1. The Development of the Cotton Industry in Paisley

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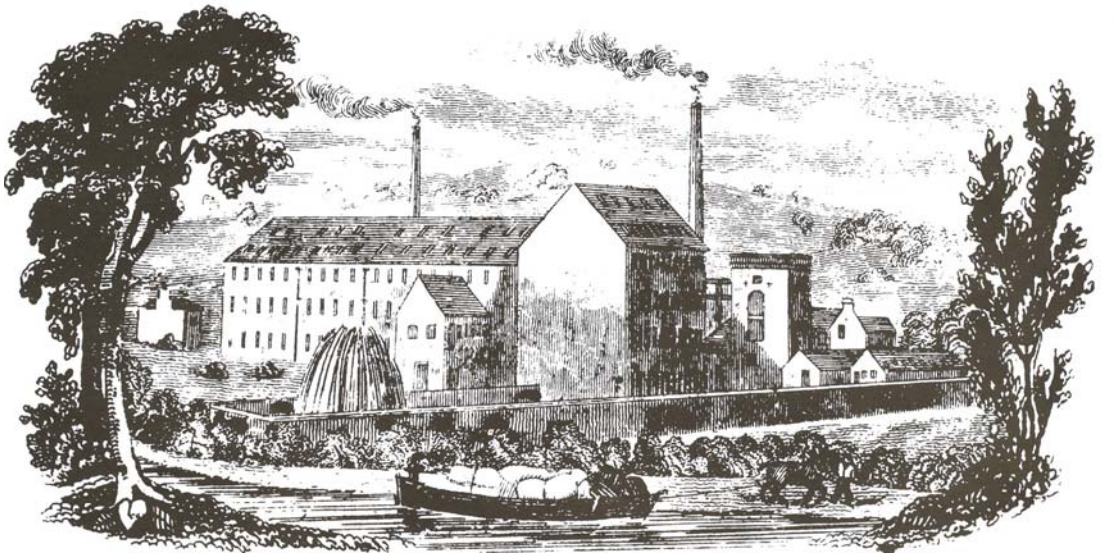
Preface

It is a common difficulty in Scottish history and archaeology that big successes become so well-known that we lose sight of how they actually started. Such is the case with cotton mills. This paper asks how the vast 'Paisley Mills' of Coats and Clark actually developed. This will take us back through a potted evolution of the textile mill, leading up to the development of Paisley's world-wide success in textile making.

The story is very wide-ranging, but as the emphasis of the 2008 conference is on built heritage, we will look at the earlier period through a quick tour of the buildings or physical evidence. The development of the cotton mill can be seen through an evolution of five groups of textile 'mill':

1. Weaving Mills or 'Manufactories'
2. Thread Mills
3. Lint Mills
4. Wash Mills, Bleachfields and Printfields
5. Spinning Mills



Early Ferguslie Mills and Paisley Canal c.1830
(Courtesy of Glasgow University Archive Services Ref. GB 248 UGD 199).

Introduction

What is a cotton mill? Today it can mean anything from a water-powered factory to a warehouse up the A9 which sells tartan rugs, shortbread and fiddle music. How does a cotton mill compare with earlier textile mills, such as thread mills and lint mills? Does a water powered mill differ from a steam powered mill? Is a Paisley cotton mill the same as a New Lanark cotton mill?

Such questions can be answered in terms of industrial history or archaeology. However to a wee boy in Neilston a hundred years ago, 'the mill' was simply where his big sisters, mother, granny and aunts worked. They spent all their lives tending

machines and knew all the jargon, although they probably couldn't answer the bigger 'mill' questions.

Three hundred years ago, most mills were rural buildings on a river bank, no bigger than a cottage. A decade later, the pace was transformed, when two visitors to the hamlet of Johnstone Bridge described the first of several very large cotton mills. Here 'a great number of machines of many kinds are worked all day and all night … the work never stops ... it seems to be the last word in mechanical ingenuity'. The industry had suddenly jumped up a scale, but the 'mill' name remained.

For workers in the new and rapidly-growing rural textile settlements, the air had a hint of dampness and riverbank growth, harking back to childhood adventures. Around the mill, the constant swish of the great water wheel mixed with the sound of the river. There was a profound feeling that overall livelihood depended on the rhythm or flow of the river. In Bridge of Weir, a string of big new cotton mills staggered their meal breaks downstream, to allow the water to build up at each successive dam, and avoid wasting water. The prosperity of the village depended entirely on a constant flow of water in the River Gryfe. This was acknowledged in the 'town rhyme', read out at local celebrations: 'May the River Gryfe flow on through life, and ne'er be wanting water....'. Here the mills were huge, but still quite close to the old meaning of a 'mill', located down in damp river valley and relying entirely on water power.

From the late 1790s, large cotton mills appeared, not only in the rural villages, but fronting streets in towns such as Paisley. Here they were powered, not by water, but by steam engines. A further century later these mills had changed quite radically, evolving into the familiar 'Paisley Mills' of the late Victorian period. By this time, the term 'cotton mill' was linked mainly with the thread manufacture of the Paisley-based Coats & Clark dynasties, who had become successful on a world scale. Today Paisley is still indelibly linked in popular history with cotton sewing thread (not to mention shawls and the 'Paisley pattern').

