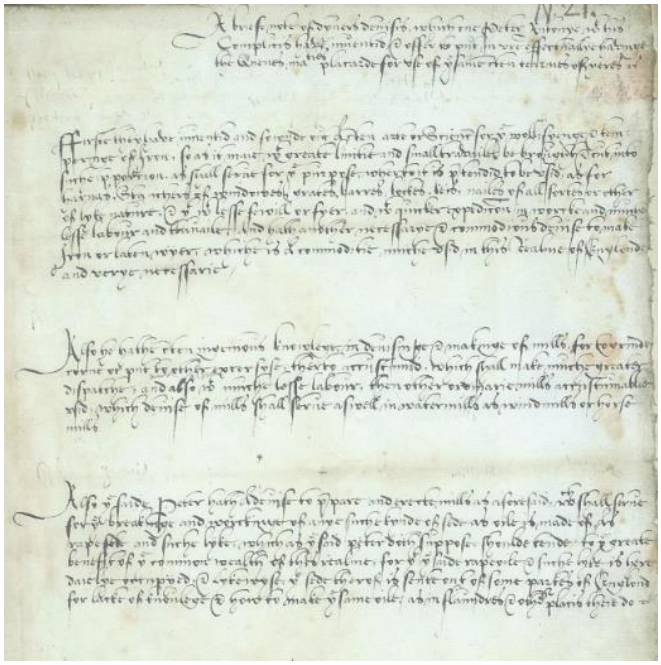


Fig. 2. The Royal placarde of 1567.

A brief note of dyvers devisis, which one Peter Anthony w^t his Complicis have invented and offer to put in uce effectually having the Quene's ma^jesties plaracrde for use of ye same certen teames of yeres as

Ffirste they have inventid and founde out certain arte or science for ye mollifying and temperinge of iron, so as it maie w^t (with) *greate linitie and small travaile be brought and cut into suche prportion, as shall serve for ye purpose whereof it is pretended to be used as for harnas stanchers of and windows grates barres, lockes, pecks, nailes of all sortes or other of like nature, and yet w^t less fewill or fyer and w^t quicker expedicon in worke and muche Lesse labour and travail, and hath another necessarye and commodious devise to make from or later wyer, which is a commoditie muche used in this realm of England and verye necessarie.*

Also he hathe certen ingenious knowledge in devisinge and makinge of mills for to grinde corne or put to other excersyse thereto accustommed, which shall make muche greater dispatche,and also w^t muche lesse labour, then other ordinarie mills accustmable used which devise of mills shall serve as well in watermills and windmills or horse mills.

Also ye said Peter hath devise to p(re)pare and erecte mills as aforesaid, which shall serve for ye breaking and worcking of any such kynde of sede as oile is made of linseed (?) *rapesede and suche lyke which as ye said Peter doth suppose, shoulde tende to ye greate benefit of ye commonwealth of this realme, for that the said rape oile and suche lyke is here daielye occupyed, and lykewyse the sede herof is sente out of some partes of England for lacke of knowlege and have to make ye same out as in Flanndres and other places there do.*

In modern English rendition might be:

A brief note of diverse devices which one Peter Anthony with his accomplices have invented and offer to put to use, effectively having the Queen's majesty's placarde (of approval) for use the same term of years, as they have first invented and found out certain arts or sciences for the mollifying of and tempering of iron, so it may with great effectiveness and small (amount) of work be effected and cut into such portions as shall serve for the purposes intended; to be used for harness stops (bits?) and for windows, fire-grate bars, locks, picks, nails of all sorts or (items) of like nature, with less fuel or fire, faster fabrication and much less labour or working. He has another much needed useful device to assist in making wire, which is a much needed commodity in this realm of England and much in demand.

He also has certain ingenious knowledge in devising and erecting mills to grin corn or to be put to uses of similar nature, which shall improve with less labour the usual mills to which we are customly used, which devices could serve also as water mills or for horse whims. The said Peter has a device to (assist) in erecting mills as previously stated, to serve for milling of oil seeds such as linseed, rapeseed which the aforesaid Peter believes would be of great benefit to the Commonwealth of the Realm. The said rapeseed oil and so forth, is in daily use here and often sent out from some parts of England due to lack of (processing) know how to be done in parts of Flanders and other places able to produce the oils.

Tintern: first English wire works and slitter

Van Ghemen was welcomed by Elizabeth's government who since 1565 had been desperately trying to resolve the production of iron wire needed for the carding of wool. This need followed from the loss of wool sales to Hainault and Flanders due to the unrest in the Lowlands. [9]

A pilot plant for the drawing iron wire was in hand at Tintern Abbey in south Wales, under the metallurgist and assay-master William Humfrey. Humfrey, in 1567 had imported a Westphalia finery expert, Corslett Tinkhaus to resolve issues with poor iron quality. His intended task was to make 'Osmond' iron at Rhyd-y-Gwern, Glamorgan, twenty miles south of Tintern.[10] Other documents indicate the Privy Council had already pursued legal actions against some of the Welsh suppliers of inferior iron.

The contents of Van Ghemen's 'Special Licence', XVIII of August 26th 1567 are shown in fig. 3 in an extract from the Calendar of Patent Rolls which enlarges on the information contained in the 'Placarde'. It also provides penalties for those breaching his licence.

There seems little doubt that an iron wire drawing mill was established in late 1567 or that a contemporary conversion was made of the existing medieval brass wire mill. It was sketched by an anonymous artist in 1807,[11] apparently still functioning in spite of its decrepit state, fig. 3. It is incontestable that there was a need to have slitting as a precursor to swaging and forge-welding of rods. This was so that initial 'ripping' passes through the larger holes of the draw plate could be accomplished.

The coincidence of dates and the licence description confirms that these were adjunct processes to the wire mill since substantial quantities of prepared iron rod stock would have been needed in order to be able to keep pace with the mechanical process. Even though the Tintern Mill scene was sketched

[9] HOW 2015, 81-90
[10] McNEIL 1996,
[11] HAYMAN 2016, 22

some 240 years later, the principle remains the same, (viz the large number of wire bundles produced seen in foreground).

Fig. 3. Tintern wire mill in 1807, with reels of wire in foreground and a draught-horse waiting.

494.) 26 *Aug.* 1567. *Gorhambury.* Licence for 21 years for Peter Anthony van Ghemen, born in the parts of Holland, a Spanish subject, and his [*m.* 14]

company to use the undermentioned new arts and devices invented by them and all other new arts invented or to be invented by them which have not heretofore been used in the realm and which within the next two years shall be practised by them in the realm; from the present date; no others to use the same unless employed or licensed by the licensees, on pain of forfeiture of the things made and 100*l.* (one half to go to the Crown and the other to the licensees) and such further punishment as the Queen or the Privy Council shall think fit. At their suit: they have invented the following arts with great expense and trouble—to cut bars and plates of iron and brass great and small in such pieces as shall be desired for works such as 'antiques', armour, 'garnyshyng' of gates, windows, coffers and other things, very meet for smiths accustomed to make armour, locks, keys, plates, bands, nails and like works of iron and brass, and also to draw iron and copper thread, with such ingenious instruments and in such a manner that far less fuel, time and labour shall be needed than formerly; also with new instruments to make oil of all kinds of seeds and other substance; also with new instruments to refine and draw out of lead and other mines a third part more substance than heretofore and with less charges of wood and coals; also to make newly devised pumps of brass good for cisterns and chiefly for ships; also to make newly devised instruments to cause a great quantity of water to spring out of a running river and to cause it to mount as high as one will, and thereby to make fountains and to refresh lands and meadows; also to make a new kind of mills to grind all kinds of corn as well by water as by land with horses, water and wind very ingeniously; also with certain mills and other new inventions to bring marsh and drowned lands to fertility and, because the said lands cannot so soon be brought to fertility, in the meantime through a new invention to bring them to great profit through drawing, gathering and breeding all kind of wild fowl using the water, and to take a great number of them and likewise therein to take a great quantity of fresh fish; and also other new inventions, which will give employment to many of the Queen's subjects and by saving time, fire and labour will make works of metal cheaper. [*m.* 15]
English. By P. S.

Fig. 4. Extract from Calendar of Public Rolls, Elizabeth I, 1566-1569.

Lawyer William Lambarde; his account

The next step in the evidence trail is Lambarde's account published in 1576, [12]of a slitting mill on the River Darent, south of Dartford in Kent. His manuscript was completed by 1570, however, this end-of-passage reference, fig. 5, could have been a late entry prior to publishing in 1576, see fig. 5 below. Two original copies of his book survive, each with a different font style: one is in the Huntingdon Library, and the other in Cambridge Library, and there are later reprints.

He was a historian, a lawyer at the Inns of Court near Blackfriars in London, and an influential legal authority,[13] whereby he was appointed Keeper of the Rolls in 1597. He founded an alms-house in 1574, was a Member of Parliament, and attended Court. At least two portraits survive, the best, fig. 5, being from an 1826 reprint of his book printed in Chatham, taken from an earlier image.

Fig. 5. William Lambarde from the frontispiece of his book's re-print of 1826.

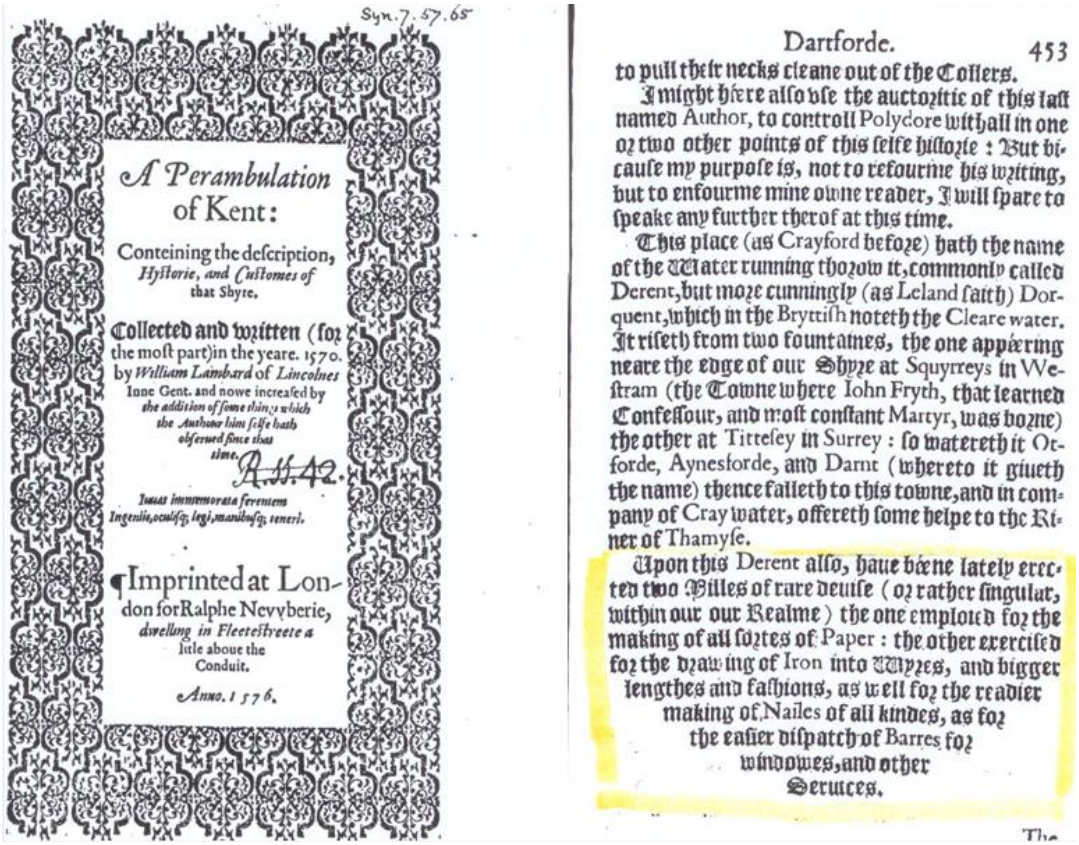
It shows a Tudor gentleman of some affluence, and his profession, works, intimacy with court, and later position of 'Keeper of the Public Rolls', all give credence to him being a thoroughly reliable witness, albeit non-technical.

The title page and reference page of his book, *A Perambulation of Kent*, published in 1576, are shown below, fig. 6. The Dartford entry may have been a late entry by the printer, and it is only possible to say with certainty that Lambarde saw the mills sometime between 1570 and 1576. [14]

[12] LAMBARDE 1576, 453

[13] His standard works, *Eirenarchia*, sets out the duties of a Justice of the Peace, the other, *Archeion*, deals with justice in the High Courts. They are standard references still in Britain and in Australia

[14] "*Upon this Derent* (River Darent*) also, have been lately erected two Mills of rare devise (or rather singular, within our Realme) one employed for the making of all sortes of Paper: the other erected for the for the drawing of iron into wyres, and bigger lengthes and fashions, as well for the readier making of Nailes of all kindes, as for the easier dispatch of Barres for windows, and other Services*". Lambarde is wrong about their being newly erected. The former Wheat Mill, and Barley mill, had been disused for some time and would have required extensive renovation, such that they may have appeared new.



Syn.7.57.65

A Perambulation of Kent:

Conteining the description, Hystorie, and Customes of that Shyre.

Collected and written (for the most part) in the yeare. 1570. by William Lambard of Lincolnes Inne Gent. and nowe increased by the addition of some thinges which the Author him selfe hath obserued since that time.

R.11.42.

Iuuat immemorata ferentem Ingenlie, oculisq; legi, manibusq; teneri.

¶Imprinted at London for Ralphe Newberie, dwelling in Fleetestreete a little aboue the Conduit.

Anno. 1576.

Dartforde. 453

to pull their necks cleane out of the Collers.

I might here also vse the auctoritie of this last named Author, to controll Polydore withall in one or two other points of this selfe hystorie: But because my purpose is, not to refourme his writing, but to enfourme mine owne reader, I will spare to speake any further therof at this time.

This place (as Crayford before) hath the name of the Water running thorow it, commonly called Derent, but more cunningly (as Leland saith) Dorquent, which in the Brytish noteth the Cleare water. It riseth from two fountaines, the one appearing neare the edge of our Shyre at Squyrreys in Westram (the Towne where Iohn Fryth, that learned Confessour, and most constant Martyr, was borne) the other at Titteley in Surrey: so watereth it Otforde, Aynesforde, and Darnt (whereto it giueth the name) thence falleth to this towne, and in company of Cray water, offereth some helpe to the Riuer of Thamyse.

Upon this Derent also, haue beene lately erected two Milles of rare deuise (or rather singular, within our our Realme) the one employed for the making of all sortes of Paper: the other exercised for the drawing of Iron into Wyres, and bigger lengthes and fashions, as well for the readier making of Nailes of all kindes, as for the easier dispatch of Barres for windowes, and other Seruices.

The

Fig. 6. Title page and reference page from Lambarde's book of 1576. (Cambridge Library edition).

It would seem Elizabeth's government had erred in granting the exclusive, long tenure licence to Van Ghemen, with its contained penalty clauses. Neither could they afford to take no action with respect to processing England's raw wool stockpile since their traditional markets of the southern Lowlands were closed to them. In developing the engine the government flouted its own rules, but the work being done in remote Tintern would have escaped notice. The solution to the problem of having a controlled site close to London lay in the availability of the two Crown owned mills on the River Darent, fig. 6, some locations refer to Sutton at Hone and others refer to Hawley Mills.

There were two water mills, formerly leased in 1534 to a George Tasser, which had reverted back to the Crown. Lambarde records both mills were in operation. One had been developed at a cost of £1500 by the wealthy Court Jeweller, John Spilman (*Johannes Spielman*). He was an anglicised Bavarian from Lindau, who developed the manufacture of parchment paper, using expertise gleaned from his father-in-law's paper-making factory in Nuremberg, and he imported a largely German workforce.[15] Both mills had received a mention in the Doomsday Book (circa 1080) as existing in King Edward's time and were owned by the manor of '*Bignours*' (now Bignor).[16] They had been resumed to Crown property by Henry VIII from the Knights of St John during the dissolution of the monasteries.

[15] DARTFORD TOWN ARCHIVE 2013 figures. Note that Lambarde records this mill. (Fig. 5).

[16] GIMPEL 1976, 12. Doomsday Book records 5624 water mills, two of which were probably used for iron production. Gimpel suggests that sites for mills remained basically unchanged up to recent times.

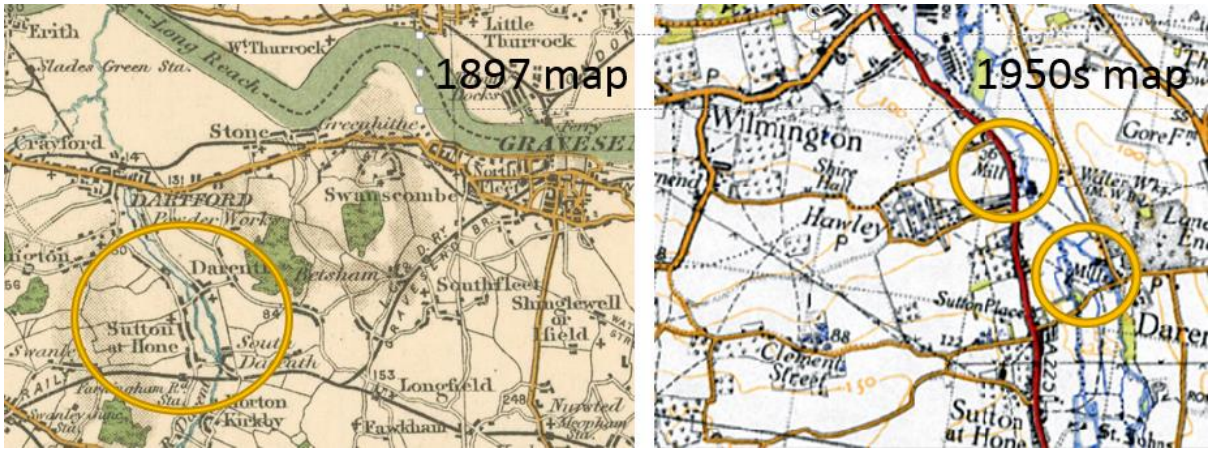


Fig. 7. Modern maps showing the mill sites and proximity to the Thames.

