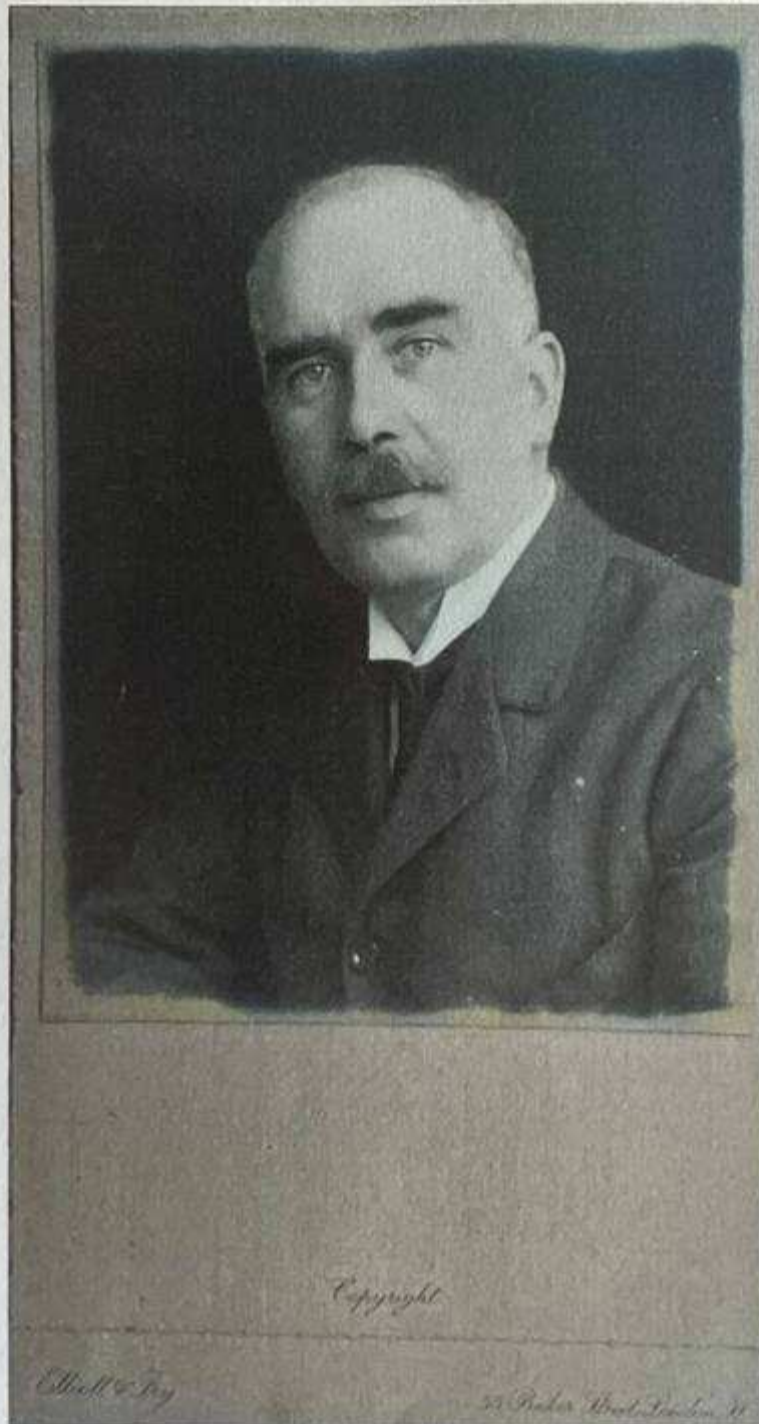
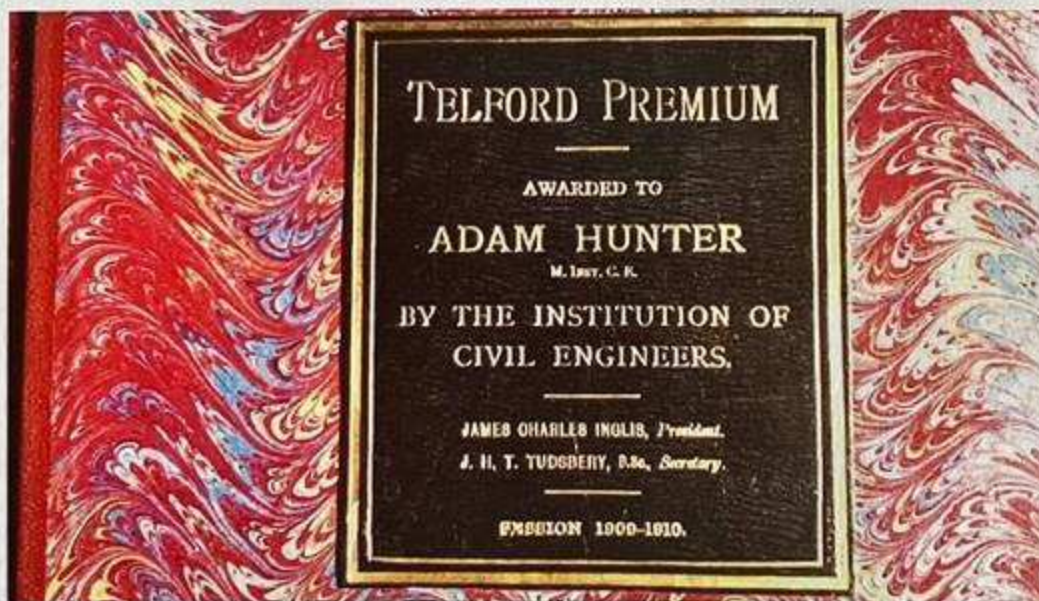


DRAFT The Paxton archive of Adam Hunter (1869-1933) - Chief Engineer, Sir William Arrol & Co., Ltd, Glasgow, Scotland [builders of the Forth, Tay and Tower {London} Bridges]. Includes many items formerly in Hunter's home or in the firm's photo archive [370+ items]



Hunter. Framed photograph by Elliot & Fry, London c.1930 [see Pt. 3]

1. Paxton article on Hunter from *The Biographical Dictionary of Civil Engineers* [with minor editing for context] 1-9
2. Hunter's own collection of 72 drawings/blueprints (from 1883 - his nos 602-665) relating to his temporary works involvement at the Forth Bridge as a trainee with Tancred, Arrol & Co. from 1886-89. Invaluable for their detailed coverage of the application of hydraulic power to the machines and equipment essential then for the erection of this world class innovation. OD indicates an original drawing/tracing; B a blueprint; Nd no date. Items neatly folded in cont. wrappers titled by Hunter. 13"x 8¼" [Box File 1]. 11-16
3. Other drawings and documents from Hunter's Archive. 31 items, mostly neatly folded in cont. wrprs titled by him. 13"x 8¼". [Box files 2 & 3 (Hunter's Arrol book draft)] 16-20
4. Large photographs [1886-] formerly in Sir Wm. Arrol & Co. Ltd's possession + Waterloo Bridge demolition. 171 images. [A3 binder & A4 ring binders 1 & 2] 20-30
5. Books and articles mainly in Hunter's possession. 54 items. [Sun Room bookcase 49 Bonaly Crescent] 30-37
6. Modern material relating to Hunter's life and work. [Sun Room bookcase 49 Bonaly Crescent & A4 binder] 37-39



1. Paxton article on Hunter published in the ICE *Biographical Dictionary of Civil Engineers*, 2014. [with minor editing for context]

HUNTER, Adam (1869-1933), civil and structural engineer.



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Hunter, a leading exponent and authority on the design, fabrication and erection of large steel structures for Sir William Arrol & Co. Ltd., Dalmarnock Iron Works, Glasgow, was born on 23 August 1869 at Crossford, Dunfermline, Fife. He died at Rutherglen, Glasgow, on 1 November 1933. His father was Adam Hunter [b. Dunfermline 1845. d. Kirkcaldy 5 July 1918].

Hunter began his engineering career as an apprentice pupil with Tancred, Arrol & Co. under James Tuit C.E. from 1886-89 on the Forth Bridge Works at South Queensferry, Scotland, where from 1885 his father, after about thirty years ironworks and mechanical engineering experience and with two patents to his name, was in charge of the firm's workshops.

It was said that Adam Hunter senior's endeavours reduced the time for building the Forth Bridge by fully two years and, on its completion in 1890, he was appointed resident engineer for the operational bridge, a post he held for many years [*Glasgow Herald* 1918].

Hunter senior's contribution to the bridge's construction was recognised by his inclusion in the official 'Forth Bridge – Commemorative Portrait Group [of] Directors, Engineers and others who have achieved this gigantic undertaking' published in 1890 [Paxton 1990, 110].

Surviving Forth Bridge copy drawings made by Hunter junior when aged 18, and still in his possession at his death, and now in this archive, include a now unique wealth of detail on hydraulically operated machines and equipment used on this project [see Part 6, Paxton PPP 2].

In 1889 he was at work on the bridge when 'with a bang like a shot from a 38-ton gun' [Westhofen 59], the last 36 bolts of the temporary ties between the north central span and the cantilever end sheared off before the temperature could be equalised for their unstressed removal. 'The huge cantilevers rocked from end to end as they had never rocked before or since, like the beam of weighing scales' [Hunter 1929, 43]. The experience Hunter gained in the erection of the Forth Bridge proved invaluable to his career.

In December 1889 Hunter was transferred to Arrol's London office (32 Victoria Street) as an engineering assistant at 2 guineas per week. He was engaged on the erection of steel structures still working to Tuit, by then the firm's Chief Design Engineer (author of *The Tower Bridge its history and construction*, 1894). From 1890-95 projects on which Hunter worked included Tower Bridge, Shoreham Viaduct on the *LB&SC Railway*, and India Dock and London Dock swing bridges.

From 1890 Hunter attended four years of evening classes at the City of London College (later London Metropolitan University) on engineering related subjects. His methodically kept 'Beeton's Diary' for 1890 has survived and strongly conveys his interests and activity during his first year in London. He maintained family contacts, was interested in music and the fine arts, visited 25 of London's leading attractions and smoked a pipe! He noted particularly the dates of Sir William Arrol's visits, the opening of the Forth Bridge on 4 March, and details of laying wood-block paving in Whitehall and Victoria St.

Also from the diary, Hunter's annual expenditure for 1890 was £101, against an income of £128. Approximately half of his outgoings were for board and lodgings and about £5 for periodicals (*The Engineer*, *Engineering*, *Mechanical World* and *Daily News*) and books on ironwork and bridges including Euclid 1/6, Westhofen's *The Forth Bridge* 4/-, Rankine's *Civil Engineering* 8/6d, and Goodeve on mechanics and mechanisms 7/-.

From 1895-1906, still working under Tuit in the London Office, Hunter soon achieved greater responsibility. In 1895 he was promoted to Chief Assistant Engineer, from March to May 1904 and throughout 1905 to Acting Chief Engineer and, on Tuit's death in 1906, to Chief Engineer. Arrol's engineering office was then transferred to Glasgow, with Hunter directing operations from a newly named 'Civil Engineering Department' at Dalmarnock Iron Works. By 1901 he had married Lottie Ruth Patrick and was living in Lambeth. It was probably about 1906 that they took up residence at 4 Viewpark Road, Rutherglen, Glasgow.

As Acting Chief Engineer Hunter's work included the design and construction of bridges over the River Nile at Cairo (longest 1755 ft), for which he acted as technical adviser on site from November 1905 to March 1906. Also by 1906, in the Republic of Ireland, Barrow and Suir viaducts (2131 ft and 1209 ft long respectively).

State-of-the-art, electrically operated cranes, for which Hunter designed the foundations and structure included two for the fitting out basin at John Brown's Shipyard, Clydebank. These were in 1904, on the east side of the basin, a 150-ton derrick crane, used for the ill-fated *Lusitania*, and, on the west side, the 150-ton giant cantilever crane of the hammerhead type which became operational in April 1907. This crane, which still exists, was soon followed by two similar ones at Newcastle (Wallsend) costing £52,000 in total.

At Dalginross road bridge, Comrie, still in service, Hunter was responsible for its novel 'constrained cantilever' design, said to be the first of its kind constructed in Britain. His surviving Arrol 'Girder Department' blueprint of the bridge dated 26 February 1904 is signed 'J. E. Tuit, Director, drawn by A. G. Harrison, checked by A. Hunter' [see Part 6, Paxton PPP 5 - image].

From 1906 as Chief Engineer and from 1910, with the additional authority of having been made a Director, Hunter exercised an overall direction of the firm's projects until 1932. These were in the United Kingdom and Republic of Ireland, and other countries to mention just 25 including Egypt, Sudan, India, Japan, Canada, Russia, South Africa, France, Ghana, Singapore, New Zealand, Kenya, Uganda, Gold Coast, Trinidad, Malaya, Argentina, Nigeria, Spain, Greece, Nepal, Jamaica, Lesotho, Iraq and Denmark.

Hunter's close contemporary and obituarist George Moncur, from 1910-33

Professor of Civil Engineering at the Royal Technical College, Glasgow (later Strathclyde University), stated that from 1906-32 Hunter, 'was

responsible for the construction and erection of all the works carried out by the firm. A few of the more important of these are: the Barrow and Suir viaducts ...; the Queen Alexandra Bridge (Sunderland, 1906-9); Middlesbrough (Transporter) Bridge (1910-11); Blackfriars Bridge widening (1907-10); Southwark Bridge (1920-21); Waterloo Temporary Bridge (1924); Prah River Bridge on the Gold Coast in Africa; Keadby Drawbridge [see Part 4 - 22 Arrol images] Paxton PPP 2]; dock-gates and caissons for the Royal Naval Dockyards, at Rosyth and Methil; Wearmouth Bridge; Athens, Greece, Power Station; dock-gates and swing-bridge for the Nag Hammadi Barrage (Egypt); Benue Viaduct, Nigeria (still in service); Ribble Viaduct; 250-ton electric hammerhead crane (Rosyth or Newcastle-upon-Tyne) and a large number of other important structures in various parts of the world.'

Hunter was elected to the Institution of Civil Engineers (AMICE 1895; MICE 1909) and in 1910 was awarded its Telford Medal and Premium Prize for a joint paper on the 1560 ft long Queen Alexandra Bridge over the River Wear, Sunderland, which cost £350,000. For this prize his book selection, characteristically for an inquisitive pontist, included, J. Gaudard's profusely illustrated bridge history classic, *Croquis de Ponts Metalliques*, Paris, 1902.

Hunter was also elected to the American Society of Civil Engineers (AM 1905; M 1911) and the Institution of Structural Engineers [M 1923], serving as a Member of its Council. He became a Member of the Institution of Junior Engineers in 1891 and of the Institution of Engineers and Shipbuilders in Scotland in 1906, subsequently serving as Vice-President of both organisations. He was also a member of the Royal Philosophical Society of Glasgow, the Engineers' Club of London, and the Liberal Club of Glasgow.

During the 1914-18 War Hunter was responsible for important works carried out by the Admiralty, War Office and the Air Ministry, and afterwards is understood to have been consulted by the War Graves Commission on engineering matters and to have visited France on several occasions in this connection [Moncur].

As an engineering consultant Hunter was held in high esteem and in this capacity he served on a number of British Engineering Standards Committees. It was while presiding at a meeting in London of the Committee on Bridge Loads and Stresses in 1932 that he was first stricken by the illness to which he finally succumbed [Moncur]. Shortly afterwards he resigned as the firm's Chief Engineer and Director, but continued to act as a consultant until his death the following year. He died at his home in Rutherglen and was survived by Lottie Ruth, and their married daughter, Ruth Whiting Phillips (d. 1992), also by his brother Peter Johnstone (d. 1948) and whether by his sister, Sara Clark (married 1903), is not known to the writer. His other brother John Chalmers Hunter was buried at sea 25th Sept. 1921. [see headstone image Rutherglen Cemetery courtesy Willie Johnston] – Ring binder 3]

Hunter was also a dedicated promoter of knowledge, particularly to younger members of the engineering profession, instanced in 1925 by his chairmanship of the Institution of Civil Engineers' Glasgow Students' Branch and his presidency of Glasgow University Engineering Society. He was especially interested in the erection of large steel bridges, a paper on the subject of which he delivered to the Institution of Structural Engineers in 1929.

This paper was considered by Major Petrie (PPIStructE) and Lt Col J. Mitchell Moncrieff (PIStructE), of 'inestimable value to the young members of

the profession'. The President also remarked, that Hunter's overseeing of the replacement of the historic iron bridge of 1796 at Wearmouth, Sunderland, erected in 1796, with its Robert Stephenson iron arch of 1858, 'was a very clever piece of work'. The same can be said of his direction of the temporary Waterloo Bridge (1240 ft long) in service over the Thames from 1924-34 which, exceptionally, required three methods of erection, by staging, overhang and rolling sideways.

In a masterly address to Glasgow engineering students in 1925, Hunter reviewed the development of bridges from Trajan's Danube crossing of c.120 AD to the steel balanced-cantilever Quebec Bridge's (1917) 'advancing knowledge of large members and exploring and remedying distortion effects.' Although mild steel was used in bridges from c. 1862, he noted that it was not until 1890 that confidence in its use for constructive purposes was established. From 1903 at Blackwell's Island Bridge, New York, the introduction of high tensile alloy steels with greater strengths had significantly increased the scope of bridge engineering by 1925, when a 'ferocious activity with reinforced concrete' had arisen.

