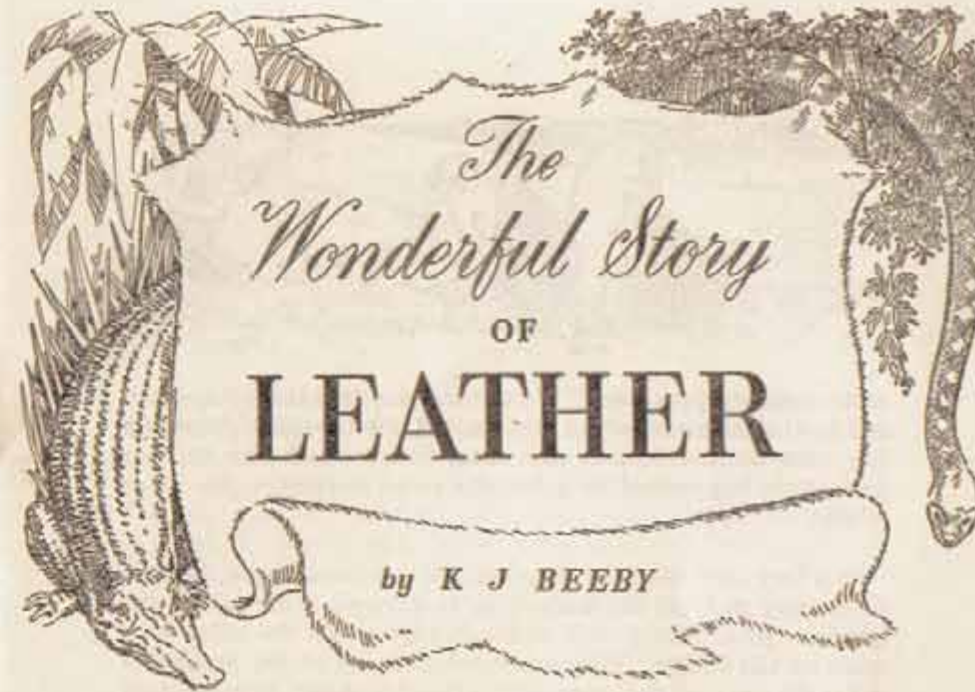


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No living man, nor any of the books in all the world's libraries, can tell us exactly when leather was first used, but we know that it was long, long ago, ages before man had learned to read and write, or even to talk properly. So, like a fairy tale, our story must begin, "Once upon a time . . ." and we can only guess when that time was. But perhaps we should be quite near the truth if we said that the primitive men who lived during the Ice Age, 500,000 years ago, were the first human beings to use the skins of animals to protect their bodies against the cold winds and the rain. We should not be guessing wildly if we said this, because in the last seventy years archaeologists have been digging into the ground in many parts of the earth in search of traces of early man, and they have found flint scrapers, dating back to the Ice Age, which may have been used to scrape the flesh off animal skins.

These primitive ancestors of ours hunted the beasts of the forest and killed them for food, and when they had eaten all the meat of an animal they would clean the skin by scraping it and sling it around their shoulders to serve as a crude overcoat. To protect their bare feet against rocks and thorns, they invented footwear, but if we were to see a man wearing their kind of shoes to-day we should laugh



at his strange appearance. We can imagine that these first shoes consisted of pieces of animal skin, slashed into the rough shape of a bag, into which primitive man thrust his foot and then tied the neck of the bag around his ankle with forest creepers or thin strips of skin.

In a very short time the skins decayed and rotted away, because these early men did not know how to preserve them, but as the centuries passed ways were discovered by which the skins were made to last longer. They were stretched out on the ground to dry in the sun until they were stiff and hard, and then, to make them soft and suitable to wear, the brains of animals were rubbed into the pores of the skin. You may wonder why animals' brains were used for this purpose, and the reason was that brains contain a lot of fatty substance which oiled the skins and made them supple. But even this treatment did not convert the skins into true leather. Many generations of ancient men came and went before the art of tanning was discovered.

