

# *Techniques and Organization of Leather Production in Poland from the 16th to the 18th Century*

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Formerly in Poland the breeding and hunting of animals was the natural source of raw material for the various sections of the leather industry. But in addition our country was situated on the crossroads of the most important land routes used by merchants who transported leather and furs from Russia to Germany and western Europe. Large herds of oxen from the Ukraine and Walachia were also driven in transit through the southern provinces of Poland. It is not possible to estimate accurately the output of the Polish leather industry due to the considerable export of raw hides, but it seems reasonable to say that, in the second half of the 16th century, the average output of the cheaper sort of leather for clothing was approximately sufficient to provide every Pole with one or even two sets of footwear, besides other leather goods. There was a drop in the consumption of leather goods during the succeeding period when farms, based on a serf system, began to grow more cereals and at the same time animal breeding suffered greatly due to the wars of the 17th century. This is reflected by the fact that during the 16th century leather shoes were worn throughout the year by the inhabitants of the more prosperous Polish provinces but wooden clogs and shoes of bast-fibre or of woven-fabric were in more common use in the 17th and 18th centuries. Thus, during the period considered here, Poland was a fairly important centre for the production of cheaper sorts of leather in central Europe.

The techniques and administration of the leather industry have not aroused as much interest among economic historians as some branches of the textile industry. It was however a typical craft, slow to adopt the system

whereby producers became dependent on commercial capital, or to evolve a manufacturing basis.

Tanning was the first of these crafts, in Poland, to abandon the guild-system and to be transformed on a manufacturing basis in the course of the 18th century. The leather industry embraced all types of tanning, beginning with the production of low-grade goods but also stretching to taw, cordovan and morocco leathers. The clothes sector also included furriers and the production of bellows, footwear, purses and bags, belts and gloves. Saddlery and production of horse-harness, will not be discussed in the present paper.<sup>1</sup>

The art of tanning was to prevent raw hides from rotting and to make them durable. By the oldest techniques they were soaked in some greasy substances or else smoked to make them hard. The tanning properties of certain plants and trees had been known since ancient times, and in Poland the procedures for the mechanical dressing of hides, by leaching in lime or ashes and tanning with powdered oak bark, had been in general use since the early Middle Ages. It is also reasonable to suppose that in the larger towns, besides the tanneries, shoemakers tanned leather for their own use. In the 14th and 15th centuries tanners' guilds were set up in the more important towns, and they produced leather not only for the local shoemakers and other craftsmen but also for sale to other home and foreign markets. The guilds sought to have the production of leather by the shoemakers prohibited. At Poznań this legal quarrel was settled in favour of the shoemakers, while in the 16th century the tanners of Cracow secured, for a period of some tens of years, the exclusive right to supply the local shoemakers with leather. In other towns, shoemakers were granted the right to tan certain grades of leather for their own use, or else to purchase them from the local tanners. In smaller towns and villages, the shoemakers' guild was far more widespread than that of the tanners and they themselves met their own demand for leather. In many of the shoemakers' guild statutes the test for a master's title called not only for skill in the making of shoes but also in the dressing of leather.

