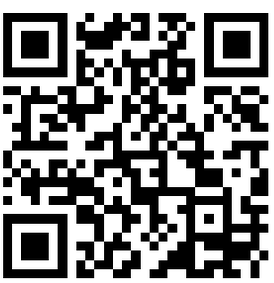


TANNING, AND WORKING IN LEATHER

IN THE

PROVINCE OF BENGAL,

BY

ROWLAND N. L. CHANDRA, M. A.,

Deputy Magistrate and Deputy Collector.

CALCUTTA:

PRINTED AT THE BENGAL SECRETARIAT PRESS.

1904.

L. C.

Published at the Bengal Secretariat Book Depôt,
Writers' Buildings, Calcutta.

OFFICIAL AGENTS.

In India—

Messrs. Thacker, Spink & Co., Calcutta and Simla.
Messrs. Newman & Co., Calcutta.
Messrs. Higginbotham & Co., Madras.
Messrs. Thacker & Co., Ld., Bombay.
Messrs. A. J. Combridge & Co., Bombay.
The Superintendent, American Baptist Mission Press, Rangoon.
Mrs. Radhabai Atmaram Sagoon, Bombay.
Messrs. R. Cambray & Co., Calcutta.
Rai Sahib M. Gulab Singh & Sons, Proprietors of the Mufid-i-am Press, Lahore, Punjab.
Messrs. S. K. Lahiri & Co., Printers and Booksellers, College Street, Calcutta
Messrs. V. Kalyanarama Iyer & Co., Booksellers, &c., Madras.
Messrs. D. B. Taraporevala, Sons & Co., Booksellers, Bombay.
Messrs. G A. Natesan & Co., Madras.
Mr. N. B. Mathur, Superintendent, Nazair Kanum Hind Press, Allahabad.
The Calcutta School Book Society.

In England—

Mr. E. A. Arnold, 37 Bedford Street, Strand, London.
Messrs. Constable & Co., 2 Whitehall Gardens, London.
Messrs. Sampson Low, Marston & Co., St. Dunstan's House, Fetter Lane, London.
Messrs. Luzac & Co., 46 Great Russell Street, London.
Messrs. Kegan Paul, Trench, Trübner & Co., Charing Cross Road, London.
Mr. B. Alfred Quaritch, 15 Piccadilly, London.
Messrs. P. S. King & Son, 2 & 4 Great Smith Street, Westminster, London.
Messrs H. S. King & Co., 65 Cornhill, London.
Messrs Williams and Norgate, Oxford.
Messrs. Deighton Bell & Co., Cambridge.

On the Continent—

Messrs. R. Friedländer & Sohn, Berlin, N. W. Carlstrasse, 11.
Mr. Otto Harrassowitz, Leipzig.
Mr. Karl Hiersemann, Leipzig.
Mr. Ernest Leroux, 28 Rue Bonaparte, Paris.
Mr. Martinus Nijhoff, The Hague.

Tanning, and Working in Leather in the Province of Bengal.

CHAPTER I.

THE ORIGIN OR INTRODUCTION OF THE INDUSTRY.

One of the earliest inventions of primitive man was covering for his body, and for this purpose no material could be obtained more easily and none could be more suitable than the skins of animals. The use of skins began so early in the history of the human race that it is impossible to fix any date as to its commencement, although it may generally be said that it began when man made his first attempts after civilization. The art of leather-making is of course of a later date, but it could not have originated later than two or three centuries after men began the use of skins. There is, however, no data from which the date of the origin of the art can in any way be calculated, and the art may rightly be said to have sprung into existence from the misty depths of antiquity.

The origin of the industry or its introduction into this Province is likewise lost in obscurity; and although there are a few legends on the subject, they do not seem to fix any period when it originated. There is hardly a village which has not its Muchis and Chamars; but ask them how, and whence, their industry came, and you will get the same reply everywhere, namely, that their forefathers in past ages were initiated into the mysteries of the art, by the deity. The Chamars allege that their common ancestor was one Rui Das, or Luidhar, or Ravi Das, and although some say he was an historical personage, who lived in the 14th century and was a follower of Ramanand, a famous Hindu religious teacher, we have no historical record of his life and doings. The common forefather of the Muchis is alleged to have been one Muchi Ram Das, presumably a purely mythical being of whom even myth furnishes us with a very poor record.

The following are some of the legends regarding the origin of the industry.

In Singbhum, the legend goes, that Mahadeo, the god of destruction, made a *mirdung* (drum), but as it gave out no sound he kept it by. One day it so happened that he threw on it the remnants of his meal, and the drum thereupon began to give out a sound resembling the utterance of the name of Ram. The business having thus become unclean, was abandoned by Mahadeo and was taken up by Rui or Ravi Das, the legendary forefather of the Chamars.

In Bankura, the legend is that, whenever the divine being would require shoes, he would call upon Luidas to supply them, granting him permission at the same time to take off sufficient skin, for the purpose, from the body of a living cow. Under the direction of the god, was the skinless part plastered over with cowdung, which caused it to be covered with new skin and the wound to heal. On one occasion Luidas, out of avarice, took off more skin than was needed, and the prescribed method of treatment consequently failed. The cow complained to the god, and the latter cursed Luidas saying:—"Your descendants shall have to earn their livelihood by working in hides and skins of *dead* animals. Henceforth the people will learn the use of articles prepared from hides and skins, and your descendants shall supply mankind with these articles, and shall have to treat the raw hides with lime, Amla leaves and barks of the Asan tree, before they can manufacture shoes, etc., out of them. Thus your progeny shall have to follow an abominable profession, and shall occupy a very low position in human society." Luidas pleaded for forgiveness, and the god relented and told him that his descendants would worship him, and that Brahmin priests would assist in the ceremonial. So he is worshipped to this day. Being an ascetic, Luidas did not require the services of barbers and washermen, and so, to this day, his descendants shave themselves and wash their own clothes.

In Mymensingh, instead of a myth we have what seems to be a fact. It is said that some fifty years ago one Bodhi Muchar came there, from his native district of Shahabad, with 110 pairs of shoes, and as the latter found a ready

sale he started the business of manufacturing shoes and working in leather. Since then many of his countrymen have established themselves in the same business in the district.

In the 24-Parganas, legend ascribes the origin of the industry to the same Rui Das mentioned above. Under the instructions of Biswakarma (the Vulcan of Hindu mythology), Rui Das skinned Mahadeo's sacred bull to provide Kartikeya (the god of war, who waged war with the Asuras) with shoes.

There is one fact that may be noticed here, namely that the industry was known in the United Provinces and North-West Bengal long before it came to be known in Lower Bengal. From enquiries that have been made it appears that in many places in Lower Bengal the Chamars and Muchis have emigrated from the United Provinces and Bihar, and this is the conclusion also arrived at, at the recent census. The industry was at one time in a flourishing state in those parts as may be gathered from the ancient history of the land, particularly the Ramayana, which gives a vivid picture of the good old days of the kings of Mithila and Ajodhya. The Mithila and Ajodhya of the Ramayana were, it is understood, conterminous—Mithila covered the area now known as Tirhut, and Ajodhya what is known as Oudh, together with the tracts between the latter and modern Bihar. Leather articles are often mentioned in literature still more ancient than the Ramayana, from which it is inferred that the art and industry came into India with the Aryan race some 5,500 to 6,000 years ago. References have been furnished in another chapter in support of this view.

CHAPTER II.

EXTENT OF THE INDUSTRY.

To form an idea of the extent of the industry, it is essential that we should know (*a*) the percentage of the population engaged in the industry, (*b*) the extent to which imported (foreign) and indigenous raw materials are used, and (*c*) the approximate quantity, or money value, of articles manufactured. Unfortunately, the information available under these heads is extremely meagre; but it is clear that the industry is at present very much limited in extent. The tanners and the manufacturers of leather articles form an infinitesimal part of the total population, and regular tanneries exist nowhere excepting a few in the metropolis and its suburbs. The material condition of the men is very bad indeed and, as they possess no capital, any prospect of an expansion of their business or its improvement is most remote. In the interior the materials—hides and leather—used are no doubt to a large extent indigenous. In Calcutta, and other important towns, particularly those which are not very far from Calcutta foreign leather is used on a very large scale. Even in the interior, wherever there are skilled shoe-makers, foreign leather, procured from Calcutta or Cawnpur, is exclusively used for the preparation of articles required for the use of the higher classes. The uneducated classes in the villages, with the Muchis, regard imported leather as inferior to indigenous leather. Foreign leather, they say, is good to look at but not substantial and lasting. It is thus only the uneducated, living away from the influences of city-life, who still use native products. But civilization and education are rapidly undermining such ideas, and the industry is steadily declining. Imported leather is also used for the preparation of saddlery and harness, but these articles are produced on a limited scale.

The manufacturer of leather articles is his own tanner, and the tanning materials he uses are almost entirely indigenous. The implements for manufacturing leather articles are usually of foreign manufacture.

It has been found impossible to obtain reliable statistics showing the quantity of articles manufactured or their money value. In places like Calcutta, Dacca, the 24-Parganas, Patna, Cuttack, Hazaribagh, etc., the outturn is considerable, but in the interior the demand being little the outturn is small, and that again is steadily falling. The estimated value of manufactured articles varies considerably. It ranges between Rs. 1,000 per annum, in some districts, and Rs. 1,50,000 in others, but there are very few districts the leather industry of which can be estimated at so high a value. These figures

include manufactures from indigenous as well as foreign materials, but it is not possible to ascertain what the proportion of articles made from indigenous materials is to those made from foreign materials. Declining with the demand for them, local manufactures are just sufficient for local consumption. It is rarely, therefore, that the products have to be exported because they exceed the country's need.

CHAPTER III.

EFFECT OF FOREIGN COMPETITION.

With the advance of civilization, the improvement of communications, and the growing severity of the struggle for existence, it is but natural that foreign manufactured articles should find their way into countries outside the homes of their production. The degree of the influx depends on the degree of the capability of the country to resist the influx, by putting in the market, side by side with the foreign manufactures, its own products. A successful resistance requires three conditions to be fulfilled, *viz.*, that the quantity of indigenous products is sufficient for the demand, that their quality is not inferior to that of foreign articles, and that their market value is somewhat less than that of the foreign manufactures. Unfortunately, these conditions are not satisfied by the indigenous products, and the result is as might be expected. Foreign manufactured shoes and boots are now sold in all bazars and temporary fairs. Fifty years back, they were to be found only in the largest towns, particularly in the seaports; but as the days have gone by, foreign manufactures have penetrated into the country, and now there is hardly an important village with a bazar which does not possess a fair supply of them. The native manufactured articles are being supplanted by the former, as a matter of course, and this process is steadily progressing. Nor is this to be wondered at. The articles locally manufactured do not stand equal in competition with the foreign manufactures. A pair of English patent-leather shoes can be had at Rs. 4 to Rs. 5 and the same article manufactured locally cannot he had at less than Rs. 3 to 4. Superiority of leather, shape and make, coupled with a very moderate price, must prevail; and so it is that foreign manufactures are gradually gaining ground. The process of supplanting has hitherto made little progress in the districts which have no means of facile locomotion, *e.g.*, the Chota Nagpur Division, the Sonthal Parganas, etc., but education and civilization are advancing and opening the way to foreign manufactures, and the day is not far off when the latter will command the field in these backward tracts also.

In some branches of the industry, the indigenous manufactures are still holding their own, and it seems they are destined to survive, as foreign manufactures have not been able to supplant them. I refer to indigenous musical instruments, and articles of coarse make, meant for rough use—water-bags, buckets, oil or molass jars, bellows, etc. The reason is not far to seek. India is a poor country and must needs prefer the cheapest products. The articles just mentioned cannot be surpassed in cheapness by similar articles of foreign manufacture.