Background

To find out more about the origins of Paisley's successful Victorian thread making, there are surprisingly few original sources. Matthew Blair's history of the Paisley thread industry is the most obvious, but is now a century old. Blair is one of a number of traditional historians who repeated the same stories. The information is still useful, but today we tend to be more inquisitive. The old accounts leave us with many gaps in the picture and fail to relate the story to the much wider forms of textile-making in the Renfrewshire.

To answer the question of 'how it all started' we need to go back at least three centuries, and two centuries before the heyday of Coats and Clark, to the beginning of the eighteenth century. Although we are looking at the origins of the spinning mill in Paisley, the town has always been the focal point of a wider area, particularly the flatter lands in the catchment of the Cart river system or 'Cart Basin'. This includes the wide valleys of the rivers White Cart, Black Cart and their tributaries, particularly the Gryfe and Levern. It also includes a large number of seemingly minor burns.

Research and published material on the early textile industry has been lacking. Could there be an unspoken fear that the most important developments always occurred ten miles east of Paisley? This paper will suggest that competition with Glasgow is not an issue. This has important consequences for Paisley's heritage today and for what is celebrated in the popular history of the west of Scotland.

1. Weaving of Fine Textiles

At the start of the eighteenth century, textile making in Renfrewshire was basically a cottage weaving industry. Textiles were coarse and poorly finished. Changes to this would gradually be driven by a group of merchant entrepreneurs. Most were based in Paisley, which was always the commercial centre. Other satellite groups in Renfrewshire were also important, particularly in Lochwinnoch, Pollokshaws and Kilbarchan.

Perhaps the most important change, which would affect everything which came later, occurred just after 1700. At this early date the Paisley-based merchants opted to take a different approach from those in most other parts of Scotland. They decided to focus on *quality* textiles, rather than the very coarse cloth which was woven almost everywhere else. Although the main textile was linen, others were introduced, including mixed cotton-linens, fine quality lawns or 'muslins' imitating Indian varieties, embroidered lawns, fine checked handkerchiefs and cambrics, all by the mid-1720s.

For our story, the first notable change involved where the weavers actually lived. In the late seventeenth century, rural areas such as Kilbarchan parish had thirty four weavers, but only one lived in the parish village. The remainder were scattered widely throughout the parish. Paisley parish was similar, and of nearly 350 weavers in total, less than 20 percent lived in the town.

The textile merchants began developing a 'putting-out' structure, supplying the yarn to the weavers, then collecting the woven cloth. This more organised structure was also related to much wider changes to agriculture. The weavers moved from a subsistence agricultural background, living a hand-to-mouth existence, to living and working in the villages and towns for a wage. By the 1740s the potential to earn a wage independently from farming transformed the settlement pattern. More than a thousand weavers had moved from the countryside to settle in Paisley town alone, fifteen times the number at the start of the century.

Along with the decision to make quality cloth, the move to towns was one of the reasons why the region would become so important, not just locally, but on a national and international scale. Due to the great demand for textile workers by the mid-eighteenth century, Renfrewshire had by far the highest population increase in Scotland. This statistic alone tells us that something special was happening, even at this very early stage. The increase was far beyond the birth rate and resulted mainly from migration. The workforce came mostly from the Argyll parishes bounding the sea lochs of the Clyde estuary. This was generations before the better-known 'Highland Clearances'.

Table 1: Some Centralised Weaving 'Manufactories':

Date*	Factory
1738	Kerr & Pollok, Shuttle Street, Paisley
1739	Kilbarchan Linen Factory (1739)
1740	Lochwinnoch Factory (1740)
1745	Cumberland Manufactory, St. Mirren Wynd, Paisley (1745)
1749	Paisley Stocking Factory, Sneddon (1749)
1755	Kerr, Moody and Co., Paisley (1755)
1767	Orchard Weaving Factory, Paisley (1767)
	* Earliest known date.

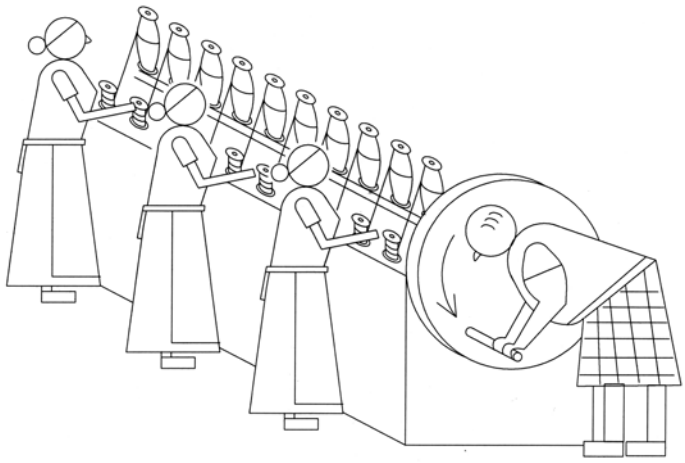
The first sign of organised or 'mill'-type working occurred from the 1730s, when the weavers were gathered together in workshops or 'manufactories'. These were not large powered mills, but were modest buildings in Paisley streets. They were simply handloom weaving shops, where workers were grouped together to control quality. One firm was Kerr and Pollock, who had a weaving manufactory in Shuttle Street, Paisley in 1738. This made fine quality linen gauzes, lawns, and checked handkerchiefs for the English market. By 1745 their warehouse and two weaving shops were valued at £1,200, a very large sum for the period. Another firm was the Paisley Stocking Factory, started in the growing suburb of Sneddon in 1750. The manufactories had a basic management structure, employing a full-time manager with a salary and a house, who trained apprentices. The next development, the thread mill, was again still situated in Paisley streets.