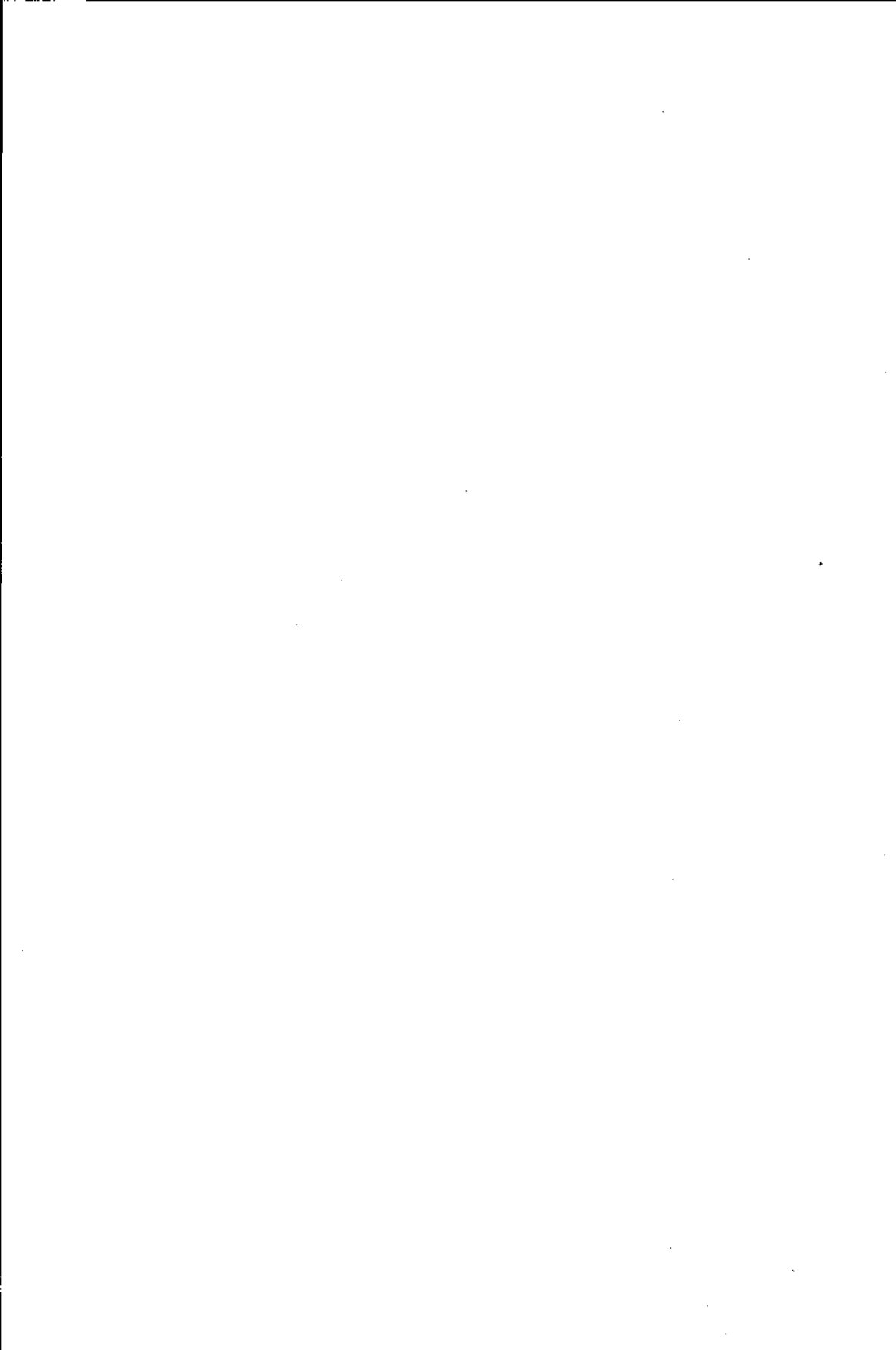
The large scale production of leather at the important centres of the tanners' guilds required mechanical improvements. There were two types of mills: that driven by water or by a horse or oxen drawn treadmill. The most common type of mill was for grinding tannins especially oak bark. Another type, with rounded stampers was used in softening, dressing and

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<sup>1</sup> The present paper is based entirely on one chapter of a book entitled *Technika i organizacja polskiego skórnictwa odzieżowego w XVI-XVIII wieku* (The techniques and administration of the Polish leather clothing industry between the 16th and the 18th century). The economic and technical data have been obtained from archival research, the examination of extant buildings and iconography, and also by reference to European manuals and encyclopaedias of technology from the 16th to the 18th century, and to the technical handbooks on tanning dating from the 19th century.