Like many important discoveries, tanning was probably stumbled upon by accident. Although our early ancestors did not know it, the parts of some trees contain tannin or tannic acid which will convert raw hides and skins into leather, and it is easy to believe that a hide or a skin was left lying in a puddle which contained leaves, seed pods, bark and pieces of wood, and so the hide or skin became leather by pure chance.

As the years went by, men grew more experienced in leather-making and found that they could use leather for many purposes besides footwear and clothing. A great discovery was that water would keep fresh and cool in a leather bag, and this knowledge enabled tribes to wander away from a spring or river bank, carrying their water supply with them. They made their tents of leather, and also used leather for beds, carpets, armour and harness-making.



Leather-making was an important trade among the ancient Egyptians, who made leather sandals, belts, bags, shields, harness, cushions and chair seats. Often they carried their mummies to burial under a pall or canopy of soft leather, dyed a delicate blue. The Israelites learnt the art of tanning from the Egyptians and although the word leather occurs in the Bible only twice, there are many references to skins, which clearly mean leather. In Genesis, chapter 3, verse 21, we read: "Unto Adam also and to his wife did the Lord God make coats of skins, and clothed them." When Jesus spoke of putting wine into new bottles, He meant skins.

A knowledge of leather-making spread to many parts of the world. Marco Polo, the famous thirteenth-century Venetian traveller, tells us that the war tents of Kublai Khan, the powerful Moghul emperor, were of leather made from the skins of lions, streaked white, black and red, and so well joined together that neither wind nor rain could penetrate. Kublai Khan's soldiers wore armour made of the thick hides of buffaloes and other beasts and the great Khan himself went into battle at his station in a large wooden castle, borne upon the backs of four elephants whose bodies were protected with coverings of thick leather.

The Greeks and the Romans used leather to make many different styles of sandals and boots and shoes, and when the Romans invaded Britain the soldiers wore leather armour and leather caps. The Britons who met the invading Roman legion also wore leather armour, for even at that time leather-making was an important trade in Britain.

In this country at that time the main material used in tanning was the bark of oak trees, which contains quite a lot of tannic acid. Even to-day oak bark tanning is carried on at several tanneries in Britain which produce very fine leather for the soles of footwear and for best-quality riding boots, hand-made shoes and for use in



artificial limbs and surgical boots. Of course, to-day the oak bark tanner operates in a modern building with the aid of up-to-date mechanical devices and scientific knowledge, but the basic oak bark tanning process is much the same as it was in early times.

The most common practice was first to clean the hides by washing them in water, after which they were put into lime-water to soak for several days. The purpose of this was to make it easy to scrape off all the hairs, and a curious thing was that the lime used must have been used before for other skins, otherwise it would not do its work. Until recent times, it was believed that the lime loosened the roots of the hairs by a chemical action, but modern scientists have discovered that this is not the case. We now know that the used lime, owing to its contact with former skins, is full of bacteria, the tiny creatures we can see only through a powerful microscope, and these bacteria find their way to the roots of the hairs and destroy them, making it very easy for the hairs to be removed.

After being thoroughly soaked in lime-water, the hides would be taken out and the hair and flesh scraped off by men using long, blunted knives. Then came a second washing in water, after which the hides were immersed in pits containing water and oak bark, pounded into a pulp. This mixture is known as a tanning "liquor." These liquors were, and are, made and used in several different "strengths."

In countries where the oak tree did not grow, other vegetable tanning materials were used, such as sumach leaves and gall. The soaking of hides went on for months and, if they were very thick, for as long as two years. To make certain that the hides were properly tanned right through they were first put into pits containing weak, used-up liquors and then passed gradually to stronger liquors. Had they been put into fresh, strong liquors at



the beginning the outsides of the hides would have become tanned before the middle parts, just as a cake baked too quickly would be done on the outside and underdone inside.

