

APPENDIX 1

Silk processing

As this book is centred around a family of silk manufacturers, it may be useful to remember the location factors, the various manufacturing techniques and the different effects resulting from the rise of the silk industry.

MULBERRY TREE CULTIVATION AND SILKWORM-RAISING

Mulberry trees are today a rarity among the vegetation of Lombardy. The economic history of the region, however, and in particular of the Lecco district, is very closely related to this species, which provided the leaves essential to the growth of the silkworm and therefore to the handicraft, and later the industry, of silk processing.

The production of silk cocoons has been a typical farming activity for over a thousand years. It was common among patriarchal families, in which labourers were never lacking.

The fact that silkworms had to be fed with fresh mulberry leaves made it necessary to raise them in a rural setting. Mulberry tree cultivation and silkworm-raising were, therefore, strictly related.



Illustrated plate showing the life of the vermis sericus, i.e. the silkworm, by the Flemish painter Jan van der Straet (Giovanni Stradano), Bruges 1523 - Florence 1605.

An ex voto from the sanctuary on the Madonna del Bosco in Imbersago portraying the interior of a farmhouse with towers for raising silkworms. The person depicted, carrying mulberry leaves in her apron, is risking life and limb to feed the silkworms.



Silkworm in a wood.

The birth of the silkworms

Silkworms were raised in the months of May and June.

The *silkworm*¹ hibernates in egg form. The eggs² were collected from merchants between the April 23 (St George's Day) and April 25 (St. Mark's Day) and left to hatch, usually under the mattress.

Incubation lasted eight to ten days, which meant that the first silkworms would hatch on around May 4th or May 5th.

The larva (the correct name for the silkworm) was a yellowish-brown colour.

The tiny caterpillars then began to be fed on young, chopped mulberry leaves, placed on a small grate at a constant regulated temperature in a protected environment.

After the hottest hours of the day, the workers prepared to go out into the countryside to gather the mulberry leaves. The oxen were yoked and the cart was laden with ladders that served to reach the higher branches of the trees, the characteristic basket-shaped cages and all the equipment necessary for the job.

With everything ready, they slowly made their way out into the fields, while at the farm work carried on as usual.

¹ *Bombix Mori* is the scientific name for the silkworm, which, in farming jargon, is known as bigatto or cavaliere.

² Known also as «seed» or «silkworm seed». It should be specified that the unit of measure used for silkworms eggs is the ounce, equivalent to 25 grams, and that an ounce produces approximately 40,000 silkworms (called in the Brianza dialect *cavalée*), and that these 40,000 worms, during their first five weeks of life, consume over 1,000 kilos of mulberry leaves.



Legend has it that silkworms were brought from China to the Byzantine Emperor, Justinian, by two monks of San Basilio, who hid the eggs in a hollowed stick.

Engraving by Jan van der Straet (known as Stradano), printed around 1590

The men, up in the highest parts of the mulberry tree, would begin to cut and throw down the upper shoots laden with leaves, while the women below on the ground picked them up and arranged them into piles. Others helped by cutting the lower branches.

Once back at the farm, the first operation was stripping the leaves from the branches and preparing them in such a way that they could be consumed without difficulty. The prepared leaves were then brought to the rooms where the silkworms were placed on a reed table.

The worms that had hatched from the eggs then began to feed on the leaves, which were placed on top in order to encourage them to eat in large quantities.

The rooms had to be specially fitted with horizontal gratings placed one above the other, from the floor to the ceiling, with a space of 70 cm between them. On these climbed boys with baskets and aprons full of fresh leaves, listening anxiously to the murmuring sound of the silkworms as they greedily ate their way through the various stages of growth.

They were fed abundantly and continually, taking great care that the mulberry leaves were always fresh but not wet. On rainy days, whole branches were cut and left to dry under the farmhouse porch.

Growth

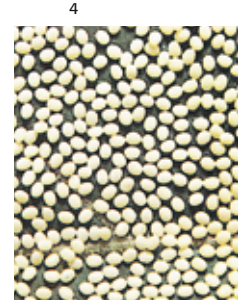
The larval stage of the silkworm was divided into a succession of growth and rest periods. In its second week of life, the silkworm stops eating to sleep for the first time. After 24 hours of almost total immobility, it slowly sheds its old skin and emerges, with renewed appetite, to recommence eating and continue its rapid growth.

