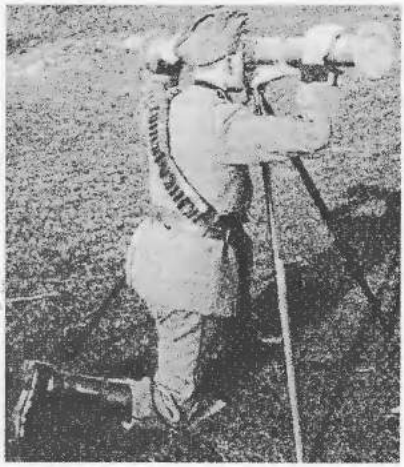
SCOTTISH INDUSTRIAL HISTORY



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The Genesis and Infancy of the Business Archives Council of Scotland

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President of the Business Archives Council of Scotland

Today, those working in the field of business history, be their objective the creation of a detailed scholarly and analytical monograph or a glossy brochure, are able to ease their creative paths by consulting a formidable body of works which includes meticulously compiled bibliographies, lists of archived material, individual case studies representing almost every type of economic activity, innumerable biographies of business men, and a small but growing number of general or industrial economic histories characterised by a micro-economic approach in which business institutions and the entrepreneur are accorded a central role. Moreover, as Professor Berry Supple has observed, *'there is perhaps no longer any serious need to defend the autonomy of business history as a field of study in Britain'*.

It was not always so. Although those who pioneered the subject in Britain in the years immediately before and after the second world war never seriously doubted the significance of their endeavours to the future development of economic and social history (and some, like T S Ashton, entertained hopes of' influencing economics), few were unconscious of the over-riding necessity of gaining the co-operation of the business man. Without the support of the business community, business history was in danger of being smothered or, at best, stunted; its future uncertain, growth retarded and sickly.

Professor S G Checkland, having successfully launched the appeal for the Colquhoun Lectureship in Business History in the University of Glasgow, was deeply conscious that the Lectureship could only fully attain its objectives by maintaining the interest and support of those who had responded to the original call for funds sponsored by the Glasgow Chamber and Junior Chamber of Commerce. Furthermore, he entertained ambitions for business history in

Scotland that could be achieved only by widening its geographical compass beyond Glasgow and the West.

Initially, something could be and was done by encouraging the London based Business Archives Council (BAC), established in 1934, to increase its activities north of the Border, but this strategy soon proved painfully inadequate. The human and financial resources of the Business Archives Council were too severely stretched to mount a Scottish campaign at this time. Furthermore, Scottish businessmen regarded initiatives originating in London with acute apprehension.

The problem was discussed at great length by Sydney Checkland, David Wilson Reid of Robertland, the archivist of the University of Glasgow, and myself. There was, we believed, no alternative to establishing a Business Archives Council of Scotland (BACS). This would not be simply a 'regional' branch of the Business Archives Council, but an autonomous body having its own constitution, its own offices, and its own resources. The Business Archives Council accepted the rationale of this move, albeit reluctantly, and promised its support which, it should be recorded, has never ceased to be other than wholehearted.

These necessary negotiations completed, the Business Archives Council of Scotland was formed in 1960 by a group of businessmen, lawyers, chartered accountants, librarians and university personnel. Outstanding among this group of enthusiasts were Ralph Hillis, sometime President of the Glasgow Junior Chamber of Commerce, Col. A.R. Cross, of Mackenzie, Roberton & Co., and W.R. Ballantyne, General Manager of the Bank of Scotland. A.M. Broom and the Scottish Record Office represented the National Register of Archives (Scotland) by John Imrie, Curator of Historical Records, and A. Anderson, Assistant Keeper of Historical Records. His Grace the Duke of Buccleuch and Queensberry agreed to accept the Presidency of the new body. David Wilson Reid, without whose professional expertise and intimate knowledge of the Scottish business and commercial world the scheme might have proved abortive, was elected Chairman.

Although the initial membership was small, the Council was an enthusiastic group with connections throughout Scotland. Its aims and objectives - principally the encouragement of *'the preservation and study of archives which bear on the history of commercial and industrial enterprise'* - were given useful publicity by the Press and by the Scottish Home Service of the BBC. A major exhibition of business records was mounted at the Mitchell Library, Glasgow. All this meant that the importance of business archives and the study of business history was brought before a larger audience of Scotland than ever before, and that the Council played a major role in establishing the 'respectability' of this branch of historical enquiry. Suspicions of muckraking were undoubtedly reduced if not entirely quelled by the eminence of some of the Council's members.

Meanwhile the work of the Colquhoun Lecturer - now the Council's honorary secretary - continued, his task made easier by new contacts and a growing awareness of the significance of business history. With hindsight, it is patently clear that much more could and should have been done by the Council in its early days. The major constraint was and perhaps still is sheer manpower. The study of business records can be incredibly time-consuming; even the history of a single large collection of records (especially when the surveyor is tempted into looking at the archives more closely than a simple catalogue necessitates) can take several weeks. Moreover, in those early days access to many collections was not gained without much patient diplomacy. There were occasions when the existence of records - now known to have survived - was denied; in other cases, it was necessary to arrange for their preservation only hours before they were due for destruction. The basements and ground floor rooms of houses in University Gardens, Bute Gardens and Ashton Road threatened to become choked with piles of ledgers, letter books and rusting deed boxes, the nucleus of Glasgow University's unique collection of business records.

Perhaps the first tangible report of this activity was the appearance of the *Studies in Scottish Business History* in 1967, but sometime before this the criticism was voiced that although the Council had set out to be a national body its activities

had been largely confined to Glasgow and the West, that the recruitment of new members had been unimpressive, and that irreplaceable records were still being destroyed by those ignorant of the Council's very existence. Attempts to meet these grievances resulted in the agreement by the Abertay Historical Society to act as a local committee of the Council in Dundee and the publication of what was intended to be a biannual *Newsletter*, the first issue of which appeared in October 1966.

In its original form, eight issues of the *Newsletter* appeared in the next seven years; not until 1973, by which time the editorship had passed into the hands of Tony Slaven, was the intention fulfilled of producing two in one calendar year. In the second of these two issues, it was possible to announce the success of the prolonged efforts to secure the preservation of the records of the constituent companies of the Upper Clyde Shipbuilders, the liquidator of which was Mr R.C. Smith, Chairman of the Council since the premature death of David Wilson Reid. It was an outstanding achievement and perhaps the most important justification for all the effort and enthusiasm of the previous decade.

In 1976, the Council's *Newsletter* was incorporated, with the *Newsletter* of the Scottish Society for Industrial Archaeology, into a new journal, *Scottish Industrial History*, under the editorship of C.W. Munn and John Hume. This event may be said to mark the end of the formative period of the Business Archives Council of Scotland.

For those who had participated in the affairs of the Council these were frequently exciting and sometimes intensely frustrating years. We were all aware that so much more might have been done, that whole areas of economic activity had been neglected, that records continued to be lost to the historians at an alarming rate, and that although the Council had gained the general sympathy of the business community, the active support of businessmen was disappointingly illusive. Nevertheless, when comparisons are made between what is accessible and available now to the business historian with the situation in the late 'fifties, the

transformation that has taken place is remarkable, and some part of the credit for this metamorphosis may be justly claimed by the Business Archives Council of Scotland, the genesis and infancy of which is sketched in this brief note.

Technical Transfer in the British Optical Instruments Industry 1888-1914: The Case of Barr & Stroud[i]

Iain Russell

In 1888, Archibald Barr and William Stroud devised, designed, ordered components for and then assembled and calibrated an optical range finder for a competition organised by the British War Office. The instrument failed to impress Army experts, but an improved and modified version was judged to have performed well in sea-trials conducted by the Royal Navy during the early 1890s. The Barr & Stroud coincidence range finder was subsequently adopted by the Royal Navy, and by 1914 as many as nine of the instruments were carried on each British battleship and battle cruiser. Foreign navies, including those of Japan, Italy and France, also adopted the range finder, and a redesigned portable instrument was accepted for service with the armies of Great Britain, Austria-Hungary, France, and many lesser military powers on the eve of the First World War.[ii]

William Stroud was Professor of Physics at the Yorkshire College of Science in Leeds from 1885 to 1909, and Archibald Barr was Professor of Engineering there from 1884 until 1890, when he accepted the chair at Glasgow University. Neither man had any previous business experience, or any experience of working in the optical industry. Their original intention was simply to develop the patent for a range finder, the rights to which they hoped to sell to supplement their academic salaries. The Admiralty's valuation of the rights to the original patent [9520 of 1888], however, fell far short of the inventors' price of £75,000, and there appeared to be no company interested in developing an instrument for which, at that time, there was no guaranteed market.[iii] The inventors decided to set up their own private partnership, which they called Barr & Stroud's Patents, and in 1893 they opened a small workshop in Glasgow where they could continue work on the development of the range finder and other optical and electrical instruments.

By 1913, when the partnership became Barr & Stroud Ltd, the small company had acquired an international reputation as optical instrument-makers. Barr & Stroud was capitalised at just £200,000, had an annual turnover of £190,000 and a workforce of just over 1,000 men,[iv] (Carl Zeiss employed more than 2,000). Yet it maintained a significant lead in the field of optical range finder development and manufacture over larger and better-known competitors such as Zeiss and C P Goerz of Germany, and other established firms in Russia, France, Austria-Hungary and the United States. Barr & Stroud's achievements depended on a range of products invented, developed and manufactured in Britain without any formal technical assistance in the form of collaboration with or licensing agreements obtained from other companies specialising in the optical instrument market.

Roy and Kay Macleod have found that, between 1870 and 1914, Britain's science-based industries were afflicted *'by a neglect of technical education, resistance to cultivate applied research, and a pattern of demand and economic protection which strongly favoured continental competitors'*. They state that *'...by 1900, the outlook for the optical industry seemed bleak. There were three alternative diagnoses for the malaise: first, that the economic and commercial structure of the industry militated against its success; second, that manufacturers neglected scientific men and scientific research; third, that the trade had few technically trained workmen or optical designers'*.