Mr. H. Cunningham, a director of Sir William Arrol & Co. Ltd from 1913 and its Chairman from 1935, when writing up the firm's development to 1950, recorded that, from 1909, 'the most important member of staff was Mr. Adam Hunter, Chief Engineer'. Dr. J. Shipway, consulting engineer and Arrol employee from 1948-53 recorded in 2004 that,

'In the past Arrol had had a brilliant chief engineer and director, Adam Hunter MICE, who had ... produced a design textbook in 1909. This book was packed with useful information and was revised and re-issued in 1920 and 1928 [*Bridge and Structural Engineers Handbook*]. I used a copy of it for most of my working life and had to have it rebound from long use. Apart from Sir William Arrol (d. 1913), Adam Hunter was probably the most able member of all the firm's staff.

The following list of works world-wide executed by Arrol's, although incomplete, gives an idea of the extent and range of Hunter's overall responsibility. Many entries relate to industrial buildings, the subject of his authoritative paper in 1906. On bridge works, his exceptional career is reflected by the mention of many large bridges on five continents, including, not least, over the Thames in London, the erection of replacements for Rennie's Waterloo and Southwark Bridges and the widening of Cubitt's Blackfriars Bridge.

Of many 100-ton to 250-ton capacity cranes designed and executed under Hunter's direction, the first of the large cantilever genre erected by Arrol's was an innovative 'Titan' variant at Clydebank in 1907. It was then the world's largest of the hammerhead type (tested with a 160-ton load at a radius of 85 ft.). This Clydebank crane now attractively conserved as a visitor centre is an iconic legacy of Scottish engineering and shipbuilding excellence. In 2013 its world-class significance was recognised by its designation as an *International Historic Civil and Mechanical Engineering Landmark* by the Institutions of Civil and Mechanical Engineers, and the American Societies of Civil and Mechanical Engineers. [see Part 6, Paxton PPP 2 – nomination; 72-73 – plaque images]

Hunter's impressive practical achievement in the application of structural steelwork placed him in the first rank of his profession from before the Great War until his death in November 1933. Afterwards his influential *Bridge and Structural Engineers Handbook* continued to be used by steelwork practitioners for at least a further four decades.

That Hunter is not as well-known as he deserves to be is partly due to Arrol's policy, which he endorsed, of crediting work to the firm rather than any individual. Nevertheless, in ensuring continuance of the firm's 'high position in work of special difficulty and great magnitude' [*Bridges*, 1909] he made an invaluable contribution to the basic infrastructure of society.

On a more personal note Professor Moncur recounted that Hunter was 'of a generous and genial disposition (with) hosts of friends both at home and abroad and was very highly esteemed by all who came in touch with him, not only for his great professional ability but for his sterling worth and amiable personality.'

ROLAND PAXTON

Works [from 1904]

[Indicative only, dates approximate. Largely based on RCAHMS's *Sir William Arrol Collection, a guide to the international material*. 2000, 82-89]

1904 Dalginross Bridge [road], Comrie; Suakin-Berber Railway Bridges, Sudan; John Brown

& Co, Clydebank 150-ton electric derrick crane. **1905** Waterford, Barrow Bridge, Republic of Ireland; Machine, smiths, pipe, and boiler shops, Cammel Laird, Birkenhead; 150-ton Giant Cantilever Crane, John Brown, Clydebank.

1906 Nile Bridges, Cairo; Sunderland Wear (Queen Alexandra) and other North Eastern Railway bridges; King Street, Wallace Street and Nelson Street Bridges, Glasgow; Waterford, Suir Bridge; Boiler, machine, other shops, crane gantry over dock, Yarrow & Co, Glasgow; Engine fitting and boiler shop, David Rowan & Co, Glasgow; Engineers' and pattern shops and smithy, McKie & Baxter, Govan, Glasgow; Erecting shop, NB Locomotive Co, Ltd, Polmadie, Glasgow; Erecting shops for Coventry Ordnance Works Ltd, Scotstoun, Glasgow; Fitting shop, G. & J. Weir Ltd, Cathcart, Glasgow; Funnel and erecting shops John Brown & Co, Clydebank; Joiners' shop, North British Locomotive Co, Ltd, Polmadie, Glasgow; Machine shop extension, Steel Company of Scotland Ltd; Machine shops, North British Locomotive Co, Ltd, Polmadie, Glasgow; Roof over mill, Steel Company of Scotland Ltd; Shop over soaking pits, Steel Company of Scotland Ltd; Jonas & Colver Steelworks, Sheffield; Store and workshops at dock, Fairfield Shipyard, Glasgow; Tinships' shop and stores, NB Locomotive Co, Polmadie, Glasgow; Tube Works for Stewart & Lloyds Ltd, Imperial Works; Wheel shed, NB Locomotive Co, Ltd, Polmadie, Glasgow; Erecting Shop extension for Wallsend Slipway; Workshops for Barr & Stroud, Glasgow. **1907** Boiler Shop for London & Glasgow Engineering and Shipbuilding Coy; Engineers' shop. Ailsa Shipbuilding Co, Ltd, Ayr; Erecting shop, Barclay Curle & Co, NB Diesel Engine Works, Glasgow; Galvanizing shop and crane gantry in yard, Yarrow & Co, Glasgow; Heavy tool shop. Thomas Firth and Sons, Sheffield; Rolling mills, Thomas Firth & Sons, Tinsley; Roof over cogging mill, Steel Company of Scotland Ltd. **1908** Blackfriars Bridge Reconstruction, London; Dowrie &

Co's Works, Port Said; Harland & Wolf Shipyard, Belfast - cranes and steelwork for slipway. **1909** Assuit Barrage Lift Bridge; Waverley Station, Edinburgh [additional work?]; North Bridge, Edinburgh [additional work?]; Gebel Aulia Barrage Lift Bridge and Lock Gates, Sudan; Manchester Ship Canal, Stockton Heath Swing Bridge; Swansea, Kings Dock Swing Bridge; Wallsend, N. E. Marine Engineering Co, 150-ton giant cantilever crane; Addiewell, Shale Bing conveyor plant. **1910** New Erecting Shop for Wallsend Slipway; 150-ton Giant Cantilever Crane for Wallsend Slipway; Newport, Alexander Dock, dock gates. **c.1910** Tapti Railway Bridge [for GIP Railway], India. **1911** Howra Bridge, Calcutta; Cork Bridge, Limerick; Roxburgh Road Bridge; Glasgow, Fairfield Shipyard, Giant Cantilever Crane; Greenock, Scott's Engine Works, Crane; Middlesborough Transporter Bridge. **1912** Swansea, Rolling-lift Bridge; 250-ton Giant Cantilever Crane, H.M. Dockyard, Portsmouth; Sasebo, Japan. Imperial Navy Dockyard, 250-ton Giant Cantilever Crane; (or **1918?**) Rosyth Dockyard, 250-ton Giant Cantilever Crane **c.1912** Grimsby, Rolling-lift Bridge No. 3; Queensferry Rolling-lift Bridge, Flintshire; Vickers Gun Shop, Sheffield. **1913** Bootle, Harland and Wolff Factory; London, Vauxhall & Beckton Gas Works, Charging Machines; Quebec Docks, Floating Crane; Rosyth Dockyard, lock and dock caissons, hauling machinery and basin sluices. **1914** Hoy, RN Oil Terminal, Orkney; 1914-18 Harland & Wolff's Govan Shipyard, Glasgow. **1915** 200-ton Giant Cantilever Crane, HM Arsenal, Woolwich. **1916** Keadby, Lincs, Rolling Lift Bridge; Tharizan [later Stalingrad] Gun Works, Tube Furnaces, Russia. **1917** Makhaleng Bridge, South Africa; Greenock, James Watt Dock, Giant Cantilever Crane. **c.1917** Glasgow, Clyde Bridge Steelworks, Messrs. Colville. **c.1918** Bridge for Eastern Railway of France; London, Hackney, Downs Road Railway Bridge [reconstruction]. Rosyth Dockyard, 100-ton Giant Cantilever Crane. **1919** London, Royal Albert Docks, lock gates, swing and bascule bridges and floating caisson [pre-war contract originally in German hands]; Vickers Armstrong Factory, Barrow-in-Furnace; Glasgow, NB Diesel Engine Works, Giant Cantilever Crane; Penistone, Cammel Laird's Works; Plymouth, Devonport Dockyard, floating caisson. **1920** London, Great Western Road Railway Bridge; Montrose South Esk Viaduct; Dumbarton, McMillan's Shipyard; Jarrow, Palmers Shipbuilders & Iron Co, Blast Furnace Wharf. **c.1920** Erode Branch Railway bridge, India; Casebourne Cement works, Storage Bins and Packing Floor; Manchester Corporation syphon contract; Takoradi Harbour, Ghana, Automatic waggon tipper, discharging hopper. **1921-32** Benue Bridge, Nigeria. **1922** Johore Causeway Lift Bridge, Sea Lock gates, Singapore; Glasgow, Blochairn Steel Works; **c.1922** Nabkoi Railway Viaduct, Uganda; North Shields, Smith's Dock Co, dock extension, Fish Jetties. **1923** Arenal Railway Bridge [renovation], Argentina; Barrow Haven railway bridge; Grangemouth Refinery storage tanks. **c.1923** Las Conchas Railway Bridge [renovation], Argentina. **1923** Sunderland, Doxford Engine Works Extension; Tania Railway Bridge [renovation], Argentina; Tilbury Docks, floating caisson. **1924** Mid Calder Road Bridge; Offia River Railway Bridge, Ghana; 25-ton moving crane, Republic of South Africa; Enugu Railway Workshops, Nigeria. **1924-34** London, Waterloo Bridge, temporary accommodation bridge. **c.1924** Barton Power Station, Manchester. **c.1925** Glasford, 'Cat-o-Tap' Bridge, Republic of Ireland; Isle of Sheppey, lift bridge; Hutt Valley Railway Workshops, New Zealand. **1925** Glasgow, Lambhill,

Baltimore Road Lift bridge; Huelva Pier, Spain; Tilbury, Ferry Road Railway Bridge; Methil Harbour Dock Gates; New Holland Pier; Sunderland, Greenwell Drydock Co, lock gates; Sunderland, River Wear, caissons for dock walls; Swansea Docks, lock gates. **1926** Prah Railway Bridge, Ghana; Crewe, railway workshops and cranes; Lyttleton and Wellington Harbours, New Zealand - floating cranes; Glasgow, Linthouse Engine Works, crane. **1927** East Linton, Haddingtonshire, Tyne Bridge; Gaya, Morhar Bridge, India; Humberside, Carlton Bridge; Newcastle-upon-Tyne, Benton Hall Railway Bridge; Newport Bridge, Monmouth; Grangemouth, Scottish Dyes Dyeworks. **c.1927** Athens, Power Station, Cranes and large pontoon for landing coal. **1928** Calcutta, Kidderpore Docks, lock gates; Castlecary, Forth & Clyde Canal Swing Bridge; Sudan Railways, two railway bridges; Nepal, road and light railway bridge; London, Beckton, No.1 Pier; Stonebyres Hydro-Electric Power Station and pipeline, Lanark. **1929** London, Kingsland Road Railway Bridge; Nag Hammadi Barrage Swing Bridge, Egypt; Buenos Aires, two railway bridges; South African Railways, railway bridge; Uganda, road-railway bridge; Sunderland, Wearmouth Bridge; Zwartkop River Railway Bridge, Republic of South Africa; Fort William, Lochaber Aluminium Smelter; Newport, East Usk Pumping Station, caisson; Nag Hammadi Barrage, lock gates, Egypt; Tilbury Docks, Leading-in girder. **1930** Glasgow, Boulevard Lift Bridge; Glasgow, Pollokshaws Road Bridge Kilbowie, Forth & Clyde Canal Swing Bridge; Lagos, Nigeria, Carter Bridge; Montrose, new road bridge; Ribble Viaduct; Jamaica, road and railway bridges; Tsoeliki Suspension Bridge, Lesotho; Westquarter, nr Polmont, Nobel's Works, Union Canal Swing Bridge; Glasgow, Kelvin Hall, proposed designs; Hoy, Royal Naval Oil Terminal, Orkney. **c.1930** Birkenhead, Rolling Lift Bridge L3; Manchester Ship Canal lock gates; Newton Heath, St. Mary's Railway Bridge. **1931** Birkenhead, Duke Street and Rolling Lift B4 Bridges; Blantyre, railway bridges; London, Glamis Road Lift Bridge; Selvieland Farm, access bridge [nr Lanark]; Newcastle-upon-Tyne, Walker Shipyard, 250-ton Giant Cantilever Crane. **1932** Aberchalder, Caledonian Canal Swing Bridge; Fort Augustus, Caledonian Canal Swing Bridge; Glasgow, Forth & Clyde Canal, Temple Lift Bridge; King's Bridge over R. Clyde, Glasgow [foundations and temporary Bridge]; Kirkintilloch, Forth & Clyde Canal Swing Bridge; Laggan, Caledonian Canal Swing Bridge; Leigh, Astley, Morley's Bridge; Dalgrain, Forth & Clyde Canal Swing Bridge; Burntisland Alumina Works; Clydebank, Elderslie Shipyard; Greenock, Garvel Dock, gates.

Publications:

'The structural design of engineering factories'. *Trans. Jun. Inst. Engineers. XVII* (1906-7); *Bridges, Structural Steelwork and Mechanical Engineering Productions by Sir William Arrol and Company, Ltd., Dalmarnock Iron Works, Glasgow, with description of their manufacturing works, and formulae and diagrams for the calculation of beams, general specifications, and other data influencing the design of structural work. Partly reprinted from "Engineering."*, London, 1909. [Prepared under Hunter's superintendence]; Parts of the foregoing were also published separately in 1909 as [1] *Bridges. By Sir William Arrol and Company, Ltd.* and [2] *General specifications, formulae and data, for cranes, bridges and workshop buildings; 'Queen Alexandra Bridge over the River Wear, Sunderland.'* [with] F.C. Buscarlet. *MPICE. 182* (1911);

Bridge and Structural Engineers Handbook, London and New York, 1920; *Bridge and Structural Engineers Handbook. Second Edition*. London and New York, 1928; [Chairman's] *Opening Address to the Glasgow Association of Students of the Institution of Civil Engineers on November 18th 1925*. Glasgow, 1925; 'Erection of Metallic Bridges', *The Structural Engineer*. 7 (1929); *Arrol's Reinforced Concrete Reference Book* by E.A. Scott. Spon, London and New York, 1930 [Facilitated by Hunter].

Sources

Ms. ICE membership records; RCAHMS Arrol drawings; Mitchell Library; and Hunter books, drawings, 1890 diary and manuscripts in this archive.

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In this version of the foregoing the author has been able to include a much better image of Hunter thanks to the kind donation on 19th May 2019 of a studio photograph (which looks like the original of the NLS Newspaper image) by his family descendent Mrs Sukie Hunter.

2. Hunter's unique collection of 72 drawings/blueprints (from 1883, his nos 602-665) relating to his temporary works involvement at the Forth Bridge as a trainee with Tancred, Arrol & Co. from 1886-89. Invaluable for their detailed coverage of the application of hydraulic power to the machines and equipment essential for completion of this world class project in the pre-electric equipment era. OD indicates an original drawing/tracing; B a blueprint; Nd no date. Items neatly folded in cont. wrappers titled by Hunter. 13"x 8¼"
[Box File 1] 9-13

602 Alteration on Jib for 5 ton Travelling Crane. Forth Bridge Works. Scale: ¾ in to 1 ft. OD. 36" x 24". Black and red ink. Nd. Folding, in cont. titled wrapper. Dimension and note in Hunter's hand. 23 ft high lattice jib.

604. Hydraulic Connections for Turn Cranes. Hydraulic Crane for Smiths Shop. 'Forth Bridge Works Diagram of connections for 2 Ton Hydraulic Crane in Field. Elevation and Plan'. B. 20"x26" Nd but c.1886. Finely detailed connections coloured yellow.

[with]

'Details of Hydraulic Crane for No. 2. Shed. Pressure 1000 lbs/sq.in. 'Signed Adam Hunter 29/10/87'. OD on tracing paper. 23"x14". Black, red and blue ink. [See Part 6, PPP Paxton 13 - image]

[with]

'Hydraulic Crane for details see other drawing. Pressure 1000 lbs/sq.in.' OD on tracing paper. 11"x 9". Also almost certainly drawn by Hunter but unsigned.

614 Forth Bridge Works. Winding gear for hoist for jetty. OD. 14"x17". Nd.

[with]

Winding engine. OD. 42"x24". Nd. Finely detailed and partly coloured. Drawn by Hunter but unsigned. 4ft dia. drum. Folding, in cont. titled wrapper.

615 Brake for barrel shaft of North Viaduct hoist (Garvie) 25/6/1888. [B]. 30"x24". Original drawn by Hunter?

[with]

Grooved pillow and pulley blocks. B. 16"x18". Nd. Highlighted in yellow. Folding, in cont. titled wrapper.

618 Travelling crane for diving bell - Forth Bridge. Sir T Tancred Arrol & Co. 21 May 1883. (by) Fullerton, Dodgart & Barclay, Vulcan Works, Paisley with their ornamental title. OD. 36"x24". Black, blue and red ink.

[with]

Driving gear for travelling crane – Diving bell. Sir T. Tancred Arrol & Co. July 1883 (by) Fullerton, Dodgart & Barclay, Vulcan Works, Paisley with their ornamental title. OD. 36"x18". Folding, in cont. titled wrapper.

620 Air Compressor. Lyle's Patent No. 8422. Signed James Lyle Engineer, Causeyside, Paisley. Initialled AH. OD. 27"x15". Nd.