Trays with «ready-made woods».



Developmental stages of the silkworm

1. Trays of silkworm eggs ready to hatch into silkworms and feed on mulberry leaves.
2. Silkworms in the fourth ecdysis (the final phase) of their growth.
3. Silkworm feeding on mulberry leaves in its last stage, known as the "fury" stage.
- 4-5. Cocoons in a wood: during the "spinning" stage (4) and upon completion (5).
6. Cross-section of cocoon with crasis, or pupa.
7. Hatching of the moth from the cocoon and mating.
8. Adult moth.
9. Silkworm eggs.



Cocoons in a "wood".
Photo by Daniele Mornati.

In the course of 40 days the silkworm «sleeps» four times, corresponding to the four skin changes, and passes through five stages.

The four resting periods were numbered: first, second, third and fourth, hence the origin of the Italian saying «dormire della quarta» (to sleep «the fourth sleep», that is, very deeply). Sometimes the various dormant periods were differentiated according to the colour assumed by the silkworm in the different stages of its growth – «the brown» corresponded to the first, «the white» to the second, and «the big one» referred to the last dormancy phase, from which came the expression «dormire della grossa» (to sleep «the big sleep», with the same meaning as above).

At each successive stage of its growth, the silkworm consumes increasing quantities of leaves and therefore demands more and more attention and care of the farming family.³

After the final change, which takes from 36 to 48 hours to accomplish, the silkworms, now large and strong and quite ravenous, consume the mulberry leaves non-stop, day and night.

The leaves must be supplied five or six times a day and also during the night, at regular intervals, for around 35 days.

After this larval stage, in which the larva grow from 3 mm at the beginning to 9 cm, at the end of the final change the silkworm is mature; ready, that is, to «climb

³ Over 1,000 kilos of mulberry leaves were needed to feed the worms from one ounce of silkworm eggs (28.3 grams), which produced 75-85 kg of cocoons, the equivalent of approximately 7.5-8 kg of silk. The leaves were consumed over a period of time which covered the five stages of the silkworm: 5 kg in the first stage, 15 kg in the second stage, 50 kg in the third and 230 in the fourth. In the fifth stage the silkworms ate so voraciously that they had to be supplied with leaves five or six times a day and consumed roughly 700 kg of leaves.



Another photo of a typical "wood" to where the silkworms have been transferred to allow them to spin the cocoon. Photo by Daniele Mornati.

up the wood» (or «the bough») and spin its *cocoon*, or *galetta*.

The «wood» was created with twigs and branches of heather, rape or broom. The silkworm climbs up these branches, and after having anchored itself to the twigs with a few strands, using a substance produced by its silk glands, it proceeds to wrap itself round and round in a sheath of silk, creating the cocoon and completing the new stage of transformation into a chrysalis. The cocoon is formed by one long continuous thread of filament, usually about 700 m. in length (but in some cases as long as 1500 m)⁴.

At the beginning of this operation, which takes three or four days, the silkworm weighs approximately 6 g, and when it is completed the total weight of the larva and the cocoon together does not exceed 3 g.

A week after the «climb up the wood» the cocoons are gathered before the moths can emerge⁵.

Gathering the cocoons

The most important day is the day when the cocoons were finally «skinned», marking the end of the farmer's hard work.

The operation requires a certain skill. The cocoons are removed carefully from the branches, without crushing or dirtying them; then the down covering them is wiped off.

Those that are flawless are set apart from the others, which may show minor imperfections, and then taken to the market to be sold.

⁴ The silk filament with which the larva weaves its cocoon is produced not from its mouth, but through the «spinnerets», an opening situated on a small cone-shaped protuberance between the labial palps and connected to the silk glands.

⁵ The moth neither eats nor flies but, after mating, lays 400-500 eggs and dies after a period of 10-15 days.

Sale

The cocoons were stockpiled in panniers, after having been wrapped, like valuables, in a sheet. The stockpiling took place in a set location, where the cocoons were weighed under the supervision of several observers and then evaluated according to quality in order to set a price and purchased by brokers. After this, the cocoons were placed in large baskets or large sacks, and the batches were carefully registered.

Before bringing them to the silk mills, the cocoons had to be «stifled», that is, the pupa had to be killed by heating the cocoons – this is the *moritura* (dying) stage, essential to prevent the moths from breaking out of the cocoons and spoiling them, making them unsuitable for spinning.