The effect of foreign competition is not, however, limited to manufactured articles only. It is to be found in the case of raw materials as well. Raw skins and hides are collected and bought up by hide merchants, who have their agents in all districts, and are exported to Europe and America, whence they are returned to this country mostly as unwrought leather, and partly, as leather manufactures.

We thus see that the effect of foreign competition is double. It is drawing out of the country its stock of raw materials, hides and skins, causing the prices of what are left to rise very high. It is also supplying the markets with manufactured articles, at such a moderate cost, that the prices of the indigenous manufactures must be lowered and their outturn reduced, if the industry has still to be carried on by the natives.

The subject of exports and imports has been dealt with in another chapter and statistics have been furnished in the appendices shewing the external and the internal trade of the country. The figures, however, are not sufficient to enable us to make an accurate comparison between the quantity of leather and leather manufactures, foreign and those which are purely Indian.

Nor can any help be had from the local manufacturers who are very thinly scattered and are too ignorant to keep written accounts. The only test possible is an inspection of the two classes of articles as they are at present stocked in the shops. This, coupled with enquiries from reliable persons of the locality, as to the proportion of the articles in the past, say 40 or 50 years back, reveals that the production of indigenous articles has steadily declined. Ask any intelligent observer, and he will say that he sees the proportion changing in favour of the foreign manufactures almost from year to year. The following statistics, from the 24 Parganas, will give some idea as to how prices have been affected by foreign competition :—

Articles.	Former cost price of raw materials.	Former value of manufactured articles exported.	Present cost price of raw materials.	Present value of manufactured articles exported.
	Rs. A.	Rs. A.	Rs. A.	Rs. A.
Cow-hide ...	3 0	7 0	5 0	6 0
Buffalo-hide ...	6 0	24 0	12 0	20 0
Calf-hide ...	0 8	2 8	1 4	2 0
Sheep skin ...	0 5	1 4	0 10	1 0
Goat skin ...	0 8	3 8	2 0	3 0
Myrabolam ...	1 8	...	3 0	...

These statistics may not be fully applicable to the whole of the Province, but they fairly indicate the effect of foreign competition, and, although it is not possible to make a correct estimate of the loss to the indigenous industry, it may be roughly estimated on the whole at 50 to 60 per cent.

CHAPTER IV.

PRINCIPAL CENTRES OF THE INDUSTRY, AND TANNERIES.

The principal centres of the industry, the extent of which has already been pointed out are Calcutta and its suburbs, Patna, Dinapur, Darbhanga, Dacca, Cuttack, Monghyr and Hazaribagh. There are no tanneries in the districts. In Calcutta and its suburbs there are 17 tanneries, of which 7 are owned and managed by Europeans and the remaining 10 by natives. A list of them is given in Appendix I.

An illustration has been given of a tannery owned and managed wholly by Indians. It represents the Calcutta Tannery. As will appear from the illustration, the principal appurtenances of a tannery are the following :—

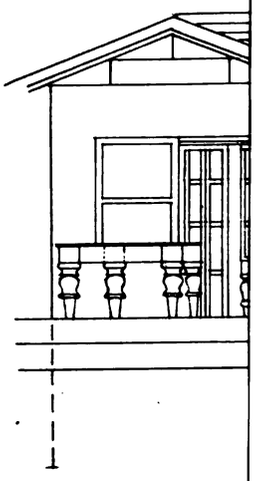
(1) Dusters and limepits, where the limeing processes are carried out.
(2) Tanners' beams, on which unhairing and fleshing are done.
(3) Bark-water pits, where the tan liquors are prepared.
(4) Tan baths, in which hides and skins are soaked.
(5) Lapping pits, where the process is repeated.
(6) Tan vats, in which hides and skins are handled or pressed.
(7) Shaving pins, on which partially tanned leather is shaved on the inner side.
(8) Press for smoothening leather.
(9) Implements for sleeking and greasing.
(10) ,, ,, graining.
(11) ,, ,, varnishing.

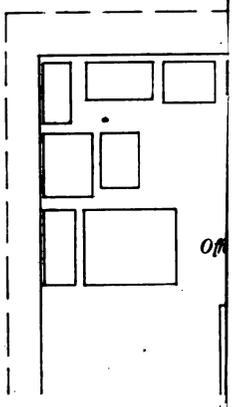
The use of these will be understood from what is stated in Chapter VII, on the process of tanning.

The principal implements used in tanneries are as follows:—

(1) Knives for fleshing, shaving and cutting hides and skins.
(2) Instrument for draining off the liquor from hides and skins and for smoothening them.
(3) Implements for greasing and sleeking leather.
(4) Tanners' beams and shaving pins.
(5) Instruments on which leather is beaten to render it soft and supple.
(6) Roller or Press for smoothening leather.
(7) Graining implements.
(8) Vessels for the preparation of the varnishing liquid and brushes to paint with.

A sheet illustrating these implements has been furnished in this volume.



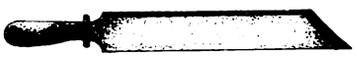


ment.

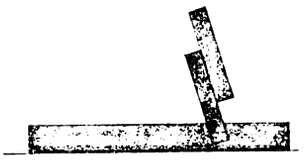
IMPLEMENTS USED IN ORDINARY TANNERIES.

Fleshing knife.

Shaving knife.



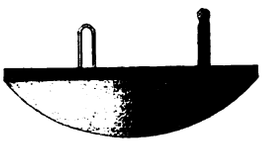
Knife for cutting edges of skins.



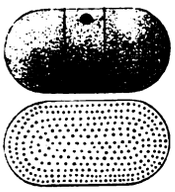
Tanner's beams for unhairing, fleshing, and shaving hides.

Instrument for draining off liquor from leather —steel blade.

Instrument for draining off liquor from leather —stone blade.

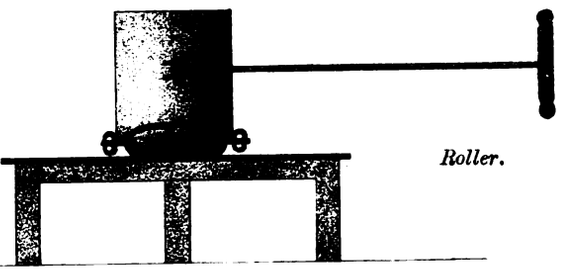


Graining hand instrument made of cork.

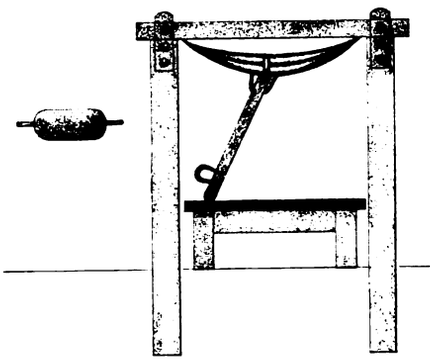


Brush for applying tallow.

Cocoanut brush.

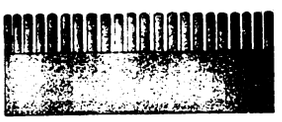


Roller.



Graining Implement.

Enamel handi for boiling varnish.



Spiked board for beating tanned leather on to make it soft.

CHAPTER V.

HIDES AND SKINS.

In commerce a distinction is made between hides and skins. By hides are meant the pellicles of cows, bullocks, buffaloes and their calves; and by skins, the pellicles of sheep and goats. The word skin is also used for the pellicles of pigs, tigers, deer, monkeys, &c.

Hides and skins can be had dry or raw. The raw articles are sold at the prices noted below, per piece.

	Rs.	A.		Rs.	A.
Cows and bullocks	2	0	to	5	0
Buffaloes	3	0	„	12	0
Sheep	0	10	„	1	8
Goats	0	10	„	1	8
Cow calves	1	4	„	2	8
Buffalo calves	1	4	„	2	0
Pigs	0	4	„	0	6
Tigers	0	8	„	3	0
Deer	0	8	„	3	0
Monkeys	0	8	„	1	0

The skins of the domestic animals in the above list are obtained from two sources, namely, from the butchers who sell the skins of the animals slaughtered by them, and from the villagers whose animals die a natural death, and who allow the Chamars to take the skins in return for shoes and articles required in connection with agricultural pursuits. Zemindars and other owners of landed property usually make arrangements of this kind. They grant permission to one or two Muchis or Chamars to take the skins of dead animals throughout their estates, and in return are supplied with shoes and other leather articles required by them, free of cost, all the year round. For the purpose of obtaining the skins of dead animals, the Chamars and Muchis often wander about the country, and sometimes they take leases of bheels and river banks, known as *shashan mahals* or *shashan bhumi*, where carcases of dead animals are thrown.

The process of removing skins from the carcases is as follows: The heads and the legs from the lower joints are separated. Then a long skin-deep cut is made from the neck to the tail and four shorter cuts along the four legs commencing from the long cut and reaching down to the joints. The skin is then separated. In the case of goats and sheep, the skin is removed by simply pulling it off the body which is suspended by the hind legs for the purpose. The skin comes off as the pillow-case comes off the pillow. The skins of the larger animals—bullocks, cows, and buffaloes—have to be separated from the flesh little by little, by means of the slaughtering knife, and great care is needed in the process, as a slip of the hand will cause a puncture in the skin and reduce its value.

A distinction is made between the skins of castrated goats and of those which are not castrated. The former are somewhat thicker than, and have not the disagreeable odour of, the latter, and fetch higher prices than the latter. Skins are sold by their measurement in inches. The length is measured from the neck to the root of the tail and the breadth is the measurement round the belly. Skins exceeding 36 inches in length and 20 inches in breadth are called *heavy* and fetch the highest price. Those which are 32 to 35 inches by 18 inches are called *mael;* 30 to 31 inches by 18 inches, *halka;* 28 to 29 inches by 18 inches, *athais;* and 25 to 27 inches by 18 inches, *sataish.* Skins of smaller dimensions are classed as kid skins and fetch low prices. The price of dry heavy skins is Re. 1-4 to Re. 1-8 per piece. Skins without hair are not sold. Falling off of the hair, marks of cut, bruise or sore, and holes, are regarded as defects. Even very slight defects in skins of the class heavy or *athais* will reduce them from the first to the second class. When the defects are numerous or serious the skins are called *ferta*, and when they are worse they are called *double ferta.* Raw skins are preferred to dry ones, as in the process of cleaning and salting the hair falls off and the value of the skins is consequently reduced. Skins and hides are sold in entire pieces. If they are cut in pieces or are mutilated, they

are not taken by the hide merchants, and are sold to the Muchis and Chamars at a nominal price.

Hides when thoroughly dry are sold by their weight in pounds. The price is As. 8 per pound for the best quality. They are divided into four classes, *halali*, *murdari*, *dagi* and *rautfol* or *ferta;* the first named being the best in quality. Hides of a very superior class are called *Commissariat hides*, but they cannot usually be had in the interior. The defects in hides are of the same nature as the defects in skins, but attention is not paid to a slight falling off of the hair in the case of buffalo hides. In the case of raw hides, taken by their weight, a deduction of $\frac{2}{3}$ of the weight is made in order to bring it down approximately to the weight of dry hides. The allowance in the case of partially dry hides depends on the degree to which the hides have become dry.

The skins of wild animals are obtained from shikaries—professional hunters—and from tribes and races inhabiting hills and jungles, *e.g.*, the Sonthals, Gonds, Kols, Hos, Mundas, Oraons, Paharias, &c. It is extremely rare that a wild animal is found dead from natural causes. The skins obtained are therefore invariably those of animals killed, and unless the animals are shot by guns their skins are damaged more or less. Animals are sometimes trapped and then battered to death. The skins of such animals are badly damaged and have no market value.

CHAPTER VI.

TANNING INGREDIENTS.