[with]

Forth Bridge Works – Air Compressor. B. 34"x10". Coloured. Nd.

[with]

Forth Bridge Works. Air Compressing Engine – cylinders 17in. dia. 24in. stroke. Scale 1½ in to 1 ft. B. Nd. Finely executed.

Folding, in cont. titled wrapper. No. 620.

622 Foundation for 1¼" Punching and Shearing Machine. Robert Harvey & Co., Park Grove Iron Works, Glasgow, 1885. Signed Adam Hunter Jr. 26/10/87. OD. 22"x20" Hand coloured. Folding, in cont. titled wrapper.

[with]

Plate Straightening Machine No. 2. B. 38"x25". Nd. Folding, in cont. titled wrapper. Finely detailed, partly coloured yellow

623 Outline plan of Combined Edge & End Plate Planing Machine shewing Counter Shaft &c. drawn in red. B. 34"x14". Nd. Length of machine bed 33ft. 9in.

[with]

Combined Edge & End Plate Planing Machine. Oval stamp – Campbell, Smart & Co., Engineers, Machine and Toolmakers, Artizan Works, Dunbarton Road, Glasgow. OD. Coloured. 18"x15". Nd.

[with]

Forth Bridge Works – Hydraulic Rams for Planing Machine. For No. 1 Shop. B. 38"x23". Nd. Folding, in cont. titled wrapper. No. 623.

624 [Forth Bridge Works] Angle Straightening Machine. OD. 24"x17". Nd. Unsigned, almost certainly drawn by Hunter.

[with]

Straightening Machine. Cont. print. 39"x25". Nd.

Folding, in cont. titled wrapper.

624A. Forth Bridge Works – Drill Twisting Machine. B. 31"x13". Nd.

[with]

Dalmarnock Iron Works. New Drilling Sheds. Augst. 1889. OD. 33"x13", Black and red ink. Folding, in cont. titled wrapper. No. 624A. Drawn by Hunter?

625 Horizontal traversing drilling machine. OD. 28"x11" Nd.

[with]

Portable multiple drilling machine. OD. 39"x23". Monogram [drawn by AH.] Nd. Folding, in cont. titled wrapper. Horizontal traversing drilling machine. OD. 28"x11" Nd. Folding, in cont. titled wrapper.

627 Centrifugal pump. OD 27"x25" (probably in Adam Hunter Jr's hand). Nd. ink.

[with]

Centrifugal pump. OD 15"x26" (in pencil in probably in Adam Hunter Jr's hand). Nd. Folding, in cont. titled wrapper.

628 Stewart and Hunter's patent shaker for filling [sugar?] casks. Print. 20"x12" Nd. Oval stamp Stewart & Hunter's Patent Greenock.

[with]

Vacuum pan for Globe sugar refining Co. Duff & Sons maker. December 1876. OD. 39"x21". Folding, in cont. titled wrapper.

630 Forth Bridge Works. Hydraulic hoist for gas producer. B. Nd.
Gas producer for Sir T. Tancred & Arrol & Co, 1883. (signed). B. Nd. With notes by Adam Hunter.

[with]

Forth Bridge Works. Gas Producer. B. 36"x23". Nd. Folding, in cont. titled wrapper.

631 Gas furnaces for heating plates. B. 38"x26". Folding in cont. titled wrapper. Partly coloured yellow.

632. Forth Bridge Annealing furnace for No.2 Shed. OD. 28"x20". Signed Adam Hunter Jr. 6/11/(18)87. Ink, partly hand coloured.

[with]

Annealing furnace. B. 33"x24". Nd. Folding, in cont. titled wrapper.

634 Hydraulic connections – 215 numbered elements, coloured yellow. B. 38"x23" Sept. 1887. Folding, in cont. titled wrapper. Forth Bridge Works. Catalogue of valves, cocks, plugs, knees, hose couplings, nuts and ruffs, hose nozzles, flanges, pipes, hoses, bend pipes, leathers and joints.

635 1¼ inch Hydraulic Valve. Full size. OD. No. 1. 23"x16". Nd. Probably drawn by Hunter. Black and red ink.

[with]

½ inch Hydraulic Valve. Full size. Valve No. 2. Working pressure 30 cwt. per sq. in. OD. 18"x16". Nd. Black and red ink. Folding, in cont. titled wrapper.

636. Hydraulic Cocks. Full size. Nos. 10 & 11. OD. 22"x19". Nd.

[with]

3/8 inch Hydraulic Valves for 2 tons/sq.in. Full size. Valves Nos. 3 & 4. OD. 18"x16". Nd. Black and red ink, partly coloured yellow. Hydraulic Valves for 3 tons sq in. OD. Nd. Folding, in cont. titled wrapper

637. Hydraulic Cocks Nos. 12 & 13. OD. 22"x16". Black and red ink. Nd.

[with]

¼ in Special Cock – Full size. OD. 22"x16". Black and red ink. Nd. Folding, in cont. titled wrapper.

638. Hydraulic Connections. Full size. Nos. 20-24. OD. 21"x16". Nd.

[with]

Hydraulic Connections, Full size. Nos. 25-33. OD. 21"x16". Black and red ink. Folding, in cont. titled wrapper.

639 Hydraulic connections – elements 34-40. OD. 22"x16". Black and red ink. Nd.

[with]

Hydraulic connections - elements 60-67. OD. 21"x16". Black and red ink. Nd. Folding, in cont. titled wrapper.

640 Hydraulic connections. Full size. Elements 80-82. OD. 20"x17". Black and red ink. Nd.

[with]

Hydraulic Connections Full Size Nos. 90-96, 110-116. OD. 24"x16". Black and red ink. Nd. Folding, in cont. titled wrapper.

644. Accumulator at Forth Bridge Works 14"dia. x 15'rise. 9th November 1885. Pressure 1000 lbs per sq. in. Initialled AH. March 1888. OD. 15"x12". Black ink, partly coloured.

[with]

(same title) by Fullerton Dodgart & Barclay, Engineers & Millwrights, Vulcan Works, Paisley for Messrs. Tancred Arrol & Co. Nov. 1885. OD. 35"x13". Black and red ink. Folding, in cont. titled wrapper. With firm's ornamental heading, Vulcan Works, Paisley.

645. Forth Bridge. Foundation for 11" Accumulator & Pumps. 15 Octr. 1883. Wm. Arrol & Co. Dalarnock Iron Works stamp. Drawing no. 383 18 October 1883. B. 24"x24".

[with]

11" Accumulator [15ft. tall]. OD. 28"x27". Black and red ink. Nd. Folding, in cont. titled wrapper.

646. Hydraulic Pressure Multipliers. 'Hydraulic Valve Full Size. Fullarton, Doghart & Barclay, Engineers and Shipwrights. Vulcan Works, Paisley 3rd December 1886. B. 16"x18". Partly coloured yellow.

[with]

Compressor for small riveting machine. F.D. & B. Vulcan Works, Paisley. July 1885. OD. 14"x19". Black and red ink, partly coloured.

[with]

Hydraulic Compressor. 22nd August 1885. Initialled A.H[unter] 1/3/1888. Makers. Fullarton, Doghart & Barclay, Engineers and Shipwrights. Vulcan Works, Paisley. Original hand coloured tracing. 37"x24". Black and red ink, partly coloured. Folding, in cont. titled wrapper.

647. Forth Bridge Works. 2 Throw Pump 2¼" bore x 4" stroke. OD. 42"x27". Nd. Black and red ink.

[with]

Forth Bridge Works. 3 Throw Pump 2¼" Cylinders 8" dia. stroke 10". Pumps 2½" stroke 4½". OD. 42"x27". Nd. Folding, in cont. titled wrapper. Black and red ink.

650. Hydraulic Bending Press by Fullerton, Dogart & Barclay, Vulcan Works, Paisley with the firm's ornamental logo. 26th January 1883 for Sir Thos. S. Tancred, Arrol & Co. Forth Bridge Works. OD. 29"x25". Signed Adam Hunter Jr. Nov. 1887. Black and red ink, partly coloured.

[with]

Bending machine for deck plates. OD. 37"x17". Black and red ink, partly coloured. [almost certainly drawn by Adam Hunter Jr.] Nd. Folding, in cont. titled wrapper.

651. Williams' Patent Hydraulic Capstan. OD. 26"x13", Black ink. Nd.

[with]

Hydraulic Drill. Full size. B. 39"x25". Nd. Folding, in cont. titled wrapper.

652. Hydraulic Press 15" cylinder x 18" stroke. (18)83 (redrawn) 29/10/87 (by A.H.?). OD. 38"x21". Black and red ink, partly coloured.

[with]

Forth Bridge – Return Cylinder for Straightening Bear. No. 2 Shop. Oval stamp Forth Bridge Works South Queensferry. Engineering Department Tancred, Arrol & Co. 20/11/85. OD. 39"x24". Ink, partly coloured. Fragile. Folding, in cont. titled wrapper.

657. Riveting Machine Cylinders. B. 9"x14". Nd.

[with]

Hydraulic Riveting Machine 10(.375)" Cylinder, 2' 0" Gap. OD. 45"x25". Black ink. Nd.

Folding, in cont. titled wrapper.

658 Forth Bridge Works 4 feet 6 inch gap fixed riveter – plan, elevation, section - ¼ full size. Ink, hand coloured. OD. 35" x 24". Nd. [See Part 6, Paxton PPP 6 - image]

[with]

Hydraulic lift used for riveting keels of ships – half size. Makers Dalmarnock Iron Works. Jan. 30th (18)86. OD. 36"x27". Folding, in cont. titled wrapper.

659. 100 tons riveting machine. B. Stamp Wm. Arrol and Co. No. 1358, 29 May (18)89, Dalmarnock Iron Works, Glasgow. B. 22" x 22". An earlier version of that shown in the Arrol photograph in Section 4.

Folding, in cont. titled wrapper.

[with]

150 ton riveting machine. B. 27" x 27". Nd. Folding, in cont. titled wrapper. An earlier version of that shown in the Arrol photograph in Section 4.

662. Foundation for 3½ screwing machine Barrow's Patent, Smith, Beacock & Tannett, Victoria Foundry, Leeds. OD. 29"x18". Nd.

[with]

Foundation for 3½ screwing machine Barrow's Patent, Victoria Foundry, Leeds. Another similar but with firm's stamp 21 May 1885. Oval stamp of firm's London Agent. OD. 30"x19". Red, blue and black ink.

[with]

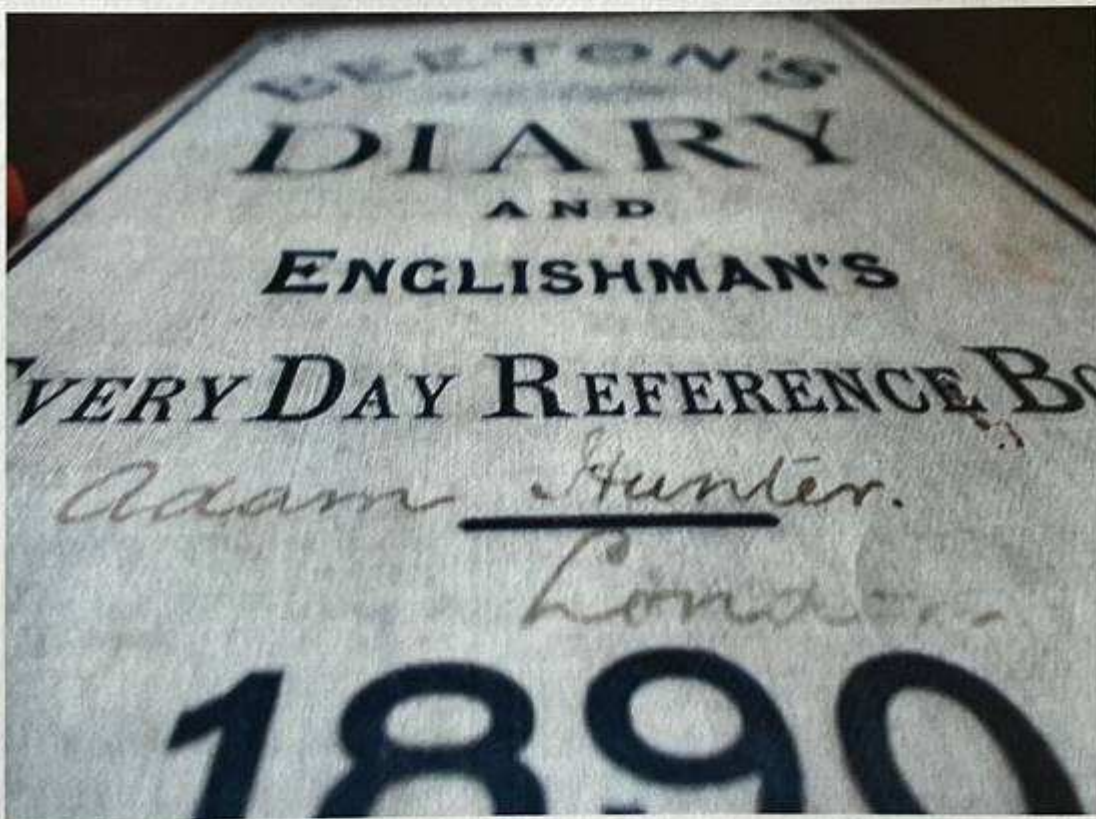
Foundation for 12 in. self acting slide and screw cutting lathe. Victoria Foundry, Leeds. OD. 24"x16". Red, blue and black ink, partly coloured. Nd.

Folding, in cont. titled wrapper. Folding, in cont. titled wrapper.

664. Air lock with hydraulic lift – Forth Bridge. (by) Fullerton, Dodgart & Barclay, Vulcan Works, Paisley in ornamental logo. 4th June 1884. OD. 37"x14". Folding, in cont. titled wrapper.

665. 50 Ton Tensile Testing Machine for Steel, Iron, Cement &c. With hydraulic force pump. By James Heriot, 163 Graeme Street, Glasgow. B. 10"x7". Nd. In cont. titled wrapper.

3. Other drawings and documents from Hunter's Archive. 32 items, mostly neatly folded in cont. wrappers titled by him. 13"x 8¼". [Box files 2 & 3 (Hunter's Arrol book draft)] 15-18



Hunter's *Beeton's Diary for 1890*. Folding map of London, useful information, adverts &c. pp. 1-173 paginated and completed throughout by Hunter. Covers from his arrival in London from 31.12.1889 - 31.12.1890. Many fascinating holograph entries relating to his first year in London working from the firm's office, also family matters. Original printed cloth with signature 'Adam Hunter London' on cover. [see Part 6 Paxton PPP 14-17 - images].

The only Hunter working diary known by the writer to have survived in his archive

Whitehall laid with new timber
blocks, uncreosoted and kept at
distance by small nails - fixed by
cement grouting, no pitch used
and on concrete bed.

opened for traffic today

4 THURSDAY SEP

At Crystal Palace
Lane

16

Attention to detail noting of timber block laying in the roadway at Whitehall, London

Specification of pneumatic machines and rock drill plant for Messrs. Tancred, Arrol & Co. Air compressors, engines and receivers. [8pp.], foolscap. (probably in Adam Hunter Jnr's hand). Nd. In cont. titled wrapper.

Concrete mixer Jamieson & Blantyre's Patent. Stonerfield Engine Works, Blantyre. OD. 36"x 23". [tracing by Hunter?]. Nd. Folding, in cont. wrapper, titled by Hunter. Fixed, with cylindrical drum 2' dia x 6' long.

Design for solid screw pile. OD. 15"x 19" a coloured tracing probably drawn by Adam Hunter Jr.) Nd. Folding, in cont. wrapper titled by Hunter.

Design for Dalginross Bridge, Comrie. Sir William Arrol & Co. Ltd., Glasgow. Feb. 26th 1904. 37"x27". Signed as approved J.E. Tuit, Director. Drawn by A.G. Harrison. Checked and signed by A. Hunter. B. Folding, in cont. wrpr. State-of-the-art design in 1904, Still in use. See Paxton & Shipway in sect. 5. [see Part 6 Paxton PPP 24-26 - images].

Notes and Queries for Structural design. N. St George Moore M.Inst.C.E., December 1901 17 Victoria Street, Westminster with signature of B.S. Aldis on front cover. {Arrol's London office? check}. 7 blueprints on design Decr 1901 general design. Notes on carriageway and tramway construction. contract and specification, tender, roadwork, platelaying, London C.C. Torquay Dolter Tramways 9 June 1905. Notes on overhead construction, trolley poles. Many details. Foolscap, 20 pp. Cont. ms. wrpr.

Considère Spiralled Concrete Piles. Details of a pile 40 feet in length. Considè, re Construction Co., 5 Victoria Street, Westminster. 8¼"x14". Oval stamp of Allendorf & Clarkson, Hope St., Glasgow. Nd. Cot. Print.

Original design for Netham Bridge [Bristol?]. Stress Diagrams. For a bow girder road bridge of 138 feet span. Two drawings on tracing paper, including graphic statics stress diagrams, very few examples of which have survived in archives.. Unsigned. Nd. c.1900. Folding, in cont. wrapper titled by Hunter. Hunter No. 31.

Columbia. St Jose de Cucuta Railway. Specification for thirteen iron bridges from 8ft 3in to 35 ft 7in span, July 1891. 7.

[With]

Great Southern and Western Railway of Ireland – Headford to Kenmare. Specification of Iron and Steel Bridgework, 8 spans of 51 ft. clear. Contract with T.H. Falkiner Esq. 3 Victoria St. Westminster, contractor for the railway. July 1891. 4, 7, tables. Folding, in cont. wrapper titled by Hunter.