The most common system was dry-heating, which at the same time as stifling the pupa also served to dry the cocoon, protecting it against mould⁶.

Finally, the cocoons were «sifted», i.e. sorted according to size and the three standard shapes⁷. The sorted cocoons were divided among three large baskets placed beneath the sieve. This sorting helped to yield a more uniform thread.

The cocoon harvest was actually more important than that of grain or grapes, and selling them at a slightly higher or lower price per libra determined whether it had been a good or a bad year after the difficult and energy-consuming stage of growing and harvesting.

Consequently, the time of selling the cocoons was a time of great tension, heated arguments, indiscreet questions and evasive answers, in a battle of wits to conceal one's own interests while discovering those of the «opponent».

The mulberry leaves were gathered and brought to the *bigattiera* (room equipped for silkworm raising) to be spread on the rush matting shelves. Engraving by Jan van der Straet (known as Stradano), printed around 1590



⁶ After this, a special rotating tool called a «skinner» was used to free the cocoons from their outer «peel», called «floss» or «waste».

⁷ Sorters then sorted the cocoons by hand, separating them according to size and quality, as each type required different treatment, especially regarding water temperature for the extraction of the silk, the speed of the reels, etc.



At the cocoon market, the baskets were displayed on tables, around which thronged buyers and sellers, assessing qualities and flaws, discussing and bargaining.

The cocoons, according to the type of «seed» used, could be either spherical, golden, rosy-coloured, pointed, white, Chinese or peanut-shaped.

Prices were highest for dry, well-matured cocoons and lowest for damp ones⁸.

These were the subjects of great discussions and battles, in an attempt to shave off a few more «pennies» from the libra.

Thus, between June and July the annual filament campaign was concluded.

The earnings from the cocoons were a fundamental part of the farmer's family budget. Considering that the wages of a farm hand in the 19th Century was approximately 1 lira per day and that the sale of an average harvest of 600 libras of cocoons amounted to an average price of 2 lira per libra, the total income for each family was about 1,200 lira. Silkworm-raising, therefore, proved to be an excellent business, well worth the hard work invested by the Brianza families.

Silkworm-raising is today only a distant memory in Brianza. It is hard to believe that this highly specialised trade of the Brianza farmers – the production of silkworm cocoons, the so-called «Brianza gold» – is now completely forgotten, when for centuries it was one of the most widespread and profitable activities in Lombardy.

Different stages in the silk mill: brushing (drawing out the end of the thread), extracting, throwing and spinning.

THE PROCESSING STAGES

Extracting the silk

Initially, as we have seen, the structure on which the silkworms were raised (known as *bigattiera*) was mounted in the farmhouse itself; later, it was moved to the silk mill.

⁸ Conditions being equal, the larger cocoons were preferred. 170-180 were needed to make one libra (477 g); one cocoon, therefore, weighed a little less than 3 g, depending on the degree of maturation and its size.

Silkworm raising was extremely widespread in Brianza: in almost every house, the entire family was involved. On the left of the picture mulberry leaves are fed to the silkworms on the shelves; on the right the "wood" is prepared. Engraving by Jan van der Straet (known as Stradano), printed around 1590



Silk was originally *extracted* mainly in rural areas, where the silkworms were raised. Extraction is the operation in which the silk filament is drawn from the cocoon. The cocoons were immersed in basins, usually made of tin-coated copper, containing hot water (heated with wood or steam, according to the stage of industrial development). In these they were steeped, in order to soften the rubbery glue (known as «sericin» or «silk gum») which held the filaments together and made it possible to unravel, or to detach, one of the ends of the filament itself. The end was nudged loose by stroking the floating cocoons with a small brush, an operation performed first by hand and later by machine. This was called the *brushing* stage. When the filament end stuck to the brush and formed one single thread, this was wound by the worker onto a *reel*⁹. The final product of this operation, carried out in the silk mill, was «raw» or «extracted»¹⁰ silk, which, before being woven, had to go through the *throwing* stage, in order to strengthen the fibres.

⁹ The basic mass was then unwound and passed to the spinner on a characteristic small pan. The spinner then took the filament ends from the basin (filled with water heated to around 60 °C), which measured approximately one hundredth of a millimetre in diameter, without forming the thread, and threaded it through the hole of the spinneret.

