

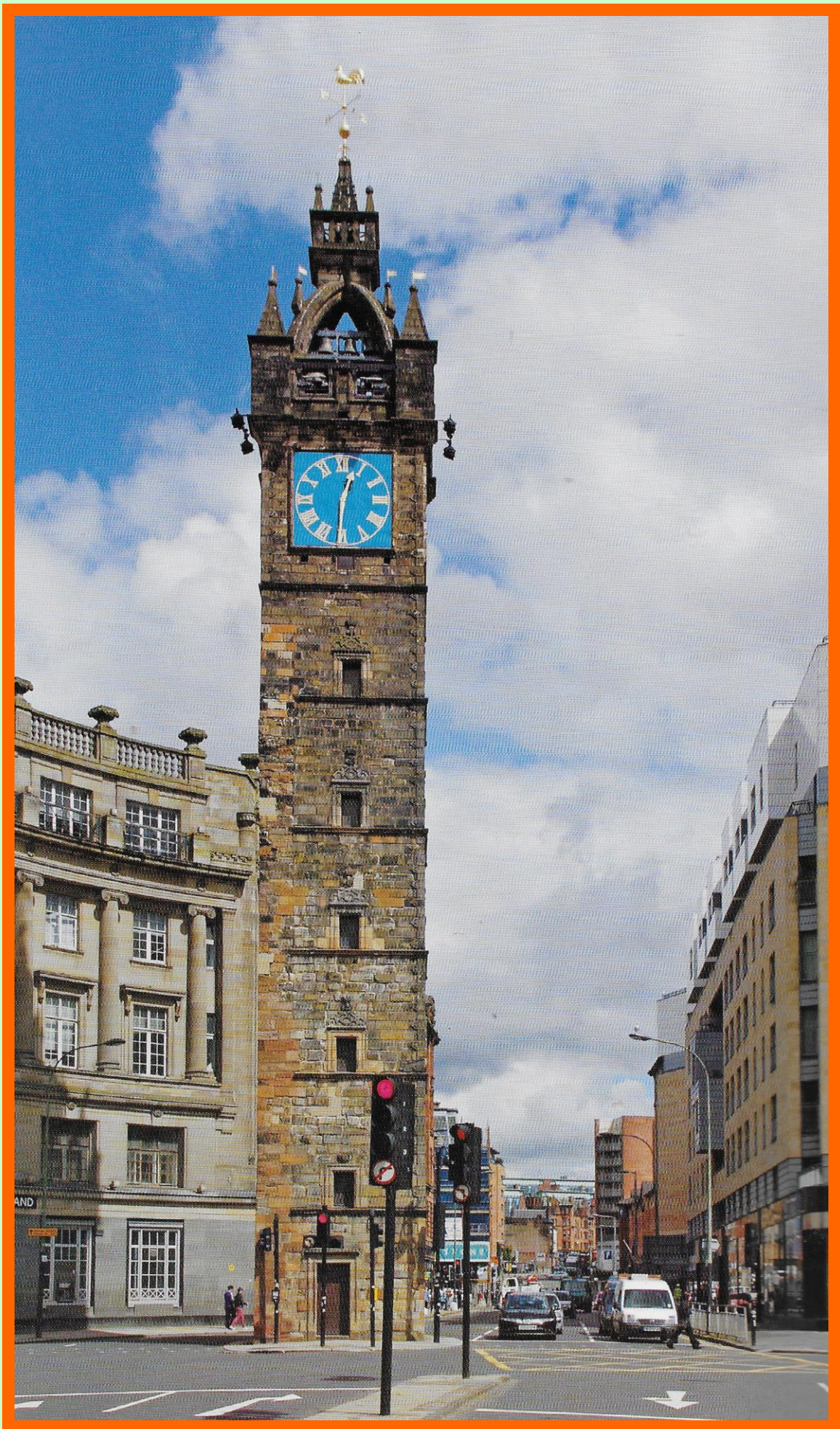


George Square and the City chambers in 1890.

HISTORIC CITIES

GLASGOW **SCOTLAND**

BRIAN ROBERTS



The Tolbooth Building of 1626 was demolished in 1921 leaving only its lone tower.



Glasgow Bridge, a hand-tinted photograph of 1910.

CONTENTS

CASE STUDY: THE UNIVERSITY OF GLASGOW

HISTORIC BUILDINGS

In page order:

George Square, Tolbooth, Glasgow Bridge, George Square, Cathedral, Barony Church, Royal Infirmary, Old College, Tontine Hotel, Tolbooth, St. Andrews Church, Saltmarket, Trongate, Britannia Music Hall, Ramshorn Church, Hutcheson Hall, Trades House, Royal Exchange Square, St. Vincent Place, Argyle Street, St. Enoch Station & Hotel, Buchanan Street, Jamaica Street, Ca-Doro, Christian Institute, Theatre Royal, Sauchiehall Street, Kelvingrove Art Gallery & Museum, St. Vincent Church, Kelvin Bridge, Doulton Fountain, Templetons, School of Art.

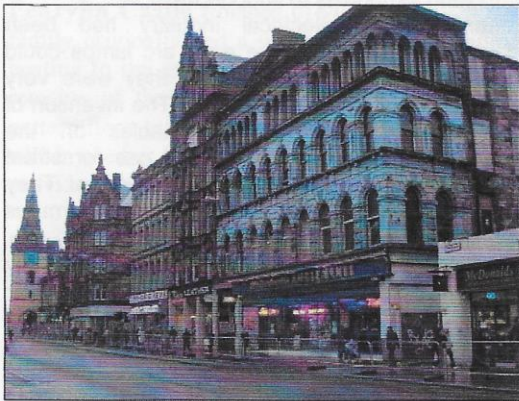
NEWSLETTER



No 10. JUNE 2004

Building Services Engineering Heritage Group

BRITANNIA MUSIC HALL TRONGATE GLASGOW



Many people will have seen this lovely example of a Victorian Music Hall on last years BBC Restoration series. The Music Hall is to be the subject of grant applications from the Heritage Lottery Fund and Historic Scotland, which if successful will help towards the intention of restoring the auditorium to its late Victorian condition.

The Music Hall dates from 1857 and originally provided a wooden bench seated accommodation for 880 persons, with standing room for a further 300. When the new projection room was added in 1897 this brought about the need for the installation of electricity, which could well have made it one of the first buildings in Glasgow to have electrical lighting.

The Mechanical & Electrical Services

The Music Hall was originally gas light. The main features were three gasoliers at auditorium ceiling level with gas mantles located around the perimeter walls. Remnants of the old gas mantle piping can still be seen at gallery level.

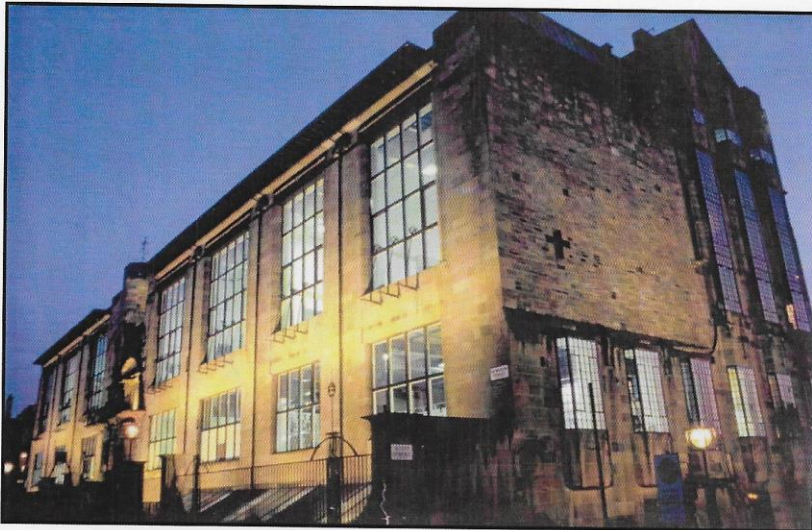
The building was heated by coal fires and a few of the fire places can still be found there. The auditorium had a natural form of ventilation. The suspended ceiling is formed as an open box grid design with a mesh fixed above the grid. The heat from the people and gas lighting created sufficient stack effect for the vitiated air to rise and exit through louvred vents at roof level.

Three suspended tungsten light fittings of two different patterns are still in place. One is possibly an original 1897 fitting and the others date from the 1920's. Red and white 'Exit' and 'Gents' illuminated signs can still be seen.

The Heritage Group have been invited to advise the 'Britannia Panopticon Music Hall Trust' on providing any information for identifying similar types of M&E services which could be inspected and replicated for this type of building.