2. Thread Twisting Mills

The improvements in the quality of weaving and the central manufactories increased output, but were not powered. However from early in the century hand power was applied to mechanised thread 'mills'.

In the history of Paisley's mills, the difference between yarn and thread is a common misunderstanding. The basic product for both was the same, spun on a traditional spinning wheel by women in the home. Thereafter, to make thread, three or more strands of the previously spun linen yarn were twisted mechanically into a strong twine. This provided many times the strength of a single strand. The end use of the thread was for sewing or lace making. By contrast, single-strand hand-spun yarn was for use on the weavers' looms.

The thread mill was an important new textile development which started in Renfrewshire. The thread mill has direct connections through to Paisley's domination of the world thread market in the nineteenth century. As was often the case in seventeenth and eighteenth century Scotland, mechanised thread making was started by a woman, and brought from a foreign country. In the popular story, Christian Shaw of Bargarran brought a hand-powered twist mill from Holland in 1722. This allowed a dozen spindles of hand-spun linen yarn to be twisted into a strong sewing thread by turning a crank. The importance of the innovation has turned Shaw into a mythical figure. Links with witchcraft have increased her renown, but to the modern mind raise doubts about her authenticity. However research has shown that she was not only promoting her twisting machinery, but training others through her own spinning school in 1728.



Basic Sketch of a Thread Twisting Mill

The increase in the size of the twisting machines led to a move to urban sites such as Paisley from 1725. The number of spindles per twisting machine increased gradually, to twelve, twenty-four and to forty-eight, and required greater motive power. As with the move of weavers away from the countryside, the need for labour to operate the thread mills also encouraged moving to towns. By the 1750s the machines were prepared and attended by 'mill girls', but had become too large to operate. The motive power was provided by unskilled labourers or 'stout Highlanders', who turned cranks at the end of the machine. A thread 'mill driver' was a common occupation in Paisley. By mid-century the machine-twisted sewing thread had developed a wide market and was well known throughout England.

By this time Paisley had over a hundred thread mills, at least half the Scottish total. By 1780, each thread machine twisted forty-eight spindles of yarn simultaneously and employed twelve people. The thread mills were still housed in modest buildings. Like the weaving manufactories, they were contained within cottages and tenements in the streetscape of the town.

The thread mills created a distinctive bustle and resonance in Paisley. A visitor walking the streets of the town in 1772 noted the 'agreeable sound of weavers looms and twist-mills'. By 1780 the economic value of mechanically twisted linen sewing thread equalled about half the value of Paisley's fine linen output. Unlike most other branches of the linen industry, linen thread would outlast the first few decades of the cotton boom. The thread mills have been underrated, and in Renfrewshire at least, were a genuine precursor of powered textile manufacture in cotton mills, and of the success of Coats and Clark in the nineteenth century.

Thread mills resulted in a large increase in output per person. Unfortunately, they still depended on the centuries-old tradition of the hand spinner in the home, to supply the initial product. Renfrewshire was the first region to successfully apply water power to thread twisting, in Kilbarchan parish in 1755. However the industry was already concentrated in Paisley and its satellite textile villages, where no water power was available. However Renfrewshire was also the pioneer of another early development which relied much more on water power, the lint mill.

3. Lint Mills

Apart from waulk mills, which we will meet below, lint mills were one of the first cases of water power being applied to a textile process. As with most early water-driven processes, they mechanised a very mundane process, like the old grain miller's 'daily grind'. They were not spinning mills, but used a relatively crude process to prepare flax before the spinning process.

Most Scottish lint mills were encouraged and partly-funded by the Board of Trustees. This was set up in 1727 by the Government to encourage textile manufacture. Again Renfrewshire was a pioneer in a new textile process and the first water powered lint mill in Scotland was built on the White Cart at Saucel in Paisley, the year before the Board was founded.

What exactly did lint mills do? In the traditional hand process of flax preparation, sheaves of flax were 'broken' or beaten with mallets on a smooth stone, to separate the reed from the rind. Next, they were held in handfuls, while being whipped or 'scutched' with a stick, until the rind was completely separated. The lint mill carried out the same labour-intensive process in two stages. Firstly, the flax was broken by

water powered stampers or rollers. Secondly, it was scutched by holding handfuls of stems against horizontal revolving blades, all driven by water power.

A linen Stampmaster's report for the lint mill at Newmill (Busby) on the White Cart in 1772 describes the process:

> 'This mill is upon Cart Water and well served with water through the year except in a drought in summer or frost in winter. Its method of breaking the flax is by mallets, and scutching in the horizontal slop, and five persons can scutch at the same time'.