The thread was guided over the little wheels of the boards and, after travelling a short stretch known as the «shutter», a continuous filament reached the reels situated in basins of water at a temperature of 40 °C, feeding into the thread of raw silk new filament ends, until the whole skein was formed, reaching a weight of approximately 70 g. After almost 7 hours the skeins were complete; they were then removed by the spinner, who took them off the reels and brought them into the silk room. Here the skeins were checked and the greatest flaws removed, after which they were divided into five parts and each bundle was tied with a thread called *pantimo*, to prevent their unravelling.

¹⁰ At the end of each day the skeins of spun silk were hung up in the storehouse on a dibble, with a number corresponding to the spinner, then weighed to check the «yield», that is, the ratio of cocoons used to silk extracted by each spinner.

Throwing

The raw silk was now ready for a second series of processing operations, which would prepare it in various ways for the requirements of the textile industry. In actual fact, the raw silk thread extracted from the cocoons was also suitable for weaving, but it was almost always first twisted, dyed and de-gummed before it was woven.

The throwing stage was composed of various operations. The skeins first had to be wound from the reel to the spool (*winding*). This operation was carried out on the winder.

After winding, the thread had to be re-wound, in order to remove all imperfections from the silk by passing it across strips of cloth or metal called *stribbie*. The spools of re-wound silk thread were then inserted into the spindles of the throwing machine.

With *spinning*, an initial twist was given to the thread; *doubling* consisted in joining two or more strands together, and finally, with the actual *throwing* operation, the thread was subjected to a second clockwise and counter-clockwise twist, which was carried out on very large, complex machines that were almost invariably water-powered.



Various controls were carried out to determine the *count*, or the ratio between the weight and length of thread, the quality and the strength of the silk obtained.

The skeins of silk were then *wrapped around* with string that also connected the ends of the skein itself, in preparation for the following stages, and finally packed into special lined canvas sacks.

These operations, from the cocoon to the skein, were traditionally performed in the silk mill.

At the same time, however, great care was taken with the silk floss, or the silk residue from these processes, to such an extent that we can truly say no part of the cocoon was wasted.

Basically, the silk floss was made up of previously rejected cocoons, discarded for different reasons (cocoons which were moth-eaten, nibbled, double, or contained two silkworms, or which the moth had already hatched out of), but also of remnants from the initial stages of spinning (known as *strusa*) and throwing (*strazza*), as well as the *spelala* (the first thin filaments which the silkworm uses to fasten itself to the «wood»).

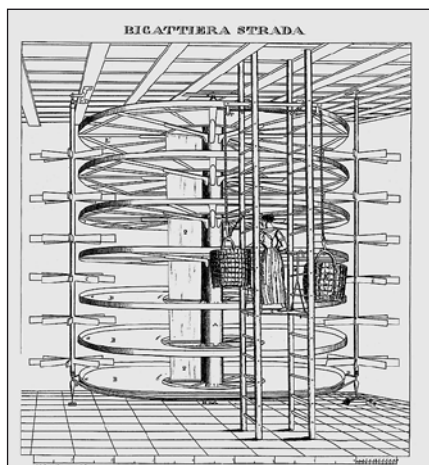
The imperfect cocoons were spun in special silk mills, while the *strusa*, which was the most valued type of silk waste, was cleaned and smoothed, to be sent to other factories especially equipped for its processing.

Considering the value and the quantity of these remnants (from each 100 kg of silk produced there were 20–25 kg of *strusa*), in the silk mill the examination of the *strusa* was particularly thorough.

Of the silk floss, other fairly valuable elements were the *gallettame*, that is, cocoons which for various reasons were not suitable for spinning (2–3 kg for every 100 kg of silk), and the *strazza*, the mass of broken or cut threads accumulated by each spinner at the end of the day. These were used to stuff pillows and cushions.

Even the pupae, though of little value, were put aside to be used as fertiliser, thanks to their high nitrogen content.

Left: a throwing machine. In these machines, built in wood and almost always water-powered, the silk thread was twisted (twice – first clockwise and then anti-clockwise) to make it stronger, shinier and more elastic.
Right: interior of a spinning machine.



Study-project of a rotating structure for silkworm-raising.

Thus twisted, the thread was then wound onto the spindles and sent to the testing room, an extremely hot, steam-filled hall, in which the throwing operation was fixed definitively (*provatura*) to prevent the thread from curling during subsequent operations.