The Ordnance Survey maps, fig. 7. clarifies the two mill locations in respect of the River Darent, but it is not possible to say which site was the Paper Mill and which was the Slitting mill. It is evident from the map that in former times a parallel leat had been cut above the northern mill close to Hawley, and this leat served the southernmost site at South Darenth, sited on the Sutton-at-Hone Road. The close proximity of the site to the Thames, and within a short distance upriver to London, make these sites ideal in all respects.

Nearby another new project had already been built on the River Darent on land abutting Sir William Winter's house.[17] This was a stamp and furnace to smelt 160 tons of gold ore which had been brought back by Martin Frobisher from Canada. Christopher Schütz had twice sailed with Frobisher to seek for, and to advise on the ores found. [18] The provisions for security regarding the smelter, because of the expected high value product of the smelter site, were presumably transferred. [19] The sensitive nature of the site is further confirmed by the fact that the site control was entrusted, at the highest level, to Elizabeth's spymaster and intelligence gathering agent, Sir Francis Walsingham. See this section's opening verso page for the personae involved and the chain of command diagram.

Bulmer's deferred patent

In 1588 England faced its greatest crisis since the Norman Invasion of 1066 with the anticipated arrival of the Spanish Armada. However, on 4th December of that year a 12 year patent, No XLV, was issued to Bevis Bulmer for a slitting *'engyn'*. [20] This was 21 years and three months after the issue of the 'Special Licence' to Van Ghemen. Coming so close after the expiry of the Van Ghemen licence, the issue of the Bulmer patent could be interpreted as a valiant attempt by the government to put the record straight. Unlike Box, Bulmer was wealthy enough to finance the refurbishment and extension as he had made £10000 from the Ashburton silver mine venture alone.[21] He was also to some extent manipulable as both his parents had been condemned to death for their part in the 'Pilgrimage of

[17] BEST 1577, 115 - 121
[18] LONDON COMPANIES 2000,
[19] The ore proved to yield unprofitable quantities of gold. The keen interest of the Queen's chief minister, Willian Cecil, is indicated by an inscription in his own hand on the reverse of the site sketch. Christopher Schütz and Bevis Bulmer had been commissioned to design and build the smelter, but the assay and control came under another German expert, Burchart Kranich, who reported to the head of the Tower of London Mint, William Humfrey, who was also a Welshman.
[20] WYNDHAM HULME 1909, OLL 53
[21] ATKINSON 1619, note 34

Grace'. Bulmer had been probably been educated as a catholic but he first sought employment in neutral Scotland. What better man to finance the construction of the Dartford slitter?

With Walsingham in control it may also have been a test of Bulmer's loyalty to the Queen as a onetime recusant catholic.[22] He was later admitted to Court and paid lavish compliments to Elizabeth, presenting her with expensive gifts. [23] Bulmer was knighted in 1606 by James I, Elizabeth's successor. As Sir Bevis Bulmer, he was granted a new patent for twelve years in the same year. The wording of this new patent suggests there had been subsequent developments to the engine after the issue of the 1588 patent; *'… in consideration of his greate labor and charges in devising a new engine by water-work for cutting of iron into small roddes.'* [24] One can speculate, from the reference to "*greate charges*" that Bulmer may have been developing adjusting screws and similar devices as well as castings needed for a more substantial machine frame. We shall never know.

Since the war and political crisis with Spain were still on-going so the rapid issue of the patent shows the importance of the project to the nation's survival. The connection between slitting and wire production has already been dealt with in the author's paper. [25]

Because of the contrarian protagonists, it was also necessary to clarify the part played by Godfrey Box in this saga. As part of the study both Box and his wife Margaret's burial records were obtained from Dartford Parish Holy Trinity Church register, figs. 8 & 9, together with the Kentish Administrators' report dealing with Box's estate, since he died intestate. He left two daughters, Sarah and Anne.[26] A Thomas Hawes, who had been executor to Box's wife, is stated as arranging the guardianship of the daughters, who were minors, with a Richard Weklin; presumably another Fleming.[27] The object of this particular line of research was the need to establish Box's standing and his wherewithal relevant to the supposed task outlined by the contrarian claims.

A further Tudor indenture was obtained, pertaining to Clement Dawbeney,[28] and an extract life of Bevis Bulmer by his protégé Stephen Atkinson, which leaves no doubt as to Bulmer's engineering and metallurgical skills.[29]

There is little doubt that Godfrey Box had been engaged by Bulmer as his 'mechanic' to run the operation as he is so described in the Parish burial register for his wife Margaret, fig. 8. It is also clear that demands on Bulmer's expertise in mining, as described by Atkinson, left Bulmer with little time to attend and run the Dartford site. [30] Thus Box flourished and profited in this role, such that when he himself died he was described as a 'gentleman', in the Parish burial register, fig.9.

[22] Both his parents had been executed by Henry VIII for their part in the Pilgrimage of Grace uprising.
[23] ATKINSON 1619
[24] JENKINS 1971,
[25] HOW 2015, 81 - 90
[26] DOBSON 2004,Refer Duncan 1893
[27] DUNCAN 1893,2
[28] Dawbeney may have been an illegitimate son of Bevis Bulmer since the patent for the slitter was transferred to him on the death of Godfrey Box in 1603.
[29] ATKINSON 1619,
[30] ATKINSON 1619,

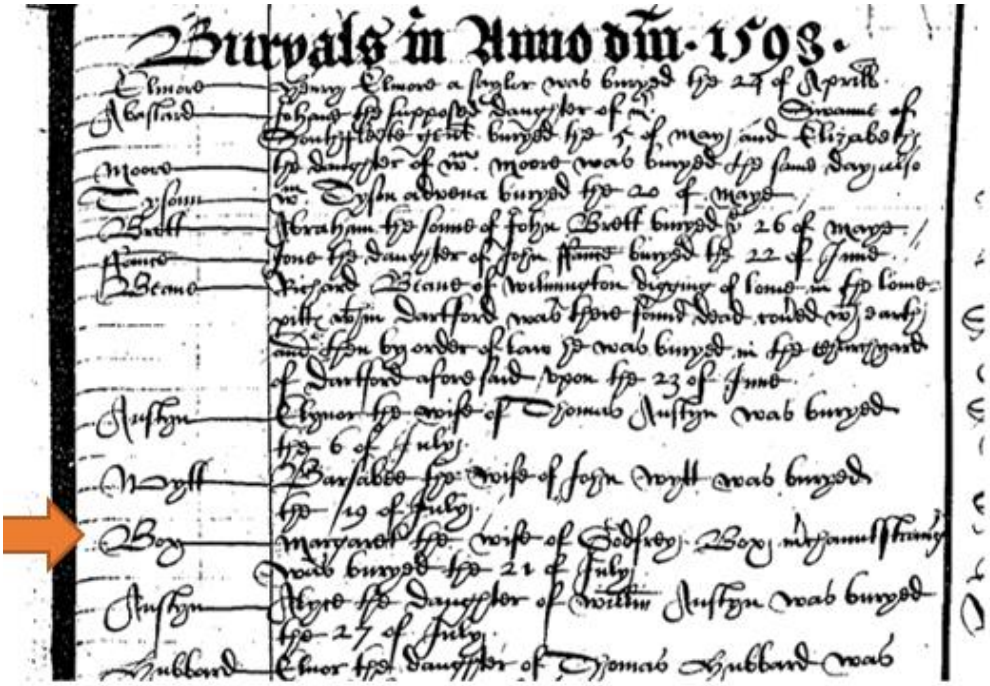
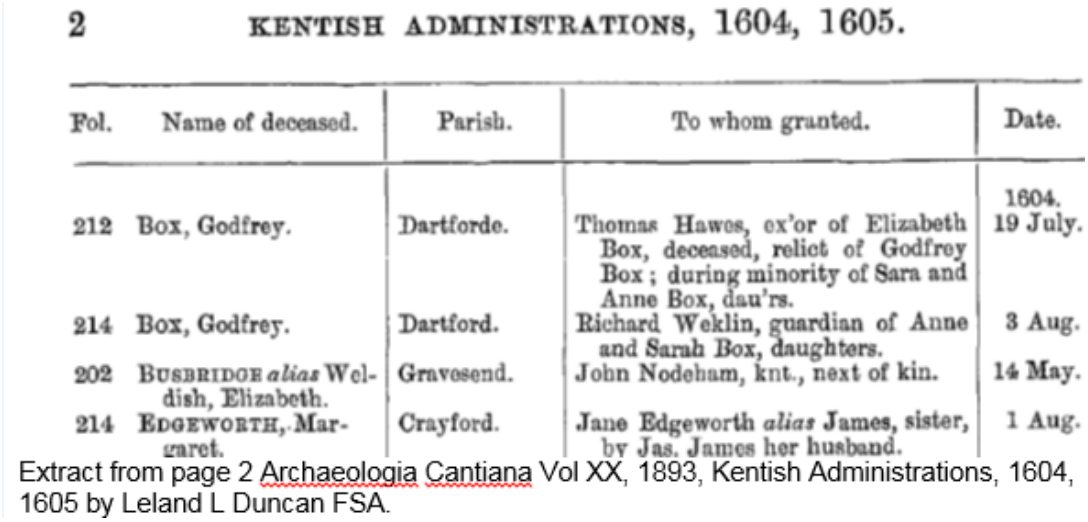


Fig. 8. Holy Trinity Church, Dartford, burial entry for Margaret Box.

Fig. 9. Holy Trinity Church, Dartford, burial entry for Godfrey Box.

Box died intestate in February of 1603 [31] leaving two daughters who were minors and so the County administrators were obliged to resolve his estate and appoint a guardian. Thomas Hawes, who had been executor to Box's first wife, Elizabeth, was appointed as caretaker of Box's estate during the minority of Box's young daughters[32]. The guardianship of the daughters was passed to Richard Weklin. The names Weklin and Box (*Buchs* or *Boche*) are more likely to be of Flemish origin than names usually found in Liège, but this is inconclusive.



2 KENTISH ADMINISTRATIONS, 1604, 1605.

Fol.	Name of deceased.	Parish.	To whom granted.	Date.
212	Box, Godfrey.	Dartforde.	Thomas Hawes, ex'or of Elizabeth Box, deceased, relict of Godfrey Box; during minority of Sara and Anne Box, dau'rs.	1604. 19 July.
214	Box, Godfrey.	Dartford.	Richard Weklin, guardian of Anne and Sarah Box, daughters.	3 Aug.
202	Busbridge *alias* Weldish, Elizabeth.	Gravesend.	John Nodeham, knt., next of kin.	14 May.
214	Edgeworth, Margaret.	Crayford.	Jane Edgeworth *alias* James, sister, by Jas. James her husband.	1 Aug.

Extract from page 2 Archaeologia Cantiana Vol XX, 1893, Kentish Administrations, 1604, 1605 by Leland L Duncan FSA.

Fig. 10. Extract from Kentish Administrations, provided by Dartford Historical Society.

On Box's death Bulmer appointed Clement Dawbeney to run the mill and the new patent rights were transferred to him in 1608, seven years prior to Bulmer's own death. At an anecdotal level, Dawbeney unsuccessfully attempted in 1612 to use the transferred patent rights to oppose the import of Flemish nail rods into the London market. The Lord Mayor of London had tests conducted on the imported iron rod which was found equal to the home produced item, and Dawbeney's suit was dismissed. [33] This minor incident is a useful measure of the success of slitting in the Lowlands, since the industry (presumably based around Liège) could supply iron rod to London cheaper than was being produced at nearby Dartford.

Background events

This long winded story has been necessary to give proper perspective to the facts and events which occurred. It is pertinent to see these as having their own particular timeline:[34]

[31] Note that Peter King gives his death as being 1604. Neither he, Lewis, nor Varman refer to the Belgian research done in the French language. Varman cites Rhys Jenkins selectively and then gives the date of the patent extension of 1606 as if this were Bevis Bulmer's first patent. He then identifies Bevis Bulmer as "Sir Davis Bulmer". None of them take account of the total disruption and dislocation of trade caused by the horrors of the civil war being fought in the Lowlands, nor of the complex political situation there or religious tight rope being walked by Elizabeth.

[32] *Jus relictae*. Uncommon in English Law but normal in Scotland. The daughters were entitled to his property but only when they ceased to be minors. It is not clear if Elizabeth was a first wife and Margaret a second, or if the lady had assumed two names at different times. There is also the possibility of a documentation error.

[33] SKEMPTON 2002, note 36

[34] Sources: BURGON 1809, Note 22: FRANQUOY 1861, 63: HANSOTTE 1972, 4: JENKINS 1971,: KONNERT 2006, 129: McNEIL 1996, 8: PATTERSON 1997, 90; PRATT 1914, 779: ROOME 1982, 11-18; ROWSE 1955, 398-424: SKEMPTON 2002, 100: SMILES 1868, 93: VAN GELDEREN 1993, 60: WYNDHAM HULME 1896, Note 20.

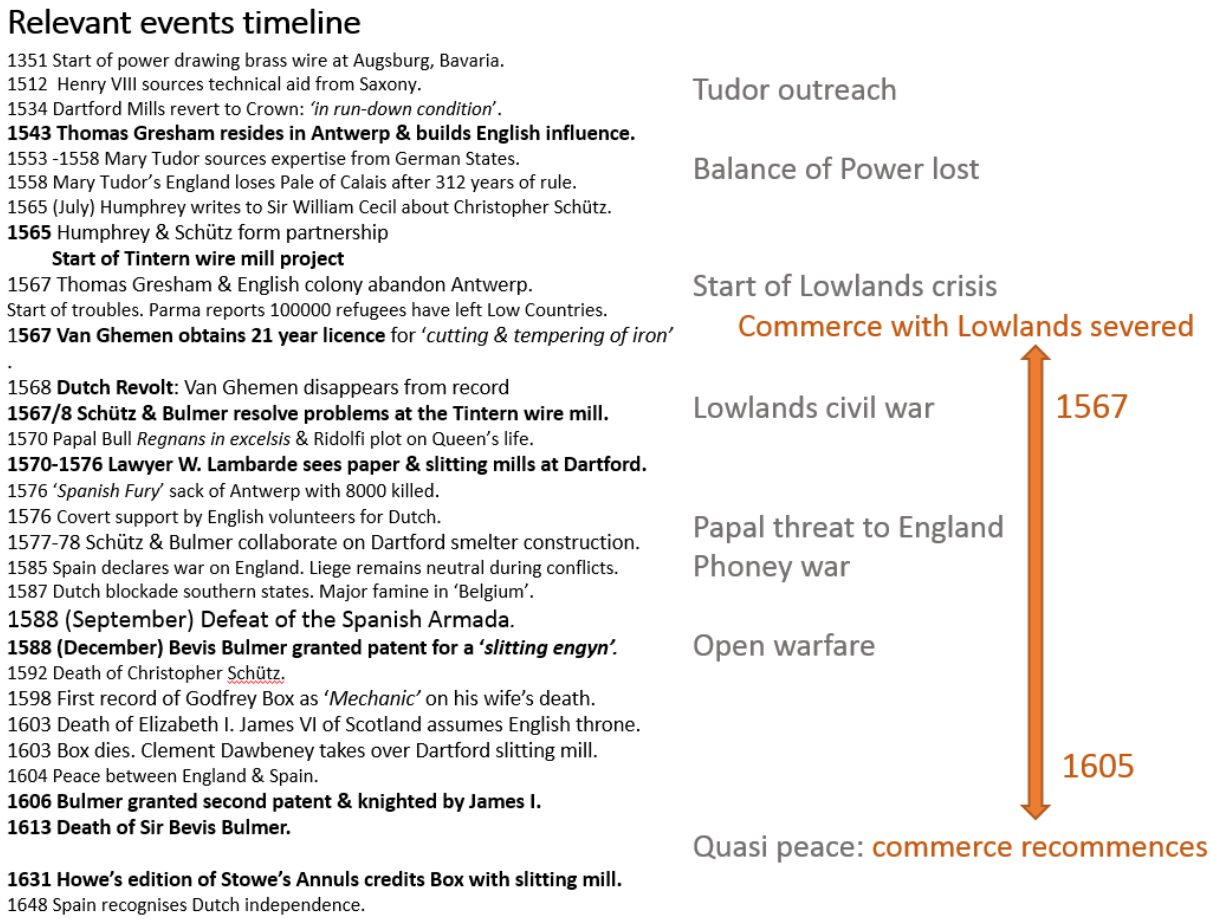


Fig. 11. A timeline of relevant events. Author

Summary of events

There is no evidence linking the Dartford slitter with Liège, however, the possibility remains open, so Hugh Bodey might possibly be right in saying that the idea came from there. A contrary view of the assertion that the engine was already developed in Liège goes against the eminent Belgian researchers, Franquoy and Hansotte, as will be seen below.

The coincidence of Van Ghemen absconding from his valued clients suggests he was somehow caught up the events overtaking the central lowlands and Antwerp in particular. It is possible to speculate that he went to fight on the protestant side of the assembling forces, or it may have been a question of protecting his property. The particularly well advised Sir Thomas Gresham was able to pull out of the violence, but only at the cost of leaving infrastructure and much else behind.

Peter King's reference to bars 'straining hollow' at Tintern confirms a source of pre-drawing material being on site in slit rod form, having already undergone swaging. Adaption of stamp machinery, as for example shown by Agricola, to a set of mechanical swaging hammers, would have been child's play to Christopher Schütz who was himself a disciple of Agricola. A variety of water-driven stamps and cutters are shown by Agricola in De Re Metallica, and a small tilt hammer which could easily be converted to power swaging. [35] A battery of these smaller hammers is shown by Weigel used in producing brass

[35] HOOVER 1950, 284, 287, 373,501, and 422 –bottom

plate.[36] However, King fails to make the connection with engineering practices of the period, thereby missing the on-site slitting engine at Tintern. This was almost certainly the prototype machine which would be subject to further development as made clear in the wordings of both patents granted to Bevis Bulmer and that granted to his successor Clement Dawbeney

In Miles Lewis' defence regarding his unlikely scenario of a State ruled by a Prince of the Church exporting (in a politically flagrant manner), equipment of military value to an apostate England, the late Kitty Roome did find evidence of letters and packages being sent from England via Calais (then back in French hands) through to Liège. However, Lewis advised me that in this instance his source was Bodey, and Bodey limits the invention description to an 'idea' coming from Liège.