They go on to conclude that, in 1914, *'the scarcity of capital for investment and research, the absence of a general apprenticeship scheme, no modem method of "costing", and "no policy of commercial or economic expansion", presented a gloomy picture [of the British optical industry]'*.[v] In these circumstances, Barr & Stroud's success appears to be remarkable. This article seeks to show how the firm acquired and developed the technology required to dominate the international market for range finders and, after 1918, to produce other optical instruments, such as binoculars, gun-sights, and particularly submarine periscopes, which also proved to be highly successful. In addition, it seeks to explain how Barr & Stroud

managed to retain control of vital technology, enabling the firm to remain one step ahead of its competitors.

It has long been fashionable to criticise British universities for their failure during the late nineteenth century to produce graduates able and willing to apply their talents to technical innovation and industrial enterprise. Recently, there have been attempts at re-evaluating this critical view,[vi] and the careers of both Barr and Stroud provide further evidence that a university education could indeed provide the stimulus for a successful career in technologically advanced industrial enterprise. Barr served an apprenticeship as a mechanical engineer while studying for a BSc at Glasgow University during the 1870s: the Department of Civil and Mechanical Engineering's famous 'sandwich courses' required students to spend just six months at the university on course work, and the other six months in local industry to acquire practical experience. He then worked for seven years as an assistant to his professor, James Thomson. Thomson was the brother of Sir William, the Professor of Natural Science at Glasgow University who was created Lord Kelvin in 1892 and was a noted inventor of scientific and electrical instruments. James Thomson and his assistant often helped Sir William with the practical work of designing the latter's inventions, and so Barr was exposed to the potentially highly-lucrative application of scientific invention to industrial enterprise.[vii]

Stroud already possessed a BSc in Chemistry when he graduated from Balliol College Oxford with a double first in Maths and Natural Science. Before sitting his examinations for a DSc at London University in 1884 he visited Germany to attend lectures and laboratory demonstrations given by the famous scientists Kohlransch and Quinke at Wurzburg and Heidelberg. He was only twenty-five years of age when he accepted the Physics chair at the Yorkshire College of Science, but had already acquired a reputation as one of the most promising scientists of his generation, and had a wide ranging knowledge of the latest developments in science. It was Barr's idea that the two professors should turn their hands to the invention of scientific instruments, marrying his flair for

engineering design to Stroud's talents for applying theoretical scientific knowledge to invention.[viii]

Barr's views on the importance of employing men with scientific training in enterprises such as the one he set up with Stroud were made clear in evidence he gave to the Worshipful Company of Ironmongers in 1906.

'I am convinced that one of the worst things a man who was going to devote his life to practical work could do was to spend too much time in any scholastic institution. The best training in Applied Science could only be got by a combination of scientific study in a University or College and service in a works, and the more intimately these two sides of his training were associated the better. The teacher and the research student should both be in intimate contact with the condition and requirements of the industry to which their work had reference.'[ix]

In 1916, he wrote that:

'..just as regards to chemists and other highly trained assistants in industry, engineering employers in this country have not yet learned to take full advantage of the facilities that are available for securing men of sound scientific training. I may be permitted to say that in my own Firm we have found such men indispensable for the development of work in new lines, and we seldom - I may say never - appoint a man to a responsible job, even in the supervision of purely workshop work, who has not had a sound and extensive course of scientific training.'[x]

Barr recruited nearly all of Barr & Stroud's managers and scientific assistants from the ranks of his own engineering students at Glasgow University, promising young men being given the opportunity to prove their worth at the factory during the six months they had to spend each year in local workshops. Harold Jackson was the first scientific assistant taken on and he rose to become company secretary and, in 1901, a junior partner in the firm. James French and J Martin Strang joined the firm as scientific assistants a few years later, and were

eventually to acquire control of Barr & Stroud. Other engineering students who started as part-time assistants and became full-time members of staff included the first works manager, George Blair, who later joined the car manufacturers Arrol Johnston; James Blacklock Henderson, who became Professor of Applied Mechanics at the Royal Naval College in Greenwich, and John D Cormack, who succeeded Barr as Professor of Engineering at Glasgow University in 1913. By August 1914 Barr & Stroud's Board and staff contained sixteen men with university degrees or technical college diplomas, all with a thorough grounding in the practical side of the business. Most of these men were involved in research and development work at the factory.[xi]

Barr & Stroud's skilled workers were also encouraged to acquire relevant scientific knowledge. Barr sent out circulars to local headmasters and Boys Brigade captains asking them to mention the firm's name to any boys interested in becoming mechanics or instrument-makers. By 1914, 15 per cent of their employees - 150 young men - were apprentices. Youngsters who joined the firm served a rigorous five year apprenticeship, and from 1904 the apprentices were sent to local night schools to take science courses, with financial rewards offered for passing examinations, and bursaries to enable the most promising to go on to study at Glasgow University.[xii] In 1917 Barr & Stroud announced they were to introduce scholarships for 14 year-old boys recommended to the firm by headmasters, to enable the boys to stay at schools where mathematics and practical physics were taught to a high standard. Glasgow School Board rejected the scheme, which required the boys to sign up for a five-year apprenticeship with Barr & Stroud on completing their education. The decision was made on the grounds that children should be given a wide education, with the prospect of going on to a Higher Grade School, rather than a course of instruction such as was favoured by German industrialists.[xiii]

Although Barr & Stroud had little difficulty in recruiting suitable managers and scientific assistants from Glasgow University, and finding and training mechanics and instrument-makers, the firm had to reach beyond Glasgow to obtain other

vital workers and technology. At first, Adam Hilger & Co of London supplied most of Barr & Stroud's optical components, using optical glass manufactured by Chance Brothers of Birmingham. The quality of the products supplied by Hilger, however, was the subject of constant complaint from the Glasgow firm. Barr & Stroud protested that Hilger's prisms were not always made to the angles specified. The quality of lenses was often poor, and Stroud noted in 1907 that Hilger & Co did *'not know one hundredth of what Zeiss know about lenses'* and noted ruefully that *'Zeiss have Rudolph, Czapski, Von Rohr and others on their staff who are the recognised authorities on lenses'*.[xiv] The backwardness of the British optical industry made Barr & Stroud's efforts to match the quality of Zeiss instruments very difficult indeed.

Barr & Stroud first advertised for optical workers in 1895, two years after their small assembly shop was opened in Glasgow. At first they sought only *'a respectable young man who could do edging of lenses etc and cementing and generally fitting the optical work into the instruments'*, and a technician was taken on the following year to start up an optical department where this work could be undertaken.[xv] It proved impossible to recruit other skilled workers to take charge of an optical grinding and polishing department, however, and Barr & Stroud had to look beyond Scotland to acquire these skills. C P Goerz offered to act as Barr & Stroud's agents in Germany, and became sole agents for the Scottish company's instruments in Germany in 1898. The agency agreement contained a clause giving Barr & Stroud the right to send a representative to Goerz's works and to study production methods there, and James French, who had recently graduated from Glasgow University, spent a year working and studying at Friedenau.[xvi] He was able to learn enough in Germany to set up a new optical grinding and polishing shop when Barr & Stroud moved to a new purpose-built factory in Anniesland, Glasgow, in 1904. Due to the recession in the optical industry, which followed the Boer War, the company was able to recruit skilled men from Yorkshire and London to work in the new department. By 1906 these men were making many of the prisms required by the company, although, owing to the

surge in demand for range finders following the Russo-Japanese War, large orders continued to be placed with Adam Hilger & Co.[xvii]

No-one on Barr & Stroud's technical staff had any experience in the computation of lens curves, and the skills of those relatively few Britons proficient in lens computation, as well as the formulae they so painstakingly calculated, were jealously guarded by their employers. In 1897, Hilger had offered to transfer his works to Glasgow and his offer of some form of amalgamation between Adam Hilger & Co and Barr & Stroud gave the latter company the opportunity to acquire an established lens making operation. Stroud, however, objected strongly to a close connection with Hilger. Apart from his low opinion of Hilger's optical work, he feared that Hilger would use a formal tie with Barr & Stroud to acquire sufficient knowledge of the business of range finder production to enable him eventually to set himself up in direct competition with Barr & Stroud.[xviii] Having spurned Hilger's proposals, therefore, Barr & Stroud had to look elsewhere for the technical knowledge they required.

In 1912 the technical assistant, J Martin Strang, was sent to the optical works of the state-run Obhoukoff Steelworks in St Petersburg, which had been awarded the contract to clean and repair Barr & Stroud range finders supplied to the Imperial Russian Navy. Ostensibly, Strang visited Russia to advise on methods of dealing with a fungal growth which had appeared in the optics of many of the Russian range finders, but he was also told by Harold Jackson that *'any information regarding the cutting of fine lenses on glass diaphragms by means of a diamond (not etching), would be very acceptable'*.[xix] Strang did better than that. Barr & Stroud enjoyed good relations with the head of Obhoukoff s optical department, Professor A Gerschun, and offered to invest in a new optical firm, which Gerschun planned to set up in St Petersburg. Barr & Stroud also agreed that Gerschun's new company would be granted agency and licensing agreements with Barr & Stroud.[xx] It is probably no coincidence that Strang who spent a lot of time with Gerschun at the Obhoukoff works, was able to study methods of computing there, and returned to Glasgow with formulae for lens computation. He was put

in charge of a new computing department at the Anniesland factory soon afterwards.[xxi] During the war the firm was finally able to obtain training in computing and optical design in Britain, when a member of staff attended Professor Conrady's lectures at the Optical Engineering Department of the Imperial College of Science and Technology. In 1919, two female members of staff attended lectures at the Imperial College, and the computing department soon assumed a vital role in the company, particularly after 1917 when Barr & Stroud began to manufacture submarine periscopes.[xxii]

Barr & Stroud's next move in the direction of self-sufficiency in optical component manufacture was to investigate ways of setting up a glass-making department. German optical glass, particularly from Schott's works in Jena, had long been considered superior to British glass. It was generally believed, however, that the best German glass was reserved for the use of German firms, and nearly all supplies to Britain were in any case cut off after the outbreak of the First World War. The technical challenge of upgrading the quality of British optical glass was subsequently taken up with great success by Chance Brother's. Nevertheless, Barr & Stroud were unable during the early years of the war to obtain sufficient quantities of pentagonal prism blocks from the Birmingham firm, and were alarmed to find the price for optical glass increase in price by 50 per cent during the first four months of the conflict.[xxiii] Although the output of range finders at Anniesland rose from forty per week in August 1914 to 120 by June 1916,[xxiv] demand continued to exceed Barr & Stroud's production capacity, and so the firm proceeded in haste with plans to manufacture its own glass.