After the throwing stage, the silk was soaked in special substances to fix the twisted thread and help it to glide smoothly.

In other words, the raw silk thread from the silk mill was twisted together with two or four other threads to make it stronger, glossier and more elastic¹¹. For this operation, the skeins were sent to the throwing factories, of which there were several in Northern Brianza. Most of these factories were water-powered, the movement transmitted by complicated mechanisms set in motion by the waters of the river Lambro.

While the extraction of the silk, especially during the initial expansion of the sector, was «geographically» related to the raising of silkworms and the cultivation of mulberry trees, silk-throwing, now separated from agriculture, found its ideal location beside mountain torrents and waterfalls, which guaranteed the regular and continuous movement of reels and spools.

Silk-throwing was introduced later than extraction, when the merchants heading for London (and later for Lyons and Vienna, the main European silk markets), found that spun silk brought a greater profit than raw silk.

Maturation

The silk thus obtained and wound onto skeins had to be subjected to various tests before being sent to the weaving factories. These were carried out in so-called «maturing» buildings, where the silk was brought in the selling or buying stages. Before proceeding with the tests, the bales of silk were carefully weighed and a skein from each single bale was placed on a table. Here, using special standards, samples were taken and tests made.

The first was a hydrometric test, to establish the market price of a batch of silk independently of its moisture content. In this stage precision was critical, as variations or small errors would mean large differences in the price of the whole batch.

The samples were placed in containers and placed in a hydrometric heater through which dry air was blown at a temperature of 140°C, after which they were weighed. They then underwent a twisting test in order to check the result of the throwing.

Another test consisted in measuring the resistance of the thread to snapping; this was followed by a test to determine the cohesion of the strands forming the thread.

The last stage consisted in checking the degree of homogeneity: the pins of each skein, wound on a black board with an instrument called a *seriplano*, showed any flaws remaining after the various processing stages. After the testing stage, the thread was ready for weaving.

¹¹ First of all, the skeins were «sized», that is, treated with a mixture of soap, vaseline, glycerine and grease, to make them softer and smoother.

Weaving

For a long time weaving retained a basically handicraft character. Only towards the end of the 19th century were power looms introduced on a vast scale in Milan and especially the province of Como, changing the productive aspect and the organisation of the work. In fact, the first to introduce them were the Gavazzis, in Desio.



Girl in typical Brianza dress. The unusually-shaped basket, or pannier, was used for gathering mulberry leaves.

The silk mills

The silk mills, where the spinners extracted the filament from the cocoon (this, as we have seen, was wound onto a reel, thus producing the skein of raw silk), had an architectural structure (often consisting in re-adaptations of existing buildings) which for the most part originated from the period between 1840 and 1860, concurrently with the diffusion of steam boilers and the need to construct buildings that could house a large number of basins, which would guarantee work year round.

The original structure, based on the courtyard and the porch, evolved into a rectangular-shaped building of three floors, each floor dedicated to a particular processing stage – on the ground floor, often characterised by the original ancient porch structure, were the store-rooms; on the first floor the basins for extraction and on the second floor the galettera, a large room, as bright and airy as possible, in which, on stacks of lattices, the cocoons were placed in preparation for spinning.*

Since the very beginning, the silk mills were closely related to the farming world. At first, they were no more than buildings in the countryside used exclusively for extracting the thread from the cocoon and owned by the farmer, where work was done only in the early summer, employing mainly women, girls and children.

As silk-throwing and extracting began to be carried out using steam-powered machines, silk mills became extremely numerous and were often owned by the silk merchants themselves.

The spacious rooms with large windows were full of steam and heavy with the unpleasant smell of macerating and boiling cocoons.