The success of lint mills was limited due to a variety of factors. The main difficulty was that building of mills was driven by landowners, not by textile merchants. Many farmers built lint mills simply to obtain a Government grant, then lost interest.

One of the big problems with Renfrewshire's early textile heritage is that it has consistently been under-rated in favour of that of the east of Scotland. Renfrewshire's official total of lint mills is low, with the Board of Trustees figures indicating only three. However research in archives and on the ground shows that there were nearly twenty. What is even more significant is that half of these sites were at waterfalls which later supported cotton mills, albeit in much larger buildings.

Table 2: Renfrewshire Lint Mills

Renfrewshire Lint Mill	Watercourse	Earliest known date
Saucel (Paisley)	White Cart	1726
Milliken (Johnstone)	Black Cart	1733
Nitton (Craigbet)	Gryfe	1734
Duchal Steps	Green Water	1736
Barochan	Barochan Burn	1737
Roadside (Mearns)	White Cart	1749
Bridge of Weir	Gryfe	1766
Hollows (Crofthead)	Levern	1772
Loups (Lochwinnoch)	Calder	1772
Hawkhead (Paisley)	White Cart	1772
Blackhall (Paisley)	White Cart	1772
Newmill (Busby)	White Cart	1772
Fereneze (Neilston)	Levern	1782
Clerksbridge	Moor Burn	1782
Newmill (Auchingown)	Yardfoot Burn	1782
Bridgend (Lochwinnoch)	Cloak Burn	1782
Inverkip	Burn	1790
Brimstone (Neilston)	Levern	1796

Lint mills were contained in buildings no bigger than an average cottage and had quite a modest impact on the overall textile making process. However they were the first big demonstration that water power could be applied to a textile making process, which led to many other developments. Although most processes were still carried out by hand, the Board of Trustees equated progress with the application of power, particularly water power.

4. Bleachfields and Printfields

Textile making has four main stages: spinning, weaving, bleaching and printing. The first two stages have received by far the most coverage. Bleaching and printing were just as important and just as widespread, but are poorly understood.

For a region to be really successful at making and marketing textiles it had to master all stages of production. Lint mills were one small part of this big picture. The bleaching of woven cloth was a much more important part, particularly for making the finest linen, where finished texture and appearance were so important.

At the beginning of the eighteenth century, very little bleaching was done in Scotland, and the only home bleaching was low-quality, part-time burnside work. In 1700 most Scottish manufacturers sent their 'brown' cloth to London for bleaching and sale. From the 1720s a number of bleachfields were set up in the west of Scotland. These were laid out by Renfrewshire surveyor John Watt, and his surviving plans shows that they were complex affairs, with burns diverted into large fields covered by canals. In 1738 the first field to bleach and print mixed cotton-linens was pioneered in Renfrewshire, at Pollokshaws. This was considered to be the first modern organised textile 'factory', well before the days of cotton mills.

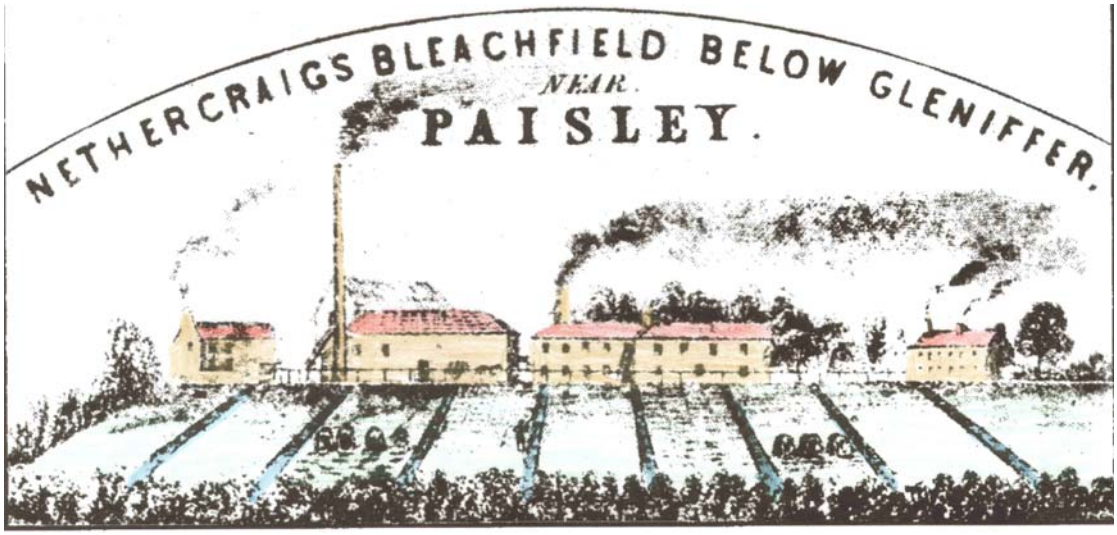
Most of the history of bleachfields covers the east of Scotland, where the Board of Trustees provided grants. Again national evidence for Renfrewshire is scant, with the official Board of Trustees figures listing only three Renfrewshire bleachfields in the eighteenth century. In the 1980s John Shaw greatly improved the figures, increasing the total to about thirty five. New research has now identified at least one hundred bleachfields and printfields in Renfrewshire by the end of the eighteenth century. Some were the largest in the country, employing as many as a thousand people in all the various stages.