Professor Barr worked at first on the design of an annealing chamber for the fine annealing of glass, and several of these chambers were made at the factory and installed there in 1915.[xxv] The difficulties involved in actually manufacturing glass were much greater than he had anticipated, since the Ministry of Munitions did not recognise Barr & Stroud as glassmakers and so refused to offer any financial or technical assistance to the company in this project. The company responded by resorting to the type of 'industrial espionage' which had proved so

successful in earlier attempts to acquire optical technology. According to rumours, which circulated in the industry, a member of the scientific staff *'dressed as an artisan'* was sent off to work in various English potteries to learn the secrets of manufacturing the special clay pots in which glass was melted during the production process. He returned to Glasgow with the necessary information, and the production of suitable pots began immediately.[xxvi] Meanwhile, Barr and James French set to work designing gas-heated melting furnaces, as well as handling tools. In 1916, Barr & Stroud were producing optical crown glass of a satisfactory quality for prisms, within nine months of embarking on the project.[xxvii]

Barr & Stroud were able to recruit locally the men of scientific talent they required to undertake research and development and the various production processes at their factory. Drawing on a great pool of skilled labour in the west of Scotland, they were able to recruit and train most of the instrument-makers, tinsmith, brass moulders and others required. Stroud, a highly-respected theoretical scientist, and Barr, a mechanical engineer with a wealth of academic and practical experience, remained in charge of research and development work, and with a small circle of scientific assistants they continued to provide the ideas for improving existing products and devising new ones. Yet Barr & Stroud proved willing to search abroad for solutions to problems which could not be solved at the factory, as in the setting up of optical components and optical glass manufacturing. The firm showed itself equally willing to search out and *'borrow'* other types of technology.

In 1896, Barr was given permission by Glasgow University to sail to the USA to visit engineering schools and report back on the design and equipment of engineering laboratories at colleges there. Barr took the opportunity to conduct some of his own research during the visit. He visited Andrew Carnegie, Thomas Edison and other industrialists, toured their works and returned to Scotland highly impressed by American machine tools and by American business methods and factory organisation.[xxviii] In 1898, he imported what was said to be the first

American milling machine to be used in Scotland, and by 1902 Barr & Stroud's factory was equipped entirely with American machine tools.[xxix] The Rowan System - a form of the American premium wage system adopted by the Clydeside firm of marine engineers, D Rowan & Co in 1898 - was introduced by Barr & Stroud in 1901, and remained in operation until the 1930s, while the organisation of the factory, described in great detail in two articles in *Engineering* in 1906 and 1919, owed much to American and German ideas.[xxx]

Nevertheless, foreign was not always considered best for factory organisation and equipment. In 1903 the works manager was sent to the USA to study the most modem American factories, when Barr & Stroud planned to build their new factory at Anniesland in Glasgow. He reported back that the Americans had little to offer in this department, and so Barr & Stroud's staff worked with the architects and consulting engineer to come up with the specifications of a suitable building. In 1903 Barr & Stroud also broke with their *'buy American'* policy' regarding machine tools, and purchased an engraving machine from the English manufacturer, William Taylor.[xxxi]

Barr & Stroud developed their own technical expertise at Glasgow, while always willing to borrow from others the technology most suited to their needs. Having developed a range of successful instruments and a wealth of technical expertise, the firm was also eager to prevent competitors from emulating their methods and copying their products. Barr & Stroud's efforts to retard the process of technical transfer to competitors were as energetic as those to acquire technology for themselves.

The greatest protection for the Barr & Stroud range finder came from patents. Barr was an expert in drawing up patents, and to him belongs the lion's share of the credit for protecting Barr & Stroud's products from duplication by others. The two professors' original range finder patent of 1888 covered a number of innovations, but the most important claim was one, which covered the moveable-measuring prism associated with the translucent or transparent scale. Previously

patented coincidence range finders contained measuring prisms, which merely displaced the image with reference to a scale.[xxxii] The patent agents, J Clark Jefferson and later Bartholomew & Liddle quickly registered the patent, in the industrial nations of the world, preventing leading optical firms from copying the idea.

The original Barr & Stroud patent was registered in Germany in the nick of time. In Jena, Ernst Abbe and Professor Czapski of Zeiss were already at work on a coincidence range finder, which worked on similar principles to the Barr & Stroud. They abandoned their work when the Barr & Stroud patent was registered, and turned instead to develop a new range finder based on the stereoscopic system devised by Hector de Grousilliers. Zeiss's disappointment at being pipped at the post by Barr & Stroud in the development of coincidence range finders was eased later, when leading members of the German company met Barr. Barr told them that, because he and Stroud had to devote a great deal of time to assembling and calibrating range finders after the publication of their first patent, they were unable to complete work on another invention, prismatic binoculars. Zeiss were able to patent their own almost-identical binoculars, and therefore protect themselves from Barr & Stroud's competition until after the end of the century.[xxxiii]

Barr & Stroud's original range finder patent expired during the early 1900s, allowing competitors to begin manufacturing coincidence range finders along similar lines. Barr & Stroud, however, introduced and patented improvements in design, which enabled them to protect the markets won since 1888. The most important improvements were the introduction of an eyepiece prism combination, which allowed the eyepiece to be set at an angle to the plane of the range finder, and the provision of foldaway handles. These innovations permitted greater ease-of-use - the inclined eyepiece reduced neck strain, while the handles were particularly convenient on portable instruments designed to be used in the field. Neither, however, marked any great scientific achievement, and the German firms of Zeiss, Goerz and A & R Hahn were understandably concerned that they could

not use such simple *'user-friendly'* features in their own range finders. In 1911, Zeiss and Goerz (the latter having amalgamated with Hahn) appealed against the patents to the German Imperial Patent Court. Barr & Stroud lost the case, but promptly appealed and in 1912 the Imperial High Court found in their favour.[xxxiv]

The strength of Barr & Stroud's patents, and the firm's willingness to defend them against the might of Germany's optical industry, undoubtedly retarded technical transfer in the field of range finder manufacture. Zeiss, unable to develop a coincidence range finder while Barr & Stroud's original patent remained in force, committed themselves to the stereoscopic range finder for naval use. Barr & Stroud were able to convince most of their customers prior to the First World War that stereoscopy was an inferior method of measuring distances in battle situations, and Zeiss won few steady customers other than the Imperial German Navy.[xxxv] Stereoscopic range finders found little more favour with military experts, while the coincidence range finders developed by Zeiss and Goerz for army use suffered from design faults, due to the relatively late start made by the Germans and from the absence of features such as inclined eye-pieces and handles introduced and patented by Barr & Stroud. Barr & Stroud found patent protection a highly effective means of limiting the spread of technology introduced and developed in Glasgow.

Patent protection alone was not enough to defend Barr & Stroud from the efforts of their competitors to acquire the skills, methods and processes which proved so successful in Glasgow to Barr & Stroud. In Russia, it was impossible to patent an invention, which was deemed to be of use to the armed forces. Other countries were increasingly willing during the early twentieth century to follow the German example, and refuse to adopt foreign-made products for the army or navy. To achieve sales, Barr & Stroud were forced by these circumstances either to set up foreign subsidiaries or to grant licensing agreements with foreign firms, allowing Barr & Stroud's inventions to be manufactured in the country in which orders were being sought.

By 1914, Barr & Stroud had a small assembly shop in Paris, operated by a wholly owned subsidiary. The agreement with Gerschun would allow his new Russian company, with Barr & Stroud a major shareholder, to manufacture the Glasgow firm's range finder under license, and a similar arrangement was concluded with two companies in Austria-Hungary.[xxxvi] In the USA where, Bausch & Lamb were manufacturing stereoscopic naval range finders under a licensing agreement with Zeiss, Barr & Stroud entered into a licensing agreement with Keuffel & Esser, whereby the latter manufactured some mechanical parts for the Barr & Stroud range finder under licence and assembled the instruments for sale under an agency deal.[xxxvii] Of all the *'superpowers'*, only Germany and Japan had no companies with formal arrangements to manufacture Barr & Stroud range finders. Zeiss and Goerz attempted in 1911-12 to negotiate an agreement to pool or exchange range finder patents, but would not enter into a ten year arrangement such as was sought by Barr & Stroud. The Scottish company believed the Germans sought only to obtain access to Barr & Stroud's coincidence range finder patents, rather than a mutually beneficial exchange, and broke off negotiations.[xxxviii] Barr & Stroud's fears regarding Japan were more complex.

Japan's highly successful campaign to acquire Western technology during the late nineteenth and early twentieth centuries has been described in many studies. Barr & Stroud first began to supply range finders and range and order transmission systems to the Imperial Japanese Navy during the mid-1890s, and completed instruments were all inspected at the factory, prior to despatch, by Japanese gunnery experts. From 1902 pairs of Japanese workmen were allowed to work at the factory, ostensibly to learn about the different stages of range finder manufacture, to enable them to repair and adjust instruments purchased by the Japanese Navy. Their eagerness to learn, and the speed with which they acquired the skills of their teachers in the workshops, earned them a great deal of respect and, quite quickly, became a cause for concern.