MACKINTOSH'S GLASGOW SCHOOL OF ART

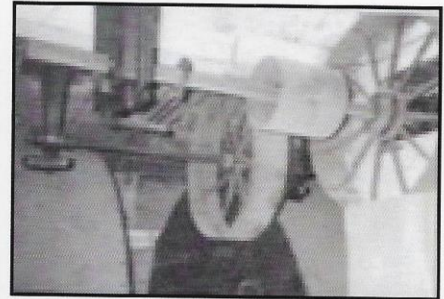
FROM "BUILDING SERVICES HERITAGE,"
CIBSE HERITAGE GROUP, 2003



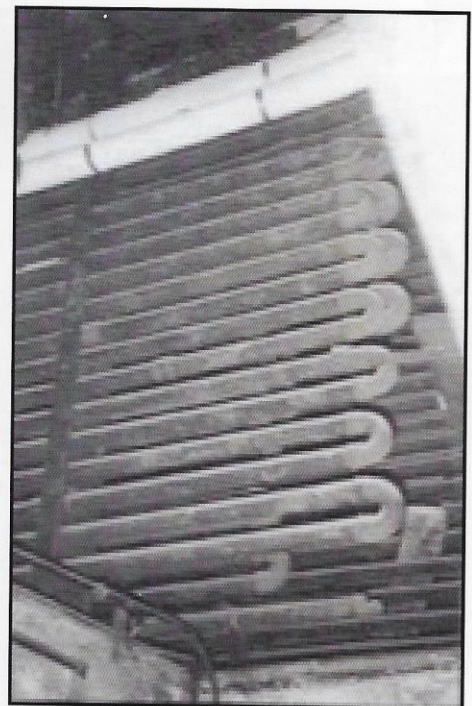
Glasgow School of Art, 1897 - 1907

The winner of the architectural design competition for the School was Honeyman and Keppie, within which Charles Rennie Mackintosh was a salaried architect. Keppie had earlier worked with the engineer William Key who had designed a plenum system for the Glasgow Victoria Infirmary, opened in 1890. Key with Robert Tindall, took out British Patent No 19,900 in 1892 which detailed a basic air conditioning system to control temperature, humidity and air cleanliness, using water sprays, blocks of ice, steam coils and hanging rope filter screens. The specification of 1896-97 for the first phase of the construction of the school refers to a ventilation system having water sprays and hung rope air filters but no direct link with Key has been established. The detailed design was the responsibility of the contractor. In this, B F Sturtevant who illustrated the principles of such systems in their catalogues of that era and who were suppliers of the two main centrifugal fans, may have rendered assistance. During the second phase of construction in 1907-9, both filters and sprays were renewed. The plenum system was taken out of use in the 1920's and replaced by an intrusive radiator system. Recent surveys have shown that the original fans remain with steam coils, basement and ceiling ducts and the dampers and grilles largely intact.

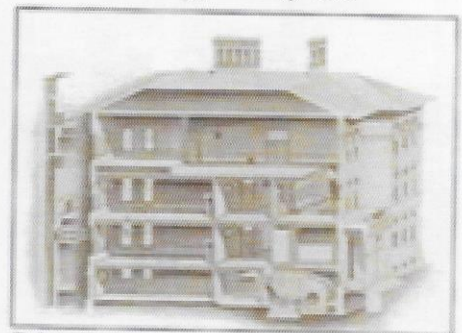
A modern study of the environmental systems is "Glasgow School of Art" George Cairns, Charles Rennie Mackintosh Society, Newsletter No 66 Winter / Spring 1995



Existing fan chamber



Existing heating coils



School Ventilation
(Sturtevant catalogue 1896)

This Newsletter is sponsored by



Historic England

MACKINTOSH'S GLASGOW SCHOOL OF ART **HERITAGE LANDMARK GONE UP IN FLAMES - AGAIN**



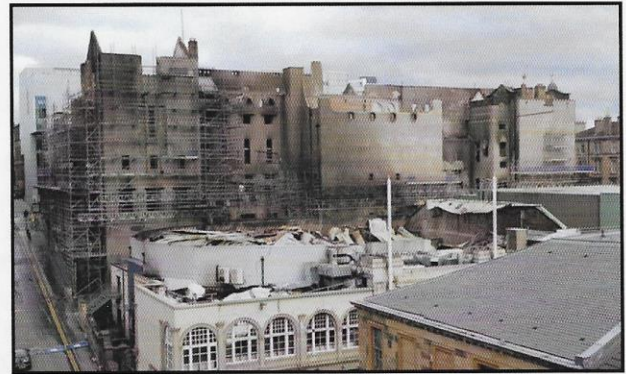
The First Fire of 23rd May, 2014



The Second Fire of 15th June, 2018

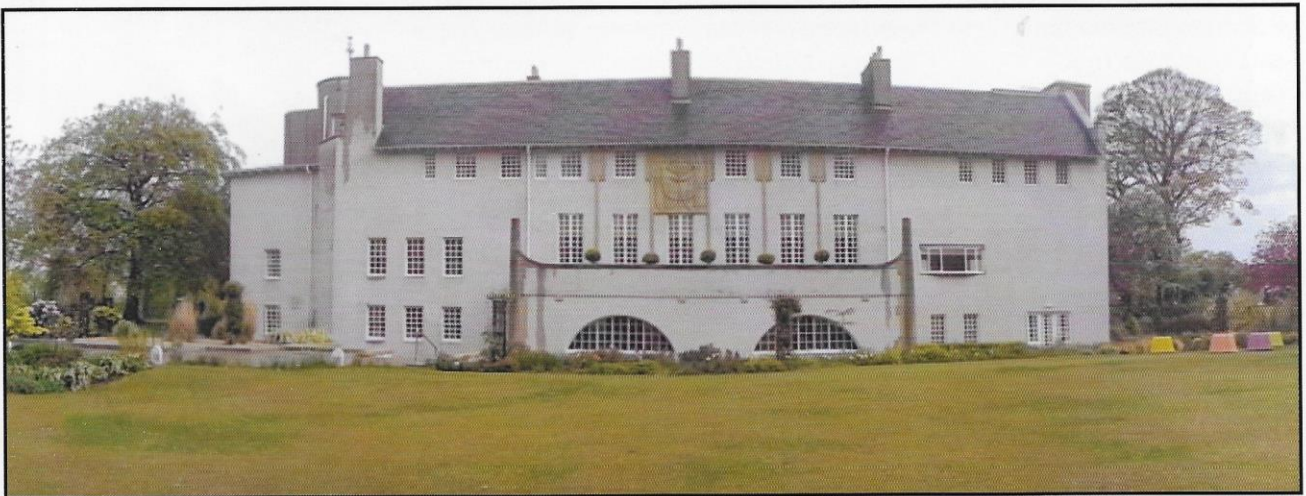


Out of control, the Second Fire spreads



All that remains is the shell of the devastated School of Art

MACKINTOSH'S GLASGOW HOUSE FOR AN ART LOVER **FROM "BUILDING SERVICES HERITAGE,"** **CIBSE HERITAGE GROUP, 2003**



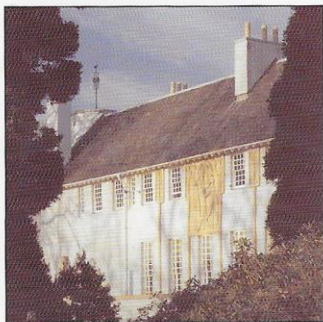
International prize-winning design of 1900 by architect Charles Rennie Mackintosh, who died in 1928, was built in Glasgow in 1996 where it stands as a tourist attraction, conference centre and art school.

HOUSE FOR AN ART LOVER, GLASGOW



Heritage Group Meeting in the Music Room

[l-r: Brian Roberts, Ian Stewart, Bob McWilliam, Stephen Loyd, Mike Barber, Laurie Wilkins. Paul Yunnie took the picture.]



Elevation

**House for an Art Lover, Glasgow,
designed 1900, built 1996**

In 1900, the Vienna magazine *Zeitschrift für Innendekoration* announced a competition for the design of a house for a connoisseur of the arts. No first prize was awarded, but Glasgow architect Charles Rennie Mackintosh won a Special Prize. He died in 1928, his house unbuilt. Then in 1988, Graham Roxburgh, a Glasgow Civil Engineer, took on the challenge of building the Mackintosh house. The story of the fund-raising and the many difficulties, which had to be overcome, are a story in themselves. The completed house stands in Bellahouston Park. It serves as a tourist attraction, conference centre and art school. The M&E engineer was Donald Smith Seymour and Rooley but the services are modern, as required for a public building. However, the decorative lighting is in the true Mackintosh tradition.



Entrance Hall

“House for an Art Lover,” book produced by Glasgow City Council and others, Glasgow, 1996.

Culzean Castle

Small Gas Making Plant

[HOMEPAGE](#)

During the 1800's the use of towns gas for lighting was becoming very popular and the aristocracy and landed gentry were keen to ensure that this new method of lighting was used in their own stately homes. Many stately mansions that were refurbished and modernised during Victorian times had their own small gas making plant built on the property.

The Heritage Group has for some time been trying to find a Stately Home in the UK which had managed to retain its original gas making and gas storing plant and equipment. Sadly our research has shown that most of the properties which once had their own gas making plant are now left with just the remains of the buildings, in varying states of dilapidation. The plant and equipment having been completely removed.

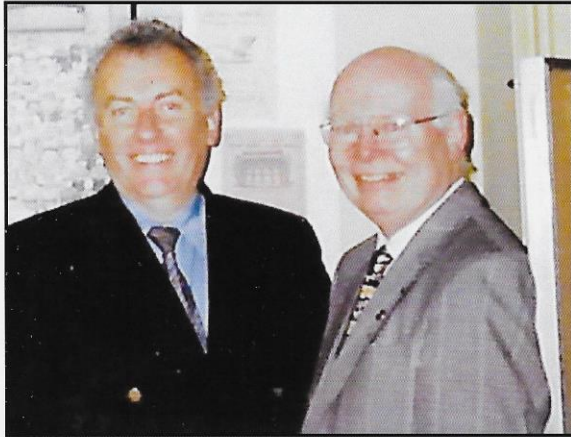
However, all was not lost. One stately home in Ayrshire, Culzean Castle now owned by the National Trust for Scotland who have completely restored the original buildings of the small gas making plant, which had slowly become derelict over the past 50 years.