When the hides were thoroughly tanned they were hauled out of the pits and allowed to dry. Then they were given a good stretching, followed by a pummeling with oil and tallow to make them pliable. Finally, they were dried in the open air.

During the Middle Ages the members of various trades in Britain organised themselves into guilds and the leather-workers were among the first to do so. Their guild was called the Saddlers and Skinners. Later, guilds were formed by the Tanners, Glovers, Pursers, Girdlers, Cordwainers and Curriers, and during the time Sir Richard (Dick) Whittington was Lord Mayor of London some of these guilds had joined together to form the Leathersellers. The guilds were powerful and imposed strict rules on apprentices and members to ensure the quality of craftsmanship. They could stop any undesirable person joining their trade and could punish bad workers and destroy faulty goods when they found them. The Leathersellers would not allow any goods to be sold after dark, because the poor artificial light of those days made it impossible for customers to inspect the goods properly.

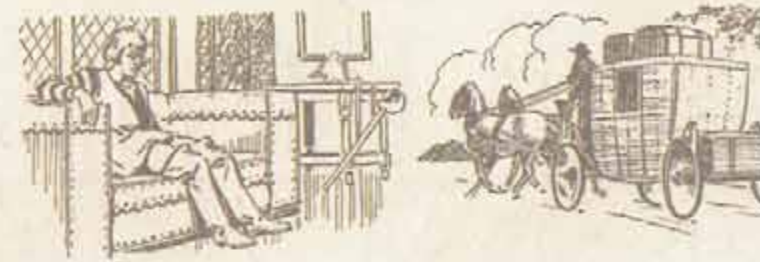
We can see that by this time the leather trade was growing into an important industry, composed of various sections, and we can understand why the divisions developed when we realise that different kinds of leather were needed for the uppers and soles of shoes, furniture upholstery and clothing, etc. One section of the trade would make stout, tough leather for soles, whilst another would produce soft, stretchy leather for gloves, and so forth. To-day, the leather industry is divided up in a similar fashion. Some tanneries specialise in making leather for the uppers of shoes, while others make sole leather or gloving leather, or leather for use in industry in the form



of transmission belting, washers and packings and many other essential articles. Then, of course, there are tanneries which produce leather for motor car and furniture upholstery, harness-making, and for use in bags and suitcases of all kinds.

We have mentioned the Guild of Cordwainers, and it is interesting to know that this Guild derives its name from Cordova in Spain, where a special kind of leather called cordovan was developed by the Moors. This leather was made from goat and kid skins and its peculiarity was that it was dressed with alum and salt, a mineral tannage which produced a soft leather, white in colour. It was often dyed and finished in brilliant colours, and sometimes decorated with gold and silver. Cordovan was used to make beautiful hangings and upholstery. In the Middle Ages it was also used in the making of shoes, and what extraordinary shoes some of them were! One style of fashion demanded long pointed toes which extended a foot beyond the toes, and the points were held up by thin chains fastened to the wearer's waist. Sometimes the points were fastened up to the knees with tassels and bells. These shoes were called "cracowes," after Cracow in Poland, from which place the fashion came, but many people called them "devil's claws" and they were forbidden by law because they became a nuisance.

Before the invention of paper and printing, a kind of leather known as parchment was used for writing on, and even for the pages of books. In the Middle Ages almost all of the books were produced by monks, and the leather parchment they used was generally made of sheep skin which was washed, scraped clean, and stretched until it reached a stage when it would not decay. The monks lettered and illustrated their books by hand, and the pages were beautifully decorated, or as we say, "illuminated," with silver and gold and many striking colours. They were bound with fine leather, often handsomely tooled and studded with jewels.

