# Large-print book

Please do not remove from the gallery

# Textiles Gallery

## Upper Level: Book 2

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# Contents

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# Accessible features

There is step free access to the whole of the Textiles Gallery. It is located on the ground floor of the main museum building, the New Warehouse. The gallery is split over two levels. A ramp connects the upper and lower levels.

All film with sound in the gallery has subtitles. Transcripts are provided for all audio exhibits.

There are five exhibits in the gallery.

Ear defenders are available for visitors who may need them during our daily textile machine demonstrations. Please ask the staff demonstrating the machinery.

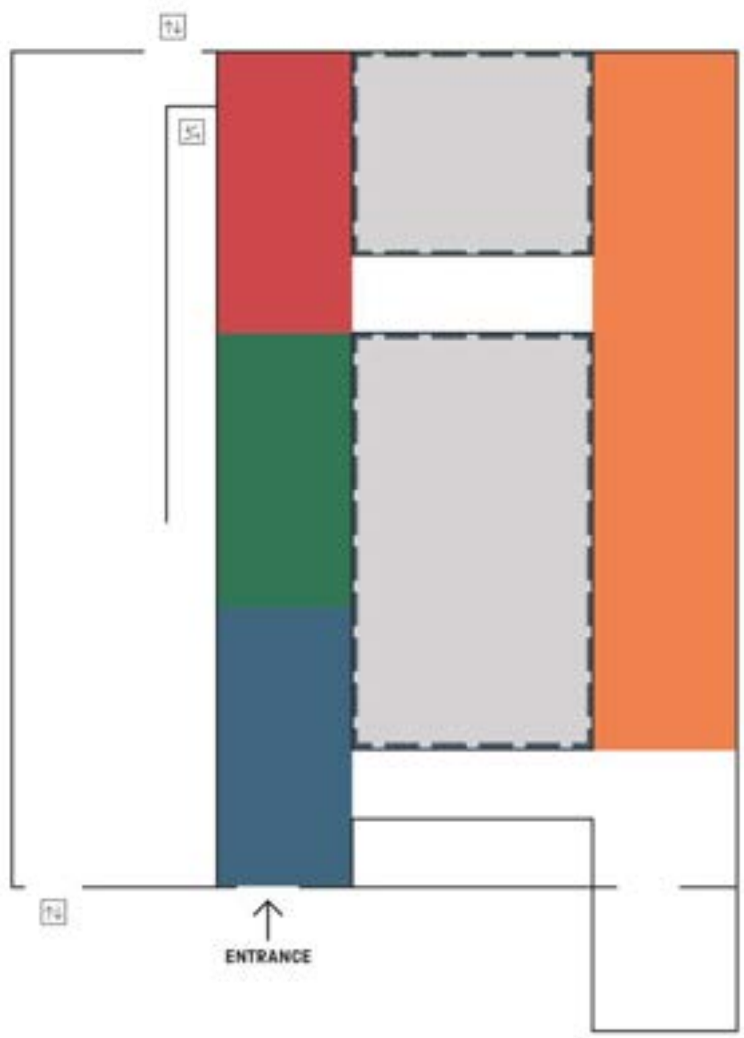
# Gallery layout

The gallery is split over two levels. This book covers the upper level. A separate book is available for the lower level.

The gallery is on the ground floor of the New Warehouse. It is entered from the Revolution Manchester gallery into the upper level. The gallery is a large, nearly square space in a historic railway warehouse building. The displays are on a platform that surrounds a central ‘well’ where the working textiles machines are located. These historic machines are regularly demonstrated. Visitors watch from the platform level. There is a glass safety barrier around the central ‘well’.

The upper level is split in to three colour coded sections. **Manchester: Made of cotton**, **The sights and sounds of Manchester’s mills** and **The science of textiles**. The displays combine historic objects, text panels and object labels. There are some hands on exhibits and audio visual content.

# Gallery map

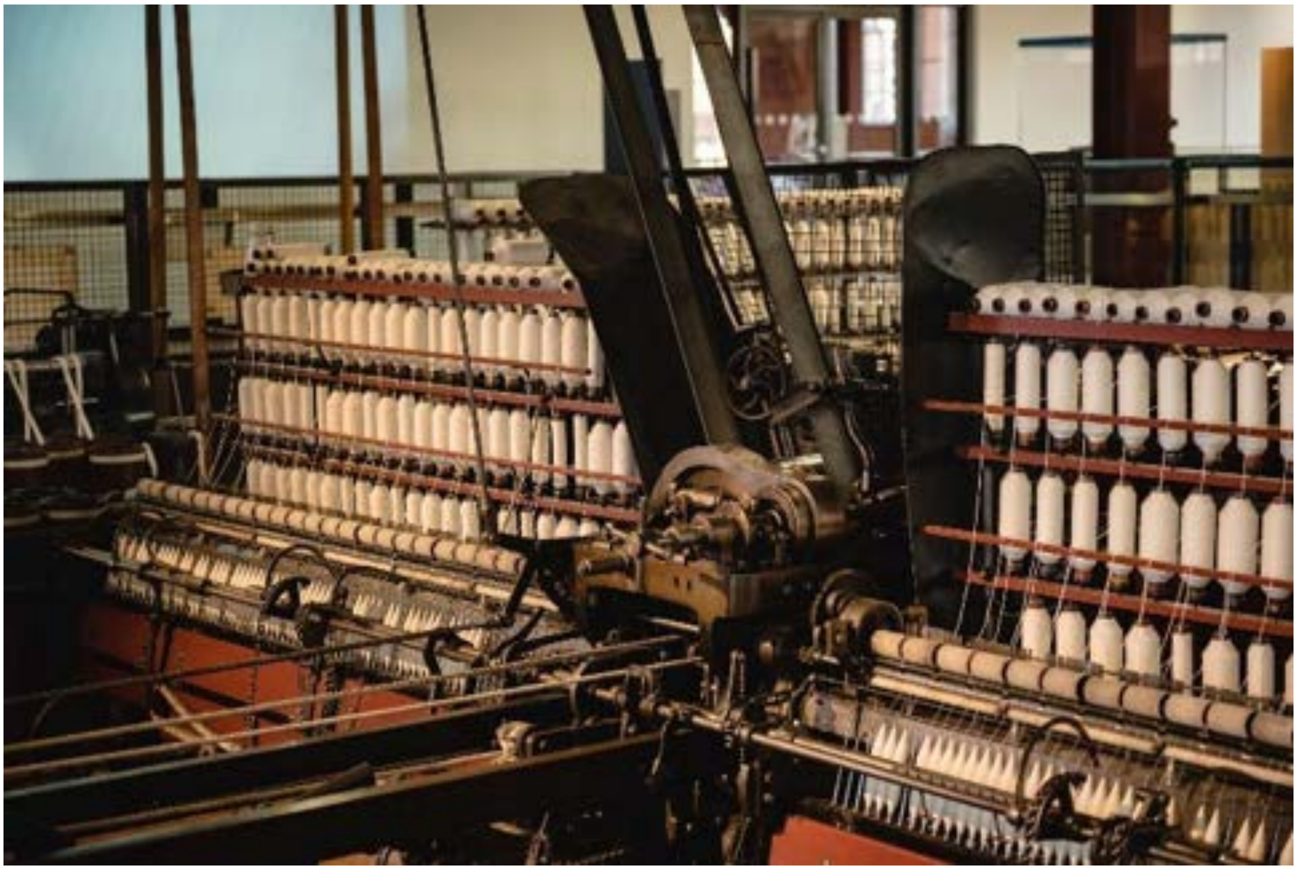



Manchester: Made of cotton

The sights and sounds of Manchester's mills

The science of textiles

# The sights and sounds of Manchester's mills



# The sights and sounds of Manchester’s mills

From the spinning rooms to the weaving sheds of Manchester’s mills, these working textile machines turned raw cotton into finished cloth.

Watch a daily demonstration to see the machines in action. Find out about the jobs they did and discover what life was like for Manchester’s mill workers.

**Spinning wheel**
around 1750

**Hand loom**
around 1825

Before factories, families made cloth together by hand. They had machines like these in their homes or small workshops. Women used spinning wheels to twist cotton into yarn. Men worked on looms weaving it into fabric.

Science Museum Group.
Object nos. Y1969.12 and Y1973.6

**Image:** Woman making yarn on a spinning wheel, 18th century.

Science Museum Group Collection

## Power loom

T. Larmuth & Co., Manchester, around 1860

By the early 19th century, new machines like this power loom could make cloth more quickly and cheaply than people. Groups of angry handloom weavers raided cotton mills at night. They burnt and broke power looms to protest against the new technology.

**How do you think you would react to technology replacing your skilled work?**

Science Museum Group. Object no. Y6000.423

**Image**: Swainson Birley cotton mill in Lancashire,1834.

Science Museum Group Collection

**Arkwright's carding engine**

Richard Arkwright, around 1800

Inventor Richard Arkwright developed this carding engine. It ran in his cotton mill in Derbyshire.

