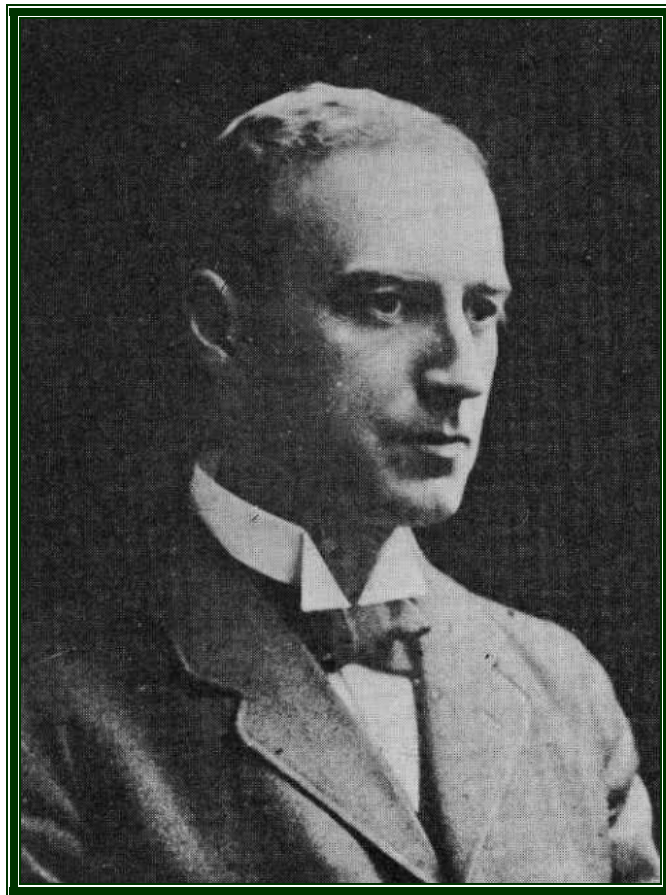




**WALLACE CLEMENT WARE
SABINE
1868-1919**



Acoustics Pioneer

Wallace Clement Ware SABINE

1868-1919

American physicist and pioneer in acoustics. Graduated Ohio University (1886). Worked at Harvard where he was appointed a Professor of Physics (1905). Began his acoustical studies (1895) when asked to investigate the excessive reverberation in a new lecture room. He even photographed sound waves using light refraction techniques. Sabine founded the science of architectural acoustics and developed methods of calculation. Boston Symphony Hall (1900) designed according to his principles was a great success. He measured the acoustic absorptivity of many materials. "He found that the duration of the reverberation multiplied by the total absorptivity was a constant and that this constant varied in proportion to the volume of the room." Now known as *Sabine's Law*, this forms the basis for the architectural design of "acoustically useful rooms."

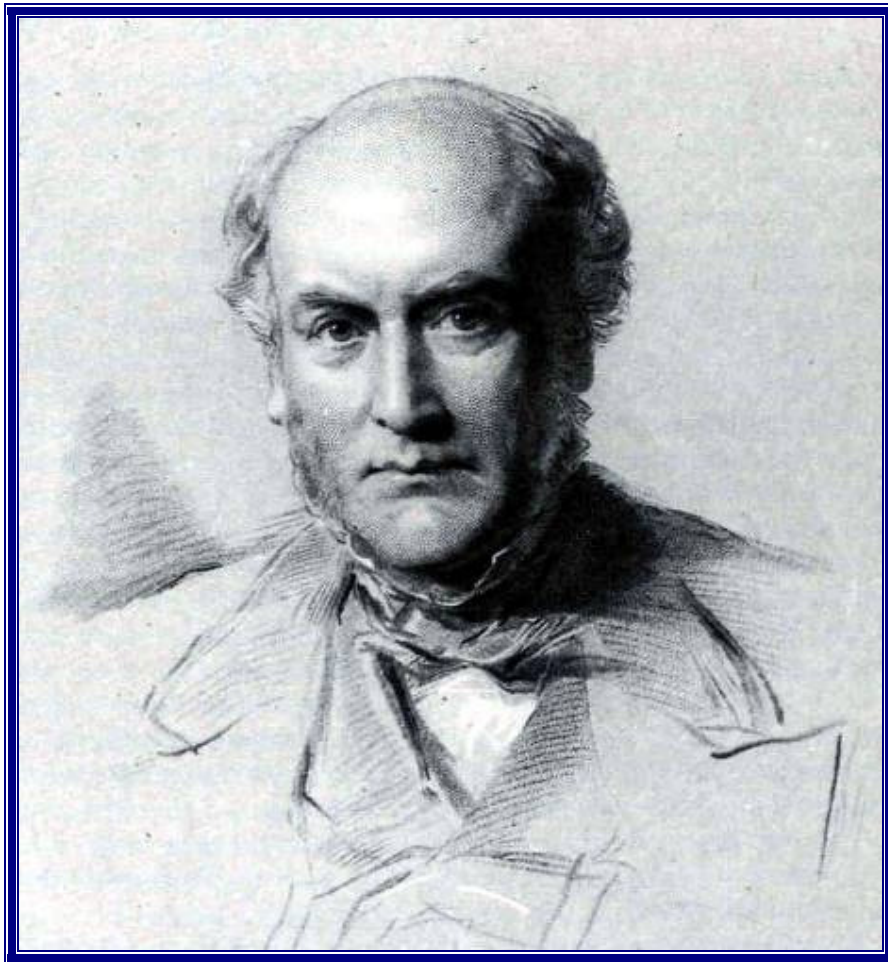
(Mini-biography from CIBSE Heritage Group Records)