In this country, with its wealth of vegetable growth, ingredients for tanning are not wanting. They are to be had in the jungle produce as well as in the products of cultivation. Numerous trees and plants furnish the materials in their bark, roots and leaves, and the greater part, being waste products, are obtained without cost, or at a small cost. Unfortunately, however, they are not made the best use of through the ignorance of the people, and there are many ingredients the use of which is not known, or, if at all known, very imperfectly. The following materials have been found in use among the indigenous workers:—

1. *Lime.*—It is obtained by burning *ghuting* or *kankur*, which may be gathered in any quantity from the beds and banks of rivers and streams and from the fields. The quantity required is small; 5 seers are sufficient for tanning two buffalo skins, or four cow skins, or 12 goat skins. The price is 2 or 3 seers for a pice. Sometimes the Chamars pay a yearly rent in order to get the right of collecting the *ghuting*.

2. *Shell lime or lime obtained by burning shells.*—It is the same as that used for building purposes. Price, two seers per anna.

3. *Aora*, *Aola*, *Amla* or *Amlaki* (Phyllanthus Embleca).—The leaves contain some essential oil or fat and 18 per cent. of tannic acid. The bark contains about 13 per cent. of tannic acid. The dried pulpy portion of the immature fruit contains about 35 per cent. of tannin, but in the ripe fruit only traces of the tannin are found. The leaves and bark are dried and powdered and used for making the tanning liquor. It produces white leather. Price, 4 annas to Re. 1 per maund.

4. *Harra*, *Haritaki* or *Myrabolam* (Terminalia Chebula).—The dried fruits are extremely rich in gallotannic acid. They contain 31 to 44 per cent. of tannin. The bark is also very rich in the same substance, but the men use the fruits and not the bark. Price of the fruit, 2 annas per seer.

5. *Boera* or *Bahera* (Terminalia Belerica).—The fruit is used, but it is not very rich in tannin. Price, 2 annas per seer. It produces yellow or brown colour, but with *hirakash* it gives a black colour.

6. *Babul* or *Ejar* (Acacia Arabica).—Fruits or leaves and bark are used for the production of buff coloured leather. The husk or covering of the seeds has beenfound to contain as much as 60 per cent. of tannin and the bark 19 per cent. of it, but the seeds contain practically nothing.

7. *Dhan* (Anogeissus Latifolia).—Leaf is used. It produces yellow leather.

8. *Baer* or *Kul* (Tizyphus Jujubus).—The root dried and powdered is used. It produces brown leather.

9. *Arjun* (Terminalia Arjuna).—Leaf and bark are used, but commonly the bark. Price, 1 pice per seer. The bark contains about 8 or 9 per cent. of tannin and is sometimes used as a substitute for, and sometimes in conjunction with, the *Asan* or *Garan* or *Babul*. Used by itself it gives a brown colour.

10. *Taur* or *Teri* (Cæsalpinia Digina).—The trees are thorny, and the fruits are hard chitinous brown pods resembling *dhan* fruits. The fruits are dried and powdered and are considered the best material of all for the production of white leather. Price, Rs. 4-8 per maund. It is superior to *Divi-Divi* not only on account of its greater richness in tannin, but also because its extract does not undergo fermentation which is deleterious to leather.

11. *Asan* (Terminalia Tomentosa).—Its bark dried and powdered is used for the final tanning of heavy skins. Price, 2 annas to 6 annas per maund. It contains from 5·7 to 13·6 per cent. of tannin and imparts a characteristic red colour to native leather and is commonly used.

12. *Banha* or *Banda* or *Bana* (Loranthus Longiflora).—It grows as a parasite on mango and mahua trees. The roots, twigs, and leaves, dried and powdered, are used.

13. *Sál* or *Sakhua* (Shorea Robusta).—Its bark is used as a substitute for that of the *Asan*. It renders the leather brittle, and the latter consequently cracks and splits. Price, 2 annas to 6 annas per maund. Chemical analysis shows that it has tannin from 4 to 16 per cent. of the same kind as that contained in *Acacea Catechu*. The bark is often used in conjunction with the *Asan*, *Babul*, *Aora*, etc.

14. *Khari nimak or black salt.*—Price, 1½ seers per anna.

15. *Kath* or *Khair* (Acacea Catechu).—Extracts prepared from the bark and the wood are used. Price, 10 annas per seer. It contains tannin to the extent of 7 or 8 per cent. and produces a dark colour.

16. *Mahua* the (Bassia Latifolia).—The bark and leaves are used mostly in Bihar.

17. *Siris* (Albizza Lebbak).—The bark is used in some places. The price is 2 to 3 annas per seer.

18. *Piyal* (Buchanania Latifolia).—The bark is used.

19. *Divi-Divi* (Cæsalpinia Coriaria).—A very valuable tanning material introduced from South Africa about the year 1834. The pods have been found to contain 30 to 50 per cent. of tannin. The cultivation of the tree has not, however, been successful in Bengal, as the climate is unfavourable to its growth. Its merits are richness in tannin and excellent weight-giving property. Its defect is that its extract undergoes fermentation and causes red stains on the leather.

20. *Gab* (Diospyros Embryopteris).—The fruits are used for colouring leather brown or black. To blacken a cowhide, two or three fruits are squashed in a seer of water to which are added 5 or 6 powdered Myrabolams, one chittak of green vitriol, one chittak of smashed-up onions, and a few pieces of old iron. The hide is then soaked in the mixture for a day and is then taken out and stretched and dried, and the operation is repeated two or three times. The price of the fruit is Re. 1 to Rs. 2 per maund.

21. *Jiyal* (Odina Wodier).—The bark, which yields a brownish-red colour, is used.

22. *Rohina* (Soymida Febrifuga).—The bark, which yields a dirty brown colour, is used for tanning. It is sometimes used in combination with other tanning materials, *e.g.*, the *Natkan*.

23. *Kud* (Diospyros Melanoxylon).—The fruit is dried, powdered and soaked in order to obtain the tanning liquor.

24. *Jamun* (Eugenea Jambolana).—Its bark produces a black colour.

25. *Aswatha* or *Bur* (Ficus Religiosa).—The bark is used. The price is Rs. 3 per maund. It produces a light brown colour. Mixed with other barks it produces a black colour.

26. *Sidha* (Lagerstrœmia Parviflora).—The bark is used. With *Asan* it gives a black colour.

27. *Kamla* or *Abir* (Mallotus Phillippinensis).—Leaves are used.

28. *Am* (Mangifera Indica).—The bark and leaves are used. With *Aola* it gives a black colour, and with lime, a kind of green colour.

are not taken by the hide merchants, and are sold to the Muchis and Chamars at a nominal price.

Hides when thoroughly dry are sold by their weight in pounds. The price is As. 8 per pound for the best quality. They are divided into four classes, *halali*, *murdari*, *dagi* and *rautfol* or *ferta*; the first named being the best in quality. Hides of a very superior class are called *Commissariat hides*, but they cannot usually be had in the interior. The defects in hides are of the same nature as the defects in skins, but attention is not paid to a slight falling off of the hair in the case of buffalo hides. In the case of raw hides, taken by their weight, a deduction of $\frac{2}{3}$ of the weight is made in order to bring it down approximately to the weight of dry hides. The allowance in the case of partially dry hides depends on the degree to which the hides have become dry.

The skins of wild animals are obtained from shikaries—professional hunters—and from tribes and races inhabiting hills and jungles, *e.g.*, the Sonthals, Gonds, Kols, Hos, Mundas, Oraons, Paharias, &c. It is extremely rare that a wild animal is found dead from natural causes. The skins obtained are therefore invariably those of animals killed, and unless the animals are shot by guns their skins are damaged more or less. Animals are sometimes trapped and then battered to death. The skins of such animals are badly damaged and have no market value.

CHAPTER VI.

TANNING INGREDIENTS.

In this country, with its wealth of vegetable growth, ingredients for tanning are not wanting. They are to be had in the jungle produce as well as in the products of cultivation. Numerous trees and plants furnish the materials in their bark, roots and leaves, and the greater part, being waste products, are obtained without cost, or at a small cost. Unfortunately, however, they are not made the best use of through the ignorance of the people, and there are many ingredients the use of which is not known, or, if at all known, very imperfectly. The following materials have been found in use among the indigenous workers:—

1. *Lime.*—It is obtained by burning *ghuting* or *kankur*, which may be gathered in any quantity from the beds and banks of rivers and streams and from the fields. The quantity required is small; 5 seers are sufficient for tanning two buffalo skins, or four cow skins, or 12 goat skins. The price is 2 or 3 seers for a pice. Sometimes the Chamars pay a yearly rent in order to get the right of collecting the *ghuting*.

2. *Shell lime or lime obtained by burning shells.*—It is the same as that used for building purposes. Price, two seers per anna.

3. *Aora*, *Aola*, *Amla* or *Amlaki* (Phyllanthus Embleca).—The leaves contain some essential oil or fat and 18 per cent. of tannic acid. The bark contains about 13 per cent. of tannic acid. The dried pulpy portion of the immature fruit contains about 35 per cent. of tannin, but in the ripe fruit only traces of the tannin are found. The leaves and bark are dried and powdered and used for making the tanning liquor. It produces white leather. Price, 4 annas to Re. 1 per maund.

4. *Harra*, *Haritaki* or *Myrabolam* (Terminalia Chebula).—The dried fruits are extremely rich in gallotannic acid. They contain 31 to 44 per cent. of tannin. The bark is also very rich in the same substance, but the men use the fruits and not the bark. Price of the fruit, 2 annas per seer.

5. *Boera* or *Bahera* (Terminalia Belerica).—The fruit is used, but it is not very rich in tannin. Price, 2 annas per seer. It produces yellow or brown colour, but with *hirakash* it gives a black colour.

6. *Babul* or *Ejar* (Acacia Arabica).—Fruits or leaves and bark are used for the production of buff coloured leather. The husk or covering of the seeds has beenfound to contain as much as 60 per cent. of tannin and the bark 19 per cent. of it, but the seeds contain practically nothing.

7. *Dhan* (Anogeissus Latifolia).—Leaf is used. It produces yellow leather.

8. *Baer* or *Kul* (Tizyphus Jujubus).—The root dried and powdered is used. It produces brown leather.

9. *Arjun* (Terminalia Arjuna).—Leaf and bark are used, but commonly the bark. Price, 1 pice per seer. The bark contains about 8 or 9 per cent. of tannin and is sometimes used as a substitute for, and sometimes in conjunction with, the *Asan* or *Garan* or *Babul*. Used by itself it gives a brown colour.

10. *Taur* or *Teri* (Cæsalpinia Digina).—The trees are thorny, and the fruits are hard chitinous brown pods resembling *dhan* fruits. The fruits are dried and powdered and are considered the best material of all for the production of white leather. Price, Rs. 4-8 per maund. It is superior to *Divi-Divi* not only on account of its greater richness in tannin, but also because its extract does not undergo fermentation which is deleterious to leather.

11. *Asan* (Terminalia Tomentosa).—Its bark dried and powdered is used for the final tanning of heavy skins. Price, 2 annas to 6 annas per maund. It contains from 5·7 to 13·6 per cent. of tannin and imparts a characteristic red colour to native leather and is commonly used.

12. *Banha* or *Banda* or *Bana* (Loranthus Longiflora).—It grows as a parasite on mango and mahua trees. The roots, twigs, and leaves, dried and powdered, are used.

13. *Sál* or *Sakhua* (Shorea Robusta).—Its bark is used as a substitute for that of the *Asan*. It renders the leather brittle, and the latter consequently cracks and splits. Price, 2 annas to 6 annas per maund. Chemical analysis shows that it has tannin from 4 to 16 per cent. of the same kind as that contained in *Acacea Catechu*. The bark is often used in conjunction with the *Asan*, *Babul*, *Aora*, etc.