The machine's wire teeth combed raw cotton fibres into long, smooth strands, ready for spinning.

Science Museum Group. Object no. Y2003.14.1

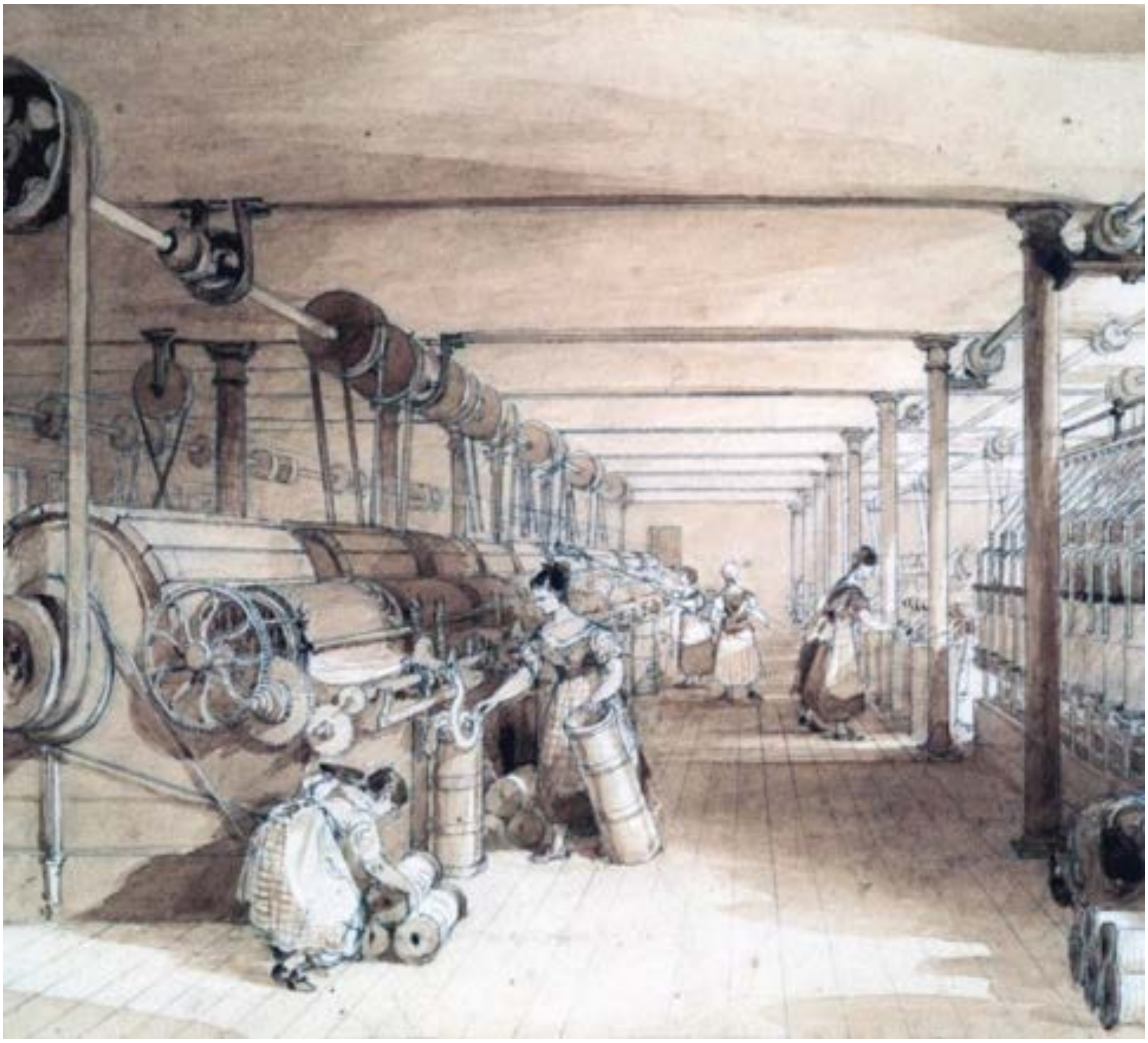


**Image:** Women operating carding engines at Swainson Birley cotton mill, 1834.

Science Museum Group Collection

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## Blowing room

In the blowing room, workers used powerful machines to open bales of raw cotton, break it up and clean it. Traders brought raw cotton, often grown and picked by slaves in the United States of America or West Indies, across the sea to Liverpool. It arrived in Manchester’s mills in tightly packed bales which were ideal for transport.

**Image**: Worker loading cotton into a bale breaker, around 1940.

Imperial War Museum

**Hopper feeder**

Platt Brothers & Co. Ltd, Oldham, 1949

Men and boys did hard, heavy work loading armfuls of cotton into the hopper feeder. The machine’s sharp spikes and metal rollers pulled tightly packed cotton into small pieces. The technology was introduced at the end of the 19th century. Workers used this machine at Bank Top spinning mill in Oldham.

Science Museum Group. Object no. 6000.417

**Image**: Cotton mill workers, 1890.

Past Pix / Science & Society Picture Library

**Scutcher**

Platt Brothers & Co. Ltd, Oldham, 1889

Grown and picked in the fields, cotton was full of seeds, sand and soil. The scutcher, invented in 1797, beat out dirt and rolled out the cotton fibres.

Platt Brothers made this example in Oldham in 1889. They employed thousands of workers, supplying textile machinery to Manchester and across the world.

Science Museum Group. Object no. Y6000.418

**Image:** Cotton pickers in the United States, 1892.

Science Museum Group Collection

## Carding room

In the carding room, machines cleaned and combed the cotton. Loose fibres escaping from the cotton made it the dustiest and most unhealthy place to work in the mill.

By the 1820s, doctors in Manchester started to realise that cotton mill workers often became ill with breathing problems and sore eyes.

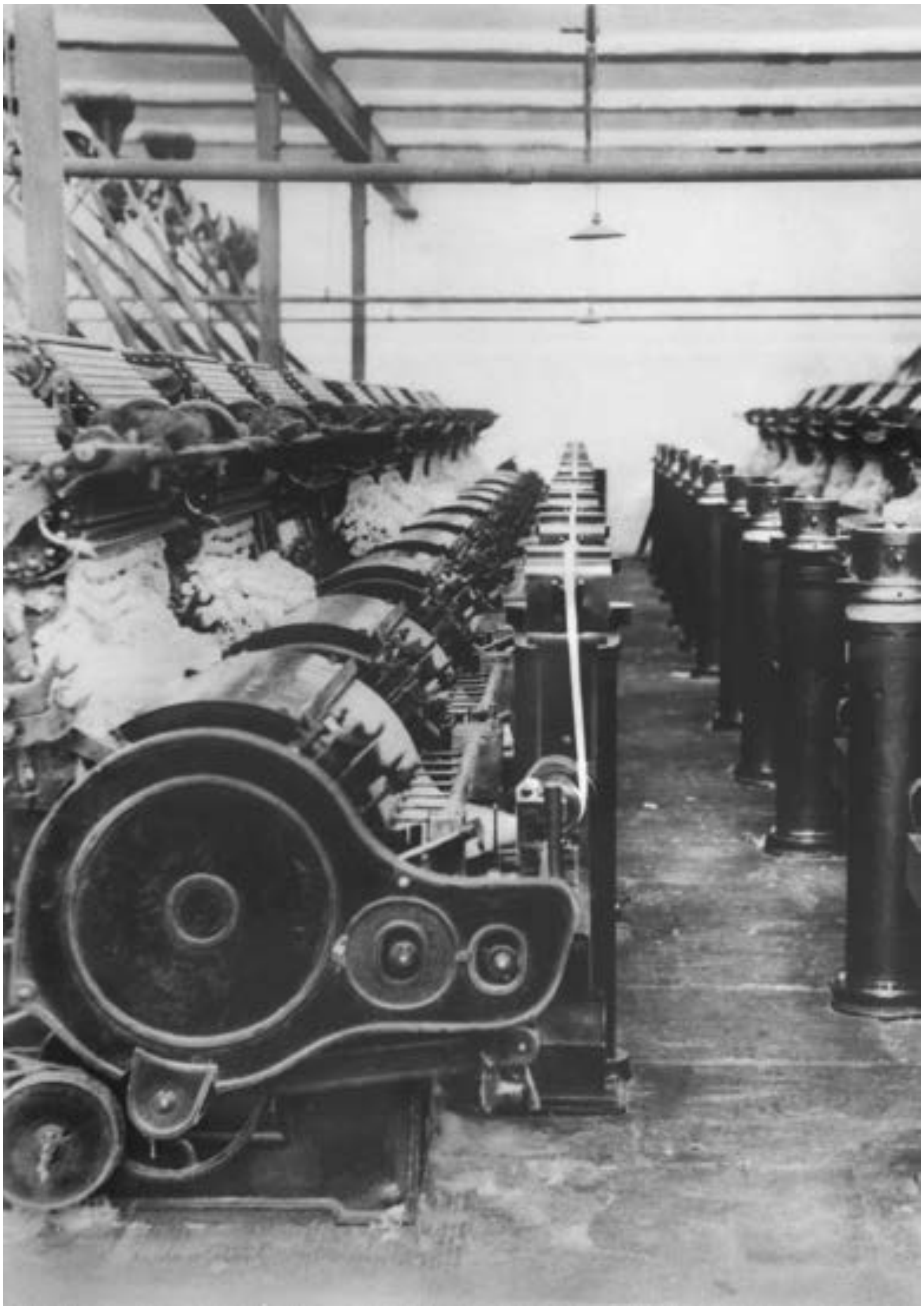

**Image:** The carding room of a cotton mill, 1906.

Past Pix / Science & Society Picture Library

**Carding engine**
Asa Lees and Co. Ltd, Oldham, 1886

This machine has rollers covered in tiny wire pins. They removed the last pieces of dirt from the cotton and untangled the fibres. White cotton fluff covered the clothes of people who worked the carding engines.