Galata [Floating] Bridge, Constantinople. Elevation. Plan and Section of bridge showing pontoons. Sir William Arrol & Co. Ltd. Glasgow. Civil Engineering Dept. Dwg. 1874, 13. 2. 1909. Cont. print 38"x24". Neatly folded. [see Part 6 Paxton PPP 49-50 - images].

Union Banking Company of York Hull Branch. Detail of Cast Iron Columns to Bank. Unsigned, Nd. c. 1890. 17"x25". Drawing on tracing paper. Neatly folded. Cont. wrpr with Hunter inscription 'showing cladding'.

Engineering cutting 15 Sept. 1893. 'The distribution of load on trough floor for bridges'. With a letter to the Editor about the article from I. Mertens. Cont. wrpr with holograph Hunter inscription.

Engineering cutting 12 July 1907. 'Double-deck railway and road bridge over the River Wear at Sunderland constructed from the designs of Mr. C.A. Harrison Engineer of the North Eastern Railway Co by Messrs Sir William Arrol & Co. Ltd, Engineers, Glasgow'. Cont. plain wrpr. For this project Hunter received a Telford Premium Prize from the Institution of Civil Engineers. [see Part 6, Paxton PPP 39].

Engineering cuttings 1893] The La Guaira Harbour Works Venezuela, by A. E. Arey M.Inst,C,E. : the Breakwater at Middelgrunden. Cont. wrpr titled by Hunter.

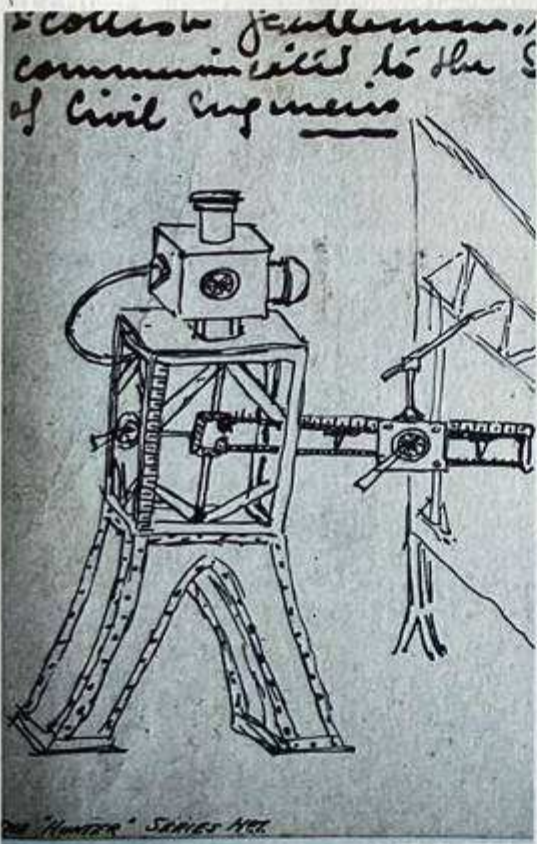
Ms. 'Proposed Footbridge at Bridgenorth, [Salop - 67 ft steel girder span?]. 9. Detailed quantities. Cont. wrpr titled by Hunter.

[advertisement] 'Sir William Arrol & Co. Ltd. Dalmarnock Ironworks, Glasgow. Single sheet c.1930 with images of Forth Bridge and Tyne Bridge, East Linton.

[autograph letter signed] From Andrew Biggart (1857-1917), Chairman, Director and former Chief Engineer, Sir William Arrol & Co. Ltd. A testimonial of 10th Novr. 1908 for Charles W. Hogg who became a partner of the Glasgow consultant engineers Crouch & Hogg from 1908-26. Hogg entered Arrol's drawing office in 1900 and left in 1905 to join his father's firm. Biggart considered Hogg 'one of the ablest engineers who has ever passed through our hands. Acting on this knowledge we recommended him at a later date to Sir Benjamin Baker ... as an assistant engineer for work on Blackfriars Bridge'. On Arrol's engraved notepaper with images of the Tower Bridge, London and the Forth and Tay Bridges. [see Part 6, Paxton PPP 9 – image].



Biggart letter of 10th Novr 1908 on the firm's bridge-spectacular headed notepaper



[Ms. postcard] Hunter, A. Addressed to his father of the same name at 4 View Park Road, Rutherglen, Glasgow. With humorous ink drawing of himself as an automaton on his Arrol work under the caption 'Sad metamorphosis of a young Scottish gentleman recently communicated to the Institution of Civil Engineers. The Hunter Series No.1.' In black-edged Memoriam envelope [see Part 6 Paxton PPP 34 - image].

[photograph] Adam Hunter. Studio photograph by Elliot & Fry, 54 Baker Street, London c.1930. Framed by Andrew Duthie, Sauchiehall St., Glasgow [frontis]

[Hunter postcards [1] Hooghly Bridge, 5th Jan. 1909 from Calcutta. Addressed to Hunter, 4 View Park Drive, Burnside, Rutherglen. From Willie [a member of the firm or family] who had 'been hearing about your wonderful Sunderland job & glad to know that all went well to completion: [see Part 6 Paxton PPP 51 - image]. [2] Thomas Telford Memorial, Westerkirk, 6th Jan.1932, addressed to Hunter at 'The Grove', Buchanan Drive, Rutherglen from his niece Pearl who thought the picture might interest him. [3] Tower Bridge, London, dated 1904 & 1905 with no apparent Hunter association - his first major work in London.

Prompt card with word translations for use by Hunter in an East African context? Holograph, 5"x3½": Luaba – to build of stone; uashi – a mason's work; afya – good health; Utanalu – rude, deceitful; Tegermea – to lean on, to rely; Katangulia – to take the lead; Utangulyi – that which passed; Kengaligali – on the back, face upwards ... ; notadi – skill in a trade; Faيدا – profit gain; sieleria marana – I do not know the meaning; luetia – to be clear; kuthmia wakati- water or wake; keninma – raise, lift up; kuhatagi – to need, desire; kutamani – to long for, desire; kugena – to change ...[Arrol's were *Crown Agents for the Colonies*]

[watercolour or copy card] 'For'rard Away' coloured hunting scene by Joseph Appleyard. 15 x 11cm. The Bedsworth Hunt painted for George Harrison, Leeds. Nd. Came with Adam Hunter items.

Erith Tramways. Typed document on Hawtayne and Zeden.s headed paper dated July 1905 containing details of the bridge over the S.E. & Chatham Railway Co's diversion on Tramway No. 3 at 2 miles from its commencement. Details of scantlings, stresses &c, &c, foolscap. 3.

[orig. tracing by Hunter?] 'Bearings for Bridge of 33 metres span' to accommodate temperature change. Single Line. Partly clrd. 28"x13". Roller bearing at one end. Neatly folded in Hunter titled wrapper. Hunter No. 11,

[Blueprint] Fairfield Shipbuilding & Engineering Co., Govan. Fitter's Shop. Side Sheeting Girders. Drawing No. 0. Sir Wm. A. & Co. London. March 28th 1898. 36"x20".

[with]

[Blueprint] Fairfield Shipbuilding & Engineering Co., Govan. Fitter's Shop. Side Sheeting Girders. Drawing No. 10. Sir Wm. A. & Co. London. March 28th 1898. 38"x27". Neatly folded into orig. Hunter titled wrapper. c.32ft span.

[Ms & printed]. Deptford Disaster [in compressed air in cast iron shaft] London Power Co. Works. January 1927. Report of Inquest Proceedings 13 Jan 1927 to 17th January 1927, "Kentish Mercury" pp. 2, 1-7. Professionally mounted in cont. binding. Covering front sheet in Hunter's hand relating to the fracture, air pressure and locks, upward pressure and downward weight, load required to break ring 7000 tons. Shaft 51 ft, deep ,, &c. &c. Ownership signature R.D. Brown on title page.

[book receipt] Adam Hunter Tradestown, to John Smith & Son Ltd. [Glasgow booksellers] 7.11.1927, for Underwood's Standard Construction Methods £1.5s. and E.S.S. No. 308. 2s.

[large plate with 16 figs] 'The bridge over the River Zambesi at the Victoria Falls. Rhodesia. George A Hobson M.Inst.C.E., London, Engineer; The Cleveland Bridge and Engineering Company Limited Darlington, Contractors'. From *Engineering*. July 7th 1905. Adam Hunter's initialled copy. no text.

Victoria Falls Bridge. Contemporary promotional photograph, for and with the heading, 'The Cleveland Bridge and Engineering Co., Limited, Darlington ... View taken when nearing completion 1905' [with safety net]. 11"x 9".

[article] 'Another Great Nile Bridge'. *Engineering* 6 Sept 1907. 342. [A. Hunter directed project. 900 ft long in seven spans.

[photocopy article] 'Machinery of the 150-ton hammerhead crane at Clydebank'. *Engineering* 22 June 1907. 803-804.

Daily Sketch 11 May 1915. Complete issue, one half penny. Includes last photographs taken aboard the Clydebank built *Lusitania* [Titan Crane assocn]

[original final draft manuscript of pp.(i)-viii, (1)-144 of Hunter's *Bridge and structural engineers handbook of general specifications, formulae and data for the design of cranes, bridges, foundations, and workshop buildings embodying the practice of Sir William Arrol & Company Ltd, Dalmarnock Iron Works, Glasgow. 2nd ed.* Hunter's most influential book. It is in the form of additions and amendments to a copy of the 1920 edition specially mounted on 4to blank leaves, on almost every page of which he has initialled the changes for this final proof. The preface has his holograph signature. Many instructions to the printer. The changes over the 8 years between the editions can be readily identified and appreciated except for the concrete section. The content of pages 145-149 is not present but may not have required changes. [see Part 6 Paxton PPP 45-46 - images].

The concrete section of the book commences at page 150, for which a separate draft is present in foolscap page sections prefixed by such holograph Hunter notes as, 'This draft is arranged in pages to suit book'. 'Remainder of draft except 3 pages of combined stresses'. About 50 pages, some duplicates

with 20 or so large tables. In cont. envelope with Hunter holograph title 'Concrete Section of Handbook. Latest draft of MSS'. [box file 3]

4. Large photographs [1886-c.1960] formerly in Sir Wm. Arrol & Co. Ltd's possession + view of demolition Waterloo Bridge. 172 images [A3 binder, A4 ring binders 1 & 2] 18-29

Mostly gleaned following Arrol disposals from Scottish book and photograph sellers. The job numbers on the back of the photographs were those allocated to the project by Sir William Arrol & Co. Ltd. Many Arrol project reference numbers are quoted in RCAHMS's *The Sir William Arrol Collection. A guide to the international material*. 2000. 90-95. 14 projects represented in this archive, not in the RCAHMS inventory, are: A3, A12, A12A, A15, N1/14, B14, R24, E25, E26, E27, E32, E33, E34, E49. Some projects in this RCAHMS inventory are also represented below. Items listed alphabetically by place names.

[Belfast Crane] in works illustrated in part of an Arrol Promotional catalogue c. 1964. Sect. 1. Bridges opening and fixed of all types; Sect. II. Dock and Harbour Equipment. Sect. III. Industrial Buildings and Power Stations. Sect. IV. Hydro-Electric Equipment; Giant Cantilever Cranes with details and image of 200 tons Crane for Belfast Harbour Commissioners [1958]. Also for 250 tons Crane for Portsmouth Harbour [1912]. [A4 2]

[Braehead Power Station] Memorandum re. Arrol images. 1 Decr 1959, For attention of Mr. Arch re. Braehead Power Station Turbine Hall 27 May 1960 from Arrol's London office. Signed A.J. Fisk? [A4 2]

Caputh 'Victoria' Bridge [Road over R. Tay]. Erected by Sir W. Arrol & Co. Ltd 1899. 6"x 4". 16 Apr. 1987. Reputed to have included refurbished trusses from the ill-fated 1st Tay Railway Bridge. [source of image unknown] [A4 2]

The Forth Bridge. Original official progress sepia photograph [by Philip J. Phillips]. 9"x 7½. 'Forth Bridge Works. No. 79 View shewing approach girders North side 30 June 1886' [before jacking to full height]. Not included in Phillips's *A Series of Descriptive Photographs illustrating Processes and Progress of Work on the Forth Bridge*. Edinburgh c.1885. Showing the state of work when Hunter started his apprenticeship. [A3 1]

The Forth Bridge. Original official progress sepia photograph {by Philip J. Phillips}. 9¼"x 7½. 'Forth Bridge Works. No. 73. View of Inchgarvie from South side, June 1886' [showing considerable activity, caissons sunk into position]. Not included in Phillips's *A Series of Descriptive Photographs illustrating Processes and Progress of Work on the Forth Bridge*. Edinburgh c.1885. Showing state of work when Hunter commenced his apprenticeship. On cont. card 16" x 11". [A3 1]

The Forth Bridge. Original official progress photograph {by Philip J. Phillips?}. 9"x 7½. 'Forth Bridge Works' looking North from near the Hawes Inn. Not numbered, N.d. but June 1888 from content. Showing the state of work when Hunter was employed on the project. On cont; card, 13" x 11½", ruled border. [A3 1]

The Forth Bridge. b&w photograph 14½ x 11" taken from the top of the central cantilever showing the steelwork as in 1998? with Hawes Pier at back.. Autograph note to Prof Paxton on verso from Chris Hogg, Head of

Photography National Railway Museum, York sending the picture for display in Forth Bridges Visitor Centre. NRM Stephen Colln. FB.29. [A3 1]

[Galloway?] Hydro-electric Valves, 11½" x 9½". Arrol job No. R7 [1933?] 'Part order for large cylindrical balanced valves made to the designs of ... English Electric Co. Ltd, London, and manufactured by ... Sir William Arrol and Co. Ltd, Dalmarnock Iron Works, Glasgow. [A3 1]

Glasgow Caledonian Viaduct at Central Station. Arrol Job No. E2 [label part missing]. 11½"x9½". Dark sepia. Photo 29D, dated September 1903.

Intensive work activity showing temporary works along line of deck and girders of adjoining viaducts, many derricks &c. Minor damage at left hand side, repairs. [A3 1]

[Glasgow] N57 Glasgow Gushetfalls Transporter Bridge. 1968. Stamp: Alston Photograph 68/819/3. W, Ralston Ltd., Glasgow C8. 9½" x 8" [A4 1]

[Glasgow] Large machine '4624' in Arrol's Workshop with works plate indicating a 5-ton load for tendering scrap iron into a furnace. Interesting background detail. 12"x10". Stamp 'The Dux Engraving Co. Ltd. Glasgow'. n.d. (1927?) [A3 1]

[Gold Coast] Birrim River Bridge, Gold Coast Railway. 60 feet span. Arrol Job No. E 27. February 1927. 12"x10". Arrol's acting for the Crown Agents for The Colonies. Bridge parts assembled at Glasgow Works for shipping.

Job board with details in foreground. [A3 1]

Gold Coast. Takoradi Harbour Works, Requisition No. 1621. 'Automatic Wagon tipper & discharging hopper. Makers Sir William Arrol & Co. Ltd. Dalmarnock Iron Works, Glasgow Contract no. 799/803'. 12" x 9½" [A3 1]

Great Yarmouth, Haven Bridge [bascule]. 45 works progress photographs March 1927 to Oct 1930. Arrol Job No. A15, mostly bearing job no. label & stamp 'Sir William Arrol & Co. Ltd.' The images, an exceptional collection, provide comprehensive coverage of a large Arrol project. They are:-

1. Pre March 1927. 12"x9½". Existing bridge. [A3 1]
2. 6.3.1927. 12"x9½". Showing the existing bridge. [A3 1]
3. 5.5.27. 12"x9½" Showing piling for temporary bridge piers. Stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. [A3.1]
4. 8.8.27. 12"x9½". Showing progress on temporary bridge piers – shipping, equipment &c. Stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. [A3 1]
5. 7.11.27. 12"x9½". Showing close-up progress on temporary bridge piers – shipping, equipment &c. Stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. [A3 1]
6. 25.11.27. 12"x9½". Temporary bridge – leaf raised – considerable activity. [A3 1]
7. 3.2.28. 12"x9½" Tower completed and leaf half raised. Showing progress on temporary bridge piers – shipping, equipment &c. Stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. Ms. note, 'Temporary Bridge erected in Great Yarmouth for use of traffic during erection of new Haven Bridge there'. [A3 1]
8. 3.2.28. 12"x9½". Anr. copy with Ms. note 'View of temporary bridge erected alongside old bridge prior to demolition of the latter'. [A3 1]
9. 3.2.28. 12"x9½". Anr. copy. [A3 1]
10. Undated. 12"x9½". Progress view [1928]. [A3 1]