All woven cloth and twisted thread had to be bleached. When the cloth came off the weaver's loom, it was far from being in a condition for sale. The spinner moistened her yarn with saliva. The weaver stiffened his web with gums and starches, including tallow and sour butter, to improve workability and strength. The bleacher's first task was to remove this mixture of oils, starch, dirt and rancid organic materials. The bleachfields solved this by washing, bleaching, drying, pressing and packing the cloth for sale. Printfields essentially carried out the same process, with the addition of printing and dyeing.

Like the lint mill, the location of the fields was dictated by the landscape. Bleachfields had to be situated near a source of water, as copious amounts were required. Apart from their fields, the early bleachfields also contained a number of buildings scattered over the site. The washing stage required power to drive the wash mills. The bleachfield's washing mill evolved from the traditional waulk mill, where large wooden feet driven by a water wheel trod and pounded the cloth. The waulkers may be thought of as the forerunners of the bleachers, using water power to wash and soften cloth and leather. In Renfrewshire, waulk mills were almost as numerous as grain mills, and several waulk mill sites later became cotton mills.

Apart from the wash mills, water power was gradually used for a host of processes across the site. Many fields had rubbing mills and beetling mills (for softening cloth) from the 1740s. In 1782 Fereneze printfield had a mill for polishing its copper printing plates. Fields such as Chapel at Arthurlie had mills for grinding dyewood and bark to produce printing dyes.

Illustrations of bleachfields are quite rare, compared with the iconic spinning mills. This is because outdoor bleaching, washing and drying dwindled by the late eighteenth century, when the evolving use of chemicals allowed the whole process to move indoors. By 1800 the typical works had a group of long buildings strung down the watercourse. In many localities the surviving 'field' name conjures up rural bliss, when in fact it was an abbreviation for the industrial bleach or print 'field', which at one time was the largest employer in the area. By 1800, working indoors was a luxury for the countless bleachfield employees who had endured decades of exposure to the elements. In Neilston in the 1790s much of the work had still been outdoors, where 'the work people are exposed much to wetness, and cold, which in the high parts of the country is often intense'.



Typical Bleachfield Layout c.1800: Old canals in bleachfield in foreground and long buildings down the Espedair Burn behind.

5. Rural Water Powered Cotton Spinning Mills

By the mid eighteenth century the Cart Basin of Renfrewshire had become an integrated textile region. Every stage, from hand spinning through to finishing, was carried out in the area. Despite all the advances, one big drawback remained. Cloth and thread making in the region still depended on the spinning of yarn, on traditional spinning wheels, by thousands of women in the home.

More thought had been given to the mechanisation of spinning than any other stage of production. In the end, it turned out that cotton was the fibre which was the most amenable to mechanical spinning. For this reason, cotton would quickly come to dwarf all other textiles in the west of Scotland from the late 1770s. Cotton was also favoured for other reasons. It was a softer textile than linen, could be drawn out into finer strands, and was more amenable to fine weaving. Cotton had always been used in Renfrewshire, but mostly mixed with other raw materials.

In the 1770s the main Paisley textile families such as the Orrs were experimenting with cotton machinery obtained from India. From the start, this was another Renfrewshire event which was of national importance. It drew interest from the pioneers of the Scottish cotton industry, who founded Scotland's first two spinning mills at Rothesay and Penicuik.

In the background, hand loom weaving was still easily the biggest employer, and from the early 1780s moved into weaving pure cottons, rather than linens and silks.

This increased the demand for the spun cotton yarn. The need would be met by the developments of Richard Arkwright. He had developed his first powered cotton spinning mill using his 'Water Frame' at Cromford in Derbyshire from 1771. The next English mills were founded in 1776 (Table 3). Scotland's first water frame mill at Penicuik was established in the same year, followed by Rothesay. The next few mills were built in Renfrewshire at Busby (1778), Dovecothall (1779), Johnstone Old & Laigh (1782 & 1784). Although Paisley continued as the commercial hub, it had no water resources available. The large mills sprung up in a ten mile radius in the basin of the Cart river system. All were on a large scale and Johnstone Old mill was one of the biggest in the country.

In Scottish history Renfrewshire's early mills are usually overlooked in favour of the later and seemingly more spectacular sites which had direct input from Arkwright. As with many aspects of Scottish history, the truth is obscured by legend. In the popular account, Richard Arkwright came to Glasgow in November 1784 and met David Dale at the Falls of Clyde, resolving to build a factory village. What is missing from the popular story is of supreme importance to Renfrewshire's pioneering industry. In truth, Richard Arkwright came to Paisley the month before he went to Glasgow. In Paisley he was made a Freeman of the town and was entertained at a dinner by the textile merchants. At this time, *before New Lanark was conceived*, Renfrewshire had four large water powered mills already spinning cotton.