The gas making plant was still in use up until the 1940's. The Castle was then connected to the local electricity supply network and the gas supply was then no longer needed.



IN MEMORIUM

We Remember Ian Stewart, 1939-2018

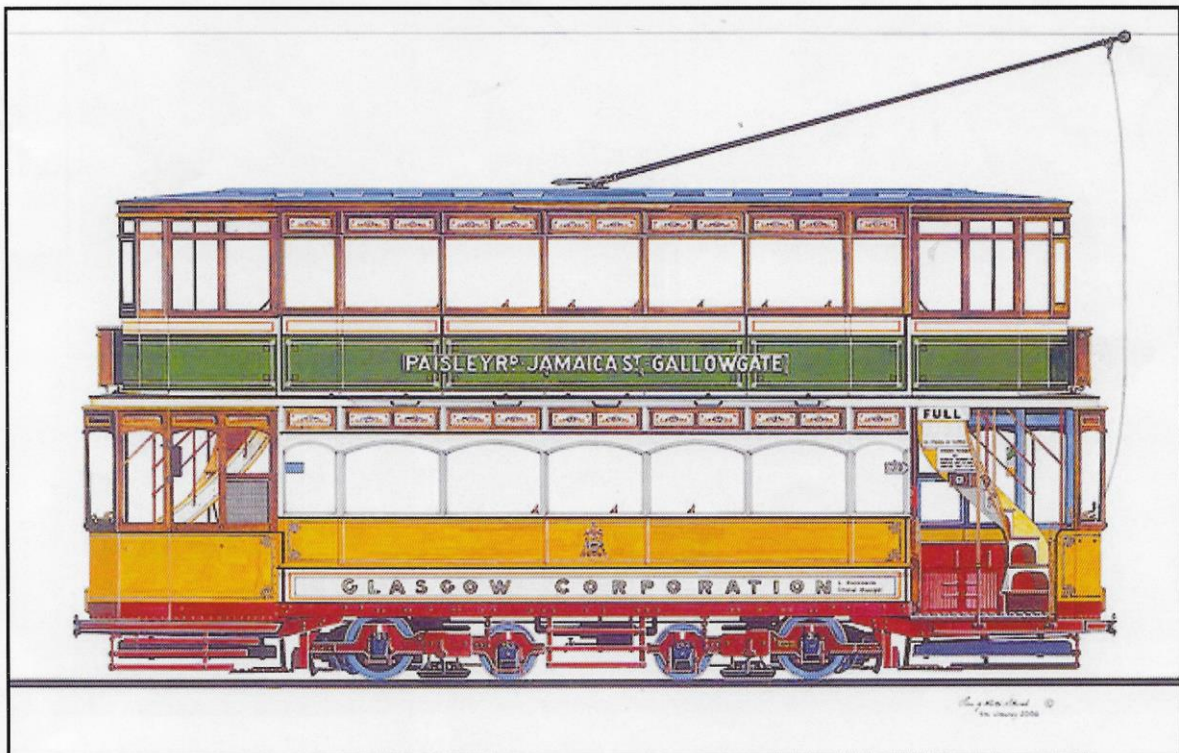


Ian (right) with Paul Yunnie at the Wiltshire Record Office



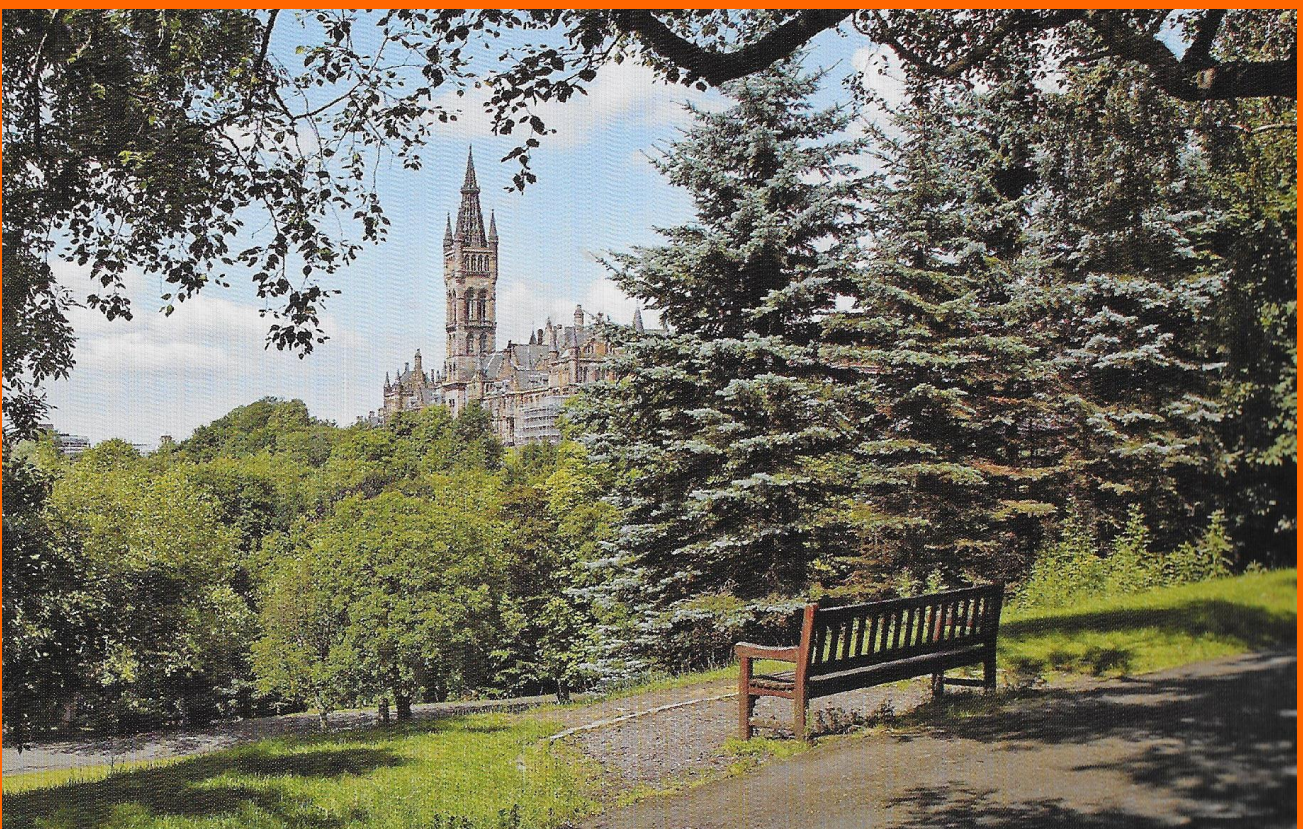
Ian (2nd left) at Glasgow's Mackintosh House for an Art Lover

Ian George McMurdo Stewart was born in Ralston, a suburb of Glasgow, the son of a Theatre Manager. He was educated at Glasgow High School and the London School of Economics. Though artistic by inclination, he joined building engineering services consulting engineers Donald Smith, Seymour & Rooley (DSSR), working there for 40 years. Upon retirement he worked part-time for 13 years with Health Facility Scotland. For over 20 years Ian represented the CIBSE Heritage Group in Scotland, served as Hon. Treasurer, regularly attended Committee Meetings in London and organised visits to heritage buildings in Scotland, including the Glasgow School of Art, House for an Art Lover and Culzean Castle. He was awarded the CIBSE Bronze Medal in 1996. However, Ian's main interest was the history of the tramcar, serving on various Tramway Societies, writing important books and producing exquisite line drawings, like the example below..



Glasgow Corporation Tramcar, 1920s serving Paisley Road, Jamaica Street, Gallowgate

THE UNIVERSITY OF GLASGOW CASE STUDY



3.2 The University of Glasgow, Gilmore Hill, 1866-70 Architect George Gilbert Scott

Since the 1996 CIBSE/ASHRAE Joint National Conference Paper [WWPV] on the works carried out by Phipson at Glasgow University, further details have been discovered, including an archive at the University containing correspondence [listed in Appendix C] with Phipson, and a number of construction drawings.

A contemporary account [TB.1870/966-7] notes the City of Glasgow Union Railway Co as landowner, but then comments that: "*The development of the University at its new imposing situation was dependent upon the purchase by a railway company of its original city centre site.*" (Was this a land exchange?) It cites William Hunter (sponsor) and in addition to G G Scott records W Conradi (architect). Though Phipson is not named, the report notes "*The clock towers housed a 'cold air chamber' to serve the ventilation system with an intake of fresh air.*"

Of the University Buildings, the architectural historian Curl writes [VA, 68] "*(the building)..shows how Scott introduced Bartizans and a Scottish flavour to his Gothic.*" He notes also "*The spire in the German Gothic style was added by John Oldrid Scott (his son) in 1887.*" There is another recent description [Walker's "Glasgow," entry 92]: "*Away from the downtown squalor, the new university adopted a double court plan that was similar, but more implacably symmetrical than, the layout of its medieval predecessor off High Street. Scott's Gothic could not, however, be described as collegiate: the scale is greater, the details harder, the style baronialized Flemish rather than Oxbridge Elizabethan. This is powerful High Victorian Gothic, machine-cut not crafted, iron and stone together.*"

In December 1865, G G Scott wrote to Professor Allen Thomson [GUA989b] requesting guidance on the choice of engineer for heating and ventilation. He referred to "Mr Rosser (successor to the late Mr Sylvester)" and to "Mr Phipson as the agent for Van Eyck's (sic) system of forced ventilation by fans, as used in France."