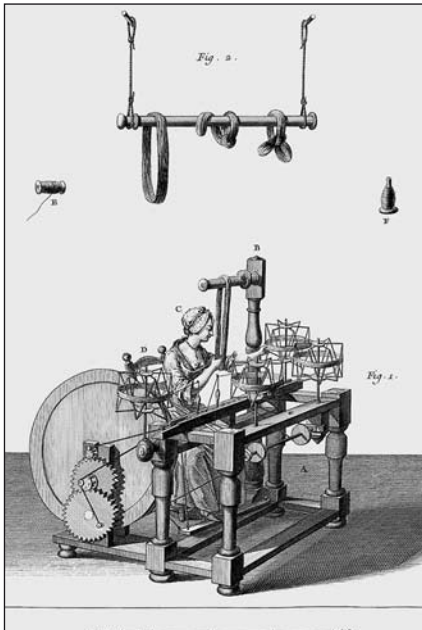
These rooms were crowded with women and young girls, who laboured in feverish activity, mechanically repeating the rapid, continuous movements without pause, to the creaking of the rotating reels and often the voices of the spinners themselves, reciting the rosary in low, chanting murmurs or raised together in chorus.

*Singing was an important element of the task; it eliminated useless talk and set a rhythm to the work**.*

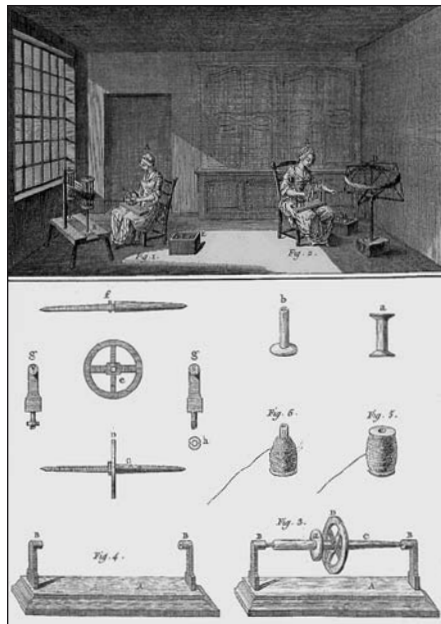
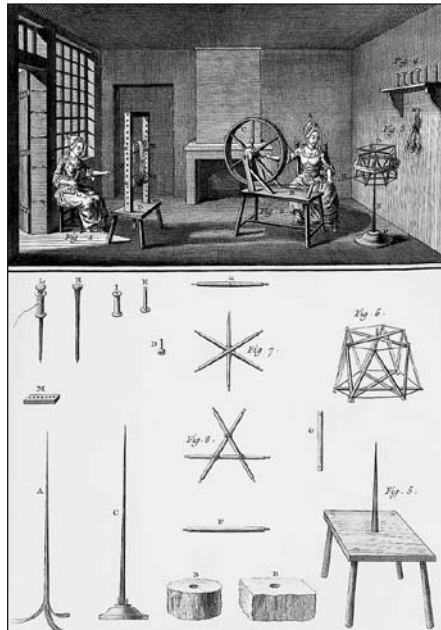
The silk mill itself was almost invariably accompanied by other manufacturing or residential structures, such as the home of the owner and his family, the dormitory for the workers who came from other towns and also, in certain cases, the spinning mill for carrying out the operations following the extraction stage.

* «Galletta» in the dialect of Brianza means «cocoon».

** The songs of the spinners were of various types – love songs, light-hearted, burlesque songs with a touch of coquettishness, and also religious songs, such as those sung in the month of May, dedicated to the Madonna.



The first rudimentary machine for silk processing, similar, perhaps, to those used by the Gavazzis of Canzo from the 16th to the 18th century.



Before actually being woven, the thread had to be fit for the *warping* stage¹².

The *weft* was inserted between the threads of the *warp* using shuttles. These were loaded with spools, especially made up during the spooling operation. The shuttle was passed back and forth from one part of the loom to the other, through the threads of the warp, which was opened at regular intervals determined by a system of punch cards – a system created by Joseph-Marie Jacquard (1752–1834), the forefather of modern processors, which dates back to the end of the 18th century.

Using this method, even very complex patterns could be created by punching them on the cards. The fabric resulting from this first phase was raw and had still to be subjected to a series of so-called «ennobling» finishing treatments. These operations usually took place at the dye works.

Dyeing

The dyeing of silk threads was carried out in very large and variously structured factories, which employed a great number of workers.

When the raw bolts of silk arrived at the dye works, they were unloaded for analysis in the laboratory, where they underwent the first «refining» operations. The fabrics were first prepared for the initial treatment, that of de-gumming, designed to eliminate the sericin, or silk gum, a substance which protects the silk thread during the processing stages¹³.