14. *Khari nimak or black salt.*—Price, 1½ seers per anna.

15. *Kath* or *Khair* (Acacea Catechu).—Extracts prepared from the bark and the wood are used. Price, 10 annas per seer. It contains tannin to the extent of 7 or 8 per cent. and produces a dark colour.

16. *Mahua* the (Bassia Latifolia).—The bark and leaves are used mostly in Bihar.

17. *Siris* (Albizza Lebbak).—The bark is used in some places. The price is 2 to 3 annas per seer.

18. *Piyal* (Buchanania Latifolia).—The bark is used.

19. *Divi-Divi* (Cæsalpinia Coriaria).—A very valuable tanning material introduced from South Africa about the year 1834. The pods have been found to contain 30 to 50 per cent. of tannin. The cultivation of the tree has not, however, been successful in Bengal, as the climate is unfavourable to its growth. Its merits are richness in tannin and excellent weight-giving property. Its defect is that its extract undergoes fermentation and causes red stains on the leather.

20. *Gab* (Diospyros Embryopteris).—The fruits are used for colouring leather brown or black. To blacken a cowhide, two or three fruits are squashed in a seer of water to which are added 5 or 6 powdered Myrabolams, one chittak of green vitriol, one chittak of smashed-up onions, and a few pieces of old iron. The hide is then soaked in the mixture for a day and is then taken out and stretched and dried, and the operation is repeated two or three times. The price of the fruit is Re. 1 to Rs. 2 per maund.

21. *Jiyal* (Odina Wodier).—The bark, which yields a brownish-red colour, is used.

22. *Rohina* (Soymida Febrifuga).—The bark, which yields a dirty brown colour, is used for tanning. It is sometimes used in combination with other tanning materials, *e.g.*, the *Natkan*.

23. *Kud* (Diospyros Melanoxylon).—The fruit is dried, powdered and soaked in order to obtain the tanning liquor.

24. *Jamun* (Eugenea Jambolana).—Its bark produces a black colour.

25. *Aswatha* or *Bur* (Ficus Religiosa).—The bark is used. The price is Rs. 3 per maund. It produces a light brown colour. Mixed with other barks it produces a black colour.

26. *Sidha* (Lagerstrœmia Parviflora).—The bark is used. With *Asan* it gives a black colour.

27. *Kamla* or *Abir* (Mallotus Phillippinensis).—Leaves are used.

28. *Am* (Mangifera Indica).—The bark and leaves are used. With *Aola* it gives a black colour, and with lime, a kind of green colour.

29. *Bakul* (Meriago Elengi).—The bark is used and produces a light brown colour. It is sometimes uesd in combination with the *Asan*, and then it produces a reddish brown colour. Price, 3 annas per seer.

30. *Dhadki* (Woodfordia Floribunda).—Leaves and flowers are used. The blossoms and leaves are dried in the sun and then made into the tanning liquor. The leaves contain as much as 20 per cent. of the tannic acid and produce a dirty red colour.

31. *Sonali* or *Sunari* (Cassia Fistula).—The bark is used in Lower Bengal and Orissa, often in combination with the *Asan* or *Teri*, or both.

32. *Sinduri* (Heritiera Fomes).—The bark is used. Price, Re. 1-4 per maund.

33. *Jika*.—The bark is used.

34. *Lodha* or *Nodha* (Symplocos Racemosa).—The bark and leaves are dried, powdered and made into an infusion. It gives by itself a yellow colour, but it is often used in conjunction with *Harra*.

35. *Natkan* (Bixa Orellana).—The fruit is powdered and used and gives a yellow colour.

36. Pounded *rice* or fermented *rice*.

37. *Gilo*. The fruit is used The tree grows in the Orissa Garjats. Price of the fruit, Rs. 2-8 per maund.

38. *Karoi*.—The bark is used. Price, 8 annas per maund.

39. *Gatiara* (probably a terminalia).—The bark is used. Price Rs. 2 per maund. It gives a red colour.

40. *Giran* or *Goran* (Ceriops Roxburghianus).—It can be had in abundance in the Sundarbans, whence it is imported into Lower Bengal for tanning purposes. The bark is used. Price varies from Re. 1 to Rs. 2. It makes the leather durable and impervious to water. The solution is sometimes prepared by boiling the bark with a quantity of *til* oil.

41. *Dholso*—Leaves are used.

42. *Dhawa* or *Dihua* (Woodfordia Floribunda).—Leaves and the bark are powdered and used. The infusion gives a brown colour.

43. *Saya* (Achryranthes Lanata).—Leaves are used.

44. *Kahua* (Pentaptera Arjuna).—Leaves are used.

45. *Guava* (Psidium Pyriferum).—The bark is used.

46. *Naina*.—The bark is used.

47. *Somrail*.—The bark is used.

48. *Kanak* (Ehretia Umbellulata).—The bark and leaves are used.

49. *Tamarind* (Tamarindus Indica).—The raw fruit is used.

50. *Bhusi* (Bran)—1 anna per seer.

51. *Linseed oil*.—Rs. 22 per maund.

52. *Fish oil*—Rs. 8 per maund.

53. *Bhusa kali* (Lampblack).—Re. 1-4 per seer.

54. *Tallow*—Rs. 15 per maund.

55. *Indigo*—Rs. 2 per pound.

56. *Khunkharapi* or *Laha* (extract from wax).—It gives a red colour.

57. *Hirakash* (Sulphate of iron or copper or green vitriol).—It gives a black colour. Price, Rs. 6 per maund. It is principally used in combination with *Harra* and *Aola*.

58. *Alta* or liquid vermilion (extract of wax).

59. *Sambul khar* or *Sakhua* (arsenic).

60. *Phitkiri* (alum).—It gives a white colour. Price, 4 annas per seer.

I may add here the names of the principal tanning materials used in England. The results they will give in this country and their suitability to it may be tested. The bark of the *Oak* is considered one of the best materials. It contains 10 to 12 per cent. of tannin. *Valonia*, or the acorn-cup of an evergreen oak growing in Greece and the Archipelago, is considered very good for sole leather. It contains 19 to 35 per cent. of tannin. The bark of the *Mimosa* from Australia contains 17 to 30 per cent. of tannin. The bark of the American *Hemlock Pine*, which contains 14 per cent. of tannin, and gives a red colour to leather, and the bark of the Spanish *Chestnut*, which contains 14 to 20 per cent. of tannin and gives a yellow colour, are used as colouring ingredients. *Myrabolams*, *Cutch*, and *Divi-Divi*, which were introduced within the last hundred years, are known in this country. Some of the other materials are

the *Algarobilla* pods from South America, which contain 50 per cent. of tannin; the *Sumach* leaves from South Europe and South America, which contain 16 to 27 per cent. of tannin; the *Mangrove* bark from Venezeula, which contains 24 to 30 per cent. of tannin; the rind of the *Pomegranate* fruit which contains 13 per cent. of tannin; the bark of the *Peppermint* which contains 20 per cent. of tannin; the bark of the *Persealingue* from Chili, which contains 20 to 24 per cent. of tannin and is very suitable for heavy leathers.

CHAPTER VII.

THE PROCESS OF TANNING.

No use can be made of hides and skins without tanning them, as in their natural state they are liable to putrefy in no time. To save them from putrefaction, tanning is required; but merely to prevent putrefaction no elaborate and prolonged process is necessary. Hides and Skins are turned into various products to meet the requirements of man, but before anything can be turned out of them they have to be made firm, durable, impervious to moisture, soft and supple. Tanning imparts to hides and skins these properties, and, as will appear, they have to be subjected to a series of operations occupying a considerable period of time. In the course of the treating, the tannins form, with the gelatins and albuminoids in the hides, a series of insoluble compounds which result in leather. Similar results may be obtained by other re-agents in place of tannin, *e g.*, alum or some acids or chlorides.

The process of manufacturing leather is divisible into two main heads, of which tanning is one and currying the other. The operation begins with treating raw hides and skins with tannic solutions and ends with manipulating them with fatty matters. Currying further softens leather, renders it more water-proof and improves its appearance. Currying, however, is not practised by the village leather manufacturers and the treating of leather with oil or fat referred to in section X is not a part of the process of currying it. In this monograph only the process of tanning has been described.

The process of tanning is almost the same everywhere. The difference lies in the tanning materials used, and the care, attention and time bestowed on the work. The method of treating the skins of goats and sheep differs slightly from that of tanning the hides of bullocks and buffaloes. The skins of deer, tigers and monkeys are dealt with somewhat differently. The successive stages in tanning bullock and buffalo hides are as follows:—

I. *Cleaning and drying green hides.*—The green pellicle flayed from the carcase of a bullock, or a buffalo, is first of all washed well, to remove mud and blood stains, dung plasters and other kinds of dirt. Plain water is used for the purpose. After washing, it is placed on the level ground exposed to the sun, the ends being pinned to the ground by small pegs in order to prevent contraction. If the hide has a bad smell, a solution of khari salt is applied to remove the smell. Sometimes before placing it in the sun, the reverse of the hide is plastered over with earth and water. Earth is used in the dry season and khari salt in the wet season. Two or three days sunning is sufficient in the dry season, but in the wet season a longer period is required. In the rainy season the hide often begins to rot, and in such cases the rotten portions are clipped off to prevent the rest of the hide from being spoiled. The hides thus dried are fit for exportation and are exported in this state from the interior. Unless they are dried and salted they must be subjected to the processes of tanning at once or they will rot. Usually, however, some time elapses before they are taken up for tanning and as the climate of the country is against their preservation in their natural state, the usual practice is to dry and salt them.

II. *Softening of dry and hard hides.*—The foregoing process renders the hide hard and dry. To soften it, it is steeped in water. Another method is to apply earth and water, or water only, and to roll the hide up and keep it by for a few days.

III. *Washing the hides.*—The washing referred to above is a preliminary one and meant only to remove the loose dirt, *i.e.*, dirt which has not gone deep into the hide. The second washing is a more thorough process. The hides are steeped in a *ban* or earthen cauldron, or wooden tub, for a day, and are then

rubbed with the hands or scraped with a blunt instrument, so as to thoroughly clean them of all dirt. Wet salted hides, dry salted hides, and sun-dried hides, obtained from merchants and dealers in hides, have to be similarly steeped in water, and washed, in order to free them from salt and to render them uniformly flaccid and soft. After washing they are stretched out on the ground to remove creases and marks of folds.

These are all only preliminary processes. The next operation is an important one.

IV. *Limeing the hides.*—The flesh side of the hide is next smeared with a thick layer of lime. It is then rolled up, folded, and immersed in a strong solution of lime in a tub or pit, and weights are put over it to cause complete immersion. It is usually taken out and aired every day for an hour or so. Some, however, soak it for three or four days continuously; after which they unroll it, air it, fold it up again, and put it into the lime vat for another period. During the period of its immersion it is often stirred in the solution, to assist the work of the lime, and in order to obtain a uniform spreading over of the substance. But this process has a more important object, viz., prevention of heating and rotting of the hide. In the cold weather, cowhides are kept in lime water for 8 to 12 days and buffalo hides for 15 or 16 days; but in the hot weather, the usual periods are 5 or 6 days and 10 or 12 days. If the hide is kept in lime for a longer period than necessary, it will decompose. This process of limeing is commonly known as "sweating." For one buffalo, or two bullock or cow hides, or six goat or sheep skins, 3 seers of freshly burnt and clean lime are used, mixed with 7 seers of water. If the hide is dry, it is first soaked in water for about 12 hours and is then put into the lime-pit, and the period of limeing it is longer by one to three days according to the season and the class to which the hide belongs.

The object of limeing is the same for all classes of hides. It is to swell the hides, to make them more porous and therefore more permeable to the tanning solutions, to render them soft and flaccid, and to loosen the fur and the fleshy and fatty substances attached to them.

