

FLAYING AND CURING OF HIDES AND SKINS

as a rural industry



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AS A RURAL INDUSTRY

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FOREWORD

Correct methods of flaying and curing are basic to the production of good-quality leather. These processes are described and illustrated in this paper, which is one of a number, issued in the FAO Agricultural Development Paper series, which deal with rural industries and the processing of agricultural products.

The latter are intended primarily for leaders responsible for guiding the development of agriculture, particularly in countries where the science of agriculture is not highly developed. It is hoped however that, in addition to the rural leader, the material in this paper can be made available to the rural craftsman, through the various appropriate extension services in FAO Member Countries.

Slaughterhouses play a very important role in any improvement scheme for hides and skins. This phase of the problem, however, is only touched upon here. In rural areas, from which many hides and skins originate, improvement does not depend upon costly slaughterhouses and equipment. Good slaughterhouses, and also portable ones, suitable for rural areas, can be erected at very little cost. When improvement in the flaying and curing of hides and skins takes place in an area, other related industries, such as tanning, manufacture of leather goods, and the manufacture, in local workshops and by blacksmiths, of tools and equipment for the tanning and related industries, may well undergo collateral development; the benefits of a hides and skins improvement scheme may thus be far-reaching.

Methods and processes, tools and implements, are described in this paper in broad outline only, with the object of showing how improvements can be made step by step.

Research is still continuing and, undoubtedly, other methods will become applicable in the future. However, the methods and processes mentioned in this paper have been proved and have been used with advantage in regions where subtropical and tropical climatic condi-

tions prevail. Should more detailed information be requested, it will be made available by FAO as a service to its Member Countries.

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INTRODUCTION

Leather in a primitive form was probably one of the first things manufactured by man, and in early times skins were used for many purposes. Today, leather still plays a basic part in everyday life, and hides and skins, the raw materials of the tanning industry, are therefore important commodities in world trade.

Most of the hides and skins entering world trade are the by-products of animal slaughterings for food purposes in large abattoirs and meat canning factories. Practically all other by-products in this industry are also used in manufacturing processes. In rural areas, however, the lack of slaughterhouses and of capital and skilled labor prevents full use being made of such by-products; nevertheless, the most important of these, viz. hides and skins, can very easily be salvaged if some relatively simple and economical procedures are followed.

With improved techniques, easily applicable in rural areas and not at all costly, this valuable raw material can contribute significantly to the economic and social development of these areas. Although exact figures are not available, conservative estimates indicate that the total losses caused by avoidable damage to hides and skins in the course of curing amount to millions of dollars a year throughout the world.

The data in Table 1 show how unsuitable methods of drying result in high financial loss, potential price being almost double that obtainable when the less suitable method is used.

Flaying and curing of hides and skins in subtropical and tropical regions should follow principles essentially similar to those applicable in temperate climates, but practical details have to be modified according to the climate and the social acceptability of the methods.

Flaying is the process whereby the hides of the larger animals such as cattle or camels, or the skins of the smaller animals, such as calves, goats or sheep, are removed from the carcass. The object is to ensure that the hide or skin is undamaged (above all is free from gouges and cuts made by the flaying knife), is ripped in a well proven practical way, and is safeguarded against contamination by blood or dung.

TABLE 1. - PRICES IN KENYA OF HIDES AND SKINS CURED BY TWO DIFFERENT METHODS

Type of hide or skin	Method of curing	
	Suspension dried	Ground dried
 Shillings and cents*	
<i>Cattle hides</i>		
Firsts	2.10 per lb.	1.20 per lb.
Seconds	1.70 " "	1.00 " "
Thirds	1.20 " "	0.80 " "
Fourths	0.90 " "	0.60 " "
<i>Goat skins</i>		
Firsts	5.50 each	2.50 each
Seconds	4.00 "	2.00 "
Thirds	2.25 "	1.50 "
Fourths	0.50 "	0.50 "
<i>Sheep skins</i>		
Firsts	2.50 each	1.50 each
Seconds	2.00 "	1.00 "
Thirds	1.50 "	0.50 "
Fourths	0.30 "	0.30 "

* 1 shilling = 100 cents.

The most appropriate method of flaying animal carcasses is of course generally adopted in modern abattoirs, where every facility is available for proper supervision, inspection and handling of the meat and all the by-products.

It should be clearly understood, however, by those who are interested in improving the facilities and conditions in slaughterhouses, so that hides of better quality can be produced, that the modern method of elevating the carcass was introduced primarily for mass production of meat and for hygienic reasons. This method, coupled with the introduction of suitable equipment and tools, resulted in better flaying. However, the curing of hides and skins by air drying or dry salting (the impregnating of freshly flayed hides and skins with common commercial salt to retard putrefaction by bacterial action), has to be modified according to climatic conditions. This may or may not be applied in temperate or cold climates.

PRODUCTION OF HIDES

The distinction between “hides” and “skins” is one of size and thickness, the larger and heavier skins being termed “hides,” while the smaller and lighter ones are called “skins.” The term “hide” refers to the skin of large animals, such as the cow, horse, buffalo and camel.

Killing (Slaughter)

In many countries it is frequently impossible to change slaughtering methods, since they are either part of a religious rite, such as the Islamic or the similar Rabbinic method of severing the trachea or windpipe and main blood vessels, or are established by custom for other reasons. On the other hand, a humane killer, for example the captive bolt, should be used whenever possible. (See page 101 below, “Hide Trade Equipment and its Use.”) Whichever method is used it should, of course, ensure that the animal is killed quickly. In some countries stunning by electrocution prior to severing the trachea or, in the case of small animals, cutting off the entire head, has been found a good substitute for the humane killer method.

Fatigued animals, especially animals which have recently completed a long trek, either by foot or rail, must not be slaughtered until completely recovered, otherwise the flesh would be overheated, resulting in incomplete bleeding and consequently poorer meat and hide keeping qualities. Also, the hide is more difficult to remove. Animals should have free access to drinking water for at least 24 hours before slaughter, with little or no food.

An abattoir should be available whenever possible, and a hide drying and salt-curing shed should be conveniently located nearby.

If an abattoir is not available, a suitable site for slaughtering should be carefully chosen, preferably on a clear, sloping piece of ground (if possible near trees) in which is dug a ditch about 75 cm. deep (30 inches) and 6 meters long (20 feet), to serve as a drain for the blood and as a means of steadying the carcass of the large animal during flaying. After most of the blood has drained out, the carcass can be hauled carefully (not dragged) to a few feet further up the incline of the drain, to avoid fouling the hide with blood.

Hoisting of the carcass can also be effected in the field, as shown in Figure 1.

It is best to slaughter animals very early in the morning, in order to supply the meat and hide markets for the day.



Figure 1. The hoisting method of bleeding and flaying can be introduced in the field without elaborate and expensive equipment. Here, for example, a very effective hoist has been constructed using only some odd lengths of timber and a tree. (Courtesy of Department of Information, Nairobi, Kenya.)

Bleeding

In cutting the throat and making the bleeding incision, the head of the stunned animal is pulled towards the butcher, with his left hand, and the throat and neck are stretched. With the knife in the right hand, a cross cut is made in the throat as near the head as possible, to a depth of approximately 13 to 15 cm. (5 to 6 inches), severing the vein and artery, which cross at this point.

There should be only one decisive cut, not a succession of short shallow strokes. A special knife 46 to 51 cm. (18 to 20 inches) long, pointed and very sharp, should be used. It is not advisable to use a flaying knife which is too short for this purpose (see page 102 for more details on knives). The cut should be deep enough, but not too deep, for this would mean puncturing the pleura, resulting in the blood flowing into the chest cavity and causing a bloody carcass. In order to preserve a good shape of hide, the dewlap, the loose hanging skin under the throat of the animal, must be cut straight down, as near the top as possible.

In countries where stunning is not practised, the animal is usually thrown down with the help of a rope passed through a ring fixed in the floor. Where this is not possible, the animal is held by its horns with its legs tied together. When the four legs are brought together the animal loses its equilibrium and falls on its side on the ground. Animals should be thrown as gently as possible. The helper then holds the horns of the animal with both hands and turns the head upside down to stretch the throat and neck, and a bleeding incision is made similar to that described above (Figure 2).

Blood should not be allowed to run to waste, as it is a valuable food for poultry, pigs and dogs. If bran or husks are mixed with the fresh blood to a paste-like consistency, it can be spread in the sun to dry.

The widely used method of slaughter described above unfortunately produces the so-called "openhead" hide, better known as "cut-throat" hide. A better shaped and larger hide is produced when a lengthwise bleeding cut is given in a perfectly straight line between breast and throat.

The bleeding operation is most important and is best done in the hoisted position facilitating the flow, leaving the forelegs free to kick.

Hides from animals which have not been properly bled have poor keeping qualities. In some countries, bleeding, even in abattoirs,



Figure 2. The animal's legs are drawn together and it rolls over helplessly, its head at the same time being drawn to the floor, ready for the use of the pole-axe, humane killer, or killing knife. Here the comparatively small incision is made with the killing knife, severing the vein and artery at the throat, in order to drain the blood from the animal.

is still carried out on the ground. When this is done every effort should be made to keep the hide free from blood contamination by the use of a sloping floor and, whenever possible, running water to an adequate drain, placing the head of the animal near a separate blood drainage pit or channel (Figure 3).

Flaying (Skinning)

As soon as the blood has completely drained out and bleeding has stopped, the first flaying operation to remove the hide from the carcass starts.

To ensure that the animal is treated as humanely as possible, it is a good practice to touch its eyes to ascertain if life is extinct, before flaying commences, which should be as soon as possible after slaughter. If there is no reaction when the eyes of the animal are touched that is sufficient proof that it is dead.

If the carcass has previously been elevated, it is lowered to the ground, generally with the back in a depression to prevent rolling over on its side, or placed in a wooden or metal cradle or skinning bed as is performed in abattoirs (Figure 4). In the field, however, it can be placed in the ditch already made in the ground, into which the backbone will fit.

Flaying of the Head

Although it is true that the head hide has less value than other parts, it is often wasted unnecessarily.

A correct method of ripping the head hide, which means the opening of the hide prior to flaying, is shown in Figure 5.

As head hides adhere tightly to the flesh, it is necessary to use a very sharp flaying knife.

The top of the spinal column is first severed through the bleeding cut to separate the head from the neck. The head remains only slightly attached to the rest of the hide. The head hide also can form part of the hide, as is described under "Hoist Flaying (Second Stage)" below (page 15).

Floor Flaying (First Stage)

With a suitable ripping knife the hide is first opened in a straight line from the neck or slaughter incision, along the middle of



Figure 3. Here an animal is being bled in a slaughterhouse. The head is placed near to the gully, trench or drain, which carries away the blood, the carcass lying on a floor which should slope down towards the gully. The floor should be of concrete, bricks or tiles for easy cleaning, and should be cleaned after each killing before flaying begins. It is very important to keep the skin as free as possible from blood and dung, as a dirty skin will putrefy.

the dewlap and belly to the end of the tail. Then each leg is opened by making an encircling cut about halfway between the hoof and the knee joint, to exclude the dewclaws (rudimentary toes in cattle), and following up with an incision on the inside of each leg, along the lines shown in Figures 6 and 7.

The forelegs are opened to the breastbone (see Figure 7) and the hind legs with a curved incision to a point about midway between

Figure 4. A contrast to flaying methods "in the field." This photograph shows a modern European abattoir equipped with steel flaying cradles, electric hoisting gear, special bins and trucks for handling the entrails and offal, and a conveyor system for handling the carcasses. Note the light and airy design, white tiled walls and clean concrete floor.



the anus and scrotum or udder, after which the tail is opened down the underside to the "switch" and the end tail bones exposed (see Figures 6 and 7).

These instructions, if followed carefully, will produce a hide of regular shape (Figure 8) with rounded rumps, an equal distance between each belly edge and the center line of the back, of medium length in the shanks, and with regular dewlaps and a generally square outline. Figure 9 shows a badly shaped hide of irregular shape.

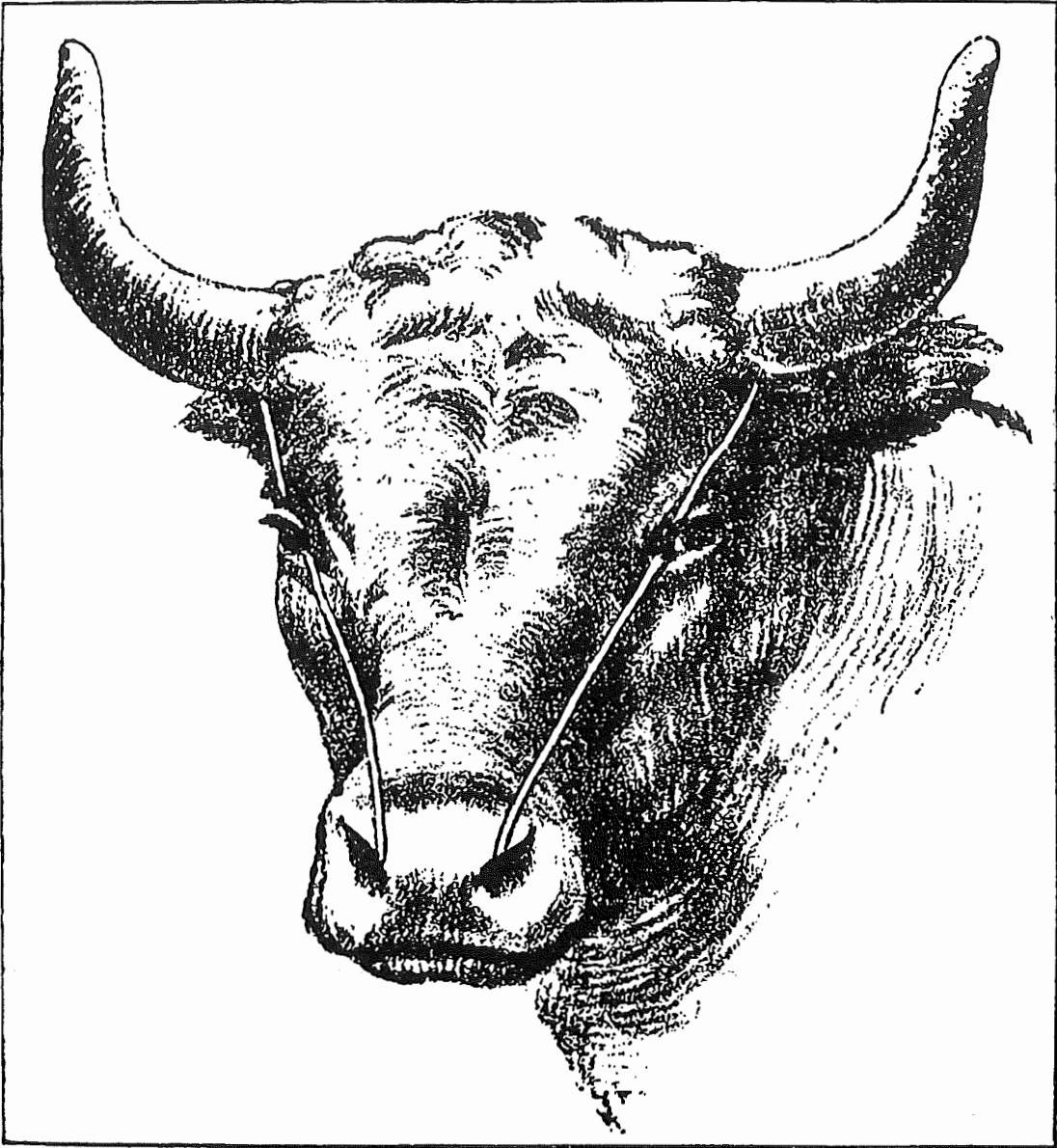


Figure 5. Head hides are often wasted unnecessarily. A correct method of ripping the head hide, which means the opening of the hide prior to flaying, is shown in this diagram. (Courtesy of the Hide, Leather and Allied Trades Improvement Society.)



Figure 6. Whether in the wilds or in a modern abattoir, the ripping cuts are important, as they determine the final shape of the hide, and thus its price. The first cut is the longitudinal one from the bleeding incision to the anus, along the center line of the belly and dewlap. Then each of the four legs is ripped down the inner side to meet this longitudinal cut. The best shaped hide is obtained when the ripping lines of the rear legs meet the long belly cut, at a point midway between the udder and the anus (see *Figure 7*).

The hide is then separated from the carcass by cutting from the lower part of the breast (Figure 10) towards the neck, and then from the lower part of the breast towards the navel, where the red meat of the sides becomes visible.

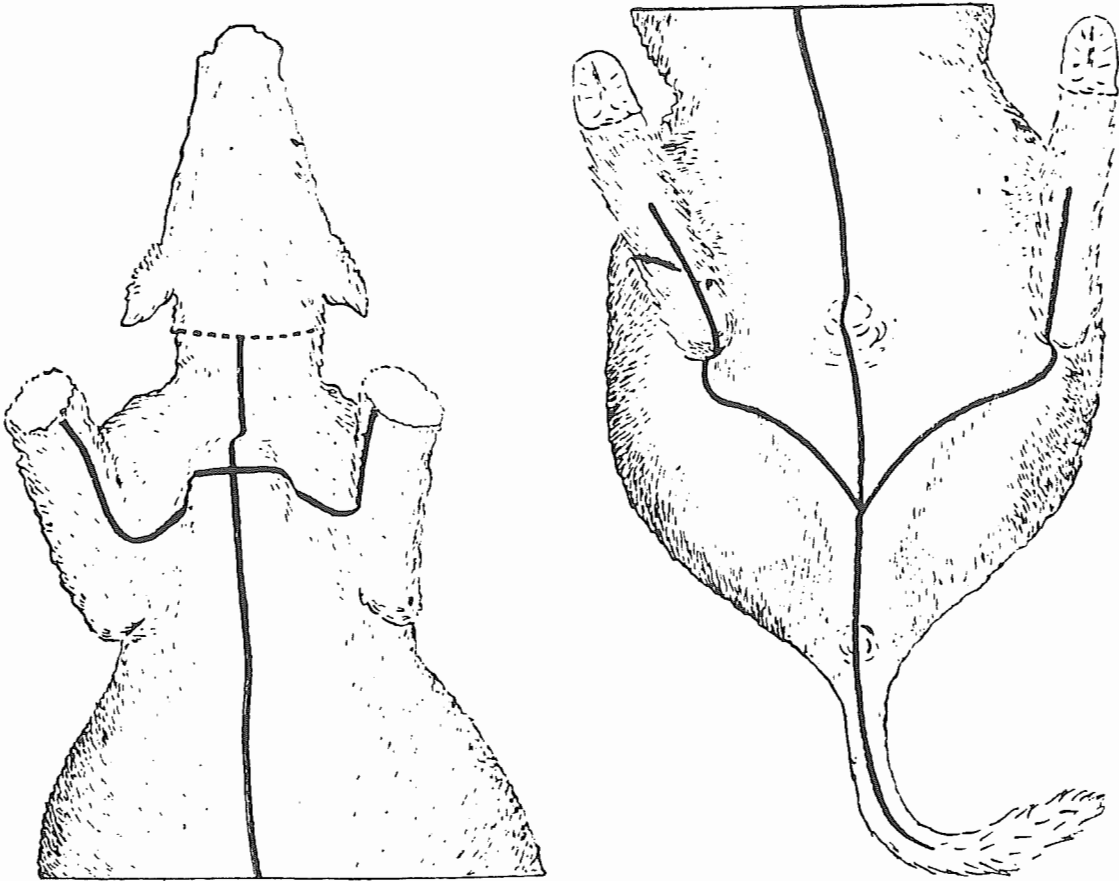


Figure 7. Ideal ripping lines for the forelegs and center of dewlap. They are practically the same as those shown in Figure 6. A hide with square shoulders, and requiring no trimming, will be obtained if this method is followed. On the right are shown the correct ripping lines for the hind legs and butt, which will give a hide of square and well-balanced shape. Note the slight curve of the round of the butt. (Courtesy of Department of Animal Production, Ministry of Animal Resources, Sudan.)

The flaying of the breast towards the neck should be carried out very carefully, in order that only the connecting tissues are severed, and leaving as much meat and fat as possible on the carcass.

In the next phase of flaying the four legs are brought together — the left foreleg brought towards the left hind leg, and so on, to facilitate further flaying.

The shoulders are flayed partly by pulling and partly by careful use of the knife.

The sides are flayed out, starting from the foreshank downwards, or from the navel towards the foreshank. By stretching the hide outwards, the flaying of the sides is facilitated, and special care should

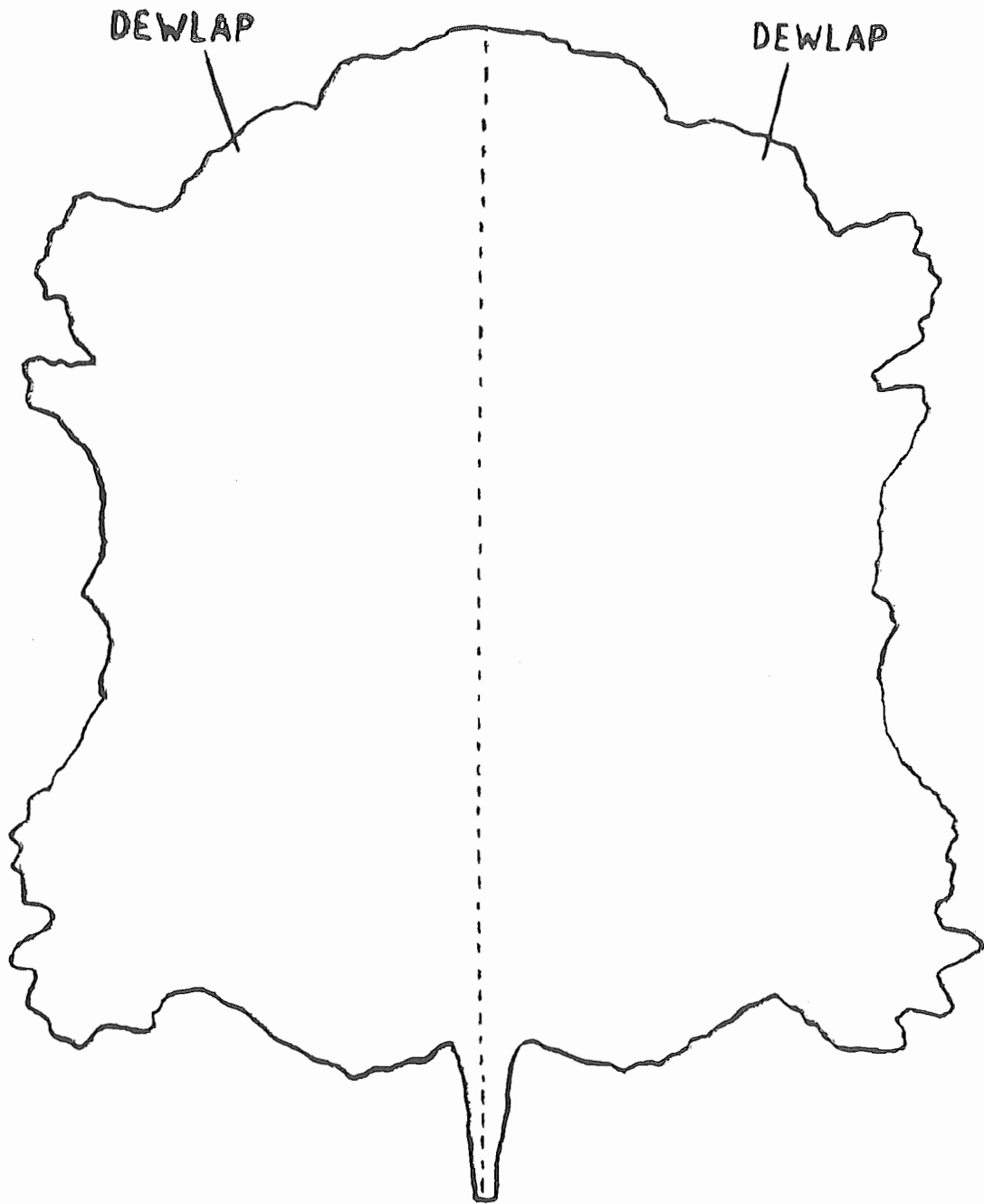


Figure 8. Correctly ripped hide. Note square shoulder and dewlap, short shanks and well-rounded butt. (Compare with Figure 9.)

be taken that the red meat covering the ribs remains on the carcass.

The flaying of the sides continues with long regular strokes and this operation requires experienced flayers. Inexperienced flayers should start by flaying legs only.

Flaying is continued downwards until the so-called "red meat" ends.

Experienced flayers using the knife are adept at raising the hide with the left hand up, and away from the knife edge, generally starting with the legs and continuing until the hide has been removed from all four legs, both left and right bellies and a portion of both rumps.

At this stage, unless hoisting cannot be effected, no further removal should be attempted, while the carcass is still on the floor. To attempt to remove any part of the hide which is on the lower half of the prone

Figure 9. Incorrectly ripped hide. Note dewlap, long shanks, difference in width from center line to edge on each side, poorly-shaped butt, and absence of tail.

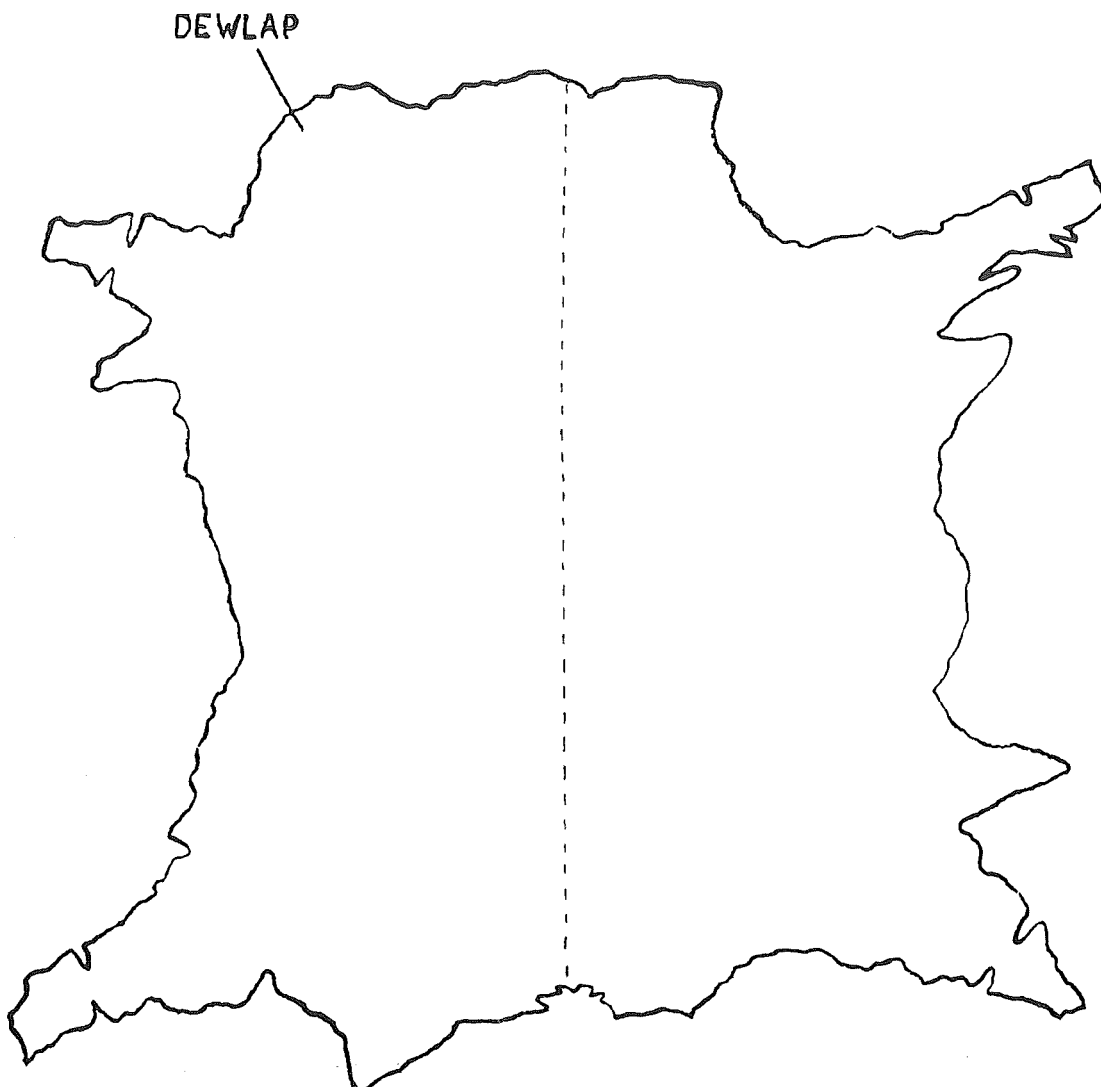




Figure 10. After ripping, the skin of this goat is being carefully removed around the shoulders with a very sharp knife with a rounded end, and only the subcutaneous fibers are being cut as the operator pulls the skin away from the carcass with his left hand. (Courtesy of Department of Information, Nairobi, Kenya.)

carcass, i. e., by cutting underneath, would invariably result in cuts and gouges.

Hoist Flaying (Second Stage)

Using a gambrel or spreader and a tail grip (see “ Hide Trade Equipment and Its Use ”), both connected to the hook of the hoisting gear, the hind legs are hung, and the gambrel raised generally about 1.5 meters (five feet) off the ground, with the head and shoulder still touching the floor. In this position the exposed tail bones are clamped in the jaws of the tail grip (Figure 11), and the hide is then removed from the tail and the tail area of the rump, by grasping the switch and pulling sharply and firmly downwards, the tail grip being clamped nearer the root of the tail, during the latter stage of this operation.

In order to complete the removal of the hide, the carcass is now raised to its fullest extent, allowing the flayers to pull the hide off the back to the hump, thus eliminating all chance of knife damage to the most valuable part of the hide.