**Image:** Workers with their carding engines, 1906.

Science Museum Group. Object no. Y1972.30
Past Pix / Science & Society Picture Library

**Drawing frame**
Howard and Bullough Ltd, Accrington, 1901

**Drawing frame**
Platt Brothers and Co. Ltd, Oldham, 1901

The fast moving rollers of the drawing frame combined six pieces of cotton into one, evening out the fibres.

Workers had to multitask, feeding the machines with cotton as well as cleaning and oiling the parts. They had to keep the machines running for up to 15 hours a day.

Science Museum Group.
Object nos. Y1967.11 and Y1967.4

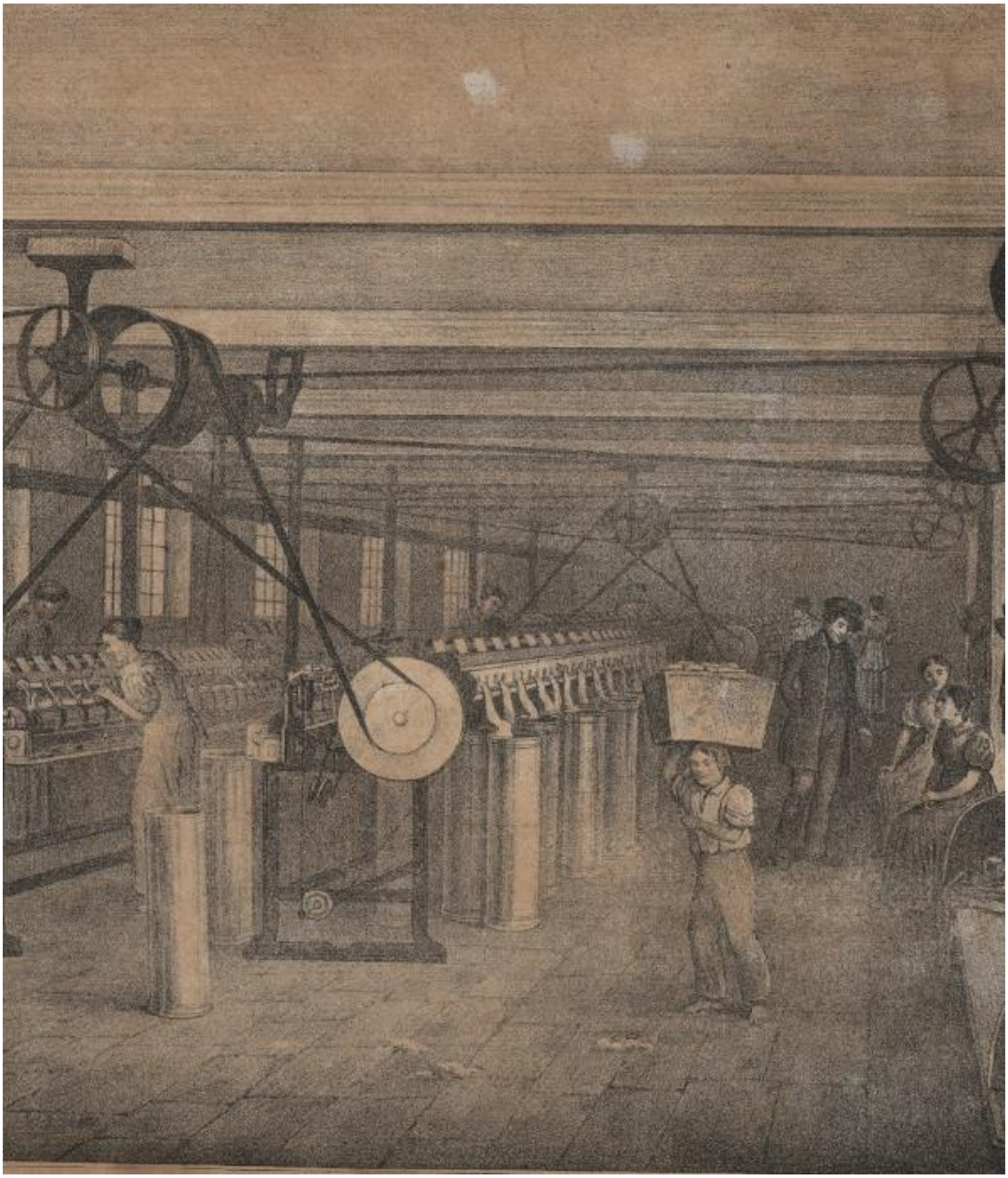

**Image:** Workers operating drawing frames, 1840.

Science Museum Group Collection

**Speed frame (Intermediate frame)**
Platt Brothers and Co. Ltd, Oldham, 1907

**Speed frame (Roving frame)**
Howard and Bullough Ltd, Accrington, 1901

Speed frames stretched and thinned the cotton ready for spinning. Leather belts, transferring power from the mill’s steam engine, drove the machinery.

By the 1920s mill owners started to use electricity supplied by new, coal fired power stations. An electric motor drives these machines, but they were once steam powered.

