

Inventions and Other Developments Associated with the Heritage Textile Industries of the British Isles

M. A. Hann[†] and E. Nicholson

University of Leeds International Textiles Archive, University of Leeds, UK

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Abstract

The objectives of this paper are to examine some of the factors which may account for the rise in predominance of British textile manufacture in the eighteenth and nineteenth centuries. This paper identifies a range of important eighteenth century British inventions and associated developments, such as the 'factory' system, which stimulated expansion in textile manufacture in the British Isles and led to the rise in international importance of various 'heritage textile industries', including the Lancashire cotton industry, the Yorkshire woollen and worsted industry, the Dundee jute industry and the Irish linen industry.

Keywords: Heritage Textile industry, British inventions, eighteenth century

I . Introduction

Textiles with functional, ritualistic, decorative and aesthetic applications have been produced throughout much of Europe for several hundred years. Various craft-based industries have evolved and have received attention from scholars and museum professionals over the years. Many well-documented collections, comprised of hand-crafted textile items, are housed in national and provincial museums across Europe. Also of importance (in the cultural, historical and heritage context) but receiving relatively less scholarly attention from textile and fashion scholars, are the various national factory-based textile industries developed alongside, or in the wake of, the Industrial Revolution, involved in the processing of various fibres, including flax (linen), wool, cotton, and jute. Towards the end of the twentieth century, many of these industries

underwent substantial declines in machinery capacity, output, numbers of establishments and numbers of personnel employed, as textile manufacture re-located geographically to locations offering lower production costs. Examples from the British Isles context include the Irish linen industry, the Yorkshire woollen and worsted industry, the Dundee jute industry and the Lancashire cotton industry; there are several others. All four had risen to a peak of output and performance, during the nineteenth and early-twentieth centuries, to be confronted ultimately with unavoidable decline towards the late-twentieth century. Examples of heritage textiles still produced today, though at reduced capacities compared to several decades ago are Irish Linen and Harris Tweed.

In many cases, communities built up around these heritage textile industries, with generations of workforces recruited often from the same families to work in the same mill. In some cases whole towns were

[†] 교신저자 E-mail : M.A.Hann@leeds.ac.uk

built by entrepreneurs in order to ensure that workers lived close to their place of employment and also, in some instances, to ensure socially and hygienically better living conditions for the workforce than would have been the case otherwise; Saltaire (in Yorkshire, UK) established by Titus Salt in 1851, and now a UNESCO world heritage site, is a good British example.

The objectives of this paper are to examine some of the factors which may account for the rise in predominance of British textile manufacture in the eighteenth and nineteenth centuries. Particular attention is focused on inventions which brought about significant increases in production which in turn led to the development of the various British heritage textile industries.

II. The Stirrings of Industrial Revolution

Radical changes in agriculture in the 1700s were necessary pre-requisites for the Industrial Revolution in Britain. Seed drills and the use of the iron plough were of great importance, and these and other agricultural inventions led to increased food production which in turn allowed population growth. Degrees of labour intensity in farming were decreased which in turn contributed to unemployment in farming and the availability of a large unemployed labour force. A proportion of this large labour force was thus available for employment in unskilled or semi-skilled textile manufacture.

The development of the 'factory' system was stimulated by the availability of several important process innovations in textile manufacture (identified below) as well as developments in water and steam power, rail and water transportation, coal mining, and iron smelting. Britain was well placed to benefit from these developments. Advantages included the availability of coal and iron resources; its position as an established commercial power; the availability of

capital to invest in new forms of industrial activity; its many colonies which acted as sources of raw materials and markets for finished products. Improvements in the transport infrastructure and in industrial production generally were strongly supported by government and the Royal Navy was available to protect British sea trade. By around the mid-nineteenth century, the Industrial Revolution had spread to France, Belgium and Germany as well as the United States and ultimately Japan. Drawing on substantial natural resources, as well as European capital to build railways and factories, the United States had overtaken Britain as the world's leading industrial nation by the last decade of the nineteenth century. Never the less Britain retained an important position industrially, throughout the nineteenth century and into the twentieth century. Probably the most noticeable benefit of the Industrial Revolution, for the societies affected by it, was sustained economic growth, the increase in average per capita income and vast amounts of wealth accumulated by industrial entrepreneurs. Working conditions faced by the newly-industrialised labour force in the new factories and mills were regarded as harsh by many contemporary social observers, and the employment of children was a particular concern; these aspects of the topic are however outside the scope of this short paper. An interesting article concerned with employment conditions and the developing trade union movement was provided by Pearce (1975).

III. Inventive Activity

The *Encyclopaedia Britannica Online* identifies five important textile inventions associated with the Industrial Revolution and the reduction of labour costs: John Kay's 'flying shuttle' (1733); James Hargreaves 'spinning jenny' (1764); Richard Arkwright's 'water frame' (1769); Samuel Crompton's 'spinning mule' (1779); Edmund Cartwright's power loom (1785). Each is considered briefly below.

For centuries prior to the Industrial Revolution, spinning and weaving were conducted on a home (or 'cottage') basis, occasionally supplementing the income from farming. Typically the women of a household, often assisted by children, were involved in spinning and men (occasionally from within the same household) were involved in weaving. A merchant (or clothier) 'managed' the process, by providing the fibrous raw material and then paying for the spun or woven goods. One handloom weaver required the yarn produced by at least four spinners, but this changed dramatically with the introduction of an invention to become known as the 'flying shuttle'. Invented by John Kay (1704–c1779) of Lancashire, and patented in 1733, the 'flying shuttle' permitted the faster production of wider cloth and led to a four-fold increase in demand for yarn. At around the same time, with populations increasing at home and the colonies providing a massive 'captive market', there was an increased demand for quantities of British-produced cloth. This in turn necessitated innovations in spinning methods in order to feed the faster and wider 'flying shuttle' looms.