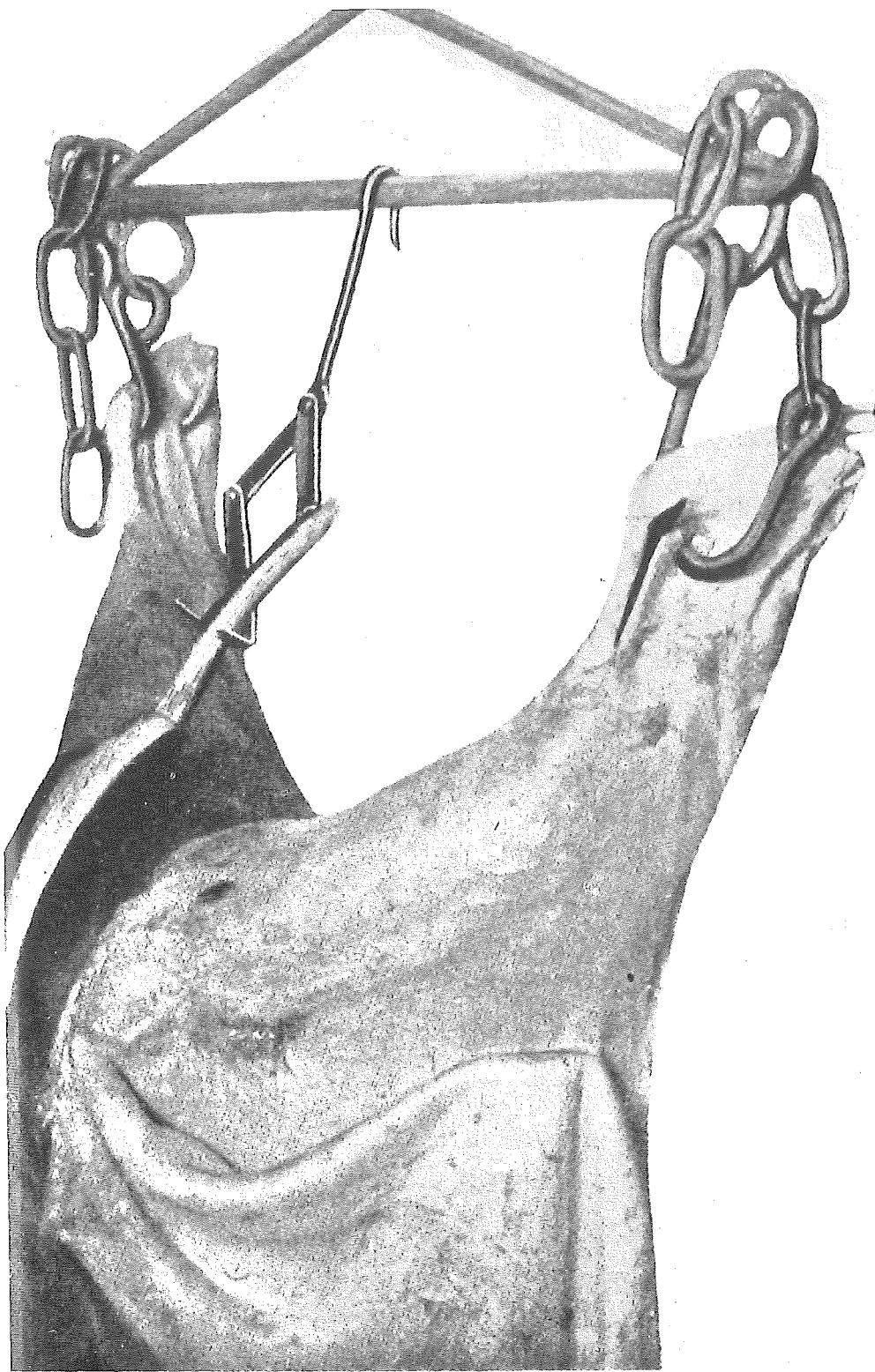


Figure 11. A gambrel and a tail grip being used together. The tail grip holds the tail securely while the hide is pulled off the tail area. When used in conjunction with a spreader or gambrel, it holds the whole carcass steady while the butt part of the hide — the part most valuable to the tanner — is being pulled off. The tail will be passed further into the grip as the hide is peeled off it. After the tail has been peeled, the fatty area round its root is flayed very carefully with the knife. (Courtesy of the Hide, Leather and Allied Trades Improvement Society.)

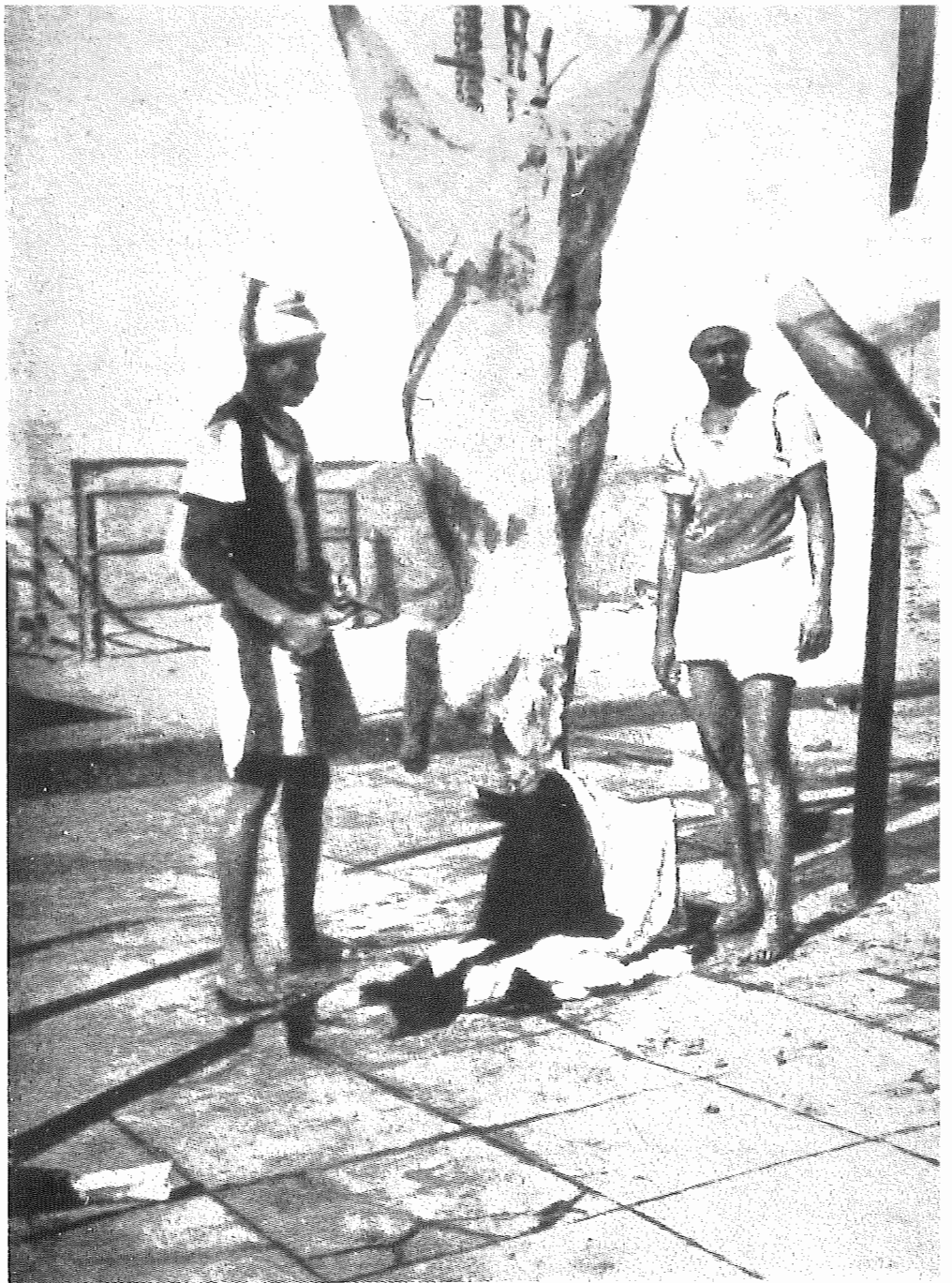


Figure 12. After the hide has been pulled off the back and flayed from the shoulders, the incision on the head, which is now almost totally severed, is continued round behind the horns to produce a headless hide. Heads are flayed at a later stage and the skin sold to small local tanners. Flaying of the head is not recommended for "cut-throat" hides. Tanners object to the loss of the head, which is torn off in the fleshing machines.

From the hump and down both sides of the shoulders and neck, the use of the knife is essential in separating the tougher and longer subcutaneous tissues. To separate finally the hide from the carcass, the slaughter incision should be continued in a line close to and behind the horns, leaving the ears on the head. After complete removal, the

hide is severed from the carcass by cutting close behind the horns (Figure 12).

When animals are slaughtered using one of the stunning methods, the head-skin — not being partially severed — can very well form part of the hide and is perhaps best flayed while the carcass is on the floor. This eliminates delay at the end of the flaying operation.

Flaying of “ Fallen ” Animals

“ Fallen ” hides are those flayed from the carcasses of animals which have died naturally, in most cases from starvation, disease or drought. In such cases the flayer is often faced with the problem of flaying in difficult surroundings and without the usual facilities.

Normally, the meat is not fit for human consumption but the hide, the only product easily marketable, is of value. Meat and bones are usually wasted, but they can be transformed — given adequate equipment and skill — into meat and bone meal to be used as a fertilizer.

“ Fallen ” hides are often of inferior quality, owing to poor flaying, the use of unsuitable knives, and the state of the carcass, which, not having been bled, is full of blood. Particularly the side on which the carcass lay would be poor, being stained or discolored and liable to putrefaction due to the coagulated blood remaining in the small capillaries of the hide. Furthermore, the subcutaneous tissues would be harder, resulting in knife cuts, scores and gouges. In addition, the hide is usually thin and of poor substance owing to disease or starvation.

The flayer can, however, prevent a certain amount of damage by careful flaying immediately after the carcass is discovered, avoiding damage by dragging, and by thorough washing after the hide has been removed, in any available clean water, either piped or from pond, river or well. Unfortunately, this is not often possible.

The method of ripping and flaying should be the same as described previously, up to the point where hoisting is necessary. A technique of ground flaying, which follows the same principles as for flaying when the animal is hoisted, can be substituted for hoisting, i. e., the removal of the hide by pulling, provided the meat is of no consequence.



Figure 13. The ideal method of removing a goatskin. The subcutaneous layers are torn simply by pulling, and without using the knife. (Courtesy of Department of Information, Nairobi, Kenya.)

First, the head is secured, by a rope around the neck and horns, to a tree or anything immovable, after which both bellies and all four shanks are brought together hair to hair behind the back of the carcass which is resting on its side.

After flaying round the neck, the hide is then removed from the shoulder and hump with the knife, leaving the remainder to be pulled off the back to the end of the tail, by a simple “tug o’ war” action. Field experience has shown that, when the instructions set out here are followed, the value of the fallen hide can be increased considerably. Flaying demonstration centers are necessary, therefore, to disseminate information on the procedures.

Hammer Flaying

This method of flaying with a round-nosed brass or wooden mullet by “biffing” or subjecting the hide to hammer blows to sever the sub-

cutaneous tissues, has been introduced in a number of areas, but with limited success due to the general apathy shown by the flayers. This method produces faultless flaying, and was introduced with a view to substituting knife flaying completely. Two important factors, however, have to be taken into account. First, the hide must still be ripped, and part of the bellies and the lower part of the legs flayed with a knife. Second, the flayer must exert himself far more when using the hammer.

Weighing up these two points, it would seem easier to continue knife flaying where there is no supervision and discipline, as too heavy blows with the hammer can cause disruption of the fibers and grain surface, resulting in poor quality leather.

Normally hammer flayed hides fetch a premium, except when knife marks and cuts are apparent.

A similar technique is that of hand-fisting or pulling (Figure 13), particularly in the case of small animals — calves, goats and sheep. The handle of the knife can also be used very effectively for this purpose (Figure 14).

Mechanical Flaying

Mechanical flaying of hides with a hand operated unit, driven by electricity or compressed air, is becoming increasingly common in large abattoirs and meat canning factories in some parts of the world. However, it has not yet been universally adopted. Perfectly flayed hides (Figure 15), and faultless meat surfaces can be obtained by this method because, although the cutting blades of the machine are dull, they are very sharp between the serrations.

The machines are operated in the same manner as a handknife, keeping the blades flat against the hide, and using a backward and forward motion (Figure 16).

It is said that with mechanical flaying a much less skilled man can take off a hide in half the time of a skilled hand-flayer, and that it takes a considerably shorter time to become skilled in its use.

Although this type of machine will certainly be more suitable for countries which are already fairly advanced industrially, it may also be of great help for less advanced countries which produce large quantities of hides.

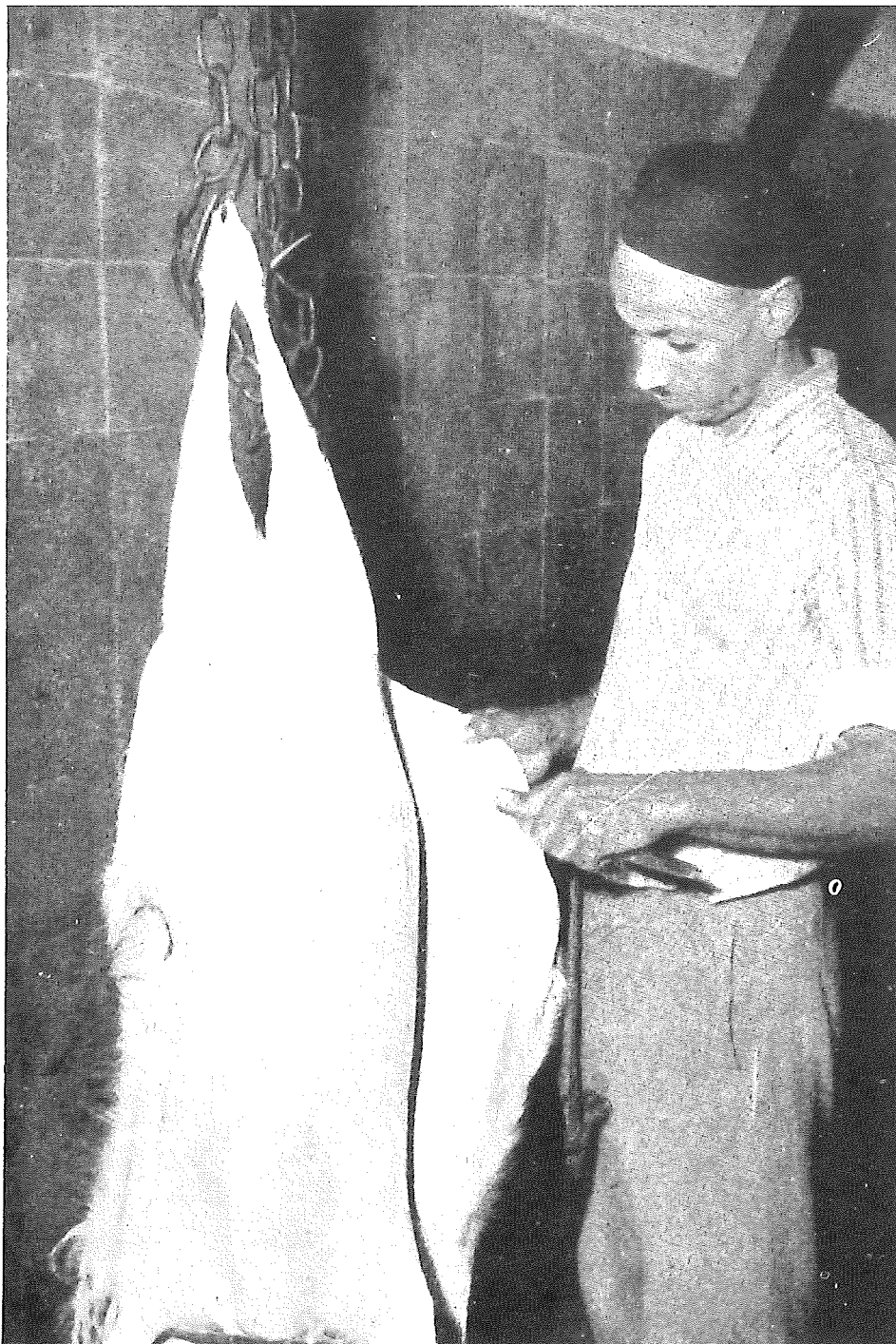


Figure 14. A tightly adhering area around the root of the tail can cause trouble in skinning a sheep or goat, and this photograph shows the flayer beating the skin off with the handle of the knife to avoid cutting at this important point.

Washing

Washing should be completed as soon as possible after flaying if water is available, and before blood coagulation sets in, either by immersing in water, or preferably by spreading out on a large table or floor in order to clean with running water and a scrubbing brush.

The former method is suitable when the water supply is limited, but agitation during immersion (Figure 17) is most essential, and the water should, if possible, be changed frequently as it soon becomes dirtied with blood and dung. Washing with running water is of course preferable. Figure 18 shows the washing of a hide on a proper table, with a brush, while water is poured on it.

The scrubbing method is only satisfactory in large abattoirs and meat canning factories where there is a continuous supply of water. Each hide is flooded by sprinklers or hose pipes and well scrubbed, both flesh and hair side.

Figure 15. A perfectly shaped hide flayed by the machine shown a Figure 16.





Figure 16. The flaying machine in operation. It is driven by compressed air and has the same action as a hand-knife, the blades being kept flat against the hide, with a backward and forward motion.



Figure 17. A buffalo hide being washed in a tub to get rid of adhering blood and dung, before salting or drying. The water must be changed after every few hides. Agitation is very necessary, even though the wet hide in this case will weigh up to 45 kg. (about 99 lb.)

Draining on a horse, to remove excess moisture and regain original weight, is essential not only from the point of view of the buyer who often purchases by weight, but also to ensure correct moisture content prior to salting.

Meating and Fattening (“ After-cleaning ”)

The term “ after-cleaning ” is used for the operations in which superfluous fat or flesh is removed. Good flaying should not need after-cleaning, but often superfluous fat or flesh adheres on the hide, mostly on the parts that covered the ribs and shoulders, with fat particularly around the tail area. Whenever possible, this operation should



Figure 18. Brush washing of a hide, stretched out on a suitable type of table, while water is poured on it. (Courtesy of Department of Information, Nairobi, Kenya.)

be avoided, as the risk of gouging, scoring and cutting is very great.

Removal of this excess matter should be carried out as soon as possible after washing. To prevent damage in removing gross lumps, the operation should be done on a flat smooth table (Figure 19), and not when the hide is suspended in frames. A very sharp and curved-edged knife should be used. (See below "Hide Trade Equipment and Its Use," page 101.) Care should be taken not to flesh the hide too closely. It is advisable to leave some tissue or flesh on the hide rather than to damage the hide by trying to remove every small piece.



Figure 19. Fleshing on a flat, smooth table. A very sharp curved-edged knife is used. Note the position of the worker's hand and the flaying knife. (Courtesy of Department of Information, Nairobi, Kenya.)



Figure 20. A buffalo hide being trimmed while lying flesh up on a fairly level floor. The marks can be seen where the strips of adhering flesh have been removed. The outline of the hide is now being improved by cutting off all useless flaps and projections and cutting the shanks short to remove the dewclaws.

Trimming

Properly fleshed hides must be trimmed before they are dried. This means that all sharp, irregular flaps on the edge of the hide and all excessively long shanks should be removed. Figure 20 shows the trimming of a buffalo hide. Re-trimming is sometimes necessary after drying, to improve the shape of the hide.

Other Considerations

The removal of stomach and intestines should always be done after flaying is completed, to avoid the risk of the hide being fouled.

The practice of cutting up all the meat and heaping it on to the hide, which is spread out on the ground, should be strongly condemned (Figure 21).



Figure 21. In order to keep the meat clean, it is a common practice to take out the viscera while the carcass is resting on the hide. Blood and stomach contents make the hide very dirty, which encourages rot, and the axe is liable to slip, chopping through the bone and making a hole in the hide underneath. Such practices should be strongly condemned, as they reduce the value of the hide. (Courtesy of Department of Information, Nairobi, Kenya.)

PRODUCTION OF SKINS

“Skins” are the integral coverings of small animals such as the calf, goat, kid, sheep, deer, alligator, and so on. The weight of the skin taken immediately after flaying is called its “green” or “fresh” weight. The weight after drying of a thoroughly salt-cured skin is called “salt” weight.

Killing and Bleeding

The method of killing small animals, such as sheep or goats, is more or less the same as described in the previous chapter for large animals.

Some flayers prefer to complete most of the bleeding on the ground, leaving final draining to be carried out during flaying in the suspended position.

As sheep and goat skins have long wool or hair, much more care must be taken, therefore, to avoid fouling with blood and dung, and when slaughtering is taking place in desert areas a suitable clean site should be selected (Figure 22), having a pit or draining slope if possible. In slaughterhouses, bleeding should take place near the draining pit or drainage channel (Figure 3).

After each killing the unavoidable fouling blood on the floor should be cleaned away, and an adequate water supply is therefore essential (Figure 23).

Flaying

Flaying is generally commenced by making a small incision on the inside of one of the hind legs through which a nozzle, stick or rod is inserted (Figure 24); air is then blown through, often by the operator



Figure 22. In the desert, where there are no slaughterhouse facilities, the best method of slaughtering and flaying a goat is to let the blood run off on the sand, then to flay the animal on a clean carpet of twigs, if available, in order to keep the skin and meat clean.

(Figure 25), but preferably from compressed air cylinders (Figure 26), in order to separate the subcutaneous tissues between the skin and the carcass. After inflation, vigorous pummeling facilitates this separation (Figure 27).

A method common in various countries consists in removing the skin from the carcass in the so-called "case" form; this, preferably, should be done by hand-pulling. It is not used with skin quality in view, but to satisfy a domestic requirement, viz. the production of water-skins.

While still on the floor, the hind legs including a small portion of the skin covering the abdomen and edges of the butt round the rump, are flayed with the knife and fist.

The carcass is then suspended by the hind legs and the skin peeled off by pulling and further fisting (Figure 28). Sometimes the belly

skin is not pulled off, but is removed instead with the knife (Figure 29), so that the surface of the carcass is left with close serrated scores. This is done to satisfy the butchers who, apparently, often consider this appearance desirable. If properly carried out, this method does not damage the skin. However, in some countries the remainder of the skin, and in fact the belly portion as well, is removed by pulling, and in the final phase the flayer uses the weight of his foot with downward pressure to remove the skin from the neck and forelegs (Figure 30).

Another common method of flaying following inflation (Figure 31) is similar to that used for hides. The carcass is ripped down the center of the belly and on the inside of each leg; the foreleg incisions join the center incision at the breast and the hind leg incisions follow the line of the rump to the anus. The bellies and legs are then flayed while the carcass is on the floor (Figure 32).

Washing

This is an undesirable practice when dealing with long-wooled or haired sheep-skins and long-haired goats, owing to the excessive quantity of moisture held in the wool, hair and the corium itself.

Figure 23. After bleeding, water is used liberally to clean floor and gully.



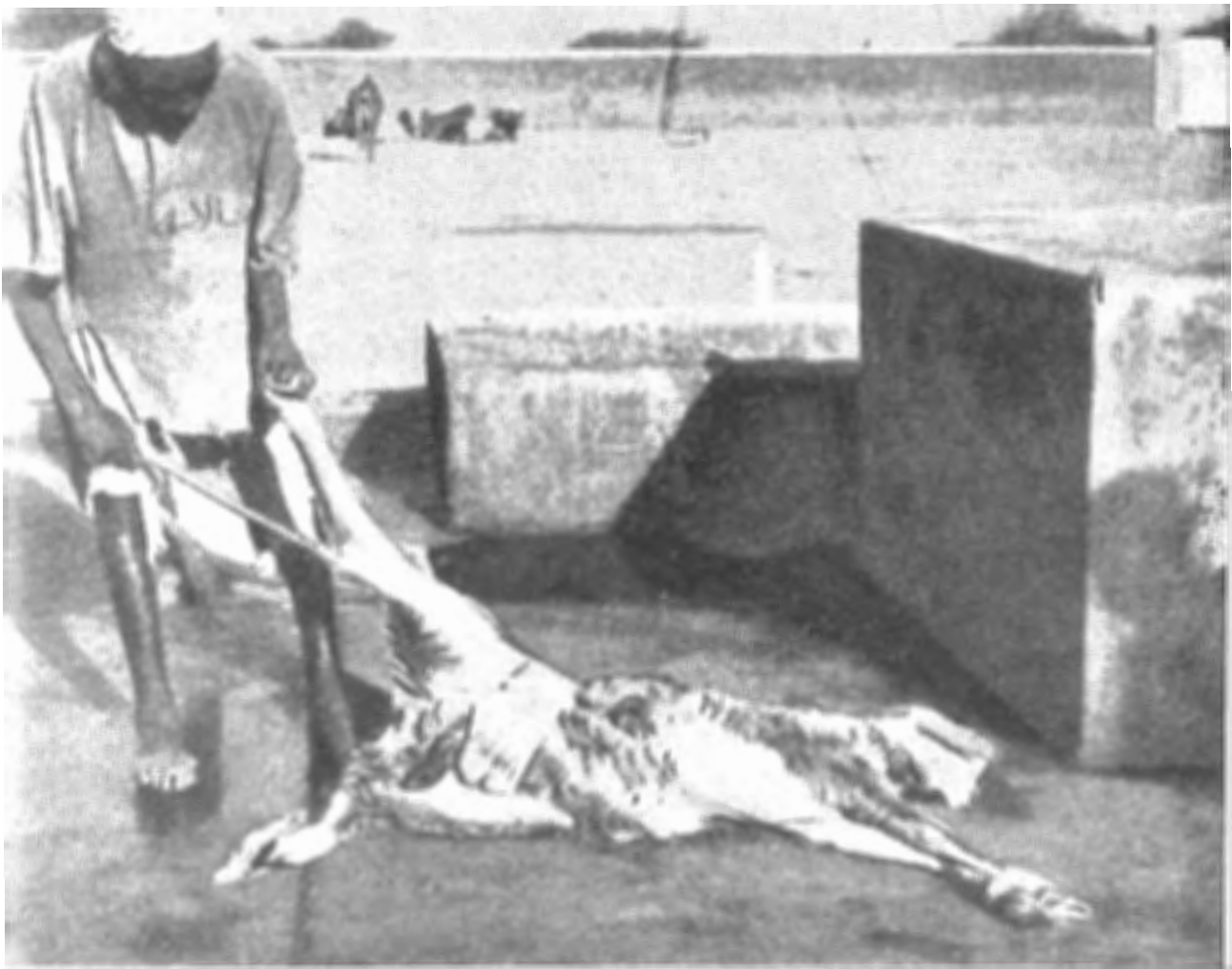


Figure 24. Flaying of a goat is commenced here by making a small incision on the inside of one of the hind legs. Through the initial incision a nozzle, stick or rod is inserted through which air is blown, often by mouth but preferably from compressed air cylinders, in order to separate the subcutaneous tissues between the skin and the carcass.

The presence of excess water in the corium will cause a weakness in fiber structure if the skin is dried at high temperatures. The danger point in drying skins containing too much water occurs when the temperature reaches 60°C (140°F), which is called the shrinkage temperature. At this stage a change in the molecular structure of the fiber occurs, which results in disintegration when the skins are subjected to water or lime solution. In tropical countries drying at extremely high temperatures is quite common, but should be avoided whenever possible.

Fatting

The fatty tissues remaining on the flesh of skins, and sheep skins in particular, are a source of damage which is sometimes quite disastrous if cleaning and fatting is neglected. During air drying the grease

Figure 25. A goat carcass being inflated by mouth. Bleeding should have been carried out nearer to the drainage channel.





Figure 26. Slaughterhouse workers inflating a goat carcass with compressed air.



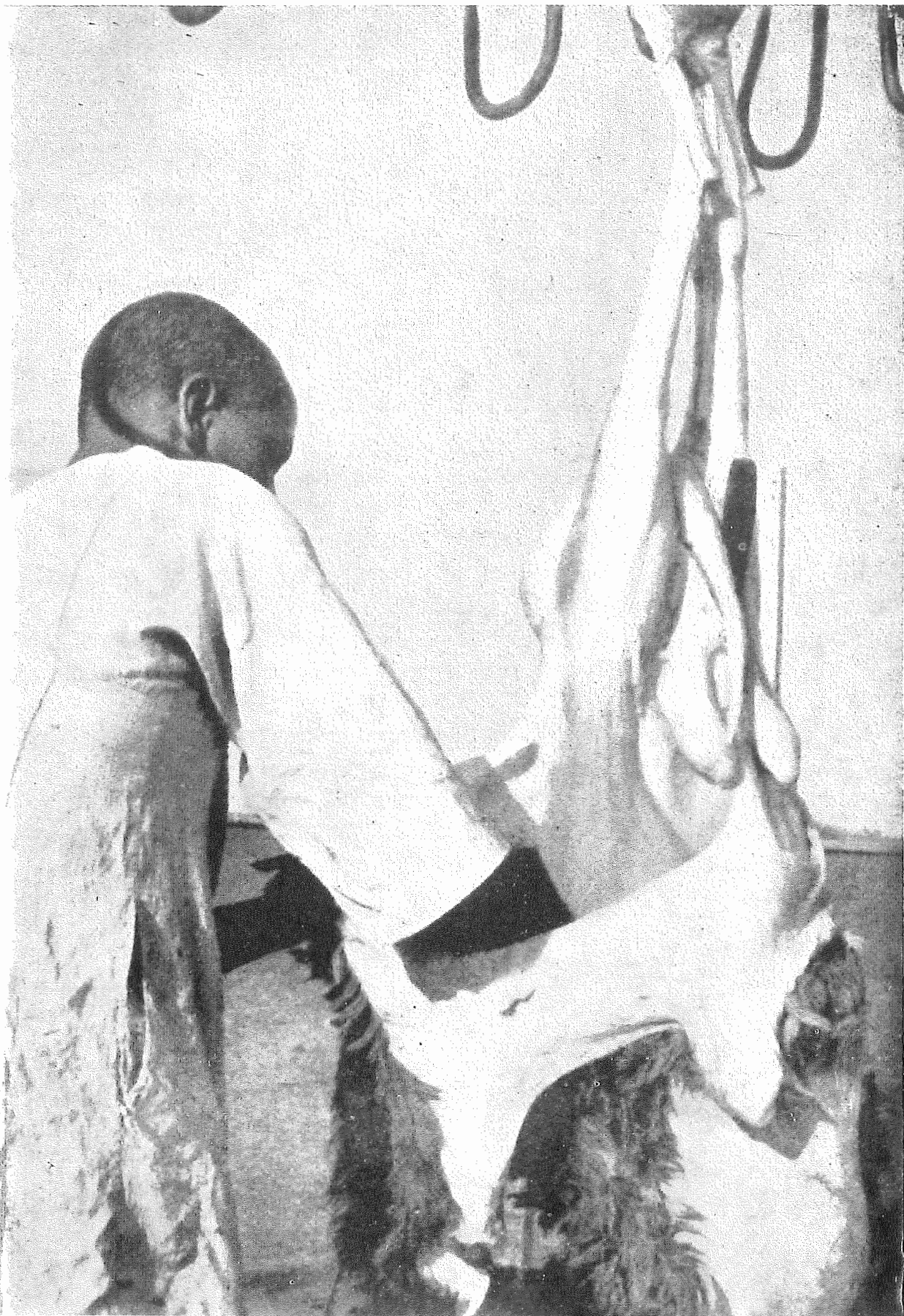
Figure 27. After inflation, the carcass is pummelled vigorously. This loosens the skin from the carcass, so that it can be more easily removed.

is absorbed by the skin, and is most difficult to remove in subsequent tannery processes, invariably causing greasy stains, which will not take the dye. Also, the penetration of brine during the salt curing process will be retarded, resulting in insufficient curing in addition to grease stains.

The fat can be removed satisfactorily by suspending the skin from a wall hook by the neck and cleaning the flesh, using a scraping action rather than cutting, with a sharp curved-edged knife.

It is not possible to clean wool or hair sheep skins or long-haired goat skins by placing on a flat surface owing to the irregular and lumpy cushion produced by the hair and wool.

Figure 28. A stage in "case" flaying. The carcass is suspended from the hind legs and the skin is peeled off by pulling and further fisting.