Science Museum Group.
Object nos. Y1974.62 and Y1981.39

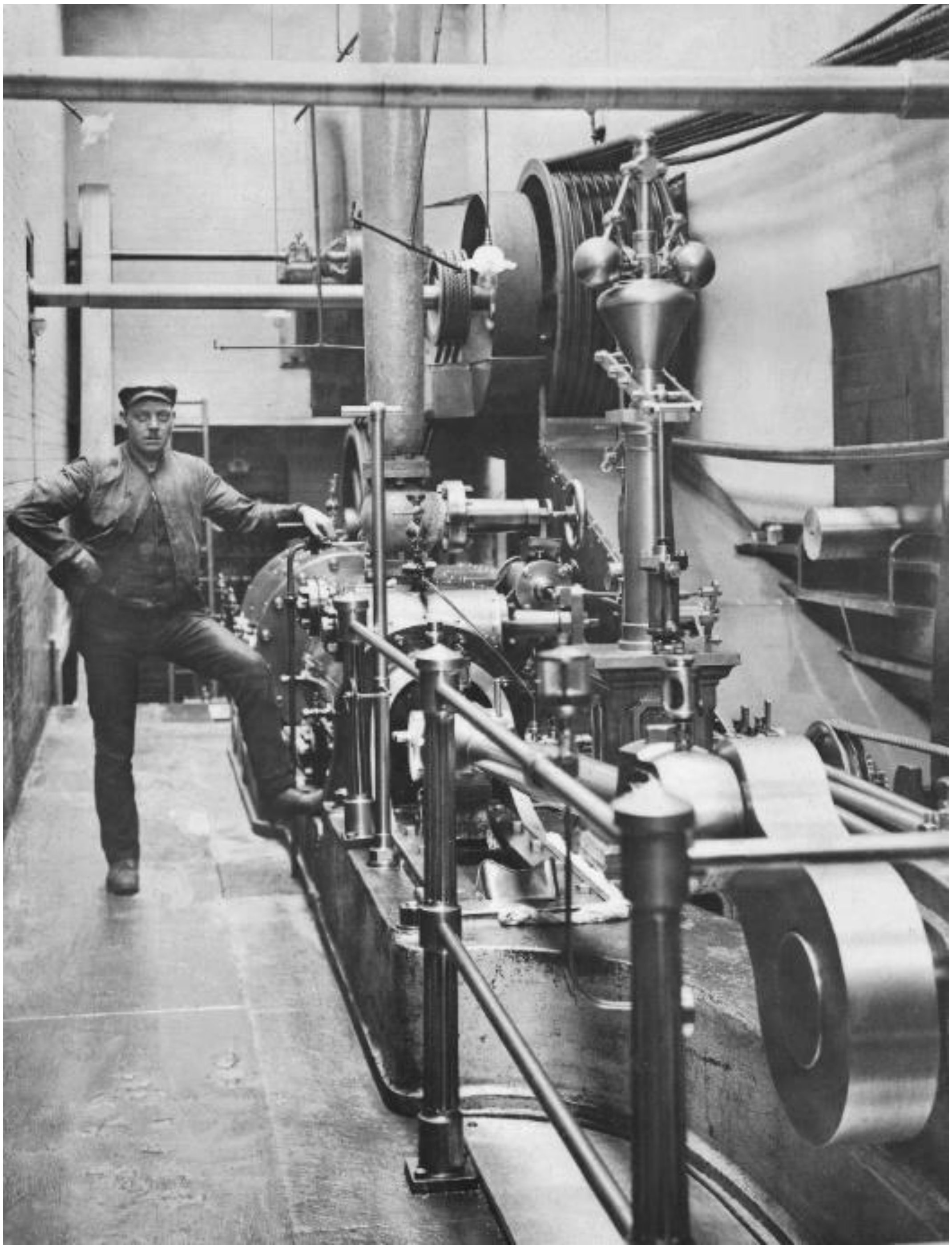

**Image:** Engineer with a Lancashire cotton mill's steam engine, 1910.

Past Pix / Science & Society Picture Library

## Spinning room

Hot, humid and deafeningly noisy, in the spinning room machines twisted the cotton to make yarn. Dodging fast moving machines, children were forced to risk their safety to fix broken threads and sweep up. Laws passed in the 19th century banned very young children from working. In 1918, it became illegal for anyone under 14 to be employed.

**Image:** The spinning room of Swainson Birley cotton mill in Lancashire, 1834.

Science Museum Group Collection

**Spinning mule**

Platt Brothers and Co. Ltd, Oldham, 1927

The spinning mule spun stronger, finer yarn in greater quantities than ever before. Invented by Samuel Crompton in 1779 it became the most common textile machine in Lancashire.

Skilled workers operated spinning mules. They had to fix problems fast, so the machines did not break down.

Science Museum Group. Object no. Y1974.61

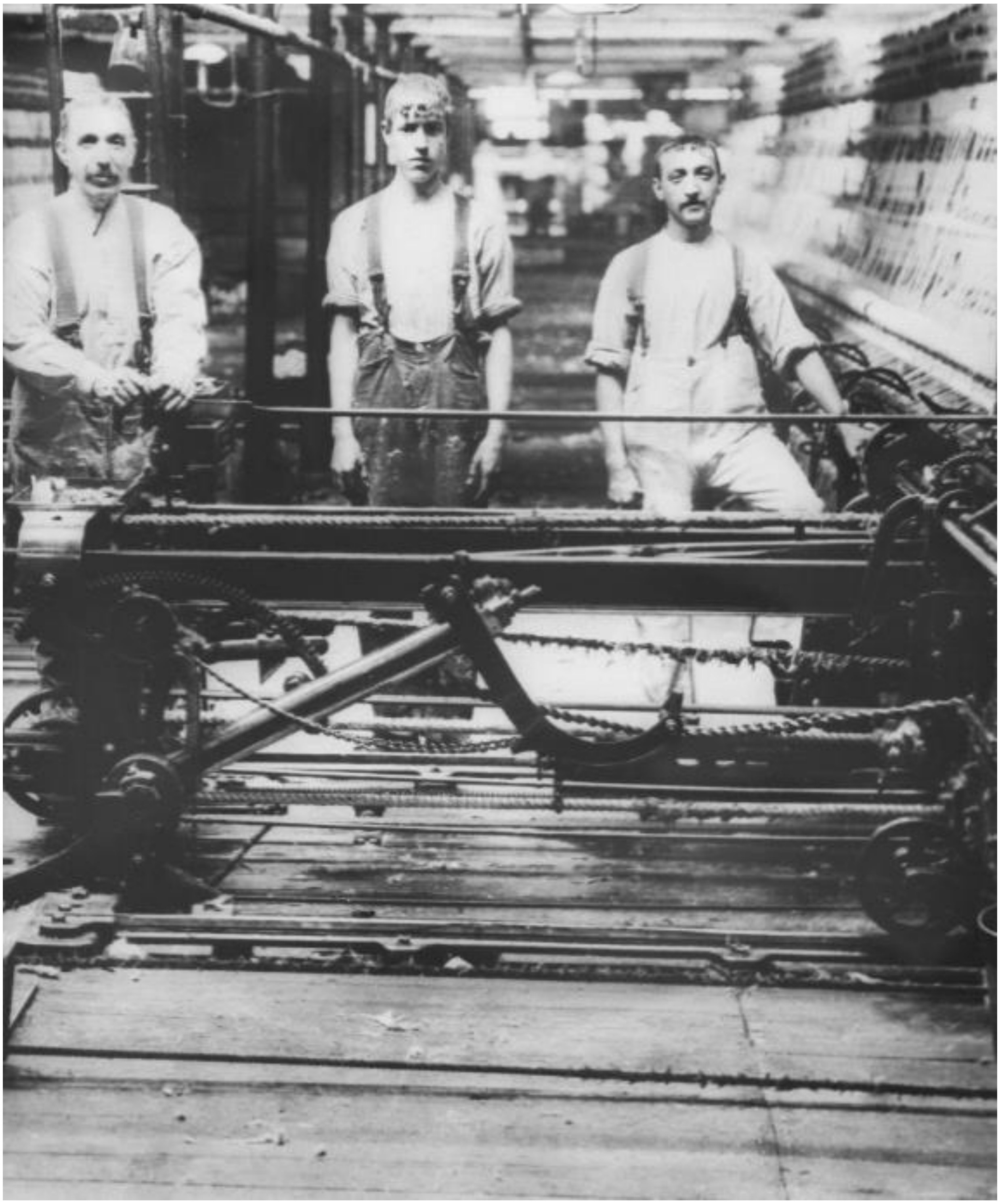

**Image:** Mule spinners with their machines, 1906.

Past Pix / Science & Society Picture Library

**Ring spinning frame**
Platt Brothers and Co. Ltd, Oldham, 1901

Today the ring spinning frame is the most popular spinning machine in the world. However, Lancashire's mill owners, wary of the expense of updating all their machinery, were slow to adopt the technology. Many blamed this caution for the decline of the region's cotton industry in the 1950s and 1960s.