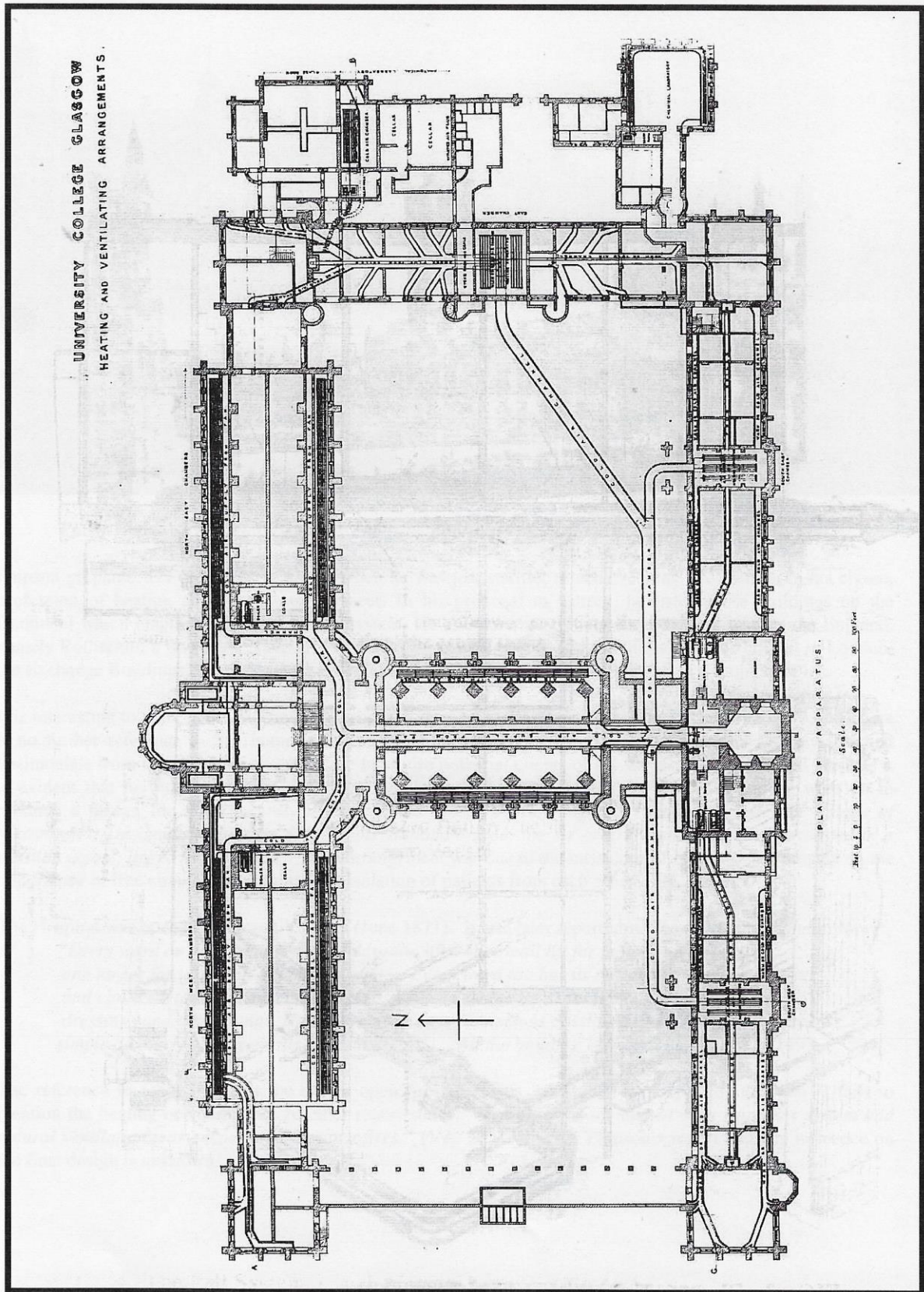
John Sylvester (1798-1852) had developed the heating business left to him by his father, Charles (1774-1828). The father had worked for Wm Strutt at his Derby Foundry, had helped develop the "cockle" stove, and had worked on the pioneering heating scheme for Derby Infirmary. Samuel Egan Rosser (1821-1877) continued the business, later being joined by Joseph Russell (1866-1927), formed the well-known contracting firm of Rosser & Russell.

Scott really meant the forced ventilation system of Dr Van Hecke, with whom Phipson had trained on the continent. This is the only reference so far found referring to Phipson as the agent for Van Hecke's system, though this may be inferred from a write-up on the National Provincial Bank of England in London's Bishopgate [TB.1864/909] where both Phipson and Van Hecke are credited with carrying out the ventilation.

The University decided that adequate ventilation and warming of this new complex of buildings was to be a priority. A committee of Professors was set up to deal with this. It included many eminent scientists and engineers, notably William John MacQuorne Rankine (of the Rankine Cycle for heat engines) and Sir William Thomson (later Lord Kelvin, who gave his name to the absolute temperature scale.)

Phipson was selected to design a scheme to conform to the learned Committee's numbered requirements which included:

- "No.5 *The fresh air should be supplied hot and cold and each class room be provided with a means of using it.*
- No.9 *The fresh air (for the building) should be drawn from some place where the air is always pure.*
- No.10 *The fresh air should be forced in by one or any required number of suitable machines."*



27. Plan of the Heating & Ventilating Arrangements, Glasgow University, 1866-70 [WWPV, 55]

Phipson's system was vast to match the scale of the buildings it serviced. The air for the entire complex travelled from inlets at the top of the central clock tower to a plenum chamber and was then sent on its way to the far corners of the complex using a steam-driven fan (described as screw-type) of 7 ft 6 in diameter via a network of subterranean passages radiating outwards to a number of heating chambers where the air was heated by gravity-fed hot water pipe coils, each set of pipe coils having its own adjacent Cornish boiler. The warm air then continued through more shafts to supply the lecture theatres, laboratories, and various other rooms.

Air was extracted from the spaces using upcast shafts heated by a concentric boiler flue. Thus the supply air supply relied on mechanical ventilation while heat generation was diversified in a large number of local boilers scattered over the complex. There was no mechanical extract, the exhaust air to atmosphere being heat-assisted. Much of Phipson's system remains in place, though now disused.

Phipson's design met the Committee's No.9 & 10 requirements to the letter. However, significantly, it did not satisfy No.5. The resulting system met with mixed reactions. We know that Phipson experienced various difficulties during the duration of the project. In 1867 Phipson experienced delays in finalising his contract [GUA1051 & 1059]. He had problems in controlling alterations and rising costs [GUA1056 & 1143]. He was also relatively inexperienced when he took on the project. Examination of Phipson's operating booklet "Ventilation and Warming: Rules & Regulations: University of Glasgow, 1871" [PC/19] suggests a methodical and clear approach to engineering problems. Perhaps the problem was a design by Committee. Certainly most of his other projects appear to have been relatively trouble-free, although he is known to have lost £1,000 of his own money (a considerable sum in those days) in connection with his work at Liverpool's Royal Infirmary. [WWP, 14]. In spite of this, in 1874 the University awarded him the contract for the "Management and Working of the Heating and Ventilating Apparatus of the University," for £255 per year [GAU3865, reproduced in Appendix-C].

The controversy boiled up again when Phipson delivered his paper "Heating and Ventilating, Glasgow University," to the Institution of Civil Engineers [ICE Minutes of Proceedings, Vol.55, 1878, 114-72. See PC/3 in Appendix-B]. He reviewed the then current theories of ventilation and heating and followed with a detailed description of the system. He concluded his paper by stating,

".....this application has given general satisfaction and is probably the best arrangement that could have been adopted under the circumstances. The successful issue is certainly attributable, in a great degree to the persevering labours of the eminent Professors, who formed the Ventilating Committee and to the Architect, the late Sir George Gilbert Scott, RA."

The paper generated a heated discussion, opened by Professor James Thomson, Professor of Civil Engineering at the University and elder brother of Lord Kelvin. He clearly indicated he did not subscribe to the view that the system was satisfactory and said, "The arrangements for carried out for warming and ventilation of Glasgow University were to be regarded as only in a moderate degree successful. They were far from admitting of being contemplated with satisfaction." Thomson continued by describing some performance tests he had carried out, "in consequence of great complaints as to the ventilation of some of the crowded classrooms."

This was followed by a succession of contributors who roundly criticised Phipson's system. One claimed the scheme was grossly expensive to build and run (though Phipson was apparently running it for £255 per year). Another remarked that a system which tried to centrally heat by warm air as well as ventilate was inherently unsatisfactory. Further, Phipson was informed that he had used the wrong type of fan! A Mr Imray who claimed to have worked with the ventilation pioneer, Dr David Boswell Reid (1805-63) on St George's Hall, Liverpool, suggested that Phipson's arrangements for admitting air to spaces was "worse than useless." A parallel may be drawn with Reid, whose heat-assisted ventilation for the House of Commons turned into a running battle with the architect, Sir Charles Barry, and was never satisfactory. By comparison Reid's mechanical ventilation scheme for St George's Hall, where he had the co-operation of the architect, Harvey Lonsdale Elmes, and then Professor C R Cockerell, was a masterpiece for its time.