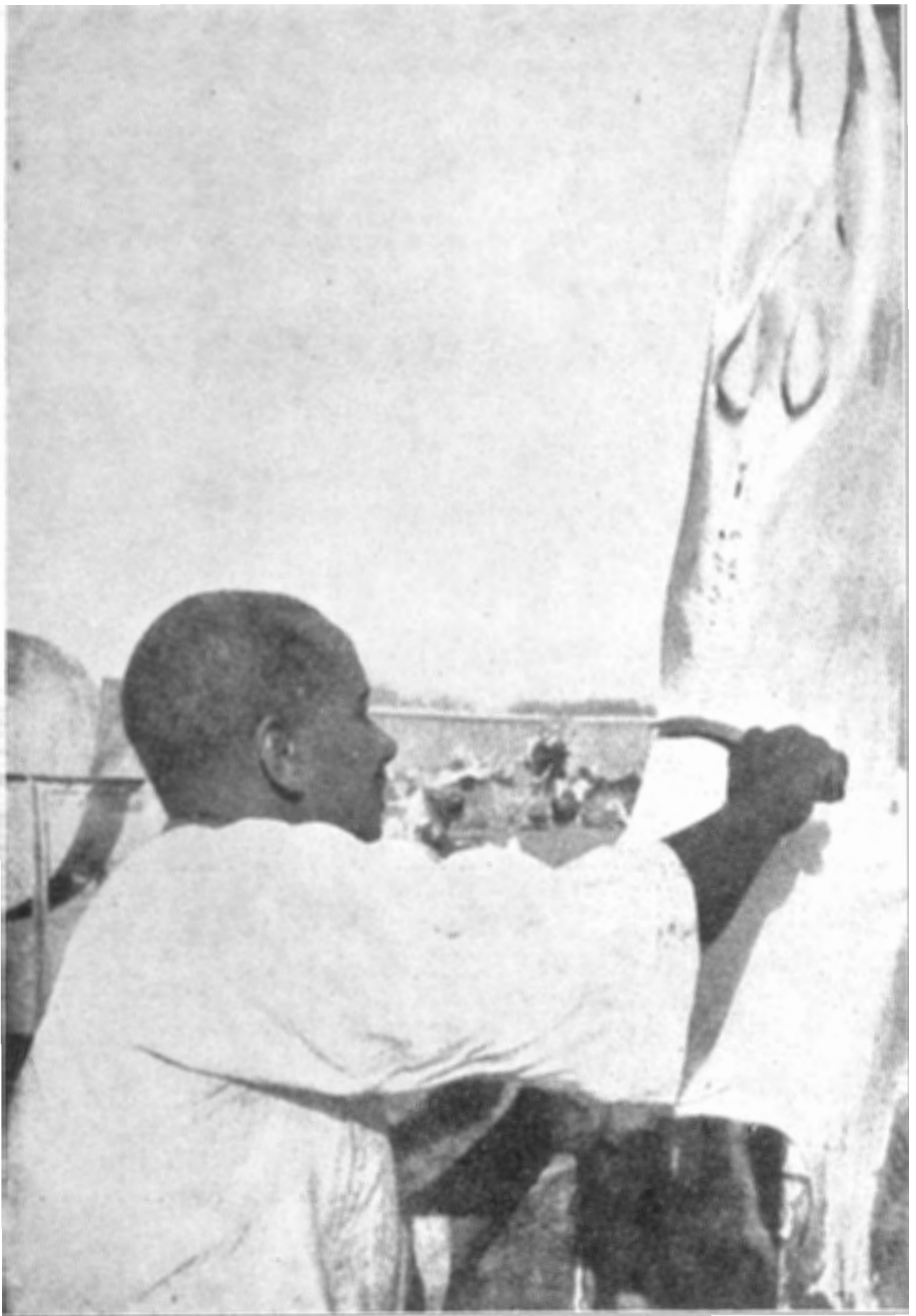
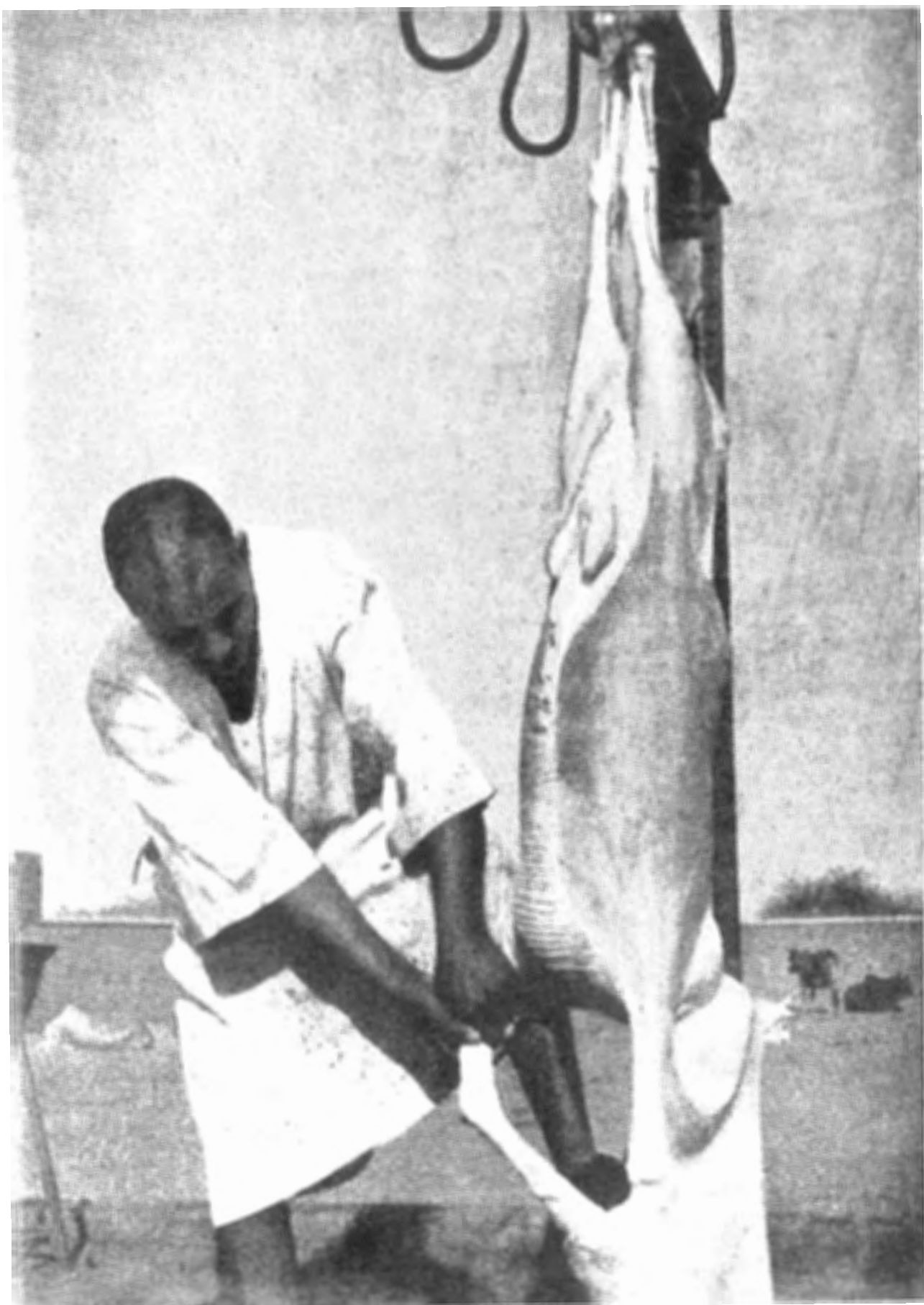


Figure 29. Another stage in "case" flaying. Sometimes, as is shown here, the knife is used to remove the skin from the entire belly portion, leaving the characteristic serrations in the meat and fat of the carcass. Care should be taken at this stage to avoid flay cuts.

Figure 30. The final stage in “case” flaying, where the skin is removed over the forelegs and neck. The worker uses the feet and his own body-weight with downward pressure, to get a strong final pull.



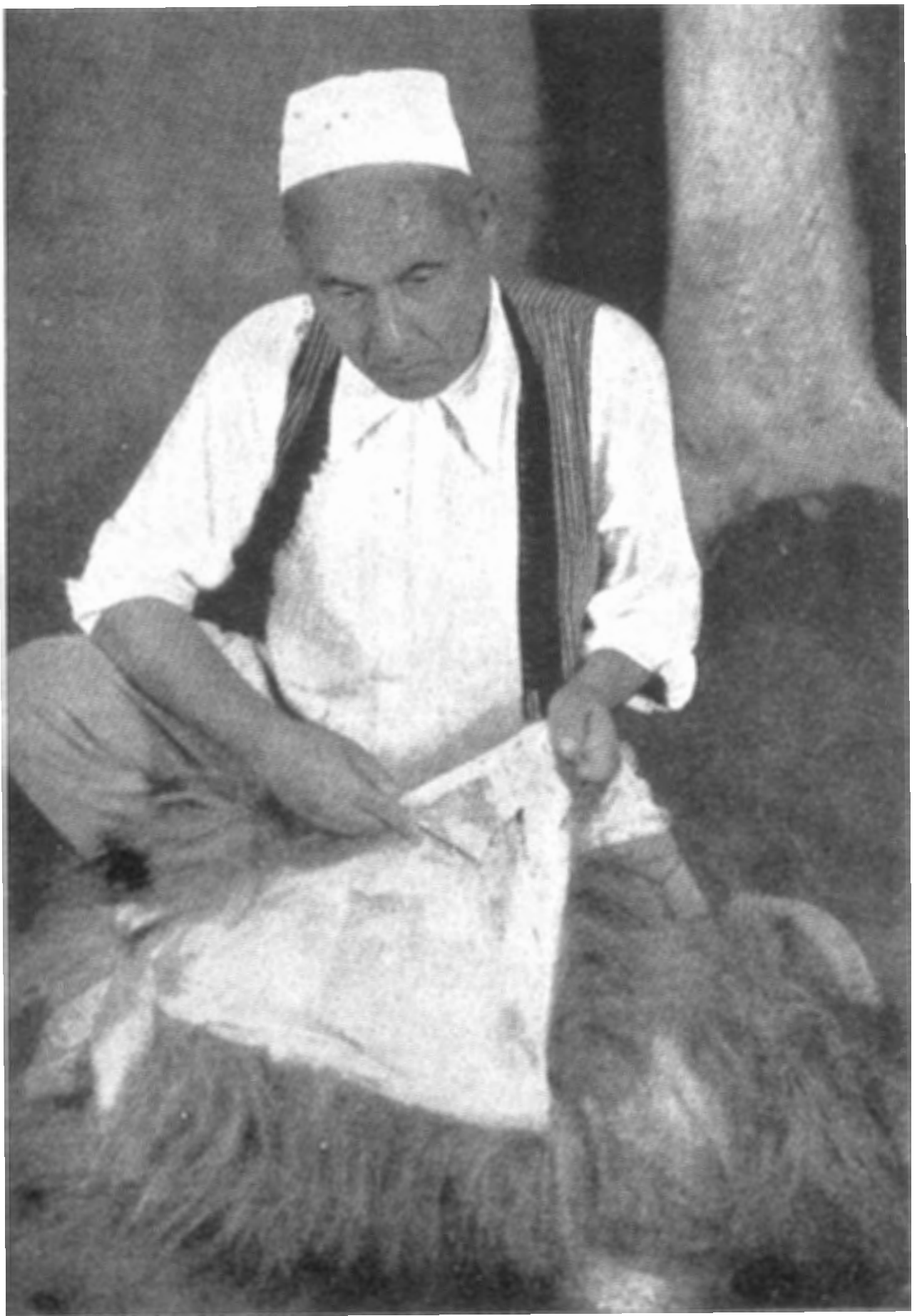


Figure 31. A stage of floor flaying, showing what should not be done. As can be seen, flaying with a sharp pointed knife causes cuts, which reduce the value of the leather eventually made from the skin. A merchant will pay less money for a hide or skin damaged by flay cuts.



Figure 32. A further stage in the floor flaying of a goat by slaughterhouse workers. Note the clean floor and the blood drainage channel on the right.

CURING OF HIDES AND SKINS

General Principles

Hides and skins, in the condition in which they are removed from the carcass, are subject, particularly in hot climates, to rapid putrefaction, as they are then very liable to attack by many types of bacteria and mould. Dust, dirt, soil, water, fodder and so on, act as continuous sources of infection, quite apart from the transmission of micro-organisms by air, insects, or contact with diseased animals. A freshly flayed hide or skin contains natural moisture to the extent of 60 percent of its weight. As examples, a hide of 22.7 kg. (50 lb.) contains 13.6 kg. (30 lb.) of water, and a goatskin of 2.3 kg. (5 lb.) contains 1.4 kg. (3 lb.). It follows, therefore, that if a hide or skin is left uncured, the combination of water and bacteria will cause putrefaction at a rate dependent upon the temperature. At a temperature of 10°C (50°F) putrefaction may require 3 or 4 days. Under tropical conditions, say 38°C (100°F), a skin will begin to smell within 12 hours, if kept damp, as putrefaction is speeded by the combined effect of moisture and warmth. A skin will remain sweet if stored moist and cold, or if stored dry and warm.

Action must be taken, therefore, to prevent putrefaction and to bring the hides and skins into a suitable condition for transport and storage. This action is referred to as preservation or curing, and field experience has shown in several demonstration centers that the value of hides and skins, when cured according to the systems described below, is greatly increased. This is also true for hides obtained from "fallen" animals.

There are main methods in general use:

- (a) Air-drying
- (b) Salt-curing
- (c) Pickling

Attention is given here particularly to the curing of hides and skins in semi-tropical and tropical climatic conditions, so emphasis will be given mainly to modifications of the above three methods as are applicable to such climates.

The choice of a suitable method and its implementation in any particular area depend on climatic and other conditions, as no one method is suitable for all areas. Some countries, for instance, have plentiful quantities of cheap salt, others have not. Some have local raw material such as timber for frames, wires or cords for suspension. Some countries have high humidity, others have strong winds. Air currents are one of the most important factors to take into account. They are more important than temperatures alone, and seem to receive less recognition in literature on curing than they demand.

In warm or hot climates, delay between the flaying and curing of a hide or skin will certainly lead to deterioration. The ideal is for this period not to exceed 3 to 4 hours, which is possible in small towns where only a few dozen hides or skins are handled per day, and even in larger towns possessing a municipal slaughterhouse, where the daily output may be some hundreds of skins. Whenever possible, hides and

Figure 33. Skins being transported in an open cart to the skin market, fully exposed to the sun. A covered cart would be better.



skins should not be conveyed in open carts (Figure 33) fully exposed to the hot sun, reaching the curing yards only after great delay; nor should they be kept rolled (Figure 34) in the unsalted condition and exposed to the sun all day, being salted after a lapse of 30 hours and more after flaying.

Municipalities and all concerned with the hides and skins industry should be urged to guard against this serious maltreatment and the financial loss caused thereby, and to see to it that hide and skin markets are covered (Figure 35), or at least that skins be kept in the shade until they are sold and despatched to the curer, if possible in a covered cart.

In areas where regular weekly markets are held, a staggering of the market days, to avoid over-lapping and consequent delay in treatment, is highly recommended.

Air-drying

In areas where the atmosphere is dry, skins of the sheep and goat can be dried in 3 hours or less.

The dryness of the air can be expressed in figures, and the unit usually adopted is the "percentage relative humidity," i.e., the amount of moisture in the air at a certain temperature, expressed as the percentage of the amount of water it would contain if fully saturated at that temperature. For instance, on a dry warm sunny day in England, the air is seldom less than 60 percent relative humidity at, say, 27°C (80°F), whereas the dry hot wind coming from the Sahara often brings the relative humidity of North Africa down to 10 percent or less.

The percentage relative humidity is easily measured by means of the wet and dry bulb thermometer, the difference between the temperatures shown on the two thermometers giving a measure of the humidity. If the two readings are about the same, the air is saturated, i.e., nearly 100 percent R.H. (relative humidity). If the air is dry, there will be a difference of many degrees — the drier the air the greater the difference.

A fresh skin placed in warm surroundings will dry very much more rapidly if the air is moving than if it is still. Even if the atmosphere is moist, but moving, it will dry a damp skin. It is, therefore, bad practice to hang up skins in an enclosed space with solid walls where air currents cannot have free access. Under such conditions the skin

remains damp and warm, sometimes for days, and therefore will inevitably putrefy. It is much better to hang skins or hides in the open air, so that they are freely exposed to air currents. Although the air is usually warmer outside than inside a building, the risk of putre-

Figure 34. Skins should not be kept rolled in the unsalted condition and exposed to the sun all day, as shown here. They should be salted as soon as possible.



faction is less, because the moisture dries from the skin in a few hours, thus lowering its temperature while drying. There are several methods of air drying, and a useful classification is the following:

- (a) Drying on the ground
- (b) Drying by suspension (Frame-drying)
- (c) Drying by suspension over cords or wires (Line-drying)
- (d) Tent- and pasarol-drying

Curing by drying alone has one danger. When the dried skin or hide has been stored for a few weeks, it is likely to be attacked by beetles, moths or other insects, which do not attack dry-salted skins. Therefore, special precautions have to be taken. A method which has been in use for many years is to spray the skins with or dip them in a solution of sodium arsenite. (More details can be found in the section "Damage during Storage and Transport," page 88.)

Figure 35. Skins, rolled and in the unsalted condition, are here exposed in the market to the hot sun for a long time, thus reducing their value. As marketing usually occupies some time, it should be done in a covered shed or building, or in the shade.



Drying on the Ground

In certain areas this is still the simplest and traditional way of drying the hides and skins. The method consists of placing them on the ground flesh side uppermost to dry in the sun, as shown in Figure 36. As the hide in drying would wrinkle and shrivel it is pegged down to the ground to keep it fairly flat (Figure 37), or is held in place by stones placed at the ends. This method gives very unsatisfactory results and hides cured in this manner are liable to show the defects known as "blister," "taint," and "hairslip." The term "blister" denotes a condition of rottenness between the inner and outer surfaces of the hide, which is often not detectable until the hide is soaked again when tanning begins, and which results in damage that completely penetrates the leather. The deteriorated or solubilized portions are dissolved, giving rise in the milder form to loss of grain, and in the advanced form to holes in the hide. In the more severe cases, large areas of the hide disappear completely (Figure 38).

"Taint" and "hairslip" represent relatively mild forms of putrefactive damage, which affect the surface of the hide and skin, and may occur on either the grain side or the flesh side, resulting in superficial damage to the leather. "Hairslip" is but an indication of putrefactive damage to the grain surface, which has so loosened that the hair rubs off easily. These types of damage are attributable to restricted and retarded drying, as is explained below.

When a hide or skin is spread flat on the ground, flesh side uppermost, the moisture cannot escape from the hair side. The flesh side, being submitted to the sun's rays, will become hotter, and therefore stew instead of dry, resulting in putrefaction.

Therefore, free circulation of air on both sides of the hide or skin is essential to dry satisfactorily, as experiments have proved.

The conclusion is that ground drying has to be condemned and the "suspension method," providing free circulation of air, and described below, should be propagated.

Drying by Suspension (Frame-drying)

The equipment used in suspension-drying consists of horizontal poles erected at a suitable distance from the ground, 1.5 meters (5 ft.) or more, according to the size of the hides.



Figure 36. The simplest and traditional way of drying skins is to place them on the ground, flesh side uppermost, to dry in the sun, as shown in this and the following pictures. This method should be rejected, as it causes an enormous amount of damage, since the flesh side dries out rapidly while the lower layers are warm and still wet. This creates ideal conditions for bacteria to develop and destroy much of the skin substance before the skin is dried through.

The poles should be in a line running east and west, and the hides should be suspended clear of the ground, by tying the tail butt and hind shanks to the poles with ropes, and then tying the head and fore-shanks to pegs in the ground. It is important that the lower ends of the hides do not touch the ground. The pegs are placed on the line of the shadow thrown by the horizontal poles at midday (Figure 39).

The hide is thus stretched at an angle with the ground, flesh side uppermost. In this manner, the hide will be freely exposed on both sides for drying. Any rain which falls on it will run off, and as the sun's rays strike it very obliquely, their effect will be less than if the hide were on the ground. It seems, however, that this method is too complicated and not worth all the trouble. The method of "frame-drying," as described below, therefore comes more and more into use.

Figure 40 shows a heavy hide being washed prior to drying, spread on rush mats to prevent it picking up further dirt. Figure 41 shows the heavy buffalo hide stretched firmly on the rough frame. Care should be taken that the hide is stretched evenly and symmetrically on the frame and not only from top to bottom, which would mean the hide drying in a long, narrow shape.

Figure 37. The hide, while drying on the ground, is pegged down flat to prevent wrinkling and shriveling. (Courtesy of Department of Information, Nairobi, Kenya.)



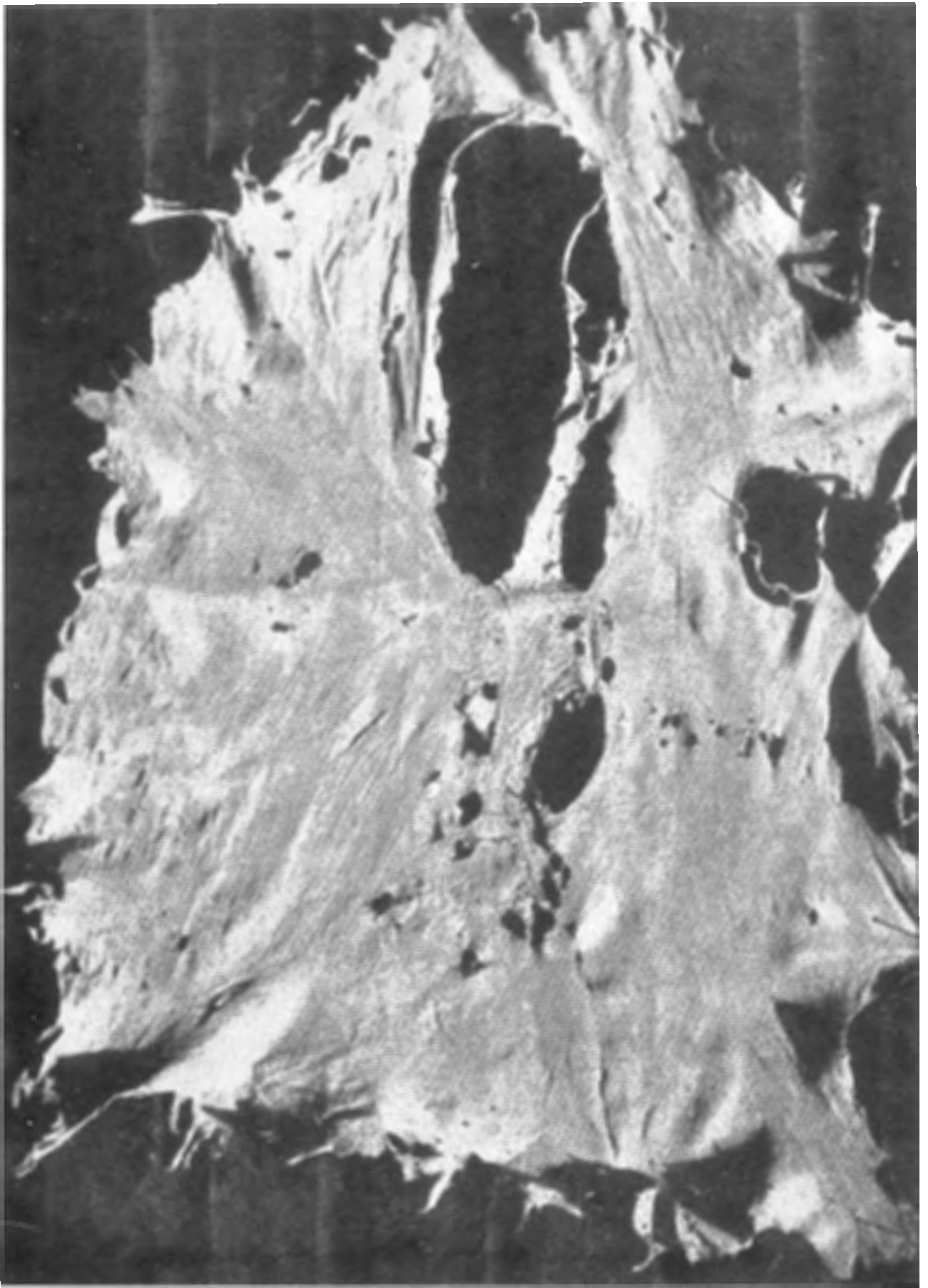


Figure 38. Skin dried on the ground in the sun, showing the damage which occurs when the tanner soaks it again in water prior to tanning. Drying on the ground should, therefore, be condemned. (Courtesy of Department of Information, Nairobi, Kenya.)

A more elaborate form of frame and a hide of excellent shape and well spread out on the frame can be seen in Figure 42.

The drying of skins on a board, using toggles which do not necessitate the cutting of the skin, is shown in Figure 43. This method, however, is more in use to dry tanned leather.

Finally, Figure 44 shows frame drying in sheds, also practised in some regions, particularly where slaughtering and drying are centralized.

Frame-drying in the open air is, of course, much cheaper. Drying in sheds, however, should not be encouraged, as sheds are often inadequately ventilated, and slower drying will result, with detriment to the hides.

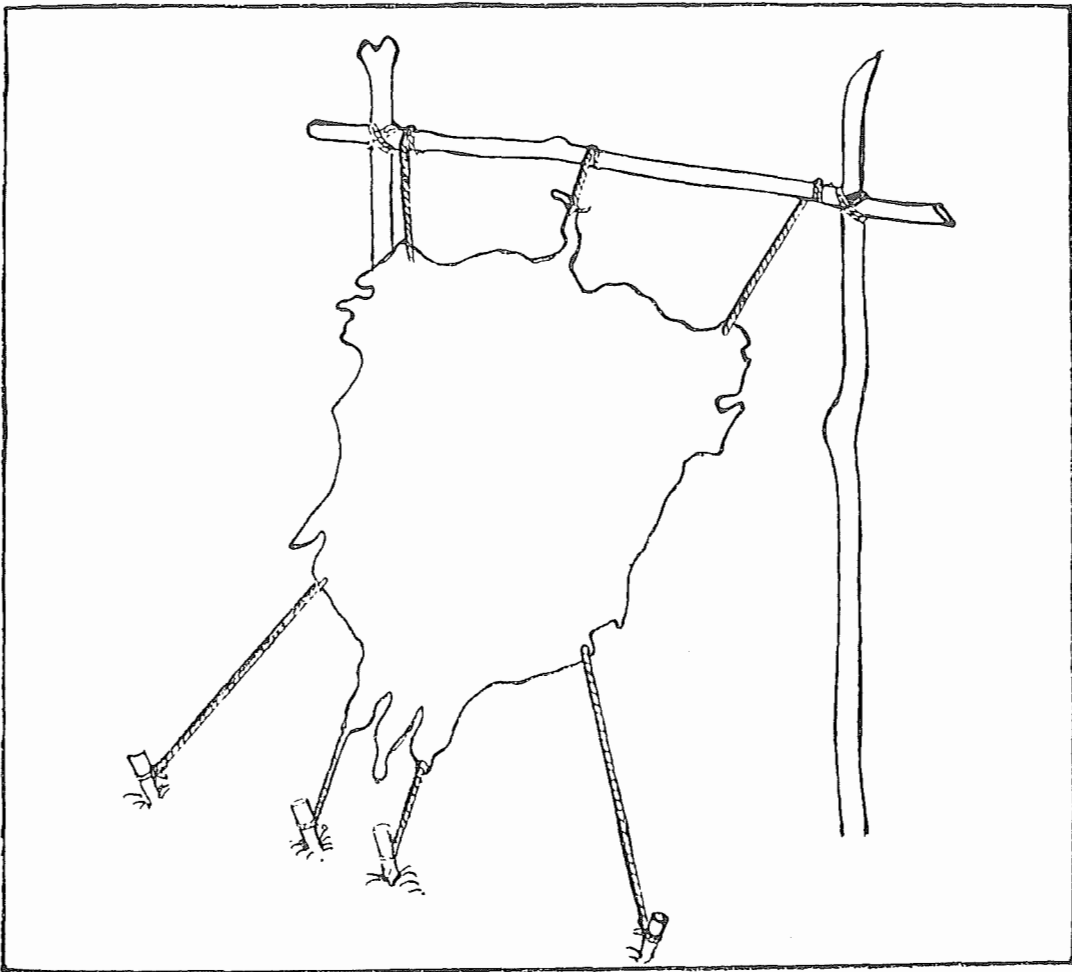


Figure 39. Diagram showing the method of drying hides where the hide is suspended from a pole and attached to pegs placed in the ground on the shadow line of the pole, so as to temper the force of the sun.

Drying by Suspension over Cords or Wires (Line-drying)

In areas where wood for frames is scarce, the line-drying method can be used. The skin is suspended symmetrically along the backbone with the hair or wool hanging down, over a cord, or wire, not thicker than one's little finger (Figure 45). The two bellies and flanks must be prevented from touching each other, and the shanks from folding inwards, by using pieces of stick or straws which will adhere to the wet flesh, so that every part of the skin is freely open to the air. Drying of the skins may be completed in three hours or more, depending on the velocity and humidity of the air which circulates. The progress during drying of goat skins can easily be checked by smell; if the hair side smells of goat all is well. If the skin or hide is dried by suspension over a thick pole (Figure 46), it will putrefy along the line of the pole (Figure 47) because a fairly wide band of the skin or hide is in close contact with the pole, thus drying more slowly than if in contact with a thin cord or wire.

Tent- and Parasol-drying

Wood not being available in the desert, and salt scarce and expensive, sun-drying in a manner similar to that described in the previous section can be practised to advantage as shown in Figure 48. In principle this method does not differ essentially from drying over thin poles or wires.

Another practice, "tent-drying," consists in supporting the backbone of the skin on a wire stretched between two posts at about 90 cm. (3 ft.) from the ground, and stretching the edges of the skin or hide by cords to pegs in the ground along each side (Figure 49).

The "parasol" or "umbrella" method involves a single central vertical pole to support the middle of the hide, with the edges stretched out to pegs in the ground.

Salt-curing

In areas where the atmosphere has a relative humidity of over 90 percent, which, in wet monsoon periods, is fairly often the case, it is not possible to dry skins effectively because the rate of drying is slow, and after a day or two the damp warm skin would begin to putrefy.