Symphony Hall, Boston, 1900 (Sabine)



Sir GEORGE GILBERT SCOTT
1811-1878



Leading Victorian Architect

[193] Sir George Gilbert SCOTT

1811-1878

English architect. Worked in the Gothic style: Albert Memorial (1864), St. Pancras Hotel (1865), both in London. Also, the University of Glasgow (1870), where the extensive ventilation and warming systems were designed by Phipson [203] to a brief established by a learned Committee, which included Rankine [164] and Kelvin [168]: "No. 9. The fresh air should be drawn in where the air is pure. No. 10. The fresh air should be forced in by one or any required number of suitable machines." The scheme used a central plenum chamber with a massive network of subterranean passages and heating chambers and upcast air extraction shafts. It was not a success because it did not satisfy Rule No. 5, where the committee had requested individual temperature control by hot and cold supply air mixing for each room.

(Min-biography from "The Comfort Makers," Brian Roberts, ASHRAE, 2000)



Glasgow University (postcard)

UNIVERSITY OF GLASGOW.

VENTILATION AND WARMING.

RULES AND REGULATIONS

FOR

MANAGEMENT OF APPARATUS,

AS DIRECTED BY

MR. WILSON W. PHIPSON,
ENGINEER.

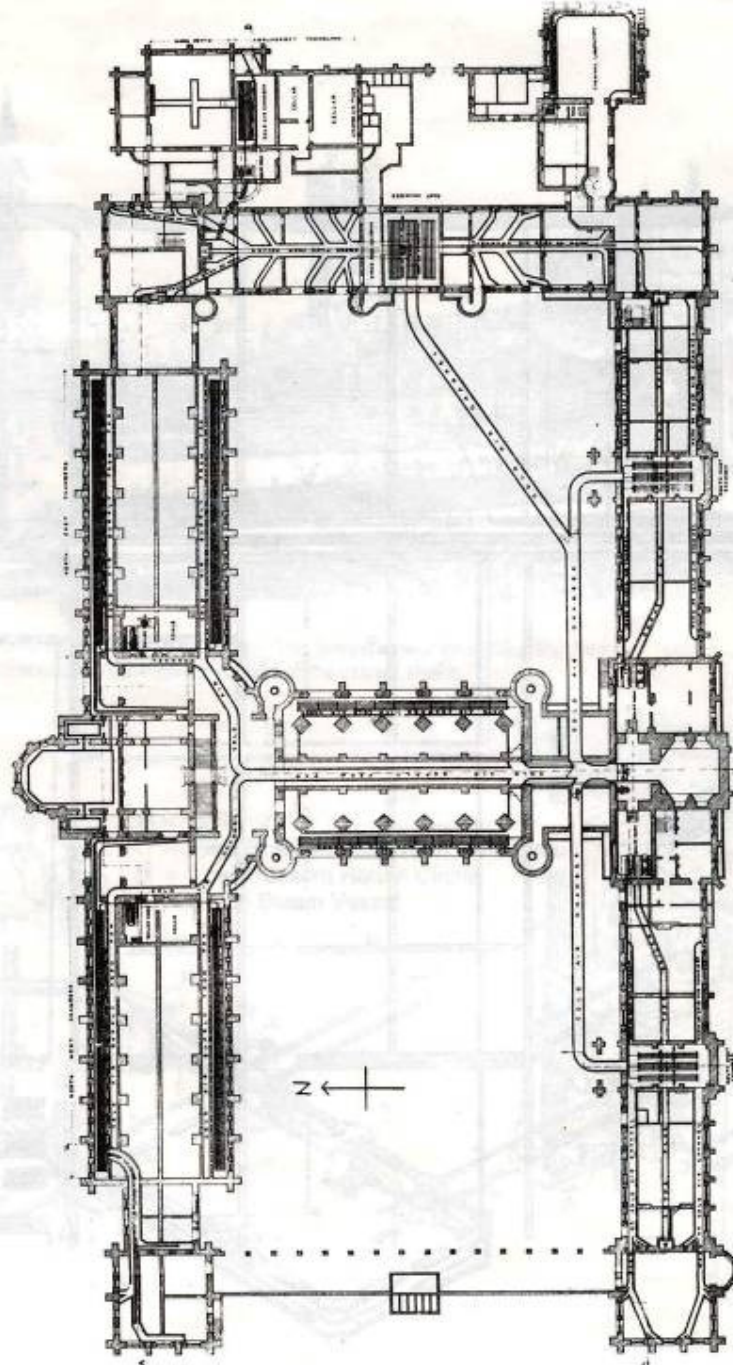
GLASGOW :