11. June 1928. 12"x9½". [Western] Caisson for Yarmouth Opening Bridge. Engineers Coode, Fitzmaurice, Wilson and Mitchell. Contractors Sir Wm Arrol & Co Ltd, Glasgow, Ltd. [with workman in cap indicative of the caisson's huge size] Photos in Arrol's yard? [A3 1]
12. 8.10.28. 12"x9½". Caisson No.1 in position. Ornamental stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. [A3 1]
13. 6.4.29. 12"x9½". Haven Bridge. Works progress view. Intense activity. Ornamental stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. [A3 1]
14. 5.7.29. 12"x9½". Haven Bridge. Works progress view. Ornamental stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'.
15. 27.12.29. 12"x9½". Haven Bridge Great Yarmouth West Pier nearly complete. Leaf raised and under construction. Stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. [A3 1]
16. 30.8.29. 12"x9½". Yarmouth Bridge, opening span, west leaf. Erected in yard'. Best image indicative of steelwork construction. [A3 1]
17. 31.3.30. 12"x9½". Haven Bridge Great Yarmouth. Works nearing completion, one leaf raised. Workmen. Ornamental stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. [A3 1]
18. 27.6.30. 12"x9½". Haven Bridge Great Yarmouth. Works nearing completion. Both leaves raised. Intense activity. Ornamental stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. [A3 1]
19. 27.6.30. 12"x9½". [different view] Haven Bridge Great Yarmouth. Works nearing completion. Both leaves raised. Ornamental stamp 'British Photographic Corporation, Regent Theatre, Great Yarmouth'. [A3 1]
20. 7.10.30. 12"x9½". Haven Bridge Great Yarmouth. Works nearing completion. Both leaves down. [A3 1]
21. 7.10.30. 12"x9½". Haven Bridge Great Yarmouth. Works nearing completion. Both leaves raised. [A3 1]
22. [Nov. 30] 12"x9½". Haven Bridge Great Yarmouth complete [figure standing in front of bascule operation building. [A3 1]
23. [Nov. 30] 12"x9½". Haven Bridge Great Yarmouth complete [figure standing in front of bascule operation building. Another copy with tracing overlay identifying part to be copied for press coverage? [A3 1]
24. April 1927. 10"x8". Temporary opening bridge Great Yarmouth. Driving timber piles for supports. Stamp 'British Photographic Corporation, Great Yarmouth'. [A4 1]
25. April 1927. 10"x8". Temporary opening bridge Great Yarmouth. A different view of timber pile-driving for supports. Stamp 'British Photographic Corporation, Great Yarmouth'. [A4 1]
26. April 1927. 10"x8". Temporary opening bridge Great Yarmouth. Another different view of timber pile-driving for supports. Stamp 'British Photographic Corporation, Great Yarmouth'. [A4 1]
27. [April 1929?] 8½"x6½", Haven Bridge Great Yarmouth. Work in progress on piers. Intense activity. 'Copyright D. Hobbs, Photographer, Great Yarmouth. Mounted on card, bevelled edges. [A4 1]
28. [April 1929?] 8½"x6½", Haven Bridge Great Yarmouth. Work in progress on piers. Intense activity. 'Copyright D. Hobbs, Photographer, Great Yarmouth. Mounted on card, bevelled edges. [A4 1]

29. [April 1929?] 6½"x 8½" format of previous image. Haven Bridge Great Yarmouth. Progress on piers. Another view, temporary bridge in background. 'Copyright D. Hobbs, Photographer, Great Yarmouth. Card mounted, bevelled edges. [A4 1]
30. [Oct. 1930] 10"x8" Haven Bridge, both leaves raised, temporary erection frame in background. Arrol sticker and stamp. ['Fox Photos, 6 Tudor St., London E.C.4.'] [A4 1]
31. [Oct. 1930] 10"x8" Haven Bridge, both leaves raised, temporary erection frame in background. Arrol sticker and stamp. Duplicate with copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4.' [A4 1]
32. [Oct. 1930] 10"x8" Haven Bridge Great Yarmouth. Workman on top of raised leaf, harbour below. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4.' In modern card mount. [A4 1]
33. [Oct. 1930] 10"x8" Haven Bridge Great Yarmouth. Workman on top of raised leaf, harbour below. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4.' Duplicate of previous image. Arrol stamp. [A4 1]
34. [Oct. 1930] 10"x8" Haven Bridge Great Yarmouth. Three workmen on top of raised leaf, harbour below, numerous ships. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4.' [A4 1]
35. [Oct. 1930] 10"x8" Haven Bridge Great Yarmouth. Three workmen on top of raised leaf, harbour below, numerous ships. Stamp 'Fox Photos, 6 Tudor St., London E.C.4.' Duplicate. [A4 1]
36. [Oct. 1930] 10"x8" Haven Bridge Great Yarmouth. Leaves raised. View from quayside road with workmen, pedestrians, cyclists, carriages. Copyright stamp 'Fox Photos, 6 Tudor St, London E.C.4. No. 32,606' [A4 1]
37. [Oct. 1930] 10"x8" Haven Bridge Great Yarmouth. Leaves raised. View from quayside road with workmen, pedestrians, cyclists, carriages. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4. No. 32,606' [duplicate of previous image]. [A4 1]
38. [Oct. 1930] 10"x8" Haven Bridge Great Yarmouth. Leaves raised. View of raised leaf showing underside and road approach. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4.' [A4 1]
39. [Oct. 1930] 10"x8" Haven Bridge Great Yarmouth. Leaves raised. View of raised leaf showing underside and road approach. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4.' [duplicate of previous image]. [A4 1]
40. 21 Oct. 1930 10"x8" Haven Bridge Great Yarmouth. Official opening by HRH The Prince of Wales. Bridge open to road traffic, more than a 1,000 people in crowd. Open-backed Rolls Royce. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4. No. 35,696'. [A4 1]
41. 21 Oct. 1930 10"x8" Haven Bridge Great Yarmouth. Official opening by HRH The Prince of Wales. Bridge open to road traffic, more than a 1,000 people in crowd. Open-backed Rolls Royce. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4. No. 35,696' [slightly different from previous image]. [A4 1]
42. 21 Oct. 1930 10"x8" Haven Bridge Great Yarmouth. Official opening by HRH The Prince of Wales. Bascule leaves partly lifted, more than a thousand people in crowd, VIPs in foreground. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4. No. 35,692'. [A4 1]
43. 21 Oct. 1830 10"x8" Haven Bridge Great Yarmouth. Official opening by HRH The Prince of Wales. Bascule leaves partly lifted, more than a

thousand people in crowd, VIPs in foreground. Copyright stamp 'Fox Photos, 6 Tudor St., London E.C.4. No. 35,692' [different from previous image]. [A4 1]

44. [October 1930] 8"x6½" 'Electrically operated, double lift bridge, Great Yarmouth. Leaves open' Igranic copyright with logo. 1118.G. A895. [A4 1]

45. [October 1930] 8"x6½" 'Electrically operated, double lift bridge, Great Yarmouth. Showing old bridge in background' Igranic copyright with logo. 1118. G. [A4 1]

Grimsby Rolling Lift Bridge spans Alexandra Dock near Victoria Mills, Victoria Street and replaced a swing bridge. It is an electrically powered road bridge built on the **Scherzer** principle in 1925 to the design of Alfred C. Gardner, docks engineer of the London and North Eastern Railway. The contractors were Sir William Arrol & Co. It was formally opened by the Prince of Wales [later Edward VIII] commemorated on a plaque on the bridge. The bridge was restored by Great Grimsby Borough Council c. 1980. Grimsby Rolling Lift Bridge. Arrol Job No. A14. c.1925. 12"x10", dark sepia. [work finished, numerous people on deck at about mid-span]. Stamp on verso 'Sir William Arrol & Co., Ltd. [A3 1]

Grimsby Rolling Lift Bridge. Arrol Job No. A14. c.1925. 12"x10", b&w matt. Anr copy. [work finished, numerous people on deck at mid-span]. [A3 1]

Grimsby Rolling Lift Bridge. Arrol Job No. A14. c.1925. 10"x18". [beautifully worked lamp or ornament with coat of arms]. Arrol Job No. A14. [A3 1]

Grimsby Rolling Lift Bridge. Arrol Job No. A14. c.1925. 10"x8". [opening ceremony at rolling end, VIPs and crowd on approach and on quayside boats]. Job sticker on verso and stamp 'Sir William Arrol & Co., Ltd.' 'No reproduction of this photograph may be made without the previous permission of The Central News Ltd, 6 New Bridge St., London EC4. [A4 1]

[Hamilton Bypass?] Major Bridge over R. Clyde being built. Temporary steel towers in foreground. 11½"x9½" 'Photograph by Richard Jones, 150 Merry Street, Motherwell. Ref. 67/138. Undated, 1967? [A3 1]

Jamaica Girder Truss Bridge 75 ft. span. Dec. 1928. Arrol Job No. E 32. 11"x9", dark sepia. Arrol's acting for Crown Agents for The Colonies. Bridge parts assembled at Glasgow Works. Foreground board with details. [A3 1]

[Keady, Lincs] King George V Keadby Bridge 3 miles west of Scunthorpe, carrying a double track railway and the A18, was opened in 1916. It was the Grand Central Railway's biggest bridge undertaking. It has three main spans, a 150 ft, clear waterway and fixed spans of 134 ft and 140 ft. Total length 548 ft. Designed by James Ball, the lifting section on the **Scherzer** principle, and built by Sir Wm. Arrol & Co. Ltd. An American concept, the Scherzer Rolling Lift Bascule simultaneously rolls and rotates on its counterbalanced tail until the opening span is almost vertical. Keadby's 163 ft. bascule was one of the first of its type in Britain and the heaviest in Europe. It was fastened down permanently in 1960 when the roadway was widened and the headroom increased. [Labrum, E. A. *Civil Engineering Heritage Eastern & Central England*. 1994. 46-47].

Keadby Bridge. 23 images formerly in the possession of Sir William Arrol & Co. Ltd., job no. A3; some with Arrol stamp.

1. 'Great Central Railway Bridge over the River Trent at Keadby. West abutment to No.2. Caisson taken Jany 4th 1914'. 7"x9". Stamp 'Photo, Moon, Scunthorpe Lincs'. [A4 1]

2. 'Great Central Railway Bridge over the River Trent at Keadby. West abutment to No.2. pier taken May 8th 1914'. 7"x9". Stamp 'Photo, Moon, Scunthorpe Lincs'. [A4 1]
3. 'Great Central Railway Bridge over the River Trent at Keadby. No.2. Pier to West Abutment taken July 18th 1914'. 7"x9". Stamp 'Photo, Moon, Scunthorpe Lincs'. [A4 1]
4. 'Great Central Railway Bridge over the River Trent at Keadby. 16 Octr 1914.' Completed pier, another in progress. 7"x9". Stamp 'Photo, Moon, Scunthorpe Lincs'. [A4 1]
5. 'Great Central Railway Bridge over the River Trent at Keadby. 16 Dec 1914. Completed pier, another in progress. 7"x9". Stamp 'Photo, Moon, Scunthorpe Lincs'. [A4 1]
6. 'Great Central Railway Bridge over the River Trent at Keadby taken Feb 23rd 1915'. 7"x9". Completed pier, work in progress on rolling lift bascule. Stamp 'Photo, Moon, Scunthorpe Lincs'. [A4 1]
7. 'Great Central Railway Bridge over the River Trent at Keadby taken May 14th 1915'. 7"x9". Completed pier, work in progress on rolling lift bascule now about half completed. Stamp 'Photo, Moon, Scunthorpe Lincs'. [A4 1]
8. 'Great Central Railway Bridge over the River Trent at Keadby 22nd July 1915'. Completed pier, work in progress on rolling lift bascule now nearly completed with lift vertical. 7"x9". Stamp 'Photo, Moon, Scunthorpe Lincs'. [A4 1]
9. Keadby Bridge on completion with rolling lift bascule at about 45° [1916]. 6½"x8½". Stamp 'George Outram & Co. Ltd. Photograph'. [A4 1]
10. Keadby Bridge on completion with rolling lift bascule at c.45° [1916]. 6½"x8½". 'George Outram & Co. Ltd. Photograph'. Duplicate of 9. [A4 1]
11. Keadby Bridge. Railway deck complete. 14"x10", sepia. [1916 - two figures on side walkways]. Stamp on verso 'Sir William Arrol & Co., Ltd.'. [A3 1]
- 11A. Keadby Bridge. Trunk Road deck complete with figure. 14"x10", sepia. [1916]. Stamp on verso 'Sir William Arrol & Co., Ltd.'. [A3 1]
12. Keadby Bridge – piles and remains of earlier bridge pier? 6½"x8½". 'No. 14. 21.6.21' [A4 1]
13. Keadby Bridge – rolling lift bascule at about 60°. 9.12.21. 6½"x8½". 'No. 17.' [A4 1]
14. Keadby Bridge – rolling lift bascule at about 60°. 9.12.21. 6½"x8½". 'No. 17.' Duplicate of 13. [A4 1]
15. Keadby Bridge – rolling lift bascule horizontal. 21.11.21. 6½"x8½". 'No. 16.' [A4 1]
16. Keadby Bridge – rolling lift bascule horizontal. 21.11.21. 6½"x8½". 'No. 16.' Duplicate of 15. [A4 1]
17. Keadby Bridge – rolling lift bascule horizontal. 21.11.21. 6½"x8½". 'No. 16.' Duplicate of 15. [A4 1]
18. Keadby Bridge – rolling lift bascule horizontal. 21.11.21. 6½"x8½". 'No. 16.' Duplicate of 15. Stamp of 'Great Central Railway. Grimsby Docks'. [A4 1]
19. Keadby Bridge – rolling lift bascule horizontal. 21.11.21. 6½"x8½". 'No. 16.' Duplicate of 15. On verso, 'Jas. Wardle c/o City engineers, New North Bridge, Hull. [A4 1]
20. Keadby Bridge – rolling lift bascule horizontal. 21.11.21. 6½"x8½". 'No. 16.' Duplicate of 15. On verso, 3-line Arrol stamp. **'Keadby Bridge. Largest of this type in Great Britain. Double line railway and roadway 16 ft.**

Footpath 5 ft. Span 150 ft. clear. Rolling weight 2922 tons. Overall width 56 ft.' [A4 1]

21. Keadby Bridge Rolling Lift Bascules. Operations Room on completion. 1921. 14" x 10". Stamp of Sir William Arrol & Co., Ltd. On verso. [A3 1]
22. Keadby Bridge. View from Railway Span of railway rolling lift bascule leaf of 150 ft. span fully lifted. 14" x 10". Cont. pencil note 'Keadby Bridge of Sir William Arrol & Co., Ltd'. [A3 1]
- [Kenya] Two Bridges Kenya – Uganda Railway. 40 ft. span. Arrol Job No. E 26. February 1927. 12"x10". Arrol's acting for Crown Agents for The Colonies. Bridge parts assembled at Glasgow Works. Job board with details in foreground. The firm's stamps – two versions, one including 'Dalmarnock Iron Works'. [A3 1]
- [Kenya] Two Bridges Kenya – Uganda Railway. 60 ft span. Arrol Job No. E 25. February 1927?. 12"x10". Arrol's acting as Crown Agents for The Colonies. Bridge parts assembled at Glasgow Works. Job board with details in foreground. [A3 1]
- [London, Port of] London Authority. Double leaf bascule bridge at entrance to George V Dock. Arrol Job No. A12&12A. 4 views dated 1921 & 31.3.1947:
- [London, Port of] View of bridge, leaf commenced, temporary works [1920]. 8½" x 6½". On verso. 3 Sir William Arrol & Co. Ltd. Job No. A12 sticker. Stamp: 'G. Marshall Smith, Specialist in Engineering Photography, 33 Portland Road, Finsbury Park N.4. Ref No. 11843.
- [London, Port of] View of completed bridge [1921]. 11½" x 9½". On verso. 3 Sir William Arrol & Co. Ltd. stamps Job No. A12 sticker. 'Double Leaf Bascule Bridge across the 100ft wide Entrance Lock at eastern end and leading into the Port of London Authority's King George V Dock opened on 8th July 1921.' Stamp: 'G. Marshall Smith, Specialist in Engineering Photography, 33 Portland Road, Finsbury Park N.4. Ref No. 17977.
- [London, Port of] Double leaf bascule bridge at entrance to George V Dock. Reconstruction of North Leaf. 11½" x 9½". Arrol Job No. 12A. 31 March 1947. On verso. Sir William Arrol & Co. Ltd. Stamp and '27210 ref. no. Showing leaf nearly vertical with large derrick in operation with ship and dock activity.
- [London, Port of] Double leaf bascule bridge at entrance to George V Dock. Reconstruction of North Leaf. 11½" x 9½". Arrol Job No. 12A. 31 March 1947. On verso. Sir William Arrol & Co. Ltd. Stamp and 27211 ref. no. An oblique view showing both leaves, north raise and work in progress. Workman. Ship and dock activity.
- [London, Port of] A12. Bascule Bridge, Royal Albert Dock, Port of London Authority. February 1920 [In pencil, Hunter's hand?]. Sepia photograph. 12x10in, On site? bridge almost complete. [A3 1]
- [London] Waterloo [temporary] Bridge. 1924. 10"x8" Sepia view from south approach, near corner of Somerset House, showing the nearly completed 280 ft. long, 600 ton, central span ready to be rolled into its final position. Title on verso. Photo. Ref. 15/6/D.JR. Designed and erected under Hunter's direction [Hunter Archive] [A4 1]
- [London] The demolition of Waterloo Bridge after the painting by Charles Cundall in the Royal Academy. 1935 [London, 1935]. 10"x6½", colour. Evocative of the gravitas of the work of Rennie & Hunter. [A4 1]
- [lamp, London? – 2 images] Site lamp [gas] and external casing. 4"x6" b&w photos on 9"x7" mounts. Embossed device 'Ingram, 4 Queen's Crescent, Cathcart NB'. For Waterloo Bridge? From Adam Hunter's archive. [A4 1]

[Malay States] E33. Peel Bridge. Federation of Malay States Railways. 20 June 1932. Crown Agents for the Colonies. 1/447. Rubber copyright stamp 'The Dux Engraving Co. Ltd. Glasgow'; 'Sir William Arrol & Co. Ltd.'; do. Do. Dalmarnock Iron Works, Glasgow S.E. Four 120 ft. span lattice girder bridge erected at the Dalmarnock Iron Works. Regs No. 1296. Company board with details in foreground and man in suit with tie and pocket handkerchief. b. & w., 12"x10". [A3 1]

Manchester Ship Canal. Barton Bridge [Bridgewater Canal Aqueduct] Repairs. Arrol Job No. B14. 13 views dated June-August 1927, one with additional stamp March 1931. 9"x12" black & white photographs stamped on reverse "Sir William Arrol & Co. Ltd". In an envelope with ornamental address label 'The Dux Engraving Co. Ltd. Photo Engravers Commercial Photographers, 60 Tradeston St., Glasgow. 22.1.46', addressed to Sir William Arrol & Co. Ltd. 85 Dunn Street, Glasgow SE (containing 13, 1927 images. [A3 1]. In chronological order:-

15.6.27. No.5. 'Swing Bridge over Manchester Ship Canal. 1928'. Closed.

15.6.27. No.4. do. do. In fully opened position parallel to canal.

15.6.27. No.2. do. do. but closer to swivel mechanism.

20.7.27. No.2x? Machinery, equipment, bridge parts &c. at canal side.

20.7.27. No.27. As No. 4 but showing work done in 5 weeks. Ms. inscription,

28.7.27. No.36. Bridge girder close up, equipment, temporary supports &c.

4.8.27. No.44. Close up of central swivel mechanism.

10.8.27. No.64. Do, full width to underside of bridge, working equipment.

Anr, date clipped, 1927. Endorsed 'Removal of Roller Paths 1928.