A realistic view of an effective threshold date for nails coming from nail rod would be after 1570-1576, and may only have applied to the London and Bristol nail-makers.

The Belgian references

Bearing in mind the 1570-76 observation and the undisclosed earlier machine at Tintern[37] it is possible to dispense with the contra-party's claim that the invention of the slitting mill came from Liège or the region to the east of the city. The late Georges Hansotte researched this thoroughly, (refer 1.4.1) and arrived at dates between 1583 and 1591 for the start of slitting in Liege. [38] These dates are later than Peter van Ghemen's special licence of 1567.

Changes in nail morphology would have taken some time to make an effect since it took time for the invention to spread. In both countries (England and Belgium) early samples show how the nails themselves rapidly modify due to the new nail rod form of supply. As already mentioned above this change in technique did not occur in northern France. A suitable time frame of between 1590 and 1610 might be appropriate from an identification viewpoint for both British and Belgian nails.

[36] WEIGEL 1698, 317

[37] One source says that the Tintern slitter ran from 1580 – 1591. (Early Modern History: Metal Working). This is after the first recorded sighting at Dartford, but the absence of earlier records may be due to official reticence. The prototype probably went through several variations, so this reference may relate to one particular variation.

[38] HANSOTTE 1972, 4

Appendix IV:

Lessons from antiquity

Appendix IV: Lessons from antiquity

OVERVIEW

This appendix looks at features emanating from the historical aspects of the study, which in turn raise four primary questions;

- Is there a common morphology to nails?
- From what source or tradition do our nail typologies come?
- What alternative systems exist (given a common human 'platonic' factor)?
- Why do wrought iron nails appear so uniform across Europe in the broad band of history?

IV – 1. Searching out a common morphology

The same or similar questions occurred to Charles Fremont who points out that nails, per se, do not have to be metallic, an observation which has been confirmed by this study.

The first signs of nails to have survived the ravages of time occur in ancient Sumeria. Some very small copper nails & copper wire were used for fixing the famous compound cast copper stele found at al' Ubaid, Ur, circa 3100 BC. Other more elaborate and beautifully cast nails were found, but these appear to be markers, having no proper fixing function.

There were definite links between Sumer and ancient Egypt, but so far no signs of nail-technology transfer have emerged during the study. Most Egyptian nail look-a-likes are furniture pins, which are often related to folding chairs or to beds. Dr Martin Odler of Charles University, Prague, currently undertaking metallurgical research on a range of these objects, drew my attention to more recent nail finds in Egypt. [39]

Freshly taken photos of nail-like objects from three sites in Sinai, presently lodged in the archives of the Leipzig University Museum's historic collection, [40] were supplied for use in this thesis. Other like images have been obtained from the internet. These have enabled a composite chart to be made, fig. . The implications shown by this chart show that the change from pins (*chevilles*) to pointed/driven nails did not really occur until around 1400BC.

It can be seen from fig. , that the first true driven nails seem to arrive between 1400 and 1250 BC. Once the Romans had established control over the Red-Sea ports the nail finds, EA1 and EA2, assume a familiar morphology in Ptolemaic times.

[39] ODLER 2019,

[40] Karl von Stülpnagel graciously took these photos, LM1, LM2, LM3, & LM4. None appear to be true nails and Herr Stülpnagel advised that the cast bronze furniture pins had been modified by forging to enable clenching.

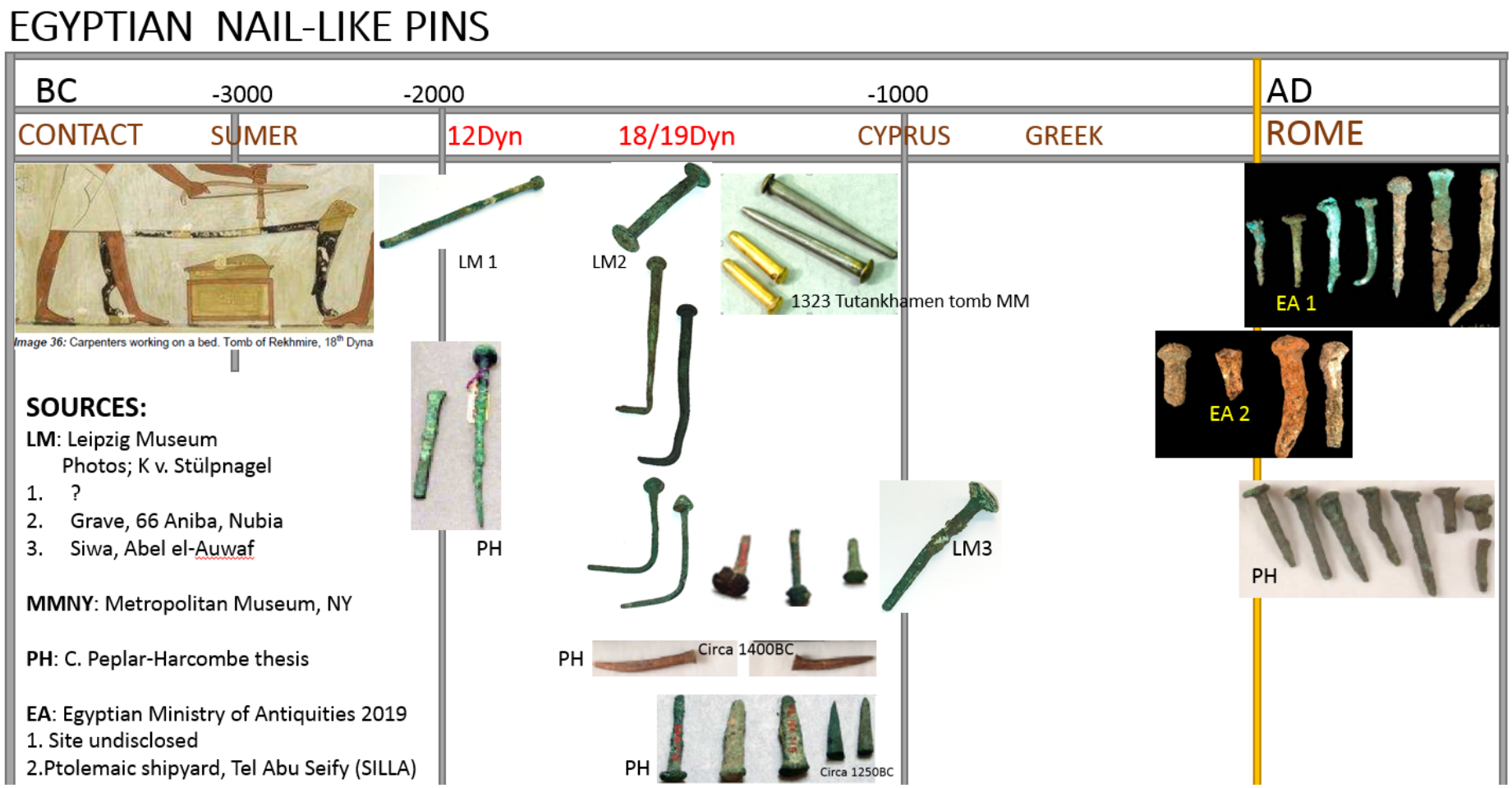


Fig.12. Progression of ancient Egyptian nail-like pins with time.

IV – 2 Development of a traditional typology

IV. 2. (i) Celtic/Roman melding

Some caution needs to be applied in attributing too much to the Romans about iron technology per se. An important Roman source makes it clear that the Celts (Gauls) led in both iron technology and in ship building:

> *"- the Celtic ships are so well built we cannot damage them with a ram. They are entirely of oak, fastened with iron nails as thick as a thumb -- their anchors are attached by iron chains".* [41]

The opportunities for researching Celtic nail types are limited and lie best within the realm of the archaeologist, but by fortunate chance the displays at the Museum of St Germain-en-Laye provide some essential clues. These include nails used to secure iron wheel rims from a fifth century BC source at Jonchery-sur-Suippes, Marne, which are not significantly different to ones used in the last century, excepting that the nails securing the rim are blunt and round-ended. They lack the full taper associated with Roman nails.

What stands out from artefacts obtained from the Rhone '*chalande',* of 90AD, (now in the Arles Regional Museum), and the selection of finished iron recovered from the Titan reef, off Saintes Maries de la Mer, is the comprehensive nature of Roman disciplined organisation. The Arles museum was able to establish that the iron beam and bars now on display at Arles Museum, fig. 12, Volume I, show that the iron came from mines at *Des Martys*, close to the *Montaigne Noir* in Aude. The finished iron items were stamped with makers marks and was destined for the Rhine Army. We can presume that the shipment was destined go up the Rhone to beyond Lyon, before traveling overland for further water travel via the Meuse, fig. 13.

There is further evidence in the form of a wooden creel of *clavae caligarii* recovered from the river silt at Arles, fig. 13. This suggests that a specialised nail making industry attached to the Army was located either in Arles or in a nearby centre such as *Massilia* (Marseille).

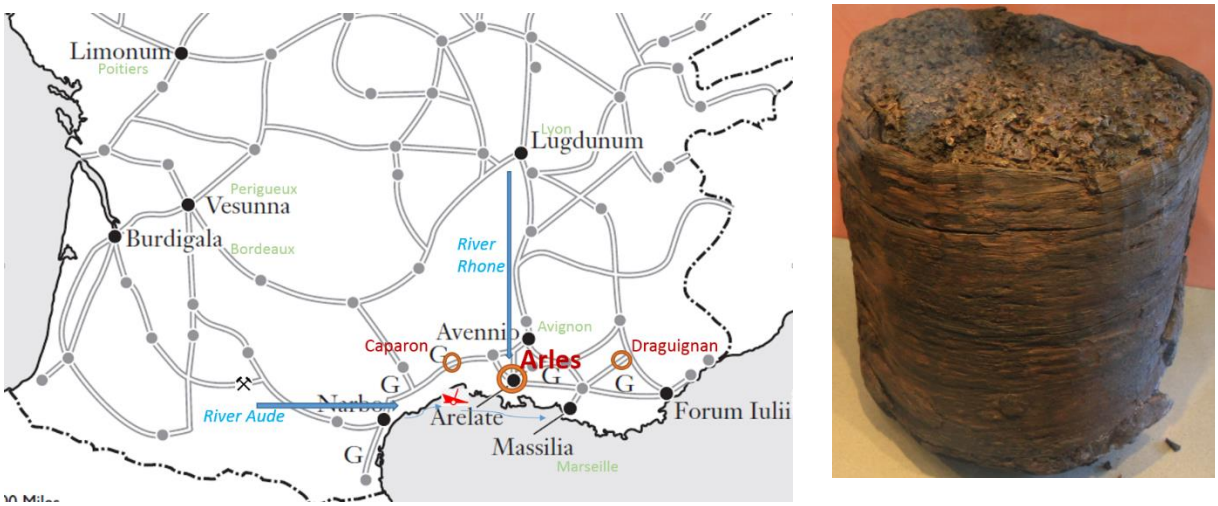


Fig. 13. The Roman iron supply route through Arles, and the restored creel of boot nails now on display. Author

Ship nails recovered from the chalande give credence to Julius Caesar's description. Sabrina Marlier at the Arles Museum shows how the hull timbers were first pegged with oak treenails.[42] These were then drilled longitudinally before the large iron nails were driven through and double clenched back

[41] DBG

[42] MARLIER 2014, 140-145

into the inside hull timbers. The same method was used in the City of London ships recovered at Blackfriars and New Guys Hospital, fig. 14. [43]

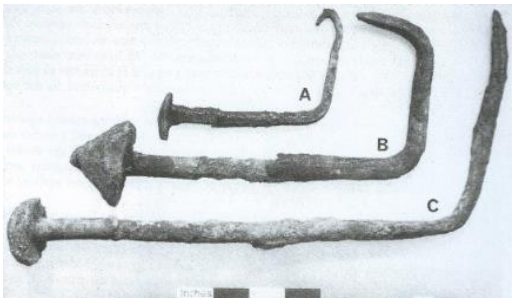


Fig. 14. Romano-British ship nails from the Blackfriars ship and one from Guy's New Hospital, after Marsden.

When compared with Roman bronze ship nails - predating the conquest of Gaul, it is evident that some melding of technology took place as the Romans learned from the Celtic Gauls. Note also that the Celtic practice was to adopt oversized heads to the hull nails, as an added water-proofing feature.

Fig. 15. Ship nails from Arles Museum and detail of cast head showing the entry sprue. Author

One more thing stands out from the examination of the Arles archives. The Roman bronze nails show a full shank taper in an exquisite display of casting technique, figs 15 & 16. It was easy to see the 'sprue', or point of entry to the metal, as the apex of the domed heads. This high standard casting could only be done using plaster-like moulds, which one presupposes would be re-used – hence a two-part mould. Thus ejection of the finished artefact would entail a full taper. The contention here is that the Romans transferred their image of an 'ideal nail' shape across to the nail-smiths supporting the army, even though it made their forged nails less effective in holding power.

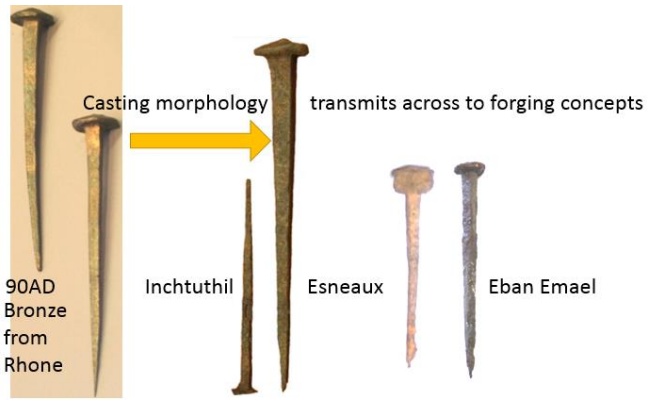


Fig. 16. Taper transfer from Roman bronze to a generalised shape iron nails. Author

Once set, this precedent continued to be the ideal form carried forward until the advent of slitting in 1576. In fact, many French nails, even after slitting was well established, continued to exhibit a quite unnecessary marked taper. Belgian and British nails do not, and one suspects this was to do with the freeing up of the industry away from guilds, which occurred first in these two countries. It also involved the nailor in less work and gave their nail industries a competitive edge. Only coincidentally did it make for a more efficient nail typology.

[43] MARSDEN 1965, 11-21

IV – 2 (ii) Roman production & organisation

In other ways we are beholden to the Romans for setting an international trade in place well in advance of a purely commercial world. Brulet shows the level of workshop and troop concentrations in *Belgia* supporting the Rhine Army. [44] (Vol. I. 3.4). There was therefore a strong association already in place comprising a disciplined corps of iron working artisans. This is an aspect worthy of further investigation.

IV – 2 (iii) Historical nail typologies

Up to the end of wrought iron nails - say by 1850 or so, the trade dwelt in an extended Roman era in regards to nail types. The most obvious of which is the most used 'common' nail, which continues down through the centuries almost unchanged. Apart from the tapered shank a further subtle difference lies in the slighty thicker rim to the head, fig. 17.

Fig. 17. Typical tapered shank common (or rose-head) nail coming from the Roman tradition. Author/McCaig

This continuity of typology applied to other often used types of wrought iron nails. Although Roman nails do not survive well in Britain, Ward's compilation of Roman wrought nails made in 1911[45] enables a good comparison to be made of how alike they are to pre-industrialised nails, [46] fig. 18.

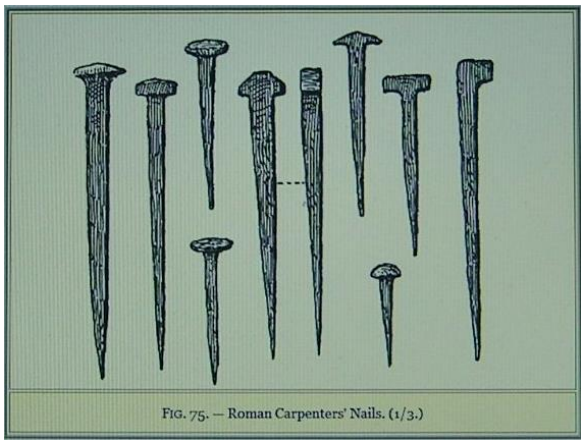


Fig. 18. Roman and post slitting nail typologies compared. Author

[44] BRULET 1990,
[45] WARD 1911,
[46] Sources used: **1.** 1740 Glastonbury **2.** 1710 Ardeche **3.** 1684 Pertuis, Provence**. 4.** circa 1760 Glastonbury. **5a.** 1863 Portland, Victoria **5b.** 1710 Ardeche **6.** 1831 Sydney, NSW.

Several other remarkable likenesses occur of which four are compared here. The common nail gets adpted with a thicker shank to take the extra wear and lateral load when used in fixing hinges in the Roman version of the jobent nail, fig. 6. This was almost certainly a Roman initiative which has come down to us through the ages. Similarly the unkanny similarity to the Roman ship sheating nail with its carefully indented underside to head, the less obvious clasp form, and the protective tip hob-nail with its distinctive, asymetrical sweep back, fig. 19.