Printed at the University Press,
By GEORGE RICHARDSON, 55 GLASSFORD STREET.

MDCCLXXI.

1871 (CIBSE Heritage Group Collection)

UNIVERSITY COLLEGE GLASGOW
HEATING AND VENTILATING ARRANGEMENTS



PLAN OF APPARATUS
Scale
1/4" = 1'-0"

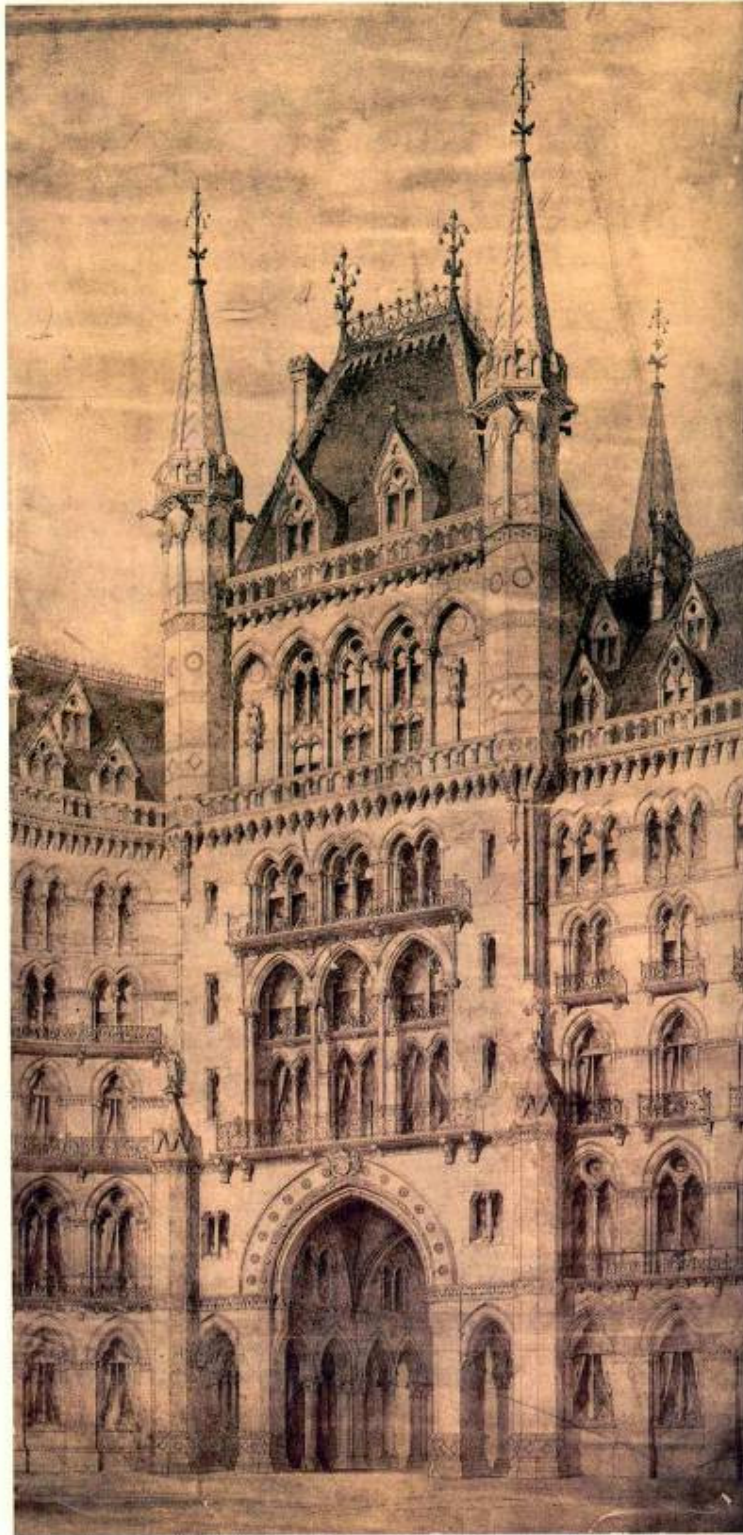
Fig 2 Glasgow University - Plan showing Van Hecke system