A CRACOW TANNERY in 1505 (*Codex of Baltazar Behem*).



washing the skins in the case of the production of taw and chamois leather. Both these types of mill are encountered in the more important tanning centres as far back as the 15th century, but by the 16th century they had also become indispensable to tawers producing white and red leather. They are however even found in tanneries producing the coarsest undyed leather. These mills were built with money contributed by the members of the guild, or else were leased from their owners. Occasionally, the municipal council subsidized the tanners' guild in the construction of a new mill or the reconstruction of one that had been ruined, which emphasizes the need for such mechanical equipment. Water-driven mills were most frequent, while those worked by horses or oxen were less common. The soaking and washing of the skins was also often performed at the mills, and it is worth mentioning that numerous municipal regulations prohibited the construction of such mills in the central quarters of the town because of the offensive odours diffused during the tanning processes. The larger tanneries were preferably built on the banks or rivers or canals which facilitated the transport of raw hides for the stage of the tanning process known in France as « *le travail de rivière* ». As early as the 18th century some towns issued regulations showing concern at the pollution of the air and river water by the larger tanneries. It is interesting to note this early display of concern for the protection of urban conditions of life.

The first tanning manufactures were established in Poland independently of the more important skimmers' guilds. They were used for the production of the higher grades of leather previously imported from abroad. The oldest one was established in Silesia in 1677. It produced bootleg calf leather, known as « English leather ».<sup>2</sup> A fair part of the Silesian and West Pomeranian manufactures used raw hides brought from Poland. The first tanning manufacture to be established in Warsaw dates from the beginning of the 18th century but by the second half of the century tanning manufactures had spread throughout Poland. On the whole, they were small workshops the output of which tended, however, to increase compared with that of the guild run tanneries. Some of the manufactories produced the higher grade « English » calf leather, *glacé* leather and Russian leather, together with other sorts with a finer finish. Their output exceeded that of the guilds. Part of it came in the form of the assortment of reds produced by guilds in the more important tanning centres. But beyond the introduction of some specialisation in labour and the employment of more unskilled labour, the tanning manufactures did not substantially raise the technical standard of the operations, and the tanning process was as slow when performed by the guilds. The growing number of tanning workshops was due mainly to the

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<sup>2</sup> *Historia Śląska* (History of Silesia), part III, and of the 15th century to 1763, Wrocław, 1963, pp. 214-217.

increasing demand for army footwear and belts, and to meet these demands the export of raw hides from Poland was prohibited.