Science Museum Group. Object no. Y1967.3

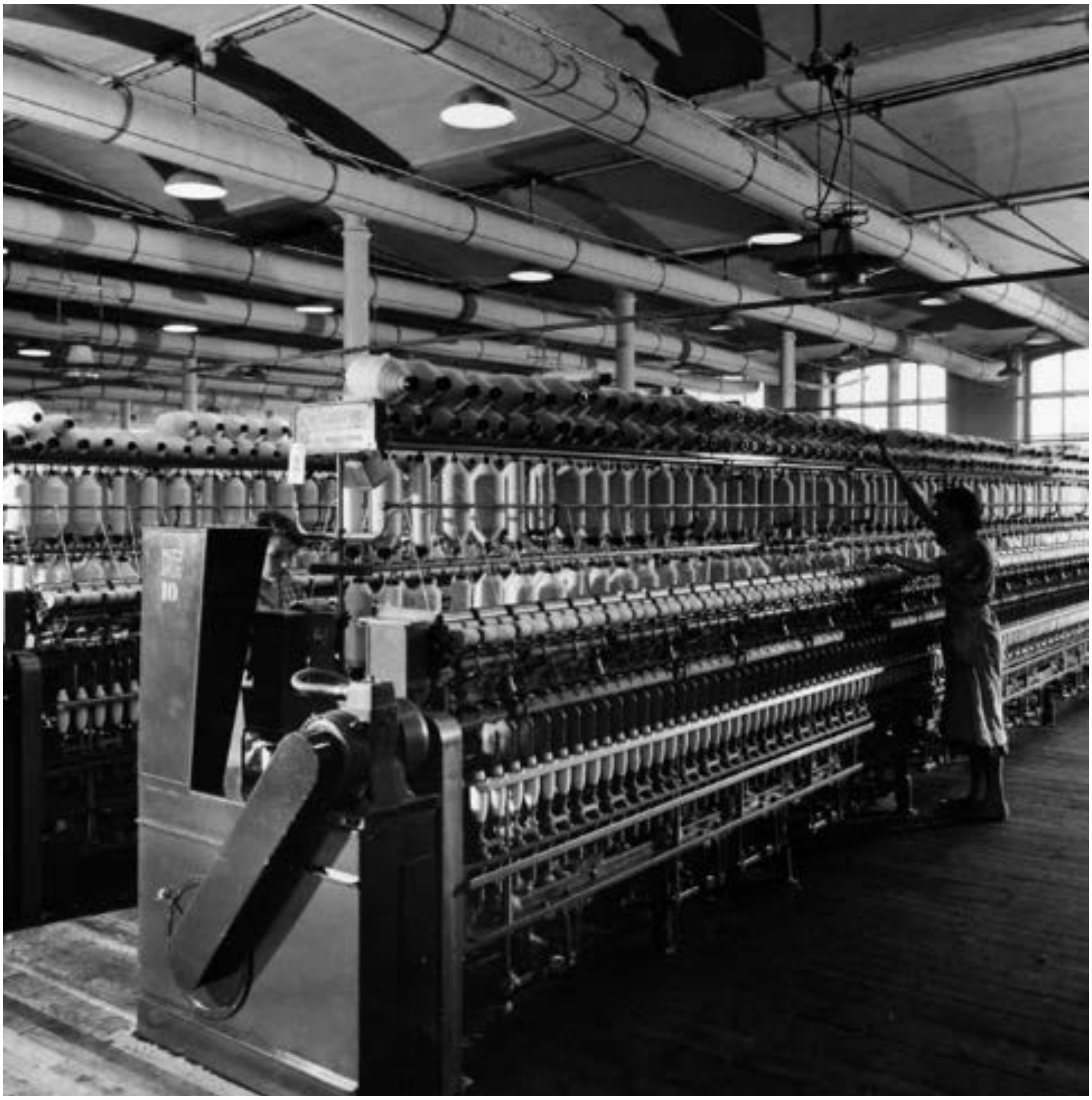

**Image:** Woman operating a ring spinning frame, around 1930.

Science Museum Group Collection

## Winding room

Women and girls in the winding room prepared the yarn for weaving. Some people argued women should stay at home. They thought factory work stopped them looking after their families. Nevertheless, by 1900 more than half of Lancashire’s textile workers were female.

**Image:** The winding room of a cotton mill, 1931.

Past Pix / Science & Society Picture Library

**Pirn winder**
Universal Winding Co., Boston, USA, around 1925

**Hank winder**
Platt Brothers and Co. Ltd, Oldham, 1897

Winding machines wrapped spun yarn onto new bobbins. These could be sold directly to customers or used for weaving or knitting. Quality cloth relied on a supply of well wound yarn, so workers had to be skilled at using the machines.

Science Museum Group.
Object nos. Y1975.65 and Y6000.425

**Image:** Women using winding machines, 1931.

Past Pix / Science & Society Picture Library

## Weaving shed

In the weaving shed, the thunderous clatter of hundreds of machines made it impossible for weavers to hear each other speak. They communicated using ‘mee-maw’, a cross between mime and lip reading.

Workers ran steam powered looms to weave cotton into cloth. Most weavers were women, while the mechanics who repaired the looms were normally men.

Science Museum Group. Object no. Y1971.78

**Image:** A Lancashire weaving shed, 1890.

Past Pix / Science & Society Picture Library

## ‘Lancashire’ loom

J. and R. Shorrock, Darwen, around 1880 Imagine a factory floor full of machines like this one. There were over three quarters of a million ‘Lancashire’ looms across the county by 1850. They supplied the world with cotton cloth.

Weavers were paid by the quantity and quality of material produced, so they had to work quickly and carefully for up to 12 hours a day, six days a week.

Science Museum Group. Object no. Y1971.78

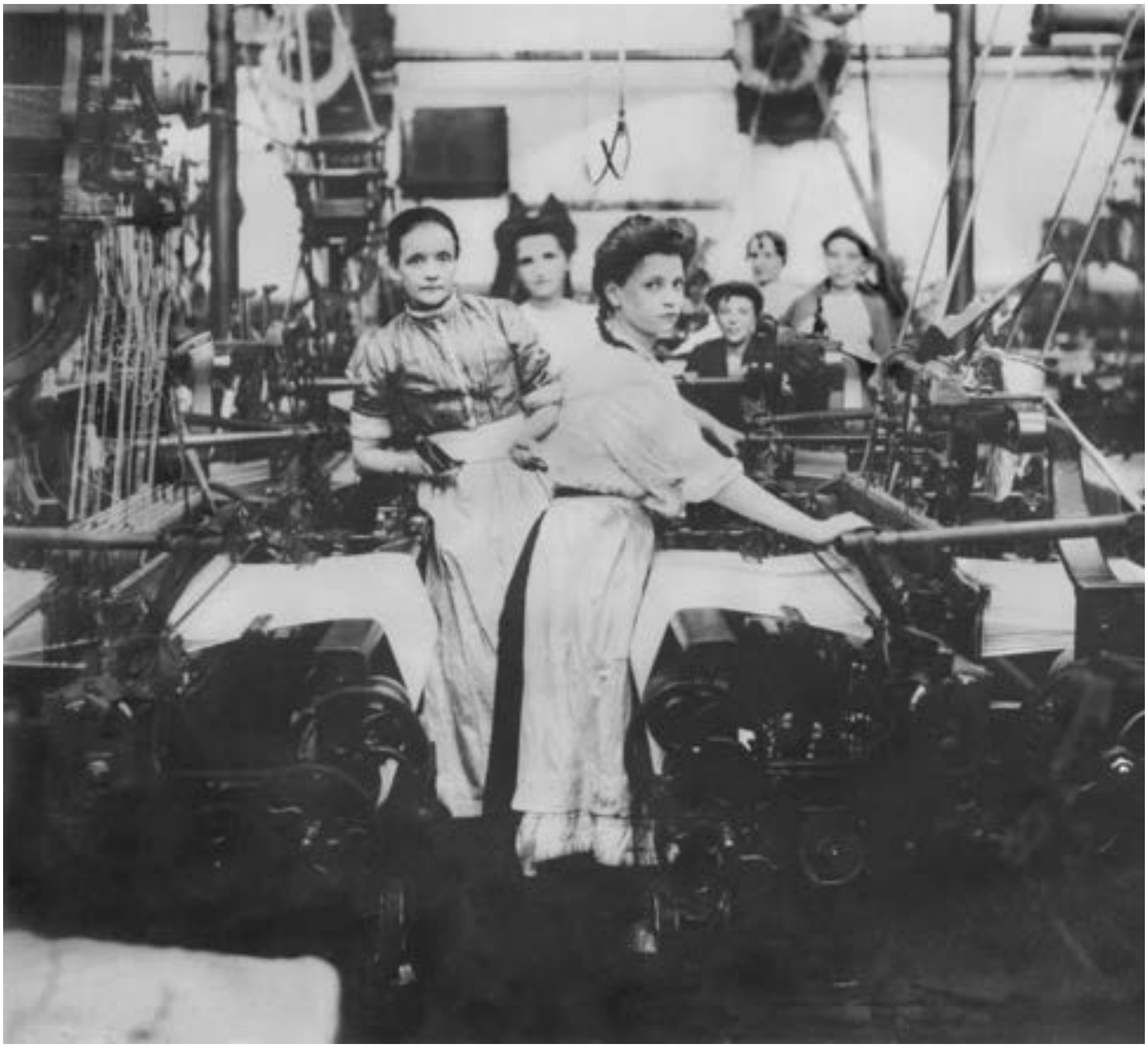

**Image:** Women operating ‘Lancashire’ looms, 1890.

Past Pix / Science & Society Picture Library

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**Northrop automatic loom**
British Northrop Loom Co. Ltd, Blackburn, 1947

This loom's rotating barrel automatically refilled the shuttle, keeping the machine constantly supplied with yarn. Just one weaver could look after up to 40 of these looms. This one, made in Blackburn in 1947, wove towelling by putting small, raised loops into the cloth.

Science Museum Group. Object no. Y6000.422

**Image:** A row of Northrop looms in a Lancashire mill, around 1940.

Lancashire County Council Archives.

**Ribbon loom with Jacquard head**
T.F. Wilkinson Ltd, Coventry, 1900

At the top of this loom is a programming system. Cards with small, punched holes programmed the loom to weave different designs. It made woven patterned cloth much easier and cheaper to produce.

The punch card system inspired the invention of the earliest computer.