4.8.27. No.43. Close up of swivel drum, roller plates &c.

5.8.27. No.52. Do. do. [human interest, 2 workmen one under swivel drum].

7.8.27. No.57. Do. do. another view [2 men working under swivel drum].

Undated. Another view under bridge showing jacking equipment close up. Endorsed on verso 'Barton Bridge Repairs. Manchester Ship Canal.

[This project is not in the RCAHMS inventory which does list B15 as Manchester Ship Canal Chester Road Swing Bridge 1933]. Barton Bridge 235 ft. long opened in 1894 is 'one of the wonders of the canal world.' Sir William Arrol & Co. Ltd. did not design and erect it, but refurbished it in 1927.

Manchester Ship Canal. A fuller set of 20, 6¼" x 4¼", progress images of the Barton Swing Bridge repair project by the same photographer as above, Dux [his no. 57 appears in both sets]. June-August 1927, [A4 2] comprising:

15.6.27. No. 6. General view looking along canal..

15.6.27. No. 7. Close up of central section.

1.7.27. No. 8. Canal side works site, supports and jacks'

1.7.27. No. 11. Close up.

13.7.27. No. 18. General view bridge parallel with canal.

13.7.27. No. 22. Close up.

20.7.27. No. 25. Canal side view.

20.7.27. No. 26. Elevation of main span.

28.7.27. No.34. Man working under turning path.

3.8.27. No. 55. Work in progress on roller path. 6 worker, 2 underneath.

- 4.8.27. No. 46. Temporary support of bridge on turning pier parallel to canal.
- 5.8.27. No. 51. Turning ring close-up.
- 5.8.27. No. 54. Close up of turning ring, workman at edge..
- 7.8.27. No. 57. Close up of turning ring, 2 workmen underneath.
- 9.8.27. No. 59. Close up of turning ring, showing rollers.
- 9.8.27. No. 60. Looking through turning ring underneath, showing rollers.
- 9.8.27. No. 61. Edge close up of turning ring underneath showing rollers.
- 9.8.27. No. 62. Edge close up of turning ring showing rollers.
- 10.8.27. No. 63. Edge close up of turning ring showing rollers.
- 10.8.27. No. 64. Mid distance close up looking through turning ring.

Manchester Ship Canal. Arrol-made swing road bridge of c. 200 ft span. c. 1893. 20 progress images of a late 1920s refurbishment of its turning mechanism. [Unidentified, but not Barton, try Chester Road nr Runcorn or anr? Check with present owners?] . 6½" x 4¾". Cont. notes of image content on versos. Nd.

The images comprise [A4 2]:

1. General view of bridge from canal
2. Assembly of top path segments
3. General view preparatory to raising bridge
4. Blocks and granite packing
5. Preparatory granite block stones (west side)
6. Old rollers top path
7. Old top gable segment
8. View of 500 ton jack
9. 1st table placed in position
10. View rollers with arches
11. Lower ring raised preparatory to removing bottom path
12. Completion of top table – spacing closure segments
13. Raising old top path segments
14. View top path completed – ready for loading?
15. Old rollers
16. Lower ring and rollers – ready for fitting arches?
17. 1st sequential view – bottom path in position
18. Bottom path completed
19. Wedges in position for 1st segments
20. Top path removed & roller plates? withdrawn

Manchester Ship Canal Swing Bridge [parallel with canal] Arrol Job No. B14. 10"x7½". With Arrol sticker and stamp Sir William Arrol & Co., Ltd. n.d. 1927?). [A4 1]

[Nigeria, Swaziland] . See [Swaziland, Nigeria]

Rotary Planer [c. 20 ft. diameter, for large crane? – in specialised workshop]. 10"x8". Stamp 'A Ralston Photograph Negative 60/741B. W. Ralston Ltd Glasgow'. [undated]. [A3 1]

Rolling Planing Machine 17' 8" diameter [for a giant cantilever crane? - intricate engineering in workshop] Arrol Job No. R24. 12"x10". Photo by Dux Engineering, Glasgow. On bevelled card with tracing paper overlay. [A3 1]

- 250 Ton Crane. Rotary Planer on top of tower. 12"x10". c.1912 [At Arrol's works - for Rosyth, Portsmouth or Sasebo?]. No Arrol Job No. on verso. [A3 1]
- Marlow Suspension Bridge. Memorandum re. Arrol images. 27.5.1960, For attention of Mr. Arch from Arrol's London office. Signed A.J. Fisk? [A4 2]
- Riviter, Giant hydraulic at Works. N1/14 [1914?] 1-343. Rubber stamp 'Sir William Arrol & Co.Ltd.' Black & white photograph 12x10in. Dramatic image. [A3 1]
- Riviter [portable], 11½"x9½". Arrol job no. N1/14 London Regents Canal Dock? [A3 1]
- Riviter [Portable] in work yard. 11½"x 9½". Arrol job no. N1/14. With Arrol's oval plate on side. All three above are fine images. [A3 1]
- 'Rosalie' Original pencil sketch of the harbour looking east towards the Forth Bridge [in background] showing 3 giant cantilever cranes [2 Titan], many smaller cranes, chimneys &c. 34 x 25cm. Signed 'Duncan Livingstone. 29th Sept 1930.' On drawing paper with part of a neatly drawn building on the verso. Livingstone {1909-1990} was a local architect. ARIBA 1933 and later, East Lothian County Architect. At the time he drew this view he was probably working at Williamson and Hubbard's architectural practice in Kirkcaldy and living in Dunfermline. He attended the School of Architecture, Edinburgh College of Art under John Begg. [A3 1]
- [Singapore] Singapore. Johore Causeway [giant rolling] Lift Bridge. Arrol Job 29 Sept. 1930'No. A4 No.2. 10"x12" b&w. Photographers label, Dorondo/Mills Lime St. Liverpool L1425 [1922]. Cantilever deck in upright position. Erection towers at sides. Project identified from RCAHMS Catalogue 2000 p.90. [to be checked at SEH] [A3 1]
- [Swaziland, Nigeria] Swaziland Oct. 1928 and Nigeria Oct. 1928. 100 ft. span truss road bridges side by side at Arrol's works. 12"x 9½". Arrol job E30. Made by Arrol's as Crown Agents to the Colonies. [A3 1]
- [Tay Bridge] Site close-up view of Arrol's 'Tay Viaduct. Pontoon for Sinking Cylinders, P[ie]r 28. 22 May 1886'. John Valentine Albumen print 11¼"x7½" on card mount. Engineer W.H. Barlow assisted by son Crawford. Built 1882. Minor edge damage not affecting engineering content. With derrick, cranes and excavator grabs on pontoon platform c.16ft above sea level. 12 men working. With illustrated article on the pontoon by Crawford Barlow 9/1885 See Hunter's copy of his Tay Bridge book] [A4 RB2]
- [Tay Bridge] Anr. view 'No.40. New Tay Viaduct. New Piers. South Side June 18th 1886'. Unsigned but probably a John Valentine Albumen print 11"x7" on card mount. Engineer W.H. Barlow assisted by son Crawford. Built from 1882. With derrick, cranes and excavator grabs on pontoon platform. With iarticle on the pontoon by Barlow 9/1885. See Hunter's copy of his Tay Bridge book] [A4 RB2]
- [Tay Bridge] View from Dundee side of the bridge Albumen print on card, unsigned. 11½"x9". 1878? Good detail of the north end of the light-weight looking structure, longest of its type in the world built by Hopkins, Gilkes of Middlesborough to the design of Thomas Bouch and swept away in a storm on 28 Decr 1879. No evidence of Hunter ownership, but he is known to have had a great interest in iron bridge development as per his 1925 address to Glasgow students [sect. 5]. [A4 RB2]
- [Trinidad] E34. Trinidad Bridge No. 35. August 1912. Crown Agents for the Colonies [Hunter's hand?]. Sepia photograph. 12"x10". Lattice girder bridge erected at the works. [A3 1]

- Unidentified. 12" x 10". Large box girders for a bridge at Arrol's Glasgow work-yard with much engineering work visible in background including lattice cantilever. Arrol Job No. E49. Not in RCAHMS 2000 Inventory, but E48 and E50 are railway bridges in India c.1910 and Argentina c.1923. [A3 1]
- Unidentified. 11½"x 9½". Large box girders for a bridge at Arrol's Glasgow work-yard' Arrol Job E49 as previous item. Not in RCAHMS 2000 Inventory, but E48 and E50 are for railway bridges in India c.1910 and Argentina c.1923. [A3 1]
- Unidentified. 11½" x 9". Part of lattice girder on railway trolley at Arrol's Glasgow work-yard' Arrol Job E49 as previous item. Not in RCAHMS 2000 Inventory, but E48 and E50 are for railway bridges in India c.1910 and Argentina c.1923. [A3 1]
- [Wallsend] N22. 150-ton Giant Cantilever Crane, N.E. Marine Engineering Company, Wallsend, Newcastle-upon-Tyne 1910 [tested to carry 187 tons as seen in the image]. Sepia photograph, 12"x10". Rubber stamp 'Sir William Arrol & Co. Ltd'. Mounted on card. Crane now demolished? One of the earliest of its type. [A3 1] For another image see RCAHMS Inventory 2000. 12. [Portsmouth Crane] in works illustrated in part of an Arrol Promotional catalogue c. 1964. [A4 2]
- Sect. 1. Bridges opening and fixed of all types; Sect. II. Dock and Harbour Equipment. Sect. III. Industrial Buildings and Power Stations. Swct. IV. Hydro-Electric Equipment; Giant Cantilever Cranes with details and image of 200 tons Crane for Belfast Harbour Commissioners [1958]. Also for 250 tons Crane for Portsmouth Harbour [1912]. [A4 2]
- [site unidentified] Major Factory Erection – Preparing foundations. Workmen. 11"x9". Stamp on verso 'Sir William Arrol & Co. Ltd.' 24 Nov. 1959. [A3 1]
- [site unidentified] Major Factory Erection – Preparing foundations. Workmen. 11"x9". Stamp on verso 'Sir William Arrol & Co. Ltd.' 24 Nov. 1959. Duplicate of previous item. [A3 1]
- [site unidentified] Major Factory Erection – Preparing foundations. Workmen. 11"x9". Stamp on verso 'Sir William Arrol & Co. Ltd.' 24 Nov. 1959. Another view of previous project. [A3 1]
- [site unidentified] Major Factory Erection – Preparing foundations. Workmen. 11"x9". Stamp on verso 'Sir William Arrol & Co. Ltd.' 24 Nov. 1959. Another view of previous project. Duplicate of previous item. [A3 1]
- [Hamilton Bypass?] Major Bridge over R. Clyde being built. Temporary steel towers in foreground. 11½"x9½" 'Photograph by Richard Jones, 150 Merry Street, Motherwell. Ref. 67/138. Undated, 1967? [A3 1]
- [site unidentified] rolling lift bridge raised – over a dock or canal entrance. b&w. 12"x10". No Arrol job no. Undated .c.1930. Workmen. [A3 1]
- [site unidentified] Hydro-electric Power Station interior. {check Galloway early 1930s} – finely detailed view of British Thomson-Houston hydro-electric turbines, with name plates of various parts..b&w.14½"x10". No Arrol job no. Undated. Sir William Arrol & Co. Ltd. stamp on verso. [A3 1]

5. Books and articles mainly in Hunter's possession. 72 items.
[Sun Room bookcase 49 Bonaly Crescent] 29-35

Adams, H. *Strains in ironwork*. 3rd ed. London & New York 1898. viii, 66, 8 fldg pls. 36 catalogue of Spon's books 1901. Cloth, gilt. Adams was one of Hunter's lecturers.

Adams, H. *Building Construction comprising notes on materials, processes, principles and practice, including 2284 engravings and twelve plates*. By Prof. Henry Adams, MICE. Cassell & Co. [n.d. c.1900]. cont. cl. Reciprocal stress diagrams.

Sir William, Arrol & Co. Ltd. *Bridges, Structural Steelwork and Mechanical Engineering Productions by Sir William Arrol and Company, Ltd., Dalmarnock Iron Works, Glasgow, with description of their manufacturing works, and formulae and diagrams for the calculation of beams, general specifications, and other data influencing the design of structural work. Partly reprinted from "Engineering."*, London, 1909. 4to. (xiii), 472, [portrait of Arrol missing], cloth, gilt. [Prepared under Hunter's superintendence] [see Part 6 Paxton PPP 44, 70, 71, 77 - images]. Parts also published separately as:

Sir William, Arrol & Co. Ltd. *Bridges*. By Sir William Arrol and Company, Ltd. Dalmarnock Iron Works Glasgow with description of their manufacturing works. Partly reprinted from "Engineering". Published for private circulation by "Engineering" Ltd., London, 1909. 4to. lii, 148. Orig. cloth, gilt, with Forth Bridge on front cover. [see Part 6 Paxton PPP 44 - image]. Binding worn.

Sir William, Arrol & Co. Ltd. *General specifications, formulae and data, for cranes, bridges and workshop buildings embodying the practice of Sir William Arrol and Company Ltd., Dalmarnock Iron Works Glasgow*, 1909. Published for private circulation by "Engineering". London, 1909. 4to. viii, 188. Orig. cloth, gilt, with Forth Bridge on front cover. Signature of [Dr] Jim S. Shipway, former employee of Arrol's, on end paper. [see pt. 6 Paxton PPP 44 - image].

Sir William Arrol & Co. Ltd. *A 250 ton electric hammerhead crane designed, constructed and erected by Sir William & Company Ltd.. The largest of its type in the world 1931*. Reprinted from *The Engineer* May 1st 1931. Oblong 4to. orig. wrpr. pp 1-8 with 12 photos and figs. Large folding plate. Rare in this form, on glossy paper. [see Part 6 Paxton PPP 83-86 – some images].

Ball, J.D.W. *Reinforced concrete railway structures*. London. Constable 1913. xiv, 213, 123 illust & a plate. Cloth, [edited by Hunter's friend Prof. G. Moncur, Royal Technical College, Glasgow].

Barlow, Crawford. *The New Tay Bridge. A Course of Lectures delivered at the Royal School of Military Engineering at Chatham, November 1888*. Spon. London 1889. The definitive account of design and construction by Arrol's of present bridge. Large 4to. pp.(x),46, 23 plates. Hunter's copy? Cloth, gilt.

Nigerian Railways – Benue Viaduct. Jenny Ashworth, antiquarian bookseller's list in 2017 of a photo. archive of Edward Maltby Bland, General Manager of Nigerian Railways. Sold for £5,000. Comprising 269 images [mainly 8.5 x14cm] in 4 albums, one with 70 of the erection of Benue Bridge 1928-32. Another album of 58 Hunter images illustrating the final leg of his voyage to Nigeria in 1920. **Inscribed by Hunter to Bland** at Ebute Metta, 1921.