V. *Unhairing and Fleshing the hides.*—The hide is then taken out of the lime-pit or tub and the water wrung out of it by twisting it tightly. It is then put on a sloping block of wood called the tanner's beam (*kanta pin*), or on a stone called *sille*, or on the floor, or on the smooth ground, as straight as possible, and the hair scraped off by means of a blunt knife called *banki* or *khurchuni*. The latter is a slightly curved instrument provided with one, but usually with two handles. It is held fast on the hide and dragged on its edge with a firm and steady hand. If the tanner is too poor to possess a knife he uses a bit of broken earthen-ware, or a brick, or a *jhama* for the purpose. The inner side of the hide is then scraped clean of its adherent flesh and fat with a sharper knife called *bandar* or *raupa*, convex and semi-circular in shape, and resembling somewhat the gardener's weeding knife, but a little wider at the head. Sometimes only the *khurpi*—an ordinary iron scraper—is used. If scraping is not sufficient the fleshy and fatty substances are pared off with the knife.

The removal of the hair requires no labour at all. The limeing putrefies the roots of the hair and causes the latter to fall off easily. Sometimes it is sufficient only to rub the hairy side with the hands or with a piece of cloth.

The removal of the hair and the flesh is usually done one immediately after the other. But sometimes an interval is allowed between the two. After the hair has been removed the hide is placed in a tub of water and washed three or four times. It is then soaked in water for about 12 hours, during which the water is changed twice, and after which it is spread on a smooth surface with the flesh side uppermost, and the flesh scraped off.

Ordinarily it takes a full day to unhair and flesh a big hide, but three goat skins can be done in one day.

If the hair is to be kept intact, the raw skin is spread out in the sun with the hairy side down and the flesh side up, and the edges are fixed to the ground by means of pegs to keep it straight. The flesh side is then rubbed hard with *khari* or rock salt to remove the flesh and fat.

VI. *Washing away the lime.*—This is the last process preceding tanning proper. The hide has now to be thoroughly cleaned of lime, and for this purpose it is put into a tub of clean water and rubbed with the hands. But

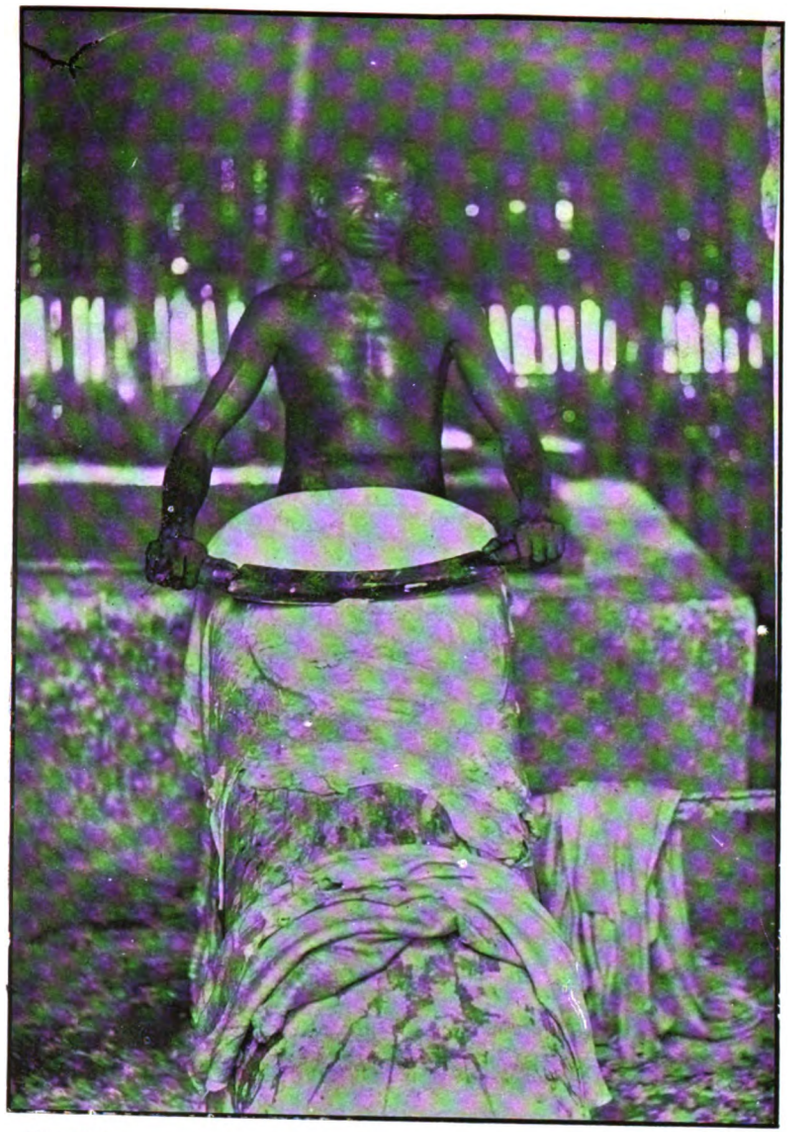
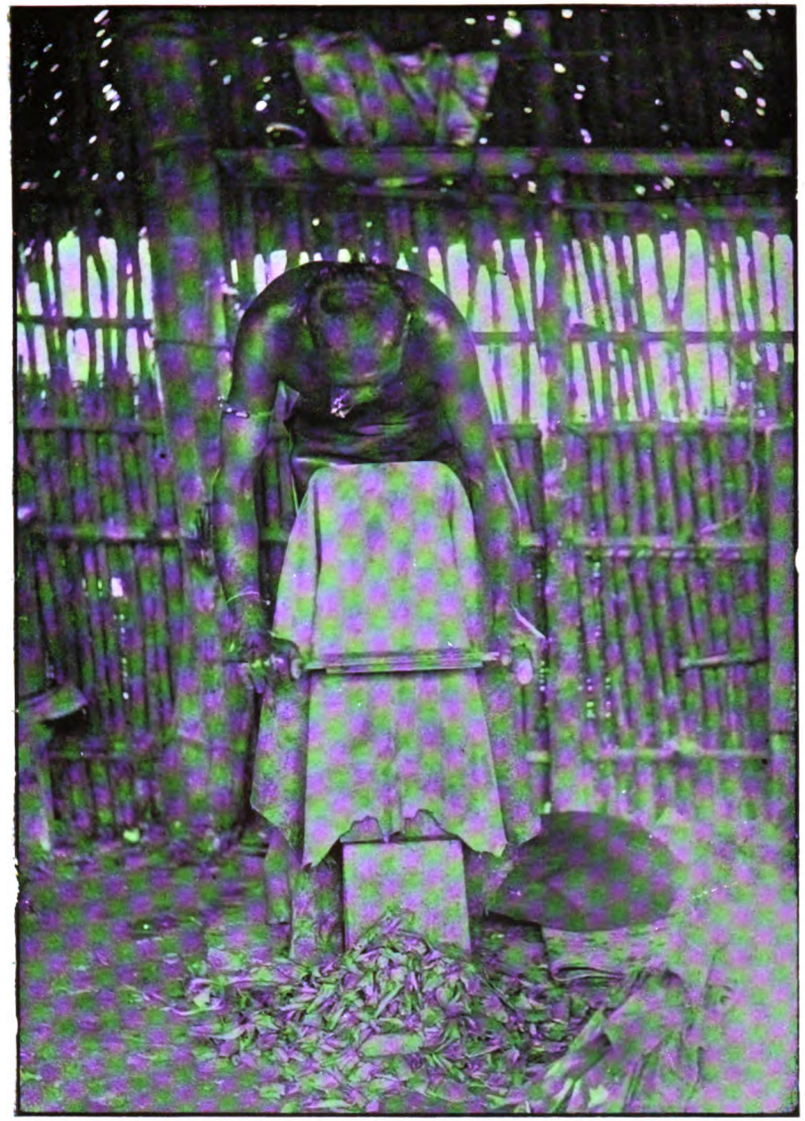


Photo-Block.

Fleshing.



Survey of India Offices, Calcutta, 1904

Shaving.

the use of running water is preferable, as the hide can then be cleaned better. To thoroughly clean it, the hide is rubbed with soap in a tub of bran and water, in the proportion of 2 pounds of bran to a gallon of water. Instead of soap, some people rub it with alum and then wash it. Others again steep it for a period of 10 to 15 days in a diluted solution of gruel or water of boiled rice. In order to remove the smell of lime and gruel they sprinkle salt water over the hide, and after this they twist the hide like cloth to take out the water. In some places the hide is dipped in a solution of the juice of *mahua* leaves for a double purpose, viz., to clean off the lime and to distend the pores for the process of tanning proper.

VII. *Tanning proper.*—The technical expression in the vernacular for tanning is making the leather *pucca*. The tannic mixture is called *kush jal*. In the preceding chapter, the names of the various tanning ingredients in use have been given, and in some cases their tannic property has also been stated. The fruits, leaves and bark of various trees and plants furnish the materials. The tannic mixture is produced in several ways. The materials are gathered green and are dried, broken up and simply mixed with cold water or boiled in water and used at once. Sometimes the raw material is boiled. Sometimes the dry material is soaked in cold water long enough to yield the decoction required. Sometimes the tanning materials and the hides are soaked together in a vessel of water. Whatever the process of preparation, there can be little doubt that it is very perfunctory and crude. A succession of tanning liquors is used sometimes with a single material and sometimes with a combination of materials. The general idea seems to be that the stronger the infusion, the more satisfactory the results to be expected and the shorter the duration of the process necessary. But it does not appear that the men have any clear ideas as regards the potency of the infusions they use.

The tanning is carried out in two ways, viz., by steeping the hide in a solution of tannic material and by infiltration of the decoction through the hide. The steeping process is as follows:—The hide is put in a vat containing the infusion and is trodden with the feet or rubbed with the hands. Some people thrash the hide in a manner similar to that adopted by washermen in washing dirty linen. The object of doing all this is to force the tannic juice into the pores of the hide and thus to impregnate it with tannin. The treading is employed for two or three hours a day; or, if it is rubbing, four or five times a day. The treading or rubbing is gradually diminished and is eventually stopped if the steeping is continued for a long period. Generally after two to four days the hide is taken out and the superfluous moisture squeezed out. Sometimes instead of twisting the hide, it is pressed on the "draining table"—a block of wood or stone or the cemented floor—in order to take off the moisture. The old solution is now thrown away, and the hide is soaked in a new and stronger solution of some other tanning ingredient. After two or three days the hide is removed and the water is squeezed out of it, and it is then put into another mixture, and this process is continued as many times and with as many tanning mixtures as the tanner wishes. Five or six steepings are considered essential for cow hides, and eight to ten for buffalo hides. In order to obtain very substantial leather, sometimes as many as fourteen solutions are used one after another. But the ordinary Muchi or Chamar does not take so much trouble, and he does not give more than two or three soakings to his hides.

Some Muchis do not at all use the process of steeping, and instead rub the hide on both sides with a paste made of the powder of a tanning ingredient and water. They then dry the hide in the sun for a period of four to eight days.

Others again do not use the second process of tanning proper, viz., infiltration, but content themselves only with steeping. They are, however, careful that the latter is really a thorough process, and for this purpose they place the hides in lapping pits after they have undergone sufficient steeping in the bark solution pits. The lapping pits are pits in which the hides are laid in strata with usually raw *babul* bark between each hide and the whole sunk in a solution of the same ingredient. The process of the lapping pits is repeated four or five times in the case of cow and buffalo hides and lasts from eight to ten months; it is repeated two or three times in the case of goat and sheep skins and lasts from four to six months.