In January 1907, the company secretary, Harold Jackson, wrote to Barr that the firm's Japanese agents, Messrs Takata, had informed him that their government

was unwilling to give any guarantee of orders, but would welcome the setting-up of a Barr & Stroud subsidiary in Japan - at Barr & Stroud's expense. Further negotiations seem to have taken place, because, in May that year, Barr met Professor Czapski of Zeiss, and they discussed the situation regarding Japan. Barr's report of the conversation is illuminating:

'Mr Stuart asked Professor [Czapski] if the Japs were to offer you an order on condition that you taught them how the whole thing was done, would you accept it? Certainly not said Professor [Czapski]. They have been at the same game with Z[eiss]. All he would promise would be that they could when the instruments were finished take them to pieces if they liked and also he would teach them to adjust them. Professor [Czapski] also said that if opticians would combine and refine said conditions it would be well, because the Japs are so clever in picking up what they can see. This from London and Jena just when we have had the same experience is very interesting. I am very glad we have decided to stick to our old offer.[xxxix]

This conversation arose at a time when Japan was ordering more naval range finders from Barr & Stroud than any other nation, and the firm had to be careful not to alienate the customer while protecting the product from Japanese imitation. In 1914, Japanese representation of the factory was upgraded when the first Japanese inspector took up residence there. The resident inspector was given free access to all parts of the factory where instruments for Japan were manufactured. However, Barr & Stroud were able to exclude him from a building in which the most advanced naval range finders were manufactured for the Royal Navy, by referring to Admiralty instructions which forbade foreigners from visiting areas in which vital war work was undertaken.[xl] Barr & Stroud continued to use the cloak of national security considerations to continue to conceal their most advanced work in range finder development during the 1920s, and the Japanese remained valued customers throughout the post war decade. It would be interesting to discover, however, if inspectors such as Mr Yamada played any part in the growth of the Japanese optical industry after their return to their homeland.

Barr & Stroud used one other means of protecting their inventions, to great effect. In 1913, with a European war becoming ever more likely, the War Office contacted Barr & Stroud's lawyers, Cowan, Clapperton & Barclay, to insist that the company hand over the rights to some of the most important patents for infantry range finders.[xli] Barr & Stroud had every right to feel aggrieved at this demand. Not only had the War Office rejected the firm's original range finder in 1889, but also when further trials were held in 1907 it had rejected the Barr & Stroud instruments on the grounds of cost, and the Army had adopted the cheaper and inferior Marindin range finder instead. Barr & Stroud had been forced to develop their infantry range finders without the backing of the War Office, and if the French Army had not adopted Barr & Stroud instruments in 1909, the firm would almost certainly have been forced to abandon the product and leave the market to Zeiss and Goerz. Only in 1911 did the War Office heed the Army's complaints regarding the Marindin range finder, and authorise the adoption of Barr & Stroud instruments.

Barr & Stroud were determined not to surrender their patent rights to the infantry range finders cheaply. If the patents were offered to the Crown then the War Office could put contracts out to tender, permitting other firms to acquire technical knowledge which Barr & Stroud had acquired and developed without state assistance. Consequently, Barr & Stroud set a high price on their products: for range finders of base lengths up to 80cms, they asked for £150,000 plus a 2 per cent royalty on the selling price of every instrument. In 1914 the offer was revised to £30,000 plus a royalty of 2 per cent for each of the three patents the War Office required. The War Office considered the price excessive, and dropped the matter.[xlii] Barr & Stroud profited from the knowledge that, to protect their instruments from predatory government departments, an aggressive stand on the price of their inventions was sufficient to ward off bureaucrats. This policy proved effective on several occasions between 1914 and 1945.

Mari Williams' research on the British precision instrument industry suggests that Barr & Stroud was in many ways a typical British company. In other companies,

'instrument design was usually in the hands of a very few individuals who either owned the firm or were closely associated with the owners', and this was certainly the case at Barr & Stroud. *'The pattern of a small number of technically literate designers and owners, together with workshop personnel engaged in a combination of on-the-job training and positive classes'*, she adds, *'was also apparent in Britain around the turn of the century'*,[xliii] and Barr & Stroud certainly conformed to this general description. If Barr & Stroud were in many ways a typical firm, how then did they overcome the obstacles to success identified by Roy and Kay McLeod?

Barr & Stroud were not afflicted by the general neglect of technical education and applied research. Where technical expertise was lacking, the firm introduced its own training courses or *'borrowed'* the expertise elsewhere. They certainly did not neglect scientific men and research, and were able to raise the capital for investment and research quite easily after the business became successful in the late 1890s, largely by re-investing profits and borrowing modestly from the bank. The company's records reveal that even the smallest job was costed with care, and, unlike the Cambridge Scientific Instruments Co,[xliv] the firm was seldom tempted to reduce profit margins during hard times. Commercial policy and economic expansion were firmly in the hands of the directors, who jealously guarded the firm's rights and aggressively promoted their instruments in any country where they detected a possible market.[xlv]

Barr & Stroud's success may well be attributed to the fact that, unlike so many British scientific instrument-makers, the company was controlled by innovative engineers and scientists who also developed keen entrepreneurial skills. Men with the energy directed the enterprise to seek out and adopt the technology they required, and who possessed the business acumen not only to tailor their product to the market but also to use all the means at their disposal to protect their inventions from imitation. Many other British science-based companies possessed scientists and technical expertise of an equal or superior standard to Barr & Stroud, but were far less successful commercially. Perhaps the perceived

failures of the British industry owed more to a lack of business expertise than to failings in technical ability.

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[i] This article was delivered as a paper at the Tenth International Economic History Congress, Leuven, Belgium. August 1990

[ii] For the history of the development of the coincidence range finder, see Michael Moss and Iain Russell, *Range and Vision.. The First Hundred Years of Barr & Stroud* (Mainstream Publishing, Edinburgh, 1988).

[iii] Letters from Director of Navy Contracts to Barr & Stroud, 10 June 1892 and 10 January 1893. Barr & Stroud to Cowan, Clapperton & Barclay, 20 November 1913. All letters cited here are preserved in the Barr & Stroud Archive.

[iv] Barr & Stroud Private Ledgers, Nos.3 and 4. *Engineering 1* August 1919, p. 133.

[v] Roy and Kay McLeod, 'War and economic development: government and the optical industry in Britain, 1914-1.8' in J M Winter (ed), *War and Economic Development* (Cambridge University Press, Cambridge, 1975).

[vi] See, for example, Robert Fox's review in *The Times Higher Educational Supplement*, 9 February 1990, of Crosbie Smith and M Norton Wise, *Energy and Empire: a biographical study of Lord Kelvin* (Cambridge University Press, Cambridge, 1989).

[vii] For an outline of Barr's academic career, see C A Oakley, *A History of a Faculty* (University of Glasgow, 1973) and the obituary by J W French in *Proceedings of the Royal Philosophical Society of Glasgow*, LX 1931-2, p.78.

[viii] Stroud described his academic career in *Apologia Pro Vita Mea*, a booklet published privately in 1935. He also wrote of the early days of his collaboration with Barr in *Early Reminiscences of the Barr & Stroud Rangefinder* (c. 1937).

[ix] Barr to Worshipful Company of Ironmongers, 17 April 1906.

[x] Barr to Frank Heath, 18 December 1916.

[xi] Barr to H S Hele Shaw, 24 August 1915. He referred to two Doctors of Science, ten Bachelors of Science, and four men with good qualifications from universities and colleges, augmented by seven other scientists taken on for the duration of the war.

[xii] Charles More, *Skill and the English Working Class 1870-1916* (Croom Helm, London, 1980), p.24. *Engineering*, CIII, 1917, p.583

[xiii] *Glasgow Herald*, 23 March 1917, p.7.

[xiv] Stroud to Barr, 24 January 1907.

[xv] Barr & Stroud to Adam Hilger & Co, 11 December 1895. EBB (Erie Brash), *Random Reflections* (unpublished ms, 1975).

[xvi] Barr to C P Goerz, 4 March 1898. J Martin Strang, *Barr and Stroud Ltd: A History* (unpublished ms, 1969), p.56.

[xvii] Brash, op.cit., *Engineering*, 4 May 1906.

[xviii] Stroud to Barr, 27 January 1897. Stroud also wrote *'I don't wish to run down H, but you must remember that he is a Teuton and a Hebrew, I won't say quite a G_J_'*

[xix] Barr & Stroud to Strang, 26 February 1912.

[xx] Barr & Stroud to Professor Gerschun, 6 November 1913.
[xxi] Strang to Barr & Stroud, 15 April 1913. Strang, *op.cit.*, p.59.
[xxii] Brash, *op.cit.* Strang, *op.cit.* Barr & Stroud to the Directors of the Optical Engineering Department, Imperial
College of Science and Technology, 8 October 1919.
[xxiii] Barr & Stroud to Adam Hilger & Co, 13 November 1914, and to Maurice Loir, 17 December 1914.
[xxiv] Barr & Stroud to Maurice Loir, 23 June 1916.
[xxv] Strang, *op. cit.*, p. 10 1.
[xxvi] R S Whipple in *The Daily News,* 19 January 1922.
[xxvii] Strang, *op.cit.*, pp.101-5. *Engineering,* 29 August 1919, p.264.
[xxviii] Barr to Jackson, 21 April and 8 May 1896.
[xxix] J W French, obituary, *op.cit.*
[xxx] *Engineering,* 4 May 1906 and 1 August 1919.
[xxxi] Barr & Stroud to William Taylor, 3 June 1903.
[xxxii] Strang, *op.cit.*, p.8. See also p.19 for an evaluation of the importance of Patent No.13507 of 1893.
[xxxiii] Barr to Lord Kelvin, 24 October 1892. Barr to Jackson, 9 May 1907. Alexander Gleischen in *The Theory of Modern Optical Instruments,* HMSO London 192 1, p. 203, notes that Zeiss were the first to develop the 'Inverted lower field' system for coincidence range finders, but Barr & Stroud succeeded in patenting it first (1462 of 1903).
[xxxiv] A file of letters and memoranda concerning the legal action proceedings in Germany, 1912-13 is preserved in the Barr & Stroud Archive. See Moss and Russell, *op.cit.*, pp.60-63.
[xxxv] There is evidence to suggest that the Russians were about to adopt the Zeiss naval range finder on the eve of the First World War, and after 1908 the US Navy favoured a stereoscopic range finder made by Bausch & Lomb under a Zeiss licence.
[xxxvi] Gerschun's company was called The Russian Society for Optical and Mechanical Industry. The French subsidiary, in Saint-Cyr, Paris, was Societe Barr et Stroud, and the Austro-Hungarian companies were Barr und Stroud GmbH and Barr es Stroud es Tarsa.
[xxxvii] Barr & Stroud to Baird, Smith, Barclay and Muirhead, WS, 1 February 1945.
[xxxviii] Moss and Russell, *op.cit.*, pp.60-3.
[xxxix] Barr to Jackson, 9 May 1907.
[xl] Starang, *op. cit.*, p.138. Barr & Stroud to Secretary of the Admiralty, 19 March 1913.
[xli] Barr & Stroud to Cowan, Clapperton & Barclay, 20 October 1913.
[xlii] Barr & Stroud to Cowan, Clapperton & Barclay, 18 December 1913 and 13 and 14 February 1914.
[xliii] Mari Williams, 'Training for Specialists: The Instruments Industries in Britain and France, 1890-1925' in R Fox and A Guiginni (eds), *Education and Industrial Performance in Modern Europe* (Cambridge University Press, Cambridge)

[xliv] See M J G Cattermole and A F Wolfe, *Horace Darwin's Shop: A History of the Cambridge Scientific Instruments Company, 1878-1968* (Adam Hilger, Bristol, 1987). Barr & Stroud Balances, 1906-12 reveals that the firm added 100 per cent on net wages and 20 per cent on materials for oncost.