29. Sir G G Scott's Design for the University of Glasgow with his Proposed Tower (redesigned by his son, John Oldrid). Note the smoke from the heated exhaust ventilation shafts [MM, 135].

The discussion did contain sentiments in support of Phipson, pointing out that he had only been trying to follow the University's specifications and that he had come late to the job when many of the architectural details were already fixed. However, from a modern viewpoint Phipson made a serious error of judgement. Quite simply, the standard Van Hecke system could only provide simultaneous thermal comfort to all the various spaces served if they had similar heat loss and gain profiles. With a mixture of crowded and empty lecture rooms this was not the case. The Committee's requirement No.5 for a supply of hot and cold (unheated) air to each classroom (with the inference that room temperature could be adjusted by hot and cold air damper control) was not met. Whether this was part of a cost-cutting exercise is unknown. Certainly, Phipson learned a hard lesson, for in his later heat-assisted ventilation scheme at the Natural History Museum, he provided both hot and cold air ducts and mixing devices.

[GAU3865] Agreement of 10 December 1874 between the University of Glasgow & Wilson W Phipson

The University of Glasgow

*Heating & Ventilation
Agreement for Working Apparatus*

Dec 10, 1874

*Wilson W Phipson
Engineer*

*1, Salisbury Street
Strand, London W.C.*

*Agreement between the Senate of the University of Glasgow and Mr Wilson W Phipson
Engineer of 1 Salisbury Street Strand, London, W.C. for the Management and Working of
the Heating and Ventilating Apparatus of the University Buildings Glasgow*

-
- 1st. *The Apparatus for Heating and Ventilating the Classrooms to be at work from the beginning of the session in October till its end in April.*
 - 2nd. *The Libraries and Museums Apparatus to be at work a longer period should it be required but not after the 30th day of June.*
 - 3rd. *The temperature of the building to be maintained in accordance with table of temperatures submitted in Report dated April 8th 1872 subject to future modification by the Senate or its Committee.*
 - 4th. *The amount of Fresh air supplied by the Fan to be equal to six times the Cube of Class Rooms in the hour.*
 5. *The terms of Contract to run from the 1st day of May 1875 and to terminate on the 30th April of any Year on notice being given by either parties before the 1st day of January preceeding (sic).*
 - 6th. *In event of notice being given by either party Mr Wilson W Phipson to give such instructions to the person or persons who are deputed by the Senate or its Committee to have the future management of the Apparatus after termination of the Contract.*
 - 7th. *Mr Wilson W Phipson to visit the Apparatus twice a year during his term of Contract and when specially summoned by the Senate or its Committee.*
 - 8th. *When the Senate or its Committee require any repairs or alterations connected with the Trade of Engineer they can be done free of cost as regards labour by Mr Wilson W Phipson's Working staff on due notice being given to him. Such works except in urgent cases to be done out of the Working Session.*
 - 9th. *At the termination of this Contract the Apparatus to be left in sound working order, fair allowance being made for ordinary wear and tear, at inspection of competent person or persons mutually selected or named for this purpose.*

- 10th. *The Annual Sum to be paid by the Senate to Mr Wilson W Phipson for Engineer and Stokers wages and general supervision to be Two Hundred and Fifty-Five Pounds £255. 0. 0*
- 11th. *This sum to be paid in two equal instalments of One Hundred and Twenty-Seven Pounds Ten Shillings each. £127. 10. 0 on the tenth day of May and tenth day of December of each year. The first half yearly instalment to be paid on the tenth of December 1875.*
- 12th. *The change of Coals for firing up the Apparatus to be at the rate of 350 Load per Annum obtained at the best market price and paid to the Coal Contractor by the Senate.*
- 13th. *The quality of Coals used to be Tripping and Dross in the proportion of one to two.*

(signed) *Wilson W Phipson*
1 Salisbury Street
Strand
WC

Dec 10/74

Signed in the presence of
William Pelly

[The witness, William Pelly, was Phipson's Assistant.

Regarding the Agreement: by comparison, the cost of the heating maintenance staff for the Natural History Museum, using the information given in Sect.3.2, works out to £712. 4. 0 per annum, and excludes any fee for Phipson. It looks like the Senate got themselves a very good deal.]