(From "W W Phipson MICE: the Evolutionary Work of a Victorian Building Services Engineer," J M Barber, Hon Secretary CIBSE Heritage Group)



ST. PANCRAS CHAMBERS
formerly
THE MIDLAND GRAND HOTEL

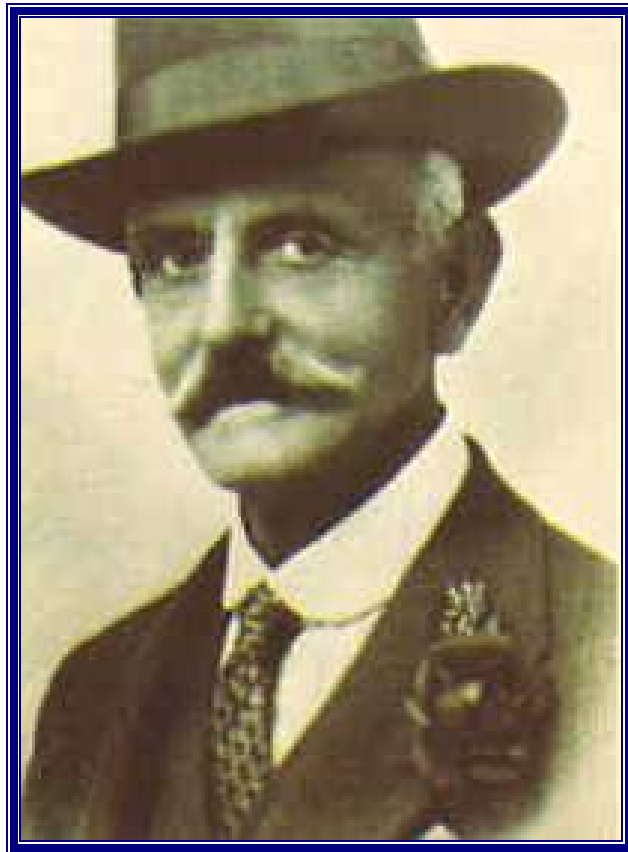
(CIBSE Heritage Group Collection)



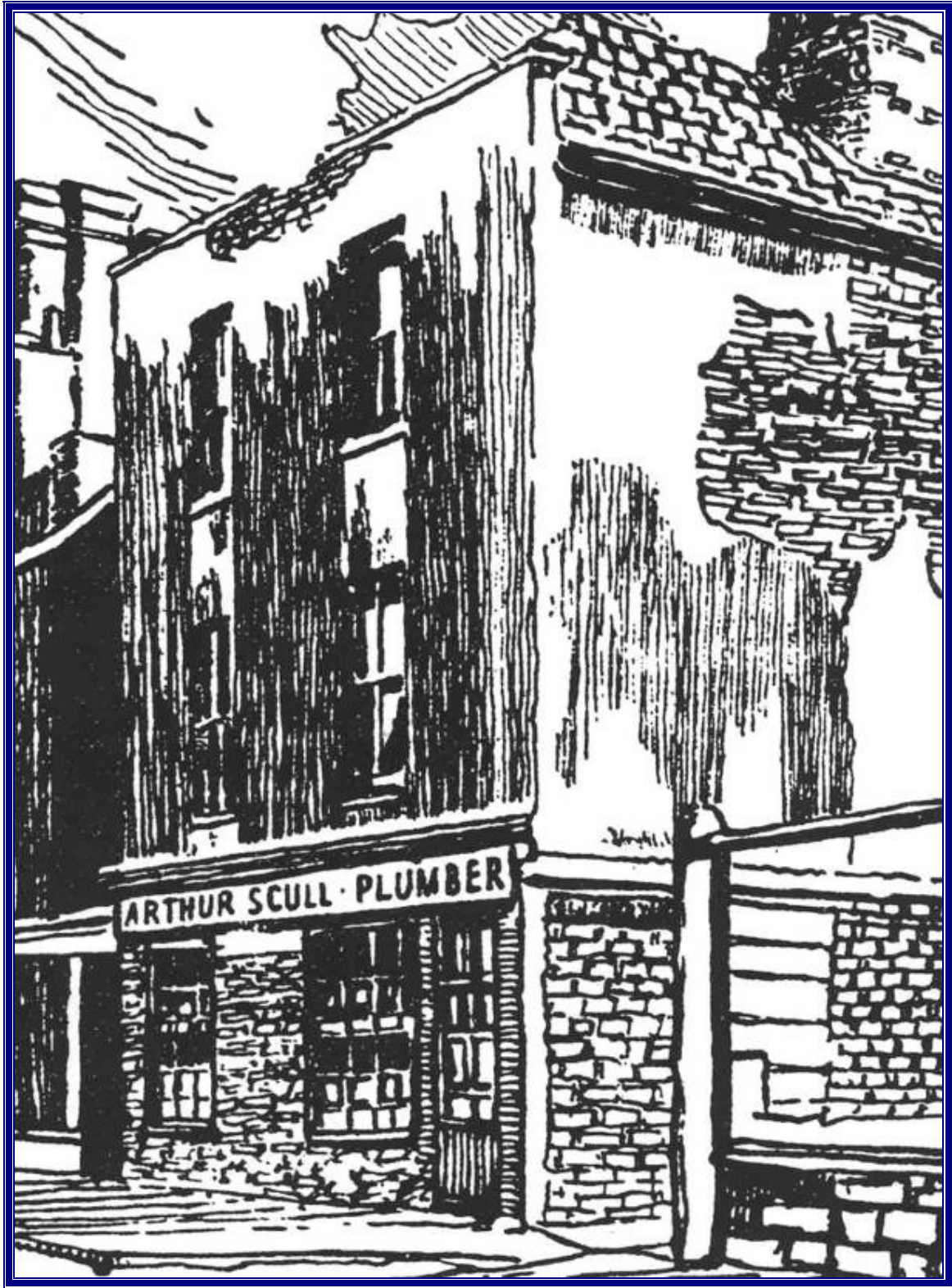
SIR GEORGE GILBERT SCOTT'S DESIGN
FOR THE CENTRAL TOWER