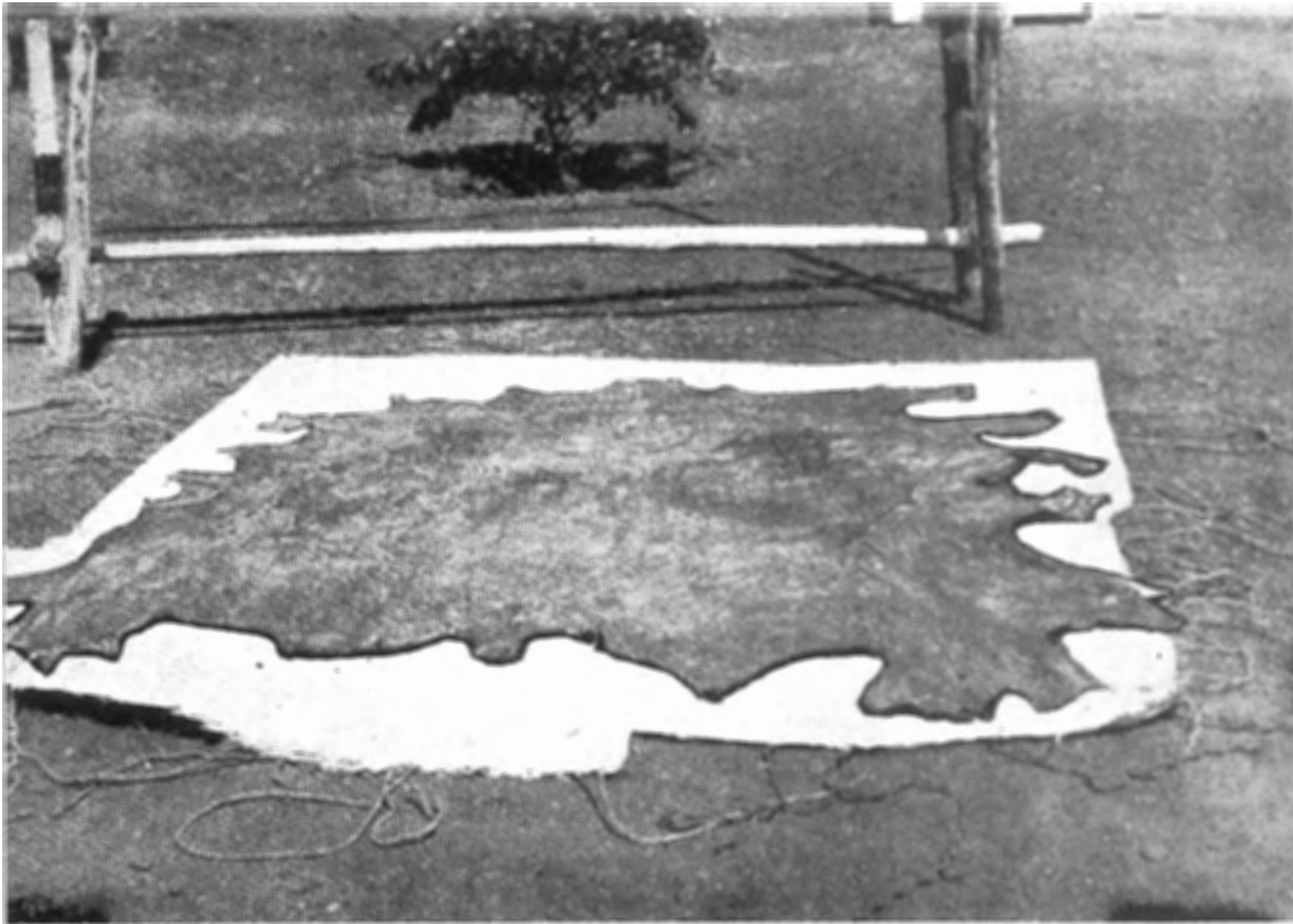


Figure 40. A heavy hide, which has been washed prior to drying and then spread on rush mats to prevent it picking up further dirt. Small cuts have been made at intervals round the edge, and thin ropes tied on. The frame on which the hide is to be spread is seen behind. (See also *Figure 41.*)

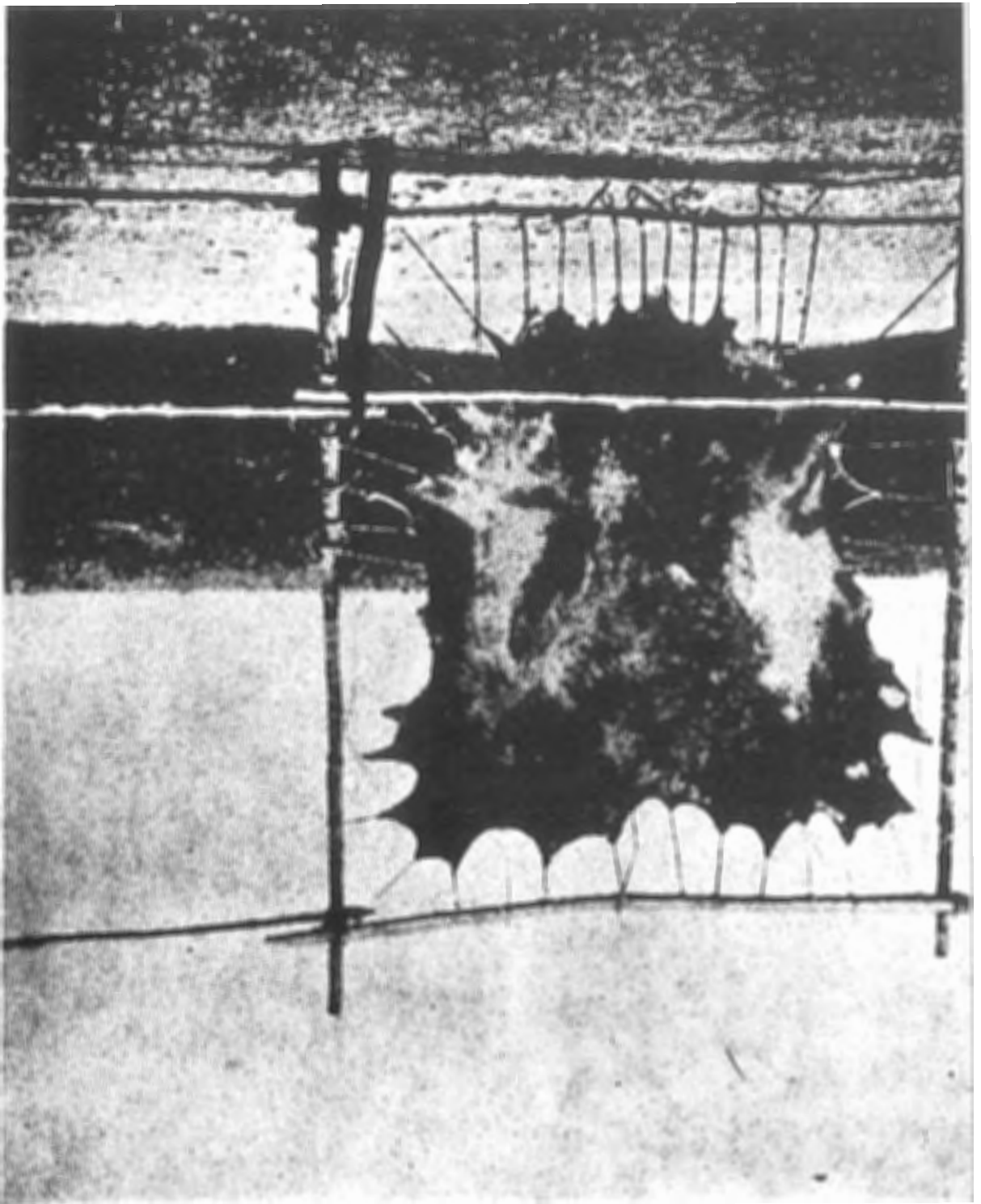


Figure 41. A heavy cattle hide has been stretched firmly on the rough frame prepared for it, and is now drying, showing the flesh side. It appears to have been a tough hide to remove, and nearly every cut of the flayer's knife shows on the flesh. Only the fatty subcutaneous layer has been cut, and the hide is not damaged.

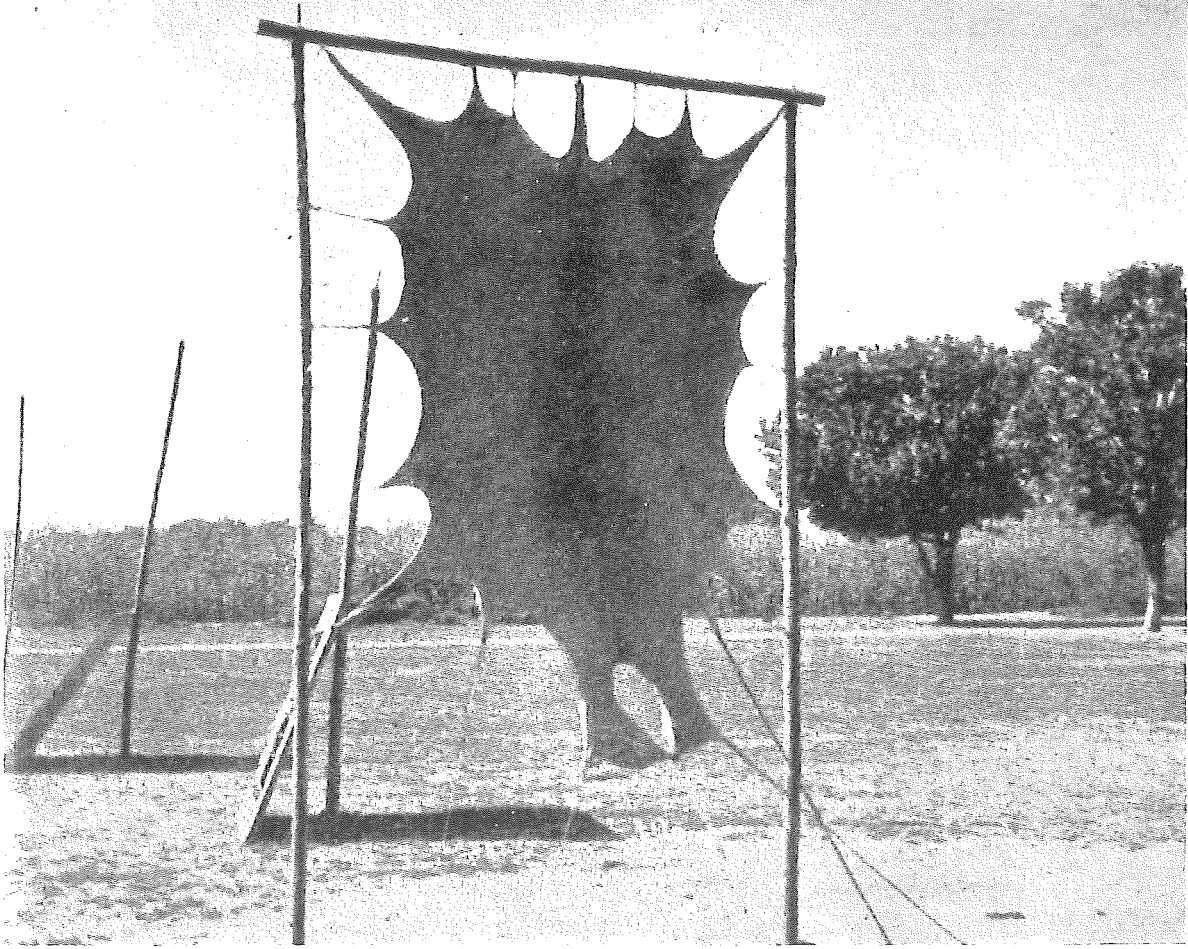


Figure 42 (above). Another form of frame with a hide stretched on it. Note the excellent shape of the hide, the result of its being stretched, not merely vertically to give a long narrow shape, but evenly and symmetrically around the frame.

Figure 43 (below). Drying skins on a board, using toggles which do not necessitate the cutting of the skins and which support them clear of the board. If the hair or wool on the skins is long there is still insufficient circulation of air under the skin. Smooth flat boards are rarely obtainable in certain regions. This method is used more often to dry the tanned leather than the raw skins.

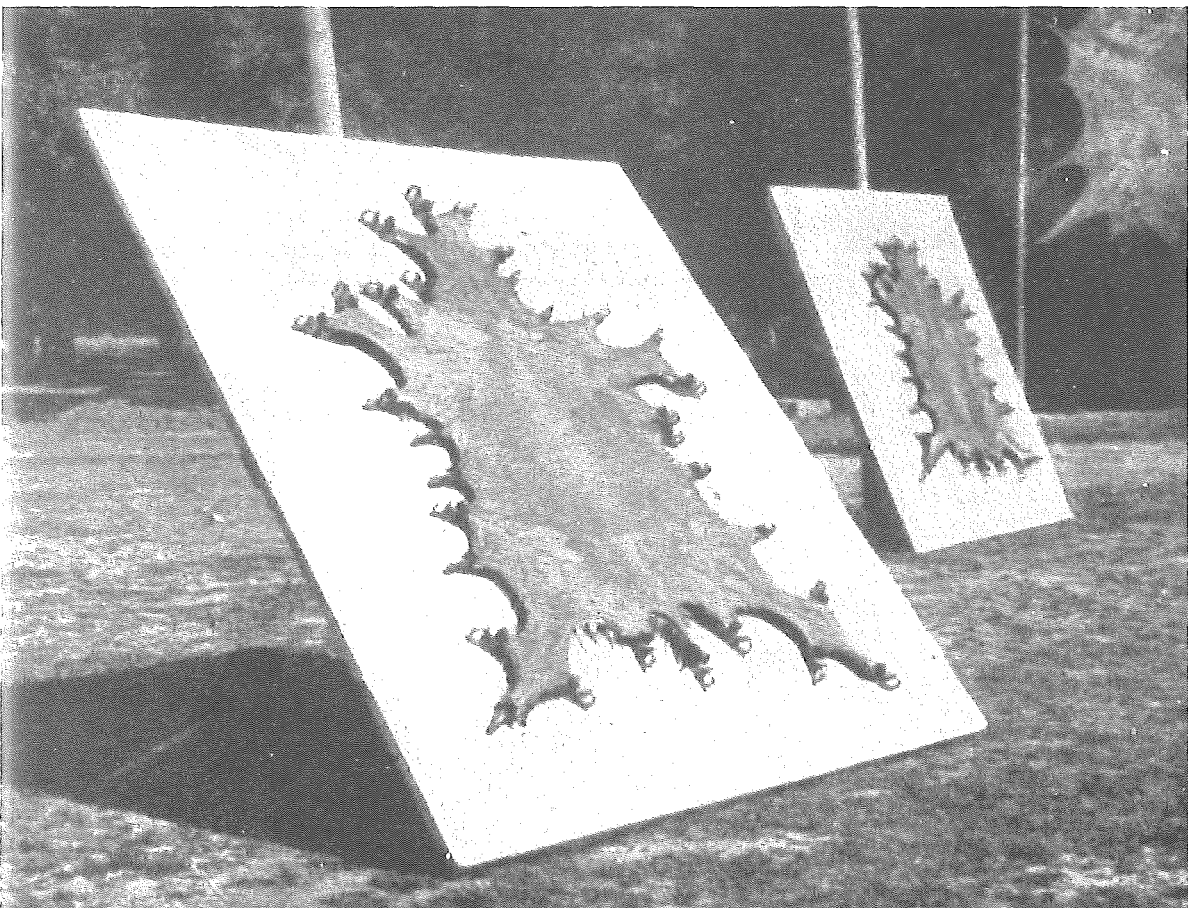




Figure 44 (above). Drying of hides on frames in sheds constructed particularly for this purpose in use in certain areas.

Figure 45 (below). Skins being hung over lines or ropes, with the hair turned to the inside. It is essential to keep the sides of the folded skins apart either with short twigs or with straw to allow free circulation of air and consequently quicker drying. Tanners prefer such hides, since they make better quality leather.



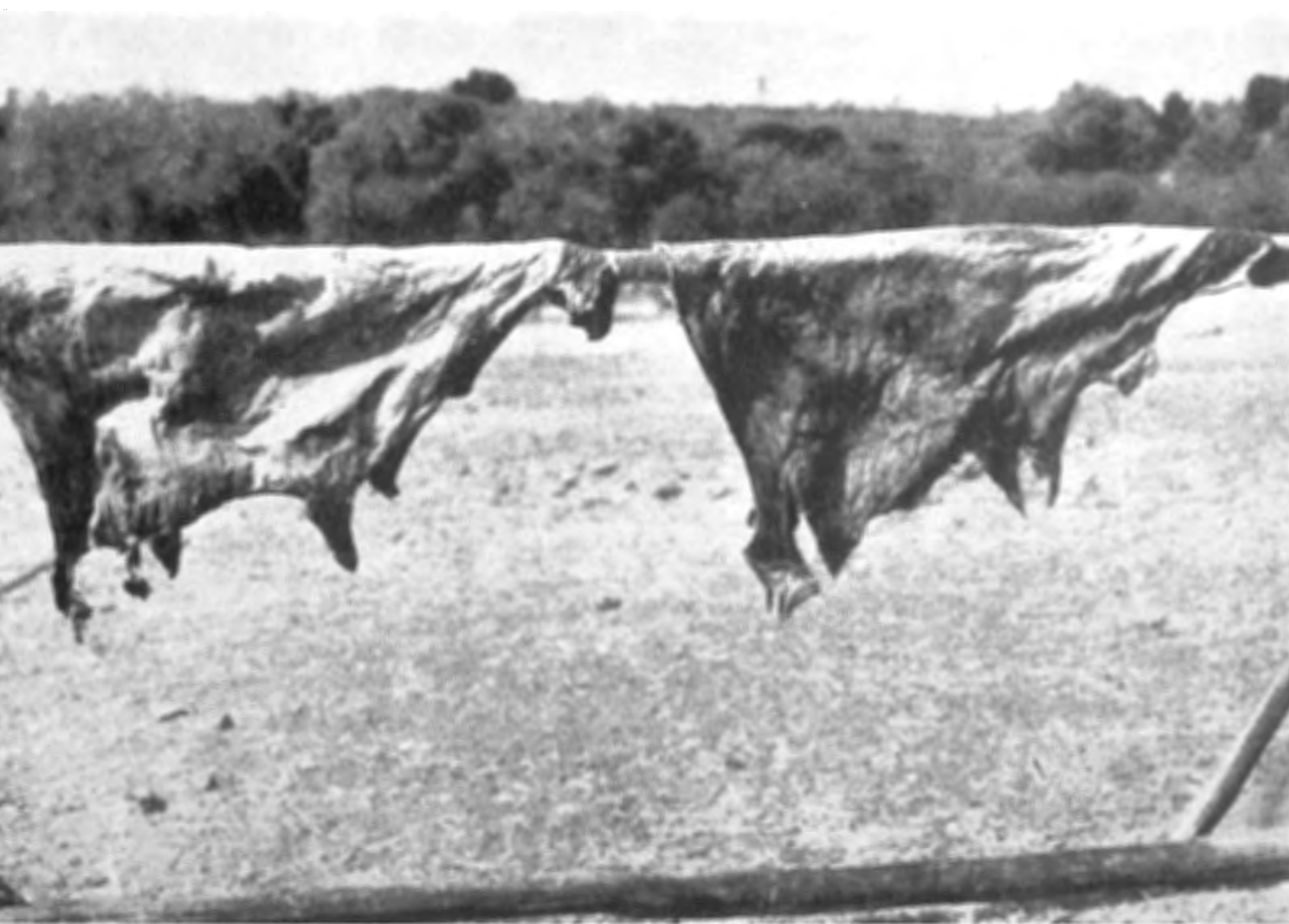


Figure 46. To allow air to circulate on both sides of the hide as it dries in the sun, an obvious method is to throw the hide over a pole, as shown in this photograph. Unfortunately, the best part of the hide, along the backbone line, now is drying under the same conditions as if it were lying on the ground, and putrefaction sets in along the pole where there is no air circulation. (Courtesy of Department of Information, Nairobi, Kenya.)

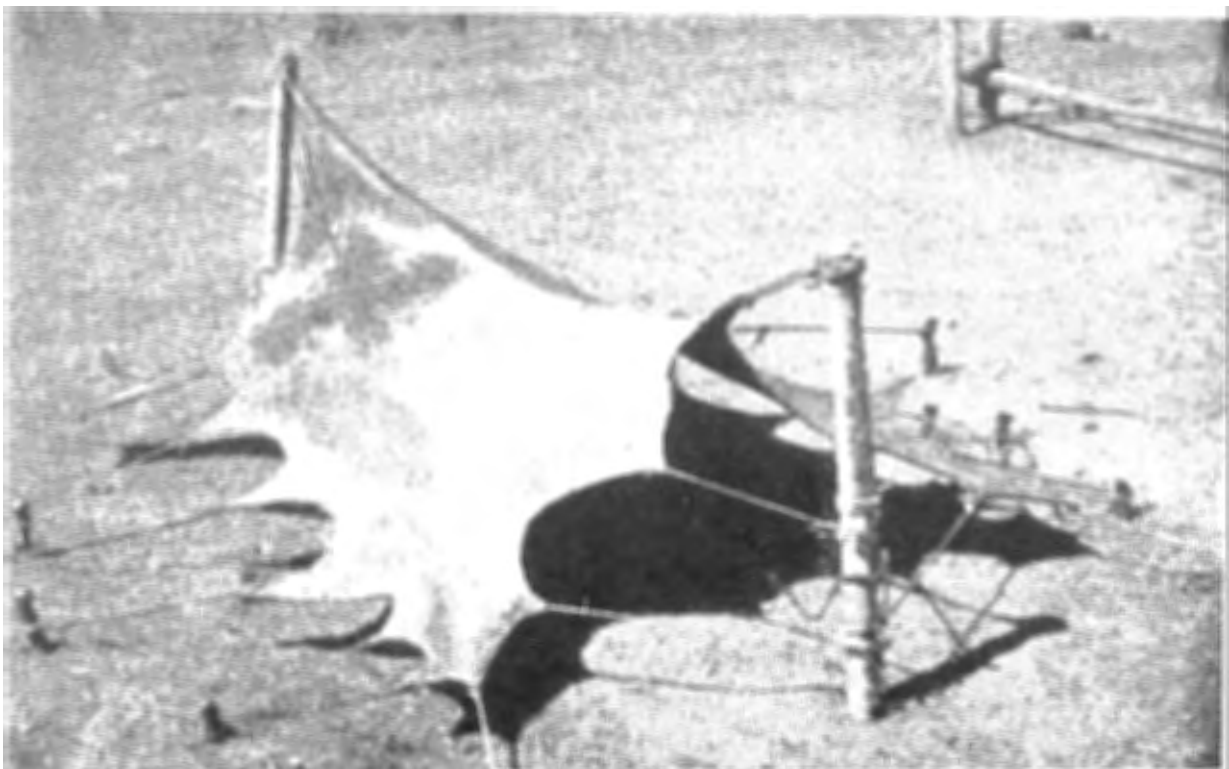


Figure 47. Local putrefaction damage along the backbone line, which is worse on the grain side than on the flesh side. The part of this pole-dried hide covering the pole has putrefied during drying because there was no air circulation along this line. (Courtesy of Department of Information, Nairobi, Kenya.)



Figure 48 (above). In the desert, where neither salt nor wood is available, the best method of curing skins consists simply of hanging them on the cord of a tent, flesh side uppermost, taking care to keep the sides from touching each other, and to separate the shanks with twigs or straw; the air can thus circulate freely over all surfaces, so that the hair and flesh sides of the skins are evenly dried.

Figure 49 (below). The "tent" method of drying, for use in areas where poles and frames are scarce. The backbone of the skin is supported on a wire stretched between two posts, and the edges of the skin or hide are stretched by cords to pegs in the ground along each side.



Even if the percentage of relative humidity is as low as 80, (and skins would dry eventually in the presence of rapid air circulation), putrefaction is very liable to develop during the long period when the skin is drying. The same is even more true for hides, as they take longer to dry than skins due to the fact that a fresh hide weighs more and is thicker. In such cases, therefore, salting is a more appropriate method. Curing by salting is broadly divided into two methods:

- (a) Dry-salting
- (b) Wet-salting

Dry-salting with Common Commercial Salt in Dry Climates

If a fresh skin is sprinkled with common commercial dry salt, a few minutes contact will show that the salt becomes wet and is absorbed by the water in a fresh skin. The application of salt has two purposes; it removes water from the hide or skin, and at the same time it delays putrefaction.

Time must be allowed for the external salt to reach the interior of the skin and still more to reach the interior of the hide. Solid salt will completely penetrate a fresh skin or even hide in a few hours, but in practice it is safer to allow longer. The more salt is sprinkled on, up to a certain proportion compared to the weight of a fresh hide or skin, the quicker will it penetrate the skin. Above this proportion salt is wasted, and nothing is gained. For the skins of a calf, goat or sheep, tests have shown that 40 to 50 percent of the weight of the skin is a reasonable figure. For heavy hides, salt to about 30 to 40 percent of the weight of the hide is adequate.

In the dry-salting method suitable for dry climates the best way to start salting action is to wash the flesh side of the skin with clean water, as shown in Figure 50. The hair or wool side is not washed, as it would retain too much water and, in fact, in certain instances washing prior to salting should not be effected at all.

The next step is as follows; the skin, after being well drained, is laid flesh up on a gently sloping even floor on wooden slats to allow for further drainage, or on a rack, and then spread evenly with half its weight of dry common commercial salt, with the edges turned in slightly to prevent the salt falling off (Figure 51).

Figure 50. The best way to start “dry” salting is to wash the flesh side of the skin with clean water on a sloping table, as shown here. The hair is not washed, as it would retain too much water.





Figure 51. After washing and shaking off the excess water, the first skin is laid on wooden slats to allow for free drainage, and half its weight of good common commercial salt is spread over the entire skin.

On this, a second skin is laid, flesh up (Figure 52) similarly spread, and then a third and so on, till the pile is of suitable height. Quite a quantity of the skins can be piled up, far more than could have been put in the pit shown in Figure 57. The pile is left for one to two days and in some areas for three to four days, after which the skins are shaken free of wet salt. In this partly dehydrated condition the skins are fully dried in the sun, suspended over a wire or a cord (Figure 45).

The skins merchant will inspect the skins before they are packed and a crucial test of a well cured skin is that there is no smell of putrefaction and that the look and feel are satisfactory (Figure 53). Later on, the leather-goods maker will appreciate receiving leather free from putrefaction holes and loose grain (Figure 54) instead of leather which results in losses when being cut up to make leather goods (Figure 55).

In some areas it is the custom to wash skins on the floor, by pouring on a little water, rubbing it off superficially and then sprinkling on a mixture of salt and water. This faulty way is shown in Figure 56.

Figure 52. Another skin is spread on the top and this also has half its weight of salt spread on it.



Sheep and goatskins are often subjected to another bad practice, being folded in the salted state and placed in a pit for two to three weeks, during which time the pit becomes filled with the liquid which seeps out of the skin (Figure 57). They are then removed, drained overnight under cover and dried on the ground in the sun. When these skins are removed from the pit, they are characterized by a strong putrid smell so that it is not surprising that this method has been found to produce leather of inferior quality. In hot weather it may result in the destruction of the skins by breaking into pieces.

Prolonged storage of skins at or about 27°C (80°F), *in the wet condition*, is dangerous, even in the presence of a liberal supply of salt, because putrefactive bacteria can become salt-tolerant (see also under “Wet-salting with Common Commercial Salt,” page 70, and “Notes on Common Commercial Curing Salt,” page 72).

Figure 53. The merchant performs the crucial test of a well-cured goatskin. He is satisfied if there is no smell of putrefaction.





Figure 54. The leather-goods maker is pleased when he gets a piece of leather made from a skin free from putrefaction holes and loose grain. (See also *Figure 55.*)



Figure 55. Leather showing a number of putrefaction holes and other defects which mean losses for the leather-goods maker.



Figure 56. A faulty method of curing goatskins and sheepskins with salt. The wet skin is placed on the floor, a double handful of salt is placed in the middle and a canful of water added, and the salt and water are spread over the flesh.

The secret of good curing in hot climates is to remove the water from the skin in as short a time as possible. It is, therefore, advisable to avoid even a superficial wash, to avoid adding water to the curing salt, and to avoid keeping skins in a wet condition for many days.

A washing is permissible, even necessary, if skins have begun to dry as a result of exposure to a strong dry wind, say 10 percent relative humidity or less. This may cause such skins quickly to form a sheath of dry tissue on the flesh side, within an hour of being flayed. If dry salt is placed on the dry surface of such a skin, the water inside it cannot diffuse into the salt, nor can the salt enter the skin. In such a case, it is necessary to wash the flesh side of the skin so as to soften it, but it should be well-drained before applying the salt. The skin should then be left in a pile for one to two days and dried.

Even when skins are left fully salted but wet for only six days, they are liable to degradation if the atmospheric temperature range is 30 to 42°C (86 to 108°F). These conditions tend to produce skins easily torn when dried and liable to go to pieces in soaking and liming.

These results are avoided when the time in the salted but wet condition is restricted to one or two days. If at this stage the salt on the skins is actually in solution and has disappeared, and the skins are still wet due to insufficient draining after washing, a second salting should be given. When skins feel "cheesy" after salting, they will dry off rapidly and suffer no harm even if exposed obliquely to the rays of the sun during the drying off from the semi-dry condition.

Dry-salting of hides is done in a way similar to that of skins. They are salted in piles, flesh up, on a wooden rack (Figure 58) and the salt is used to an extent of about one third of the hide weight.

Racks on the floor are necessary to avoid the bottom hide being fouled by a mixture of blood and brine which drips away.

The pack of, say, 40 hides is left for three or four days, re-salted if necessary for another two or three days and dried as rapidly as possible. The slightly lower weight of such hides when dry is more than compensated for by the better quality and therefore the better price.

When draining has ceased, the hides may be re-piled flesh up on two racks.



Figure 57. The skin being treated by the faulty traditional method, which consists of rolling up the skin with the salt-water mixture in it and placing it in a pit from which the water, salt, blood and dung cannot escape. The pit is left filled for three weeks. Under these wet conditions, in a hot climate, the salt is completely ineffective as a curing agent.

Finally, the hides are either dried by suspension or laid on the ground in the early morning or evening sun, or in the shade either at once, or after a second salting. In practice, framing salted hides is very uncommon, as it is too expensive.

In order to “condition” for folding, each hide should be laid out flat in the morning or evening sun or shade, until the minimum moisture content necessary to permit of folding by the correct method is reached (see page 95 below on “Grading, Folding and Baling”). This condition is necessary in order to fold and ventilate without the risk of decomposition by the overheating of the unexposed and folded portion.

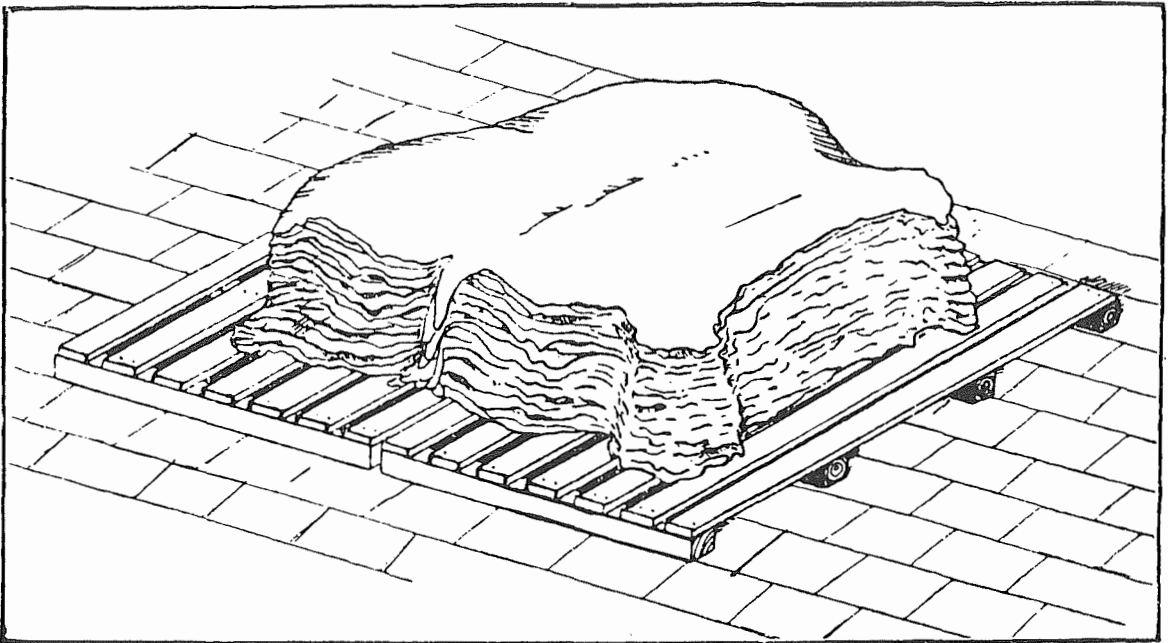


Figure 58. Dry-salting of hides is done by a method similar to that used for skins, as shown here. They are salted in piles on a wooden rack, flesh side uppermost. During curing the pile should be turned over to avoid heating, and when draining has ceased the hides may be opened out and piled flesh up on two racks.