Yet another process remains to be mentioned. In some places after the first course of steeping the hide is removed from the bath and is placed on a wooden plank and scraped by means of a wooden instrument like the hairing knife called *beonga*. After the second course of steeping it is again scraped and brushed until it regains the original colour.

We now come to the next process, viz., that of infiltration, a process generally followed by Muchis and which comes after that of steeping in tan-liquors. For this purpose the hide is sewn up on three sides and made into a bag resembling the bhisti's *masak* (leather water-bag). A tanning infusion is then poured into the bag until the latter is quite full. The open side is then sewn up and the bag suspended from a tripod made of three bamboos or poles. Underneath the bag is placed a vat which catches the infusion, as it percolates through the hide and falls out drop by drop. Instead of the infusion prepared beforehand many tanners put inside the bag the tanning materials and then pour water into the bag. The infusion is thus made inside the bag. Some say that the object of this process is to clean the hide and to expel all fatty matter from it. But this cannot be, as in the first stages of the tanning the hide has already been cleaned as thoroughly as possible. The real object is to complete the impregnation of the hide with the tannin. The infiltration is repeated as often as the tanner desires. When the inside has been well done, the bag is turned inside out and in the reversed bag the tanning liquid is poured, and the process is continued until the tanning is satisfactorily done. A test as to whether the infiltration is complete or not is to beat on the hide to find out the sound it gives. If the sound is hard, and not soft, the tanning is considered done. If after three or four days the sound is soft, the hide is taken down and put back into the tanning pit for a few days. Soft sound on striking the hide, together with the appearance of granular excrescences on the latter, are signs indicating that the process has been unsuccessful.

Of the tanning ingredients mentioned before, the following are mostly used. They are shown in the order of the extent of their use:—

(*a*) Harra or Haritaki (*Myrabolam*).—It is used almost everywhere.
(*b*) Babul (*Acacia Arabica*)—Used almost as much as the preceding.
(*c*) Amla, Aora, Amlaki (*Phyllanthus Embleca*).—It is very extensively used.
(*d*) Asan (*Terminalia Tomentosa*), Am bark (*Mangifera Indica*), Garan bark (*Ceriops Roxburghianus*), Sal or Sakhua (*Shorea Robusta*) come next. Of these Asan and Garan are more in use. The latter is used only in Lower Bengal.
(*e*) Teri or Taur (*Cæsalpinia Digina*), Mahua (*Bassia Latifolia*), Arjun (*Terminalia Arjuna*), Bahera (*Terminalia Belerica*), Dhawa or Dahua (*Woodfordia Floribunda*) come next. These have been placed in the order of the extent of their use.

Where two or more ingredients are used mixed, it has been found that generally the following combinations are made:—

(1) Harra and Natkan.
(2) Do. and Giran or Garan.
(3) Do. and Bahera.
(4) Amla and Gilo.
(5) Do. and Dholso.
(6) Babul and Bahera.
(7) Do. and Harra.
(8) Do. and Garan.
(9) Do. and Am.
(10) Bahera and Dahua or Dhawa.
(11) Asan, Sakhua or Sal and Babul.
(12) Harra, Garán and Teri.
(13) Babul, Garan and Harra.

In the process of steeping, the materials commonly used are—Harra, Garan Teri, Babul, Am, Amla, Mahua and Bahera.

In the process of infiltration the materials commonly used are—Asan, Dhawa, Sal or Sakhua, Babul, Banha, Dhan and Arjun; but most of all, and in preference to all, the Asan.

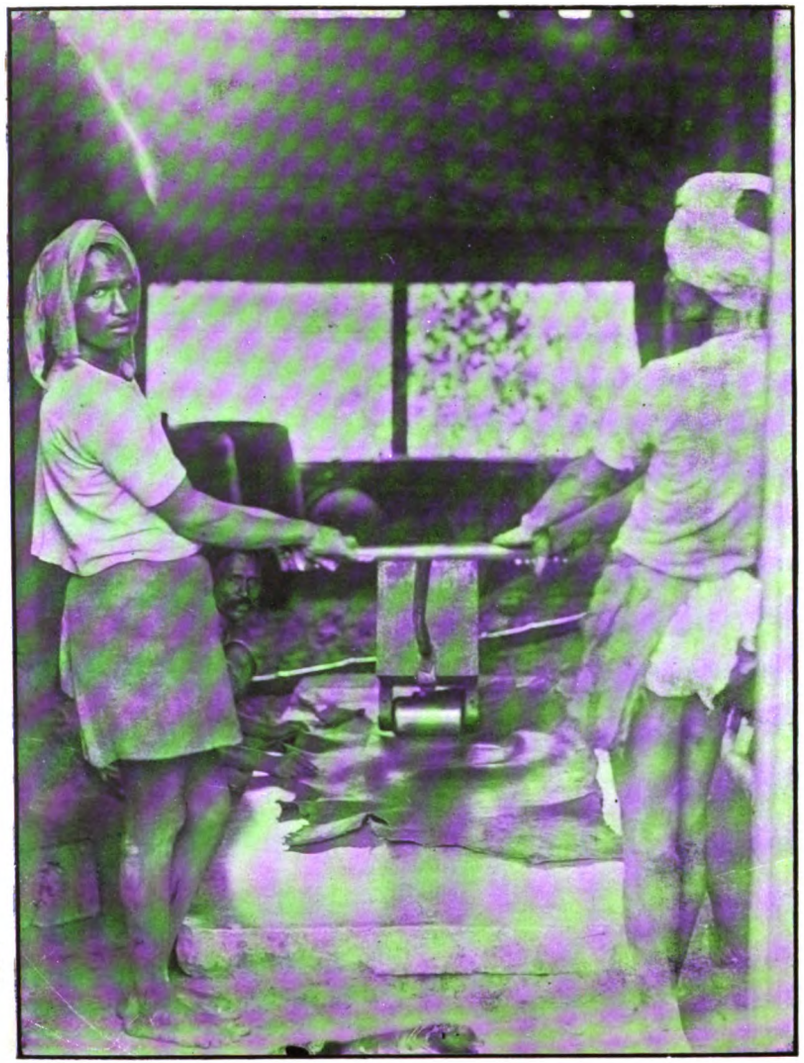
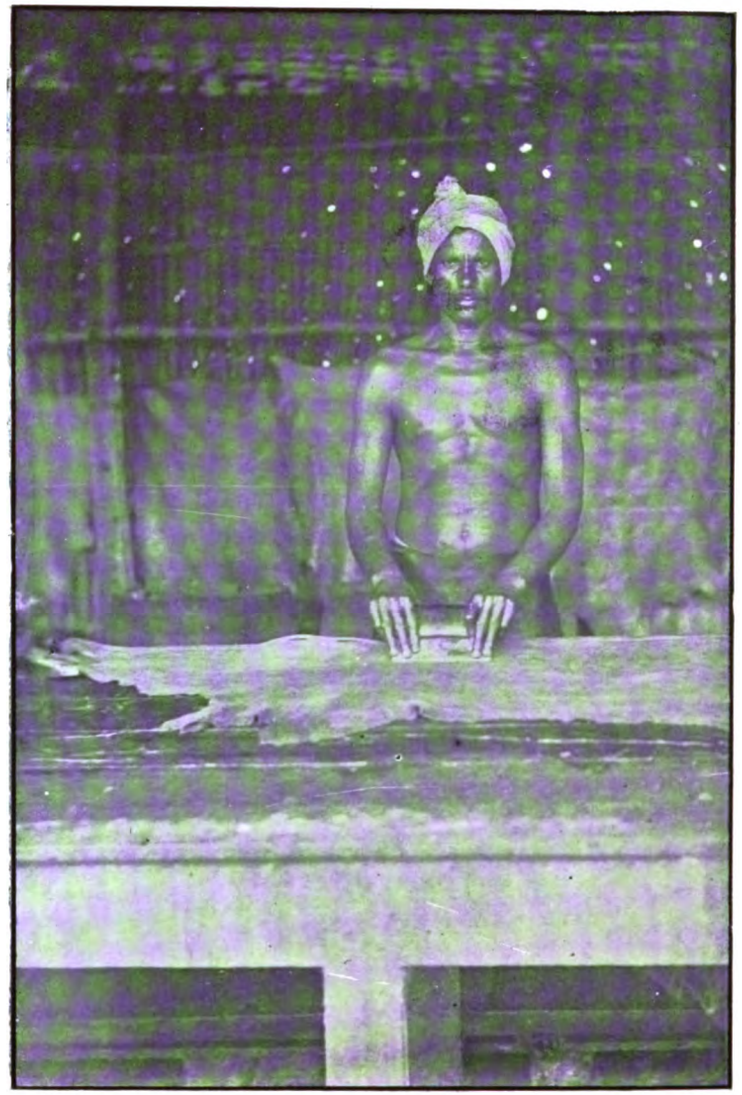


Photo-Block

Smoothening of hides by the roller.



Survey of India Offices, Calcutta, 1904.

Greasing and sleeking.

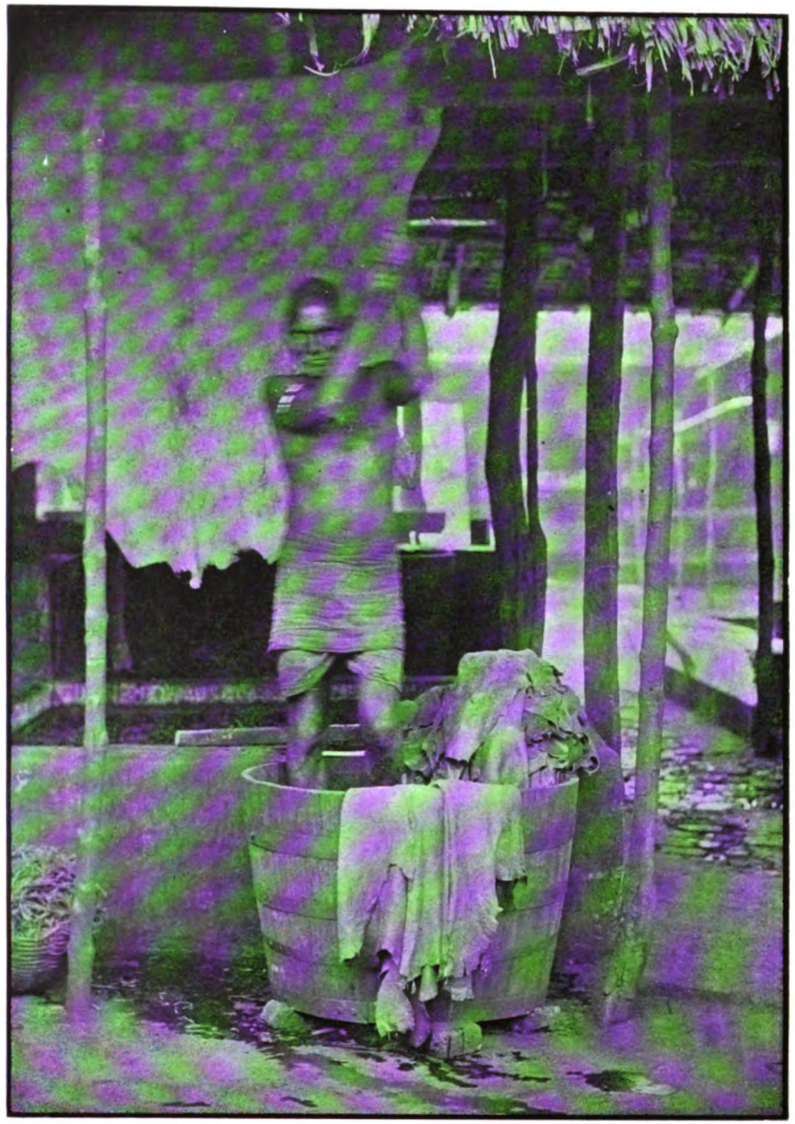
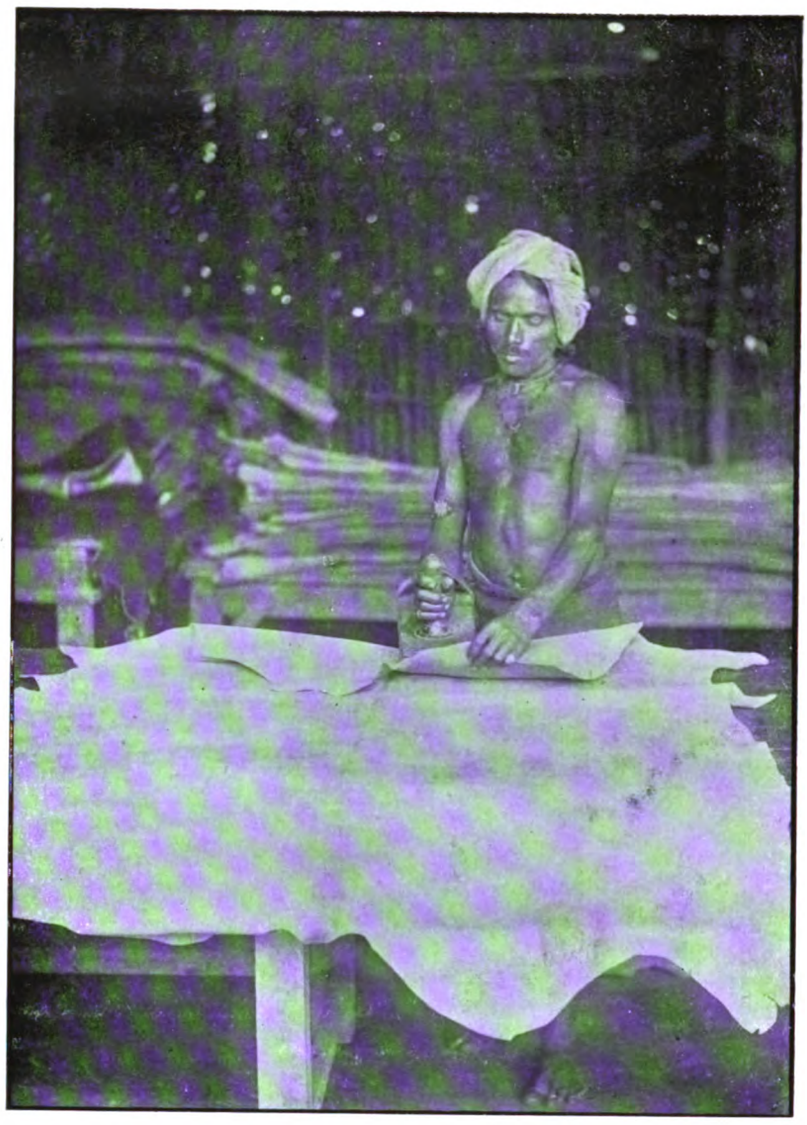