ARTHUR SCULL 1860-1929



Those who knew Arthur Scull personally recalled his cheerful temperament and his well-dressed appearance – with his jauntily placed hat and malacca cane. But most remembered his incredible drive, enthusiasm for work and restless energy.



The original premises in Milk Street, Bristol, 1881



A history of Drake & Scull

Past & Present

A Company History, 2000 (CIBSE Heritage Group Collection)

Arthur Scull

Arthur Stanley Scull was born in Bristol on June 7th, 1860, the son of a pork butcher and one of 11 children. The Sculls were not a wealthy family and when the boy reached the age of 14 he was apprenticed to G.F. Tuckey, a master plumber.

Bristol was experiencing a strong commercial revival and a rapid increase in population. The Electric Revolution was not the only one that began towards the end of the nineteenth century. The start of the industrial era, with its consequent concentration of populations into towns and cities, created new problems concerning the supply of water and the disposal of human waste. The authorities had largely ignored these problems for decades. When Arthur Scull started his apprenticeship only one house in three in Britain had piped water and many areas were still served by the communal pump.

A number of cholera epidemics killed tens of thousands, mainly those from the slums of Victorian Britain. But it was only after the Prince Consort was struck down with the disease in 1861 that Parliament passed a series of sanitary acts.

Improvements were made, but slowly. When Arthur Scull received his indentures in 1881, the sewage system was still in a terrible state. The old brick drains were too large to be self-cleaning, some ran uphill or through right angled joints. There were waste pipes that were flues for sewer gas, unventilated soil pipes, untrapped fittings, drain vents near windows and pipes so rotten that they 'crumbled like shortcake'.

Once Arthur had finished his apprenticeship he could have earned good money with his master, Tuckey, or with any other well established plumber in Bristol. But Arthur was not only a first class artisan, he was also a young man of remarkable business acumen.

In the 1880s in Britain there was a great deal of money about and more was being spent on the home. There was no better way of impressing one's friends than to possess a bathroom – in fact for the first time ever, houses were being designed and built with one room especially for the bath. All this meant that there was a big demand for good quality plumbing work. Arthur had saved the sum of ten guineas during his apprenticeship, and in 1881 he rented small premises in Milk Street, Bristol and set himself up as a Master Man.

Arthur Scull served his apprenticeship during a period when the function of the plumber was changing. For centuries plumbers had worked with lead, fixing guttering and flashings on roofs and covering wooden boxes with lead to make cisterns and sinks. From the middle of the nineteenth century onwards, plumbers began using other materials and developed additional skills, such as making and fitting iron pipes. In those days each bend, elbow, branch, cross, cup, socket and tee had to be made by the man on the job.