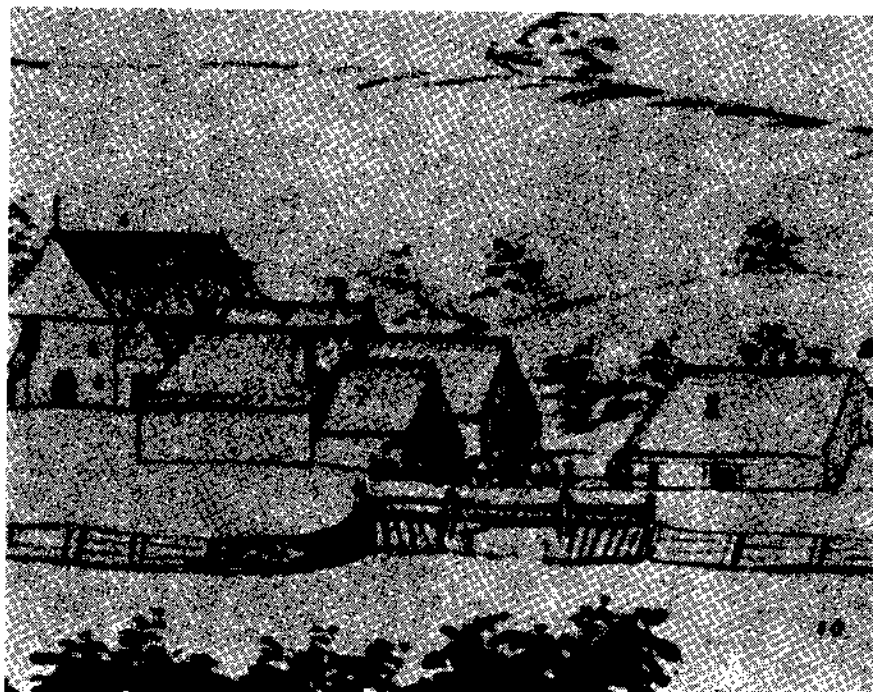
The tanning operations were carried out in rather confined spaces, while all the vats and pits for soaking and tanning the hides were situated in a barn or a yard. Thus, besides indoor space for the mechanical treatment and finishing of hides, the tanneries required many additional buildings. Hides were dried under the roof of barns or else in lofts. In the picture of a Cracow tannery in 1505, the workshop master can be seen cleaning hides in the yard, and nearby there is a vat used most likely for soaking them in lime. One of the apprentices is putting the hides into a basket while another is pumping water to wash them with. A view of Grodno in the year 1568 shows three tanners dressing hides on a river bank. The only drawing available which shows work going on in a barn is that of D. Chodowiecki, dated 1770, but here also the vats for liming and tanning are in the yard. The mill for grinding the tannins and dressing the hides would stand a little way off, and as a rule it was a small, one-roomed, building near some source of water. Among the oldest mills in Poland is the tawers's mill at Toruń, dating from the 15th century, which is shown in a picture of 1734. The workshops of the Polish tanning manufactures of the 18th century were, as a rule, lodged in rather small quarters, consisting of one or two rooms, in buildings which were hardly adapted to the requisite operations. An industrial style of architecture did appear until the 19th century. In country towns and villages the tanneries did not usually have more than one room at their disposal, and therefore made use of nearby farm buildings too. Because of the nature of work involved in tanning it was always desirable to perform it outdoors for most of the year, both in the craftsmens' shops and the smaller manufactures.

In discussing the most important technical improvements introduced in the Polish tanning industry between the 16th and the 18th century, attention should firstly be given to the essential processes involved in primitive methods of tanning. The materials used consisted largely of raw cattle and calf hides, less often horse skins, although methods for their preservation by drying or salting were also known. Great care was exercised in performing the wet work required prior to further tanning operations. The wet work consisted in the soaking of hides, loosening of the hair, liming, mechanical dressing which removed the hair, smoothed the fleshside, and sometimes split the thicker skins. The next step was to remove the lime by washing and pickling to reduce the swelling, and this was followed by maceration in enzymes, for which the excrement of hens, pigeons or dogs was used. After a warm macerating bath the action of the enzymes could be stopped by pickling the hides in an acid-salt solution and then they would be rinsed, scraped and dried. It is not possible to determine if all the above operations were used throughout Poland in primitive tanning processes. We do know, however, that the hides were washed and soaked, leached in lime, mechanic-



DANIEL CHODOWIECKI, A TANNERY (1770).

THE TOWER'S MILL AT TORUŃ, dating back to the XVth Century.  
Engraving by Steiner (1734).





ally dressed and subjected to some operations to remove the lime. The inventories of tanneries mention numerous tools for mechanical dressing, such as two-legged adjustable trestles made from half a tree-trunk. The removal of the hair and the remaining parts of flesh called for the use of sharp knives, both straight and curved, scrapers and calenders. The variously shaped knives are shown on the stamps of the tanners's guilds. At least three pits were needed for soaking the hides in lime water, and these were lined with beams or thick planks, only occasionally with stones. More than 60 cattle hides or 300 calf skins could not be placed in one pit.