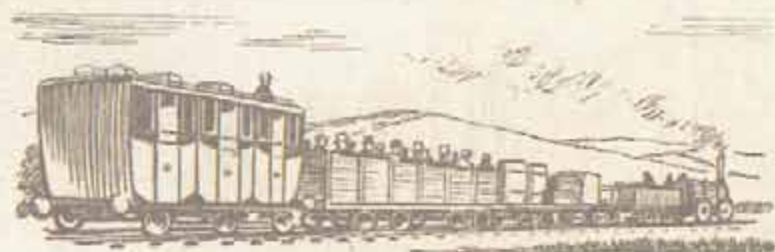


When brave men journeyed forth from these shores to explore the world beyond the seas, they steered their courses by the aid of charts, drawn upon parchments which were often the shape of the original skins from which they were made. Leather plays a very important part in travel to-day just as it did in olden times. When the stage-coach appeared on the roads of Britain it had leather seats, a leather-covered framework, leather suspension straps and, of course, leather harness for the horses. The records show that by 1634 there were 6,000 coaches on the streets of London. The travellers carried their belongings with them in leather trunks, and all kinds of small leather cases were used to protect such articles as knives and forks, medical equipment, coin scales, wine bottles and musical instruments.

In Cromwell's time, heavily built, square-shaped chairs and settees were upholstered in leather and after the Restoration leather wall panelling became fashionable in the great houses. The walls must have looked very beautiful because the leather panels were silvered, gold varnished, embossed and painted. There seemed to be no end to the uses of leather.

After the terrible Fire of London insurance companies were founded and they gave their attention to fire-fighting equipment. Leather fire buckets were made and in 1670 a fire engine was invented which had a leather hosepipe. Galileo, the famous Italian astronomer, invented his new telescope, and Hooke, about 1665, developed the compound microscope into a useful instrument. There was a demand for these instruments and in the absence of suitable metal tubes the outer tubes were often made of leather and the inside tubes of green vellum, which is made from calfskins.

The coming of the railways in the period of the Industrial Revolution encouraged all classes of people to travel and led to an increased demand for leather luggage—trunks, portmanteaux, gladstone bags, and all kinds of leather cases. It is easy to see that



less leather was needed for horse-drawn coaches as rail travel grew popular, but this did not mean less work for the leather-workers because leather was required in great quantities, not only for luggage but also for use in the railway trains. Leather upholstery and window straps were used in the carriages. As carriage design developed the water hoses and corridor screens were made of leather.

In this era of mechanical progress, machinery needed to be driven and the leather industry provided the belting necessary. Early machinery was largely made of wood, and leather was used for hinges. Arkwright's water power driven spinning frame of 1769 employed leather-covered rollers. In the leather industry itself, new knowledge was gained which enabled tanners to produce a great variety of leathers of a higher quality than ever before. Sir Humphrey Davy, who invented the miner's safety lamp, experimented with various kinds of vegetable tanning materials and his work yielded a lot of new and useful information. Many kinds of vegetable tanning materials were used, including the bark of hemlock and mimosa; the wood of the chestnut tree and quebracho—a South American tree; valonia, which is the cup of an acorn which comes from South East Europe and Asia Minor; myrabolams—the unripe, prune-like fruit of an Indian tree; and other vegetable substances, all containing tannic acid. Each of these materials possesses special merits which enable different kinds of leather to be made.

For thousands of years men had known how to tan leather with alum salts, that is a mineral tannage, and it was believed—quite rightly—that the salts of other metals besides aluminium could be used to make leather. Iron salts were tried, but these were not very successful. However, the experimenters were undaunted, and finally in the nineteenth century, an American chemist named Augustus Schultz developed a chrome-tanned leather, so called because the salts of the metal chromium were used in the tanning process. Schultz's chrome leather was stiff, hard and coloured blue, but



it was very resistant to water and could be made more quickly than other types of leather. How could it be made soft and pliable? The answer was supplied by a young Philadelphian tanner named Robert Foerderer who learned how to treat the hard chrome leather with soap and oil so that it became supple.