Photo-Block.

Treading hides in tan liquor vats.

Survey of India Offices, Calcutta, 1904.

Softening hides.



Graining by hand.

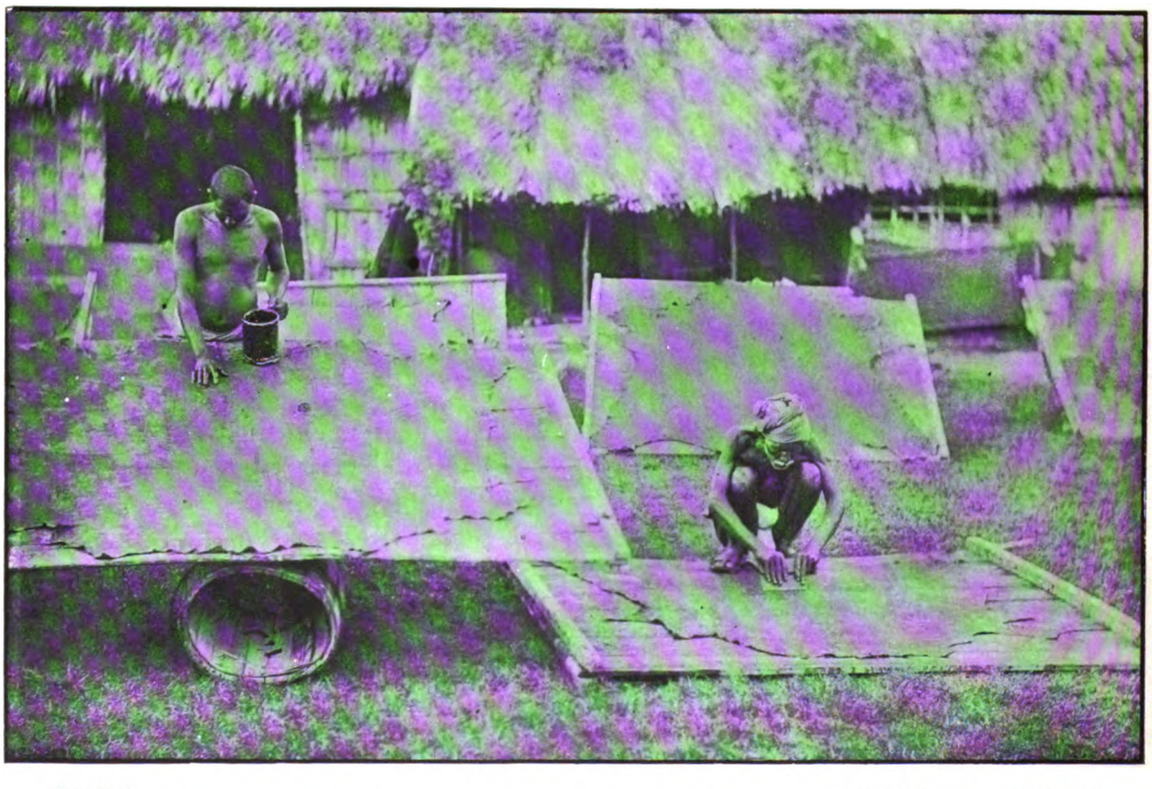


Photo-Block

Varnishing.

Survey of India Offices, Calcutta, 1904.

VIII. *Making the leather compact, soft and supple.*—After infiltration has been completed, the bag is opened up, and the leather stretched out on a flat board, and the tanning ingredients are dusted off or washed away. The leather is then allowed to dry partially. Next comes the process to make it compact, soft and supple. It begins with an application of khari salt, fried and powdered, mixed with flour or pounded rice, or without it, on the inner side of the leather. The salt is rubbed till it permeates the leather, and a little water is sprinkled over the latter, if it is tough. It is then rolled up and trampled under foot for an hour or so. After that, it is unrolled and placed over the mouth of a hollow block of wood called *ookhli* and hammered by the end of a heavy pole called *shamat*. In order to have the whole surface beaten on, the leather is moved about over the *ookhli*. The hammering process lasts for a couple of hours or so, and its object is said to be to give compactness to the leather. In tanneries the process consists of striking the leather with force—like the washerman striking his linen on the washing board—on a spiked surface, *i.e.*, a block of wood covered thickly over with blunt wooden spikes. The inner surface of the leather is, thereby, broken up and the leather made supple.

IX. *Shaving.*—Next, creases and marks of folds, etc., are removed, and for this the outer side of the leather is scraped, rubbed and scoured with a knife of *khair* wood (if the tanner possesses it) or with merely a piece of split bamboo, somewhat like a paper-cutter, called the *pelengi*. After this, the leather is finally dried in the sun before it is subjected to the process of shaving. The leather is now spread over the *shaving pin*—a sloping board—with the inner side upwards, and the surface is carefully worked upon with a sharp two-handled convex knife. The rough parts are pared off and the leather is made uniformly even. The parts which are thicker are also sliced away, in order to make the leather uniformly thick.

X. *Smoothening.*—In the villages all that is done in this process is to spread out the leather on an even surface and to place over it weights. In tanneries the leather is spread over a smooth surface and rolled over with a heavy roller. One man catches the leather spread out and two men work the roller up and down over the leather till perfect smoothness is obtained. Or instead of using the roller, the leather is placed on a smooth surface under a press and is allowed to remain there till it is perfectly smooth.

XI. *Polishing and graining.*—The leather is now dressed with fish oil and tallow or pig's lard, and when the application has well soaked in, it is rubbed, by those who possess it, with a three-sided steel instrument called a "*sleek*," to remove any crease and unevenness still left. The ordinary village Muchi polishes his leather by drawing over it a flat smooth piece of iron. Graining is a process known only to regular tanners and is followed in regular tanneries. To produce grained leather it is worked on on the greased outer side with an implement with a cork surface, an illustration of which is given.

XII. *Colouring and Varnishing.*—Varnishing is not known to the village Muchis. Varnished leather is only produced in regular tanneries, *i.e.*, in Calcutta and its suburbs. The village Muchi usually colours his leather. He produces leather of different shades of red, black, yellow and white, the quality of which depends on his knowledge of the colouring ingredients and the method of using them. His knowledge of the materials is very limited indeed, and his method of colouring very primitive. To obtain black leather he simply rubs black ink composed of myrabolam and ferrisulph. He colours leather red by applying *laha* or *khunkharapi* (extract from wax). White leather is manufactured by the use of *lodha* or *nodha*; brown, by the use of the *dahua* or *dhawa* decoction; orange, by the application of colour extracted from the *kusm* flower. There is no gloss or glaze in the leather, and the colouring is so imperfect that it can only pass muster before rural folks unacquainted with foreign manufactured leathers.

Tanning goat and sheep skins.—The process of unhairing and fleshing these is much the same as in the case of the hides already mentioned, the principal difference being that the period of the limeing of these skins is usually two or three days only. After this the skins are soaked in *amani* (water in which rice has been boiled) for three or four days. They are then spread out on the ground

and sprinkled over with salt. After a few hours the moisture is rung out, and the skins are again spread out and from time to time twisted and pressed with the hands to make them soft. Some tanners soak the skins in a solution of alum, instead of in *amani*, for two or three days, in order to make them smooth and soft. Next comes the process of colouring, which consists in soaking the skins for three days in a solution of *sunari* or *sonali* bark in order to obtain a brown colour; or in *alta* (extract of wax) for a red colour; or in alum for a white colour; or in ferrisulph for a black colour. If a repetition of the soaking is necessary a new bath is prepared and given, as the same bath can be used only once.

Sometimes the skins are not at all tanned; but are merely tawed by the application of *khari*.

Method of treating tiger, deer and monkey skins.—The skins of tigers and deer are also tanned by the village Muchis, where these animals can be had, viz., Orissa, Chota Nagpur, the Darjeeling Terai, the Sunderbans, &c. Monkey skins are merely tawed by the use of *khari*, but as this animal (the *langur*, which is to be found almost everywhere) is held sacred and is not killed, the work in this line is nominal.

Tiger skins are dealt with in the following manner. They are rubbed with *khari* and *phitkiri* (alum) and then dried in the sun. Next they are made tough by the use of *Sankua* (arsenic). They are then rubbed with *dahi* (curd) mixed with chalk. For deer skins the hair of which has to be retained, the process is similar, but where the hair is not required, the following process is followed. The skin is soaked in water and the hair scraped by a knife. It is then well cleaned in water and soaked in *harra* solution. A second steeping in *harra* is next given, and the solution is rubbed into the skin. Then follows a steeping in *bakul* solution, and it lasts three days, and the solution is well rubbed into the skin. The latter is then sewn into a bag, and an infusion of *bahera* is poured into it. When infiltration is completed the skin is dried and *dahi* is rubbed on it. This completes the process.

