



Descendants of the Lacemakers of Calais

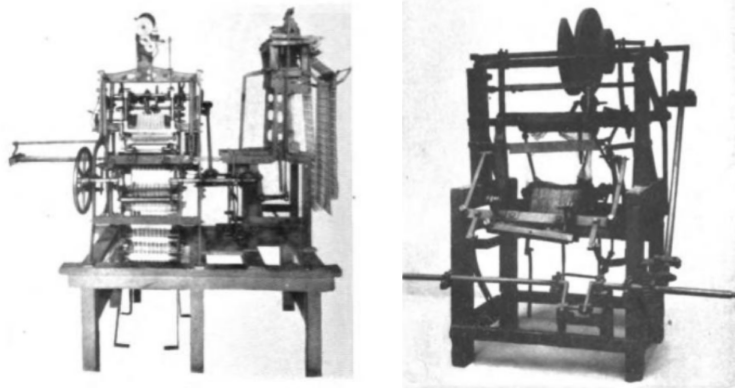
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Lace and the work processes to make it

Lace is “a fabric of fine threads of linen, silk or cotton, interwoven in a net, and often ornamented with figures; a delicate tissue of thread”.

A Leavers lace machine is a very complicated mechanical apparatus. Simply, it consists of two integrated sections; the portion where the lace is made and the Jacquard which governs the pattern. Lace cannot be produced unless both sections operate perfectly together. In turn the machine operation is one phase in a series of work processes that result in finished lace fabric. The work processes have changed with time and the processes shown here are generally as they were in the mid-nineteenth century.

However, while some manufacturers made lace from design to finish, it was common to find a division of production between machine owners and finishers with the machine owners selling their lace in the brown to a finisher or other manufacturer. This created two classes, “fabricants finisseurs” being those who manufactured and finished and “fabricants façonniers” being those who manufactured and sold their lace in the brown. The façonniers are usually workmen who have purchased a few machines and buy in the designs and materials, even the jacquard cards while the finisseurs have many machines and workers who can provide the skills to complete all processes required to manufacture finished lace.



Early Leavers Lace Machines

Work processes

In large factories that make lace “from beginning to end”, there are more than 20 separate processes involved in the manufacture of Leavers machine-made lace. These can be divided into phases:

- 1a: artistic work of design and pattern control and 1b: preparation of the yarns for the machine
- 2: making the lace on the machine, and
- 3: finishing work

Work in each process is dependent on completion of the work in the previous process though phases 1a and 1b are independent of each other and should occur simultaneously.