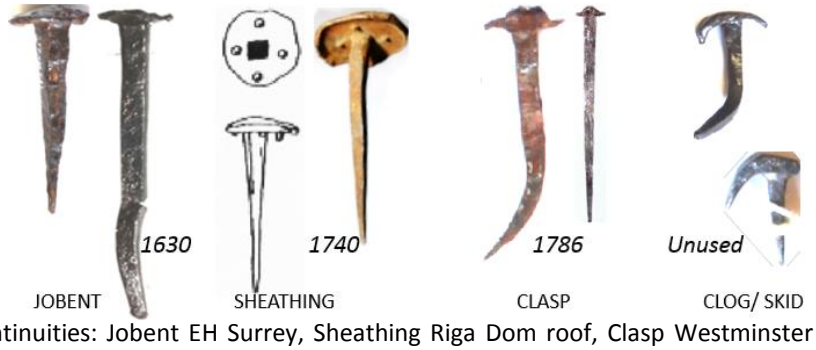


Fig. 19. Secondary continuities: Jobent EH Surrey, Sheathing Riga Dom roof, Clasp Westminster and a Naish collection miners boot hob. (Also used on worker's clogs and for timber skids). [47]

There are other like similarities, particularly in respect of door nails, but this thesis is not intended to dwell too long on antiquity, but rather to arrive at a practical dating system. Suffice it to note that up to the end of wrought iron nails - say by 1850 or so, the trade dwelt in an extended Roman era with respect to nail typology.

There were alternative systems which might have been developed, but in fact were not done. Random development by smiths or iron workers has been revealed in what has already been noted by Duhamel du Monceau in what he simply terms, *clous de ferronier*. Du Monceau illustrates a common type of spur-head brad, which has showed in heritage restoration works at Rue Haut, Apt, (under the control of Prof Vanden Eynde), and these were immediately recognisable as such. The significant difference between these and those from a professional nailor lies in the forging process, which involved folding the iron shank laterally from a flattened section of hot iron.

IV – 3 Two schools of nail-making

The other major departure comes with oriental nails, which stretch further back into antiquity. Awareness of this whole world of difference came about as a result of exchanging framing information with Yiting Pan and her colleagues, at Cambridge. She has kindly provided the excerpts from the Chinese sources seen at the front of this thesis. Dr Pan also provided this fascinating set of references to 'nails' coming from ancient ancient caligraphy scipt changes, fig. 20.

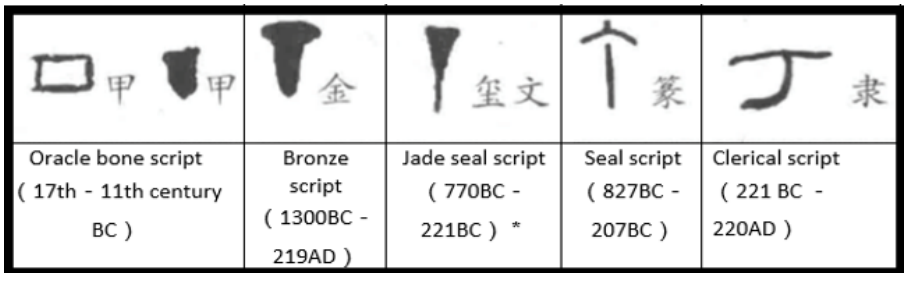


Fig. 20. A progression of references to the word 'nail' seen in Chinese caligraphy changes. (Dr Yiting Pan).

[47] Roman exemplars are from the Liege archives and are shown on the left of each pair: Eban Emael EB-CBR F13 L2: EB-CBR F90: WAN-GOLF Secteur 4 #65. Author. The sheathing nail sketches relate to the Roman period ship found at Richborough, Kent.

IV – 3 (i) Western and Eastern schools

The two schools can be very simply divided into countries in which the obore is used to form nail heads (usually rose-heads) as is the case in the West, and the Eastern school. In the Eastern School only hammer and anvil are employed in folding techniques, or, for T-heads and decorative nail heads, a flattening followed by a rolling technique is used.

They are best known through Japanese nail-making techniques, but it would appear Chinese nails set an overall pattern for South-East Asia, which, coincidentally also influenced both framing and temple construction in Japan. In the Japanese system a basic classification of nail types starts with the folding. Thus three basic forms, fig. 22.

Fig. 21. Japanese nails classified by the folding technique.

Obore headed nails appear in China during the 15th Century in the Baochuanchang shipyard, figs. 2, Vol. I, & 22. [48] The use of headed nails might be due to direct Western contact with the Portuguese, or it could reflect earlier maritime contact with ancient Ceylon, India, and Roman sandal nails etc.

Fig.22. Nail group from Baochuanchang showing western style heading, compiled by Yiting Pan 2016

IV – 3 (ii) A worldwide perspective

Archaeological finds show that Roman influence stretched far to the north beyond the Limes customs frontier, fig. 31, right up to the Baltic, but to develop a historical picture of cross-cultural contacts the Roman influence in the east was also examined, fig. 23.

At first limited to travel via the red Sea, by the time of Titus, (71 -80AD), a more direct route had opened to the East via the Gulf, fig. 22. Strabo commented on the eastern trade; [49]

[48] PAN 2006, : see also MERCER 1929, 244-246
[49] TITUS 17.1.13

Previously not more than twenty ships dared peep outside the Straights, but now great fleets are sent as far as India and the extremities of Ethiopia.

Pliny the Elder bemoaned of "*50 million sesterces that India annually drained from the Empire.*" [50]

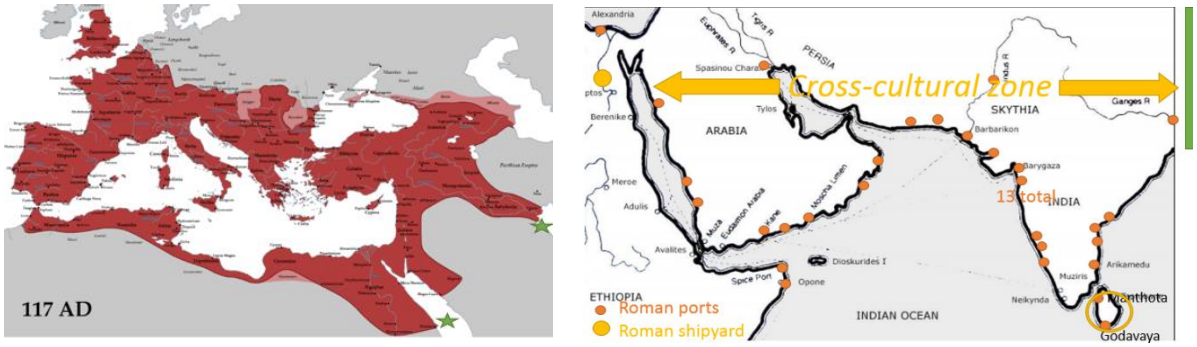


Fig. 23. Eastern trade routes of the Roman Empire and its trading ports on the Indian Ocean. [51]

IV – 3 (iii) Pivotal points of influence

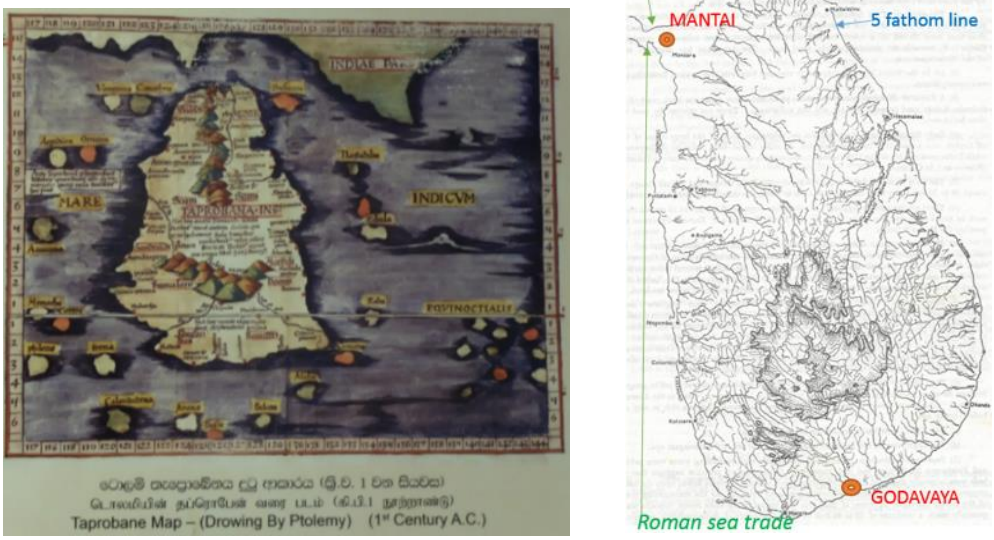


Fig.24. Ptolemy's 1st century map and the ancient Ceylon shore line during the late Pleistocene. Courtesy Deraniyagala, 1958

A map by Ptolemy dating from the 1st century, fig. 24, shows that the island of Ceylon was already well known to the ancients. Extensive finds show it acted as hub between Imperial Chinese and Roman influence. [52] Prof Manawadu at Moratuwa University, Colombo, advised the author that there was contemporary sea-borne trade as part of the maritime Silk Road, carried out by the Chinese Empire which approached Mantai (Tamil name) from the north. Further travel southwards was restricted by shallows, fig. 24, [53] but many Chinese coins and artefacts have been found at this location. Manthota (Sinhalese name), to the south of the shallows, operated as a port from 5th century

[50] PLINY 6, 101
[51] YOUNG 2001, adapted from the *Periplus Maris Erythraei*

[52] AUTIERO 2017 demonstrates the extent of trade with Roman glass found in Chinese tombs c200AD and Indian ivory carvings found at Pompeii.
[53] DERANIYAGALA 1958 (2001), 13

BC until the 11th century AD. Both parts are now abandoned but numerous Roman finds occur in the southern part of the area.

In addition to ancient Manthota, other excavations have shown significant Roman finds at the now silted-up, former port of Godavaya on the south coast on the Walawa River east of Galle. Offshore a vital wreck of uncertain date – 2nd century BC to early 1st century AD, has been recently examined. [54] The Godavaya wreck may be an Egyptian vessel or date from the Roman conquest of Egypt. Its contents show it was outward bound with exports of iron and copper ingots, fired bricks, beads & bangles. Found with it were Roman coins and amphorae. Most telling of all were ingots of solid dark blue glass, as used by both the Egyptians and Romans. However, no nails were found associated with the wreck, suggesting that the vessel was of stitched construction, after the Arab manner. A similar boat from Cheops, circa 2500 BC, is said to have been capable of like voyages. [55]

Roman trading extended also up the east coast of the Indian sub-continent and up the River Ganges. This puts Persia, Arabia, and India, potentially within a Roman sphere of influence. Some nail finds in the ruins of the former royal palace complex at Polonnaruwa in central Sri Lanka show Roman style door nails and this complex was burnt down in 1240, well before the arrival of the Portuguese in 1510.

A further cross-cultural contact was detected by Sir Mortimer Wheeler's 1946 excavations of a Roman trading port at Arikamedu on the east coast of India, lying to the north of Jaffna.[56] This fits with similar Roman activity along the Malabar Coast. A remarkable surviving account details this aspect of Roman trade: the *Periplus Maris Erythraei* - which provides details of Roman trade through the Red Sea. [57]

Although further research is needed an interface between the Western School and Eastern School of nail-making is likely to be in the area of Bangladesh.

[54] DIMUCCI 2015, 22: SOLANGARACHCHI 2011, 325 shows iron exported in Roman times & use of iron nails at Sigiriya, 304
[55] McCARTHY 2005, 13-29
[56] BEGLEY 1997, 513-537
[57] AUTIERO 2017, 80-81. Also mentioned by SOLANGARACHCHI 2011, 327

IV-4 European (Western) uniformity of pattern

The Roman links are in themselves insufficient to explain the unusually high uniformity expressed by nails across Europe, and the background of a high Celtic iron culture prior to Roman dominance is also a factor but not in itself absolute. However, one historical event stands out as explaining the 'standardisation' of a European culture as affecting nails. These concern the army regularisation and reforms started by Augustus at the start of the new millennium AD. [58]

Scandinavia was little touched by Roman rule or cross-contact and it is perhaps significant that in Sweden, with its severe winters, and hence use of thick timber walls, that there exists in Europe a partial exception to the use of obores for heading nails, fig. 25.

Fig. 25. Abandoned partly completed spikes and large nails at the Alga Museum, Sweden. Matthias Halgren.

It can be seen that, for the larger spikes, extensive use was made of folding techniques in order to form the head. The nails being made, seen in Volume 1, chapter 1, fig. 13, were done using a freestanding obore of major proportions, which allowed shanks of significant length to be headed.

As already noted, survival of techniques in Sweden suggest a long term affinity of thicker forged battens in the nail trade across Europe, possibly deriving from Roman preferred stock iron (as seen in chapter 1, fig. 12. There is a certain logic to Sweden maximising its abundant water power resources in the retention of these methods and stock sizes.

Fig. 26. The Alga nail and spike factory circa 1851. The vertical obore is shown on right, in right foreground

[58]ROTH 1998, 20-22: STANKOVIC 2012, 131: also FEUGERE 2002, 89-200 who discusses the organisation of Roman army equipment and its Celtic borrowings.

Appendix V

Emerson's Iron Works mill: a confused description, 1758

V. 1 Suspicious Ironmasters

When Arthur Young made his six month tour of northern England in 1770, one of the things he particularly noted was the "excessive jealousy of the manufactures" (sic) in their reluctance to provide information on their processes. His Swedish contemporary, Angersteins commented on this same secrecy with which he had to circumvent in his seeking out information both at Blenheim in Oxfordshire and in Birmingham: [59]

Just below the steel furnace there was a button factory, to which I gained access with the assistance of the owner of the steel works. I saw here the casting, stamping, turning, polishing, and scouring carried out very quickly and deftly, mostly with the aid of lathes, the spindles of which are split to hold the loop of the button. The owner of the works then came in and started to berate the workers for letting me in. I did not wish to become involved in any trouble with him, so I went on my way.

Blenheim 1753.

Soon after he had a second disappointing encounter:

I walked two English miles south of Birmingham to look at a rolling mill for sheets for boxes and narrow sheets of copper and silver plated tin to be used for the manufacture of buttons. This mill is not shown to strangers but due to the recommendations of a file-cutter, whom I had taken with me as company, I was let in. This upset the owner when he arrived a little while later, and he loudly upbraided the workers and the file cutter.

Birmingham, 13th April. 1753

V. 2 Emerson's Rollers

In the light of these three experiences, there is a possibility that Emerson, (refer to Chapter 1, section 1.1.4 above), was also deliberately misled. He describes a set of 'toothed' rollers as a slitting mill when his drawing clearly shows that the interchangeable rollers, AB, do not intersect each other, fig. 27, and hence slitting action, or shear, would not have been possible.

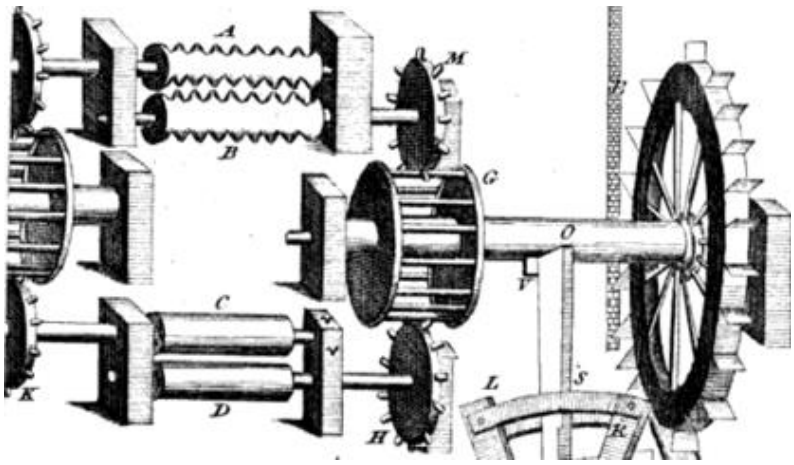


Fig. 27. Iron Works rolling mill as sketched by Emerson. [Pl. XXXIX]

Emerson's description, taken from the original, reads as follows, fig. 29: [60]

[59] ANGERSTEINS 1756,

[60] EMERSON 1758, 194/195

slitting iron bars. C, D are 8 inches diameter; A and B about 12. And these cylinders may be taken out and others put in, and may be brought nearer to, or farther from, one another, by help of screws, which screw up the sockets where the axles run. The axles of N, I, K lie all in one horizontal plane. And so does M, G, H. But the cylinders A, B, and also C, D, lie one above another.

For making the plates; if a bar of iron be heated and made thin at the end, and that end put in between the cylinders C, D, whilst the mill is going, the motion of the cylinders draws it through, on the other side, into a thin plate. Likewise a bar of iron, being heated and thinned at the end, and put in between the toothed cylinders A, B, it is drawn through on the other side, and slit into several pieces, or strings. And then, if there be occasion, any of these strings may be put through the plate mill with the same heat, and made into plates.

Fig. 28. Emerson's description of adjustable slitters

The two points of particular interest are firstly that the screws allowed for adjustments in height. (Refer back to fig.5, Volume I, for an open view of these high turn screws). Secondly Emerson's description informs us that heated iron bars were introduced into the 'toothed rollers', but, it is wishful thinking on his part that several bars would be produced from off the rollers. This can be seen by comparing what he drew with a similar process in the same area just some forty years later, fig 29.

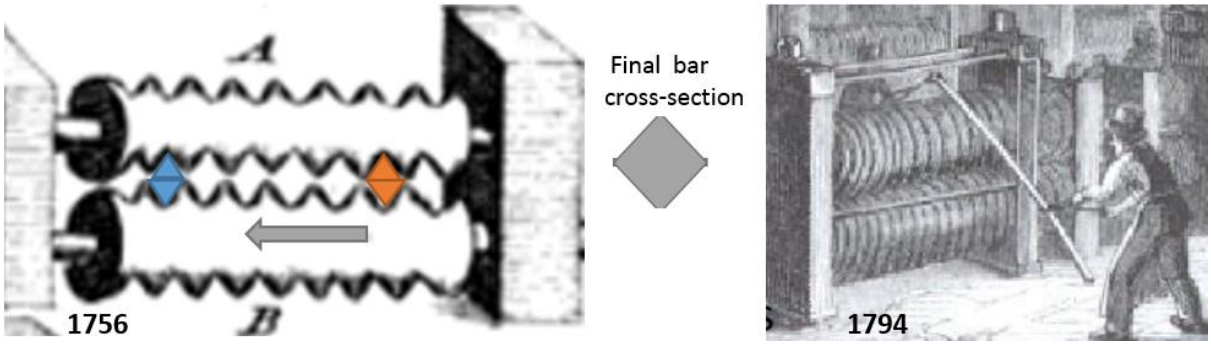


Fig. 29. Iron rollers from Emerson's sketch compared to those at Horsley Forge, Birmingham.