Arthur divided his time between his workshop and job site during the day and attended to his accounts in the evenings. On slack days the plumbers were put to work in the Milk Street workshop making lead soil bends and guttering from sheet lead. It was during this year that Arthur Scull took on his first apprentice, William Rudman, the son of a Bristol lamplighter.

The exceptionally high standard of Arthur Scull's 'sanitary engineering' soon became well known in Bristol. Within five years of starting he was employing two plumbers and their mates and taking on a wide variety of other work. This included lead roofing, piping for gas supplies, bell-hanging and hot water supply.

In 1889, Arthur Scull moved to larger premises at 17 Redcliffe Street, a building that had been occupied for many years by a plumber named Jacques Fear. Fear had been a traditional plumber – working and dealing in lead. When Scull moved into his new workshop, he found that Fear had left all his plumber's benches, with their lead pots and pig-lead mounds. It is fairly certain that the wide range of lead working equipment was one of the main reasons why Arthur Scull decided to expand this side of the business.

At first the firm concentrated on the restoration of country church roofs, which were then nearly all of lead. He took on more men, and another apprentice. Arthur bought a horse, cart and trap, as well as a large quantity of scaffolding equipment for roof work. The Company's first country house was 'Glencot' at Wookey Hole, Somerset. Arthur Scull began making his reputation for this kind of work at about the same time as Bernard Drake was making his at Chatsworth.

The job involved all the internal and external plumbing. No expense was spared in making it perfect. All the piping was in lead while all the eave gutters were made from 8lb milled sheets, dressed to shape on curved oak blocks – a highly skilled job which Arthur carried out himself. In addition to the plumbing, the firm also installed a battery powered electric bell system. Plumbers had traditionally been the craftsmen who installed manually operated bell wires into houses and when electrical bells appeared they quickly adapted to the new technology.

It was probably this foray into electrical work that encouraged Arthur Scull, in 1882, to branch out into general electrical contracting. Electricity was making rapid progress into the field of domestic lighting and there was no shortage of invitations to tender. Initially the firm took on a good deal of electrical installation in houses and factories in the Bristol area, but by 1900 electrical work became more specialised, competition became keener and the firm stopped tendering for it.

During the years that followed both Bristol and the firm of Arthur Scull grew in size and prosperity. The appearance of towns and cities was changing fast. Schools, churches, factories, hotels, mansions, libraries and even office blocks were shooting up. And by now it was accepted that all buildings should be supplied with sanitation.

In 1899 the firm was employing a permanent staff of 14 plumbers, all of whom were first class craftsmen. The Company's reputation had travelled so far that it sent men out to jobs in the neighbouring counties and beyond. Plumbers said that if Arthur Scull was still happy with the quality of your work after one month you could get a job anywhere in the country.

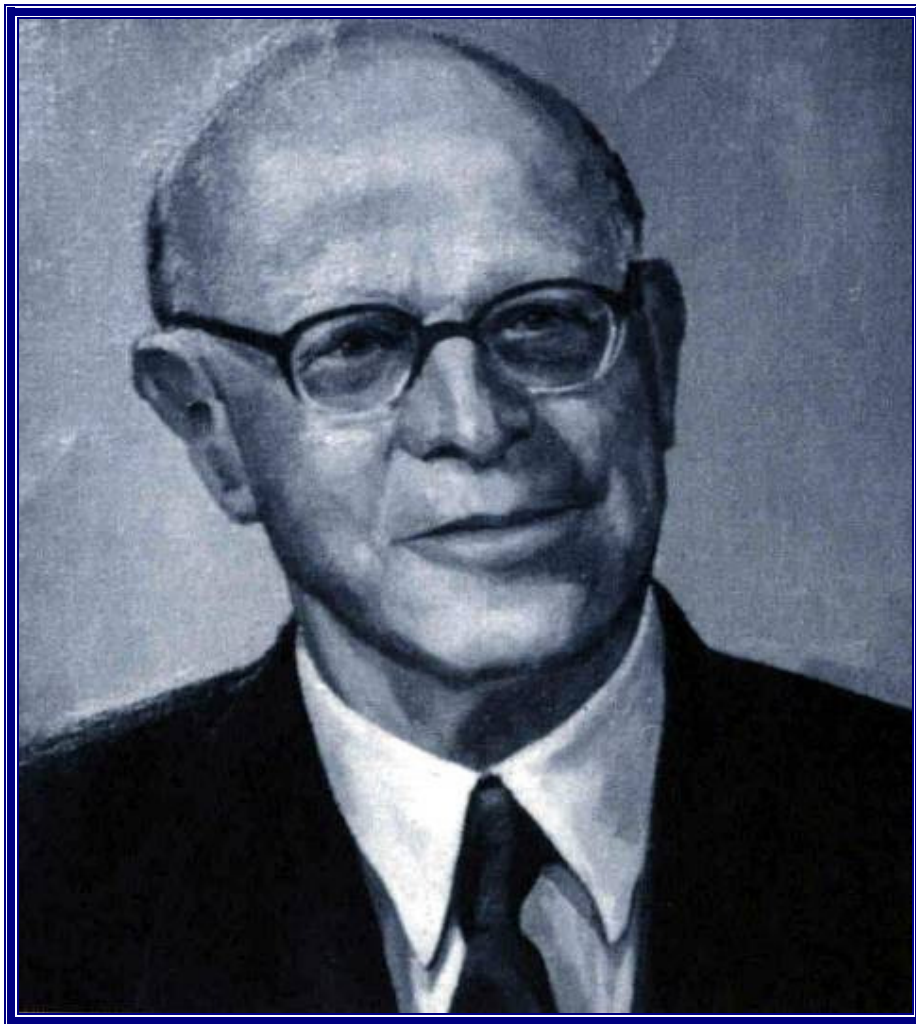
During the first decade of the century the firm's list of prestigious contracts was impressive. It included fashionable spas and hydros, hospitals, municipal buildings, insurance offices, large factories, and works of civil engineering. Like Drake & Gorham, it also included some of the finest private houses in the land. The grand Edwardian hotels installed baths by the hundred in order to compete with each other. It was in this period that the Company undertook its first overseas work after a disastrous earthquake destroyed the town of Kingston, Jamaica in 1907. These were great days for Arthur Scull. His business had grown steadily and consistently ever since it was founded 23 years previously and he could see no apparent reason why the growth should not continue.