[xlv] Archibald Barr and Harold Jackson emerge from the firm's correspondence as the dominating directors on business policy prior to 1914.

Penny Banks in Glasgow, 1850-1914

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When William Callender of the Glasgow office of the Royal Bank of Scotland died in May 1868, there was found, folded in the pocket of his greatcoat, a hand written list of the penny banks in which he had played a significant role in helping to create.[i] This list begins with the Barony Penny Bank, which had opened on May 15 1852, and stretches to the Working Men's Provident Bank in Partick, which opened on March 18 1865. In the intervening period, Callender had contributed to the creation of 23 other banks, including institutions as far away as Broughty Ferry in Dundee, Padiham in Yorkshire and Greenwich in Kent. That Callender contributed so much to the Penny Bank movement, and appeared to value these institutions so highly that he carried this note about with him at all times, is evidence to support the *Glasgow Herald*'s 1860 description of his relationship to Penny Banks as one of *'the first who made the principle a living fact.'*[ii] It also reveals something of the commitment of bank officers working in other institutions to the penny bank cause. This was very much part of the middle class and philanthropic attitude which sustained the penny banks and which saw them develop as one of the most remarkable social phenomena of the nineteenth century. This paper will consider the rise of the penny banks in Glasgow in the second half of the nineteenth century and estimate their contribution to the mixed economy of welfare, which has been developed as a way of understanding the strategies adopted by families for dealing with poverty. Within this rubric, further questions suggest themselves – the extent to which these organisations represented self-help or philanthropy, and the role of families and gender in determining attitudes towards saving can be examined. This is essentially an exploratory paper, which will do no more than scratch the surface of the enormously rich archive collection which survives at the University of Glasgow's Business Records Centre. In this sense, then, the paper will suggest avenues for future and much more complete, research.

Penny banks were essentially gatherers of very small savings from the poor working class. Samuel Smiles described them thus; *'the Penny Bank is emphatically the poor man's purse. The great mass of the deposits are paid in sums not exceeding sixpence, and the average of the whole does not exceed a shilling. The depositors consist of the very humblest members of the working class, and by far the greatest number of them have never before been accustomed to lay by any portion of their earnings'*[iii] For Smiles, of course, these banks were wholly beneficial both to the depositors and to society more generally; they displayed all the classic hallmarks of Victorian philanthropy, in which well-meaning and dedicated members of the middle class provided the means by which the poorer classes could help themselves escape the tyranny and degradations of poverty and drunkenness. The issue of whether they were indeed the *'poor man's purse'* – that is whether they were used to make small savings for foreseeable exigencies, and whether withdrawals were as important an aspect of their operation as deposits, is an important pointer to their position in the array of strategies available to poor families for managing very tight budgets.

The first penny bank was founded in Greenock by James M Scott. The Greenock Provident Savings Bank, which retained the old form of operation (rather than becoming a Trustee Savings Bank) throughout its existence, had been founded in 1815. In the Annual Report of 1847, the hope was expressed that *'the working classes may, by continued representation, be brought to take such a view of their own interest as will induce them really to use the bank, as it was originally intended and expected they would'*[iv] Complaints that the poorer class of depositors were not as open to the benefits of thrift and economy as they might have been, were a common feature of the annual meeting. In the same year, there were 4382 open accounts, of which only 1490 had balances of less than £5.[v] The previous year, in 1846, James Scott applied to use the bank hall to conduct the business of what was then known as the 'Penny Club'. His plan was to open the club for two hours every day, between 8 and 10 am, for the receipt of sums from one penny to one shilling. The object of this club was to *'promote habits of regularity and frugal economy...for the benefit of persons of all ages, both sexes and every*

class'. The incentives to regular saving were powerful; *'one shilling will be presented by the committee to every depositor making regularly a weekly sum not less than one penny – additional premiums will also be awarded.'*[vi] In the first year of operation, 1846, the Club received £177 13s 11d. The following year, it collected £188 10s 9d, and in 1848 £208 3s 4d. Very little more is known about the Greenock club, except that the Trustees of the Greenock Provident looked upon it 'in the light of a nursery and valuable auxiliary to the Provident Bank.'[vii]

This attitude towards the penny banks was fairly common throughout the savings bank movement, and it was the model of Greenock, which the Rev. Dr. Buchanan held out to the fifteenth annual meeting of the Savings Bank of Glasgow in 1850. He noted that, despite the success of the Glasgow Savings Bank (already the largest and most successful in Scotland, soon to be the largest in Britain) *'the banks' depositors...still bear a small proportion to the thousands in our wide-spreading population who habitually spend their all from week-to-week in improvidence and vicious gratification...this applied to the masses who existed in a stratum of society which the operations of this bank could not reach or contribute to elevate'*.[viii] Buchanan noted the success of Scott in Greenock, citing *'no fewer than about 5000 depositors'*, as well as similar banks in London and Hull. Encouraged by these examples, the first penny bank in Glasgow had been formed *'in one of the most degraded and necessitous districts of the city'*, and in the four weeks that it had been open, 132 depositors had joined. He felt it to be particularly gratifying that many of those appeared to be making regular payments, and the average receipts for each evening were about £2.[ix] Buchanan's purpose in describing this bank was to encourage others – *'gentlemen who felt interested in the social elevation of their fellow men'* to start up similar institutions. In this he was successful – two more banks were founded in the following year, and by the end of the decade, there were 36 in Glasgow, with around 8000 depositors.

This growth continued and, in 1863, Rev. Dr MacLeod of the Barony noted that there were 64 such banks in and around Glasgow. The 20028 depositors had

some £3000 to their credit, and approximately £2500 had been transferred to the Savings Bank in the previous year. This last item was a result of the general rule that £1 was the maximum which could sit in any account – on reaching this sum, it would be transferred to the Savings Bank, and the latter was very aware of the benefits in terms of new customers which they accrued by this means. As early as 1852, the Savings Bank Committee had referred to them as 'auxiliary banks', and looked forward to them bringing a large class of new customers to the Glasgow bank.[x]

By the time of MacLeod's oration in 1863, however, it was clear that a more formal organisation was required to continue the success of the penny banks. He suggested that those in charge be paid for their labours – a suggestion never taken up – and he proposed the creation of a committee *'for the reform, organisation and dissemination of penny banks throughout the city'*.[xi] By 1865, the Penny Banks Association was in a position to produce an annual report and statistical summary of the operation of all the banks in the city and surrounding area.

It was, of course, not only in Glasgow that the Penny Bank movement took root, although it generally recognised that the city provided the model of operation. By 1867 there were 874 penny banks operating in the United Kingdom, (682 in England, 169 in Scotland) with slightly under £60 000 in total deposits. The rhetoric is revealing of the quasi-religious fervour, which underlay many good works of the period: *'the Penny Savings Bank is the brilliant triumph of peace. It is the star of administrative power and order which peace alone can create, it is the fruit of freedom which peace alone can nurture; it is the mark of a perfecting confidence between our people and our government which peace alone can ripen.'*[xii] The Annual Report of 1868 reported the President of the Yorkshire Penny Bank (of which there were 216 branches with 31267 depositors) as saying that *'the first idea...was borrowed from your Scotch institution'*.[xiii] It also cites examples of government officials in India starting savings banks there, and the beginnings of the Cents Savings Banks in Canada, under the aegis of Dr Laurence Hill, *'who was long in Glasgow'*. Horne describes the early promoters of penny

banks such as Queckett in London and Sikes in Huddersfield, and notes the importance of friendly society principles in their development.[xiv] Indeed, the boundaries between friendly and benevolent societies, funeral fund collections, works banks and penny banks were often blurred, at least in the early days of their operation.

The key to success of the penny banks lay in uniformity of approach. At a meeting on 28 November 1865, the Glasgow Penny Bank Managers adopted the following rules;

1. Each penny bank shall be worked by more than one person attending each time the bank is open.

2. Two records be taken simultaneously of each transaction

3. The balance of cash be lodged weekly in the National Security Savings Bank

4. The ledger be balanced at least every six months and the balance be audited by the Trustees, or by an auditor appointed by them.