We can see the importance of chrome tanned leather when we realise that most of the uppers of shoes worn to-day are made of fully chrome tanned leather or semi-chrome, which means partly vegetable and partly chrome tanned leather. Our modern shoe factories at Northampton, Leicester, Bristol, Norwich, Kettering, and other centres, produce about 140,000,000 pairs of shoes each year to keep our population healthily shod, and an enormous quantity of leather is needed for this purpose. The soles of footwear are generally made of vegetable tanned ox hide, which produces a hard-wearing, flexible platform on which durable and sturdy shoes are made. The uppers of our shoes are generally made of calf, kid, kip or cattle hide, while the linings are made from kips, goat or sheepskin.

We begin to wonder why it is that in this modern scientific world of ours, with all the new materials we hear about, leather is still the most suitable material for making footwear, just as it was when our story began 500,000 years ago. The reason is to be found in the remarkable structure of leather which is made up of millions of tiny string-like fibrils, each finer than a hair. These fibrils may be several inches long, but they are very fine, so fine that it would take 5,000 of them, placed side by side, to span an inch. These fibrils are grouped together into coarser units called fibres—from 20 to 30 fibrils make one fibre—and the fibres, in turn, are grouped together into fibre bundles, from 10 to 20 fibres making one bundle. If we were to look at leather under a powerful microscope we should see that the fibre bundles are woven together in an intricate pattern, weaving this way and that, up and down, and we



would observe that between the fibres there are tiny channels or passages; these are filled with air.

Now, let us hear what the men of science have to tell us about this amazing structure of leather which is so important in boots and shoes. They tell us that this fibre structure makes leather the most healthy and comfortable material for footwear because it enables our feet to get rid of perspiration.

Do you know that your feet, and the rest of your body, are continually giving off moisture through the pores of the skin? For our health's sake it is essential that this unwanted perspiration should escape. This is a simple matter where our legs, arms, head, shoulders and trunk are concerned, because on these parts we wear loose clothing which allows the moisture to get away. But it is different where our feet are concerned; *they* have to be encased in footwear for the greater part of each day and for that reason it is important that our boots and shoes should be made of a material which does not act as a trap for perspiration.

Leather is the only footwear material which allows the perspiration to escape. The moisture from our feet, in the form of water vapour, finds its way into the channels between the fibres and travels through the leather until it reaches the outside, where it evaporates. A simple way of understanding this is to picture the wick of a cigarette lighter absorbing petrol vapour from the body of the lighter. The petrol vapour travels up the wick and escapes out of the end of the wick ready for the spark to set it alight. In a similar way, the perspiration leaves our feet and escapes from our shoes through the leather.

You will see from this that Nature has given us a material which ventilates our feet when we make it up into footwear, just as it "ventilated" the animal whose skin it once was. But leather does even more than this to keep our feet healthy and comfortable. Leather soles keep our feet warmer in winter and cooler in summer.

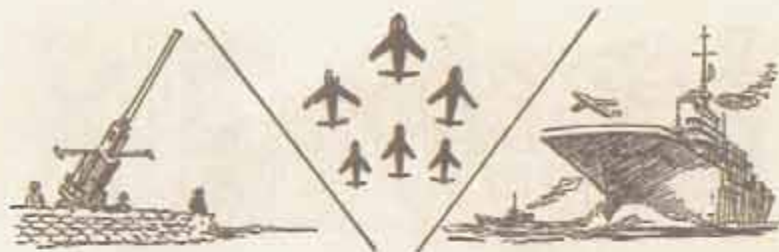


Here is the explanation: When the weather is cold and damp, just when our feet need warmth to keep them comfortable, foot perspiration, in the form of water vapour, is absorbed in the all-leather shoe and comes to rest inside the fibre structure of leather, and gives off heat which warms our shoes. On warm, dry days exactly the opposite happens. The water vapour passes straight through the leather and evaporates from the outside of the sole. This cools the leather. Can you imagine a more perfect arrangement?