Although Emerson shows the gaps in the rollers in a haphazard size range, the method of working would appear to have been from right to left, in an assumed series of decreasing sizes, and done in a series of passes. For the initial pass the gap on the extreme right would have been opened to a maximum by the rapid-turn screws in order to suit the size of the hot bar being introduced. [61] Note that in the Horsley Forge picture, one rolled length is processed at one time with a man on either side of the rollers. It was the job of the second man to catch and pass back the still hot length of rod to enable the following pass.

The final bar cross-section would have been square bar stock for the large nails suitable for use in canal locks and sluices, the construction of which was gaining momentum at that time as seen above, figs 75/76. In the smaller part of the range (marked in blue) this reduced size bar stock would suit fabrication of large ship nails.

[61] Conversely Emerson refers to the ability to change the pairs of rollers to a different size, and thus, implicitly, to a different size range for the bars being produced.

V.3 Schubert's recapitulation

A worrisome aspect of Emerson's assertive diagram is that the eminent German émigré, H R Schubert, in his master work on the British iron industry, reproduces Emerson's figure in slightly modified form, fig.30, and quotes the accompanying text without reservations. [62]

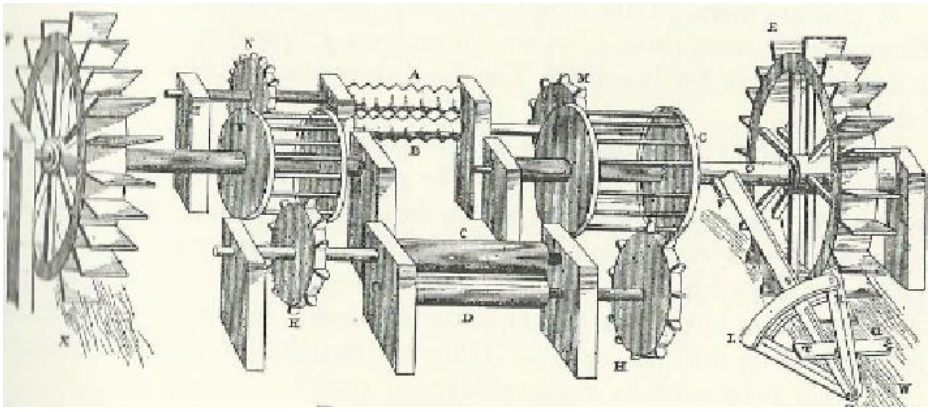


Fig. 30. Schubert's modification of Emerson's sketch showing the docking shears, right.

The availability of the shears, L – R, raises the possibility that the industry was already moving towards producing stock items in those lengths readily adaptable to conversion to large spikes required in canal works, and for those needed for ship building. Certainly, there are aspects of commercial advantage worth concealing.

Why such an eminent personality as Schubert allowed himself to be persuaded that a set of rollers could be construed as a slitting mill, is far from clear. Coming from a German background, with its double elements of *Zeinhammer* and slitter, may be part of the explanation.

[62] SCHUBERT 1957, 309

Appendix VI

Translations from Frankish & German texts

Extracts from Christoff Weigel's *Abbildung der Gemein-Nützlichen Haupt Staende*. Regensburg, 1698:

Der Torheit Spitz; heisst Eigen Witz.
The height of foolishness; is called self-conceit.

Kein Mensch fragt sich warum einer meint	*No one questions what is intented as*
Der Nagel sinkt, der anfangs scheint,	*the nail sinks down. From the start it*
daß man ihn zu den starken zaehle,	*appears solid. Self-satisfaction projects itself in*
Die Selbstkraft zeigt sich Tugend leer,	*an absence of virtue and the testing*
faellt der Versuchungs Hammer schwer,	*hammer descends like covetousness,*
So biegt und kruemmet sich die Seele.	*as writhes and flexes the soul itself.*

Nailors, or nail-smiths, have an advantage in their trade as the journeymen can practice their skills and work both in and outside of the Roman Empire ["The Holy Roman Empire"] *with the chance to travel through foreign lands. But there exists a difference in this trade between the makers of sturdy and of fine nails. Making fine nails needs some special knowledge and more expensive tools are required.*

Their Masterwork [trade competance piece]) *must be done in Nuremberg, along with the fit-out of working vehicles, in steel as well as iron, inside of four days and based on their own skill. They must also present 2900 finished nails of three sorts including ------ such as 400 large spikes, like those driven in to clad the Town gates. (2) One thousand studded items with square top heads and likewise forge eight sided heads. (3) They must themselves make 1500 of the tiniest cloth, (floater) nails; so light that they can float on water* [by surface tension].

When we provide for all nails and similar peculiars in regards to the worth, and importance, the wide range of different types which we would quickly give the reader, would not be without much trouble, or be too long, since the range of nails is obviously very high in number. We want to be sure by the forenamed explanation of what they consist: distinctive sorts of listed nails set before various hand trades as to their different needs: fixing nails in which the top

buyers mostly deal. ***Latticing nails*** *to affix rendering lattices to small areas and to large parts, as also to the frame to the boards and to the Morfen. In like manner also star-hobs to the partitions. Pig-bristle brads and other short fixings for studding, and as used for artillery and for plumbing purposes. The* ***plating nail*** *for the platers; and for the fixing of (thicker) iron straps there is a countersunk head available. Also, for the application of saddlers, slides, ships, and then rose nails for linings, and scuttle nails are made for small carriers. The half nail and the so-called effect nail* [common?] *relate to joinery. The hinge nail, the nailor knows almost before all other needs. The bottom strap castle (door) spiral and rose nail; the cobbler's nail-smith, the mason and stone (worker), and wall builder, thus to firmly attach and to stop drooping, the broad head nail* [known as 'cross' or 'crucifixion'] *nail. The plasterer especially uses them with plaster covering in its wet state and when fresh in rendering houses and plug over ship nails. Cobblers and clockmakers need simple* [headless?] *and doubled stud-nail points, and small brads, of which last the farmers need in various locations. The fabric worker is served by a special sort of nail* [tenter-head nails] *which are somewhat bent over following the screw maker's trade. All of these trades and types are of iron which the nailors' themselves refer to as the 'black' trade.*

The Copper smith prepares nails made from copper, and for the aristocracy and potentates he prepares nails of silver and gold, to adorn the throne of His Majesty and in order to enhance favorite upholstery, even sometimes to the equipping, decorating, and ornamenting of favorite horses.

Such to the preparing of nails with their work so to the range, as from the common everyday man to the highest potentate, and down to the small farmer: would so few or even none were found the not least promoted, and a nail's indispensable usefulness is self-evident, as too is the importance of this manual trade. **[Translation stopped here].**

Some references explained:

Plating nails, are a form of jobent nail used to attach flattened iron sheet, fig. 31.

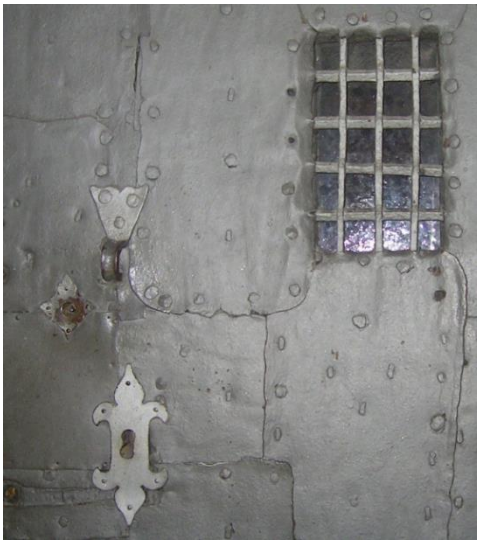


Fig. 31. Reliquary door in Ulm Cathedral (*Ulmer Dom*), circa 1618. Author.

Small nails to affix spirals, probably refers to the spiral-scroll work commonly seen on castle and church doors, fig. 32.

Fig. 32. Door scroll, Ulmer Dom, circa 1618. Author.

Latticing nails. These small tacks were used until WWII as a means of attaching plaster support lattices for fire-proofing timber and log construction, fig. 33.

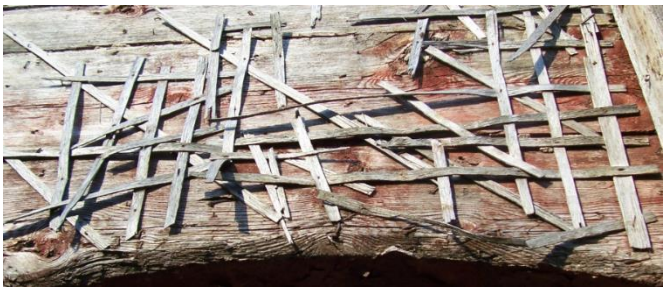


Fig. 33. Latticing to wooden lintel. Tallinn old town, date unknown. Author.

Extracts in the thesis text from Zedler 1732, Krünitz 1779, Beck 1895, Otto Johannsen, and Boehm 1911, have already been made in passing, and are not repeated here. Extracts relating to nails and nail technology from French language texts appear in the author's works.[63]

[63] HOW 2017; HOW 2019 (DRAFT); HOW 2018, 345-356.

Appendix VII

Sources of samples and nail data obtained

Inventory of nails collected and inspected

Interpretive limitations

As with many of the written texts consulted during the study, it was found that the most reliable sources of data came from original sources. In the case of nail types the best sources came by removing in-situ samples from datable locations and then cleaning them for laboratory interpretation. Allied to this was a reliance on heritage architect and trades colleagues who could do some of this work by proxy, and also be consulted on the zones and estimates of dates. The locations are shown on the following maps by red rings, with isolated properties shown by smaller rings, and major centres shown by encompassing ones. Museum collections accessed during the course of the study are shown by green rings and Roman sources are indicated by blue dots.

The acquisitions have been given four basic gradings:

- E**xemplars**, **[E],** these are nail samples in especially good condition, capable of being cleaned to expose the natural bloom of forging, or show machine marks, prior to their being photographed. A further caveat is that some nails acquire accretion or wear from their use which needs to be left in-situ for future interpretation. Typical examples of this are jobent nails which show localised wear, flashing nails (which often retain lead adhesion), and lath nails, whereby the nail heads and necks retain lime traces.
  Depending on the background climate of their locations, exemplar nails may be rare or simply unobtainable. In the latter case sketches need to be prepared, (based on multiple observations of good or lesser quality nails), to an exacting standard to demonstrate their essential their details for the historic record. In other cases the best obtainable photographs can be enhanced to show the nails' distinctive features, using Photoshop.
- Samples in **good condition [G],** sufficient to display traceable features over part of their body, such that aspects of the work done can be accrued via several samples.
- Samples in poor condition suffering loss of material through corrosion and rust, form the majority of samples found in Victoria. This is because samples have mainly come from abandoned buildings. Hence the samples have usually been exposed for several years to disadvantageous conditions. In Adelaide, and South Australia generally, due to the prevailing dry semi-desert conditions, the quality of samples increases enabling easier interpretation.
- Samples in bad condition. In many cases these have to be retained and cleaned, thereby wasting much time and effort, against the possibility that no further samples of the particular type will show up later. Experience shows that most samples should be kept since, every so often, a rare type of nail will show up in a sample of poor condition.

Inspections of other collections

Collections owned by other enthusiasts vary enormously, from carefully itemised and labelled samples, to ad hoc boxes, which may include nails, screws, bolts and smaller items of interest. Most Australian samples are in private collections. Gaining access to museum collections, usually dwelling in semi-forgotten archives, is particularly difficult. In the case of the huge statutory collection of Heritage Victoria it proved impossible, even after some five years of reminders following an initial request for help from their nominal curator. With the exception of sources in Liege, Brussels, and Aix-en-Provence the study concluded that museums in general are not particularly interested in nails or their study.

Building provenances and dates used

Researchers should exercise caution with respect to discovery of one single nail sample from any building or location. The common sense caveat is that, whereas one or two nails may have been introduced on some occasion, possibly well after original construction of the building or part thereof, a pattern of general use emerges from multiple samples, seen in the same room or area. Conforming samples are then likely to be original.

There are further caveats. Renovations quite often involve replacement of architraves and linings, or reveals to doors or windows. These events are unlikely to worry an experienced researcher since such items usually follow fashionable trends, but they could lead a novice into a false dating trap. For example, the typical Victorian deep architrave, often in two pieces, and totalling 160 -190mm deep, cannot be mistaken for post- war narrow skirtings, which are still in vogue today. Thus it is only recent replica skirtings which might upset a visual check. A further test then lies with the timber types, which have seen many changes in the last century.

Having noted these provisos, Australian heritage buildings are mostly well documented and can be researched in the first instance through Heritage Victoria (or equivalent body), by the National Trust of Australia, or by local historical societies, which are active in towns of even small sizes. An obvious check is that many commercial buildings had their year of construction embossed on their facades. Recourse can also be made to the original town maps which provide the dates of original sales of land by the Crown. An additional source of early individual dwellings comes surprisingly from the hydrographic surveys made by the Royal Navy. This is because so much of early settlement was strictly coastal and the navy hydrographers were particularly thorough. For example the chart for Warrnambool made in 1870 shows the extent of the main town in Lieutenant Stanley's survey of the harbour, acting like a time capsule of development.

Remote buildings, falling into ruin and facing oblivion, nearly always have other traces of date left behind. These often consist of pages from newspapers used to cover the wall boarding prior to wall paper being applied. Another surprise is the large number of early buildings with different sorts of graffiti. Sometimes these are simple notes giving the date when a case of tea arrived. Sometimes they signify completion by the builder. On a few occasions workmen had written uncomplimentary comments about the architect in control of the works, which they had also left dated and hidden.

If all else fails, there is still a possibility to assess a date based on stylistic features. Their study formed the basis of my MSc dissertation for the Western district. In the course of my professional career I advised heritage architects in informal discussions, prior to arriving at joint conclusions of construction dates. In the case of alterations or additions, recourse can usually be made to secondary datable features which have been well covered by several authorities inside Australia.

Moving outside of Australia the systems described above are essentially paralleled in Britain and I found much the same in Denmark and the Baltic States, and parallel systems in Belgium and France, although I then relied on the advice of colleagues in heritage work for more precise dates.

Processing and archiving samples

Faced with frequent additions to the collection process it became necessary to dedicate an entire room to act as a nail laboratory and archive space. This had the disadvantage of being contaminated by the constant cleaning of specimens and fine dust created by the cleaning process. Thus a separate home-office had to be maintained in use throughout. Also bi-secting of nail samples had to be done by constructing a purpose made jig in my home workshop.

There is no one single adequate cleaning method applicable to every specimen and each of the two most important categories (exemplars, and good quality ones) deserved individual variations of approach. Many inappropriate turns were taken initially in an attempt to speed up the cleaning process, the most deleterious being using variations of phosphoric acid commercial cleaners. If left

too long in these fluids the nail specimens ended looking like strings of metal fibre. A significant amount of time is needed to first clean off rust and detritus and then selectively apply rust removal fluid in brief applications. This technique per force may take up to five days on an intermittent process, but rarely can be done in less than 3 days if the fine detail of manufacture is to be retained. It is one of the reasons why such a long study time has been needed. Some colleagues rely on electrolysis for a cleaning method. This works well but involves coating the nail with other metal from the anode material. It also destroys the natural bloom caused by hammering which is part of the evidence trail, and it invariably removes the original protective coating. Thus the process of conserving the very few exemplars obtained has taken many hours per specimen.

There are similar problems in photographing individual specimens if the critical pieces of evidence are to be seen. It was eventually found that the right combination of natural afternoon sun combined with flash light gave the best results if back lit from below on a transparent sheet. This also extended the study process. Further laborious photography is desirable in many cases since those taken in museum box-rooms involved less than adequate conditions and in some cases were done under intense pressure from the archivist and with easily transported cameras.

A variety of containers were used in archiving specimens since the nails varied from 4 mm up to a maximum of 405mm long. These were racked according to the main areas of locations sourced. In the course of the study the rack space more than doubled and so poor quality specimens ('Seconds') were therefore kept separately. The photos below show the racking system and laboratory equipment.

In the following tables the last column shows the prime element of datation. In nearly all cases dates can be arrived at in multiple ways which we as heritage experts are familiar. Muntham Station for example, being one of the most famous of the first pioneers in Victoria has multiple historic references and is referred to in several early diaries, but I was happy to take the direct evidence of a cast iron fire back with raised inscription; *MUNTHAM 1836.* In like cases either newspapers or reminder notes provide dates.