Dry-salting with Common Commercial Salt in Damp Climates

Dry-salting with common commercial salt in a climate which is continuously humid is unlikely to be satisfactory, because, when the humidity of the air is above 75 percent, common commercial salt becomes increasingly damp until it actually forms a solution with the water absorbed by it.

Dry-salted skins, stored in a humid climate, are thus liable to lose salt by its dripping out of the skin as a solution, and hides and skins which have been salted in a persistently damp climate cannot remain dry during storage.

In some areas, particularly in Bengal, this difficulty is to some extent met by using a mixture of common commercial salt and anhydrous sodium sulphate, in the proportion of one to five. As sodium sulphate without water of crystallization can absorb a great amount of water, it is more suitable for curing in a damp climate. After the above treatment the skins can be dried by one of the approved methods without any risk of putrefaction. However, in a drier climate, common commercial salt is better because it is a more effective preservative.

Wet-salting with Common Commercial Salt

There are several versions of this process. One of the most primitive is wet-salting in pits, where the hides are laid flat in pits, one by one, with a layer of salt over each. The moisture is thus drawn out of the hides, which lie in a concentrated but frequently dirty brine.

Skins are often folded together and piled up in pits, which is a bad practice, as they quickly start to deteriorate. This method is therefore to be strongly condemned (Figure 57).

Wet-salting is better carried out in the same way as dry-salting, by piling the hides and skins on a clean wooden rack so that the pile is raised 5 to 8 cm. (2 to 3 inches) above the floor to assist drainage. The final drying, as described above for the dry-salting methods, is omitted. Skins should not be stored in the wet-salted condition in a warm atmosphere.

In the large curing establishments in Buenos Aires, from which the Frigorifico hides are derived, a method of wet-salting, combining brining and piling, has been developed. By this method, the freshly flayed hide is washed under a strong jet of water, which also cools it, defatted on a table, and the submerged in a tank of circulating brine for 24 hours before being sprinkled liberally with dry salt. The temperature of the brine is maintained at 13°C to 18°C (55°F to 65°F).

To counteract the damaging effects of salt-tolerant bacteria during wet-salting, various disinfectants should be added to the salt before

use. following materials have been found suitable for this purpose; the proportions given are per 100 parts of salt weight:

Sodium fluoride	2 parts
Sodium silicofluoride	2 parts
Sodium pentachlorophenate	0.2 part
Zinc chloride	0.5 part
Mixture of 2 parts soda ash and 1 part naphthalene	

Pickling

The preparation of pickled pelts involves two main operations - dehairing the skins, and treatment with salt and acid. Pickling is used in cases where it is convenient to unhair or dewool sheep skins locally and then handle the pelts as a separate article.

The skins are first dewooled by treating the flesh side with a paint consisting of a strong solution of sodium sulphide into which slaked lime has been stirred until it is of a creamy consistency. The paint so treated adheres to the skin, which then swells and tightens by absorption of water; its water content rises to about 80 percent, as against 60 percent in the freshly flayed condition.

After painting, the skins are either folded down the backbone, flesh side inwards, or stacked flesh to flesh, for 24 hours, after which the wool is pulled. After dewooling the pelts are washed, limed, delimed, bated and pickled. Deliming is done with a solution of ammonium chloride or sulphate in a drum or paddle. In the pickling operation the pelts are gently pushed ("paddled") round and round in the pickle solution of common commercial salt and sulphuric acid. The paddle used here is a rectangular wooden vat with revolving blades above it, but dipping about 30 centimeters (12 inches) below the surface.

The proportion of salt in the solution should be about 12 percent and the amount of sulphuric acid should be so adjusted that the final liquor, when the skins are removed, is about 0.01 normal (centinormal) or 0.5 percent, i.e. fully acid to the test paper or indicator Thymol Blue.

Paddling should continue for at least 3 hours, and after leaving all night, a further hour's paddling is given.

The skins are then removed, drained and packed into wooden barrels for export. These should be protected from winds or strong

draughts which increase evaporation and encourage the seepage of liquor into the wood of the cask.

Pickling, however, should be undertaken only where adequate equipment, e.g. drums, paddles, and fleshing machines, operated by highly qualified technicians, is available.

Pickled pelts should not be stored in any hot climate for much more than a year.

Notes on Common

Commercial Curing Salt

Purity

Common commercial curing salt, as used in industry, in which the basic principle is sodium chloride (NaCl), varies greatly in purity, which may be almost 100 percent, or as low as 70 percent in the case of natural salts containing also earth, clay and other salts.

The impurities found in the better grade curing salts are sodium sulphate, and chlorides and sulphates of calcium and magnesium. Magnesium and calcium chlorides, being more hygroscopic than sodium chloride, would tend to keep salt wet if the climate is humid, and the salted hides would remain damp. They also tend to form soaps with the natural fats in the skins, and these would complicate any subsequent chrome-tanning process. The total calcium or magnesium salt content of commercial curing salt should not, therefore, exceed 1 percent.

Size of Grain

Coarse-grained salt (6 mm. or more) is unsuitable for curing hides and skins, because the large grains absorb the water from them only slowly. It also causes dents and pits in the hide or skin which are difficult to remove. Finely powdered salt, if stored in bulk, sets into a solid block in damp atmospheres, and requires re-grinding before use. The best size is about 2 to 3 mm.

Denaturant

In many countries edible salt is taxed, and thus too expensive for curing and many other industrial purposes. To meet the need of

industry for cheap salt, it requires to be denatured, thus rendering it unpalatable. Several materials for this purpose have been used, some of which, however, are found by the tanner to spoil the leather made from skins cured with salt so denatured.

Such denaturants as copper sulphate, alum, iron oxide or bichromate cause difficulties in the tanning process. Admixture of materials such as petroleum products or coal tar compounds, in proportions not exceeding 1 percent, have been found satisfactory by the tanner, and also acceptable to revenue authorities as a means of preventing the salt being used for edible or cooking purposes.

Curing with Infected Salt

As salt can become infected with various bacteria during the curing process, it is obviously a bad practice to use it repeatedly. If, however, it is mixed with a disinfectant and is dry, it may with safety be used more than once. Mixing the salt with 2 percent sodium silicofluoride has been found to render it safe for re-use, and so treated it has no harmful effects on leather subsequently tanned with it.

DAMAGE AND DEFECTS

Many kinds of damage reduce the value of hides and skins. The causes are several, and some of them are described below, under four main headings.

Damage while the Animal is Living

Scratches

Scratches are a very common type of damage caused by thorns, barbed wire and horns. Goad punctures, generally in the buttocks, inflicted by sharp pointed metal-tipped staves, also reduce the value of the hide considerably.

Barbed wire damage can be prevented by the use of plain fencing wire, and horn rakes by polling or horn tipping.

Branding

The extensive use of the hot iron for branding cattle, as a means of proving ownership, is perhaps in some countries the greatest single cause of damage while the animal is alive. The burn normally penetrates the hide or skin and is visible on the flesh side (see Figures 59 and 60), rendering it quite useless to the tanner; it is usually placed on the rump or back of the animal and quite often on the thigh. Animal owners should be taught to avoid branding on the most valuable parts of the hide, and to confine it to the hump, the lower part of the legs, cheeks, pate, horns or hoofs, as shown in Figure 61.

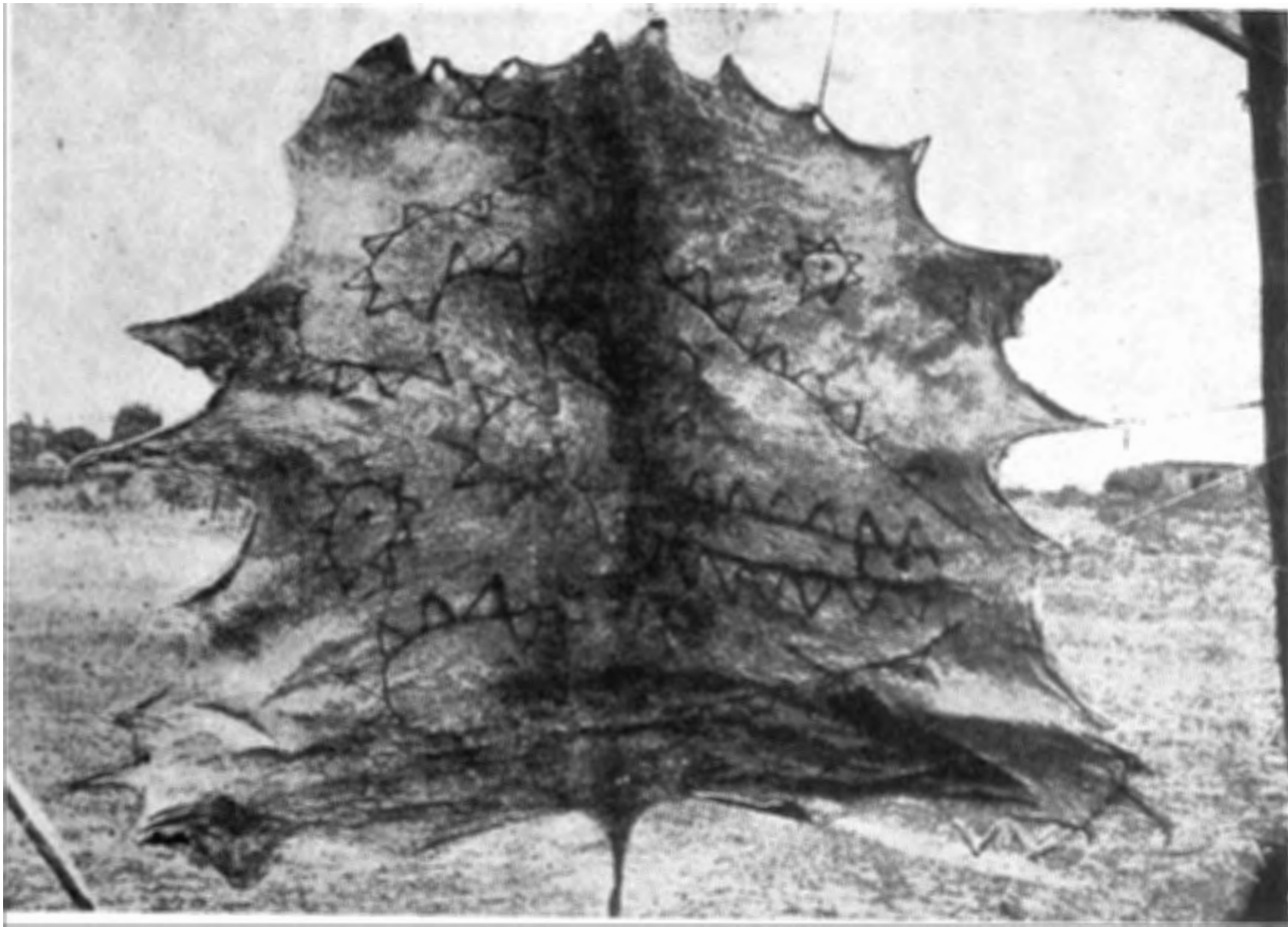


Figure 59. Many cattle owners and some goat owners brand their animals with a hot iron, in order to be able to identify their stock in case of loss. It is also often done in the belief that it will cure animals of diseases, but this should not be encouraged as the hide so marked will fetch a low price. If branding is necessary it should be done as shown in Figure 61. (Courtesy of Department of Information, Nairobi, Kenya.)

Chemical branding substances are relatively inexpensive and quite easily applied. Normally, the branding iron is dipped in the fluid and then applied to the hair. A certain amount of care is necessary, however, as some chemicals cause damage.

Another form of branding is used by cattle owners for curing animals of diseases. It is generally encouraged by such influential persons as witch doctors and the branding usually covers the infected parts of the animal. In some parts of Africa the whole or part of the animal is decorated by inflicting knife scratches which, on healing, produce black hair from the increased growth of the protein or pigment melanin in the hair follicles.

Mechanical damage from cattle horns

This is a common source of hide damage amongst animals with horns, particularly in countries where types of the old "long horn" cattle prevail. The animals are damaged usually in the abdomen, forequarters or hindquarters. The injuries frequently are neglected, and give rise to bacterial and parasitical infection which, if neglected, cause a large-scale "sloughing" of the tissues with resultant scar tissue formation and deterioration of the hide.

"Thorn" and "Stick-grass" lesions

In certain parts of the world, skins, particularly sheepskins, suffer from a defect referred to as "thorn," a condition which arises when small thorns or sharp burrs and grass seeds work their way into the substance of the skin and remain embedded there. This grass, *Cenchrus biflorus*, is quite common and has disastrous effects in parts of North Africa. It is also known as "Heskaneet," the Arabic name, or "stick grass."

The burr-like seeds cling and bury themselves in the long hair when the animals are grazing, puncturing and penetrating the skin. Tanned skins are frequently seen with both sides completely peppered with minute healed and open lesions and, in many cases, with part of the burr remaining in the skin. This fault is particularly serious in skins destined to be made into leathers for gas meters. There is no practical remedy, since herds must graze and, unfortunately, this type of "Heskaneet" is spreading rapidly.

Damage caused by Parasites, and by Fungal and Virus Diseases

Mange

Mange is a skin disease of which the commonest type is known as follicular or demodectic mange, and is caused by parasitic mites visible only under the microscope. It is spread by contact with infected animals or enclosures, the mite living in the hair follicles and under the surface of the skin. After mating, the females move deeper into the skin to lay hundreds of eggs which, when mature, spread and do further damage.

The condition can be detected fairly easily by examining the flesh side of air-dried hides, noting the round "cheesy" yellow spots and the dried lesions in the hair. During the early tannery processes the "cheesy" mass is washed out leaving empty pockets, thus producing a pitted and scarred grain surface, and reducing the value of the leather considerably.

Scabies

There are several varieties of scabies, but they may be considered collectively for the purposes of this paper.

The mites multiply prolifically under the skin surface, and hides damaged thereby have a coarse grain, and lesion and scratch scars, so that they are totally unsuitable for the production of good quality leather.

Ticks

These blood-sucking parasites are usually found attached to the tender parts of the skin, the thinner portions of the hide such as the dewlap, the inner parts of the thighs and under the elbow, where they feed.

The damage takes the form of small holes, if the bite is made just prior to slaughter, or of small, more or less healed scars, which mar the smoothness of the grain and detract from the appearance of the finished leather. Secondary infections lead to far more extensive damage.



Figure 60. A piece of leather spoiled by branding.

Lice

Lesions caused by lice scar and damage the grain surface by the inflammation set up where the parasites have attached themselves.

Leeches

Leeches are aquatic sucking annelids which attach themselves in numbers to the skin of animals, particularly when they are watering. They concentrate near the surface of the water so that, when the animals are partially immersed in the watering pools, they attack in a more or less regular line around the rumps and down the bellies, finishing near the forelegs; they make small punctures and give a bruised appearance to the grain.

Warble Fly Larvae

The larvae of these insects (*Hypoderma Bovis*), which are wasp-like flies, attack cattle and do very considerable damage to hides during the final stages of larval development. The larvae, hatched from eggs deposited on the hairs of the legs, penetrate the body and, after undergoing a number of changes, finally reach the skin of the back. Here they become encysted, the cysts having a hole to the outer air so that the larvae can breathe. The larvae reach maturity in this position and then work their way, hind-end first, out of the back, and drop to the ground in the pupa state to continue their life cycles.

A warble hole may in time heal over, forming a heavy scar. As many as six to seven hundred warble holes have been recorded in a single hide. A piece of leather showing warble holes is shown in Figure 62.

Treatment of the live cattle against the warble fly with a freshly prepared wash of derris root several times in a season is compulsory in a number of countries; the larvae cause not only hide damage but also a reduction in milk yield and in body weight and therefore in the yield of meat.

Ringworm

This is a common disease caused by a fungus, and is spread by direct or indirect contact. The fungus attacks the hair and its roots causing

circular inflammatory patches, later turning into scabs or secondary infections. The scars are clearly visible to the tanner, being shiny and circular in appearance.

Cow-Pox

The first symptoms of cow-pox, an infectious disease, are small inflamed spots, usually on the udder or tender parts of the skin. Later, blisterlike eruptions appear, and these become charged with pus.

Figure 61. Branding, if necessary, should be performed only on those parts of the animal hide which are of secondary importance to the leather industry, as shown below.



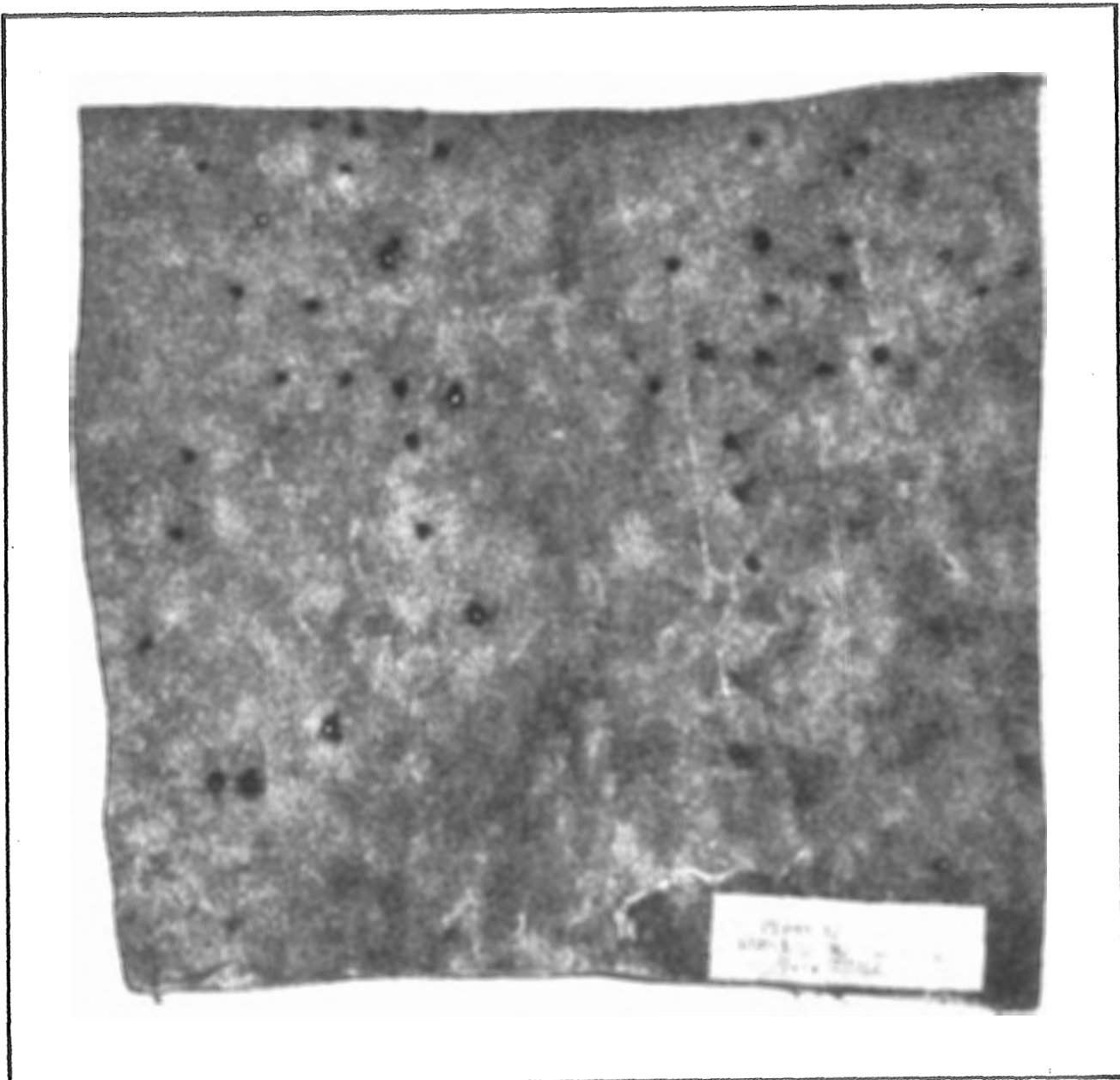


Figure 62. Leather spoiled by the larvae of the warble fly. They penetrate the skin and the subcutaneous layers and grow to a considerable size, under the hide on the back of the animal. A breathing hole is made in the hide, and is later enlarged to allow the larvae to emerge. When the holes do not heal, the leather becomes practically valueless.

Apart from the damage caused by the lesions, further damage is self-inflicted by the urge of the animal to rub the irritating parts on any rough object, causing further infection and damaged grain. Figure 63 shows a photograph of leather on which pox marks can be seen.

Hyperkeratosis or X-disease

This is a skin disease of unknown origin whose characteristic symptom is thickening and coarsening of the epidermis and hair follicles,

especially in the neck. Rupture of the hair follicles during unhairing, owing to the hair in the involved areas remaining tight, also results in inverted and exposed hair follicles protruding above the grain surface, thus giving a rough finish.

Rinderpest

This virus disease causes dark, scabrous discolorations, and the hides of animals dying from it are thin and light.

No other lesions directly attributable to the disease itself are found on the hides, but the poor light hides yield thin sole leather with thin fibers and little resistance to abrasion. In addition, the thinness may make old scars and blemishes more easily seen, while sores and abrasions may develop from struggles after animals have become too weak to stand.

Trypanosomiasis

As would be expected from the progressive anaemia and emaciation of animals dying from this disease, the hides are thin and light, and there is often a marked loss of hair and general marked exaggeration of all old scars and wounds. Apart from the loose weak structure of the debilitated hides, the latter are often damaged by "struggling" lesions, while the terminal prostration of the dying animals may lead to putrefactive damage.

Streptothricosis

Many African hides are damaged by this disease, which commences as inflammatory and suppurative lesions which later break spontaneously or become indurated. The severity of the lesions varies with season and climatic conditions, but even in the more dormant form they cause blemishes to the superficial leather tissues.

Sweating sickness

This is a disease of cattle in Southern Africa. At certain times of the year the animal shows clinical symptoms of extreme irritation, accompanied by sweating, under the forelegs and extending along the body. The cause is unknown but the animal rapidly loses condition and frequently rubs against posts and trees. The hides from such animals are frequently of poor quality, which is the result of this constant rubbing of the itching parts.

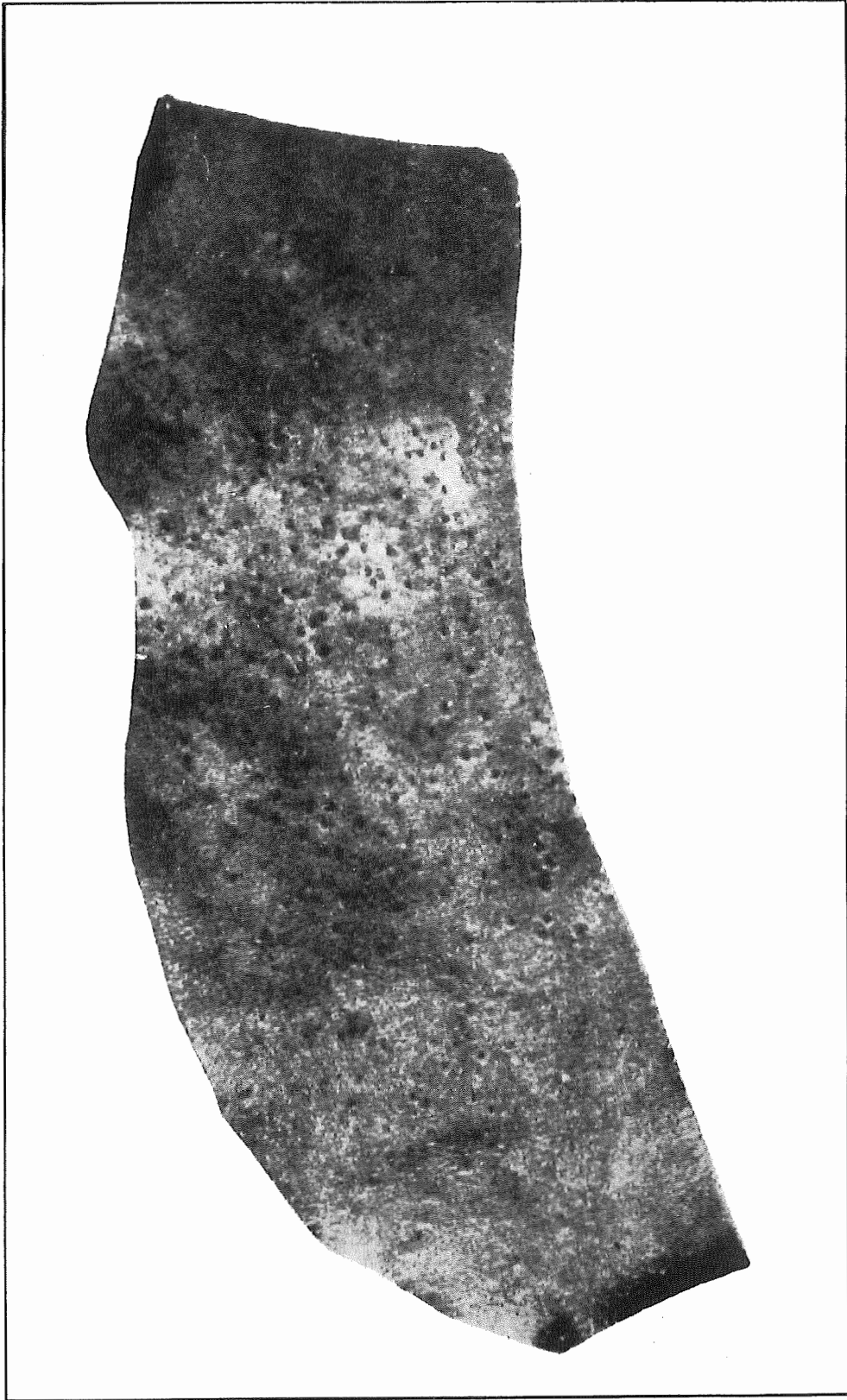


Figure 63. The black spots on this piece of leather are cow-pox marks.

Anthrax

Although the hides of animals dying from anthrax show no actual defects due to the disease itself, mention must be made of it. Whenever cattle die suddenly for no obvious reason, anthrax must be suspected, and a veterinary officer, whenever possible, should be called in. Flaying of an animal that has died from anthrax is never permitted. This disease causes sudden death, and all tissues of animals so affected contain spores of the anthrax bacillus which may infect anyone handling them, as anthrax spores remain viable for a long time. Even workers in centers thousands of miles away, handling hides and skins and other livestock products from anthrax-diseased animals, know the dangers under the names "rag-sorter's disease," "wool-sorter's disease," "Liverpool disease" and "malignant pustule or carbuncle."

Damage following Death, or during Flaying, Drying or Salt-curing

Fouling with blood and dung

Blood is difficult to remove from wool or hair, and is liable to interfere with efficient curing. Skins and hides should not, therefore, be allowed to come in contact with blood on the floor of the slaughterhouse.

Bruises

Unnecessarily hard beating of animals with sticks and ropes when driving them to slaughter causes bruises on the meat, but also leads to blood extravasation in the hide or skin over the bruised area. The smaller blood vessels become ruptured and the flesh side of the fresh hide or skin appears red. Unless the hides and skins are carefully cleaned and dried without delay, local accumulations of blood will quickly putrefy and cause blemishes or weak spots in the final leather.

Similarly, when animals are thrown preparatory to the Mohammedan or Rabbinic method of slaughter, bruising often occurs if they are allowed to fall heavily on concrete floors.

Bruising also occurs if animals are driven so that they jam in doorways or knock each other against the walls, and every effort should be made to avoid this.

Bruising immediately before slaughter increases the risk of putrefaction and, in addition, the grain surface may be damaged by abrasions and cuts.

Inadequate bleeding

If carcasses are not bled out completely at the time of slaughter, blood remains in the vessels and capillaries of the hides and skins.

Figure 64. Leather made from a calf-skin which has been badly cut and damaged by knives, so that its value is considerably reduced. (Courtesy of Department of Information, Nairobi, Kenya.)



If cleaning and drying are delayed, bacteria may develop more rapidly along the blood vessels than through the substance of the hide or skin.

As a result of bacterial spread from the blood vessels, hide and skin fibers in their vicinity are destroyed, and open channels, following the course of the blood vessel, are formed through the hide or skin substance. Unfortunately this defect cannot be seen in the dried hide and only shows up clearly in the final stages, especially if the leather is glazed; the characteristic appearance produced, with shallow grooves on the grain surface following the pattern of the damaged blood vessels, is the reason for the term "veiny" often applied to such leather.

Rubbed or dragged grain

This damage is due to abrasion of the grain surface, usually the result of dragging the live animal or carcass over rough ground.

Flay cuts, gouge marks and scores

Attention has already been drawn to the extensive damage, caused by the careless use of the knife, (and often the hatchet, in the case of buffaloes), and usually by the use of knives with pointed tips, during the removal of hides and skins from carcasses, and during removal of surplus flesh and fat.

These defects can all be avoided. Some examples of these faults are illustrated in Figures 64, 65 and 66.

Bad pattern

The correct method of opening up a carcass has already been described earlier in this paper. No deviation from the ripping lines as shown in Figures 6 and 7 should be permitted, since otherwise the final shape will not be symmetrical (Figure 9).

This may not appear to be a very serious matter, since the shape of hides and skins cannot affect their conversion into leather. However, a bad pattern does seriously affect the usefulness of hides and skins for the production of commercial leather of recognized grades, as hides and skins are not uniform in structure over the whole body and the belly portion, for example, is much less valuable than the butt for certain purposes.



Figure 65. The flesh side of a hide which has been very carelessly or unskillfully removed from the carcass. The knife has cut deeply into the hide substance, and however clever the tanner and leather-goods worker may be, the damage is irreparable and the value of the hide may be reduced by as much as 75 percent.

Delay in cleaning, drying, or curing

Damage through putrefaction caused by inadequate washing, drying and curing has already been discussed above in the section "Curing of Hides and Skins." Good leather can never be produced from badly cured hides and skins (Figures 38, 47 and 55).

Overstretching and distortion

When hides and skins are laced to a frame for drying they should be under light tension just sufficient to stretch them to their normal shape. If they are too tightly laced to the frame, they come under great tension when they contract during drying, and this causes undue stretching of the thinner portions and rupturing of fibers. Thus the leather produced will be of lower breaking strength and have a looser structure where the ruptures have occurred.

If the lacing rope is too tight in one direction only, the shape of the hide or skin will become distorted, and its value will correspondingly fall.

Folding

If hides and skins are folded down the line of the backbone as soon as they leave the drying-frames or wires, they apparently suffer little damage. If they are allowed to become flint dry before folding there is a danger that fibers will be ruptured and cracks will develop in the leather as a result of the rupture of the grain.

Damage during Storage and Transport

Rubbing during transport

In subtropical and tropical countries many forms of transport are used to convey hides and skins from outstations to the more important markets. The motor-lorry, bullock-cart, and even animal transport, bulls, camels and donkeys are used.