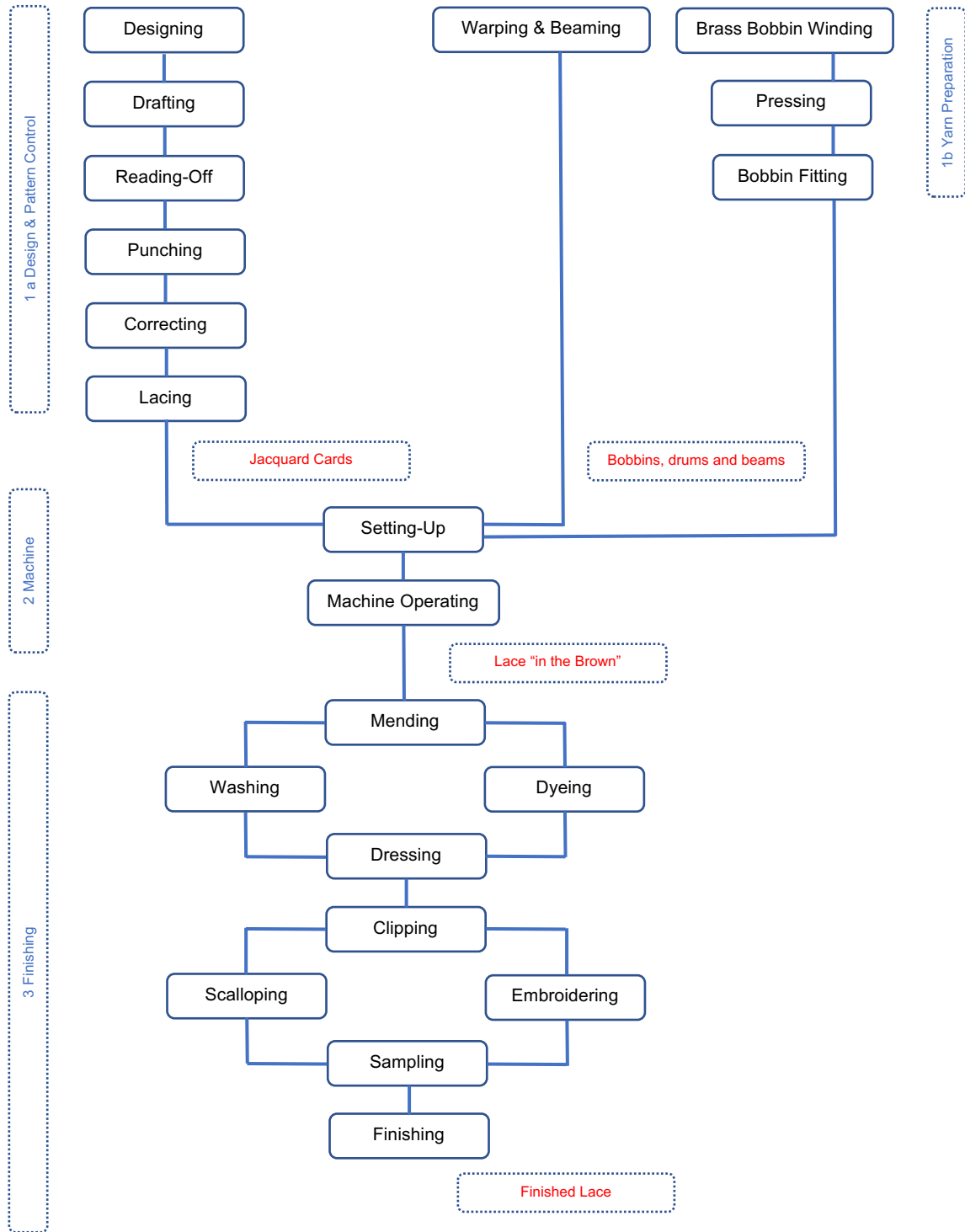


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Work process diagram

In the diagram the work phases are shown left and right and the phase end-product is shown in red.





Phase 1a: Design and Pattern Control

Designing

Designing is crucial to the success of any lace manufacturer as a designer (*dessinateur*) creates new designs unique to that manufacturer. However, the designer's imagination must be controlled by his knowledge of the capabilities of the machine – original designs **must be capable of being** produced by the machine in a balance of imagination and technical skill. The result of the designer's imagination is an artist's drawing.

Drafting

The work of the draftsman (*esquisseur*) is far more complex and mechanical than that of the designer; a subtle fusion of the artistic and the technical. Draftsmen have been called "the souls of the machine".

The draftsman uses a pantograph to transfer the design drawing onto paper at several times its original size and modifies the design guided by his artistic ability and his exacting knowledge of the machine's placement of the many thousands of warp and beam threads.

The draftsman then numbers and colours the sketch to record the movements of every one of the machine's parts and every yarn thread.

A draftsman can take a decade to become proficient in his work.

Reading-Off

The draftsman's sketch is "read-off" onto a sheet of specially squared paper. A simplified design is drawn over the paper, the pattern perforator (*pointeur*) numbers and perforates the paper, which together indicate every thread location and colour. The numbers are tabulated to inform the card puncher's work.

This work includes supervision of the card punchers work.

Punching

The card puncher (*perçeur*) follows the numbered tables and uses a machine to punch holes in stiff but pliable cardboard cards of such a length and width to fit exactly the Jacquard cylinder. The arrangement of holes controls the movement of the Jacquard droppers and blades which in turn control the movement of every bobbin as they twist around the warp threads.

The work requires speed but also accuracy.

Correcting

The cards are checked, and errors corrected before the coils of cards are taken to the lacer.

Lacing

The lacer (*laçeur*) ties together the Jacquard cards into two packs; odd numbers for one cylinder and even numbers for the other cylinder and stacks them ready to attach to the Jacquard.

The phase results in a design ready to be made by the machine as controlled by the Jacquard cards.

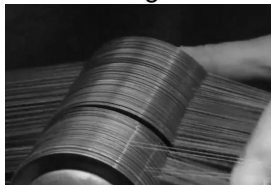
Phase 1b: Yarn Preparation

Slip Winding or spool winding involves selection of the correct thread yarn and winding the threads onto the drums and bobbins.

Warping or the placing of the requisite number of threads on the main warp beam comprises two operations, the winding of the threads from spools onto the warping mill, and the running back of the threads onto the warp beam by the *wapeur*. The warp drum is 200 to 250m diameter and runs the full width of the machine and set low down at the front. A similar operation by the beam operator transfers threads onto the beams which are rollers about 40mm diameter that also run the full width of the machine but behind the warp drum.

Brass bobbin winding also comprises two operations; the winding of many threads thousands of metres in length from yard spools onto a drum about 500mm width by the *dévideuse* and then from the drum onto the brass bobbins by the bobbin winder (*wheeleuse*). The bobbin winder hand winds simultaneously a number of single threads onto an equal number of bobbins. It takes about 100 metres to fill each bobbin depending on the yarn type. Filled bobbins are set onto vertical rods for the bobbin presser.

In all winding work the tension of the thread on drums, beams and bobbins is carefully controlled.



Threads being guided into the spinning bobbins.