GEORGE SQUARE



GLASGOW CATHEDRAL c.1870



BARONY CHURCH c.1855 DEMOLISHED 1886



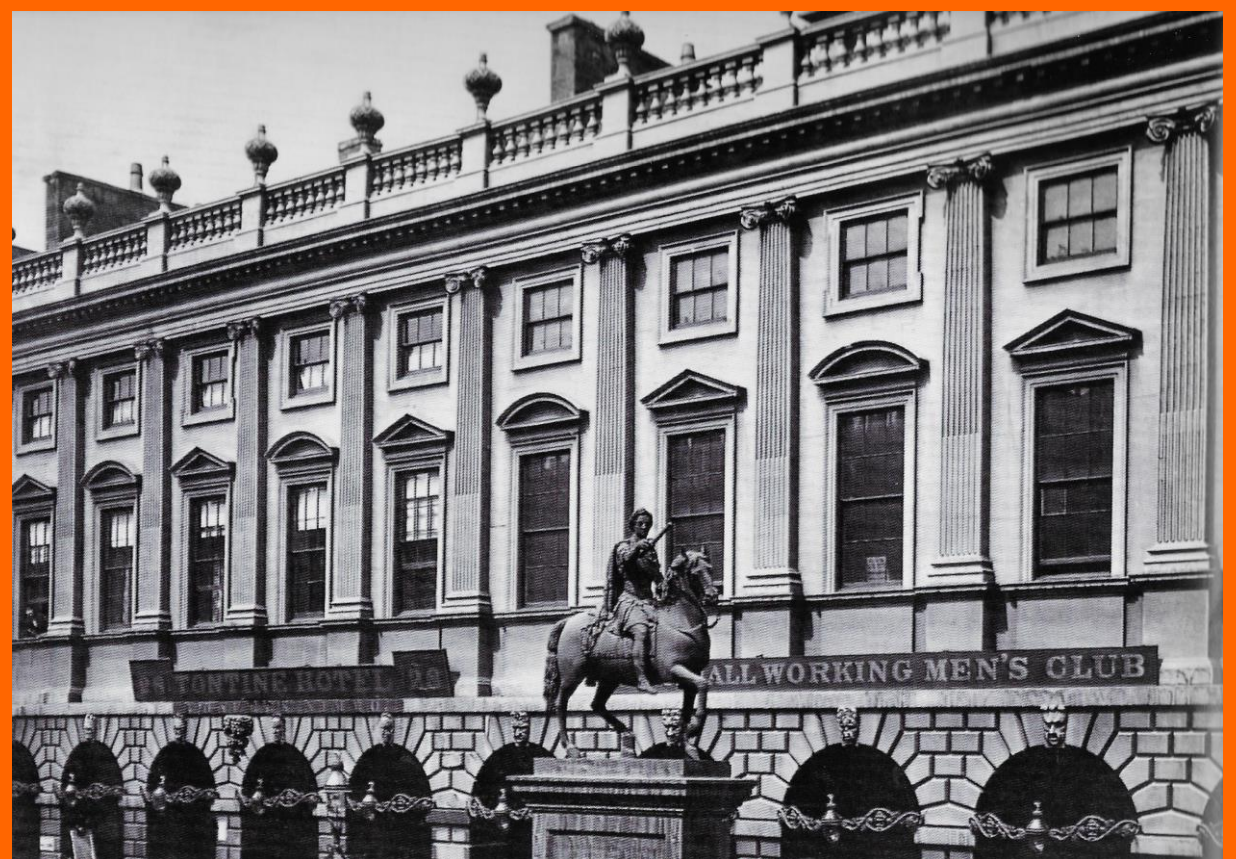
ROYAL INFIRMARY



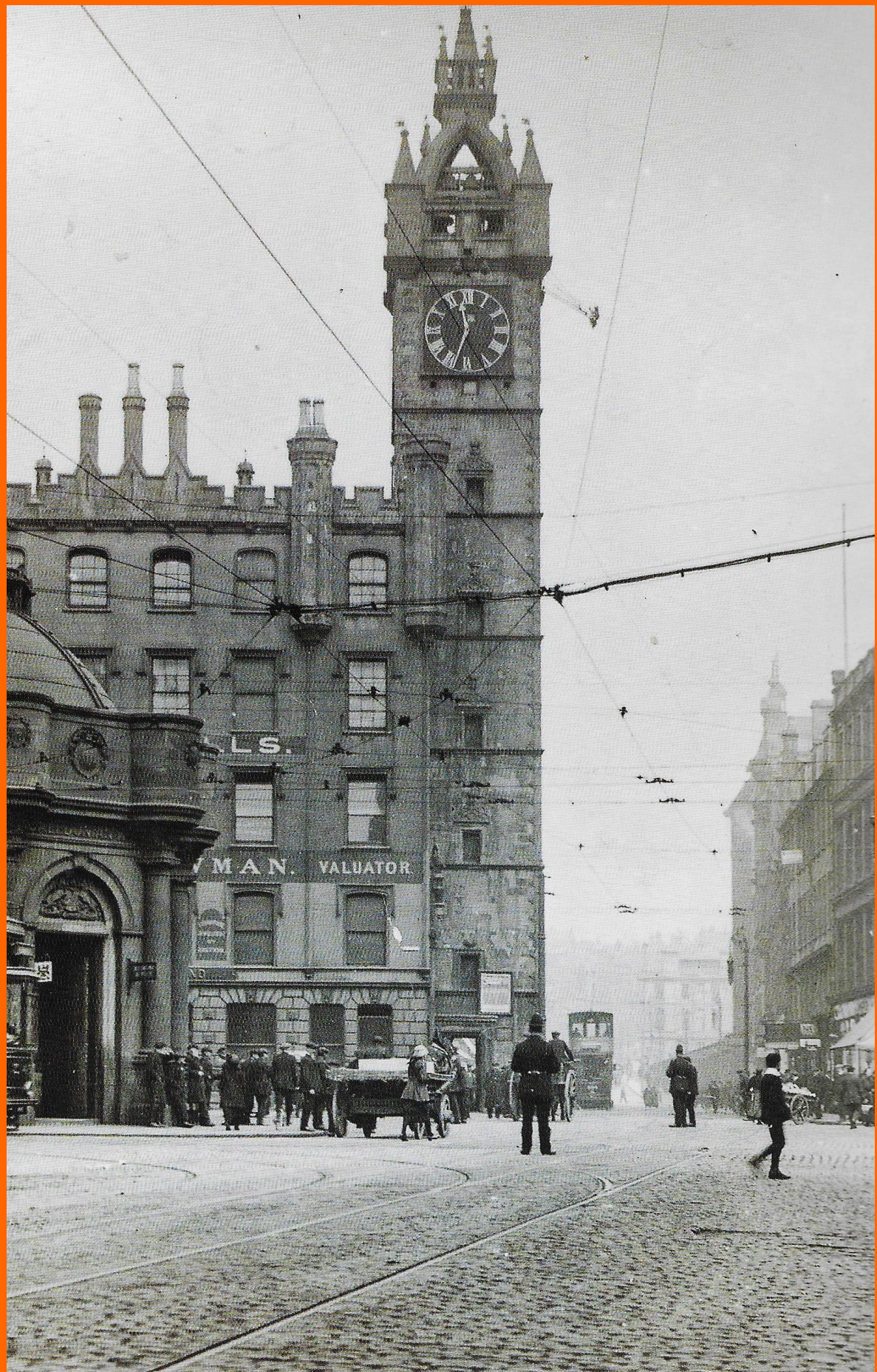
OLD COLLEGE, GLASGOW UNI, c.1865



TONTINE HOTEL c.1865



TOLBOOTH STEEPLE c.1915



ST. ANDREWS CHURCH c.1925



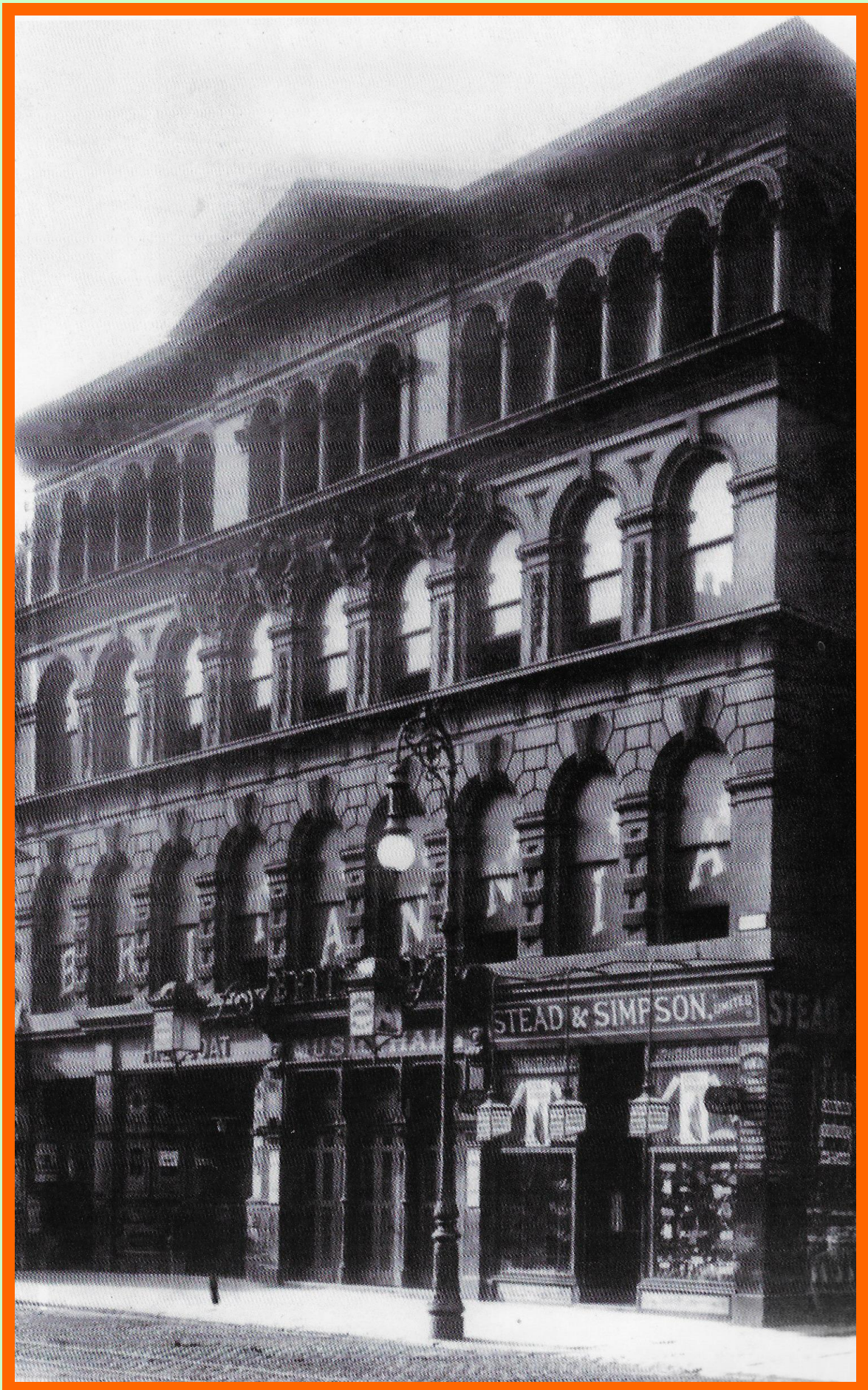
SALTMARKET c.1885



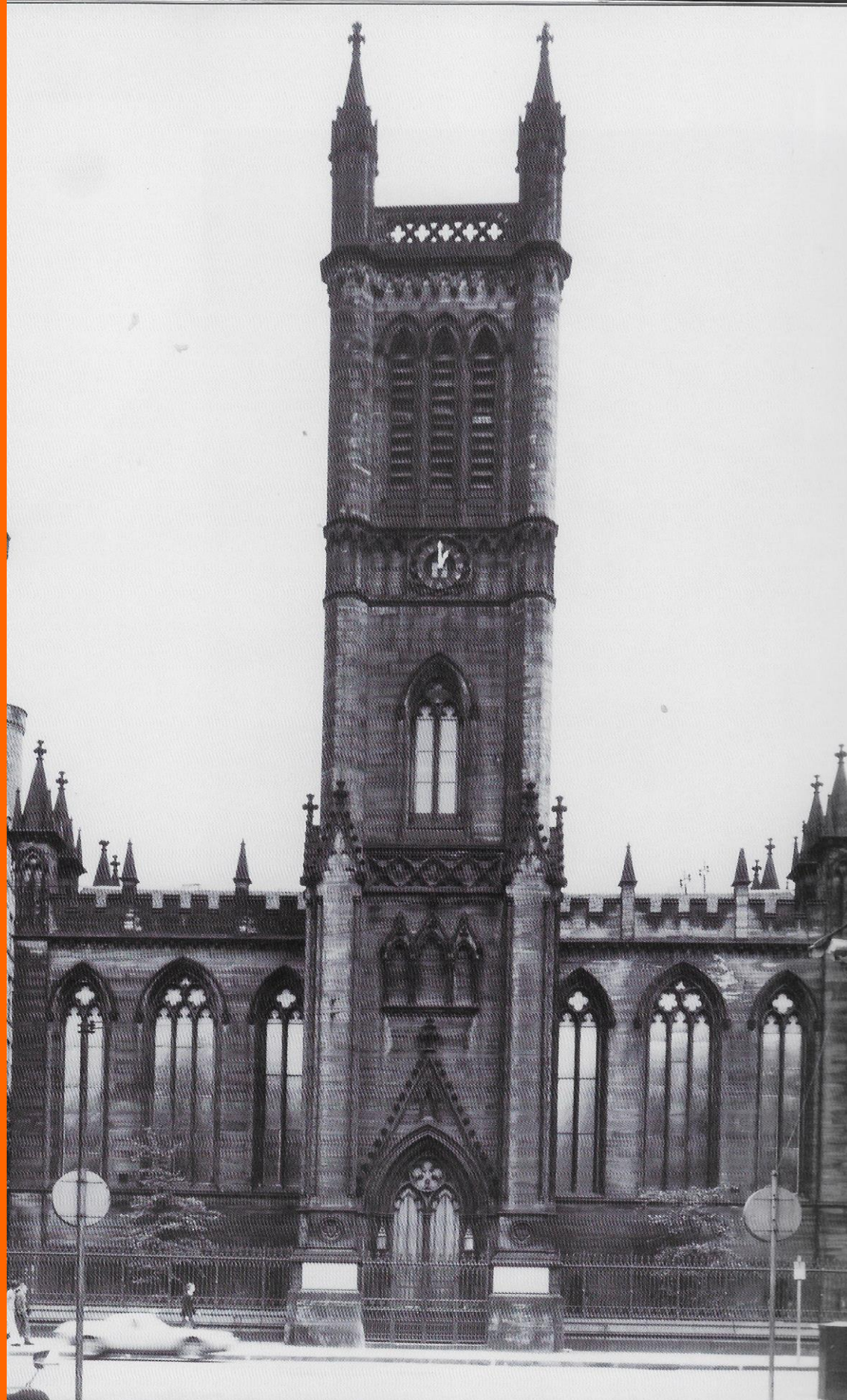
TRONGATE c.1888



BRITANNIA MUSIC HALL c.1892



RAMSHORN CHURCH 1975



HUTCHESONS HALL c.1955



TRADES HOUSE c.1952



ROYAL EXCHANGE SQUARE c.1920



ST. VINCENT PLACE c.1895



ARGYLE STREET 1920



ST, ENOCH STATION AND HOTEL c.1890



BUCHANAN STREET 1901



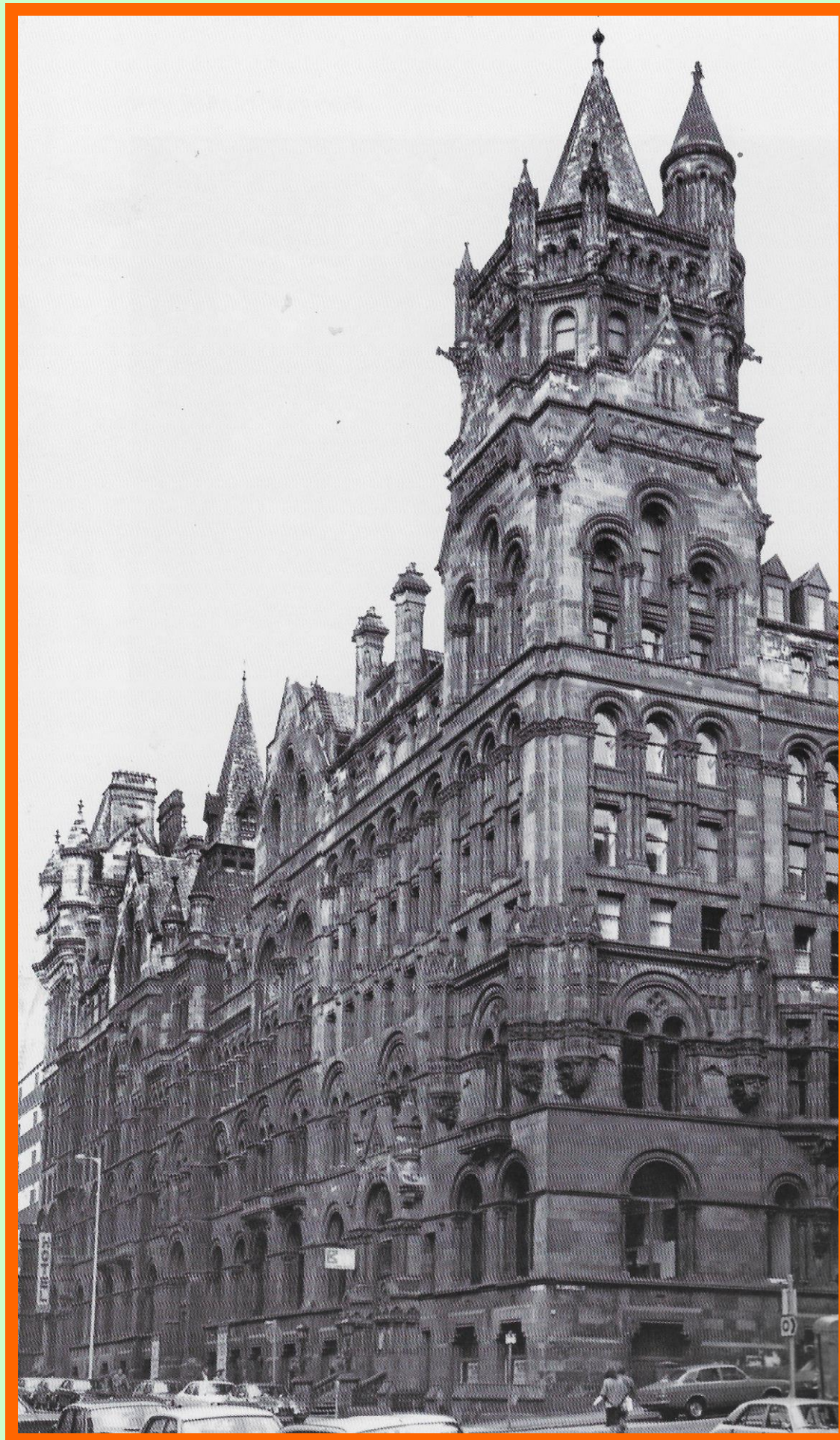