Biggart, A.S. Occasional Papers of, handed to Roland Paxton by Malcolm Fraser at a Forth Bridges Visitor Centre Trust Meeting on 9.12.2002. All IESIS papers except the last: 'On sinking the Cylinders of the Tay Bridge by pontoons' XXVIII 1885; 'On Erecting the Superstructure of the Tay

- Bridge' XXX 1886; 'On Manipulating the Material, and Building, and Drilling the Great Tubes of the Forth Bridge' XXVIII 1884; 'On the Forth Bridge Great Caissons; their Structure, Building and Founding' XXIX 1885; 'On the Manufacture of Girders used in the Forth Bridge' XXXII 1888; 'The Forth Bridge Works' 55th Rep Brit. Assn. 1885; 'On the Erection of the Superstructure of the Forth Bridge' XXXI 1888; do.do. XXXI 1890; 'Wire Ropes' Min. Proc. ICE CI 1889-90. 8vo, black calf, gilt labels. In mod. cloth-bound box. Ownership checked with M. Fraser 30.3. 2017. [with] Testimonial by Biggart on Sir William Arrol & Co's 'Bridges' engraved notepaper 10.11.1908, on behalf of C.W. Hogg 'one of the ablest engineers who has ever passed through our hands'. In 1909 Hogg father C.P. Hogg of Crouch & Hogg was elected President of IE&SinS
- British Steelwork Association. *The steel bridge, a summary of its merits*. London, [1930]. 4to. 38 with fine images. Orig. pictorial wrapper featuring Arrol's East Linton 3-span plate girder bridge 1927- [with Hunter's books].
- British Steelwork Association [ed. Gilbert, W.R.] *Modern steelwork*. London, 1930, 334. [includes article by or after Hunter on Wearmouth Bridge and many advertisements and illustration including the Tyne and Forth Bridges for Arrol & Co. Mod. wrpr.
- British Steelwork Association [ed. Gilbert, W.R.] *Modern steelwork*. London, 1930, 334. [includes article by or after Hunter on Wearmouth Bridge and many now historically valuable advertisements and illustrations including the Tyne and Forth Bridges for Arrol & Co. Cont. blue cloth, gilt devices.
- Buckton, E.J. 'The New Waterloo Bridge.' *Jml, I.C.E.* No. 7. 1942-43. 145-201, 7 fldg plates. Complete issue in printed wrapper. Includes a detailed history of the bridge 1811-1942.
- Burr, W.H and Falk A.S. *The graphic method of influence lines for bridge and roof computation*. New York, Wiley, 1909.1905. Cloth, gilt. [see PPP 43]
- Burr W.H. & Falk, M.S. *The graphic method by influence lines for bridge and roof computations*. New York, Wiley; London, Chapman & Hall, 1905. ix, 253, 2 large folding plates. Cloth, gilt. Adam Hunter's signature on title. An authoritative work. Praises Bow's notation. Authors at Columbia University. [see Part 6 Paxton PPP 43 - image].
- Buscarlet, F.C. & Hunter, A. 'The Queen Alexandra Bridge over the River Wear, Sunderland. *MPICE*. 182 (1911). 59-131 (including Hunter's contributions in discussion and correspondence), pls 2-4 [in D. & T. Stevenson set]. Also, a photocopy in polypocket. In box file 3.
- Carron [Catalogue]. Rain water, soil goods and general castings. January 1932. 4to. 172, 46 price list. Orig. cl. Works photos and many illustrations.
- Crosby Lockwood & Son's *A Catalogue of Books including new and standard works in Engineering: civil, mechanical and marine; Electricity and electrical engineering ...*1895, 48. [with] *Catalogue of Weale's Rudimentary Series comprising 350 distinct works* [c.1895] 16. Hunter had several of the books listed, wrpr.
- Etchells, E.F. ed. *Modern steelwork*. A review of current practice in the application of structural steelwork to buildings & bridges. Nash & Alexander, London, 1927. 276, many illustrations and advertisements. Orig. cl., gt. [with Hunter's books]. Hunter's gigantic temporary girder to take traffic whilst Waterloo Bridge was being demolished is shown below in an Arrol advertisement on page 195.

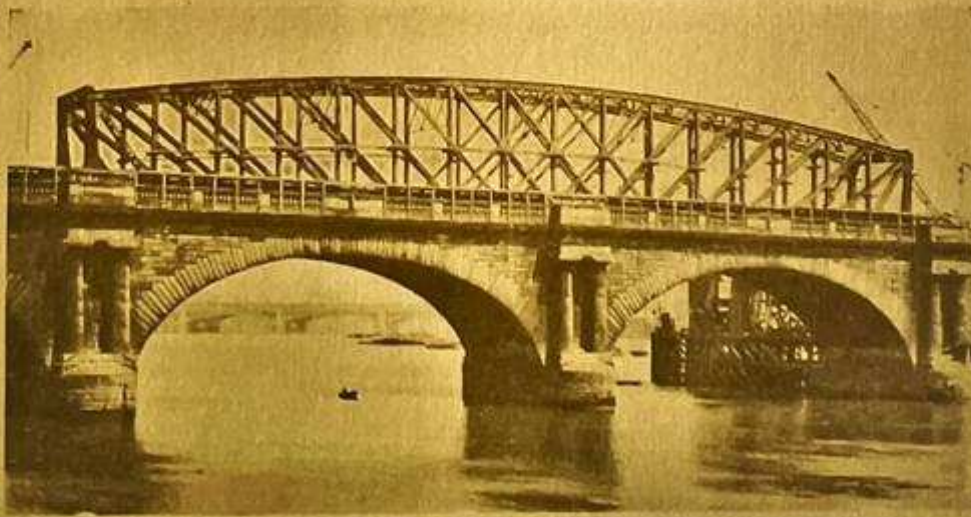


FORTH BRIDGE.

Sir WILLIAM ARROL & Co. Ltd.
Dalmarnock Ironworks,
GLASGOW.

Manufacturers of
BRIDGES of all types—Steel-Framed Buildings—Dock Gates
—Caissons—Cranes—Hydraulic Machinery.

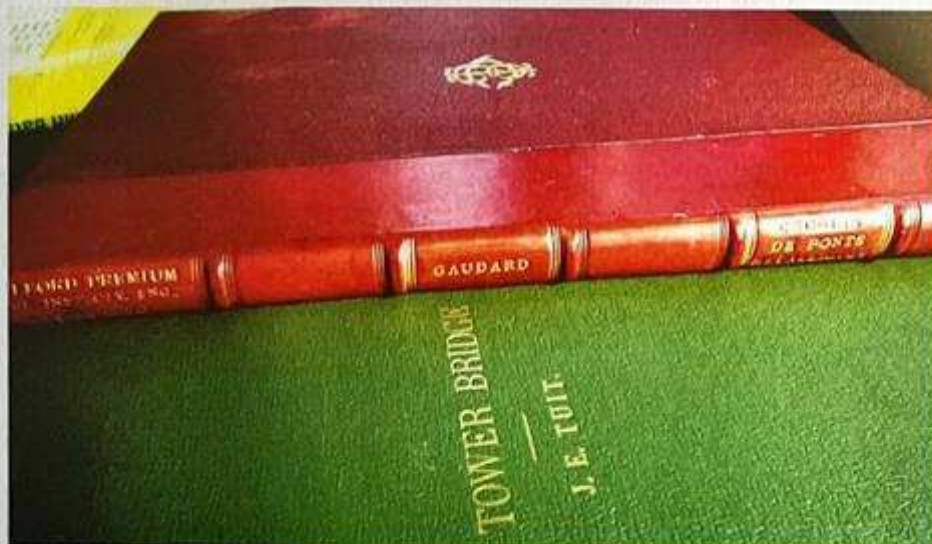
CONTRACTS undertaken in all parts of the WORLD.



Main Span of temporary WATERLOO BRIDGE erected ready for launching.

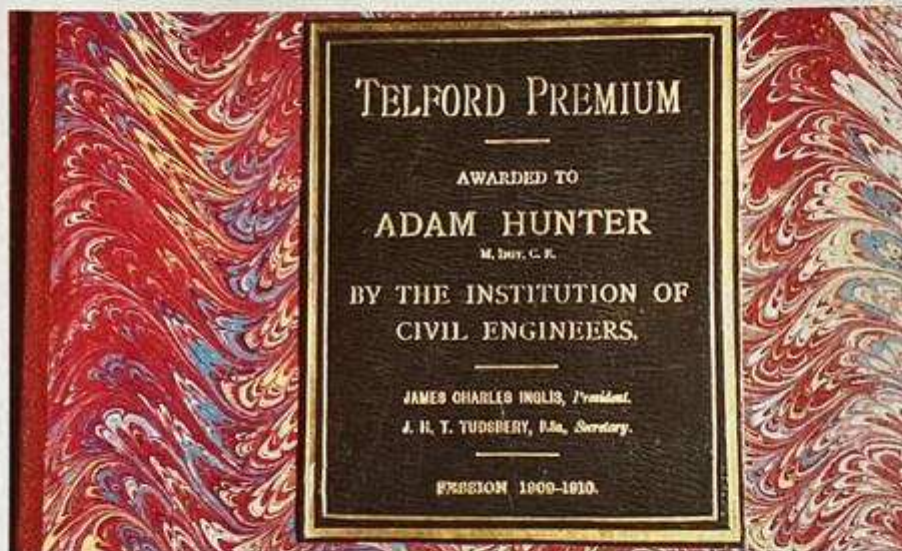
Arrol's temporary girder erected on the old bridge in 1925 then moved sideways to accommodate southbound traffic during demolition of Rennie's iconic Waterloo Bridge opened in 1817. A magnificent Hunter achievement.

- Edinburgh Town Council. The New North Bridge Edinburgh. Edinburgh 1896. La. 4. to. (vi), (64). Andrew S. Biggart then Managing Director of Arrol's attended on behalf of the firm and presented the Lord Provost with 'a beautiful ivory mallet ... on the occasion of laying the foundation stone 25 May 1896 [photo p.30, see pp.9, 23, 25]. Many illu. Orig. cloth with arms.
- Fidler, T. Claxton. Calculations in hydraulic engineering. Part 1 Fluid pressure and the calculation of its effects in engineering structures. London, Longmans, 1898. xii, 156, 32. Cl., gilt. [Hunter's signature].
- Farnsworth, A.W. Constructional Steelwork: Being notes on the practical aspect ... London. Griffin 1905. 1st ed. xv, 248, [1]-86 Griffin's catalogue. 103 illustrations of equipment &c. [riveters were still mainly hydraulic but had developed since the 1880s. Orig. cl. gilt. Sir Wm Arrol thanked for lending illustration blocks/photographs. Name cut from 1/2 title – Tees Docks Office? Described in *Practical Engineer* as 'worthy and of particular value'.
- Fitzmaurice, M. Plate girder railway bridges. London & New York, Spon, 1895. 104, 4 folding pls, 32 Spon's catalogue 1894. Cloth, gilt. [Adam Hunter's signature on half title] [see PPP 43]
- Fitzmaurice, M. Plate girder railway bridges. London & New York, Spon, 1895. 104, 4 folding pls, 54, Spon's catalogue of scientific books 1909. Cloth, gt. Loosely inserted copy of Fitzmaurice's paper 'The Forth Bridge'. 11.I.1888.
- Flitcroft, J.N. 'Serious corrosion of a steel bridge. Jubilee Bridge, Barrow-in-Furness. Excerpt from *Proc.I.Mun.E.* 80 (1953-54), 251-8. 14 figs. Designed by Baker, erected by Sir Wm, Arrol & Co. 1908. Total length 1123ft. £159,000, Bascules of Scherzer rolling lift type.
- Freeling, J.K. Architectural Engineering – high building construction. New York, Wiley, 1906. [Arrol firm stamp 25 July 1911]
- Frietag, J.K. Architectural engineering with special reference to high building construction including many examples of prominent office buildings, Second edition, rewritten, second thousand. 1906. Xiv, 407, 194 illu. Sir William Arrol and Co Ltd oval stamp dated July 25 1911. Hunter's copy. [see Part 6 Paxton PPP 43 - image].



Hunter's Gaudard in Institution of Civil Engineers gilt presentation binding

Gaudard, J. *Croquis de ponts métalliques par Jules Gaudard Ingénieur Civil*, Professeur Honoraire de l'université de Lausanne. Paris, Librairie Polytechnique, 1902. 4to. 158, (1), 55 plates with 526 illustrations of iron bridges from the beginning of the 19th century, including the Forth Bridge. The most comprehensive contemporary review of this subject. Hunter's ICE Telford Premium prize was awarded for his paper on the erection of Queen Alexandra Bridge, Sunderland. Its presentation gilt prize label reads: [see also Part 6 Paxton PPP 39, 41, 43 – for other images]



- Glasgow Post Office Directory, 1910,' pp. viii, 1872, iii; folding maps 'Environs of Glasgow' 21x9in; 'Glasgow City' 42x39in. Cloth, gilt. Probably from Hunter's office as it came with his other books. Includes details of many establishments with which Sir Wm Arrol & Co. would have had contact at this significant period of its development 4 years after Hunter had returned from London to become the firm's Chief Engineer with his office at Dalmarnock Iron Works, Dunn St. [see Directory map excerpt at end].
- Goodeve, T.M. *The Elements of Mechanism*. Longmans. 1874. 4th ed. 237 figs. Orig. cloth. gt. EUL copy. Hunter's copy edition not known. Ex EUL
- Greenwood, W.H. *Steel and Iron... practice and theory of ... manufacture and treatment in the rolling mills the forge and the foundry ... with 97 diagrams from original working drawings*. Cassell. 1900. Viii, 536, (16 cat). Orig. cloth.
- Gwilt, J. *An encyclopaedia of architecture historical, theoretical and practical. illustrated with about seventeen hundred engravings by Wood. New edition. Revised portions rewritten and with additions by Wyatt Papworth*. London, Longmans, 1888. xiv, 1443. Cloth, gilt. With book receipt to Adam Hunter, 85 Preston St., Bridgton from John Smith & Son (Glasgow) Ltd. bookseller, 'for Gwilt 7s.6d.' [see Part 6 Paxton PPP 43 - image].
- Hiscox, G.D. *Mechanical Movements Powers Devices and Appliances ... for the use of Inventors, Mechanics, Engineers. Illustrated by Eighteen Hundred Engravings*. 10th ed. New York. 1904. Cloth, gilt. Hunter had an 1890s edition of this encyclopaedic work.
- Hiscox, G.D. *Mechanical Appliances*. 970 illusts. Constable, London 1904. Cl.
- Hunter, A. 'The structural design of engineering factories'. *Trans, The Junior Institution of Engineers*. 1906. XVII (1906-7) Author's separate reprinted

with the authority of the Council in its original printed [edge-frayed] wrapper. 1-28, 22 plates. [see Part 6 Paxton PPP 30-33 - images].

This important paper was read on 3rd Dec. 1906 at The Westminster Palace Hotel, London.

- Hunter, A. *Bridge and structural engineers handbook of general specifications, formulae and data for the design of cranes, bridges, foundations, and workshop buildings embodying the practice of Sir William Arrol and Company Ltd, Dalmarnock Iron Works, Glasgow.* 1st ed. Spon. London. New York, 1920. viii, 308, many illu. Cloth, gt. With Forth Bridge embossed on front cover.
- Hunter, A. *Bridge and structural engineers handbook of general specifications, formulae and data for the design of cranes, bridges, foundations, and workshop buildings embodying the practice of Sir William Arrol & Company Ltd, Dalmarnock Iron Works, Glasgow.* 2nd ed. Spon. London. New York, 1928. viii, 345, many illustrations. Cloth with Forth Bridge embossed on front cover, gt. Inscribed by Hunter to 'Professor Blackadder with compliments. Feby. 4, 1929'.
- Hunter, A. *Bridge and structural engineers handbook of general specifications, formulae and data for the design of cranes, bridges, foundations, and workshop buildings embodying the practice of Sir William Arrol & Company Ltd, Dalmarnock Iron Works, Glasgow.* 2nd ed. Spon. London. New York, 1928. viii, 345, many illustrations.
- Hunter, A. *Bridge and structural engineers handbook of general specifications, formulae and data for the design of cranes, bridges, foundations, and workshop buildings embodying the practice of Sir William Arrol & Company Ltd, Dalmarnock Iron Works, Glasgow.* 2nd ed. Spon. London. New York, 1928. viii, 345, many illustrations. Cloth with Forth Bridge embossed on front cover, gt.
- Hunter, A. *Bridge and structural engineers handbook.* [1st ed.] London, Spon, 1920. Forth Bridge in gilt on front cover.
- Hunter, A. *Erection of metallic bridges.* London. I.Struct.E. 28 Feb. 1929. Author's separate of presented paper. Straker Brothers Ltd., London, 1-45. Orig. printed wrapper. [see Part 6 Paxton PPP 30,38 - images].
- Hunter, A. *Erection of metallic bridges.* London. I.Struct.E. 28 Feb. 1929. Author's separate of presented paper. Straker Brothers Ltd., London, 1-45. Orig. printed wrapper [see PPP image 30]. Duplicate copies.
- Hunter, A. [photocopy] Institution of Civil Engineers. Opening address by Mr. Adam Hunter M.Inst.C.E., Chairman to the Glasgow Association of students of the Institution of Civil Engineers on November 18th 1925. Glasgow, Robert Anderson Printer. With a manuscript note from Gordon Masterton to my office in the Dept. of Highways, Edinburgh 11.1.88, referring to Hunter's comment that Caputh Bridge over the Tay, 1887, was the first steel bridge completed in Scotland'. A valuable historical overview of bridge development.
- Jamieson, A. *Elementary Manual on Applied Mechanics ... for ... engineering students.* Griffin, 1904 xvi, 345, 52, Griffin cat. Orig. cloth, gilt. A later edition of a work known Hunter when in London in the early 1890s. Not Hunter's copy. Newry prize label.
- Jamieson, A. *Text-book of Applied Mechanics and Mechanical Engineering ... Volume III 7th ed. revised.* 1908. Frontis. large folding plate of 139-ton steam crane at Glasgow Harbour. xviii, 232. Valuable for worked examples of framed structures including by graphic statics. This copy came from the Borough Engineer's Office, Birkenhead. Hunter had a copy. Orig. cloth. gilt.