Science Museum Group. Object no. Y1969.42

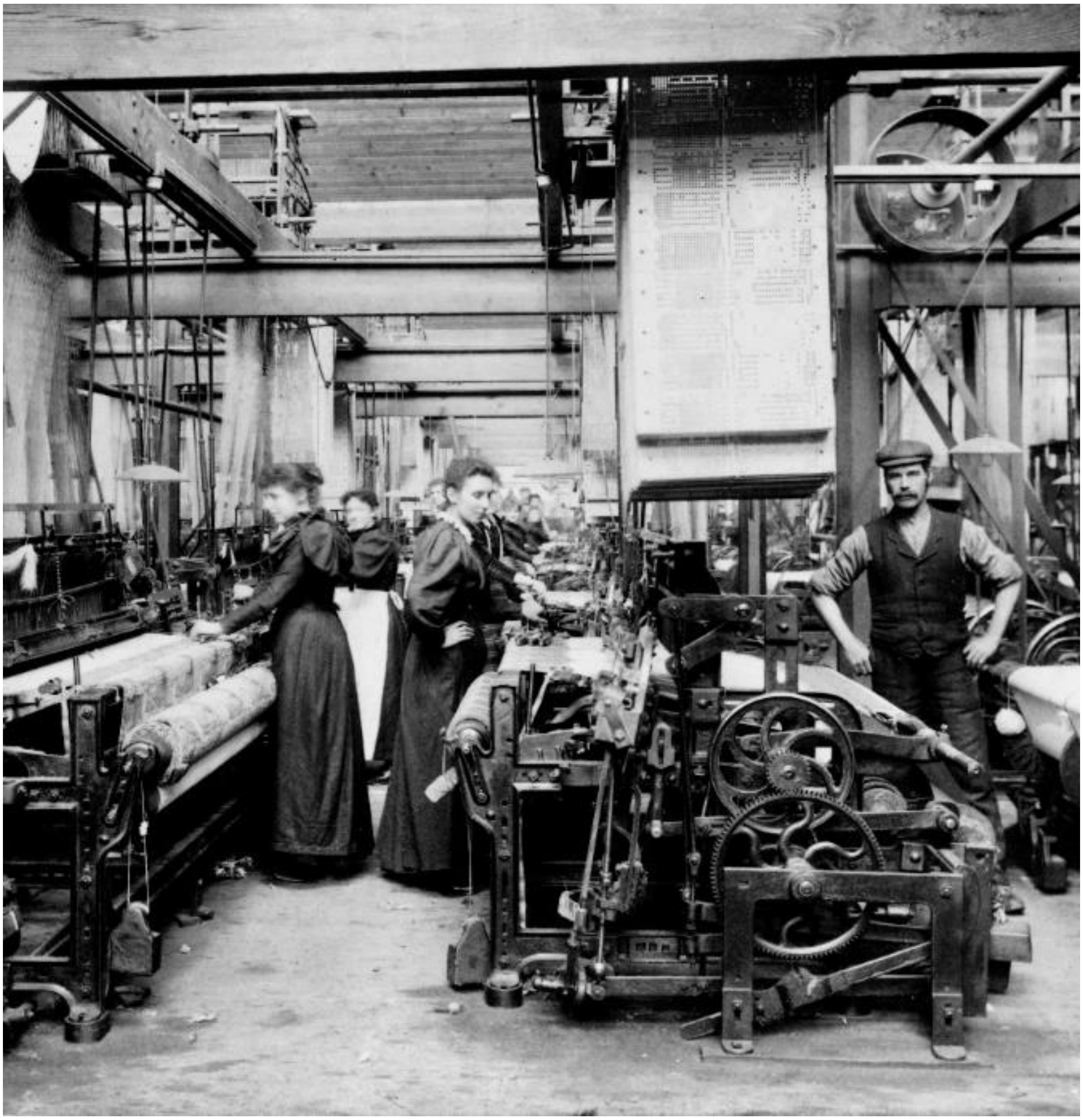

**Image:** Weavers using Jacquard looms, 1900.

Past Pix / Science & Society Picture Library

**Hopper bale opener**
**Platt Brothers & Co. Ltd, Oldham, 1955**

**Bale breaker**
**Platt Brothers & Co. Ltd, Oldham, 1911**

When raw cotton arrived at the mill, these machines opened up the bales and started to break apart the tightly packed fibres. Their powerful spikes and rollers could do the job much faster than by hand.

Science Museum Group.
Object nos. Y2005.97 and Y1981.29


**Image:** Raw cotton loaded onto a lorry ready for delivery to a mill, around 1930.

Science Museum Group Collection

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# The science of textiles

# The science of textiles

Arkwright's water frame started a textile revolution. Manufacturers could make more fabric more cheaply than ever before.

But what about better fabric?

How could we make cloth stronger? Warmer? Cooler? Waterproof? Flame retardant? Crease resistant? Stretchy? Brighter? More colourfast?

Since the start of the Industrial Revolution, scientists have looked for ways to make textiles do more.

Now we use textiles in ways that Manchester's early industrialists could never have imagined. Science continues to revolutionise the way we make and finish fabric.

**Image:** Researching dyes at ICI Blackley, Manchester.

Walter Nurnberg Collection / National Science and Media Museum / Science and Society Picture Library

## Inventing fibres

Natural fibres like cotton and wool come from plants and animals.

From the early 1880s, scientists began experimenting with making fibres from chemicals.

They did this by drawing molten plastics into thin strands that behave like threads.

The first fully synthetic fibre was Nylon. American scientists developed it in the 1930s.

Nylon quickly became a successful silk replacement and was invaluable for making parachutes during the Second World War.

Manchester was not left behind. In 1941, scientists at the Calico Printers Association developed Terylene, the first polyester fibre.

**Image**: Terylene process worker at ICI Billingham, 1955.

Walter Nurnberg Collection / National Science and Media Museum / Science and Society Picture Library

## Specialist fabrics

It is hard to imagine living in Manchester without a waterproof coat.

But waterproof fabric was not available until 1824, when chemist Charles Macintosh found a way to apply rubber to cotton.

His waterproof fabric paved the way for a whole raft of developments, from umbrellas to life jackets.

P. Frankenstein & Sons started making waterproof products in Manchester in 1854. In the 1940s they began producing specialist survival clothing.

In 1959, Frankenstein developed a flying suit which circulated liquid through pipes to keep the wearer cool.

NASA used the suit in trials for developing the Apollo spacesuits.

**Image:** Full pressure suit testing at P. Frankenstein & Sons, Manchester, around 1965.

Science Museum Group Collection

## Warm and dry

**Blouse from an immersion suit**
P. Frankenstein & Sons, Manchester, around 1945

An immersion suit is a waterproof drysuit, used to help people survive in very cold water. They are kept on ships for emergency evacuations.

P. Frankenstein & Sons used their expertise in waterproof garments to successfully move into producing survival gear in the 1940s.

Science Museum Group. Object no. Y1986.184

## Engineering efficiency

In the early 1970s, a Lancashire invention called Dextralog broke new ground in how we use computers to gather data and make decisions.

Textiles manufacturers in Britain were striving to compete with cheaper goods made overseas. Achieving maximum productivity in their mills was crucial to bringing costs and prices down.

Manufacturers needed to know how efficiently their looms were running. The challenge was finding a way to keep watch over the hundreds of looms weaving cloth in their factories.

An enterprising team harnessed early computer technology to develop Dextralog, a pioneering loom monitoring system.

**Image:** Weavers working at their looms in a weaving shed, around 1970.

Courtesy of Kirklees Image Archive.

## Dextralog hands-on activity

## Flip to match

Dextralog sent messages to mill managers about why their looms had stopped. Matching this information to individual looms helped them fix problems quickly.

Each tile has information about why a loom has stopped.

1. Turn over any two tiles
2. If the two tiles match, leave them face up
3. If they don’t match, turn them back over
4. Keep going until you find all the matching pairs

**Try taking turns with a partner and see who can find the most pairs.**

## Data and decisions

The Dextralog computerised monitoring system gave weavers, engineers and managers real time data about the efficiency of their looms.

It could pinpoint problems, identify stoppages, measure machine speeds and predict outputs.

From Chorley to Chile, Ashton to Australia, Dextralog gave manufacturers around the world the power to make better business decisions. Even small changes could increase a mill's productivity.

Today, factories across the world use production monitoring systems descended from Dextralog's ideas.

## The people behind Dextralog

A small but skilled team developed the Dextralog monitoring system.

In this film, Dextralog chairman Tony Cann, Dextralog senior engineer David Wood and A.S. Orr Co. Ltd managing directory Brian Hamilton, reveal how hard work, determination and risk taking made Dextralog a success.

Film, edited, colour, sound

**Nova computer instruction reference card**
about 1971

This was computer engineer David Wood’s manual. He built the Dextralog system using the Nova, an early American minicomputer.

Early 1970s computer technology was basic. David spent hours adapting the Nova’s components to run the Dextralog system.

Facsimile
Science Museum Group. Object no. 2016-2004

## **Selector box and selector box circuit board**
about 1972


2016-2003.2

Electronic selector boxes were the eyes and ears of Dextralog’s monitoring system.

One was attached to each loom in the mill. If the loom stopped, the box’s sensor registered an ‘off’ signal. The weaver could press a button to give more details about the reason for the stop.

The box sent this data to a central computer, which processed the information and created reports.

Science Museum Group. Object nos.
2016-2003.2 and 2016-2003.3

**Dextralog report printout**
about 1975

Dextralog reports could pinpoint loom stoppages and show how many looms were down at any time.