Hides and skins are often loaded singly on to lorry transport or tied in loose bundles. Consequently, any movement will make the surfaces rub together and cause considerable damage, especially to

the grain, folded edges and corners. A lorry journey, for instance, of 300 to 400 miles over rough sandy and desert tracks can result in deep abrasions in the grain and portions of the pelt. This causes irreparable damage which could be reduced considerably by tighter baling, and if packing facilities were improved.

Rubbing damage, caused during normal transportation by road, rail and steamer is more or less negligible, but a certain amount of care is required to ensure protection of bales against rubbing and tearing on the outside surfaces, by adequate covering with hessian or gunny, especially in the case of skins.

Wetting

The importance of protection against wetting by rain and floods and contamination by sea water during shipment cannot be overemphasized. If hides and skins are accidentally or, as in many cases, negligently wetted and not immediately dried out, bacterial action will set in again as a result of the loss of salt. In the case of air-dried hides or skins, wetting leads to even more active bacterial action. Pickled skins are also affected by the removal of the salt, which causes acid swelling. In all cases considerable fiber destruction takes place, resulting in serious losses.

Such damage can be reduced considerably by ensuring that hide stores are constructed with rainproof roofs and floor drains and slopes to counteract any risk of flooding. All piles of hides and skins should also be kept clear of the floor by stacking on racks to raise the bottom hides at least ten centimeters (four inches) off the ground. In many countries, a simple shed will give sufficient protection.

Railway and shipping authorities should cooperate by covering hides and skins with tarpaulins during the rainy seasons in railway yards, and by stowing shipments in suitable holds away from iron decks.

Vermin damage

Damage to hides and skins in store is not generally excessive, but persistent attacks by gnawing rodents can reduce good hides and skins to third, and even reject or glue-stock quality.

Precautions against this damage would include keeping stores clean, periodical movement of stocks, and the use of poisons, traps and cats.

Another objectionable contamination is the defilement of stocks by rat, bat and bird manure. This is not, of course, damage in the usual sense, but the resulting appearance would undoubtedly harm the reputation of any trader.

Insect damage

By far the most serious damage to which hides and skins are exposed during storage and transport, and especially so in areas where excessive humidity and heavy rains are common, is that done by insects.

The most destructive of these is of the beetle family, *Dermestides*, but it is the larvae of the *Dermestes maculatus* (*Vulpinus*) and *Dermestes lardarius* and not the beetle itself that cause the most damage. The beetles are about 8.5 mm. (1/3 inch) long and very dark brown and black in color. They lay their eggs on hides and skins generally in creases, folds and fatty parts of the flesh.

The larvae hatch out after 3 to 12 days, the period normally depending on the temperature and humidity. The larvae grow rapidly to about 1.3 cm. (1/2 inch) in length and are brown and hairy in appearance, hence the term "woolly bear" used by the trade.

Before becoming fully grown the larvae molt 6 or 7 times, and evidence of this can very often be seen in any heavily infested hide. The damage is caused by the extremely ravenous feeding and destruction of the hair and the grain, even to the extent of complete perforation. The growth cycle is continued when the grown larvae crawl away to pupate, eventually emerging as adult beetles.

White ants also cause considerable damage, forming their characteristic "lanes" throughout the bottom hides of a stack and gradually creeping up through the pile. Evidence of this was once seen in a country in Asia during the war when pressure of work retarded the routine turning and restacking of leather stocks. In less than 2 or 3 months white ants had totally destroyed at least 15 cm. (6 inches) of the lowest part of the pile. This can also happen to raw air-dried stocks.

It is recommended that insecticides be used to counteract this danger; it is essential, however, that they be applied correctly and, in the case of liquid, in sufficiently strong concentrations. Powders, to be most effective, should be spread evenly over the hair side and well rubbed in by hand.

Figure 66. A goat-skin, which has been very well flayed except for one cut. The good work of the operator has been spoiled by one careless slip of the knife. The skin is thus probably one grade poorer and worth less.



The following is a very good method of applying powdered insecticide to skins. A large wooden tray, which should be large enough to hold a skin laid flat, and be about 30 cm. (12 inches) deep, is partly filled with the powder. The skins are then well rubbed in the powder, both flesh and hair, and each one very lightly shaken before removing. This eliminates any waste, the excess powder being retained in the tray. Applying powdered insecticide in the open when it is windy should be avoided, if possible.

Liquids are applied by dipping and spraying both surfaces, and are popular and considered very effective in some parts of Africa. Exporters and hide dealers there find that a very suitable method is to dip all air-dried stocks in sodium arsenite solutions. The dipping (not soaking) is carried out in brick tanks, faced with cement and with a sloping hearth, similar to that shown in Figure 67, to drain excess solution back into the tank after dipping. However, when only a few hides are dipped daily, any simple draining system, such as a pole supported over the solution and on which the hide is hung, would be sufficient.

The sodium arsenite solution may also be applied to both sides of the hide or skin by spraying with a pump; an ordinary hands-pray gun is also adequate. After dipping or spraying the hides and skins must be laid out in the open, turning and airing off until dried out.

The solution for the sodium arsenite ("arsenic") dip is prepared by boiling:

- (a) 5 kg. (11 lb.) white arsenic (arsenic trioxide)
- (b) 5 kg. (11 lb.) soda or 15 kg. (33 lb.) washing soda crystals, and
- (c) 45 liters (10 gallons) water, until the arsenic trioxide is dissolved.

This solution is then diluted to 225 liters (50 gallons), so that the percentage of white arsenic in the final solution is 0.2.

It is sometimes the practice to use white arsenic in hot water only, but this is inefficient, because arsenic trioxide is not soluble in water. Such suspensions are wasteful and may contain up to 70 times more trioxide than the amount necessary when dissolved in a soda solution. A disadvantage of this method, however, is the poisonous nature of arsenic.

Recently, preservation of dried hides or skins against attacks of beetles, moths and other insects has been successfully achieved by

spraying with a 5 percent suspension of sodium silicofluoride, using about 4.5 liters (1 gallon) for 50 skins or 10 to 15 hides. To prevent rapid settling of the mixture and ensure even spreading over the skin, a small amount of a surface active agent is added.

Other insecticides to be recommended are as follows:

1. D.D.T. (dichloro-diphenyl-trichloro ethane) of not less than four percent in the powdered form;
2. Benzene hexachloride (1, 2, 3, 4, 5, 6 - hexachlorocyclohexane) containing not less than 0.5 percent of gamma isomer, in the powdered form;
3. Sodium silicofluoride in the form of a powder containing not less than forty percent of pure sodium silicofluoride;
4. p-dichlorobenzene (1, 4 - dichlorobenzene) in the powdered form;
5. Pyrethrum in the powdered form.

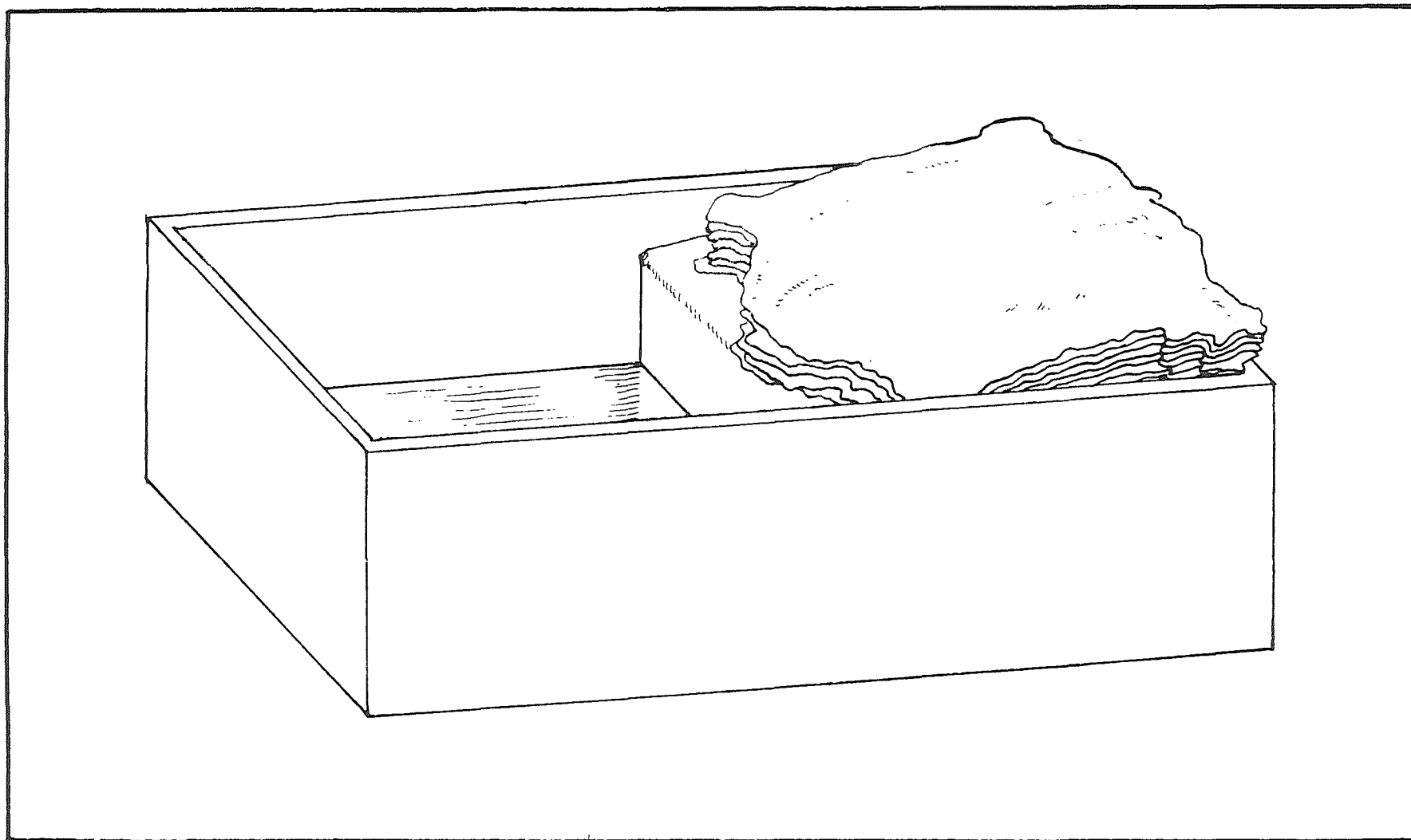


Figure 67. A type of tank, made of bricks and faced with cement, and with a sloping hearth, which is used for dipping air-dried hides in sodium arsenite solutions. It should be noted that dipping is not the same as soaking.

GRADING, FOLDING AND BALING

Grading

The buyer of a hide, when grading for quality will, of course, take into account any defects and damage such as described above under "Damage and Defects." First-grade prices will clearly not be obtainable if there are many defects.

A useful system of grading "green hides" — considering *flay defects only* — is the following.

First-grade hides are those which have no knife defects. Very slight scores and gouges may be overlooked. The pattern or shape is regular and symmetrical.

Second-grade hides have a good shape or pattern, and are reasonably free from knife damage, that is, up to approximately a sixteenth of the area may show concentrated scores and gouges, or approximately an eighth of the area if the damage is dispersed. One or two flay cuts near the edges in the belly or shoulder may be allowed.

Third-grade hides have up to half of their area damaged by the knife, i.e. showing cuts, scores and gouges. Hides showing excessive damage to the back or "butt" portion do not, however, fall into this category. The shape or pattern is irregular.

Reject-grade hides include all hides which show more knife damage than any of the other grades, including those which are badly damaged in the back or "butt" portion only. The shape or pattern is very irregular.

The objects of laying down three grades in addition to the first, which is the standard required to qualify for a flaying bonus, are



Figure 68. Hides should not be folded as shown here. Handling will be difficult and they will be damaged during transport.

to encourage buying by grade as well as by weight, and to build up a reputation among overseas buyers; the latter will, of course, be conditional on standardization of the grades of export consignments.

The quality of flaying might well be indicated on the hide by some distinctive mark. Each slaughterhouse could be supplied with cutting-edged marking hammers (see "Hide Trade Equipment and its Use," below), with a design to represent each grade, and a symbol indicating the slaughterhouse or source of origin. The tail is laid flesh up on a flat surface of a piece of timber or section of a tree trunk, and a cut is made about five to ten cm. (two to four inches) from the base of the tail with a well directed blow; the mark thus made will be permanent and will survive all tannery processes.

Folding and Baling

If the dried hides and skins are to be exported, folding and subsequent baling after grading are important for good marketing.

Hides should not be folded as shown in Figure 68, as handling will be too difficult. They should be folded and piled as demonstrated in Figure 69 or Figure 71.

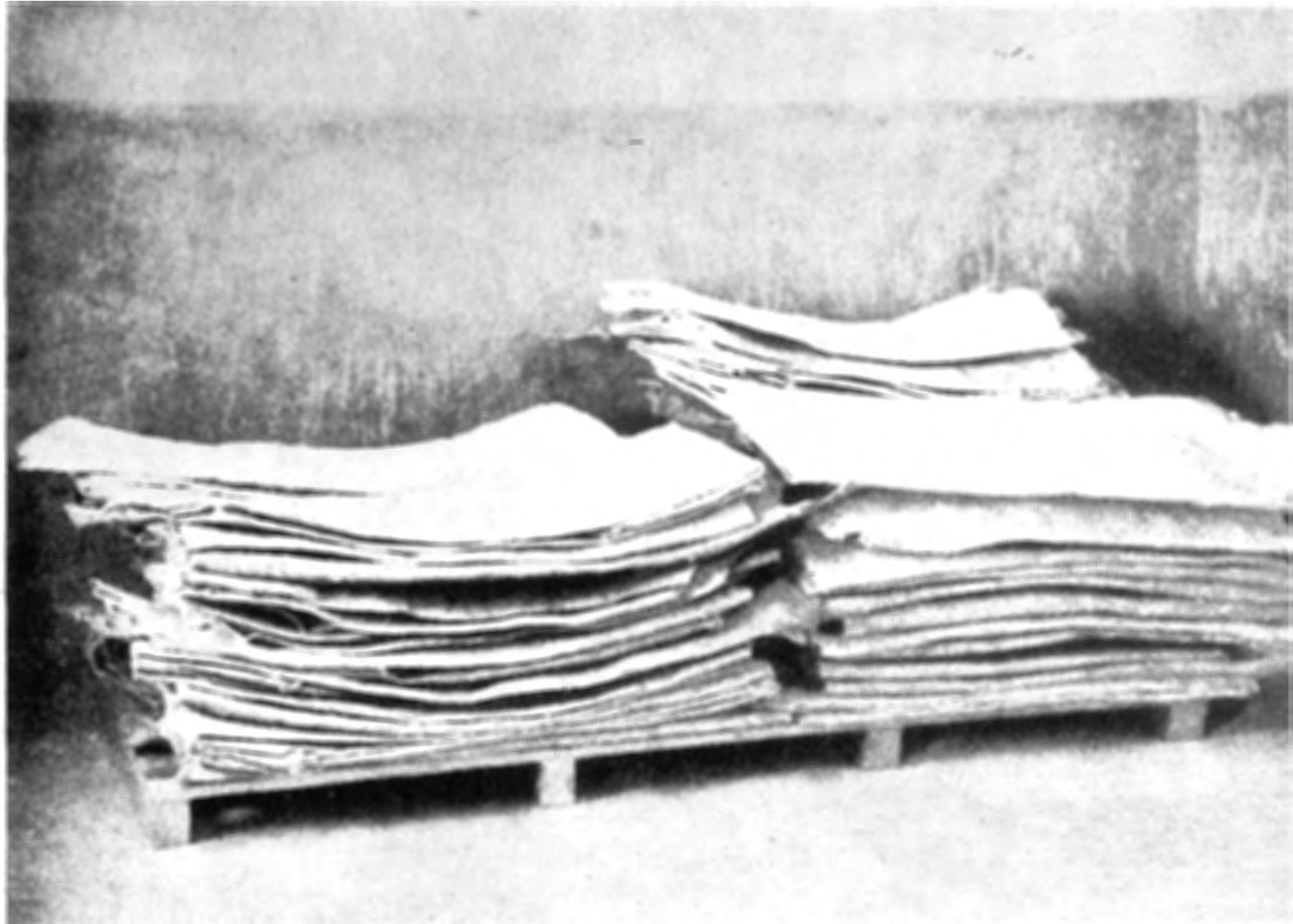


Figure 69. To avoid damage during transport and to make handling more easy, hides should be folded as shown in this photograph.

Folding can be done in the following way (see Figure 71):

1. The bellies are folded along the lines *a-a* and *b-b*, but not more than 1.3 meters apart. The long hind shanks are also folded in. In order to fold symmetrically, and ensure that all packages are of the same size, the worker uses a stick, as can be seen in the action photograph in Figure 72.
2. The next fold, along the line *c-c*, should not be more than 1.5 meters from the fold of the tail.
3. The fold down the ridge of the back, along the line *d-d*, should be made carefully to ensure a rectangular shape.



Figure 70. Folded hides, tied together with wire. They will be damaged during transport at the places where wire and hide are touching. It would have been better if a piece of gunny or skin waste had been placed between the hide and the wire as protection.

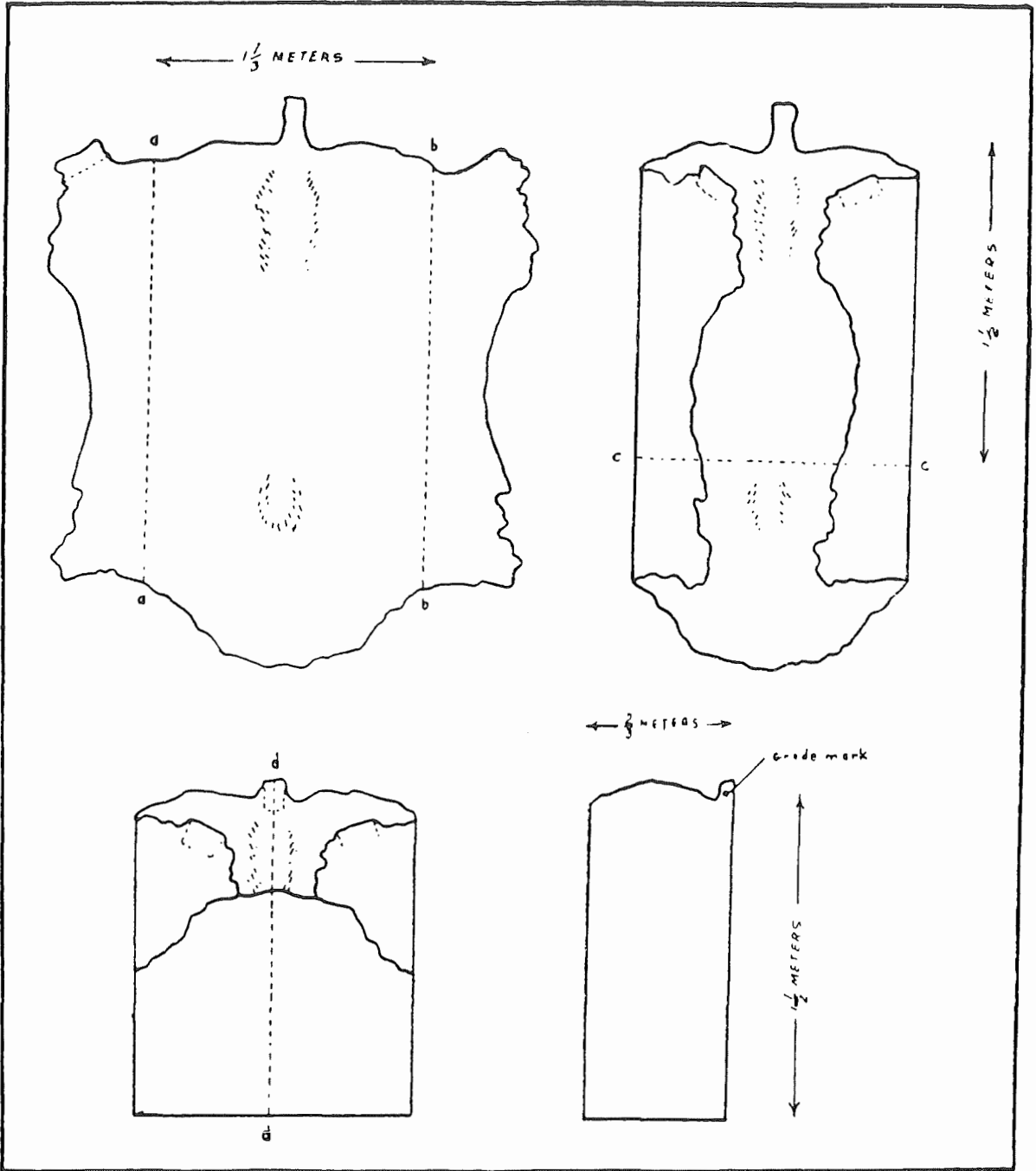


Figure 71. Diagrammatic sketch showing how hides should be folded. The bellies are folded along the lines a-a and b-b, not more than 1.3 meters apart, as shown upper left. The long hind shanks are also folded in. The next fold, shown at upper right, should be made along the line c-c, but this fold should not be more than 1.5 meters from the fold of the tail. At bottom left, the fold down the ridge of the back is shown. This fold, along the line d-d, should be made carefully to ensure a rectangular shape. The pack thus obtained is illustrated bottom right. Its maximum dimensions are $1.5 \times \frac{2}{3}$ meters. The packs later on can be put into a baling press, such as the one depicted in Figure 87.



Figure 72. A hide being folded by the method shown in Figure 71. The worker uses a stick, in order to ensure symmetrical folding.

The dimensions of the package must not exceed $\frac{1}{2}$ by $\frac{2}{3}$ meters. The above method cannot, however, be used in all climates; in extremely dry weather, for example, the repeated folding would cause cracks.

Baling prior to export can be done by hand, but several common types of power-operated and hand-presses can also be used, particularly in very dry climates, for with them pressure can be applied sufficiently strongly without cracking the hides along the folds. This equipment is described in more detail at page 115 below.

HIDE TRADE EQUIPMENT AND ITS USE

Branding Irons

These irons must not be confused with the branding irons which are, unfortunately, so extensively used for branding cattle on the hoof for identification purposes. Branding irons used in the hide trade for identification purposes are used carefully and economically.

The iron, manufactured of special non-corrosive or heat resisting metal, is generally designed with one or two letter symbols of about 2.5 cm. (one inch) square for each symbol, and so cut to burn a precise figure of about 0.3 cm. (one eighth of an inch) in width.

They are used extensively as a method of marking air-dried hides to identify the source of supply, i.e. a specific zone or province, and this system should be made the subject of an ordinance which would be of value in a program aimed at improving hides and skins and maintaining certain standards.

Branding irons can also be used to mark the grade or quality.

The mark, whether grade or source of origin, should be burnt on the flesh side of a shank and about 2.5 to 5 cm. (one or two inches) from the edge.

Marking Hammers

Hammers for marking numbers and letters on hides and skins are used from the time the hide or skin is removed from the carcass until the leather is processed in tanneries.

For the identification of raw stock quality, hide markets introduce a single mark on the flesh side of the tail, made by a cutting-edged hammer having different designs for the various grades and letter symbols of the market concerned (Figure 73). These designs can be cut on both ends of the hammer head, thus doubling the life of the hammer. The cut or mark, if effected skillfully, can be seen throughout all tannery processes, but it is normally only required to the pelt stage, that is, after the hair or wool has been removed.

Another type is known as a slotted hammer, the head of which is designed with a cavity into which the stamps or dies are set and screwed tightly (Figure 74). The stamps are interchangeable and can be obtained either with a straight cutting edge, serrated or spiked. The sharp teeth-like perforation left by the stamp in raw stock can be readily identified on the finished leather.

Flaying and Ripping Knives

In many areas ancient indigenous flaying and ripping tools are still used (Figure 75).

The apparently widespread use of the pointed and two-edged knife for slaughter as well as flaying is without doubt one of the main reasons why knife damage by cuts, scores and gouges, as described above, has reached such appalling proportions (Figure 76, and the first two knives from the left in Figure 77).

Those who have to guide rural hides and skins improvement programs should make it their job to introduce improved knives to reduce this damage. Sometimes the new types are accepted, often not. In this connection it is well to remember the important part played by the blacksmith in the villagers' life and to realize that he could easily be instructed how to make a suitable knife instead of an unsuitable one (Figure 77).

The flaying knife of the type illustrated in Figure 78 is now used in many parts of the world, having a curved convex edge with a rounded tip and a blunt, slightly concave back edge. The shape of this knife edge greatly reduces damage by cuts and scores, provided it is used correctly, with confident and careful sweeps, avoiding the "picking" or "nibbling" action so commonly connected with pointed knives.

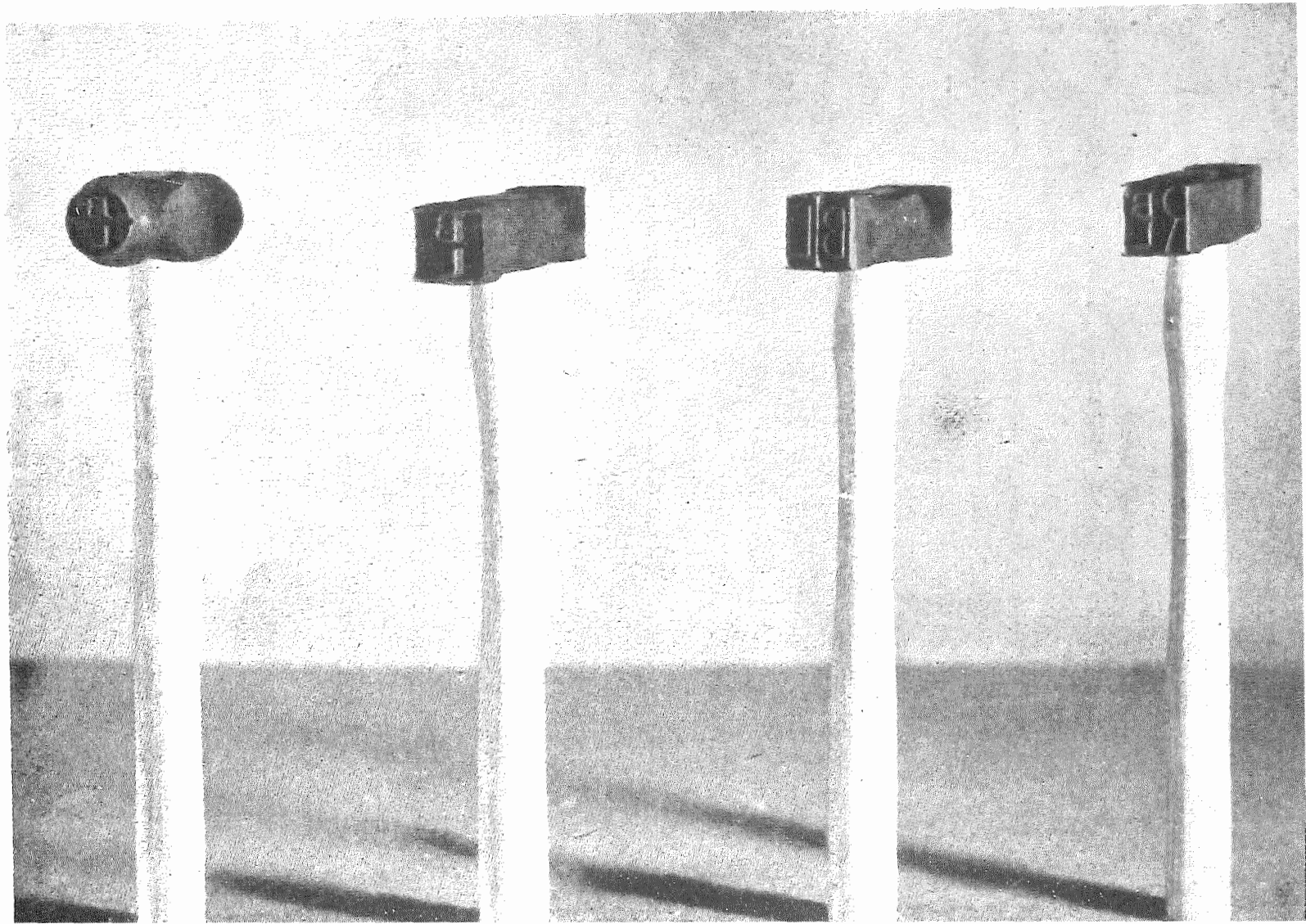


Figure 73. A set of cutting-edged hammers, all having different designs for the various grades and letter symbols of the market concerned. In this case, from left to right, they are used to indicate first, second, third grades and rejects, particularly for "green" grading in slaughterhouses.

There are also so-called “safety” knives constructed with a small button on one side of the blade near the rounded tip, which tends to keep the knife edge away from the hide, while at the same time the subcutaneous tissues are severed; or there is a specially constructed “edge protector” for use during some phases of the flaying process. There are many other similar type modifications of this knife.

Ripping knives have features similar to that of their curved flaying counterpart, but with a straighter cutting edge and curved end, in order to facilitate the action of “ripping” by inserting the sharp tip with the cutting edge uppermost, and thrusting forward and upwards with the blunt back edge, pressing on to and away from the carcass, thus cutting through the skin in the desired line, moving away from and in front of the operator.

The method of ripping with the knife edge pressing down through the skin and into the carcass should be avoided, since the knife is liable to cut into the meat, and spoil the appearance of the carcass.

Grindstones

The grindstone, of which a simple type is depicted in Figure 79, is an essential piece of equipment for maintaining a thin and sharp edge on flaying and ripping knives, particularly the initial grinding of a new blade when made from tempered steel.

The circular stone can be revolved and a knife sharpened by one operator using a foot treadle, but can also be turned by a second operator using the handle. The stone is kept wet by immersion in water held in a trough, and at no time should knives be sharpened dry.

The knife blade should be held to the stone, which revolves away from the operator, with the cutting edge forward, and back edge very slightly raised. The grinding should be continued until the steel has been reduced evenly along the whole cutting edge, without altering the original shape.