A major innovation in spinning was the machine which became known as the 'spinning jenny'. Some historians give credit to Thomas Highs (1718–1803) of Lancashire for its introduction in 1764 and others argue that the credit should go to James Hargreaves (1720–78), also of Lancashire, who acquired the patent for the machine in 1770. By the late 1700s, more than 20,000 spinning jennies were being employed, each spinning yarn using multiple spindles (of between twenty and thirty per frame) at the one time, thus replacing the efforts of a large number of hand spinners.

The next important invention, the 'water frame' (first known simply as the 'spinning frame') was patented in 1769 by Richard Arkwright (1732–1792) who apparently obtained a model of a machine designed by Thomas Highs and, making reference to this model, built a full-sized machine. Sometime later

Arkwright left his native Lancashire for Nottingham where, in 1777, he met Jedediah Strutt (who had made several inventions relating to knitting). Sponsored by the firm of Need and Strutt, Arkwright built Cromford mill on the river Derwent in Derbyshire, housing water frames producing cotton yarn. Arkwright is considered by many observers as a leading entrepreneur of the Industrial Revolution and a contemporary authority on textile processing technology. He is also associated with the introduction of the factory system as well as with the mass production of cotton yarns (a century before Ford). In the publication *World Heritage Sites in the United Kingdom*, it was commented that:

'... the Derwent Valley site is significant because of the development of early technology at ... Cromford Mill in 1771. Here, Richard Arkwright first introduced factory production and transformed the scale of the output and the numbers of workers on the site. A shift system was introduced with workers employed in large buildings and living nearby in dependent communities. The spread of the factory system created a new cultural tradition and the venture introduced a degree of social enlightenment and concern for the quality of life ...'

Yet further improvements in spinning came in 1779, with the introduction by Samuel Crompton (1753–1827, also of Lancashire) of the 'spinning mule', so called because it combined elements of both the 'spinning jenny' and the 'water frame'. This invention permitted a single operator to work simultaneously with numerous spindles and, in a relatively short time, the Lancashire town of Bolton, with many factories operating spinning mules, had become a world centre for the production of fine cotton yarns.

Following from these important developments in spinning and the potential for immense increases in the quantities of yarn produced, attention was turned to weaving. A power loom was introduced by Edmund Cartwright (1743–1823) of Leicestershire

in 1784 (patented in 1785). A few further patents followed, including his last patent in 1792 which added multiple shuttle boxes for the weaving of weft-ways stripes and checks.

IV. Associated Developments

The inventions mentioned above stimulated massive developments across all the textile industries of the British Isles, including cotton manufacture in Lancashire (mainly in Oldham, Bolton and Manchester), woollen and worsted manufacture in Yorkshire, jute in Aberdeen and linen in Ireland (predominantly to the north-east of the island). In terms of quantity of output, the Lancashire cotton industry was predominant and, by the mid-nineteenth century, was producing around half the world's cotton cloth.

The bulk of eighteenth and nineteenth century textile inventions, including those mentioned above, were applied first to cotton manufacture and, in some instances, it took several decades before their applicability to the mechanisation of other textile industries was realised. In order to understand why this was the case it is important to realise that different types of fibres have inherently differing properties and require different processing conditions.

The adoption of textile inventions in Britain created demand for massive increases in supplies of clean cotton fibre, with seeds and other non-fibrous material removed. Inventions sourced elsewhere contributed. Of great importance was the introduction of the cotton gin (patented in 1793 by Eli Whitney, New England, USA), an invention which stimulated the Industrial Revolution in Britain and encouraged cotton plantation owners in the USA to plant more cotton.

Power sources to run the new machinery were also of great importance. Typically, in the eighteenth century, water power was used (thus the location of many mills adjacent to sources of fast flowing water). With the introduction of an improved steam

engine in the late-eighteenth century, coal became the main fuel. The northern English counties of Lancashire, Yorkshire, Derbyshire and Nottinghamshire were rich in coal mines and as a result these areas were well placed as locations to engage in factory-based textile manufacture.

V. Conclusion

The rise to international predominance of British textile manufacture, and the various heritage textile industries identified here, was reliant on the introduction of the factory system, the availability of cheap labour and investment capital, as well as inventive activity across a wide range of areas. Developments in mining, canals, roads, railways, iron smelting, chemical production, water and steam power, and improvements in machine tools were also of importance.

Various factors influenced the decline of these heritage textile industries in the twentieth century, after over one hundred years of predominance. Probably the most important factor was the increased competition faced in both home and overseas markets following the 'migration' of industrial activity to locations offering cheaper means of production. A further factor seems to be the rise in importance of man-made fibres as substitutes in many end uses.

References

- Addy, J.(1976). *The textile revolution, seminar studies in history*. Longman, London.
- Aspin, C.(1981). *The cotton industry, Shire album series no 63*. Shire Publications, Aylesbury (UK).
- Beesley, I.(1987). *Through the mill*. Dalesman Books, in association with the National Museum of Photography, Film and Television, Bradford.
- Collins, B.(1994). *Flax to fibre. The story of Irish linen*. Irish Linen Centre and Lisburn Museum Publications, Lisburn (Northern Ireland).

Keighley, M.(2007). *Wool city*. G Whitaker & Co Ltd., Bradford, p.6.

Lemon, H.(1951). Some aspects of the early history of spinning with special reference to wool. *Journal of the Textile Institute*, 42(8), 496-497.

Local Authority World Heritage Forum(2002). *World*

heritage sites in the United Kingdom, London.

Pearce, C.(1975). *The Manningham Mills Strike, Bradford, December 1890-april 1891*. University of Hull Occasional papers in Economic and Social History, No. 7, Hull, p.58.