Table 3: British Water Powered Cotton Mills established before 1780

Date	Water Frame Mill (County)	Founder
1771	Cromford Upper (Derbyshire)	Arkwright
1776	Belper (Derbyshire)	Strutt (Arkwright associate)
1776	**Penicuik (Midlothian)**	**Brotherstone & Co.**
1777	Birkacre (Lancashire)	Arkwright, Strutt & Co (destroyed 1779)
1777	Wirksworth (Derbyshire)	Arkwright
1777	Holywell (Wales)	Smalley (Arkwright's former partner)
1777/8	Bakewell (Derbyshire)	Arkwright & son.
1778	**Rothesay (Isle of Bute)**	**Kenyon & Co.**
1778	R. Derwent	Gardom Praes & Co (Arkwright licensee)
c.1778	Papplewick (Bulwell)	Robinson (Arkwright licensee)
1778	**Busby (Renfrewshire)**	**Wm Ferguson**
c.1778	Nottingham	James (Arkwright licensee)
1779	**Dovecothall (Renfrewshire)**	**Haughs, etc.**

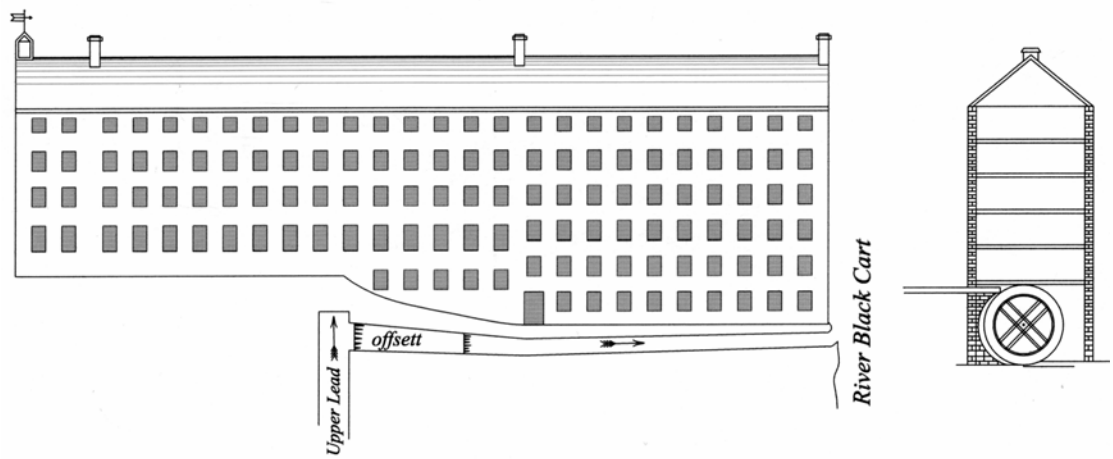
In the history of the industrialisation of the west of Scotland, a great deal more attention has been paid to Glasgow than Paisley. The problem is partly related to how we view an area in retrospect. If it latterly became a centre of heavy industry, any earlier but differing strengths may be undervalued. It is a common misconception that Glasgow had thirty-nine water mills by the 1790s. This is wrong by a factor of thirty-nine, as Glasgow had barely one water powered cotton mill, and all the rest were in Renfrewshire.

Glasgow's proximity undoubtedly had significant advantages for Renfrewshire, but has created big distractions from the truth. It has been admitted at an academic level that in 1780 Paisley and Renfrewshire were *more important than Glasgow*, but this has yet to penetrate popular history.

The Old Mill at Johnstone (Paton's Mill) is the oldest survivor in Scotland. It was built on the Black Cart beside an existing meal mill and powered by a new dam further upstream. Unlike other cotton mills such as at New Lanark, which were burnt down

and rebuilt in the nineteenth century, Johnstone Old Mill is from an earlier generation. The timber floors and harled walls hark back more to an agricultural building, but built on a massive scale. It is six stories high and the water wheel was located in the basement in the centre of the mill. Power was transferred to each floor via drive shafts. The lower floors held the water frames. The upper floors held the powered preparation stages including carding, drawing, roving and reeling.

The mill was still operating into the early twenty-first century, but unfortunately is now abandoned. Despite its supreme importance, vandals run loose in the interior. Five year ago many of the original sixteen-pane sash-and-case timber windows survived with their original hand-made bullseye glass. In 2009 every window has been smashed and the ancillary buildings are gradually being burnt out by vandals.



Johnstone Old Mill: A typical Rural Water Powered Cotton Spinning Mill
(The right hand half, the 'Old End' is now the oldest survivor in Scotland)

Writing in 1781, Semple describes the newly-built mill on the Levern at Dovecothall, which again shared the fall of an older grain mill:

> At that place is a corn mill, and a large cotton mill. The outer great wheel is sixteen feet diameter and three feet thick; the water is conveyed to it by wooden roans. The mill within has two rows of frames, with twenty-eight in the row, each frame having twenty-four spindles, for spinning of cotton, on the one side, and twenty on the other, total 2,464. About 250 people are employed in carding, roving, spinning, and other work.

Thereafter several water powered spinning mills were built in Renfrewshire each year, with a peak of nine built in 1792. Linwood Mill (1792) was the largest cotton mill in Britain. By 1795 Renfrewshire had more than forty big water powered cotton mills. This was half the total in Scotland, whether measured by number, size or value. However there is still one final missing link in our story, between the rural water mills and the urban mills of Coats and Clark.