.....in 1925

A year later the Company began working on another important contract – the casting and erecting of the huge lead dome of the National Museum of Wales, based in Cardiff. Early in 1928, Arthur Scull decided to withdraw from active participation in the firm. He was in his sixty-seventh year and his health had begun to fail. Anthony Scull was appointed Chairman and Managing Director with a salary of £1,200 per annum. William Rudman, now the firm's oldest employee, became a director with £600 per year. Arthur Scull remained a director, but only in name. He took no further part in the management of his old firm. Unfortunately Arthur did not enjoy a long retirement and died in January 1929 after a short illness.



ANTHONY SCULL
born c.1898



Son of the Company Founder

Most of the early archives of Arthur Scull's business were, unfortunately, destroyed by fire bombs in 1941 and, as a result, little is known of the firm's activities during the Great War. One thing, however, is certain – it did not do well. This was due not so much to the acute shortage of labour, which lasted throughout the war years, but to the shortage of work. This resulted in the most severe competition. Arthur Scull did his share of work on army camps, munitions factories and other government establishments but on profit margins that were barely sufficient to pay overhead expenses.

Another blow came in 1916 when Arthur brought his son, Anthony into the firm to learn the business. Ten days later the boy announced that he had enlisted in the army. This move enraged his father who threatened to inform the army authorities of his son's real age. Eventually, however, he accepted the situation and Anthony spent the next three years in the army.

When Anthony returned to civilian life in 1919, he found the business sadly depleted. But he soon showed a remarkable talent for business and his energy and enthusiasm began winning contracts. In fact, the firm's order book grew at such a rate that Arthur Scull had trouble financing the ever-increasing amount of business.

Anthony not only restored the firm's country house and church business, he also greatly enlarged the scope of the Company's contracts. He secured work in cinemas and brought in central heating contracts for hotels and office blocks. He got orders for boiler installations and maintenance in mills and factories. Most importantly of all, he steered the firm into a new area which was set to grow rapidly over the coming years – public housing. Anthony Scull was quick to take advantage of the opportunity. He secured

(Text from "A History of Drake & Scull: Past & Present," 2000)

the plumbing work on the first council house project of the Bristol Corporation, the Fishponds Estate, built in 1920. As Anthony had anticipated, this brought the firm a large number of major contracts. Between the wars Arthur Scull & Son carried out plumbing installations in towns and cities all over the country. In 1925 the firm carried out all the plumbing for the new Bristol University buildings. The Company installed an immense amount of piping and fittings as well as a great quantity of ornamental cast lead work. In the same year, Arthur took his son into the business as a full partner and the firm became Arthur Scull & Son.

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Those who knew Arthur Scull personally recalled his cheerful temperament and his well-dressed appearance – with his jauntily placed hat and malacca cane. But most remembered his incredible drive, enthusiasm for work and restless energy.