In the following code the initials represent the prime dating method for provenance:

- D – Dendrochronology
- G – Graffiti, which includes notes
- N – Newspapers or printed items
- H – Local histories and family knowledge
- T – Town allotment maps showing sales dates, or other dated surveys
- B – Buildings dated by fascia or by other permanent inscriptions
- C – Classified buildings by state heritage authority of by National Trust
- A – Heritage architect or archaeological sources
- F – Featured items such as locks, hinges, stoves, and mantle-pieces etc
- P – Placement in relation to other datable surrounding town buildings
- S – Stylistic features and such like estimates

GROUP 1: ACQUISITIONS IN VICTORIA – LISTED BY LOCAL AREA

WESTERN DISTRICT

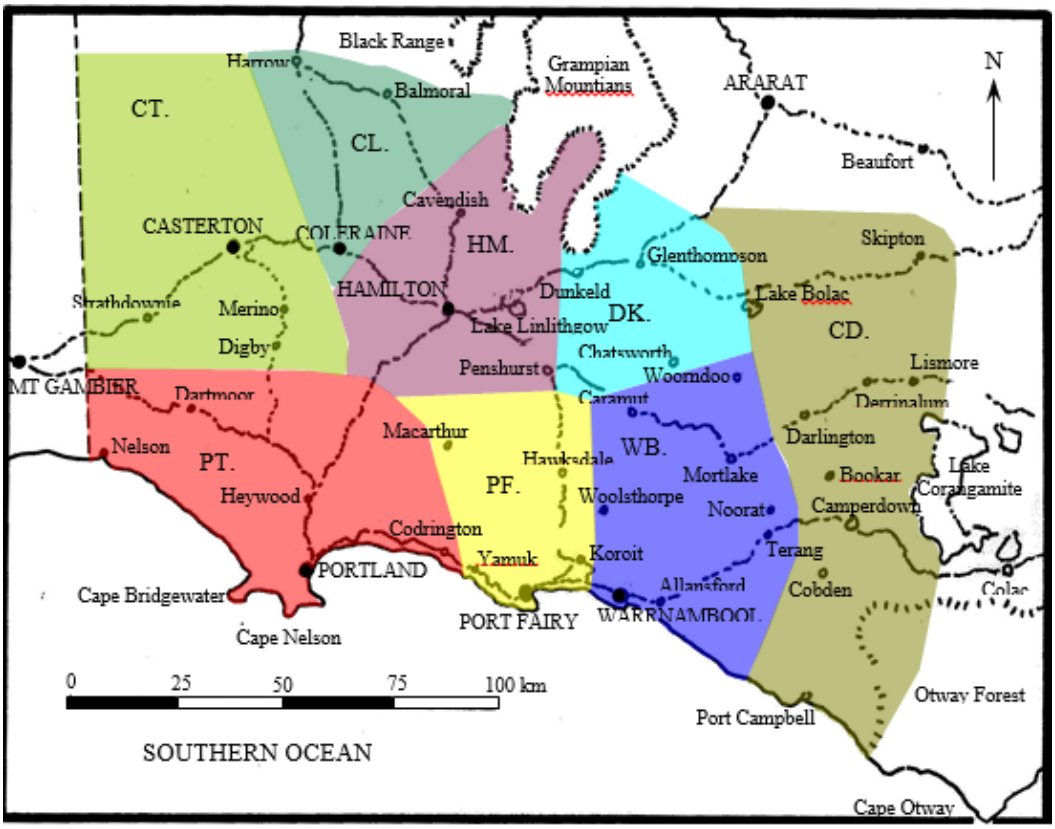


Fig. 34. The eight zones of the Western District of Victoria investigated & sampled

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
CASTERTON AREA [CT]					
MUNTHAM STATION					
Muntham original homestead, 1836	1	1	13	1/2/4/5	H
Henty Barn. Circa 1854			2	5	H
Muntham stables. Circa 1858			1	3	H
Merino Downs woolshed, 1839			2	3	H
PORTLAND [PD]					
Steam Packet Inn, Bentinck Street, 1841	1		14	1/2/3/5	C
Macs Hotel kitchen, Gawler Street, 1848		3	11	2	H
Henty wood mill, Convincing Ground, 1849	1		18	1/3	A
Macs Hotel repairs, Gawler Street, 1875			19	2/3/5	A
101 Palmer Street, 1850		1	4	4	A
70 Julia Street, 1850-51		1	3	2/4	C
38 Hurd Street, 1852		1	1	4	T
Maretimo Homestead, 1851			1	2	C
8 Glenelg Street, 1853	1	1	43	1/2/3/5	N

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
PORTLAND					
8 Glenelg St. porch			15	1/2	S
14 Glenelg Street, 1854	1		1	1	A
15 Gawler Street, 1853/4			2		C
9 Tyers Street, 1856			3	4	C
3 Bentinck Street, 1858, relocation			1	1	C
15 Gawler Street extension, 1868 – 1885			5	4	C
9 Tyers Street extension, circa 1876			1	4	C
Richmond Lane stable, 1895			1	3	H
Artillery Company drill hall, 1897			6	4	C
98 Percy Street, 1905		2	37	1/2/3	H
DIGBY					
Rifle Downs house, 1845			9	2/3/4/5	C
Rifle Downs extn, 1905		2	7	1/2	C
Rifle Downs stables, circa 1900			1	1	H
Rifle Downs woolshed, circa			1	4	H
Crawford River House, 1844		2	5	1/2	C
CAMPERDOWN AREA [CD]					
DARLINGTON					
Elephant Bridge Hotel, 1854		2	36	1/2/3/5	H
BOORCAN					
Marida Yallock Homestead, Cook's quarters. 1874			118	1/2/3/4	P
Marida Yallock men's quarters. 1876		1	2	3	H
Marida Yallock oven facilities, 1876			1	3	H
Marida Yallock old stables, 1876			16	1/2/3	H
Marida Yallock Woolshed, 1894			3	4/5	H
Marida Yallock. Workshop. 1895			9	5	P
		2	5	3/5	
CAPE CLEAR					
Shepherd's hut, circa 1878					F
NAROGHID					
Bullen Merri crater cottage. Circa 1889			25	3/4/5	H
Bullen Merri cottage extn Circa 1895			41	3/4/5	F
BOOKAR					
745 Darlington Road, 1912			2	5	S

LOCATION/PROPERTY	CONDITION E	G	TOTAL	ZONES	DATING
DUNKELD AREA [DK]					
CHATSWORTH					
Chatsworth House, 1859	1	2	11	1/3/5	C
Chatsworth House extension, 1872		1	4	2/5	C
DUNKELD					
114 Martin Street, 1909			3	4	H
HAMILTON AREA [HM					
HAMILTON TOWN					
Hamilton Club, 1879	5	1	20	3/5	H
Crathie, Clarke Street, 1875		2	2	1/3	G
STRATHKELLAR					
Correagh, 1854		1	21	1/2/3/5	C
Correagh stables, 1854		5	51	1/2/4	C
Doling Doling, 1868	1		1	1	H
Mayfield cottage, 1860			1	1	H
TAHARA					
Murndal, Manager's house, 1846			2	1/5	C
Murndal, Elevated Barn. 1846			1	4	C
Murndal, Wash House, 1848			2	1	C
Murndal Meathouse, Circa 1856			1	5	H
Murndal Stables, 1885		3	4	3/4	C
Murndal Workshop, 1885			1	5	C
Murndal, Single men's quarters, circa 1885			1	3	H
Murndal, Shearing shed, 1889			2	3	H
'*Danna', Peppers Lane, 1886*		8	106	2/3/5	G
CAVENDISH					
Mokangar stables, 1858	1	2	6	3/5	G
PENSHURST					
Burger Cottage, 1853			1	5	C
Burger Cottage outhouse, c 1853			1	3	C
Burger Cottage Kitchen – ruins, 1853			3	4	H
Mountview, circa 1902			2	5	S
CARAMUT					
Boortkoi outhouse			69	3/4/5	H

LOCATION/PROPERTY	CONDITION E	G	TOTAL	ZONES	DATING
COLERAINE AREA [CL]					
HARROW					
Log jail, 1859				3	C
Kalang cottage, 1876			3	4	C
COLERAINE					
Shops in High Street, 1866 & 1872		4	7	4	B
Cottage ruins, Henty Highway. Circa 1878					F
Blacksmiths Shop. Circa 1898			3	5	H
Mount Koroite House. Henty Highway, 1904			5	4	H
VASEY					
Woodmill cottage, c 1880					H
BALMORAL					
Kongbool original homestead. 1846		6	15	3	C
Kongbool homestead extn. 1895		2	32	1/3/5	C
Kongbool woolshed, 1878			2	1/5	H
Kongbool stables, circa 1890			2	5	H
Kanagulk woolshed, c 1875			3	4	S
PORT FAIRY AREA [PF]					
PORT FAIRY					
Tannery shed, c 1836			2	2	C
Captain Mills Cottage, 1835			2	1	C
14 William Street, c 1851			29	1/3/4/5	C
Old St Andrews, 1855			3	1/2/3	C
Old St Andrews, Presbytery, 1856		7	49	1 - 5	C
Digby cottage, 1856		3	341	4/5	H
St Patricks Church, Princes Highway, 1957		3	54	1/2/4/5	B
Digby cottage, skillion, 1868			41	4/5	F
Digby cottage rear extn, 1895			236	1/2/4/5	F
94 Bank Street, 1857			2		B
Telegraph Station, Bank Street, 1858			1	1/3/4	C
6-8 Princes Street, 1856		2	352	1 - 5	C
National Bank, Sackville Street			2	3	B
Wharf shed, c 1880			2	1/3/4	C
Emoh stables, Cox Street, c 1882			4	3 /4	F
83 Bank Street, rear, circa 1890			45	2/3/4/5	F
Bank Street shop, circa 1890			1	3	F
68 Sackville Street rear, circa 1874		1	3	3	F
46 James Street, 1893		1	14	3/4/5	H
Rockleigh stables, Princes Highway, 1895			1	3	H
Railway Goods Shed, 1901		5	28	3/4/5	C

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
CROSSLEY					
Sheehans Road, stage 1, 1878	2	2	273	1/2/3/4/5	H
Sheehans Road, stage 2. Circa 1890			448	2/3/4/5	F
Eagan ruined cottage, Scots Road, circa 1900			12	1/5	H
TOWER HILL					
Granny Malady cottage, 1851			1	3	C
Bob Malady cottage, circa 1877			1	3	P
Hawthorn Vale, 1881		9	95	1/2/3/4/5	H
Hawthorn Vale barn, 1882			15	2/4	P
KOROIT					
Court House Hotel sheds (pre-existing), c 1875			2	3	C
Conns Lane farmhouses, circa 1875 to 1905			11	1/3/5	P
67 Garden Street, circa 1878			6	1/3/4	P
129 Commercial Street, Koroit, 1878			6	3/4	H
37 Garden Street			7	3/4	P
Mahoneys Farm, 1885			4	5	H
91 Commercial Place, 1897			12	4	H
13 Commercial Place extn. 1895			19	4	P
Guides Hall, High Street, circa 1890			5	5	H
Mahoneys Farm, wash house, circa 1900			4	5	H
Hanrahan Farm, Nine Mile Creek Road, 1889			7	1/5	H
MINAMITE					
Greenhills stables, 1874			12	2/3/4	C
Greenhills meat house 1876			1	3	C
Greenhills cottage ruin, c 1878			3	2	F

WARRNAMBOOL AREA [WB]

WARRNAMBOOL CITY

Fala Park frame remnants, Wollaston Rd			3	3	H
Osburne house, Merri Street, 1851		1	376	1 - 5	C
Courthouse excavation, 1853			9	1/3	C
Christ Church Rectory, 1853		2	14	1/2/3/4	C
Wyton, Botanic Road, 1854			3	3	B
84 Koroit Street, 1855 (re-roof c 1872)			5	1	H
Flagstaff Hill Crimea War hut, 1855			2	3/4	C
Fala Park remnants. 1856		1	5	3	H
Kelson cottage, Dennington, 1856		1	7	2	C
116 Timor Street dig, circa 1858			26	2/3	A
67 Liebig Street, 1860			2	3	P
Customs House, Fairy Street, 1860			2	5	C
Criterion Hotel, Kepler Street, 1864			3	4	H
Commercial Hotel, Liebig Street, 1867		1	2	3	H
Florence Collins Centre, Kepler Street, 1867			3	4/5	H
Airlie, Henna Street, 1868		2	8	4/5	C
George Taylors Store, Lava Street, 1868		2	7	1/2/3	H

LOCATION/PROPERTY	CONDITION E	G	TOTAL	ZONES	DATING
WARRNAMBOOL CITY cont'd					
Drill Hall, 1870			2	3/5	C
Masonic Hall, Kepler St. 1870			33	3/4	B
St Ann's Convent, 1872			35	2/3/5	C
St Joseph's Church, 1872			15	4	B
Masonic Hall renovations, 1900			34	4	B
Courthouse, Timor St. 1871	3	7	13	4/5	C
Lighthouse relocation cottage, 1871	6		6	5	C
Christ Church South Nave & Vestry, 1856		3	257	1/2/3	C
Christ Church North Nave 1861			319	1/2/3	C
Christ Church entry porch, 1874		3	62	1/2	C
Christ Church Nave vent remnants, 1875			6	1	F
Christ Church Organ loft, 1887			416	1/2	C
Christ Church Bell Tower 1882		1	29	1/2/3	B
Christ Church Lych Gate 1890			31	1/2	B
Christ Church Rectory, 1853	1	3	57	1 - 5	C
Christ Church Rectory extension, 1876			2	5	C
5 Park Street, 1875		3	24	2/3/4	H
6 Murray Street original			3	3	T
240 Lava Street. 1876			8	3	T
History House, Merri Street. 1876			2	3	H
65 Kepler Street, 1876	1	1	18	5	C
67 Kepler Street, 1876		1	4	5	C
Bonique, Farnham Park, 1877		4	145	1 - 5	C
Christ Church stables. Circa 1878			3	3/4/5	H
3 Japan Street, 1878		3	33	3/4/5	T
Kerr St/ Ardlie St Cottage, 1878			12	3/4	B
Ripper cottage, Mortlake Rd. 1878			1	4	P
95 Kepler Street, stable complex. 1878			2	2/3	F
40 Banyan Street, 1878			50	3/4/5	T
6 Murray Street, 1878			33	2/4	T
Cemetery Sextons House. 1879	1	2	37	1/2/3/5	H
Cemetery Rotunda. 1879			1	1	H
194 Timor Street shop, 1879		1	4	5	H
Supper Rooms, Liebig St. 1880		1	15	4	H
116 Banyan Street, 1882		1	20	3/4/5	P
202 Liebig Street stables. 1882			2	3	F
Police watch-house, 1883			5	5	C
6 Murray Street extn, 1884			30	2/4	F
44 Japan Street. 1879			8	3/4/5	T
Police stables. 1884		1	17	2/3/4/5	C
Proudfoot's boathouse, 1885			11	1/2	C
Proudfoot's boathouse extn, 1888			3	2/3	H
38 Kerr Street, 1885			8	1/2/3	H
260 Lava Street stables circa 1882		2	7	2	T
Ponting's shop, Kepler Street, 1882			3	4	H
20 Esplanade, Dennington, 1884			5	1/2/3	S
31 Kruger Street, 1886			5	2	B

LOCATION/PROPERTY	CONDITION E	G	TOTAL	ZONES	DATING
WARRNAMBOOL CITY cont'd					
Police Sergeant's quarters, 1887			1	3	C
Flagstaff Hill Battery hut, 1887			2	3	H
58 Fairy Street 1887		2	18	2/4	B
148 Fairy Street. 1887	5		32	1/3/5	B
Mozart Hall, 1888			7	1/2	H
Dursley cottage, Koroit Street, c 1888	1		5	1	B
48 Hopetoun Road. 1893	4	3	619	1 - 5	H
Courthouse alterations. 1889	15	25	104	2/3/4/5	C
Osburne veranda, Merri Street, 1889	1	3	27	1/2	F
81 Fairy Street, 1892			4	2/5	H
181 Fairy Street, 1892	3		45	1/2/4	B
Botanic Gardens well cover, 1893			2	2	G
23 Spence Street, 1898			10	2/3/5	B
Water Pump Station, Queen's Rd, 1893			2	5	C
Proudfoot's boathouse extension, 1893			6	2	H
10 Ryot Street, 1894			1	1	T
93 Lava Street, 1894		3	454	1/2/4/5	B
98 Lava Street, windows 1892		4	9	4	H
14 Redford Street, 1895			5	3	B
13 Ryot Street, 1895			5	2/3	T
25 Fairy St, Wash house remnants, 1899			129	4/5	S
24 Mickle Crescent, 1900			27	1/3/5	T
38 Kerr Street, 1900		2	11	3/5	T
152 Fairy Street workshop, 1904			2	2	H
St Ann's School, 1905	2	6	98	3/4/5	H
48 Banyan Street, 1909		1	6	1/2/3/5	G
28 Banyan Street, 1910			8	4	S
260 Lava Street, c 1911		1	40	1/3/5	S
Cooee Guest House, Liebig St, 1911			11	4/5	H
65 Canterbury Road, 1935		2	148	1 - 5	S
Christ Church reroofing, circa 1959	16	54	1,455	1	H
ALLANSFORD					
Motang house, 1861			8	3/4/5	H
Motang Barn, 1861			7	1/2/3/4	H
Motang stables, 1863			4	1/2/3	H
Ziegler Blacksmith, c1878			4	3/4	H
Elm Bank, Dry Lake Road. Shearing shed. 1885			2	3	S
Elm Bank house, Dry Lake Rd, 1885			8	2/3/4	G
Motang Park cottage. Circa 1905			26	4/5	H
Tooram Hill House, 1911			53	1/4/5	H
GARVOC					
Moore house, Princes Highway		1	4	1/3/5	H
GRASSMERE					
Halfway House			4	1	H

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
MORTLAKE – WOORNDOO					
Marnooka woolshed, 1846			6	1/2/3	H
Absalom Cottage, 1878			1	3	H
Plough Inn stables, Mt Shadwell, c 1878			3	1/3	H
Killymord stables, Hamilton Highway, 1890			3	3	H
Absalom Cottage extension, 1890			1	3	F
WINSLOW					
Relocated cottage. Caramut Road. Circa 1880			7	3	F
BALLANGEICH - GRASSMERE					
Sambell woolshed, 1885			11	1/3	H
Rosehill house, 1886			2	5	H
FRAMLINGHAM					
Aboriginal Reserve cottage, (C of A), 1889			4	3/4/5	C
HEXHAM					
Stapleton residence, 1856	2	9	66	1/2/3/5	H
Cottage ruin, 1883		1	11	3/4/5	F
Boonerah, circa 1891			4	3/5	F
TERANG					
39 Estcourt St. 1901			2	1	H
Glenormiston Stables, 1876			25	3/5	c
NOORAT					
22 Glenormiston Road outhouse, c 1905			34	3/4	f