The hides prepared for tanning were slimy, soft and flexible in order to be uniformly susceptible to the action of the tannins. In those days oak bark was the basic tannin, but by the 18th century the barks of spruce, birch and willow also came into use. The dried bark was ground in the mills, or powdered with hand stampers in the smaller tanneries and shoemakers' shops. The early methods of tanning recommended the addition of powdered tannin to the bath where the hides were being soaked in lye or ashes. Today the leaching is done at an earlier stage and this provides certain tanning extracts. In early times hides were also tanned in Poland by a vegetable process known as the « bestrewing » method. In preparing sole leather the skins would be soaked in a series of weakly fermenting solutions for a time ranging from four months to two years. The « immersion » method was a technical improvement on this; the hides were tanned by soaking them in a succession of vats with progressively stronger tannin extracts. The statute of the tanners' guild at Poznań limited the number of skins in one pit to 24 cow hides and 100 sheep or calf hides. This method was used mainly for the initial pickling of skins in a weak liquid in wooden vats. In the guild tanneries the hides were given no less than four baths in various concentrations of the liquid. In the manufactories the technique showed an improvement in that the number of vats and pits was probably larger and the « immersion » method was in wider use.

The finishing of the lowest grades of leather did not usually go beyond the operations of drying, stretching, smoothing and greasing. In the usually cramped spaces, their execution to a satisfactory standard was greatly hampered, particularly during bad weather. Every trace of tannin should have been removed before greasing the hides, though complete de-acidification was not absolutely necessary since the fatty emulsions removed the acid residues. The lower grades of leather were treated with tar, the tallow of cattle, and also with unguol or bone oil. Some special greasing stuffs were prepared from vegetable oil. Strong greasing agents were regarded as essential for the higher grade leathers. The cheapest sorts were left in their natural colour, only occasionally being blackened with a mixture of iron salts, soot and old beer. The leather was smoothed and stretched by beating it out on a flat table with a wooden or stone hammer. Articles made of such leather that

are still extant prove the durability of vegetable tanning, but also show the lack of concern for outward appearance which would only have been acquired by a more painstaking finishing process. It is also interesting to note the great and widespread demand for footwear and other goods made of cattle or sheep leather and produced « en masse » by tanners and shoemakers in towns and villages. The leather used was sound and flexible but differed distinctly in colour from the goods produced at the more important centres of leather production or from those imported from abroad. The Polish saying « Bootlegs make the man » shows the difference between the wearer of grey or simply blackened boots and the owner of coloured footwear.

The red-leather tanners stood at the top of the craft. Their methods of preparing the hides for tanning were very much the same but they showed more concern with the quality of the raw material. Also their tanning operations were performed with greater care, using at least six pits with progressively stronger liquids. The inferior sorts of bark were used only in the first soaking, only the best oak bark being used thereafter. As far back as the 18th century, quebracho bark with a 23 per cent tannin content was used in some guild workshops for the final solution. This was one of the highest quality tannins and was brought from South America. From the 16th century the highest grades of ox hide were additionally tanned in herbs. These were probably gallnuts (an outgrowth found on oak trees) sumach and bilberry leaves. The wide assortment of red-leather goods also included small quantities of Russian leather, that is hides of young oxen tanned in oak bark to a light yellow-green colour. Most probably, the Hungarian fashion of treating the hides, commonly used in France at the beginning of the 18th century under the name of « *Hongroyeur* », was also known in Poland. By this method the larger-sized cow hides were treated in alum and greased at high temperatures. The better finishes called for a wider assortment of tools, such as variously shaped knives, scrapers, files and hammers. Metal punches or stampers were also used to perforate, emboss or make other designs on leather in the finishing process.

The most important operation was that of dyeing the leather. The standard Polish techniques in the dyeing process may be compared with those given in Rosetti's *Plictho* which was published in Venice in 1547 or 1548. S. M. Edelstein and H. C. Borghetty, historians of the art of tanning, have analysed the chemical recipes given in this manual with reference to a Bolognese manuscript of the 15th century and other technical hand-books from the 16th century. The *Plictho* recipes for blacks, greys and browns recommend treatment with gallnuts followed by the application of iron salts or sulphates, that is by a method then already widely used both in Poland and Germany. The Italian recipes for other colours, however, recommend more vegetable dyestuffs than were in common use for dyeing leather anywhere in Central Europe. Redwood, called brazil, indigo, sumach and curcuma are