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Pressing and fitting

When the bobbins are filled with yarn they expand and have to be pressed flat before use in the machine. In this operation the presser (*presseur*) stacks the filled bobbins in a frame and places it into a hydraulic-powered press to compress them. The bobbins are constrained from expanding by the frame, heated in an oven, cooled and sorted.

The bobbin fitter (*rémonteur*) then fits each brass bobbin into a thin metal holder or carriage after checking and correcting the alignment of the carriage spring. The bobbins and carriages are ready for placement into the machine.

Each Leavers machine requires 4000-5000 bobbins.

The phase results in drums, beams and bobbins filled with threads.

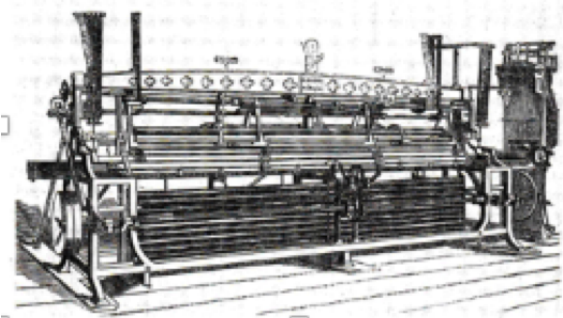
Phase 2: Machine Operation

Setting Up

Setting up involves

- threading the more than three thousand warp and beam threads up through the sley and tying them off to the roller at the machine top,
- fitting the few thousand bobbins,
- fitting and adjusting the punched cards into the Jacquard,
- checking alignment of all moving parts and threads including the Jacquard bars

The body of the machine, where the lace is made, is from 4.5 to 5.6m in width, nearly 3m in height and about 12 tonnes in weight. The working parts of the inside of the machine consist of combs, points, bobbins and carriages, steel bars, and brackets.



Leavers Machine 1851 – thread beams below and Jacquard at right

Simply, the warp beams and smaller beams are set on frames at the lower portion of the machine, a perforated steel sheet called a sley is set horizontally part way up for the full width of the machine, with the bobbins and carriages set just above it. Above them are the Jacquard bars and at the top is the roller where the lace fabric is wound.

The thousands of threads from the beams are passed up by hand, each to a particular hole in the sley, then to another hole in an individual bar and finally are tied off at the top roller. This work is performed by the twist hands and the setting up of a machine occupies 2 men from 10 days to 2 weeks.

Machine Operation

The machine is operated by steam supplied to the machine floor from the boiler house. The twist hand assisted by the mechanic supervises the machine operation from when he activates the steam connection to run the belt and pulley system to the end of the run.

At the end of the run, the top roller with the lace fabric wound on it is taken off. This fabric is grey and greasy after the threads have passed through the sley.

The beams, rollers and bobbins are removed, cleared of unused threads and returned to the winders.

Phase 3: Finishing

Mending

The dirty lace, "in the brown", is removed from the roller, spread across large tables and inspected for defects. When a bobbin runs out of thread or threads break, a hole is formed in the fabric.

The menders repair the defects using the same thread type and colour as that used to make the fabric. Mending of the finer parts in the net (tulle) and the pattern is by hand, though it is possible to mend some defects by machine.



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Washing and Dyeing

The lace is dirty from the black materials threads pick up as they pass through the sley. The fabric is scoured, boiled, pounded in tubs of soapsuds, then soaked in solutions of lime and acid and finally washed.

If required by order, the fabric is dyed in wooden tubs.

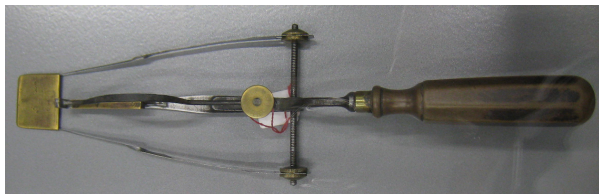
Dressing

Washing and dyeing leaves the fabric material limp and raw, and it is dressed by immersion in warm, weak baths of soda ash, then sizing with thin starch paste to give it a robust quality and pleasant feel. Surplus stiffening fluid is extracted, and the fabric is spread across frames for dressing.

The lace is pinned to the frames to hold it into shape as it dries in the dressing rooms that are kept at a high temperature.

Clipping

The clean and dry lace is "drawn" or cut up into the required widths. Bands or strips of lace have runner threads holding them together and these are hand cut and drawn to produce narrow widths of trim. These will vary widely to suit the final applications such as trims for curtains, doilies and samples.



The loose bobbin threads are cleared away and loose but attached threads are removed using scissor-like clippers

Scaloping and Embroidering

The surplus loose material is cut away by hand from the straight laces and trimmed from those with scalloped edges.

The fabrics are embroidered if the design calls for additional detail, either by hand or foot-operated machine. (Later large machines did this work).

Sampling

Samples are cut and fitted to cards to create sample books.

Finishing

Lace strips are cut, measured, folded or wound onto cards to order and packed into boxes or for display in the sales room.

References

Calais Lace Museum exhibits

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