Leather soles also protect our feet against hot and cold pavements. In summer, when the sun is shining brightly, the streets and pavements get very hot and leather soles keep this heat away from the sensitive palms of our feet more effectively than any other soling material. In winter, when there is ice and snow underfoot, leather soles stop the cold from striking through to chill our feet.

Why is it, we may wonder, that leather soles act as barriers against heat and cold? Again, the answer is found in the natural properties of leather bestowed by its unique, unmatched structure. The fibres of leather have spaces between them which are filled with air. This air clings to the surfaces of the fibres and is held stationary. Now, still air is a poor conductor. Neither heat nor cold can strike through this barrier of still air to overheat or chill our feet. Thus, in addition to being the only truly healthy material to walk on from the vital foot-health point of view, leather shields and protects the feet from climatic extremes.

The wonderful fibre structure of leather is a gift of Nature and all the efforts of the men of science to copy it in man-made fibres have ended in failure. It is true that new fibrous materials, such as nylon, have been made by clever men, but their efforts pale before the work of the master hand of Nature as seen in the fibres of leather.



We have seen that leather has been used throughout man's history for very many useful and essential purposes, and when we look around us and notice how many different uses there are for leather in the atomic and jet age in which we live, we are brought to realise that leather is a timeless material, in the sense that it is just as necessary in our lives to-day as it was in the lives of our early ancestors.

Many of the sports and games, which help to keep us healthy and alert, need leather equipment—footballs, cricket balls, boxing gloves, punch balls, saddlery for horse riding, to name just a few. Then there are beautiful leather articles such as handbags, gloves, belts and cases of many kinds.

But these leather articles we have mentioned are but a few of the thousand and one useful ways in which leather serves the needs of the nation. If you are very observant you might be able to make a list of perhaps 100 different leather things, but your list would be far from complete. For example, you would not know that in a modern battleship there are more than 2,500 leather packings used in the main armament machinery and in the steering gear controls.

Leather plays a very important part in the equipment of the R.A.F. and the Army as well as the Royal Navy. It is used in almost every industry in Britain to keep the wheels turning, or in the equipment of the workmen, and even the machines themselves often have important parts made of leather. In the textile industry the wool factories depend on leather in every department to do special jobs which no other material will do nearly as well as will leather. Walrus hides, made into leather as much as 1½ inches thick, are used by metal workers for the polishing and buffing machines which put a shiny finish on metal articles.

Many different kinds of hides and skins are made into leather



and the tanner chooses his raw material according to the kind of leather he needs to make. For example, the maker of sole leather uses a hide that will produce a thick, tough, hard-wearing type of leather and the most suitable hide for this purpose is that of the ox. Ox-hide is also used, among other things, to make tough leather for footballs. Calf, kid and cattle hide are used to make upper leather for footwear, and calf is also made into handbags, travel bags and wallets.