- Kunz, F.C. *Report on the Blackwell's Island Bridge [Queensboro']* By F. C. Kunz Chief Engineer The Pennsylvania Steel Co. Steelton Penna, March 24th 1909. 4to. 65, photos, 7 fldg tables. Orig. printed wrapper. Adam Hunter's signature on title. Compliments slip of Pennsylvania Steel Co. C.C. Schneider was the consulting engineer [see Part 6 Paxton PPP 27, 29 - images].
- Lanarkshire Steel Co. Ltd., *Motherwell. Sections, brands, tables &c.* Motherwell, 1917. Photos, 296, many illustrations in colour. Cloth, gilt.
- Lewis, L.P. *Railway signal engineering (mechanical)*. London, Constable, 1918. [Edited by G. Moncur, Professor of Civil Engineering, Glasgow & West of Scotland Technical College]. Holograph inscription by Moncur 'To Mr. A. Hunter with the editor's compliments, June 1912'. Moncur's signature on half title.
- London. Tower Bridge from the river over small boats – late 1890s. On cover of *The Queen's London*. Part 2. Price 6d. Attractive pictorial cover in crimson and black. Photograph by Perkins, Son & Fenimore, Lewisham.
- Marks, E.C.R. *The Construction of Cranes and other Lifting Machinery*. Third edition revised and enlarged. Manchester, London, New York. 1904. viii, 260. [4]. 202 illusts. Cloth, gilt. Not Hunter's but he would have had one. [copy] Mitchell Library. 'TD 208. Records of Sir William Arrol & Co. Ltd., bridge and crane builders, 85 Dunn St., Glasgow, G40, deposited in September 1972'. [12pp]. Wrpr.
- Overman, F. *The manufacture of steel. Containing the practice and principles of working and making steel*. A. Hart, Philadelphia. 1853. xi, 226, 28 text figs. cloth, gilt., [acquired with other Hunter books].
- Pencoyd Iron Works. *Wrought iron and steel in construction ...made by the works. A.P. Roberts & Co...Bridge and construction department*, Philadelphia. 8th ed., 1892. 20"x4" frontis of works. v, 257. x, 43 clrd plts. Cloth, gilt. Signature Thomas Lord 14.Nov 1892, complimentary copy.
- Robinson. H. *Hydraulic Power and Hydraulic Machinery*. Griffin. London 1887. (xiv), 190, (2). 42 pls + many figs. 1st edn. Cl. gt. Dedicated to Sir W. G. Armstrong for whom the author had worked. Of interest in that this form of power was used extensively to erect the Forth Bridge. No Arrol mention.
- Schneider, C.C. 'Structural design of buildings'. *Trans. American Society of Civil Engineers*. 1904. 371-508, 4 pl. Bound by Hunter in ½ calf, gilt with his initials and title in gilt on cover, signature on front end paper and key matter throughout the text highlighted. Erratum slip at 471 [see Part 6 Paxton PPP 27 - image].
- Scott, E.A. *Arrol's reinforced concrete reference book ... as used by the Reinforced Concrete Department of Sir William Arrol and Company Ltd., Glasgow*. London, Spon, 1930. Cloth, gt. [with Prof. W. Blackadder's signature on front end paper].
- [photocopy] Stevenson, R.L. Excerpt from *Human documents portraits and biographies of eminent men. Articles by Robert Louis Stevenson ...* New York. S.S. McClure 1895. With Adam Hunter's signature, Nov. 1896 on end paper. Comprising 'My first book – "Treasure Island" and 'Portraits of Robert Louis Stevenson'. The map of *Treasure Island* was drawn in D. & T. Stevenson's office, Edinburgh. 119-20.
- Smith, J. Russell. *The story of iron and steel*. London Appleton & Co. 1908. 1st ed. frontis. xi, 193. 14 illustrations - steam hammer, giant cantilever

- cranes, 3 Carnegie steel plants at Philadelphia &c. Historical development and use, a subject of interest to Hunter. Signature of A. Lumsden. Orig. cl.
- Stewart, D.S. *Influence lines. Their practical use in bridge calculation.* London, Constable, 1947. viii, 207, cl. gt. [first published 1939].
- Stewart, D.S. *Practical design of simple steel structures. Vol. III Tables.* London, Constable, 1929. 2, 19, 4. Cloth. [edited by Hunter's friend Prof. G. Moncur, Royal Technical College, Glasgow].
- Stewart, D.S. *Practical design of simple steel structures. Vol. III Tables.* London, Constable, 1929. 2, 19, 4. Cloth. [edited by Hunter's friend Prof. G. Moncur, Royal Technical College, Glasgow]. With Cuthberts and Associates stamp,
- Stewart, D.S. *Practical design of simple steel structures. Vol. 1. Shop practice, riveted connection and beams &c.* London, Constable, 1929. xv, 183, 4, 200 figs. Cloth. [edited by Hunter's friend Prof. G. Moncur, Royal Technical College, Glasgow].
- Stewart, D.S. *Practical design of simple steel structures. Vol. 1. With appendix of tables {formerly Vol. III}. 4th ed.* Constable, 1955. xv, 231. Cloth. [first published 1929] Volume 1, complete. Signature of David Clark on half title.
- Stoney, B.B. *The strength and properties of riveted joints.* Spon, London & New York. 1885. V, 87, 24 advrts, Cloth, gilt. Acquired with Hunter's books. [see PPP 43]
- Thomson, J. 'Modern methods of steel bridge manufacture.' Excerpt *Trans IESS*. LXXV (1931-32). 270-301. Includes vice-president Adam Hunter's discussion contribution at 293-296.
- Tuit, J.E. *The Tower Bridge, its history and construction from the date of the earliest project to the present time.* London "Office of The Engineer", 1894. 1106, 6 folding plates, many figures and full page photosd [Hunter's copy but with no ownership signature – he worked under Tuit on this project]. Cloth, gilt. [see PPP 18 & 40]
- Unwin W.C. *The Elements of Machine Design.* Longmans, 1877. xii, errata. 219 figs. 326. Signed 'James Durie June 1877'. advt leaf. 1st ed. orig cloth.
- Unwin W.C. *The Elements of Machine Design,* 1885. xvi, 509, 2, 325 figs. Ex libris Edin. Univ. Orig. cloth, gilt Lib. Hunter is known to have had an interest in this work when in London..
- Welch, C. *History of the Tower Bridge.* London, Smith, Elder & Co.. 1894. 4to. x, 284, 74 illustration [with Wolfe-Barry's description].
- Western, R.W. *Simple explanation of engineering formulae – direct stress and stiffness.* London, Batsford, 1892. Sir William Arrol and Co Limited oval stamp dated 24 April 1908. Hunter's copy.
- [Westhofen, W. *The Forth Bridge.* London: Offices of "Engineering" 1890. Reprinted from 28th February 1890 issue. Folio, cloth, gilt. In his diary Hunter has an entry for 4sh. on 22 March for 'The Forth Bridge', probably for this work, but this copy is not present in this archive.
- Wray, Col. H. [R.E.] *Instruction in construction. Some applications of theory to the practice of construction being a part of the course of construction at the School of Military Engineering, Chatham. Fourth edition revised by Colonel H.C. Seddon.* London: HMSO, 1891, Roy. 8vo. 454, 21 fldg plates.. Red cloth, gt. A tour de force. Adam Hunter's signature on title.

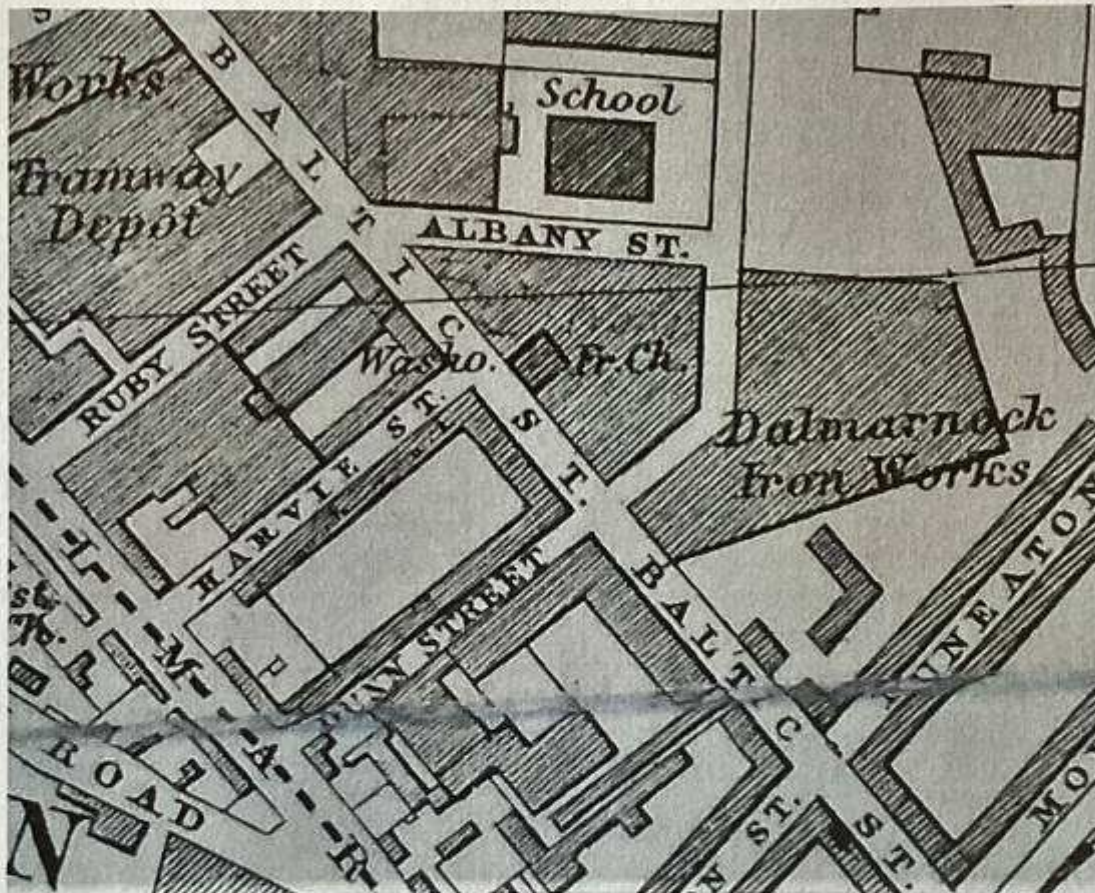
In 1891 Hunter was attending evening classes at the City of London College [see Part 6 Paxton PPP 43 - image].

6. Modern material relating to Hunter's life and work (27 items)
[Sun Room bookcase 49 Bonaly Crescent & A4 RB 3] 37-39

- [this catalogue] The Paxton archive of Adam Hunter (1869-1933 - Chief Engineer, Sir Wm. Arrol & Co. Ltd., Glasgow, Scotland. 2016. A4. 40.
- [Arrol, Sir William] R.M. Birse's draft entry and support items for Arrol's entry in the *Biographical Dictionary of Civil Engineers* 2007. v. III. Includes notices of Biggart, Meik, Hunter, Tuit & Reg. Middleton, surveyor. 50 pp. A4.
- [Arrol, Sir William] List of Giant Cranes. Compiled by Dr Newman. 3 sheets A4 [Craigellachie Bridge refurbishment 1964]. Arrol's illustrated advertisement from *The Structural Engineer*. 42. March 1964. A4. [4].
- [Cunningham, H.] *Sir William Arrol & Company Limited 1909-1950 - Bridge Builders. Structural & Mechanical Engineers and Crane Makers*. Sir Wm. Arrol & Co. Ltd, Glasgow (1950). 4to. cloth, gilt. 30, 28 plates, including Rosyth caisson launch and Waterloo temporary bridge, London. d/w.
- Daily Record and Mail 534 Souvenir Supplement* 26 Sept 1934 [8]. Stunning images of the 'Queen Mary' to be, under construction at Clydebank, Titan Crane in background. In box file 3. [see PPP Paxton images 89-91].
- Forth Bridge Riveter. ICE Scotland Museum interpretive notes and images to accompany the new Arrol Riveter Display at H-W.Univ. EGIS in 2015. A3.
- Forth Road Bridge Joint Board. *Forth Bridge Superstructure built by the A.C.D. Bridge Company a Partnership comprising Sir William Arrol and Company Limited ...* (+ Cleveland Bridge & Dorman Long) [1964]. A4. 80. Many illu. & pls. Orig. wrpr. In plain card box. From the Arrol dispersal, presumably intended for presentation. Page 78 outlines the company's bridge works [1872-1964].
- Humm, R. [copy ms] 'Scherzer Rolling Lift Bridges in the British Isles totalling 35' many built by Arrol. [2015]. A4. 6. Pres. slip to Roland Paxton + notes.
- Humm, R. [art.] 'Scherzer Rolling Lift Bridges in the British Isles'. In *Archive The Quarterly Journal for British Industrial and Transport History*. No. 85 March 2015. 26-46. A4. Issue 85 complete in printed wrapper. With a.l.s. from the author to Prof R. Paxton of 24 May 2017 tipped in.
- [Hunter biographical details. ICE membership records. Glasgow Herald obit. notice 3.11.1933. *Engineering* obit. Notice 1.12.1933. Gravestone wording *Rutherglen Cemetery 10"x 8" photograph*. Draft article by Roland Paxton for the *Biographical Dictionary of Civil Engineers*. 28th March 2013. 6.
- Hunter, Sukie {Great niece of Adam Hunter}; Hard copy of extensive email correspondence with family details & images following her introduction to Prof Paxton by Eleanor Knowles of Timelines. 26.7 - 6.8.17.
- Johnston, I. Beardmore Built. Clydebank 1993. Photocopy pp. 18-21 only, relating to the 1903 German-made Benrather 150-ton giant cantilever cranes erected in 1904 at Dalmuir and Barrow shipyards
- [Knowles, E., Joyce, J, in association with Prof. Roland Paxton]. Hard copy of website, *Engineering Timelines Engineer Biography Adam Hunter*, A4. 19.
- Newman Dr, B. Ms.copy. List of Sir William Arrol's Giant [cantilever] Cranes-1904-58. A4. 3pp.

- [Mitchell Library - copy] TD 208. 'Records of Sir William Arrol & Co. Ltd., Bridge and Crane Builders, 85 Dunn St., Glasgow G 40.', deposited in September 1972. A4. 13. Wrapper.
- Edinburgh. New North Bridge 1895. March. Copy of 'Detailed Drawing of Steel Arch Girder' [150x22in]. 'Contract Drawing No.5. Scale 1in=2ft', Cunningham, Blyth & Westland Engineers'. Endorsed: 'This is Contract Drawing No.5 referred to in Article 115 of the Specification of Works and is signed relative to the Contract...' (by in holograph) 'William Arrol' for Sir Wm. Arrol & Co. Ltd and 'Andrew McDonald', Lord Provost of Edinburgh. See Paxton & Shipway below for bridge details Not from Hunter's Archive.
- [PPP] Paxton, R. 'Adam Hunter 1869-1933, Chief Engineer Sir William Arrol & Co. Ltd'. A4 hard copy in colour of Power Point Presentation first given in Clydebank Town Hall 19 August 2013 and to the Institution of Structural Engineers in London 17 March 2014. [with synopsis and abstract].
- Paxton, R, [ed] *100 years of the Forth Bridge*. Thomas Telford 1990. 4to. {x}, 166. Cl. d/w. In this definitive history the chapters on design and construction were written by former Arrol staff engineers..
- [Paxton, R., nominator] International Historic Civil Engineering Landmark designation to the American Society of Civil Engineers for the Titan Crane Clydebank [with] correspondence and newspaper cuttings from the Sydney Morning Herald re, Titan and, Daily Mail 20 April 2013 re. Britannia [see Part 6, Paxton PPP 72, 73 images].
- Paxton, R. & Shipway, J. *Civil Engineering Heritage Scotland Lowlands and Borders and Highlands and Islands*. Thomas Telford Ltd. 2007 2 volumes xii, 396; xii, 272. Orig. prtd wrprs. Includes 28 Arrol entries relating to UK projects.
- Royal Commission on the Ancient and Historical Monuments of Scotland [RCAHMS]. *The Sir William Arrol Collection. A guide to the Scottish material held in the National Monuments Record of Scotland*, 1998. [eds. M. McDonald & M. Oglethorpe].
- RCAHMS. *The Sir William Arrol Collection. A guide to the international material ...* 2000. [eds. M. McDonald and M. Oglethorpe]. Prof. Paxton's extra illustrated copy with his speech at the book's joint launch by Mrs Kathleen Dalyell, Chair of RCAHMS and himself as Chair of RCAHMS's Architectural Programme Committee, and a photograph at the Forth Bridges Visitor Centre on 30 September 2000 [see Part 6 PPP Paxton - 47, 48, 53, 55-57, 60, 61, 63, 64-68 - images].
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- Sydney, Titan Crane – newspaper cuttings, papers and letter from the Chair, Engineering Heritage Australia. 2013.
- Sydney, Titan Crane –*The Newcomen Bulletin* No. 179, April 2001 Full page image on title. General view of crane with Sydney Harbour Bridge in background. At p.16. Note on The Sir William Arrol Collection salvaged in 1987 and the RCAHMS catalogues. The company ceased to exist in 1999.
- Williams, A. *Engineering Wonders of the World*. London, Nelson [1908]. 3 vols.4to. (vii),456; (vii), 448; (vii), 408. Half mor. gilt. Wonderfully evocative of world engineering at the time Hunter was Chief Engineer of Sir Wm. Arrol & Co. Ltd. Excellent articles on projects to which the firm contributed e.g. The Forth Bridge; Manchester Ship Canal [for which

Arrol's supplied 12 bridges in 1890] with images at Barton which complement the 33 of the 1927 refurbishment in this archive. The Scherzer rolling lift bridges; transporter bridges and the great Zambesi Bridge interested Hunter.



Sir Wm. Arrol Ltd's Dalmarnock Iron Works, Dunn St, Glasgow 1910 [from Glasgow Post Office Directory map [see entry in Pt. 5].

3.9.2022 *t/w u*