JAMAICA STREET c.1885



CA-D'ORO BUILDING c.1874



CHRISTIAN INSTITUTE & YMCA c.1975



THEATRE ROYAL c.1925



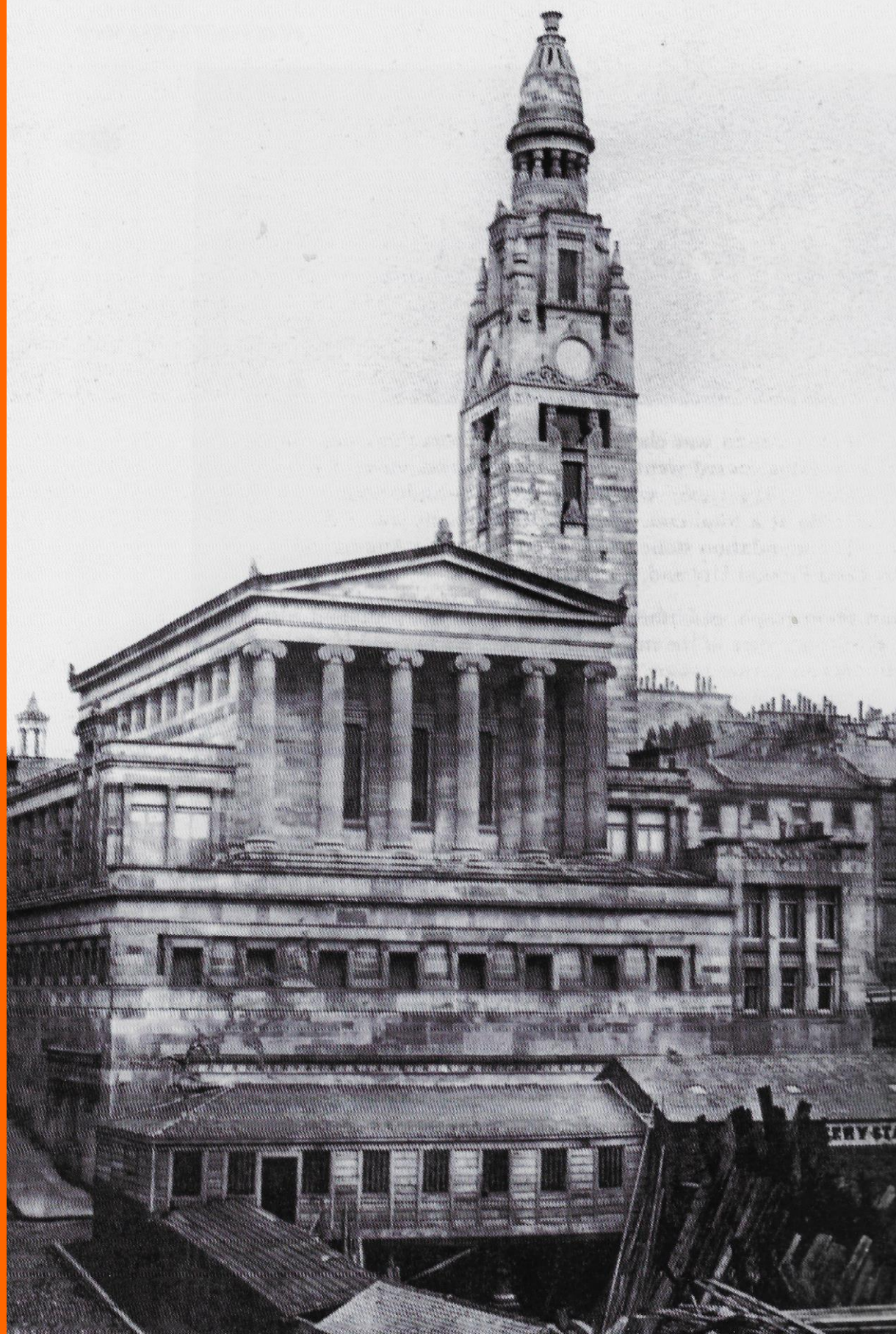
SAUCHIEHALL STREET 1878



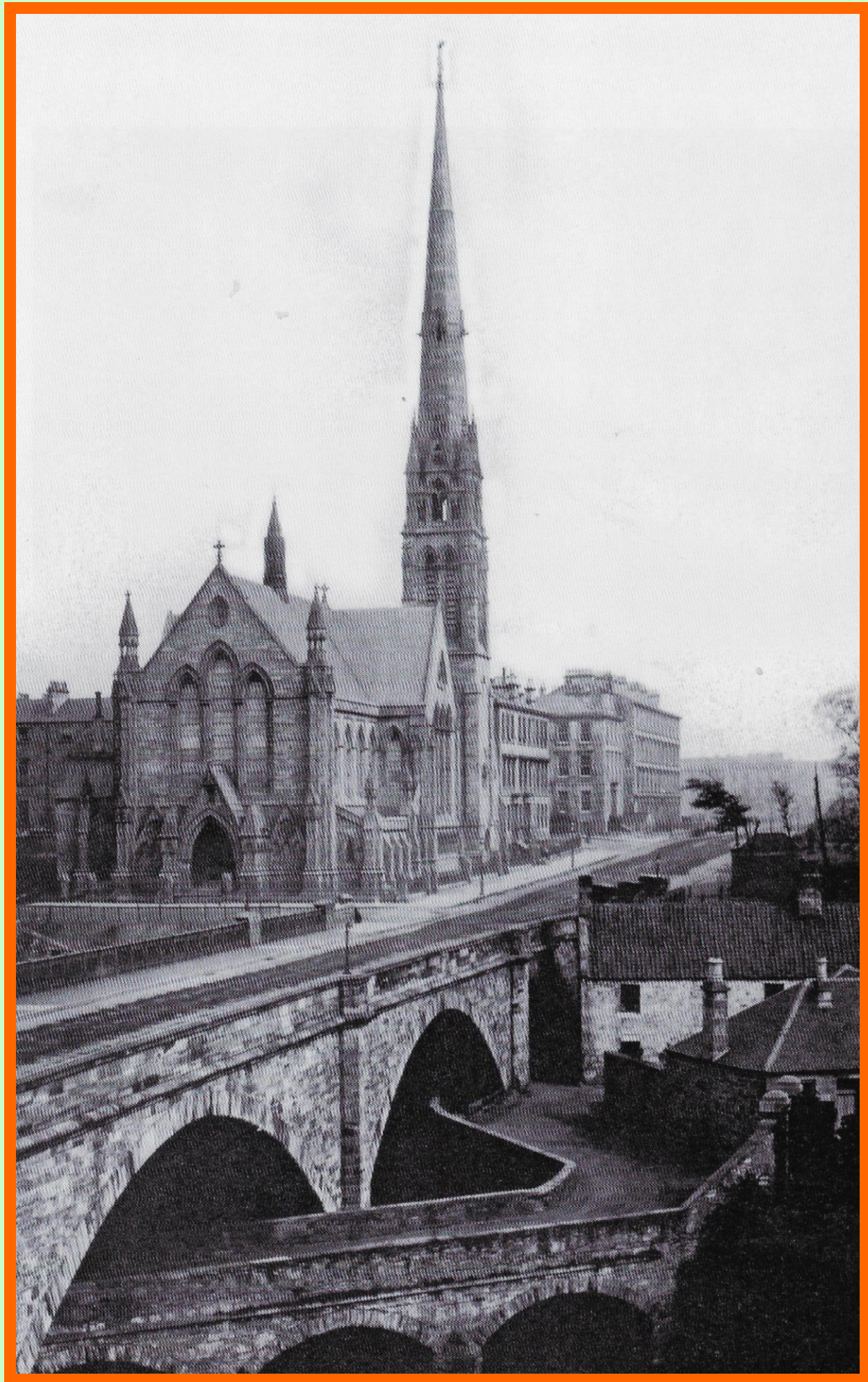
KELVINGROVE GALLERY & MUSEUM 1901



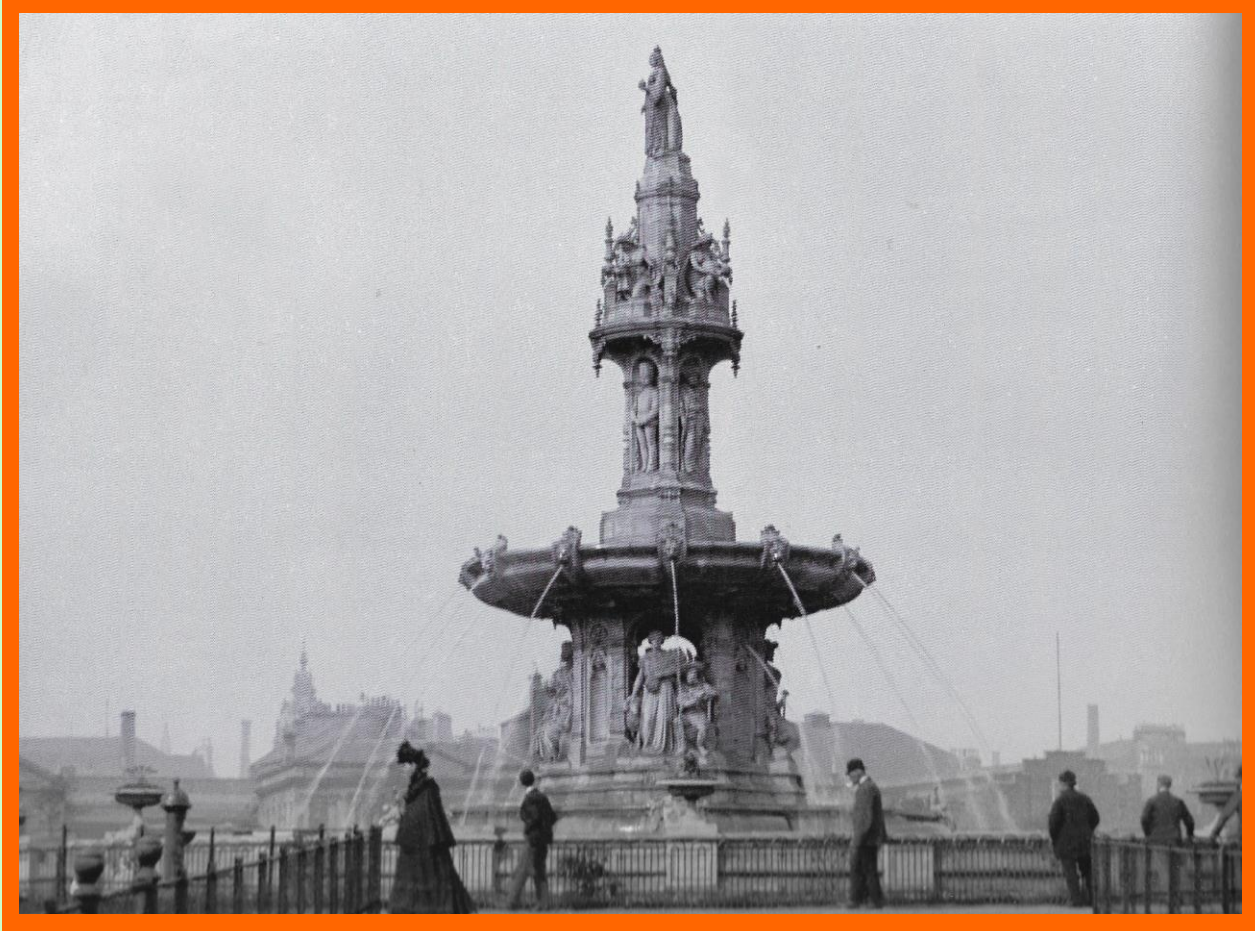
ST. VINCENT CHURCH c.1875



KELVIN BRIDGE c.1858



DOULTON FOUNTAIN 1891



TEMPLETON'S CARPET FACTORY 1900





Glasgow School of Art: Built East End and Entrance 1897-99, West End 1907-09.

GLASGOW

REFERENCES

2006 Wilson Weatherley Phipson: Victorian Engineer Extraordinary 1838-91, Brian Roberts, CIBSE Heritage Group/ English Heritage.

2013 Glasgow: Then and Now, Carol Foreman, Pavilion Books, London.

FURTHER READING

1892 Wilson Weatherley Phipson 1838-91, A Memoir.

1989 Mackintosh's Masterwork: The Glasgow School of Art, Wm. Buchanan (Ed), Chambers.

1994 The Builders Illustration Index 1843-1883, Richardson & Thorn, Builder Group with The Institute of Historical Research, University of London, Guildford.

1996 W.W. Phipson MICE, The Evolutionary Work of a Victorian Building Services Engineer, J.M. Barber, CIBSE/ASHRAE Joint Conference.

Original hand-written and printed Phipson Documents are held in the CIBSE Heritage Group Archive located in the Architecture Library, The Bute Building, Cardiff University.

Other similar documents are held by the Institution of Civil Engineers and the University of Glasgow.