GROUP 2: ACQUISITIONS FROM MELBOURNE & VICTORIA

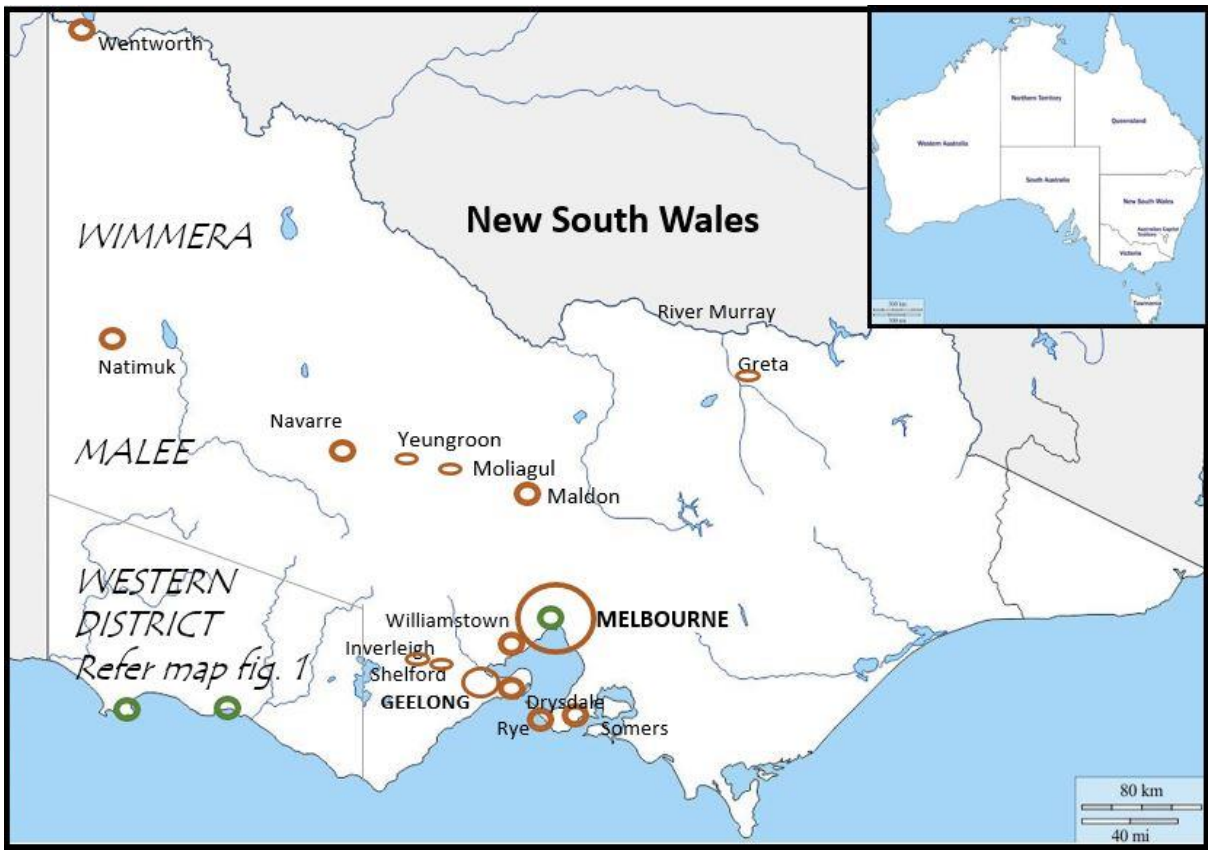


Fig. 35. Locations of nail finds across Victoria

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
GEELONG REGION					
GEELONG CITY					
226 Moorabool St			2	1	H
Swan Inn, Fyansford, 1842			9	Viewed	C
DRYSDALE					
Cotiyule, 1844		1	3	1	C
SHELFORD					
Cottage ruin, circa 1878			5	3	f
INVERLEIGH					
Lulotte house 1842			14	1/3/4	C
Lulotte stables			2	1	C
Woodbourne original log house 1844		1	10	1/2/3/5	H
Woodbourne brick extension, 1856			2	1	h
WIMMERA REGION					
Moliagul cottage, Banyeena Rd, circa 1849		1	3	2/3	h
MALLEE					
Dunolly, St Arnaud Road, 1869			2	3	S
Navarre Rd cottage, circa 1890			1	3	S

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Old Wedderburn, Yeungroon, circa 1895			2	3	S
RANGES & NORTH					
Commercial Hotel, Maldon, 1867		1	60	3/4/5	C
Greta woolshed, Wangaratta, 1881		1	3	4	H
MORNINGTON PENINSULA					
Finigal farmhouse, Rye, 1886	1		16	1/3/4	C
Coolart, Somers 1888			9	2/3/5	C
MELBOURNE AND ENVIRONS					
MELBOURNE CITY					
Parliament House, 1866	5	2	89	3	C
Parliament House east wing, 1878		2	91	1/2/3/5	C
Warwick, 1881	1		5	4	H
HAWTHORN					
Cestria, 521 Glenferrie Rd, 1891	29	49	276	1/2/3/5	H
MIDDLE PARK					
102 Park Street, 1891	1	9	30	1/2/3/4	P
PORT MELBOURNE					
Bridge Street 1888		2	12	4/5	P
ST KILDA					
42 Alma Road, 1880			1	1	H
MOONEE PONDS					
Courthouse, Mt Alexander Rd, 1888		1	9	1/2/5	C
WILLIAMSTOWN					
43 Aitken Street, 1844			4	4/5	C
31 Russell Street, 1867			15	1/2/3	C
Major Newman's cottage. Pontville, 1845		4	75	Viewed	C

GROUP 3: ACQUISITIONS FROM TASMANIA

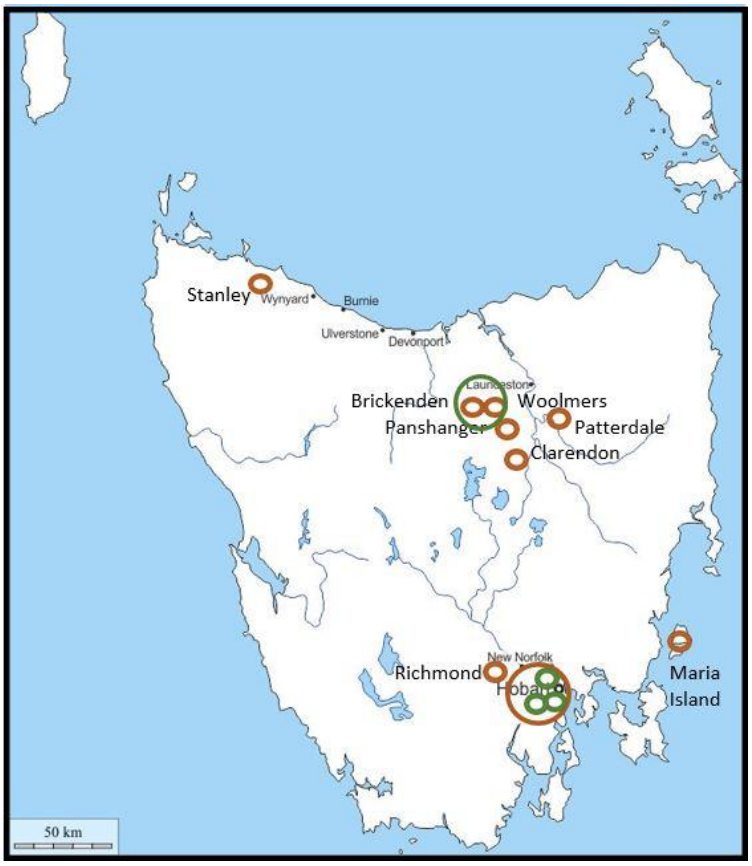


Fig. 36. Locations of nail finds & source information in Tasmania

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
HOBART AND ENVIRONS					
Anglesea Barracks, 1803			7	2/4	C
Public Secretary's Office, 1803				Viewed	C
Bank Arcade, 115 Liverpool St, Hobart, 1805		2	13	Viewed	C
Hobart Museum & Art Gallery, 1823		1	1	1	C
Hobart Museum roof repairs, 1889			8	2	H
Norinya, Battery Point, 1840		2	9	4/5	C
80 New Town Road, 1843			1	3	C
29 Adelaide Street, 1842			3	4/5	C
36 Adelaide Street, 1842			4	3/4	C
57 George Street, Nth Hobart, 1848/ 1882	1	1	14	1/2/3/5	H
Maria Island, Watch house			1	2	C
LAUNCESTON AND NORTH COAST					
Panshanger, Longford, 1824			2	3/4	H
Clarendon House Evandale, stables, 1838			1	1	C
Patterdale, 1832-39			3	1	C
Brickenden Farmhouse, 1838		3	79	1/2	C
Woolmers 1818	3	5	609	1 - 5	C
Woolmers Cottage, 1839			74	1/2/3/5	C
Woolmers – late insertions	3	8	53	1 - 5	F
Catholic Church, Stanley, c1895			3	1/3/4	P

GROUP 4: ACQUISITIONS FROM SOUTH AUSTRALIA

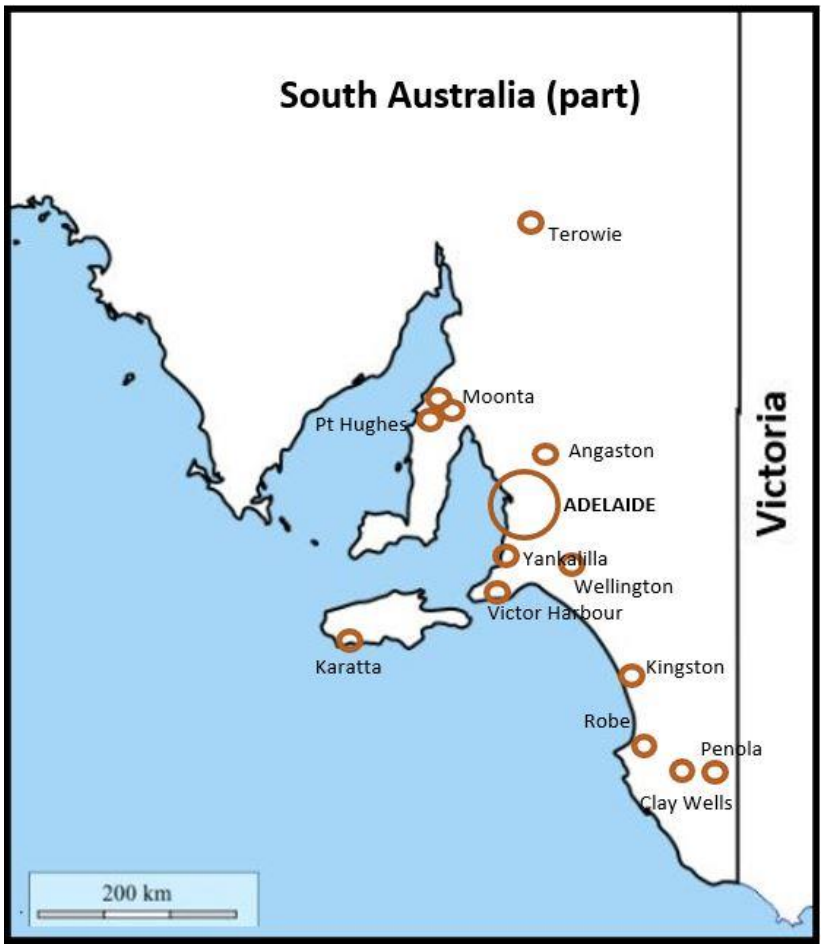


Fig. 37. Locations of nail finds & source information for South Australia

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
ADELAIDE AND ENVIRONS					
Government House, North Tce. 1855-69	4	16	409	1 - 5	C
Ayers House, North Terrace, 1855		2	18	2/3	C
Weitunga, Fulham, 1878			11	1/4/5	C
14 East Terrace, Market, 1875			3	5	C
Mortlock Library, 1879	3	3	7	3	C
Bray House, 566 Hutt Street, 1881			6	1/2	C
Morphettville Adelaide, 1885	1	2	6	3	C
Goodman Building (Herbarium) Hackney Rd, 1909	3	1	4	1	C
Government Buildings – unspecified (Ref LV)	5	13	285	3/5	C
Government Buildings – unspecified (Ref PS)	12	27	480	1/2/3	C
Auchendarroch Mansion, Adelaide Hills, 1879			3	4	H
BAROSSA VALLEY					
Mechanics Institute, Angaston, 1870			3	2/4	C

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
FLEURIEAU PENINSULA/ KANGAROO ISLAND					
YANKALLILA					
Lord Cottage, Second Valley. 1886			11	1/2/3/5	H
Farmhouse ruin, Yankalilla, c 1882			50	1/2/3/5	S
Old Courthouse Wellington, 1864		1	7	2/4/5	C
Karatta Lodge, 1890	1		1	1	C
2 Flinders Parade, Victor Harbour, 1860			1	5	C
Goods shed, Railway Pde, Victor Harbour, 1864			3	2/4	C
SPENCER GULF & COPPER TRIANGLE					
MOONTA					
Railway Station, Moonta, 1878	1	1	2	1	C
Cunliffe Street shop, Port Hughes, 1866			9	1/2/3	C
Matta Flat ruined cottage, c 1868			2	2	C
FLINDERS RANGES					
Railway Station ruins, Terowie, 1880			30	1/2/3/4	C
SOUTH-EAST REGION					
KINGSTON					
26 Janet Street, Kingston, 1894			4	2	C
PENOLA					
Yallum Park stables, C1880			2	2	H
Glencoe			1	1	C
Petticoat Lane pioneer cottage, Display			11	1 - 5	H
Hollicks cottage			2	4	H
CLAY WELLS					
Kangaroo Inn 1846			4	2	H

GROUP 5: ACQUISITIONS/INSPECTIONS FROM NEW SOUTH WALES

Fig. 38. Locations of nail finds & source information for New South Wales

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
SYDNEY AND ENVIRONS					
Parliament House			2	3	C
Supreme Court, King Street, 1823		3	48	1/2/3	C
Supreme Court, King Street, 1865-70		2	6	2/3	C
Supreme Court, King Street, 1885		2	8	2/3	C
21 Lower Fort Street. The Rocks, 1831	2	19	115	2/3/4/5	C
Bronte House, 1843			1	2	C
Parliamentary Library, 1906		1	1	4	C
PRIVATE SOURCES					
Goldfinders Inn, Kurrajong, 1809 (C Hallam collection*)*			6	3/4/5	H
Goldfinders Inn NSW Heritage collection		2	59	Viewed	C
Clive Lucas collection, 18 sites NSW & Tasmania			33	Viewed	C
Ian Stapleton collection, 14 sites NSW & Tasmania		2	21	Viewed	C
SOUTH COAST					
Kiora, Moruya, 1836 (renovations c 1885)			19	2/3/5	H
Kiora Cheese Factory, 1892			8	3	H
Munns Cottage, Merimbula			1	1	H

GROUP 6: ACQUISITIONS FROM BRITAIN

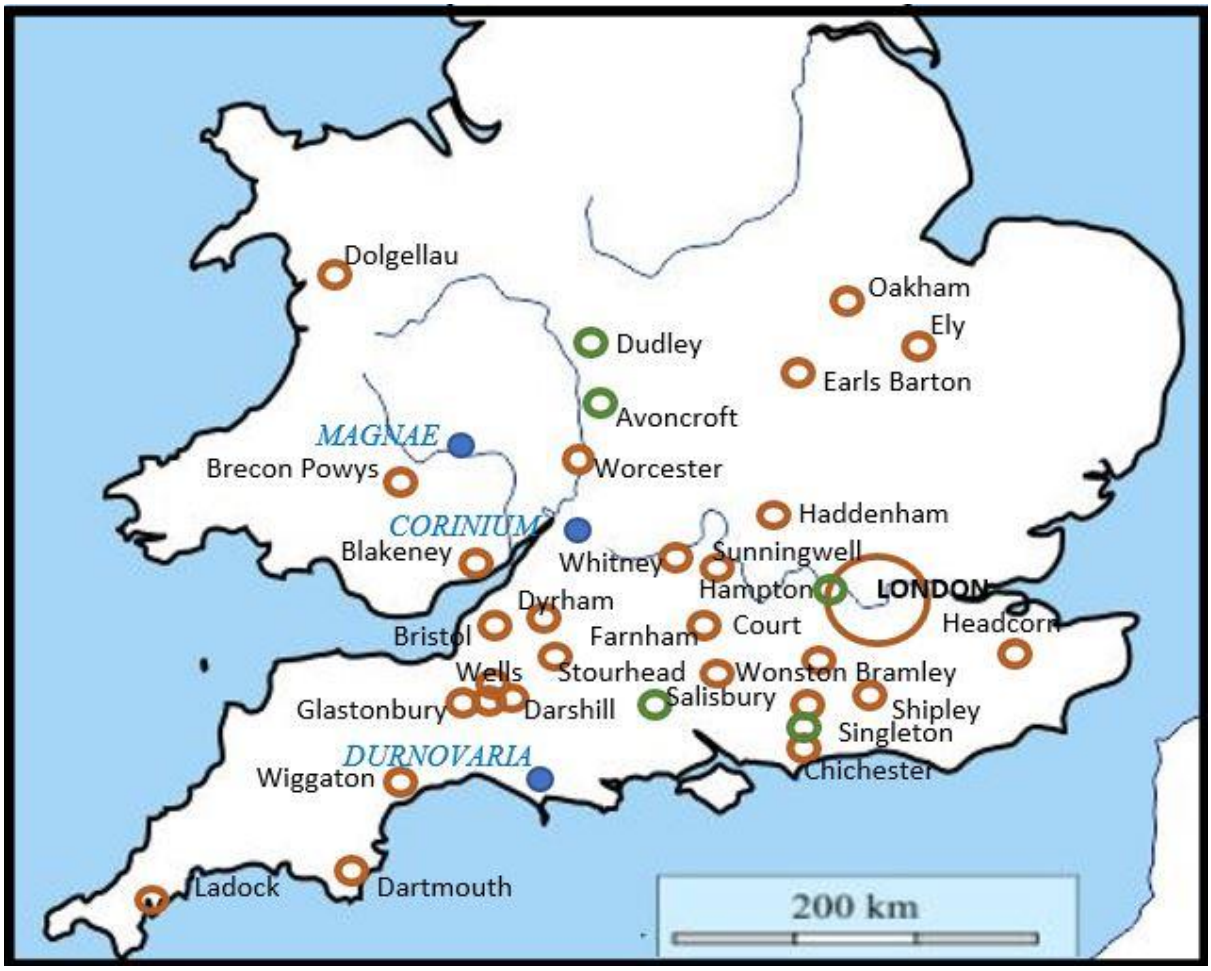


Fig. 39. Locations of nail finds & source information for England & Wales

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
PART A: ROMAN BRITAIN					
Cirencester: CORINIUM DUBONNORUM 2nd C			9	3/5	A
Kenchester: MAGNAE DUBONNORUM 2nd C			5	3/5	A
Dorchester: DURNOVARIA 1st – 4th C			150	1/2/3/5	A
PART B: ENGLAND & WALES					
Chapter House, Ely Cathedral, 1351	1	1	3	5	C
Bishop's Camera, Farnham Palace, roof renewal, 1381			4	2	C
Tower House, Wells, 1410			1	2	H
Farmhouse at North Sussex, 1490- 1530			3	2	H
Hampton Court Palace collection 1580 -1780	3	3	24	Viewed	C
Town house, Chichester, circa 1590			2	2	H
English Heritage (internal fitting) circa 1630			1	5	C
Winkhouse Farm, Wiggaton, 1650			2	4	H
Wheatsheaf Inn, Brecon Powys, 1680	1	1	3	5	H
All Saints, Oakham, Rutland, circa 1680	1		1	5	H
Hanham Mills cottages, Bristol, c 1680	3	13	623	4	S
King's Head Hotel, Blakeney, Glos. 1685	1	2	3	3/5	H