Dextralog also monitored loom speed. It could predict how long a machine would take to finish a job and when it would run out of yarn.

Manufacturers used this data to decide how to improve their looms' efficiency and increase cloth production.

**Do you use computers and data to help you make decisions?**

Science Museum Group. Object no. E2019.0452.1

**Photograph of the Dextralog central unit**
about 1971

This photograph showed customers unfamiliar with computer technology what the Dextralog system looked like.

It shows the Nova computer, which ran the system, the keyboard, where operators selected data and the screens, which presented the reports.

**How does this computer compare to ones that you use today?**

Facsimile
Courtesy of Mr H.A. Cann

## Testing textiles

The British Cotton Industry Research Association was based at the Shirley Institute in Didsbury, South Manchester. It was Internationally renowned for textile testing and research.

The Shirley Institute helped pave the way for the innovative textiles research that continues today.

This drive for textiles research began in the early days of cotton mills. Manufacturers wanted to be sure their products were high quality.

They asked local scientists to produce equipment for testing the weight, strength and smoothness of their yarn and cloth.

Scientists moved from testing fabrics to finding new and better manufacturing methods.

**Image**: Testing fibres, Trafford Park, Manchester, around 1965.

Walter Nurnberg Collection / National Science and Media Museum / Science & Society Picture Library

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1 Condenser

2–3 Burettes

4 Linen prover made by Joseph Casartelli & Son Limited, Manchester, around 1920

5 Joseph Casartelli & Son Limited, Manchester, around 1920 Blackburn's Yarn Balance made by John Nesbitt Limited, Manchester, around 1925

6 Pick counter 5169 patented in 1910

7 Beesley's Yarn Balance made by Goodbrand & Company Limited, Manchester, 1922

8 Lea or Hank Quadrant C325 made by John Casartelli & Son Limited, Manchester, around 1954–1965

9 Yarn balance made by Joseph Casartelli & Son Limited, Manchester

10 Knowles Patent Yarn Balance made by Goodbrand & Company Limited, Manchester

11 Control and indicator unit from a Ferranti-Shirley viscometer made by Ferranti Limited, Manchester, around 1955

12 Moisture tester made by the Record Electrical Co. Limited, Broadheath

Crystaline pigments developed by Dr. H.E. Schunck, a leading 19th century Manchester research chemist:

1 Indigo Blue crystallised from aniline
2 Indigo Blue purified by Fitzsche's process
3 Isopurpurin, a red dye
4 Alizarin, a red dye
5 Souvenir sample of the first synthetic Indigo made by a British manufacturer, Levinstein Limited of Ellesmere Port, 1916
6 Monastral Blue pigment sample from ICI Blackley Works, Manchester

7–15 Aniline Dyes:

7 Diamine Violet
8 Diamine Black
9 Anthracene Yellow
10 Crystal Scarlet
11 Diamine Rose
12 Acid Yellow
13 Diamine Green
14 Irisamine, a red or pink dye
15 Immedial Indone Concentrate

## 16–25 Natural Dye Samples:

16 Brazilwood, a red dye
17 Indigofera plant, a blue dye
18 Smyrna root – Madder, a red dye
19 Naples root – Madder, a red dye
20 Quercitron bark (outer), a yellow dye
21 Young fustic, a yellow dye
22 Persian berries, a yellow dye
23 Quercitron bark powder, a yellow dye
24 Madder, a yellow dye
25 Weld, a yellow dye

26 Pestle and mortar
27 Purple dyed yarn

## Dyes

Manchester's textiles industry needed quality dyes.

Once, the only way to colour cloth was by using plants and animal products. These dyes were expensive and did not last well.

All this changed in 1856, when William Perkin discovered the first successful artificial dye.

Perkin was experimenting with coal tar, a waste product from the coal industry. He realised it dyed cloth purple, and patented his dye as 'Mauveine'.

His discovery led to a whole industry. Artificial dyes were brighter, cheaper and longer lasting.

Imperial Chemical Industries (ICI) made dyes in Blackley, north Manchester, from 1926. They became a global leader in dye production.

**Image**: Workers dyeing textiles, around 1920.

Daily Herald Archive / National Science and Media Museum / Science & Society Picture Library

## Yarn dyeing frame

This dyeing frame can dye 225kg of yarn at a time. The yarn is placed on nickel tubes and dipped into a bath of dye. A pump forces the dye into the yarn through holes in the tubes.

Science Museum Group. Object no. YINP905.1

## Finishing textiles

Creating textiles does not stop at weaving. To turn plain cloth into something you can sell, it needs to look attractive.

Manchester became a centre for bleaching, dyeing and printing industries, employing thousands of people.

Over the years, engineers, scientists and designers have worked together to find quicker, cheaper and more lasting ways of finishing cloth.

We continue to find new uses for textiles, and ways to make them do more than early industrialists dreamed possible.