A drawing extant on the register of the Cordovan artisans' guild in Cracow shows the most important tannins and tools: the bush of a tanning herb, a currycomb, a brush, a smoothing wheel and two crossed knife scrapers. Manuscript No. 1219 in the Library of the Polish Academy of Sciences, Cracow.



mentioned, and represent the standard dyestuffs used in Italy, the adoption of which was partly due to the influence of the Near East.<sup>3</sup> The Polish tawers' guilds of the 16th century used a more primitive blackening substance made of iron and soot. The higher grades of leather were treated in an extract of capeche wood of American origin, sometimes referred to as Blauholz. Sour beer with bits of scrap iron were mixed with the capeche extract and rubbed into the upper side of the hide with a brush. The reds were dyed with brazilwood imported from South America. The inferior grades of leather were dyed with iron minium, brownish-red mineral dyestuffs or vermilion-coloured lead minium mixed with oil and brushed into the upper side of the skin. Other skins were bleached by discolouring or dyeing them a yellow or rusty colour with birch and then sumach barks which were added in the final dubbing. No mention has, however, been found of American or Indian yellow wood (Gelbholz) being used for these colours, although it is known to have been brought to Poland in the 18th century for dyeing textiles.<sup>4</sup> As early as the 16th century the Italian book of formulae for dyeing leather gave preference to vegetable dyestuffs while in Poland the more primitive and less resistant mineral dyeing substances were still used. It does not seem, however, that the art of dyeing in Poland was then below the average European standard, and this may have been due to contacts with the highly skilled tanners of the Near East.

During the tawing and chamois-making processes, the hides were tanned in the fats of sea animals, preferably in codliver oil or seal oil, but also in whale, herring or shark oils. The fat of land animals was used only as an auxiliary in greasing hides tanned with vegetable substance or in alum. Oil tanning is the most suitable way of treating the hides of deer, stags or elks which have exceptionally thick and pliable fibre. The skins of goats and sheep, together with calf skins and split skins of higher grade ox hide may also be treated by this method. The tawers experienced certain difficulties in securing continuous and sufficient supplies of the skins of wild animals and of fish fats. Liming had to be more thorough than in the simpler tanning processes because it was necessary to loosen the skin fibre more thoroughly. The mechanical dressing which consisted in the removal of the thick hair or wool, followed by crumpling and stretching, also presented more difficulty. The tawing and oil-tanning (chamois) methods had to be repeated until the hides acquired the degree of flaccidity and pliability required in making clothes and clothing accessories. The treatment of these hides in fulleries or in taw mills considerably increased their flexibility and receptiveness to

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<sup>3</sup> S. M. EDELSTEIN, H. C. BORGHETTY, *Dyeing and tanning leather in the sixteenth century*, in « Actes du XI<sup>e</sup> Congrès International d'Histoire des Sciences, Varsovie-Cracovie 24-31 août 1965 », VI, Wrocław 1968, pp. 65-70.

<sup>4</sup> E. KOWECKA, *Farbiarstwo tekstylne na ziemiach polskich* (The art of textile dyeing in Poland, 1750-1870), Wrocław 1963, p. 164.

greasing. The taw mills were equipped with a number of rounded stampers. It is possible to estimate the output capacity of a taw mill in Cracow, between 1790 and 1807, on the basis of bills issued for the fulling of skins. The yearly output may have ranged from twelve to over twenty two thousand small skins, the number of the larger cattle skins being unimportant. This yield may be regarded as fairly high and as being dependent on the amount of raw material available.<sup>5</sup> Lactic acid, and potassium carbonate (wine stone), were mentioned in every shop inventory, and were used for removing the lime. It is not possible to determine whether all the hides were subjected to the preliminary treatment in alum. The essential difference between the tawing and the chamois process was that in the former the upper side was dressed while in the latter the flesh-side of the hide was tanned and dyed. The yolk of eggs was also used in more advanced tawing operations.<sup>6</sup> The oil-tanning itself was performed in a fullery, where the skins were warmed and piled up so as more readily to absorb the grease. In the absence of a taw mill, hand-worked fulleries were used, resembling those employed in the preparation of textiles. There was a stamping trough and a thick, grooved, hand-worked plank or beam acting as a stamper. The oil-tanned skins were dried in the shade, both outdoors and indoors. After that the hides dressed for chamois leather were sometimes dyed, while the taw leather had the upper side polished.