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Britain					
Glastonbury recycling items, 1590-1810			504	1 - 5	S
Dyrham Park, Somerset, 1715			6	1	C
Tower House Wells, windows, 1720			103	2/4/5	F
Craven Street, Westminster, 1730			1	2	C
Bowlish House, Darshill, Shepton Mallet, 1732		2	142	1/2/3/5	C
*Beaulieu Court Farm, Sunningwell repairs 1750/*1850			2	2	C
21 Charles Street, Westminster, 1750			4	3/4	C
Stourhead Pantheon portico, 1753			6	2	C
North house farm, Headcorn, Kent, circa 1801			17	1/2/3	H
23 Newcomen Street, Dartmouth, circa 1805			108	4	H
23 Newcomen St renovations, Dartmouth, circa 1825-30			406	4/5	F
Shelford House barn, Dinder, circa 1830			10	2/3	S
Manor Farm Haddenham stables circa 1836			32	1/2/3	S
Percival Terrace, Brighton, 1845			3	2	C
Kensington Palace, London, insertion		4	5	5	F
Bowlish House skillion, Darshill, 1860			112	3/4/5	F
Greyhound Farm barn, Dinder, S'set, c1865			1	2	S
Blacksmith shop, Marden, Sussex 1880	2	4	14	2/3/4	S
Charleton Road, Shepton Mallet, 1905	1	1	11	2/4	H
Wonston Chapel, Hampshire, 1908			5		C

GROUP 7: ACQUISITIONS/INSPECTIONS: BELGIUM

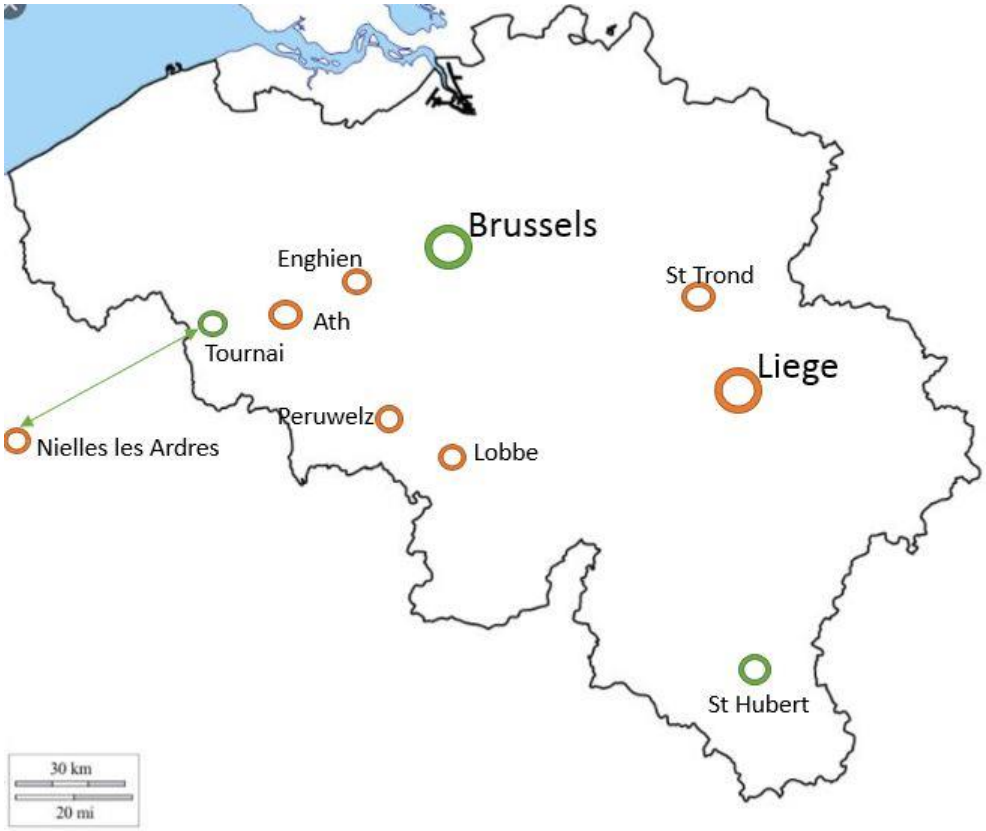


Fig. 40. Locations of nail finds & source information for Belgium

LOCATION/PROPERTY	CONDITION E	G	TOTAL	ZONES	DATING
Brussels: 13 Rue aux Ixue, 1762	5		5	2	C
Liege					
Former Infirmary of the Saint James Abbey, 1370	1		1	2	C
Later additions 1700-1830	1	1	5	2/5	C
Bishop's palace, c1350	1	1	4	5	C
Le Neuvice, Rue Neuvice, c1440		1	1	5	H
Chateau de Saive			4	1	H
Ath: *23 Rue Haute, 1535/* 1715	5	6	21	2/5	C
Peruwelz: *Basilique de Bon-Secours 1890*			5	1	C
Enghien: *Eglise St Nicholas, Chapel St Anne 1690*	1	2	7	5	C
St Hubert					
Fourneau St Michel			28	Viewed	H
Libramont			57	1/2/5	H

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Tournai (Nielles les Ardres)					
Organ by Van Belle of Ypres 1685	3	6	68	Inspected	C
Tournai (St Trond)					
Eglise de Beguinage. Organ by Christian de Huy 1644	6	8	234	Inspected	C
Tournai (Lobbes)					
St Ursmer Collegiale. Organ by Rifflart. 1818		6	106	Inspected	C

GROUP 8: ACQUISITIONS AND INFORMATION FROM FRANCE

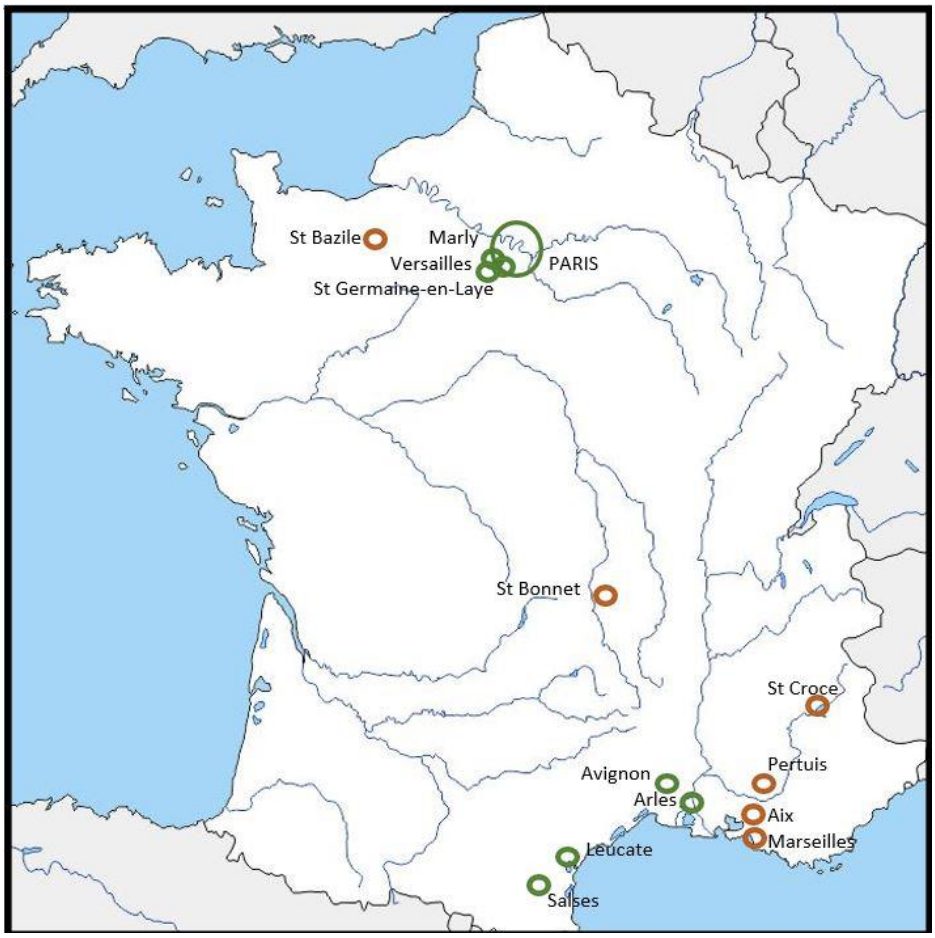


Fig. 41. Locations of nail finds & source information for France

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Aix					
Rue Ferdinand Mistral, 1740	1	1	2	5	H
Cours Mirabeau environs, 1780			7	2/5	P
Pertuis: *Le Petit St Jean, 1646/1684*			47	2-5	C
Grambois; *Chateau de Pradines, 1780*			3	2	C
Cucuron; *Portes anciennes collection 1680-1790*	2	4	45	2-5	P
St Bonnet; *Le Relais, 1750/1840*	3	4	9	2/4/5	H
St Croce *circa 1640 ruin*			1	5	H
St Bazile; *Les Autels (sur le pont), 1680/1740*			1	4	C
Marseille; *Rue Grignan, circa 1780*			2	2	P
Avignon; *Palais des Papes display*	3	3	7	2	C
Arles Museum; *display & archives, Roman*	11	23	75		C
St Germaine–en-L museum; *Gallo-Roman display*			142	Viewed	A
Leucate museum; *display*			7	5	A
Salses; *castle in-situ display*			Many	4/5	A
			17		A

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Marly site dig; Dr Bruno Bentz director **Versailles site dig**; Dr Annick Heitzmann director			11		A

GROUP 9: ACQUISITIONS AND INFORMATION FROM GERMANY

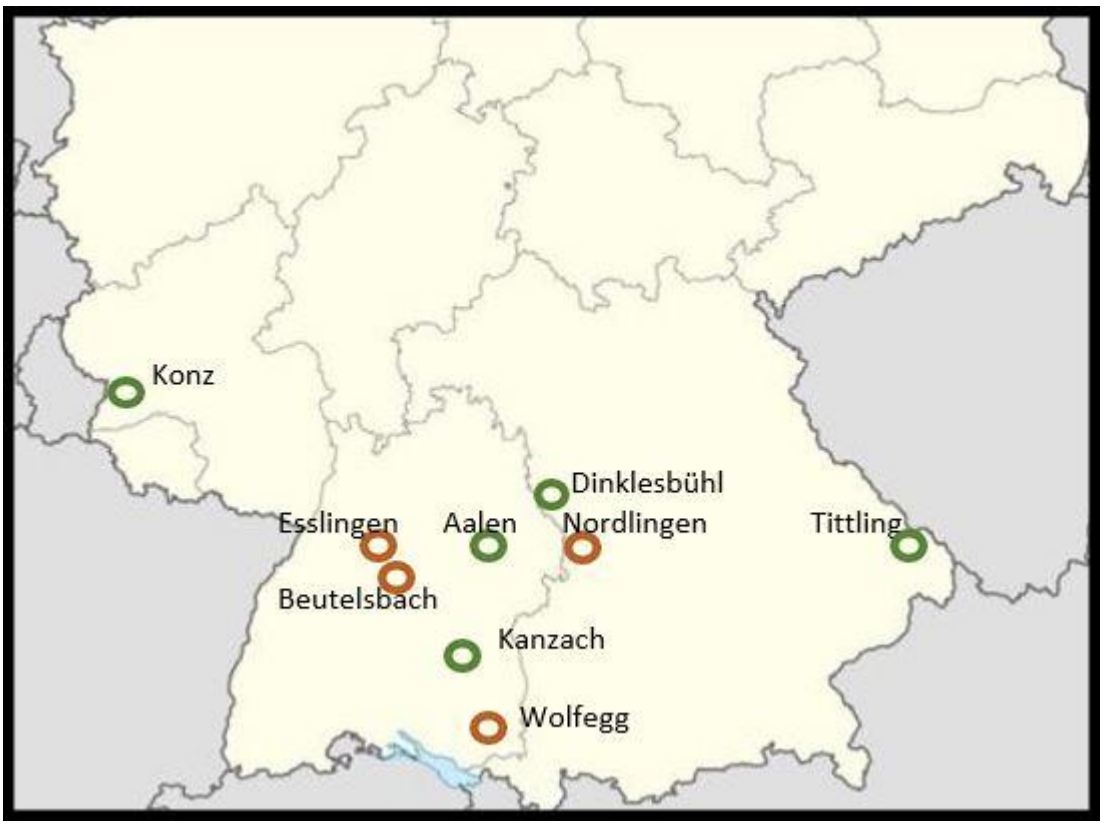


Fig. 42. Locations of nail finds & source information for Germany

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Beutelsbach					
23 Marktstrasse, 1500-1510	3		8	2/5	D
Esslingen					
Innere Brücke, 1380-1459	1		3	2/5	P
Stuttgart: *17 Augustiner Strasse, 1850*			5	2/5	H
Nürtigen: *Rathaus, 1769*		3	4	2/5	C
Nordlingen: *8 Mühlgasse, 1580*			3	5	H
Nordlingen Museum: (Roman) A			7		
Schloss Wolfegg; *castle roof*	3	3	8	2/5	H
Tittinger; *Bayerische Wald museum*			1	4	modern
Konz; Roschieder hof museum display			23	4/5	seen
Aalen: Limes Museum (Roman**)**			51	-	A (seen)
Kanzach: Medieval Hall replica			1		modern

GROUP 10: ACQUISITIONS FROM DENMARK

Fig. 43. Locations of nail finds & source information for Denmark & Sweden

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Asferg (Jutland)					
4 Ejstrupve, Faarup, 1700			39	2/3/4	H
GROUP 11: SAMPLES FROM SWEDEN					
Stockholm			24	Ship nails	-
Sodra Raga: *Church nave roof, 1320*			5	1	D
Arboga: *Skoldkloster castle, 1660*			2	1	H
Samples examined:					
Ransberg Kyrka, 1350, bell tower, 1666			4	1 / 2	D
Gokhem Kyrka, c 1320			4	1 / 2	H
Stora Kopinga			2	1 / 2	H
Morup Kyrka, 1380			1	1 / 2	D
Dadesjo Kyrka, 1180			46	1 / 2	D

GROUP 12: ACQUISITIONS FROM THE BALTIC STATES

Fig. 45. Locations of nail finds & source information for The Baltic States

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Riga					
St Jacobs Tower 1517		1	1	2	D
Castle/Palace 1780			4	2	H
17 Marstala Iela, c1280			6	2	A
Riga Dom, 1760		1	2	1	A
31 Lacplesa Iela, 1850			4	2	A
St Jacob's basilica renovation, 1845		2	2	5	G
16 Basteja Iela, 1860			6	3/4	A
3 Kramuz Iela, 1879			3	1	A
Aluksne *Museum*			4	Viewed	
Adasi					
Cesis new castle, 1820			3	1	C
Turaida					
Kuldiga *Museum*			12	Viewed	
Leipeja Church roof	1		1		C
Tasu Manor House		3	18	2/3/5	H
Manor house, 1732-1761	1	5	16	2/3/4/5	H
Collection inspected		3	4	Viewed	

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Estonia: Uuerbala castle display			16	Viewed	A
Lithuania: Traka museum			11	Viewed	A

GROUP 13: ACQUISITIONS FROM ITALY

LOCATION/PROPERTY	CONDITION E	CONDITION G	TOTAL	ZONES	DATING
Rome: St Peter's Basilica portico, c 1680	1	1	2	4	A
Pisa:					
Door nails circa 1530			3		S
Batten nail circa 1700			1		P
T-head floor nails		3	7		P
Rafter nail			2		P
Lath nails cut c1830	2		2		S
Rafter nail cut c 1890	1		1		S

GROUP 14: ACQUISITIONS FROM USA

St Augustine, Florida			7	3	H
GROUP 15: *Ukrainian*		4	7	5	-
GROUP 16: *Albanian*			3	5	S
GROUP 17: *Chinese*			8		C
GROUP 18: *Japanese*			9		P
GROUP 19; Furniture nails, 1830-1900	26	86	128		-
GROUP 20; Samples from Mr Richard Jones			124	1-5	-
GROUP 21; Unused samples (Weald & Downland Museum)			70	1-5	S
GROUP 22; Other unused samples			228		-
Group 23; Miscellaneous & boat nails			52		-