¹² The warping machine was a somewhat complex apparatus, made up essentially of reels, on which the threads from spools were wound in a subsequent stage. These spools were mounted on a frame called a cantra and the threads coming from each one, in a fixed number, were wound onto the reels and pulled along by their rotation. The operation was repeated several times on each reel, joining a new section to the previous one until the desired number of threads for the type of fabric to be manufactured were produced. At this point, the threads wound on the reel of the warping machine were transferred to the beam, which was then placed on the loom for the delicate operation of drawing-in, that is, the preparation according to a precise scheme of the passage of the warp thread through the mesh of the heddles and the teeth of the comb.

These fundamental operations for weaving were carried out by two specialised workers called «loom rimettine» («drawing-in operators»), who created the fabric by weaving the warp and the weft.

¹³ The fabric was wound in a spiral around a star-shaped structure called a «scouring star». When the spiral was completed, the star was raised, then immersed in large containers of hot, soapy water and soaked until the silk gum had completely dissolved. After a few hours, the fabric was taken out and placed to dry.



At the end of the de-gumming stage, the silk was placed in the spin-drying machine for the final drying. Meanwhile, the ingredients for dyeing were prepared – an operation which was carried out with great care¹⁴. The resulting fabrics were ready for the finishing stage, after which they could be sold directly or printed. Once dyed, the bolts of silk were dried thoroughly, carefully hung up and finally rolled or folded into bales. Before being sold or sent on to be printed, the silk was once again checked and weighed.

Printing

Finally, the silk reached its last stage – printing. This was an extremely delicate operation, in which a pattern, usually of several colours, was transferred to the whole bolt of silk¹⁵.

The bolt was then subjected to the final finishing treatments. The first was steaming, which

Extracting the silk in the troughs heated by wood fires. On one side, the operation of drawing out the end of the cocoon thread took place, while on the other side the spinners joined the silk filaments together and wound them on reels ready for spinning. Engraving by Jan van der Straet (known as Stradano), printed around 1590.

Another system involved soaking the fabric in large tanks and then hoisting it up onto poles that kept it stretched out smoothly. For less fine fabrics the operation could be carried out with cord, with the wound fabric continually dipped into the de-gumming solution.

¹⁴ A specialised laboratory controlled the whole procedure, step by step, preparing all the dosages necessary; the rest of the substances were then mixed and stored in demijohns. This mixture was then sent in large pans to the actual dyeing department. Here the dye was poured into large tanks, in which the fabrics were immersed in a continual and sequential movement, unrolled from a reel.



Machine for twisting, or «throwing», the silk filaments.

In the course of the 19th century, however, the ancient «workshop» was never totally abandoned. Here the manufacturing process continued to be organised according to the manufacturing methods of the 18th century, with the merchant-owner of the business directing the work produced by five or six looms per workshop, personally supplying the craftsmen with yarn and marketing the finished product.

served to fix the print and render it indelible. After this it was put through a «tentering machine», known in the local dialect as a *ramoeuse*, which straightened the fabric and established the final width and the size characteristics.

Another treatment was *searing*, which served to eliminate the fluffy surface nap. This was carried out with a small flame that was passed over the whole width of the fabric¹⁶. At the end of these processes, the fabric was packed very carefully¹⁷. The fabric was then wrapped, tied and labelled, ready to be stored in dry, well-aired storehouses. The contents of each storehouse were registered by the accounting offices, and finally samples were prepared for the sales representatives.

¹⁵ One way of proceeding was the ancient method of hand-printing, where a carriage holding a frame reproducing the pattern was passed by hand over the bolt of fabric, stretched out on long boards; in practice, the print was distributed with a spatula, called a *raclan*. For each colour there was a frame with a different design and every frame had to be passed over the whole length of the bolt. This was an operation that required a lot of patience and attention, but yielded excellent results.

For less fine fabrics, a special rotating cylindrical machine was used. The cylinders were engraved with the pattern and rotated in contact with others that were dipped in the dye. The fabric passed between the printing cylinder and the dye-loaded cylinder and was printed with the design.

¹⁶ Another type of treatment involved passing the fabric over a large cylinder to produce a glossy surface. Sometimes the bolts of silk were subjected, for commercial reasons, to a sizing treatment, which gave the fabric a certain rigidity. To render the silk softer, the fabric was passed between ribbed cylinders.

¹⁷ Another system of packaging was carried out using a wooden frame called a *barchetta*.