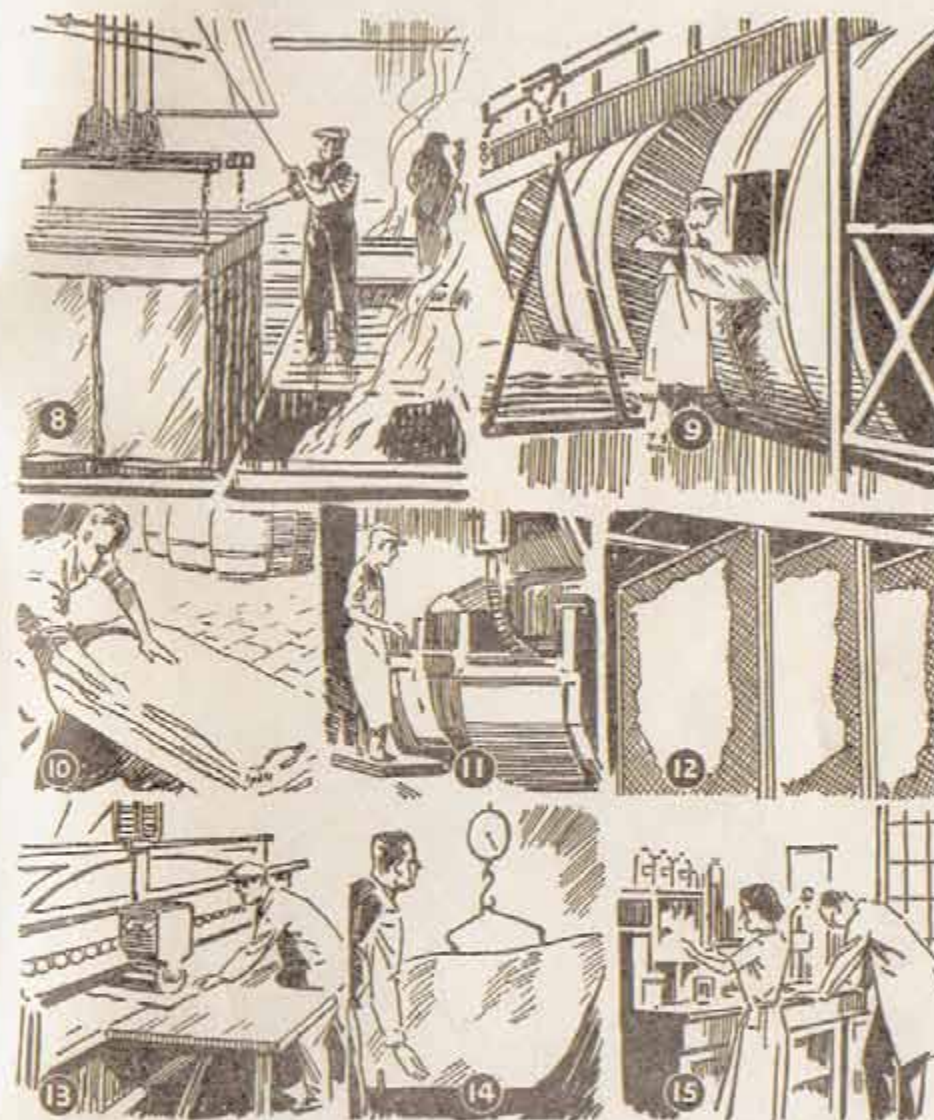
Sheep are a very important source of leather: the sheepskin leather industry produces a wide variety of leathers for many purposes, including lovely, soft leather for ladies' clothes, linings for shoes, woolskin rugs, chamois leathers and sheepskin skivers (the grain split of the skin) for bookbindings and many other very useful purposes.

Cow hides produce beautiful upholstery leather for motor-cars and furniture and pigskin is used to make suitcases, saddles, and a host of fancy leather articles. Antelope leather is made into beautiful trimmings for ladies' clothes, and reptile leather from snakes, crocodiles, alligators and lizards finds its way into the fancy goods trade where it is put to a great number of uses, including the making of dressing cases, the backs of toilet articles such as hairbrushes, and for handbags, wallets and shoes.

It would take many volumes to tell the full story of how leather is used in the life of our nation, but we have learned enough to make us realise that our modern life could not go on without this wonderful material. Although we have reached the end of our little book, the wonderful story of leather will continue to be lived out in our lifetime and in the future beyond.



- 1 Inspecting raw skins
- 2 Liming Pits
- 3 Removing hair by machine
- 4 Cutting off flesh
- 5 Scudding: cleaning the grain side of a hide with a blunt knife
- 6 Rounding: cutting off shoulders and bellies; only the best of the hide is made into sole leather
- 7 Splitting a hide or skin by machine



- 8 Tanning hides in pits
- 9 Tanning hides in drums
- 10 Cutting a butt into two bends
- 11 Dyeing shoe upper leather
- 12 Stretching and drying
- 13 Rolling sole leather
- 14 Weighing a butt
- 15 Scientists at work

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