Sharpening Steels

The steel (Figure 80) is another very useful tool for maintaining a cutting edge during the flaying operation, and, in addition, should

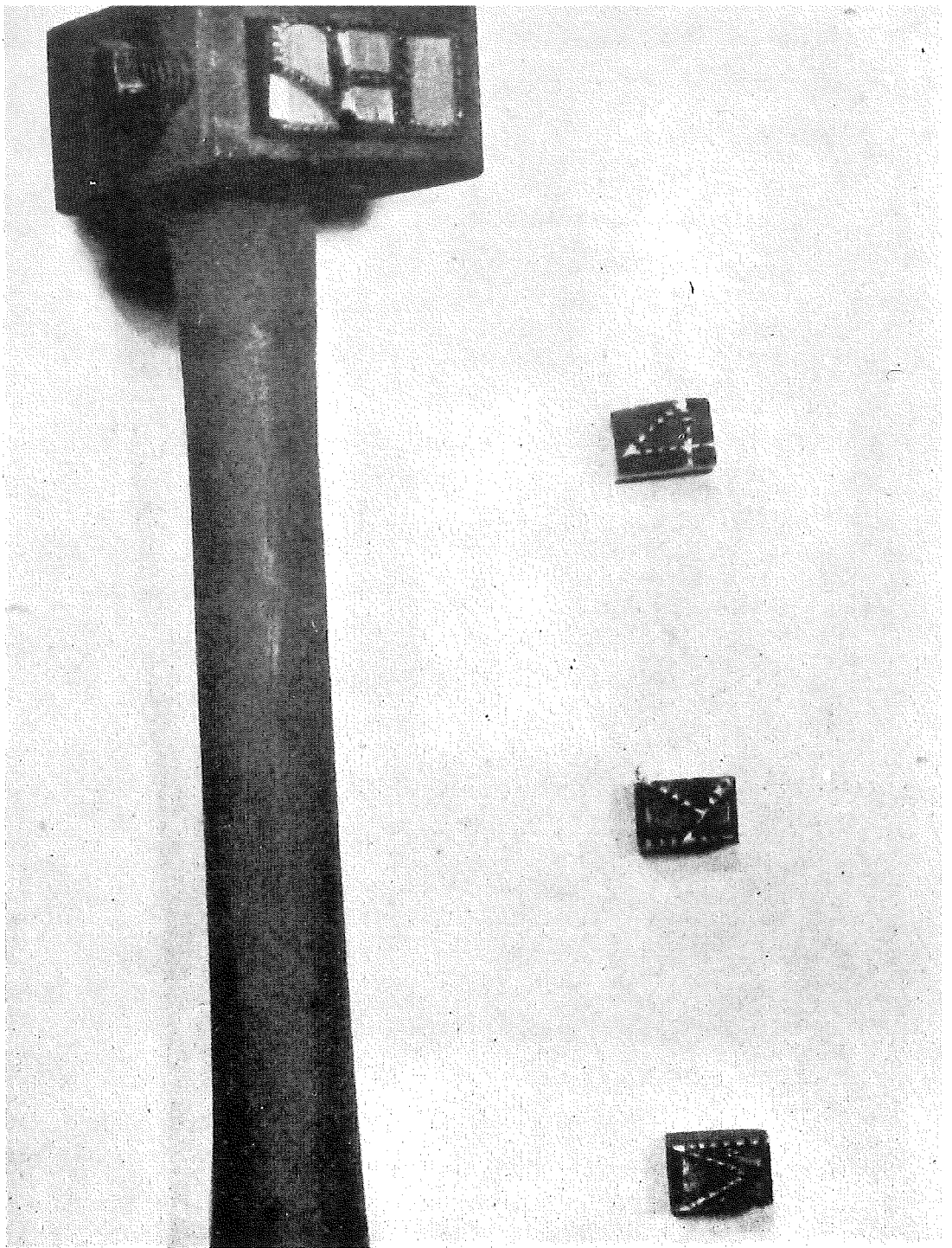


Figure 74. A hammer of the so-called "slotted" type. The head is designed with a cavity into which the stamps or dies are set and screwed tightly. Some spiked dies are shown on the right.

always be used immediately after the wet-stone grinding, to maintain a keen edge by removing any "feathered" edges caused by the stone.

The tool is made of hard steel with serrations running lengthways, which grip and pull into position any minute jagged unevenness of the edge when the knife is run down and over its surface.

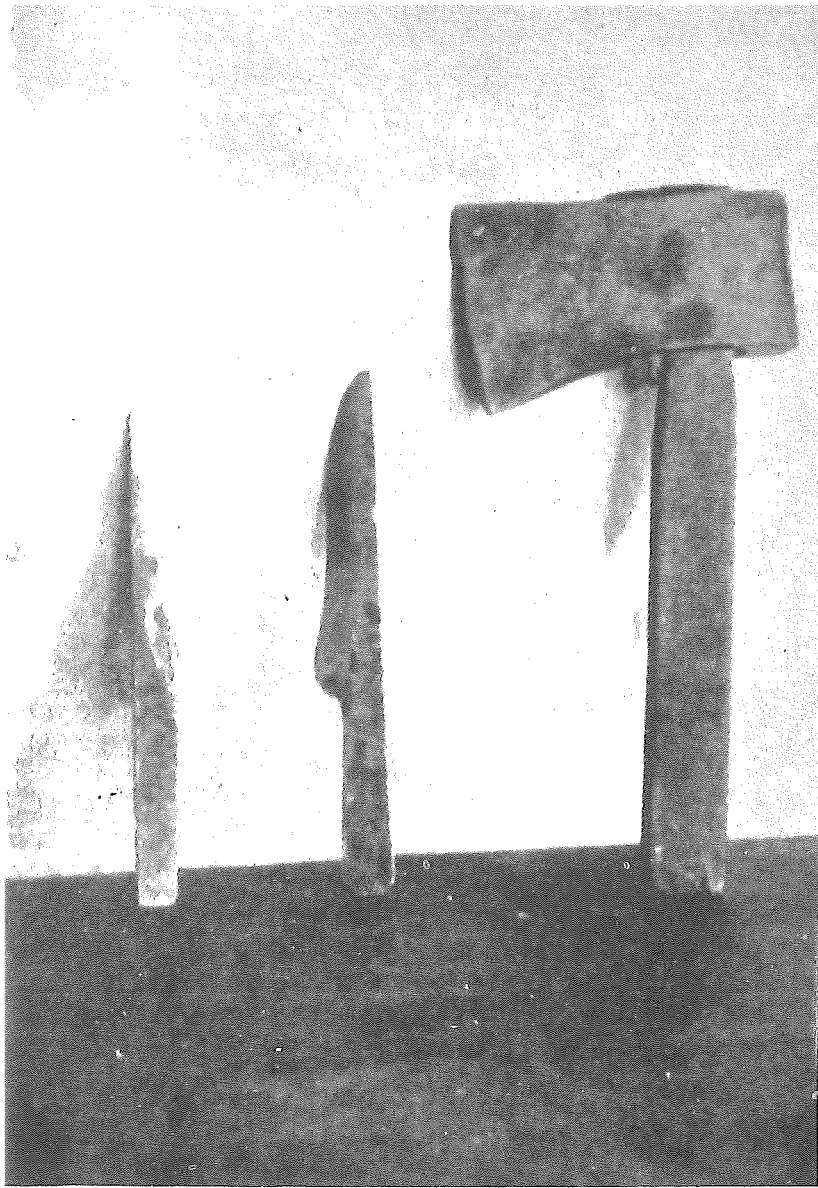


Figure 75. Some examples of unsuitable indigenous flaying tools which are still used.

The action of “steeling” a knife is that of sliding the blade edge against the steel in a downward motion towards the hand grasping the steel, changing the side of the knife edge against the steel with alternate strokes.

Hoisting Gear

The equipment recommended for elevating cattle carcasses, after floor flaying, is a half ton (minimum) triple geared endless chain pulley block, which should be suspended at least 4 meters (13 feet) from the floor. The hook of the hoist is lowered—or raised by a running hand-chain, and needs very little effort to raise a heavy carcass owing to the triple gearing (Figure 81).

Figure 76. Above is shown a two-edged pointed knife which, having the straighter edge, must only be used for ripping. The knife shown below, being curved, could be used for flaying. The grindstone on the right is essential to maintain a sharp cutting edge.





Figure 77. An illustration of the gradual advance made by a rural blacksmith in copying the imported knife shown on the extreme right. The other four to the left are locally made.

Other types, as depicted in Figure 82, are fitted with 1.6 cm. ($\frac{5}{8}$ in.) rope for a 3 meters (10 feet) lift, and can be operated to elevate, lower, lock and unlock with one rope only.

Gambrels or Gambals

The gambrel is essentially a spreading piece designed to hold the carcass in the elevated position by the hindlegs. An example of this is seen in Figures 11 and 12 where, in this case, the gambrels are made of steel. Wooden gambrels are also used extensively, with notches on the upper edge so as to take carcasses of various sizes (Figure 83).

Tail Grip or Tail Extractor

The tail grip was designed solely as an aid to improved flaying and is widely recommended and used. The design is simple and can eventually be manufactured locally, as can many of the other pieces of equipment described here. It consists of a steel hook fastened by a swivel joint, allowing free horizontal movement, to a single or double trellis, which is made to retract and has open serrated jaws bent at right angles (Figure 84).

The exposed tail bones are gripped between the jaws which tighten with increased pressure as the hide is pulled off, as shown in Figures 11 and 12.

The use of the tail grip avoids extensive knife flaying round the root of the tail and eliminates knife damage entirely, since the flayers are able to pull the hide off the back to the hump.

The Humane Killer

Whenever possible, animals for slaughter should be killed humanely. Several types of equipment, such as the captive bolt, have been designed and are in use as "humane killers" in many parts of the world.

The action is that of a spring-loaded bolt, driven forward for about 5 to 8 cm. (2 to 3 inches) by the explosion of a cartridge behind it. The bolt penetrates the skull. One of the instruments, shown in Figure 85, replaces the heavy long-handled "pole axe" which had to be used with great skill and accuracy to avoid undue suffering to the animal.

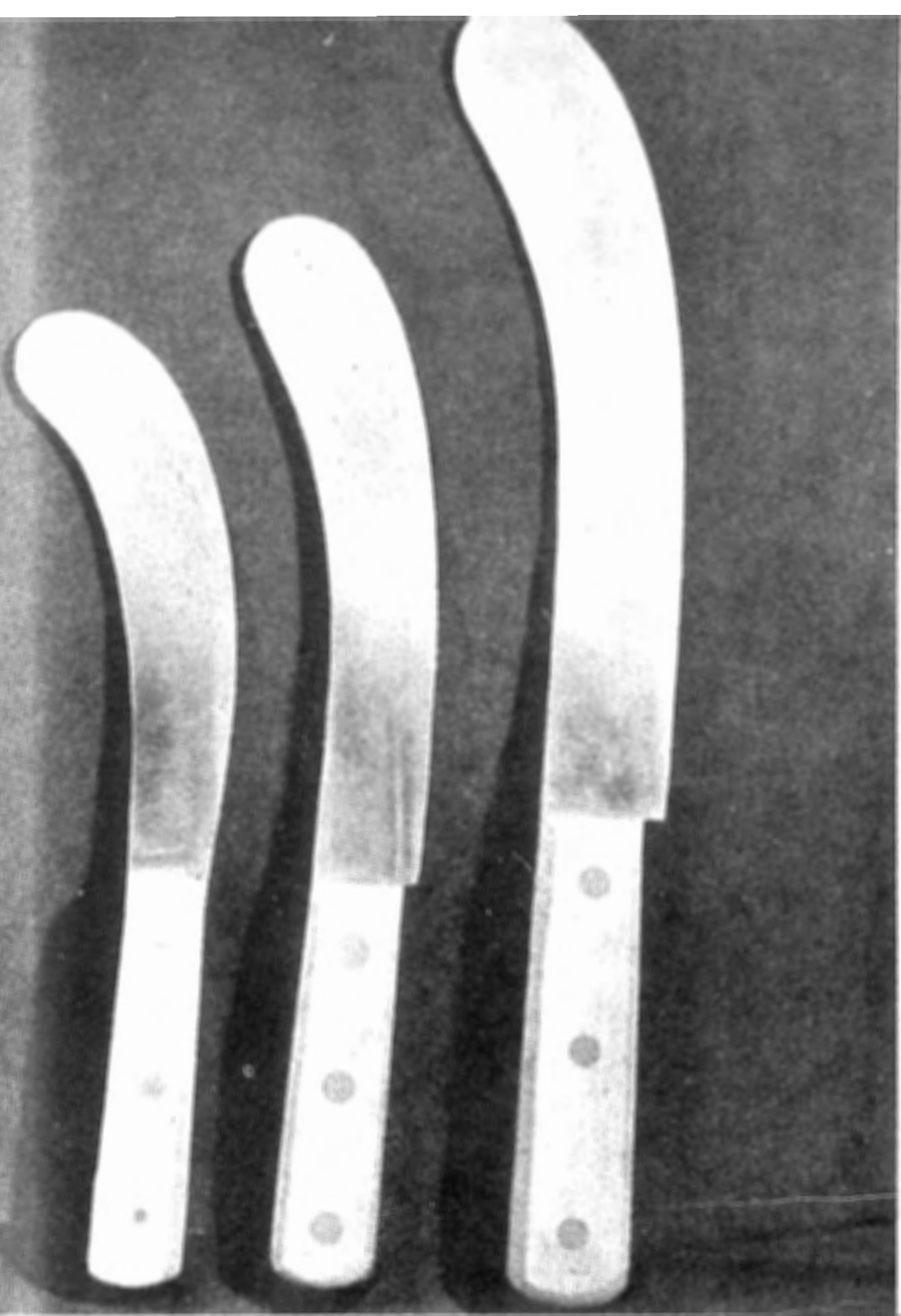


Figure 78. A set of improved flaying knives, now used in many parts of the world, having curved convex edges with a rounded tip and a blunt, slightly concave, back edge. The shape of the knife edge greatly reduces damage by cuts and scores, provided it is used correctly. (Courtesy of Department of Information, Nairobi, Kenya.)

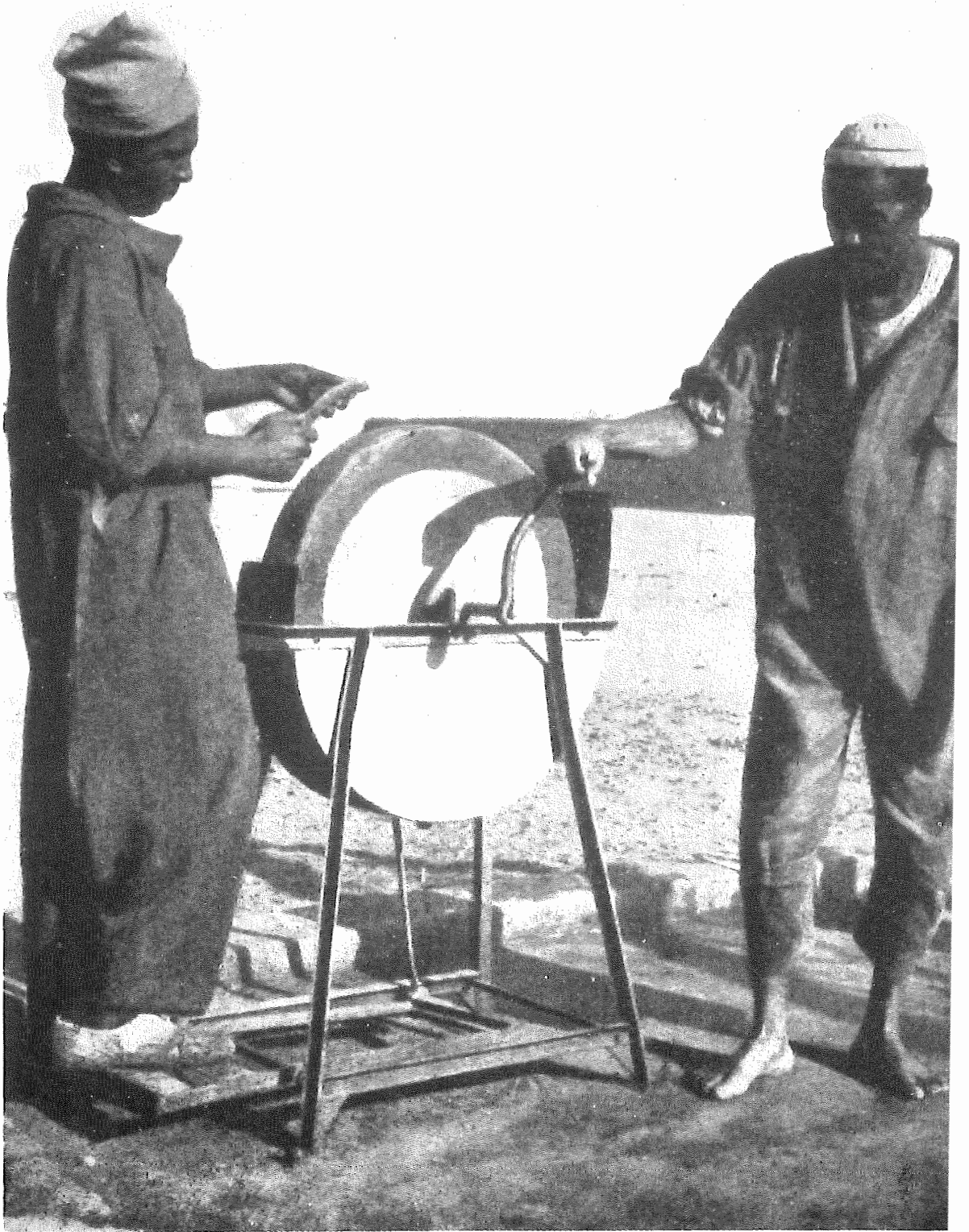


Figure 79. A grindstone is necessary for a flayer to sharpen his flaying and ripping knives regularly. The circular stone can be revolved by one operator, using a foot treadle, but can also be turned by a second operator with the handle. The stone is kept wet by immersion in the water held in the trough, and at no time should knives be sharpened dry.

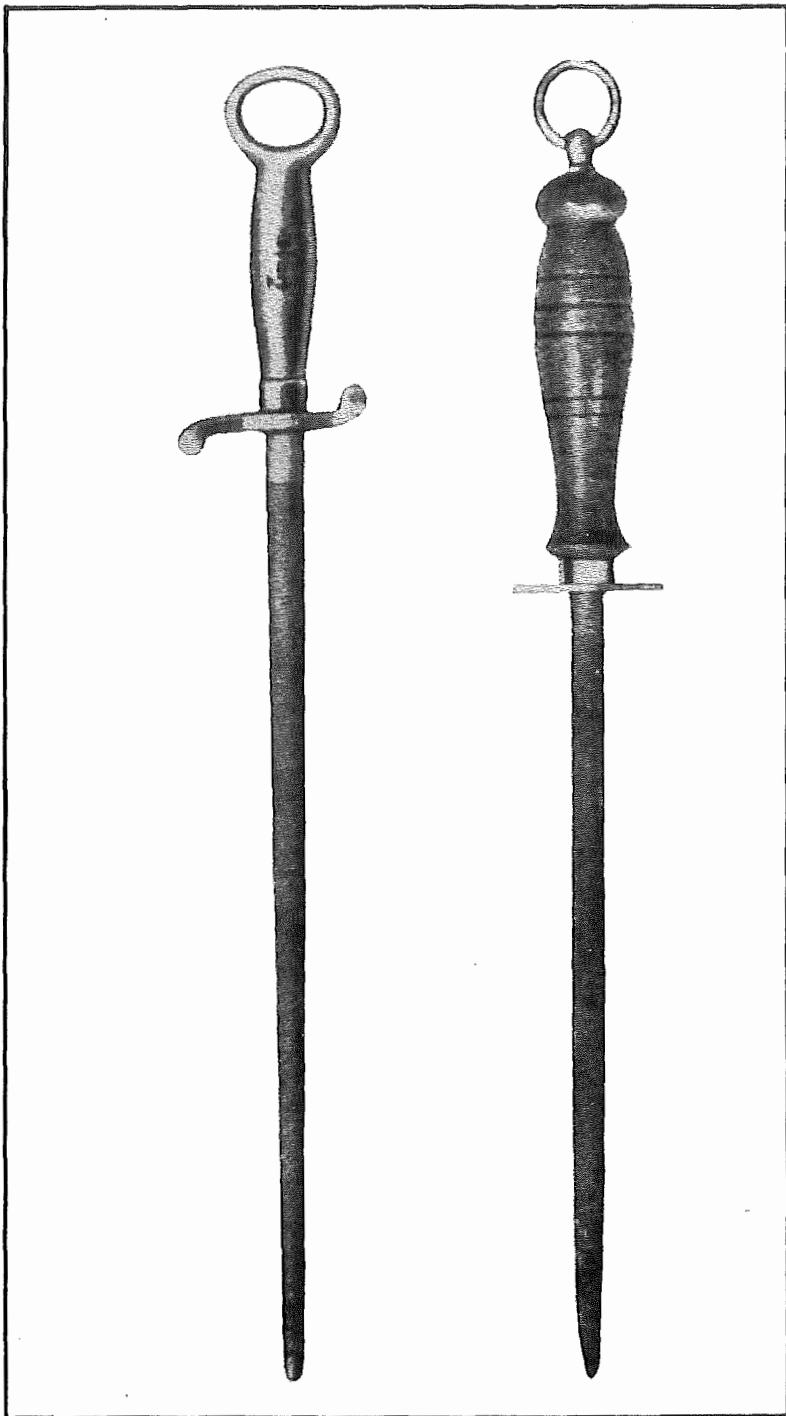


Figure 80. A type of sharpening equipment, made of hard steel, with serrations running lengthways which grip and pull into position any minute jagged unevenness of the edge, when the knife is run down and over its surface. The action of "steeling" a knife is that of sliding the blade edge against the steel in a downward motion towards the hand grasping the steel, turning each side of the knife edge to the steel with alternate strokes. The sharpening steel has a fitting and a ring so that the butcher can attach it easily to his bellyband.

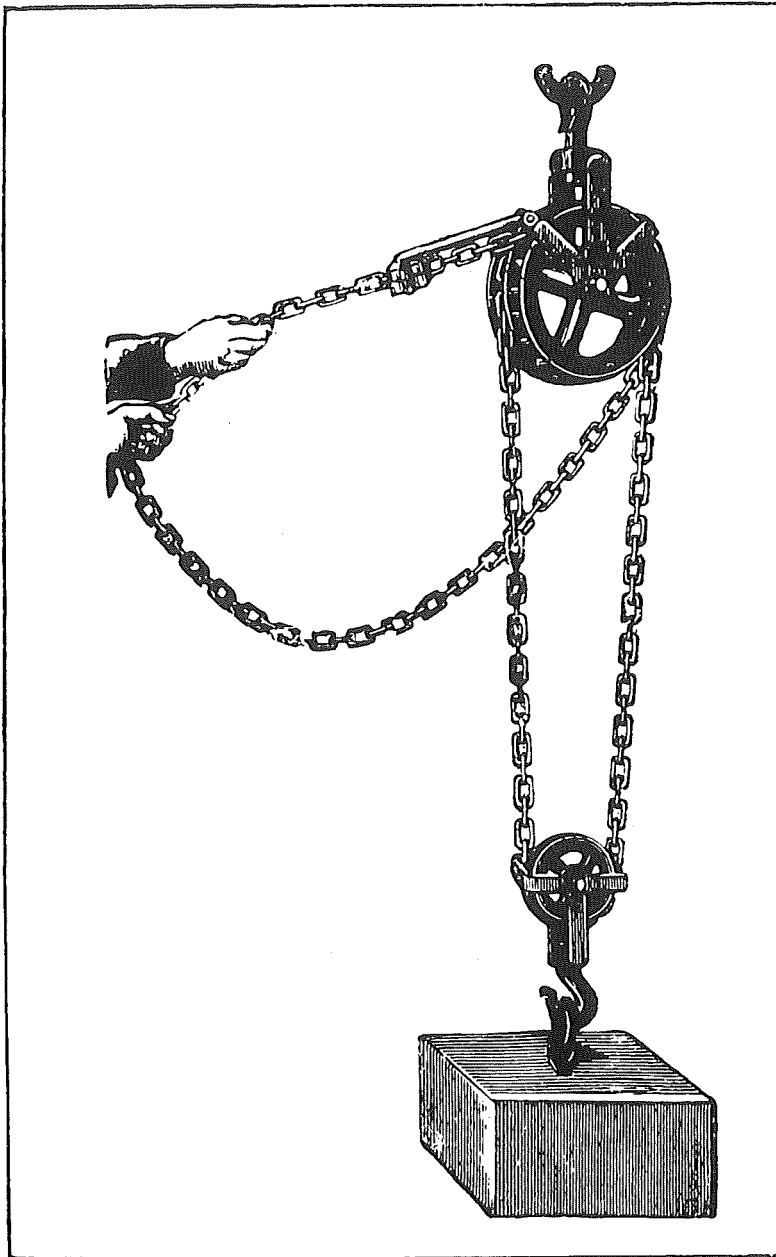


Figure 81. Hoisting gear with an endless chain pulley block. The hook of the hoist is lowered or raised by a running hand-chain, and it needs very little effort to raise a heavy carcass since it has triple gearing.

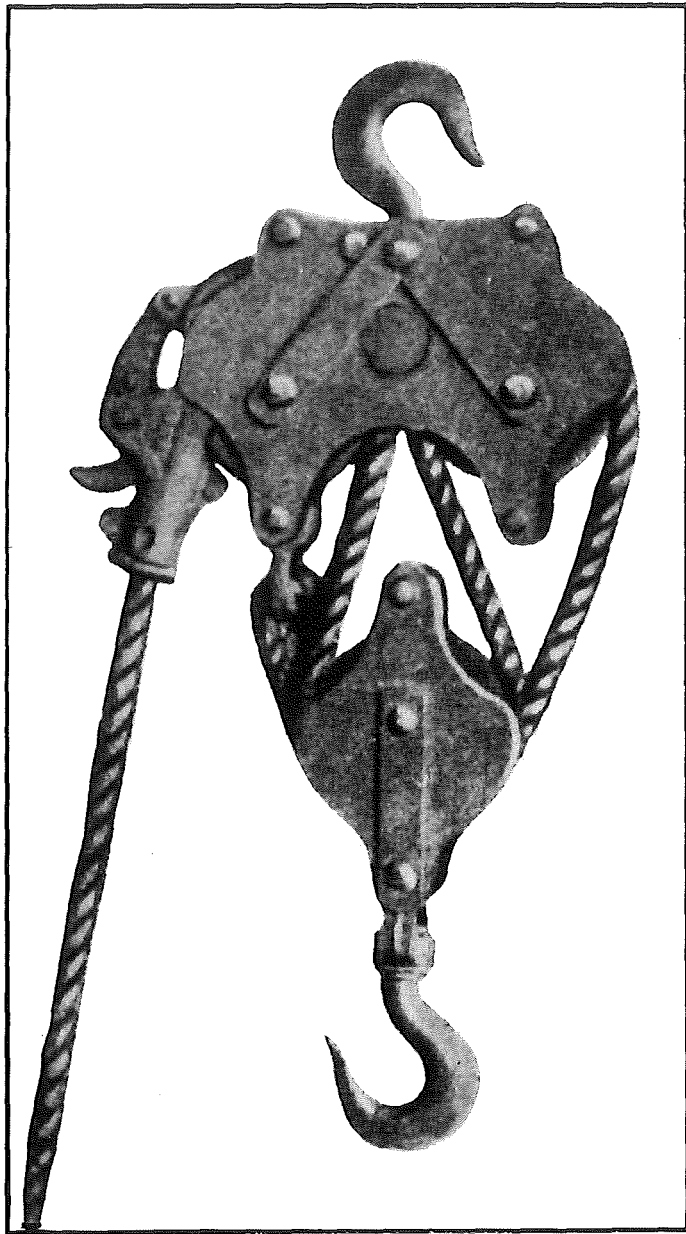


Figure 82. Hoisting gear, fitted with rope, which can be operated to elevate, lower, lock and unlock with one rope only.

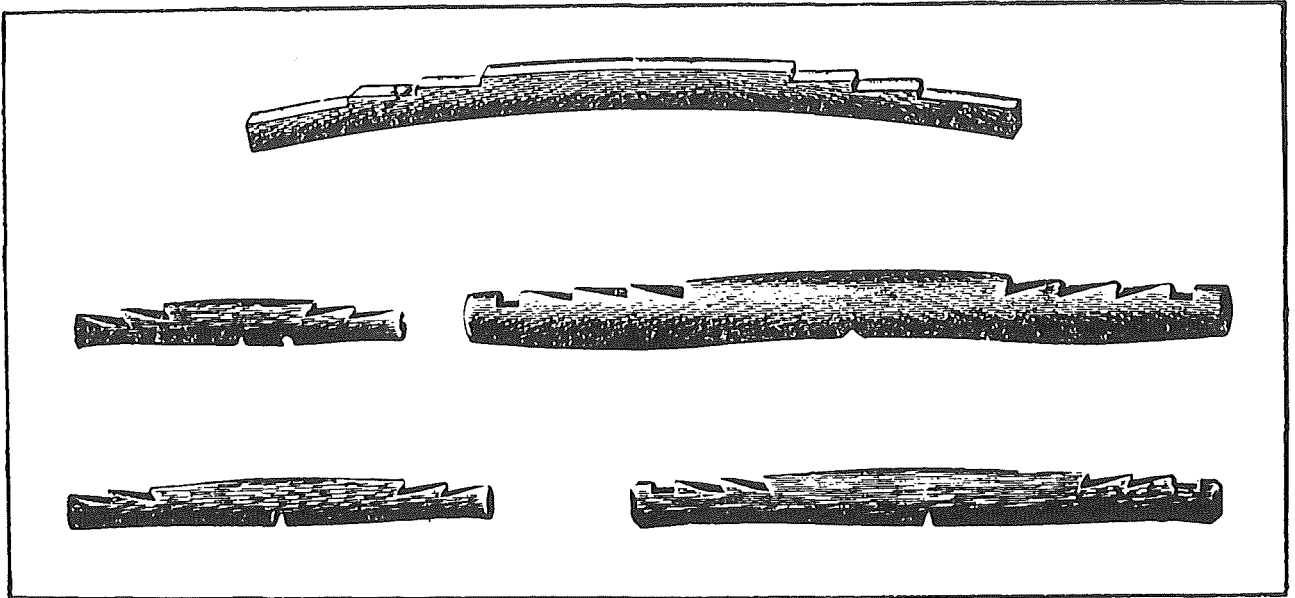


Figure 83. Wooden gambrels which have notches on the upper edge so that various sizes of carcass can be taken. This type is widely used for small animals, such as sheep and calves.

Mechanical Flaying Machines

These machines (Figure 86) take more or less the same form, although there are certain fundamental differences in the principle used in constructing the actual cutting surface. This cutting surface consists either of revolving blades, or two circular blades with serrated edges, held together within the hand unit, which oscillate in opposite directions, and it cuts by means of the serrations.

The type, of which a typical lay-out is shown in Figure 87, is driven by compressed air on the oscillating scissors principle at approximately 18,000 oscillations per minute, Figure 16 shows the machine in use in an actual flaying operation. Other machines are electrically driven. All types of mechanical flaying machines require very careful maintenance.