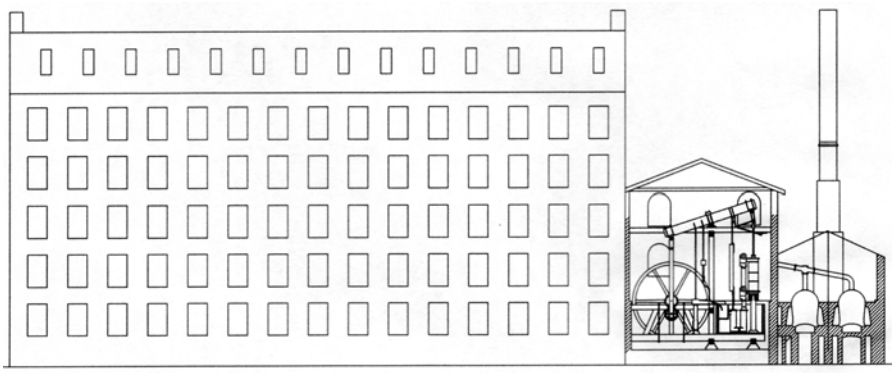
6. Urban Cotton Spinning Mills

At the same time as the development of the water frame, two other cotton spinning machines were being developed, the 'Jenny' and the 'Mule'. The machines were quite similar, with the mule being a refinement of the jenny. These were not initially

powered, but they could be supplied with rovings (prepared strands of cotton) from the same powered preparation stages used in the water frame mills. From the mid-1780s the rural water mills began fitting jennies and mules. Johnstone Old Mill had a jenny shop adjacent, supplied with rovings from its water mill. The owner, Robert Corse, acquired the newly built water mill at Elderslie and fitted exclusively mules, to supplement their water frame mill at Johnstone.

At the same time as the big rural water mills were being built, smaller spinning mills developed in Paisley. These combined Arkwright's powered preparation stages with hand-powered jennies and mules. Their preparation machines were initially driven by modest sources of power, including hand cranks (like the old thread mills). They were also powered by horse gins, similar to a horse mill on a farm, where horses walked in a circular rink, turning a central shaft. Thirdly they were powered by crude steam pumps or 'return water' engines which replenished ponds or large tanks. The water from the pond then powered a water wheel, before being pumped back up into the reservoir by the steam engine.

In 1782 a mule mill was built in Abbey Street, Paisley. Larger enterprises followed, such as the mills of David Findlay and Alexander Pollok, with at least twenty mule jennies, or around 3,000 spindles. From 1790 mules began to be powered and the mills continued to grow. Underwood mill was initially powered by more than 100 mill drivers turning cranks, working in shifts. Within two years manpower had been changed to horsepower. A return water engine was then installed, with a Savery steam engine. This pumped water in an endless cycle back over a water wheel. Finally in 1798 a fourth power source was employed, when Underwood ordered the first Boulton and Watt rotary steam engine for a cotton mill in Scotland. Other big urban mills followed in Paisley, including St. Mirren and Adelphi.



Sketch Reconstruction of Paisley's Underwood Mill
(With cross section of the Engine House, sketched from original in Boulton & Watt Collection)

The impact on the size of Paisley in comparison with other Scottish towns was astonishing. In 1791 the population of the city of Glasgow exceeded 40,000. Paisley had more than 30,000, having risen from seventh position in 1755, and overtaking Perth, Inverness, Aberdeen and Dundee to become Scotland's third largest town after Glasgow and Edinburgh by the late 1790s. Comparison with the other main county towns was perhaps most revealing. Dumbarton and Lanark were struggling to reach a population of 3,000 by the 1790s, and Hamilton bemoaned Paisley's 'opulence' and tenfold lead.

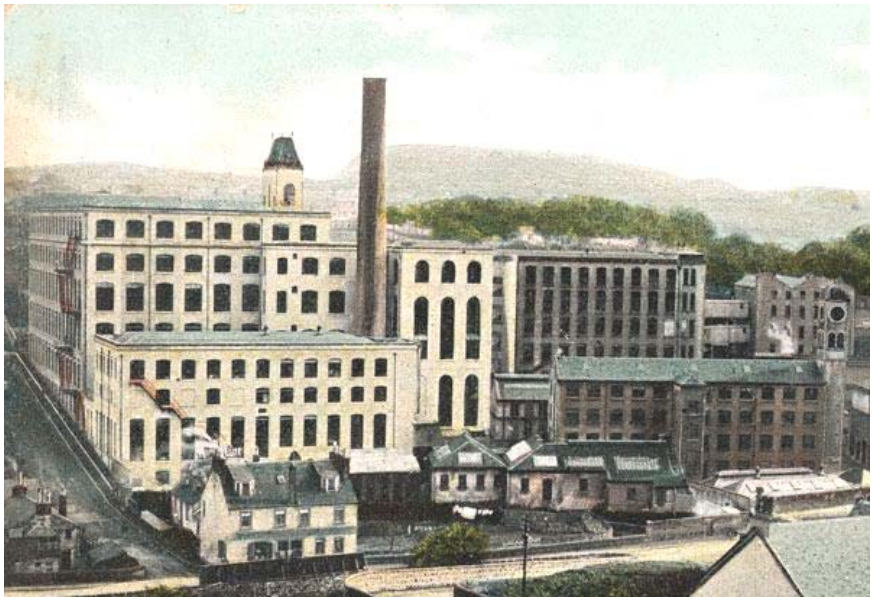
The two decades from 1780 to 1800 were a period of intensive change in the size and power source for cotton spinning mills. The rural spinning mills had been large from the start, and the urban mills went through a rapid evolution in size, soon catching up. By 1800 the availability of James Watt's rotary steam engine allowed the

largest spinning mills to be built on any urban street corner, avoiding the need to find a waterfall in a rural location.