These rules formed the basis of operation in all penny banks, and were quickly codified in a pamphlet prepared by William Meikle, the cashier of the Savings Bank of Glasgow. The Savings Bank undertook to provide, free of charge, the necessary books and stationery for starting a penny bank, and Meikle's Penny *Savings Banks: How Formed and Managed* (1868) received widespread publicity. Most banks were open once a week, on Saturday evenings between 6 and 8 p.m., although other days, such as Mondays, were also used. Where possible, subtle pressure was exerted on depositors – the annual report of 1869 noted that *'the foremen of the various works wait at the pay table and gather in the books and the small deposits of the workers'*.[xv] It would be difficult to miss the implied threat in such an arrangement. The same report recommended that *'the name adopted by each Penny Bank should be a district rather than a denominational one'*. Churches and philanthropic Christian missions had been the mainstay of many of

the banks, but the association stressed the practical value of the work, *'entirely divested from sectarian motives or tendencies'*[xvi]

The success of the Penny Bank movement in the city is evident in Chart 1, which shows the number of operating banks and open accounts at the end of each year as reported by the Penny Banks Association, and Chart 2 which shows the amount of money held in open balances and transferred each year to the Savings Bank. By 1914, there were 279 such banks in and around Glasgow (although it should be noted that some of these were indeed fairly far from the city), with in excess of 80 000 accounts, holding just over £26 000. In the period between 1864 and 1914, these banks had transferred in excess of £1.2 million to the Glasgow savings bank.

Olive Checkland, in her study of *Philanthropy in Victorian Scotland* argues that the penny banks, *'by providing a neighbourhood deposit centre, encouraged the fragile resolve of the poor...and provided a critical link in the chain of self help'*.[xvii] This is an interesting conclusion, since the aims of the Penny Bank trustees and much of the rhetoric surrounding their establishment was clearly of the middle class, philanthropic sort. These banks were designed expressly to inculcate middle class values of long-term thinking and thrift into working class family budgeting. The Trustees were not depositors, but rather ministers of religion and others seeking to enlighten and educate the poorest members of their society. The approach was widespread and fundamental; *'to teach the humble industrious citizen the principles of economy is the aim and end of the Penny Savings Bank.'*[xviii] Or, more apocalyptically, and referring to a pipe smoker *'if he had saved the money spent on this debauchery between the ages of twenty and fifty...would have in the Savings Bank £72 18s 11d; hard heavy-glittering gold instead of a nasty, offensively smelling, muddlefying weed for which, in the shape of return, he gets smoke and fumes as if his body was on fire and flames twisting out at the garret, and ashes, and blacked burned pipes, with an unnatural precocity of parts, ending in premature decay'*[xix] As Checkland notes, the concept

of Trusteeship was elitist, and their attitude was profoundly philanthropic. This was especially clear in regards to the encouragement of school banks.

From 1873, the Penny Banks' Association entered upon a campaign to have banks located in schools. The encouragement and inculcation of good habits among the young was seen as one of the chief ways in which the philanthropic goals of the movement could be met; *'the early instillation into the youthful mind of habits of thrift and prudence cannot but be fraught with great and lasting good to the individual and to the community at large.'*[xx] This coincided with the requirement of compulsory attendance in the city and School Boards had been created to administer the provision of education in 1872. The Penny Banks' Association held meetings with members of the school boards, with a view to establishing a bank in every school. To further their cause, they printed an abridged version of a pamphlet on School Banks in Belgium, and forwarded it to members.[xxi] School banks were fairly common in France, Belgium, Holland and Italy, and they spread slowly to the cities of London and Liverpool.[xxii] In Glasgow, agreement was reached with the School Boards in 1877 for the opening of banks in schools, and by the end of that year, there were 18 operating in Board Schools.[xxiii] The following year, the Council of School Managers, meeting in Liverpool, resolved that *'the teaching of thrift should become part of the national education'*. Great things were ascribed to the operation of school banks, including increased attendance and interest in schoolwork.[xxiv] Chart 3 shows the spread of school banks in Glasgow. Clearly, the success achieved here was rather limited – particularly in the period before 1905. Horne notes that William Meikle had never been particularly persuaded of the opportunities for spreading the word in schools, and that it was not until 1904, with the coincidence of the new Local Education Authorities, and the Savings Bank Act of 1904, which allowed the savings bank trustees to donate stationery and other expenses, did the school banks make any real impact.[xxv]

The middle class philanthropy, which the penny banks represented, offers an opportunity to explore these institutions using the rubric of Finlayson's *'mixed*

economy of welfare'.[xxvi] Finlayson suggests that there were a variety of agencies – both state and non-state, which were accessed by the poor in their attempts to deal with the difficulties of their situation. There are two crucial elements here; first, the voluntary principle was very important, but this could take the form either of straightforward provision of charity, or in providing the conditions for the running of mutual societies which offered, in Daunton's phrase 'contingency' benefits.[xxvii] Secondly, Finlayson took the view that such mutual-aid working class activity could *'shade into a pursuit of providence more associated with the middle classes: self help'*[xxviii] The niceties and precise location of the Penny Banks on a spectrum of voluntarism or class purity is, however, less important than the principle that here was an institutions which clearly aimed – through philanthropic and voluntary means – to provide the opportunity for the poorest of the working class to engage in the process of bettering their lot. One of the key implications of the kind of approach taken by Finlayson and Daunton – and evidenced also in the work of Paul Johnson[xxix] is that the working class was not homogeneous, and there were occasions and institutions in which the self help activities of one group of workers might pull them away from others. The relationship between the Savings Banks and the Penny Banks is just such an example. Peter Payne's study of the Glasgow Savings Bank is convincing in its argument that the bank was used as a savings institution by the working classes. But what Payne describes – the mechanics, iron-workers, domestic servants, smiths, masons, wrights, joiners, clerks - is the respectable working class, those in steady employment and who could reasonably afford, at least in good times, to save a shilling or two per week. The average balance held by all depositors at the Savings Bank in 1848 was £18 14s 10d. Even the 293 handloom weavers had an average balance of £12 17s 7d.[xxx] For those with less than 1s per week to deposit, the Savings Bank offered no welcome and no assistance.

It is not, perhaps, the absolute sums which are of importance in discerning the role of the penny bank, however, but the frequency of use. If the Penny Banks were indeed, as suggested by Smiles, the 'Poor Man's Purse', then we may understand their contribution to the mixed economy of welfare. Such investigation requires

analysis of those who opened accounts and how these accounts were managed. The data available are of frightening proportions, and this paper does little more than suggest ways in which they might be used. By tackling some of the issues, and using small samples of the data, it is hoped that hypotheses can at least be established for more extensive research.

Table 1: Depositors' Opening Balances

	Barony	Unidentified
Number of Depositors	103	155
Total Deposited	£4 5s 2d	£5 7s 1.5d
Average Deposit	9.92d	8.29d
Number of Deposits <6d	59	63
Number of Deposits >2s	13	5
Most Common Deposit	1d	6d
No. of men	62	76
No. of women	41	79
Average male deposit	8.58d	7.74
Average female deposit	11.95d	8.85

Source; Ledger Books of Barony and Unidentified Penny Banks, GUABRC TSB63/15/14/1/1; TSB 63/15/5/1/1.

The nature of the deposits is important in determining the people who made greatest use of the banks. In the list of banks assisted by Callender, the average opening balance of the 2418 depositors, across 22 banks spanning 13 years, was 11.06d. Table 1, however, gives a more detailed breakdown of the amounts lodged as opening balances at two of the city's Penny Banks – the Barony, which

opened on May 15 1850, and an unidentified central Glasgow penny bank, which first opened on April 5, 1875. The data are extracted from the opening balances on the first night of operation in the Barony bank, and the first two nights of operation in the unidentified bank.

There are a number of interesting things to notice in this table. The first is of course the limited sample and possible bias caused by opening balances. But the very small scale of the balances is remarkable. In both banks, the average deposit was well under 1s, and in the case of the Barony bank, the number of those depositing 1d was greater than any other amount. Clearly, the penny bank was true to its name. The relationship between women and men depositors is interesting; that there were so many women is worth noticing in itself, but that these women deposited, on average, more than the men, is striking. At the moment, I am unable to make much of this, other than to note that it accords with some of the standard work of authors such as Jane Lewis and Shani D'Cruze on the importance of women in running household budgets.[xxxi] Much remains to be done on this of course, but the possibilities for articulating with the literature on the role of gender in determining family saving and expenditure patterns are extremely exciting. That this saving was very much a family and household activity is underlined by the numbers of people with the same surnames and addresses who appear in the bank ledgers. In one example, seven members of the Campbell family of 40 Sinclair St. all opened accounts at the unidentified bank on opening night. Maggie, Peter and Colin each deposited 6d, Samuel and Jessie 1s, James 3s and Jane 5s.[xxxii] This family clearly had some disposable income, but the amounts were, on the whole, too small for deposit with the Savings Bank. In another case, seven members of the Gourlay family, all of Parliamentary Road, each deposited 1d at the Barony bank, with the exception of Catherine Gourlay Snr. who had 6d.[xxxiii] Again the opportunities for exploring the structure and contours of family economies with this type of data are enormous, especially given the possibility of linking this with the census material of the late nineteenth century.

It has been noted above that the frequency of transaction, and the extent, to which the depositors' had to withdraw their money, will reveal much about the role of the Penny Banks as the Poor Man's Purse. Preliminary investigation, of the operation of the first 22 accounts opened at the unidentified bank in April 18, suggest some hypotheses which could be tested by further work. Of the 722 transactions logged between the opening and closing of these accounts, 645 were deposits, 47 were transfers to the Savings Bank and 29 were withdrawals. The mean of all deposits was 44 83d, but if the 33 deposits of more than £1 – that is, those which made their way straight to the Savings Bank – are excluded, the mean falls to 16 6d. The most common single transaction in these accounts, however, was the deposit of 2d: this happened 108 times. The average withdrawal was slightly over 10s 5d. In total, these depositors transferred £104 11s 3d to the Savings bank. It seems that these accounts largely took the form of very small savings building up either to the point of transfer, or to withdrawal of what was, in these terms, a significant amount. Table 2 provides further details on this pattern and gives some data on the turnover, longevity and frequency of use of these accounts.