Cordwaining in Poland did not only involve the manufacture of goat-skin for upholstery leather. Coloured goat, sheep, and calf leather was in great demand as material for footwear, clothes and clothing accessories. This new craftsmanship developed in Poland during the 16th century to satisfy the fashion for coloured men's shoes which had been adopted from the Near East, and that for black shoes commonly worn in Spain, but also elsewhere, by the clergy. The preliminary tanning processes in the manufacture of cordovan, liming and mechanical finishing, were very much the same as in the preparation of the lower grades. The differences consisted however in herb-tanning and in the final dressing. The tanning was done by soaking the skins in extracts of gallnuts, *Rhuspellium* herb and sumach. A drawing which has survived in the register of the Cordovan artisans' guild in Cracow shows the most important tannins and tools used: they were oakwood, the bush of a tanning herb, a currycomb, a brush, a smoothing wheel and two crossed knife scrapers.<sup>7</sup> The choice of tannin for the preliminary preparation of cordovan leather depended on the colour to be acquired. Thus, gallnuts were used to obtain dark and black colour, while sumach gave yellowish-greenish shades. The leather so prepared was then coloured in mineral dye-

<sup>5</sup> *The National Voievodship Archives in Cracow, Acta deposita* No. 223, 224, 233.

<sup>6</sup> S. M. EDELSTEIN, H. C. BORGHETTY, *op. cit.*, p. 66, mention analogous methods of tawing in Italy in the 16th century.

<sup>7</sup> *Manuscript No. 1219* in the Library of the Polish Academy of Sciences, Cracow.

stuffs, such as verdigris or basic copper carbonate for the greens, « Berliner Blau » for the blues, and the vermilion colouring cinnabar, that is mercury sulphide and its most important ore for the reds. The extant relics and the information available on the dyestuffs used suggest that, by means of mineral dyestuffs being rubbed into the upper side of the hide, Polish cordovan leather acquired sufficiently bright red blue and green shades. White cordovans were obtained by tanning in sumach extracts with additional bleaching. The gilding and painting techniques used for upholstery cordovans were also known in Poland.

The art of producing morocco leather was much less common in Poland than that of making cordovans, and so the highest grades of morocco shoe leather were brought from Turkey, Lithuania and Suczawa in Bucovina. The morocco leathers were prepared with the best quality goat skins and were dyed yellow, red, white, brown, green, less often blue or black. By the end of the 16th century guilds of morocco leather artisans had been set up in many towns of eastern and southern Poland, possibly because of the fashion for the oriental style of footwear and harness. The dressing of morocco leather consisted in using sumach extracts and dyeing with substances brought chiefly from the Near East. In the 18th century the production of both cordovan and morocco leather was considerably reduced due to the drop in the demand for coloured leather.

Between the 16th and the 18th century, the techniques and organization of the Polish tanneries producing leather for clothing did not differ much from the average standards obtaining in central Europe. The production « *en masse* » of the most common shoe leathers was not free from defects in the dressing methods, but it satisfied the need for footwear and clothing of the majority of the population. All the standard tanning techniques for the production of every day articles and for luxury goods in cordovan and morocco leathers were known and applied in the guild workshops of the more important leather producing towns. Mills used for grinding tannins or assisting in the dressing of leather had been known since the 15th century, and the technical standards of Polish tanning gradually improved thanks to the fact that Poland lay at a meeting point for the knowledge of the techniques used in western Europe, Italy and Spain, and of those employed in the Near East, in Russia and in Hungary.