7. The 'Paisley Mill'

Through this period, linen thread continued to be a Paisley success although it was still being twisted by hand-driven machines in small workshops until after 1800. It was only from the 1820s that cotton thread began to replace linen thread on a large scale. From this time, thread twisting moved to much larger mills, similar to the big spinning mills and the world famous steam-powered Paisley Thread Mill was born.

Despite the growth of the urban steam-powered mill, the rural water mills continued to expand until the decline of the cotton spinning industry in the late Victorian period. Thread occasionally persisted in the rural mills, such as at Crofthead, which outlasted the decline by moving to thread production. The picture below shows a rare example of the evolution of the cotton mill, from the old plain sandstone mills on the right to the more modern 1880s brick buildings on the left. The modern part though painted white, mirrors the Victorian 'British' or 'Oldham' style familiar in Paisley, particularly at Ferguslie (now demolished).



Crofthead Mills, Neilston

The decline of the rural spinning mills coincided with the boom in urban thread production dominated by Coats and Clark. In the 1830 to 1870 period the big urban thread mills were no different in size and appearance from the rural spinning mills which had been built from the 1770s. Yet the demise or rebuilding of most of the older urban mills conceals the link in the mill 'family tree'. Some of the older plainer variety of urban mill such as Bankend Mill at Sneddon, and the Clark's Burnside Mill at Lonend, (built 1858) survived into the 1960s. Sketches of the original Ferguslie Mills (Coats) and Seedhill Mills (Clark) are shown at the start of this article and on the cover respectively (both c.1830) and demonstrate the link with the older rural spinning mills.

So what does all this mean for Coats and Clark? Traditionally little connection has been made between Renfrewshire's wide variety of earlier textile production, and its later success with twisted cotton thread. Even the link between the big rural water mills and the Paisley mills has been confusing. The Paisley mills developed in the

same size and type of buildings as the spinning mills. The main difference is that the early spinning mills spun cotton yarn to supply the weavers. The Coats and Clark mills twisted cotton thread for sewing.

By the end of the nineteenth century the massive success of Coat and Clark allowed the building of the familiar red brick mills designed by the most prominent British architects. The mills were no longer simply functional buildings but architectural statements in their own right. The demolition of the older and less elaborate mills has cut the visual link in the evolution of the Paisley cotton mill. Hopefully this article has done a little to show that there was no break, and it was all part of a continuous evolution. The celebrated textile heritage of Paisley does not begin in the 1890s but stretches back a further 190 years to 1700.

Postscript

Beyond the mills, new research is also showing that the Coats and Clark dynasties themselves had earlier links. These stretch back before the start of cotton thread making, to the beginnings of the rural cotton spinning mills. The precise connections have still to be unravelled, but their kinsmen had many connections with the first cotton mills. In the 1780s and 90s, various Clarks are linked with the following spinning mills: Johnstone Old, Johnstone Bank Top, Elderslie, and in Paisley at a horse powered mill at Sneddon, and at Underwood Mill. In the same period kinsmen of the Coats family appear at Mile End Mill, Glasgow and in several yarn partnerships in Paisley.

Notes and Sources

Much of this research over the years was inspired by the late Sylvia Clark, who provided the author with a great deal of source material, often scrawled on the back of old Christmas Cards in Sylvia's practical style. Although Sylvia was long accepted as the authority on Paisley's industrial heritage, she was equally interested in County-wide developments.

Sources have been omitted from this overview as they exceed the length of the paper and can already be found in the author's book 'The Rise of the Cotton Factory in Eighteenth Century Renfrewshire', (Archaeopress 2008). This is based on the author's PhD thesis. For a shorter and less demanding read see: 'The Making of Scotland's First Industrial Region: The early Cotton Industry in Renfrewshire', Journal of Scottish Historical Studies (2009).

Other source articles by the author on early cotton mill sites include:
Busby and Dovecothall Mills: *Scottish Industrial History*, Vols.11-13 (1990); *Scottish Archaeological Gazette*, No.19, (1989); and *Renfrewshire Local History Forum (RLHF) Journal* Vol.2 (1990).
Eaglesham Mills: *RLHF Journal* Vol.7 (1995).
Johnstone Old Mill: *Conservation Plan* (2002).
Renfrewshire Mills generally: 'The Rise of the Cotton Factory in 18th Century Renfrewshire' at *Scottish Textile Heritage Online* (2004).
Rothesay Mills: *Transactions of Buteshire Natural History Society* XXVI (2004).
Thornliebank Mills: *Old Thornliebank*, by Maud Devine (Stenlake 2005).
Also the author's series on mills on the River Kelvin in: *Friends of the River Kelvin* (FORK) newsletter (2006 to present) and entries in *Discovery and Excavation in Scotland* (annually).