Anthony Scull continued with the policy of expansion. He saw a tremendous future in central heating and started a separate department within the Company to specialise in this work. He also formed a department for lead roofing and devised a special scheme for country churches. The firm undertook to replace dilapidated lead roofs with new copper ones. The work was done free of charge because the value of the lead removed was sufficient to cover the cost of the new roof – in fact, sometimes there was a balance on the right side to be handed over to the vicar. In the meantime the Company enlarged its basic operations and obtained a number of council house contracts. One of the most important of these involved the installation of plumbing into 2,090 homes in Nottingham. By prefabricating all fittings in a workshop on the site, the work team completed the entire job in 16 months.

The great depression created serious difficulties for the Company. Arthur Scull & Son, like Drake & Gorham, refused to cut back on its high standard of workmanship and materials. It was only through careful economies and planning that the Company continued to obtain its share of contracts.

Not only did the Company survive those difficult years, it continued to grow. In 1934, it obtained a foothold in London, the most competitive city in the country, by opening a small office in Kingsway House, Holborn. In the same year the Company started its first job for the British Aircraft Corporation at its factory at Filton, Bristol.

The re-arming of Britain during the three years that preceded the Second World War brought an end to the depressed conditions that had plagued

Britain since 1931. Good management and strict economics had protected Arthur Scull and Son while other contractors went bankrupt. By 1937, however, the Company was once again in a position to expand. Profits, which had been low throughout the difficult years suddenly rose and in 1938 they reached a record of £15,227.

During the war, the Company was kept busy all over the country carrying out plumbing and heating work in aircraft factories, airfields, service and evacuation camps, munitions factories, foundries, mills, hostels and military hospitals. In addition, it carried out a great deal of timely and valuable work in repairing air-raid damage throughout the south and south west.

The biggest single operation undertaken by the Company during the war was to lay the plumbing and water mains for an aircraft factory and aerodrome on the shores of Lough Neagh in Northern Ireland. The scheme was for an American military establishment. Aircraft were brought in parts from America, assembled and then flown off to Africa. A labour force of over 7,000 men was assembled to build the complex – then the largest concentration of labour ever to be gathered together in Britain. The Company laid over 16 miles of piping at Lough Neagh, varying from two feet to 12 feet in diameter. In addition to water mains and fire mains it constructed a large plant to draw water from the lake, filter and purify it and pump it into the works.

It was at this time that a fire-raid destroyed the Company's headquarters premises in Redcliffe Street. Fortunately it did not own the building and the stock and furniture were only a very small proportion of its assets. The worse loss was the Company's records which were totally destroyed. Within a month the firm's office staff was re-established in new premises in Clifton, almost in the shadow of Brunel's great suspension bridge.

The merger negotiations between Drake & Gorham and Arthur Scull & Son were carried out in secret during the first months of 1964. Both sides were aware of the considerable benefits that would result from the merger. They were, therefore, anxious to arrive at an amicable agreement and to avoid anything in the nature of a 'take-over battle' of the sort so frequently seen during the 1960s. In the event, complete agreement was reached and the fact announced to the staffs of both companies on February 18th, 1964.

When the merger was complete, a new company, The Drake & Scull Engineering Company Limited was formed. Hamlyn Drake was elected Chairman with Anthony Scull as his deputy. The new company was responsible for the integration and development of the two businesses. It was divided into four regions, operating from London, Bristol, Manchester and Glasgow. Each region had three separate divisions: plumbing, electrical and mechanical services. In addition, there was an overseas division managed from Bristol.

In March 1966, Anthony Scull retired as a director and Deputy Chairman of the Company after 51 years in the business. He left no sons and so was the last of the Scull family to be connected with the firm. During his early years as Managing Director of Arthur Scull & Son he ran the firm in a benignly paternalistic way. He did not like it when the business became too large for him to know all his employees by name. Anthony was a strict employer but, nevertheless, he was liked and respected by his men as humane and considerate. The Company was always known as a caring company and benefited from the foresight of Anthony Scull setting up a works provident scheme for craft personnel and a pension scheme for staff – long before this became commonplace.

ENGINEERING
ARTHUR
SCULL
& SON^{LD}
SPECIALISTS

district
industrial and domestic

HEATING

high pressure hot water and steam
hot and cold water services

AIR CONDITIONING

fire protection
automatic fuelling

SANITATION

ornamental lead work
sewage disposal

PLUMBING

KINGSWAY HOUSE
KINGSWAY
LONDON WC2.

HEAD OFFICE:
384, PRINCE'S BUILDINGS
BRISTOL 8
EST 1881

PORT OF SPAIN
TRINIDAD
B.W.I.

(From HVCA Year Book 1948)



*Bristol Cathedral and Council House;
Both provided with lead roofs by Arthur Scull*



In 1960 Arthur Scull moved into new offices in Whitehouse Street, Bedminster, Bristol