Baling Presses

There are several presses manufactured which are driven by hand, animal power and other power sources. They are also very frequently driven by direct-coupled electric motors, having “push button”

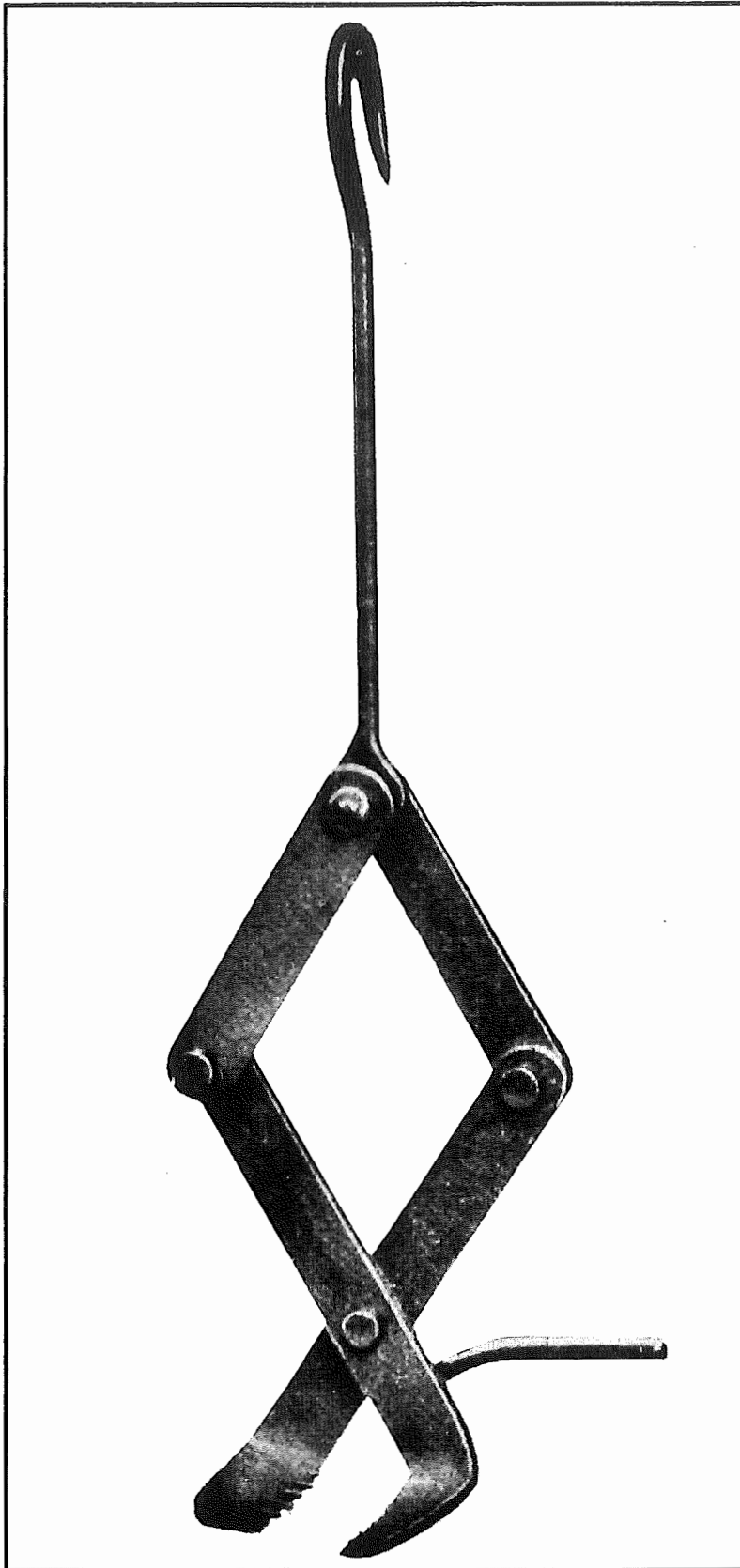


Figure 84. Tail grip or tail extractor, to be used in combination with a gambrel. The use of the tail grip is an advantage, as it helps to avoid extensive knife flaying round the root of the tail, thus eliminating knife damage entirely, as the hide can be pulled off the back to the hump. (Courtesy of the Hide, Leather and Allied Trades Improvement Society.) (See also Figures 11 and 12.)

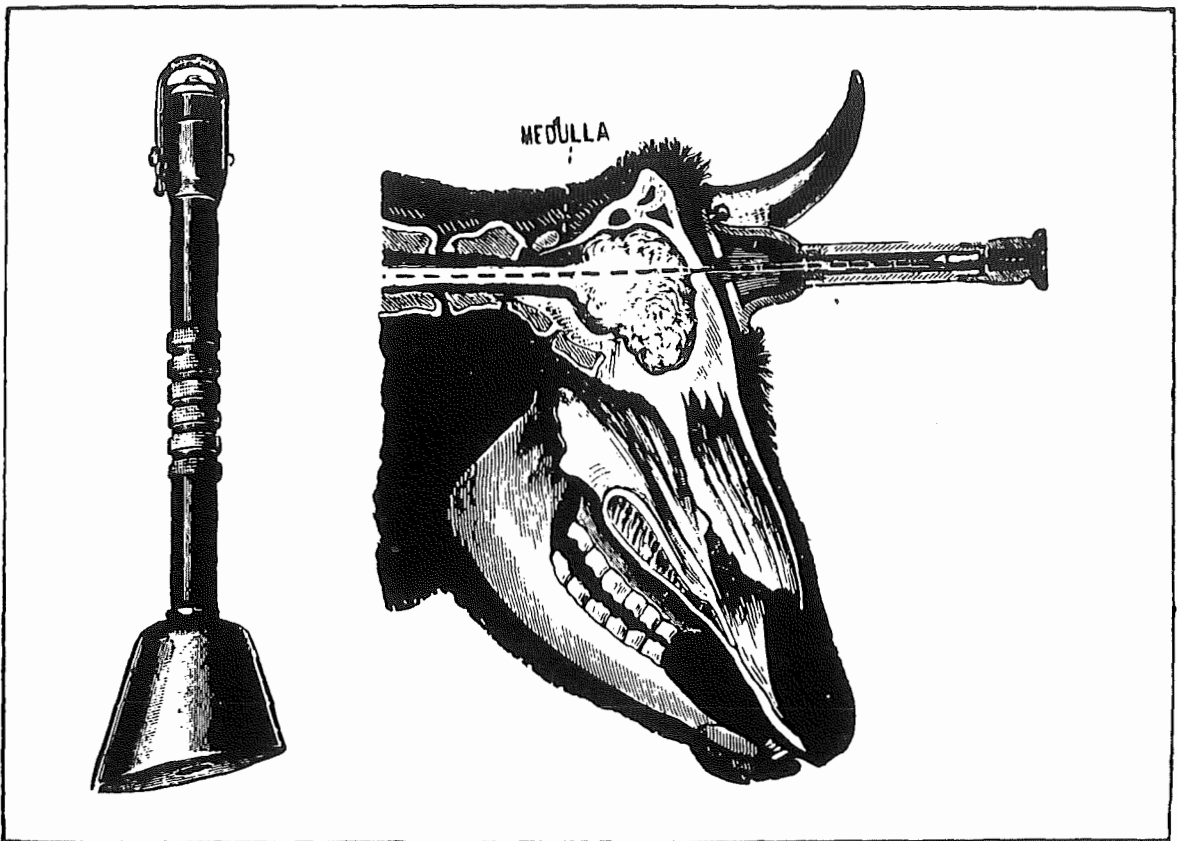


Figure 85. An example of a "humane" killing instrument, in which a spring-loaded bolt is driven forward by the explosion of a cartridge behind it. The bolt penetrates the skull.

control. They are made in a variety of sizes, capacities, powers and styles, to suit the work for which they are intended.

A type made almost entirely of steel with only a few parts of cast iron, thus reducing breakage to a minimum, is shown in Figure 88. The table, as shown in this figure, on which the hides are placed prior to being pressed, is about 60 cm. (2 ft.) above the floor. The press is fitted with a knock-off arrangement, which automatically stops the winch when the bale is pressed down to the required size, and applies a brake that holds it there while the bale is fastened. The press does not require any foundation.

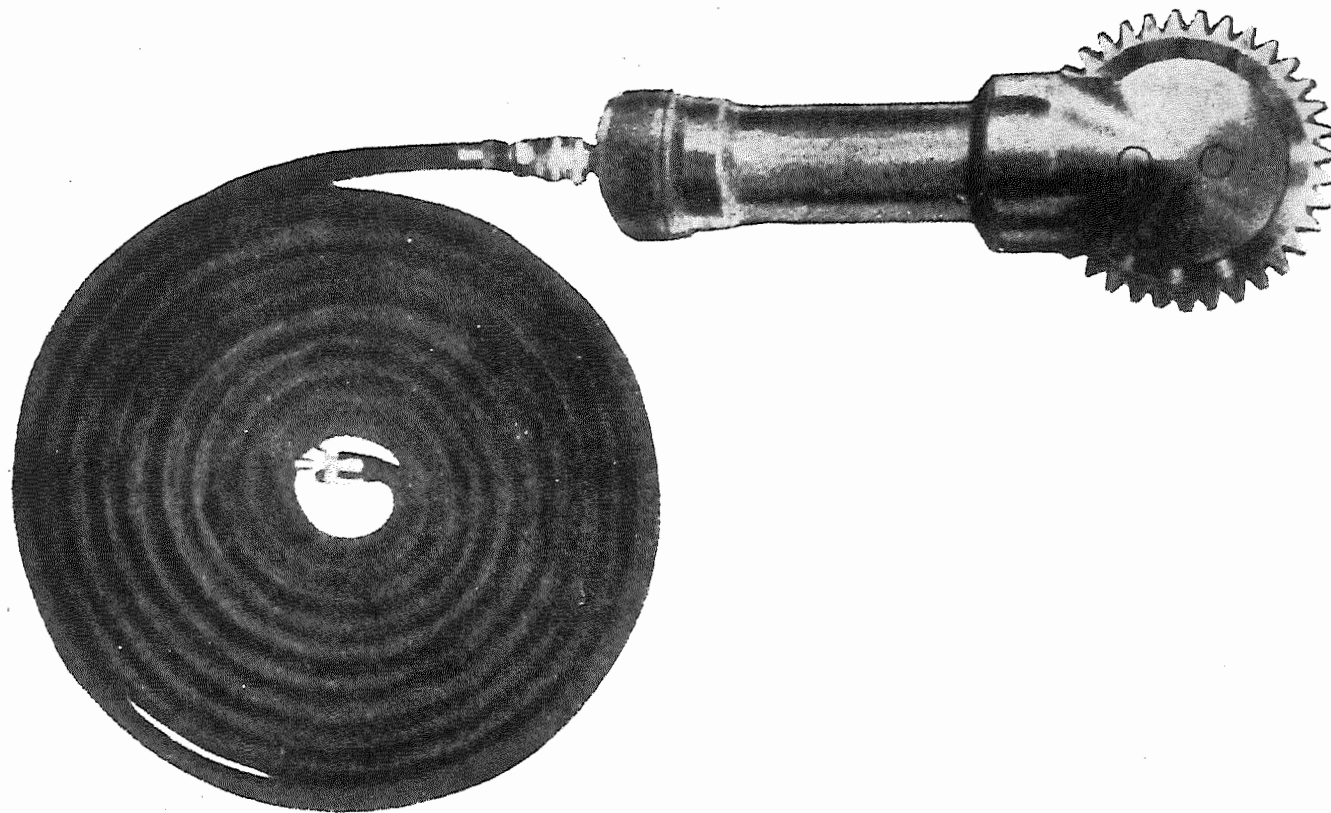


Figure 86. A mechanical flaying machine which is driven by compressed air on the oscillating scissors principle at approximately 18,000 oscillations per minute.

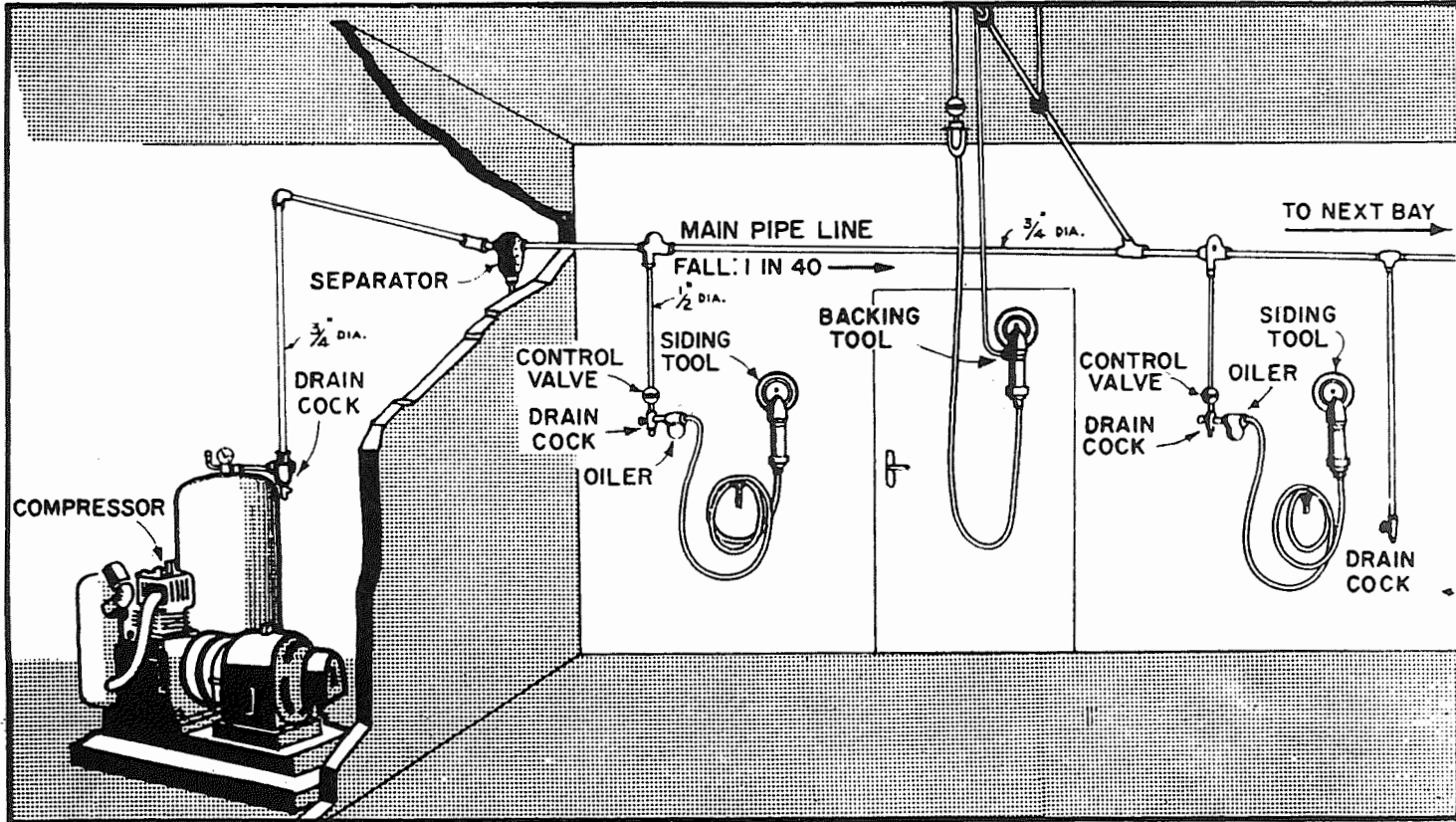


Figure 87. A typical slaughterhouse lay-out for mechanical flaying machines.

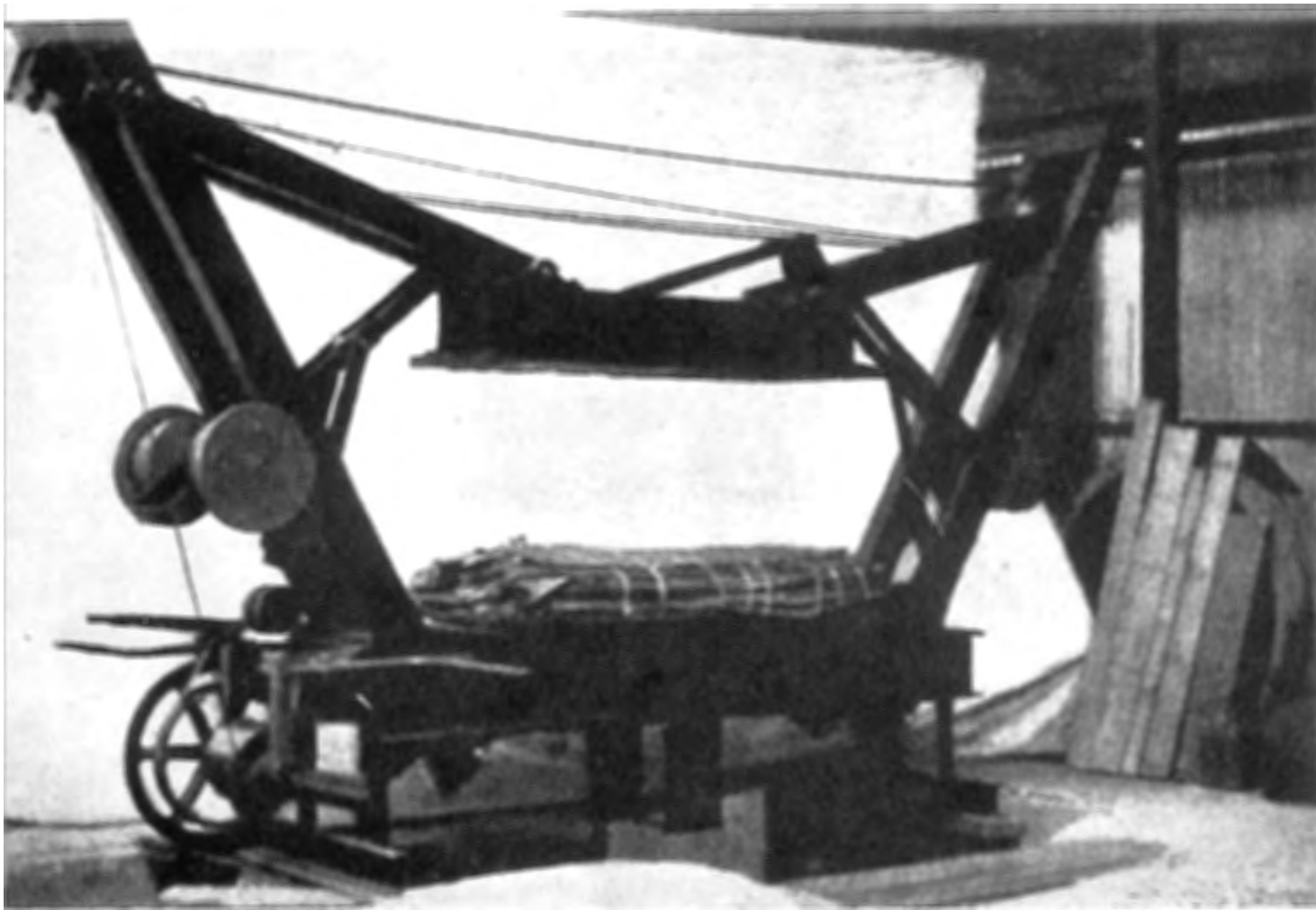


Figure 88. Baling press which can be used with advantage for hides.

PROPOSED DEVELOPMENT SCHEME

It should be realized, particularly in countries where the science of agriculture is not yet highly developed, that in order to make the best use of the raw material, hides and skins, either for local consumption or export, continuous guidance under a hides and skins improvement scheme is necessary.

Such a scheme may be operated through a general organization or through a private organization directed and controlled by the government. The method chosen will depend on local conditions and it must be recognized that to change existing methods will take time in most areas, as local habits, customs and beliefs may retard progress.

An approach will have to be made to farmers and merchants, and as a first step there should be practical field demonstrations. Other visual aids, such as the diagrams and photographs appearing in this paper, would also help. The flayer, however, plays an important rôle and special attention must be directed towards his education.

In many countries flayers lack even the elementary knowledge to avoid knife damage and certainly do not realize how detrimental bad flaying may be to their own and their country's income. Experience has shown that once flayers have been taught the correct methods, have been supplied with proper knives and are given better working conditions with the incentive of more income, they are quick to make the best use of the opportunities presented.

Two ways of stimulating the interest of the flayer are the *better flaying competition* and the *cash bonus*. The better flaying competition is most suitable for small communities. It may be sponsored by local officials or by hide and skin merchants. Perhaps the best occasion on which to start a competition would be one of the many festival days which are celebrated in villages. The competition may

continue for several months and may include a number of villages and, eventually, neighboring slaughterhouses. The standard for allotting marks may be fairly simple and entrants may be divided into categories according to the numbers of animals they have available.

Undamaged flaying and good ripping could be appraised as follows:

Undamaged hide or skin	2 points
Slightly damaged hide or skin	1 point
Damaged hide or skin	0 point

(Natural damage, as for instance from warble fly larvae, should not be taken into account.)

In order to make it possible for competitors with very little slaughtering to win a prize, those taking part in the competition should be subdivided into groups, as follows:

Category A (Individual slaughtering)

- 11- 25 items
- 26- 50 items
- 51- 75 items
- 76-100 items

Category B (Gangs of slaughtermen and slaughterhouse operatives)

- 101-200 items
- 201-300 items
- 301-400 items, etc.

The cash bonus method is more appropriate for use in recognized slaughterhouses or in cooperatives. There are various ways of awarding the bonus but usually there is a qualifying rate, i.e. a flayer will qualify for the bonus if more than fifty percent of his weekly total consists of "best-flayed" hides. In addition to the qualifying bonus, a higher bonus may be paid in proportion to the percentage of best hides produced over and above the qualifying rate.

In slaughterhouses a bonus scheme can operate successfully only if there is a trained supervisor. His duties would include the supervision of general routine flaying, meat jointing, meat instruction and hide grading. He would keep simple records of the hides and skins graded for flaying defects only in order to support the bonus scheme and

confirm figures for the revenue from slaughtering fees. In some countries the bonus is not obtained from governmental sources, but is paid by a private organization such as a hide merchants union. (For simple hide grading standards see "Grading, Folding and Baling.")

It will be seen that under a Hides and Skins Improvement Program two types of officer are necessary; the *flaying instructor* and the *hide inspection officer*. The flaying instructor should be a man of great patience and tact, as he must be on good terms particularly with the senior workers who are practised in flaying. He must be capable of giving good systematic instruction by practical field demonstrations.

The duties of hide inspection officers call for men of good education and standing, who not only possess the requisite technical knowledge, but are fitted to exercise administrative authority. The recruitment of such officers will not be easy as it is unlikely that they will be found amongst slaughtermen.

As an improvement program develops it will be necessary to grade the staff of the section under which the program operates. Salaries should be sufficiently high to attract the most suitable type of man and should provide opportunities for advancement to young men who wish to make it their career. The head of the section would be in the top grade and would be responsible for the general control of all instruction, the maintenance of standards and the supervision of all matters relating to the hides and skins industry in general. The staff would be recruited gradually and would be expanded according to need. The increased prices obtained for better hides and skins should enable countries to finance an improvement scheme.

In countries where much of the flaying and preparation is done in villages the formation of cooperatives, which would undertake grading and marketing, is desirable. These societies could be established at first at the village level and later could be amalgamated in marketing unions which could deal with hides and skins not only for local consumption, but also for export. The establishment of such cooperatives should be fostered by governments.

When a start has been made it is desirable to create regular contacts amongst all concerned in the development of the industry. For this purpose it is advisable to establish a committee on hides, skins and leather in which government officers, representatives of cooperatives, merchants and tanners would meet regularly. Such a body

would be of help in an advisory capacity to the chief of the section responsible for the improvement program.

When a number of countries in a region have embarked on improvement schemes, it may be advantageous to organize a regional conference at which technical officers and representatives of the trade might exchange and discuss common problems. Experts might be invited to attend in an advisory capacity.

To supplement the educational and supervisory work done under an improvement scheme, legislation will probably be necessary to provide for such matters as the issue of certificates for qualified flayers, methods of flaying, and the grading and classification of hides and skins.

GLOSSARY

Abattoir	A large slaughterhouse.
Anhydrous	Containing no water of crystallization.
Belly	The extreme left or right side of a hide removed by cutting along a line parallel to the backbone line and at such a distance from it as to remove about 23 percent of the total area of the hide for the two bellies. The belly includes the front and hind shank.
Bend	Half a butt, (see definition below), cut down the back.
Blister	A condition of rotteness between the inner and outer surfaces of the hide.
Brining	The soaking of hides, after flaying, in a saturated solution of common commercial salt, prior to salting down in pile.
Brisket	The part of the hide covering the breast.
Butcher cuts	Damage caused by careless and improper use of the knife during flaying, usually penetrating right through the hide or skin (also called flay cuts).
Butt	That part of the hide remaining after the shoulder and bellies have been removed. Its very compact texture makes it specially suitable as heavy shoe-leather.
Captive bolt	A pistol with a plunger or bolt in the barrel which penetrates the brain when thrust forward on firing. It is used as an alternative to the pole-axe.
Centigrade (°C) (Degrees Celsius)	A temperature scale on which the freezing point of water is recorded as zero, and the boiling point as 100 degrees. Temperatures expressed in degrees Centigrade may be converted to degrees Fahrenheit (°F), (see definition below), by multiplying by 1.8 and adding 32 to the product.
Corium	The derma or true skin; that part of a hide or skin which remains after removal of the epidermis, the hair, and flesh, and which is converted into leather.

Correct pattern	A standard pattern for a flayed hide or skin, when laid out flat, which is adopted by the trade and which enables the tanner to obtain the maximum quantity of good leather from it.
Country hides	Hides produced by farmers and country butchers, and not in recognized abattoirs or slaughterhouses.
Curing	The treatment of hides and skins with common commercial salt, or by air-drying, to render them nonputrescible, so that they can be transported and stored until the tanner is ready to deal with them.
Cut throat	A hide of an animal slaughtered according to Islamic or Rabbinic law.
Derma	Also called corium or true skin. The part that is converted into leather.
Dewclaw	An undeveloped (rudimentary) toe in cattle.
Dewlap	The loose hanging skin under the throat of cattle, where the butcher (flayer) first inserts his knife when slaughtering or flaying.
Disinfectant	An agent added to a material to destroy micro-organisms present in it, or to free it from other infection.
Epidermis	The superficial layer of cells protecting the derma or grain layer of a hide or skin. It dries off as a scurf at its surface, and renews itself by new growth underneath.
Fahrenheit (°F)	A temperature scale on which the freezing point of water is recorded as 32 degrees and the boiling point as 212 degrees.
Fallen hide	A hide which has been removed from the carcass of an animal that has died from natural causes.
Fatting	The removal of unwanted fat from the flesh side of a fresh hide or skin.
Flanks	The portion of a hide or skin covering the area defined under <i>Belly</i> , above.
Flay cuts	See <i>Butcher cuts</i> , above.
Flaying or Skinning	The removal of a hide or skin from an animal carcass.
Flaying knife	The knife used to sever the subcutaneous tissues when removing the hide or skin from the carcass. It has a curved cutting edge and tip, so as to reduce damage to a minimum.

Flaying machine	A mechanical hand unit, replacing the flaying knife, and consisting of two saw-edged circular blades placed together, moving in opposite directions, and powered by electricity or compressed air. These machines are capable of producing perfectly flayed hides. It is not used for flaying skins.
Flesh side	The side of a hide or skin next to the body.
Fleshing	The removal of the loose connective tissues by which a hide or skin is attached to the carcass.
Fresh hide	Also called green or raw hide. A hide or skin which has not been treated in any way, except possibly by light salting.
Gambrel, Gambal or Spreader	The spreading piece used for suspending carcasses from hooks for flaying.
Gouges	Knife damage to a hide or skin during flaying, in which small portions of the corium are scooped out.
Grain layer	The top layer of the corium including the hair follicles.
Green hides	See <i>Fresh hides</i> , above.
Grind-stone	A machine with a circular whetstone, powered by hand, feet or mechanically, to sharpen flaying and ripping knives.
Ground-drying	The sun-drying of hides and skins, in which they are spread on the ground, flesh side uppermost, and either weighted down with stones or pegged to the ground through holes around the edges. This method of drying is unsatisfactory and is to be condemned.
Grubby hides	Hides damaged by the grub of the warble fly, with holes and healed scars on the back portion.
Hair slip	Loosening of the hair in hides and skins due to putrefaction. See also: <i>Blister</i> .
Head	The portion of a hide or skin from the head of the animal.
Hide	The integral covering of a bovine animal.
Hoisting gear	The mechanical device used to raise the carcass of a heavy animal from the slaughterhouse floor to facilitate flaying and dressing.
Humane killer	A lethal weapon used for killing animals (see <i>Captive bolt</i> , above).

Humidity	The humidity of the atmosphere (absolute humidity) is the amount of water vapour present, measured in grams per cubic meter. Relative humidity is the ratio of the amount of water vapour in the atmosphere to the amount which would saturate it at the existing temperature.
Leather	Animal hide or skin so treated as to make it permanently resistant to decomposition when wet, and to make it supple when dry.
Meating	The removal of particles of meat from the flesh side of a hide or skin.
Pattern	The outline of a hide or skin when laid out flat.
Pelt	Skin from which hair or wool has been removed.
Penetration	The diffusion of a substance into a hide or skin, or piece of leather.
Pickling	The saturation of unhaired hides and skins with a weak solution of sulphuric acid and a strong solution of common commercial salt, or some other acid-salt combination, to preserve them or to prepare them for tanning.
Poor pattern	An outline or contour of a hide or skin, when laid out flat, which does not conform to the standard or correct pattern adopted by the trade.
Putrefaction	The state of rotting in hides or skins caused by bacteria which liquefy the gelatin.
Ripping	Opening of a hide or skin before flaying.
Ripping knife	The knife designed for easy opening of a hide or skin before flaying. Also useful for slaughtering, bleeding, eviscerating, etc. Similar to the flaying knife but having a straighter cutting edge.
Salt stains	Indelible stains on the grain surface, and often deeper, caused by improper or delayed curing.
Scores	Knife damage to hides or skins during flaying by cuts that do not penetrate completely through the skin.
Shank	The portion of a hide or skin which covers a leg of an animal.

Shoulder	The portion of a hide which covers the shoulder of an animal from a line drawn at right angles to the backbone and a little behind the forelegs, but not including the foreshanks; with the head removed, the hide is known as “headless” or “squared.”
Skin	The integral covering of a small animal, sheep, goat, or reptile.
Skull	The bony structure of the head excluding the lower jaw.
Soaking	Treating raw hides and skins with water to clean them, and, when necessary, to remove salt and soluble matter. This prepares them for the later processes.
Spreader	See <i>Gambrel</i> , above.
Stained	The discoloration of a hide or skin, or finished leather, which may be either on the surface only, or throughout its whole thickness.
Stunning	Rendering an animal unconscious by electric shock, pole-axe or humane killer before bleeding.
Subcutaneous tissues	The muscular and fibrous tissues which connect the hide or skin to the carcass. Usually loose enough to allow twitching of the skin.
Take off	The removal of a hide or skin from an animal; the flaying of an animal.
Tail Grip or Tail Extractor	A device which hangs on the hook of the hoisting pulley and which grips the exposed tail bones between two serrated jaws.
Taint	See <i>Hairslip</i> and <i>Blister</i> , above.
Toggle	A metal clamp equipped with jaws to grip leather and a prong to hold it in place in a slotted metal frame.
Trimming	The removal of unwanted portions of a hide, skin, or piece of leather.
True Skin	The corium or derma; the part of the hide or skin which is converted into leather.

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Panama	Distribuidora Lewis S.A., Edificio Dorasol, Calle 25 y Avenida Balboa, Apartado 1634, Panama 1.
Peru	Librería Distribuidora Santa Rosa, Jirón Apurímac 375, Lima.
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Poland	Ars Polona-Ruch, Krakowskie Przedmiescie 7, Warsaw.
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Romania	Ilexim, Calea Grivitei N° 64-66, B.P. 2001, Bucarest.
Saudi Arabia	University Bookshop, Airport Road, P.O. Box 394, Riyadh.
Senegal	Librairie Africa, 58 Av. Georges Pompidou, B.P. 1240, Dakar.
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Somalia	« Samater's », P.O. Box 936, Mogadishu.
Spain	Mundi Prensa Libros S.A., Castelló 37, Madrid 1; Librería Agrícola, Fernando VI 2, Madrid 4.
Sri Lanka	M.D. Gunasena and Co. Ltd., 217 Norris Road, Colombo 11.
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