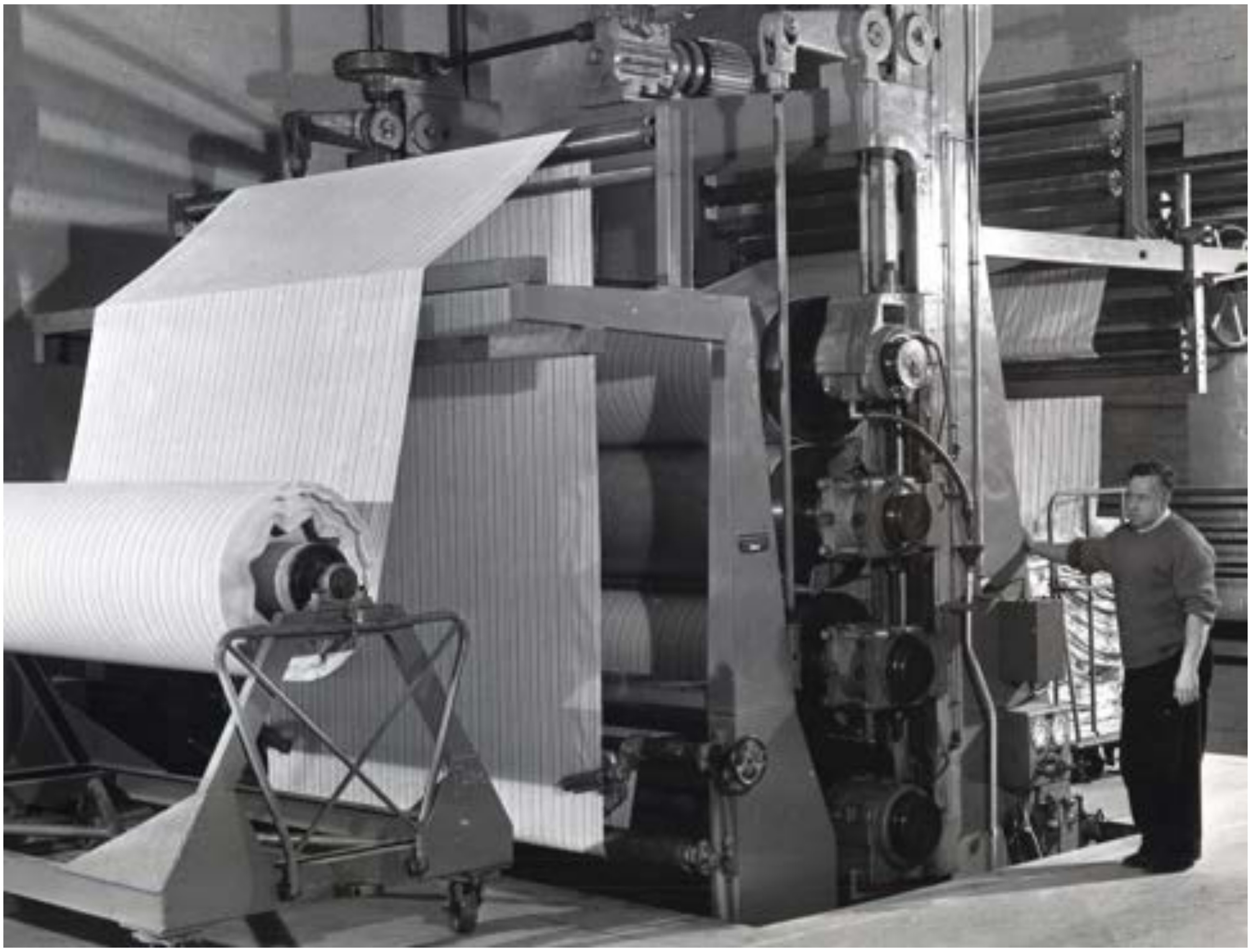

**Image:** Textiles finishing at Mather & Platt Ltd, Manchester.

Science Museum Group Collection

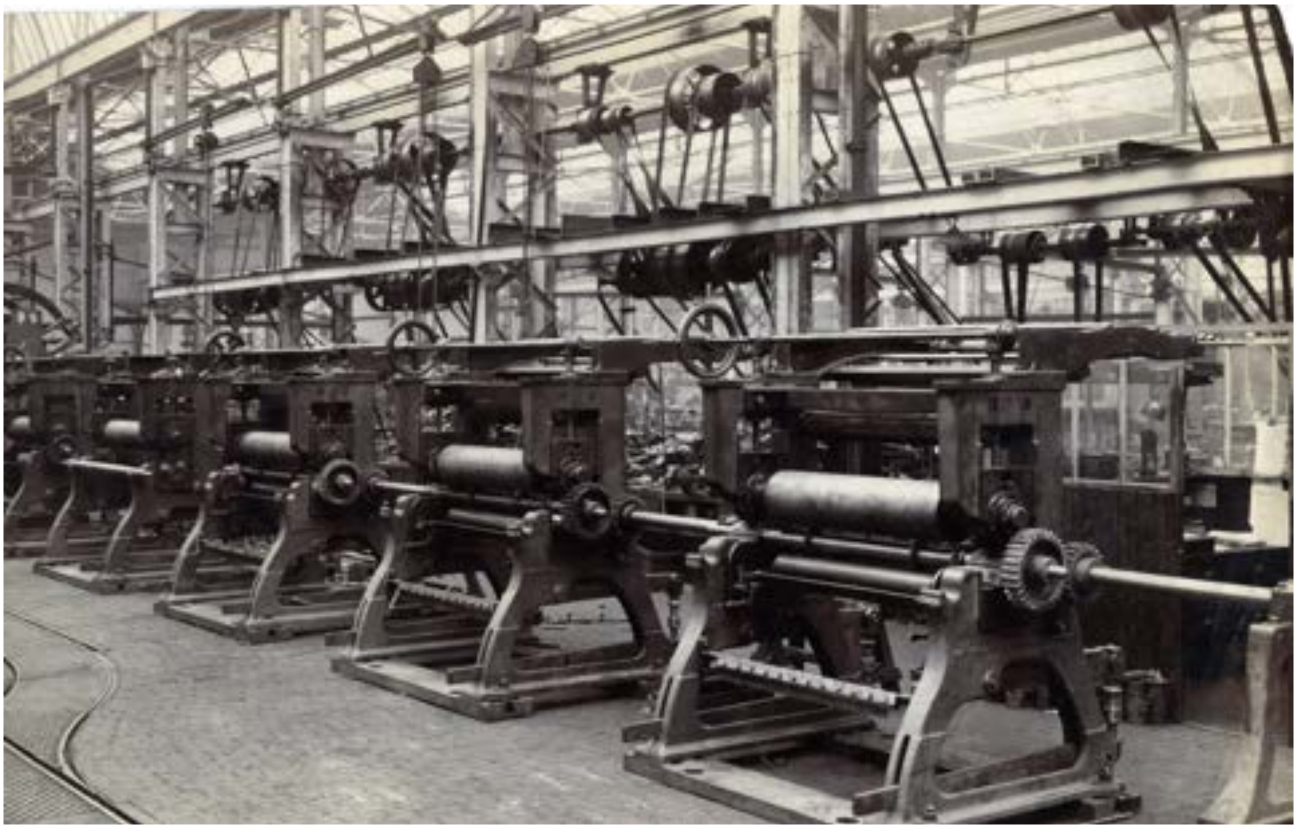

**Image:** Row of single colour printers at Mather & Platt Ltd, Manchester.

Science Museum Group Collection

**Trish Belford,**
**textile designer and researcher**
3 minutes

Trish Belford is a textile designer and Senior Research Fellow at Belfast School of Art. She is interested in finding new ways to print and finish textiles by combining art, science and industry.

Here she talks about her textile design work and collaboration with architect Professor Ruth Morrow. Blending textiles with concrete, they create innovative building materials that have been used internationally.

**Explore samples of some of Trish's designs below.**

Film, colour, sound

## Textile printing

Manchester machine makers Mather & Platt made very successful printing machines. The company sold them across the globe.

Their machines could print up to 15 colours at the same time. Each roller printed a different colour transferring the whole pattern to the cloth in one pass.

Textile printing was not always so easy. Early printing was done by hand.

Printers applied designs to cloth one colour at a time using hand carved printing blocks. It was a very skilled job, and meant the cloth was expensive.

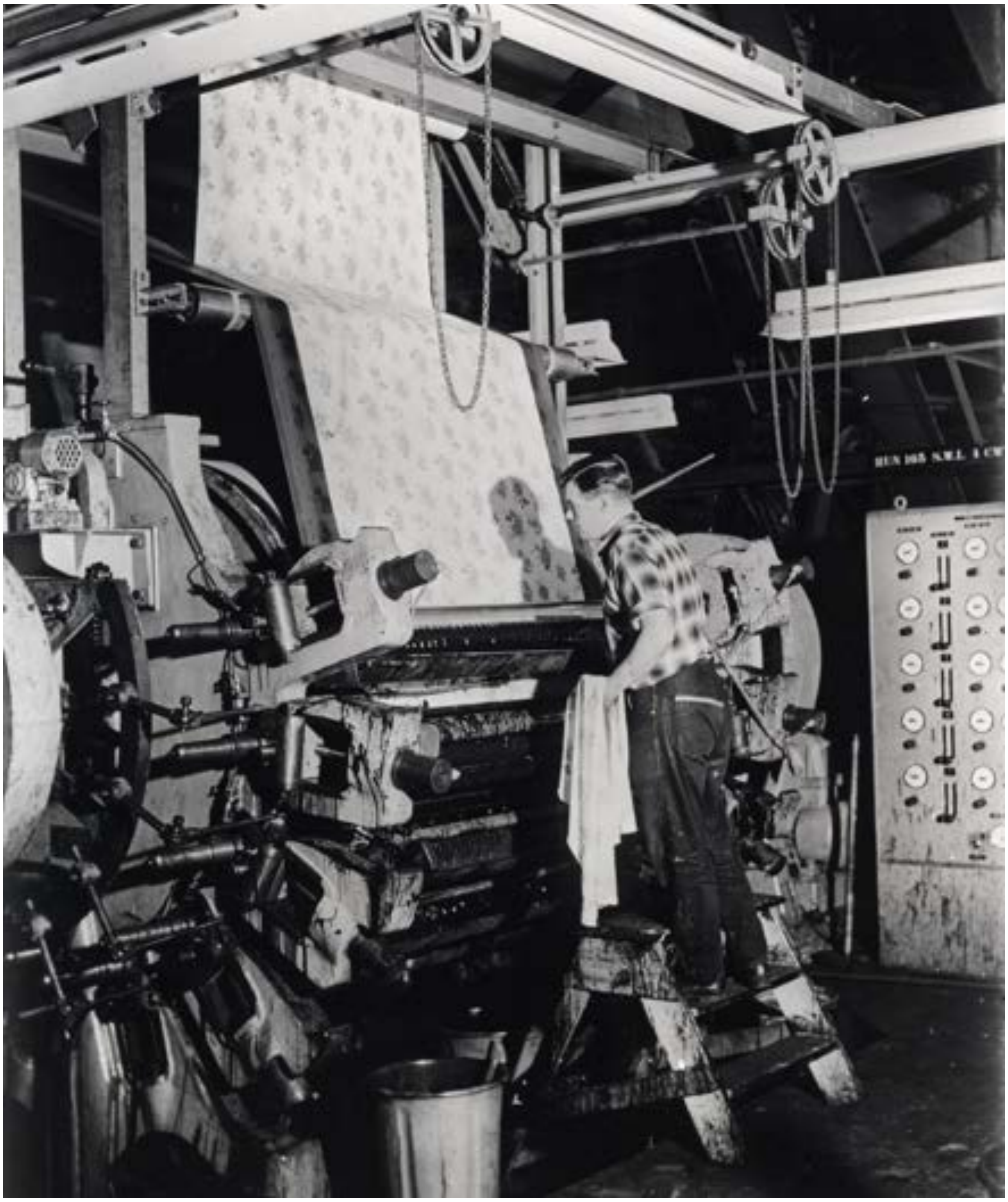

**Image:** A 10 colour printer at Mather & Platt Ltd, Manchester, around 1975.

Science Museum Group Collection

1–5 Set of five hand printing blocks from pattern C7415 made by Stead McAlpin & Company Limited of the Cummersdale Print Works, Carlisle, around 1840

6 Moorish Window trademark hand printing block of George Booth & Company made by Shaw & Latham of Bloom Street, Manchester, 1866

7 Trademark hand printing block of Paterson Zochonis & Company Limited, emphasising the full weight and quality of the cloth

8–9 Two small hand printing blocks

10 Laser engraved printing rollers manufactured and used by John Spencer (Hazelhurst) Limited. The pattern is built up on the cloth by passing over each of the four rollers in turn

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