There are a number of important elements in this table. First, it is striking how few withdrawals there are; many of the accounts seem to have a small number of deposits and they are then closed with one withdrawal. Second, it is clear that these accounts could lie dormant for a long time – in one case for over thirty years. But most commonly, the accounts would lie dormant for a few months either between deposits, or more usually, prior to a withdrawal. It does not seem to be the case - as is implied by the 'poor man's purse' analogy - that depositors repeated a pattern of saving and withdrawing. Third, the very small scale of many of these accounts is striking. Some represent very small savings (occasionally over quite a long period) indeed. Many do not even reach the level at which a transfer to the Savings Bank would be required. Fourth, there is further evidence of family saving, with the Campbells, the Goodwins, the Hunters and the Mains'. The fifth interesting element is the case of Elizabeth Dickson, who at one point was depositing two, three and sometimes four pounds a week. Why she was

Table 2: Account Details of 22 Customers at Unidentified Penny Bank

Name	Date Closed	No. Deposits	No. Withdrawals	No. Transfers	Total Turnover
Campbell, Maggie	11 Dec 1876	30	1	0	£1 2s 4d
Campbell, Peter	4 Dec 1876	29	1	1	£1 1s 7d
Crosbie, Mary	1 Aug 1877	45	2	0	£1 13s 3d
Dickie, Maggie	18 Oct 1875	13	1	0	5s 8d
Dickson, Elizabeth	28 Jan 1901	129	4	31	£89 19s
Douglas, Bella	27 Feb 1930	24	0	5	£8 0s 10d
Forbes, Alexander	21 Feb 1876	6	1	0	5s 8d
Gilchrist, William	12 Nov 1876	34	1	2	£3 15s 6d
Goodwin, Gracie	13 Sep 1875	15	1	0	3s 9d
Goodwin, William	5 Jun 1876	13	1	0	7s
Houston, Christina	10 Apr 1876	7	1	1	15s
Hunter, Agnes	3 May 1880	81	4	1	£2 17s 5d
Hunter, James	3 May 1880	66	1	1	£1 2s 4d
Hunter, William	3 May 1880	67	1	0	12s 8d
Mains, James	6 Sep 1875	9	1	1	£1 3s 6d
Mains, William	2 Aug 1875	9	1	0	2s 8d
McEwan, Alexander	21 Jan 1878	15	2	0	10s 5d
McMenemy, Jeanie	23 Oct 1875	2	1	1	9d
Paterson, Mary	13 Mar 1876	30	0	3	£2 16s
Robb, Rachael	16 Apr 1879	14	3	0	7s
Wheldon, John	11 Oct 1875	7	1	0	5s

using a penny bank to do this, and the source of this money, must remain matters for conjecture, but it is in cases such as this that linkage to the census material, which will give details on occupation, marital status etc. will be most helpful.

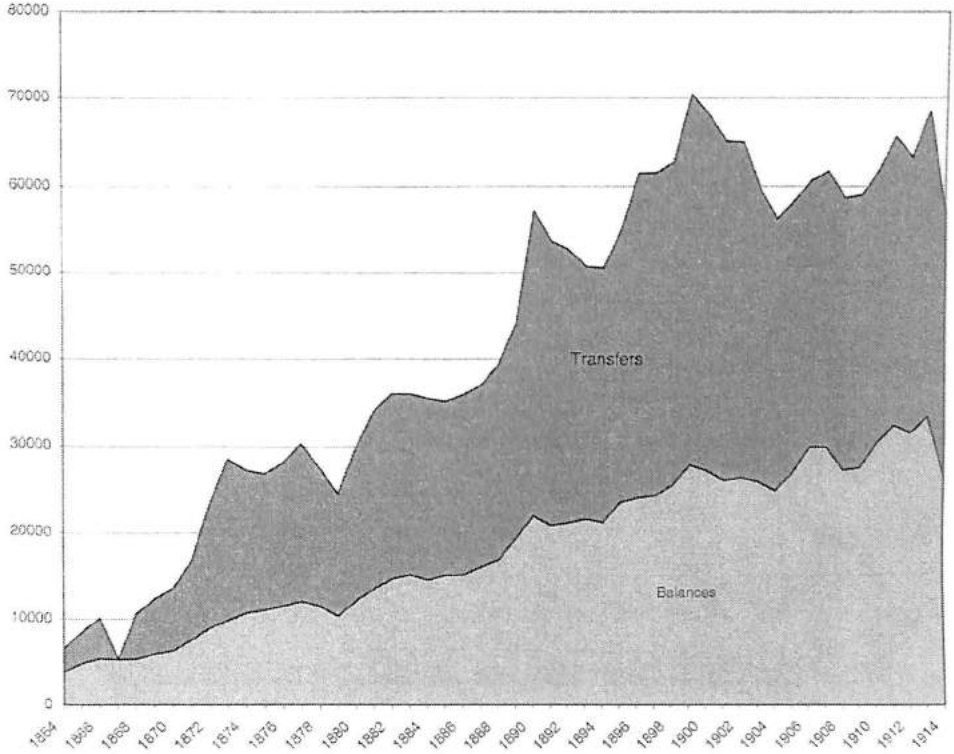
The most important thing to stress about table 2, however, is that the sample is extremely small and unreliable; the conclusions to be drawn from it are no more than indications. Some corroborative evidence is contained in Chart 4, which shows the average deposits and withdrawals from the Bellshill Penny Bank in the four-year period 1861-64. The average deposit for this series is consistent with that for the other banks examined – somewhere between 1 and 2 shillings, while the average withdrawal is between 10s and £1, with occasional larger amounts. In the period covered by this data, the Bellshill bank – open once a week as was the norm – had an average of 34 depositors and just over 7 withdrawers on each occasion. It transferred £491 16s and 7d.[xxxiv]

Conclusion

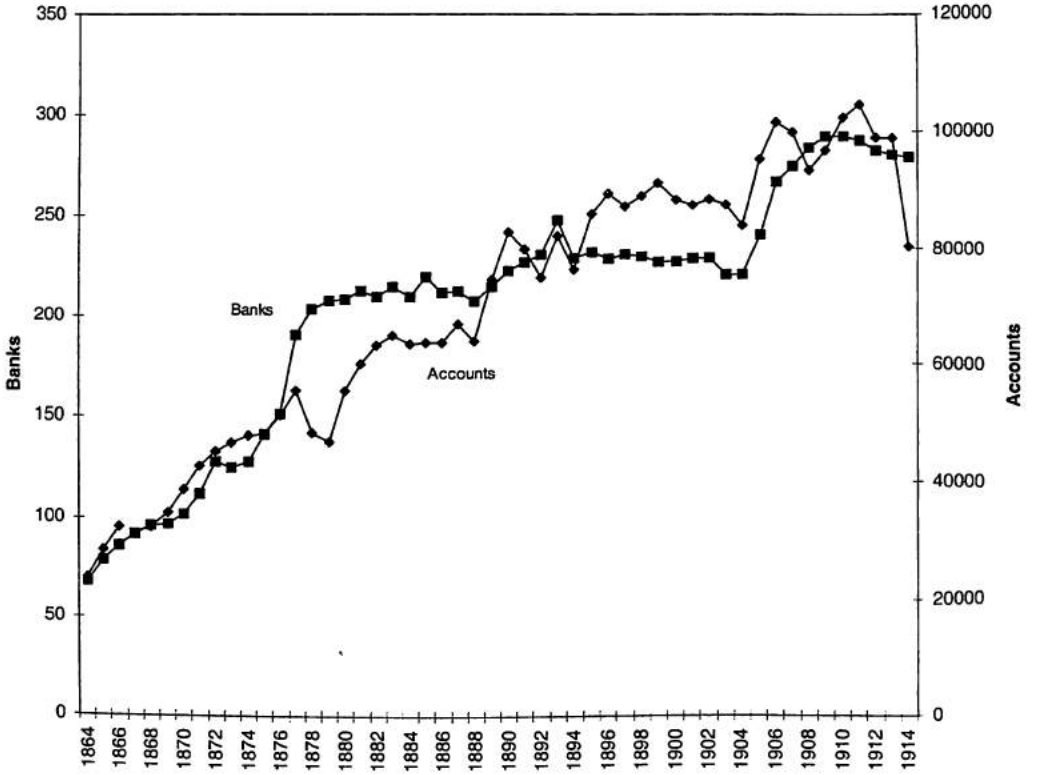
The Glasgow Savings Bank was the largest and most successful in Britain. Even here, however, the Savings Bank movement catered overwhelmingly for the respectable working classes – those who could afford to make regular payments in excess of three or four shillings, and whose accounts quickly built up towards £20 or more. The Penny Banks catered for the poorest working classes – individuals who could afford, at best, to save 6d per week, but who very often could not raise this amount and who were unable to commit to making regular payments over a long period. These penny banks performed the most basic function of banking – that of treasury, of keeping very small sums away from the temptations of current expenditure. Philanthropy and self-help are the key concepts in understanding the operation of these institutions, and it is clear that, by offering a route into small savings, they offered one strategy to poorer families attempting to manage small budgets. As a component of the mixed economy of welfare, they have largely been overlooked. The evidence presented here indicates that they did indeed play an important role in encouraging saving, and in allowing tiny sums to be put aside

for later use. This is important, but further work is required if we are to construct any reliable understanding of the contribution of the penny bank movement to Glasgow's working class economy.

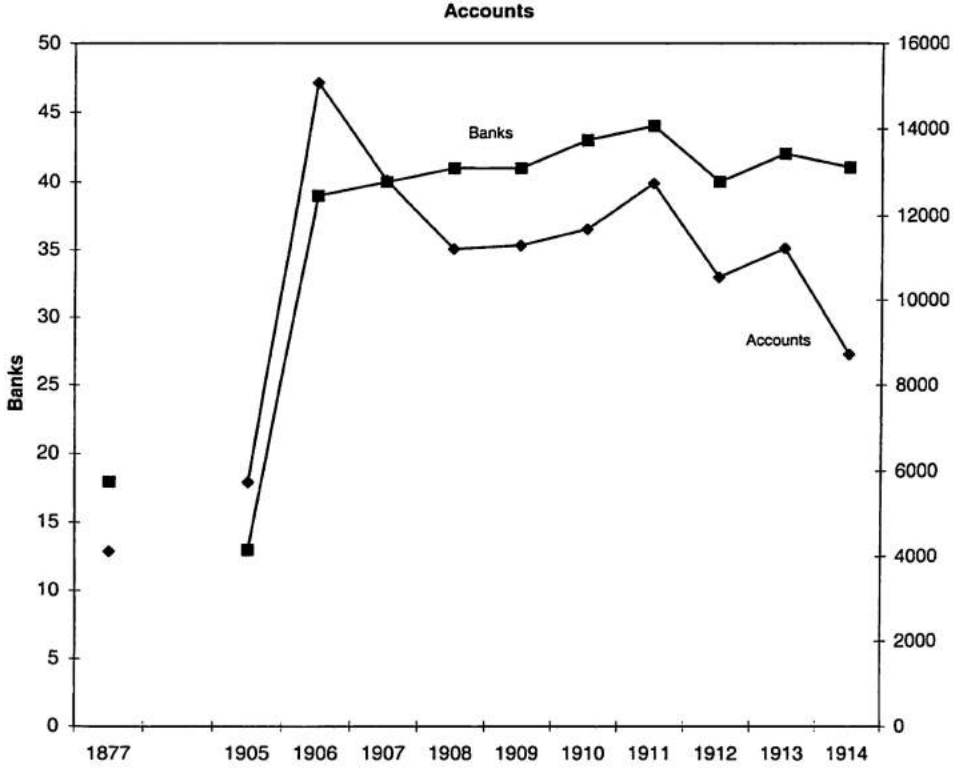
Open Balances and Transfers (£), 1864-1914



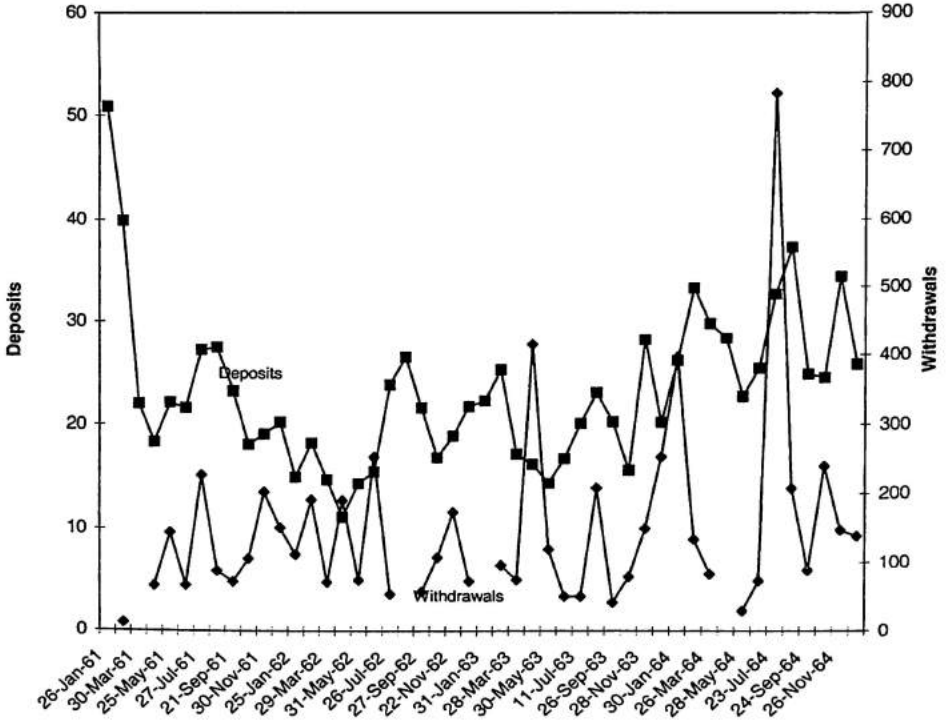
Number of Penny Banks and Number of Accounts, Glasgow 1864-1914



Number of School Banks and Accounts: 1877 and 1905-14



Bellshill Penny Bank: Average Deposit and Withdrawal, Monthly, 1861-64



[i] Note taped into front cover, Penny Savings Bank Letters, 1860-1866 Glasgow University Archives and Business Records Centre, Trustee Savings Bank Collection, TSB 63/15/4/3. An attached note, written by John Cruickshank indicated that Mr Callender had 'long retained' this list in his pocket.
[ii] *Glasgow Herald*, 23 October 1860
[iii] S.Smiles *Thrift* (London, 1882)
[iv] Minutes of Annual Meeting, 1847. Greenock Provident Bank, Minute Book, No.2.GUABRC, TSB 64/1/1/2
[v] ibid.
[vi] Greenock Penny Club. Savings card inserted in GUABRC TSB 63/15/4/3.
[vii] Minutes of Annual Meeting, 1848. Greenock Provident Bank, Minute Book No. 2, GUABRC, TSB 64/1/12
[viii] Report of the Fifteenth Annual Meeting of the Savings Bank of Glasgow, 1850 GUABRC TSB 63/1/4/1.
[ix] Ibid.
[x] Annual Report of the Savings Bank of Glasgow, 1852 GUABRC TSB 63/1/4/1.
[xi] Annual Report of the Savings bank of Glasgow, 1863 GUABRC, TSB 63/1/4/1.
[xii] Paper by Comptroller General; 'The Penny Savings Banks in the United Kingdom that invest their deposits in Savings Banks' GUABRC TSB63/15/2/1.
[xiii] Annual Report of the Penny Banks Association, 1868, GUABRC TSB63/15/2/1.
[xiv] H.O. Horne *A History of Savings Banks* (Oxford, 1947), chapter 10.
[xv] Annual Report of the Penny Banks Association, 1869. GUABRC TSB63/15/2/1.
[xvi] Ibid.
[xvii] E.O.A. Checkland *Philanthropy in Victorian Scotland: Social Welfare and the Voluntary Principle* (Edinburgh 1980) p.136.
[xviii] Report of the Penny Banks Association, 1865;GUABRC TSB63/15/2/1.
[xix] 'Savings Banks – Report of a Great Public Meeting Held in Glasgow on 10th February 1852' (Glasgow, 1852). This is quated in P.L. Payne 'The Savings Bank of Glasgow, 1836-1914' in P.L. Payne (ed) *Studies in Scottish Business History* (London, 1967).
[xx] Report of the Penny savings Banks, 1877, GUABRC TSB 63/15/2/1.
[xxi] Report of the Penny Savings Banks, 1873, 1874 GUABRC TSB 63/15/2/1.
[xxii] See Horne, *Savings Banks* 194-195
[xxiii] Report of the Penny Savings Banks, 1877, GUABRC TSB 63/15/2/1.
[xxiv] Quotation from the Conference of School Managers, Liverpool, 28 January 1878. Report of the Penny Savings Banks, 1878, GUABRC TSB 63/15/2/1.
[xxv] Horne, Savings Banks, p.196-7.
[xxvi] G. Finlayson *Citizen, State and Social Welfare in Britain, 1830-1990* (Oxford, 1990), and G.Finlayson, 'A moving frontier: voluntarism and the state in British social welfare, 1911-49' *Twentieth Century British History* (1990) Vol. 1 pp.183-206.

[xxvii] M. Daunton 'Introduction' in *idem* (ed) *Charity, self-interest and welfare in the English past* (London, 1996) p.12.
[xxviii] Finlayson, *Social Welfare* p.42.
[xxix] P.Johnson *Saving and Spending: the Working Class Economy in Britain, 1870-1939* (Oxford, 1985).
[xxx] Payne 'Savings Bank' p.167.
[xxxi] J. Lewis 'Women in England, 1870-1950: Sexual Divisions and Social Change' (Brighton, 1984); S. D'Cruze 'Women and the Family' in J.Purvis (ed) *Women's History. Britain 1850-1945: an Introduction* (London, 1996)
[xxxii] Unidentified Penny Bank, Depositors' Ledger Boos, GUABRC 63/15/14/1/1
[xxxiii] Barony Penny Bank, Depositors' Ledgers. GUABRC TSB 63/15/5/1/1
[xxxiv] Bellshill Penny Bank cash book. GUABRC TSB 63/15/13/1/1

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The first edition of Scottish Industrial History [Volume 1.1] appeared in the autumn of 1976 with the coming together of the *Newsletters* of the Business Archives Council of Scotland and the Scottish Society for Industrial Archaeology. The editorial for the first edition highlighted *'the trend among academics and amateurs, to realise their interdependence'*, subsequent editions have re-inforced that interdependence. *Scottish Industrial History* has published articles on a wide range of topics relating to industrial and commercial history, and welcomes further contributions.

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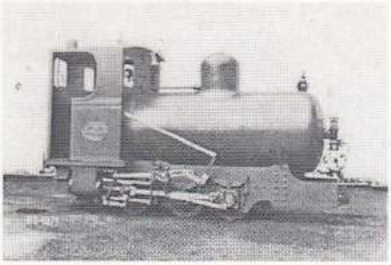

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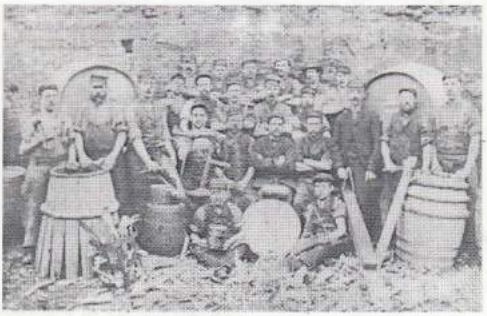

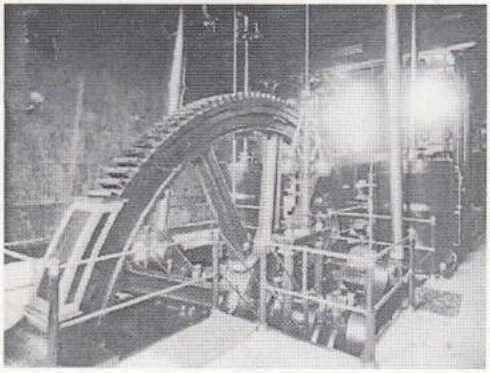

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