These skins are treated in such a defective manner that they never last long. The hair falls off and the skin is attacked and damaged by insects. Tiger skins, bear skins, deer skins, and the skins of other wild animals are, therefore, usually sent to Calcutta to be treated by taxidermists. Their processes are not indigenous and need not be described in this monograph.

CHAPTER VIII.

THE DEFECTS OF INDIGENOUS TANNING.

Leather, like other commodities of a marketable nature, is judged by certain general standards, such as colour and texture. The lighter the shade and closer the texture, the superior is the quality of the leather.

The native manufactured leather has no claim whatever to superiority of quality as it has many defects as pointed out below. But before entering into the defects of indigenous leather and indigenous tanning, let us see what the hides are. As a rule, hides of a superior quality are not available. The cattle are weak, lean and poor in growth. The hides are consequently wanting in strength, compactness and thickness. Moreover, they are often spoiled by sores and skin diseases. The practice of branding the diseased part of an animal's body, on the supposition that the disease will be cured thereby, really deteriorates the skin. Then the Muchis are careless in taking off the skins from dead bodies, and this results in punctures and cuts in the skins. Thus the material to work with is very inferior if not defective.

The native manufactured leather is neither soft nor durable nor impervious to water. Often it is raw and ill-smelling. It cracks and splits or rots easily. All this indicates serious defects in tanning. The indigenous process is as tedious as it is crude, and time and labour could be saved and better results obtained by the introduction of modern methods. To begin with, dry hides could be better softened by the use of sulphide of sodium. Putrefaction in the process of limeing could undoubtedly be prevented by using solutions of borax or carbolic acid. To remove lime and to distend the pores more effectually before commencing actual tanning the leather should be treated with dilute acids.

The tanning extracts are generally of a very inferior kind, as they are prepared carelessly. The green materials are obtained often in a most careless way. The bark, for instance, is removed by beating it with mallets or sticks, and the result is that much of the tannic juice is lost. It ought to be removed by means of some peeling instrument. At present no distinction is made between full grown trees and mere saplings. The bark of full grown trees of course yields the largest quantity of tannin, and care should be taken to use bark from full grown trees only. Then, again, the bark is stripped from the trees at all seasons of the year, whereas it should be taken when it is most juicy, and for this purpose it should be removed only in the season when the sap is upon the trees. The stronger and more quick-acting tanning ingredients which can be had in abundance in this country, should be chosen and foreign materials of known efficacy should be tried. At present no precaution is taken to prevent the formation of gallic acid in the infusions used, and hard water is used in the preparation of the latter. The fullest effect is never obtained from them. By the use of disintegrators better tan-liquors can be produced. The strength of the infusions should be tested before using them. Then, again, sufficient time is not allowed for the tannin to act on the hide thoroughly. Lastly, for the production of very soft and flexible leather the process of bating, *i.e.*, treating with pigeon or hen dung, may be adopted.

CHAPTER IX.

MANUFACTURE OF LEATHER ARTICLES.

We have now tanned leather. The cost of tanning leather in the indigenous fashion is roughly estimated at As. 8 to Rs 3-8 per piece. The price of tanned leather varies according to its quality and the demand for leather-made articles. The better the quality, the greater must have been the labour involved and larger the number of tanning materials used. Then, again, if there is a great demand for leather articles, the price of leather must be high. One thing is beyond question, viz., that within the last 30 or 40 years there has been a great rise in the price of raw hides and skins, owing to their exportation to foreign countries, and this has produced its natural effect on the price of tanned leather.

The price of leather at present is as follows :—

Cowhides, brown leather, Rs. 4 to Rs. 9 per piece.
Ditto, black leather, Rs. 4 to Rs. 8.
Buffalo, brown leather, per piece Rs. 12 to 15; per pound As. 12.
Sheep and goat skin, brown or white, Re. 1 to Rs. 2.

The articles manufactured by the village Muchis consist of shoes, slippers, native pump shoes or chamarkhani or nagra shoes, embroidered slippers of kinds for the use of Muhammadan women who get this article as part of their marriage dowry; various sorts of drums, leather straps or strings for tying carts and ploughs, whip-lashes, money-bags and pouches, water-carriers' bags, leather sheets for covering things, bellows, &c. In many places, carriage cushions, scabbards for swords, baskets and boxes, machine belts, jars for keeping oil, ghee or molasses, coverings for boxes, coverings for bullocks, ropes and vessels for drawing water are made. Saddles and bridles are made only in the larger towns, *e.g.*, Calcutta, Patna, Dacca, Monghyr, Dinapur, &c. In most towns decent boots and shoes are made, as the workmen are more clever than their brethren in the villages, and as they use foreign leather. Country harness (for hackney carriages, ekkas, &c.) is made in all the important towns.

The following list shows the prices of the various articles manufactured :—

Country or nagra or chamarkhani shoes, As. 8 to Re. 1 per pair.
Munda shoes, Re. 1-2.
Shoes for the upper classes, Re. 1 to Rs. 3.
Boots, Rs 3 to Rs. 5.
Slippers, As. 6 to Re. 1-4.
Do., ornamented, As. 12 to Rs. 2.
Motes (bags for drawing water), Rs. 3 to Rs. 5 each.
Leather straps for fastening oxen to the ploughs, As. 2 per piece.

Musical instruments—

Dugi, As. 12 each.
Tabla, As. 12 „
Dholak, Re. 1 to Rs. 3 each.
Khole, Re. 1 to Rs. 10 „
Khanjani, As. 4 to As. 8 „
Mirdang, Rs. 4 to Rs. 5 „
Dhak, Re. 1-8 to Rs. 10 „
Mandar, Re. 1 to Rs. 2 „

Native Saddles, Rs. 8 to Rs. 10 each.
Asan (seats) made of deer skins or tiger skins, Rs. 2 to Rs. 5 each.
Whip lashes, An. 1 to As. 4 per piece.
Money-bags and pouches, An. 1 to Re. 1 each.
Bridles, Rs. 2 to Rs. 4 each.
Mundles, As. 8 to Re. 1-8 „
Hide ropes, Rs. 10 to Rs. 12 per piece.
Skin-jars, As. 8 to Rs. 2 each.
Skin boxes and baskets, Re. 1 to Rs. 3 each.
Water-bags, Rs. 3 to Rs. 5 each.
Jhalla, (coverings for bullocks) Re. 1 to Rs. 3 each.

Goat and sheep skins and calf leather are mostly used in the villages for making strips for sewing and for shoe-edging (*magji*). Cow leather is mostly used in making the top parts, and buffalo leather, the soles and heels of shoes and boots. Goat and sheep skins are generally used for the inner lining of boots and shoes. Goats-skin is mostly used for musical instruments, the principal centres of the manufacture of which are Calcutta, Murshidabad, Dacca and Vishnupur (in Bankura).

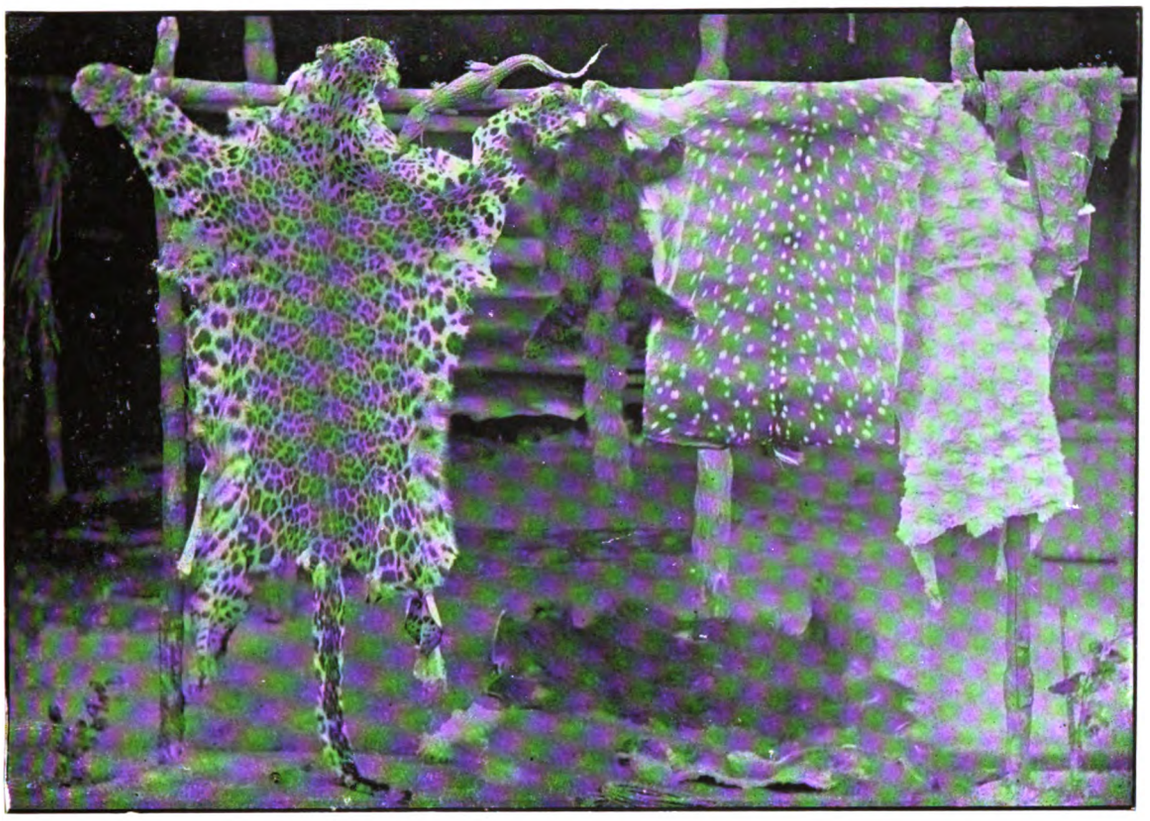
Tiger and deer skins are mostly made into asans (carpets to sit on) and foot rugs.

In a separate list (see Appendix II) the various articles manufactured by native workers employed at Messrs. John Teil & Co.'s Tannery at Kidderpore, the oldest tannery in this country, have been mentioned. Being properly trained by their employers their products are much more varied and better finished than those of their brethren in the villages.

The commonest of all articles manufactured is of course the shoe, and it may be worth while briefly to describe the indigenous process of manufacturing it. The stages of the preparation are as follows:—

(1) Cutting pattern on paper.
(2) Planing leather and cutting it according to pattern.
(3) Preparation of the upper part of the shoe.
(4) Ditto of the sole.
(5) Heel-making.
(6) Joining all together.
(7) Cleaning.

The first thing is always to cut a pattern on paper. The next process is to plane the leather. The upper part of the shoe, called the *kuanda* or *asbab*, is then cut out. A piece of leather of about the right size is taken and from the middle of it a piece is cut out to make the opening for the insertion of the foot. A second piece of leather is then taken and a similar opening of exactly the same size is made in it. The two pieces of leather are then stitched together round the inside of the opening and are turned inside out to get the sewing inside. The edges are then trimmed and stitched together. Oftener, however, the outer leather is cut in two pieces, but the lining is kept a whole piece as it gives a better shape. When the pieces of the outer leather have been joined together they are mounted on a wooden mould and stitched up with the lining. The upper part is now done. Then the *tala*—sole—is made by taking three or four pieces of leather and cutting them into the right shape, pasting them together and then stitching them by a narrow strip of leather—*salu*—down the centre and then by a leather string round the edges. Then the leather for the heel is cut and joined together by paste and stitched on to the sole, but as the stitching cannot reach the end of the heel on account of its thickness, nails are used to attach it firmly to the sole. Finally, the upper part and the sole are joined together, the edges of the upper part being stitched to the edges of the sole. The shoe is then cleaned by a piece of glass and rubbed over with wax or lard.



Skins of different animals tanned at the Calcutta Tannery.

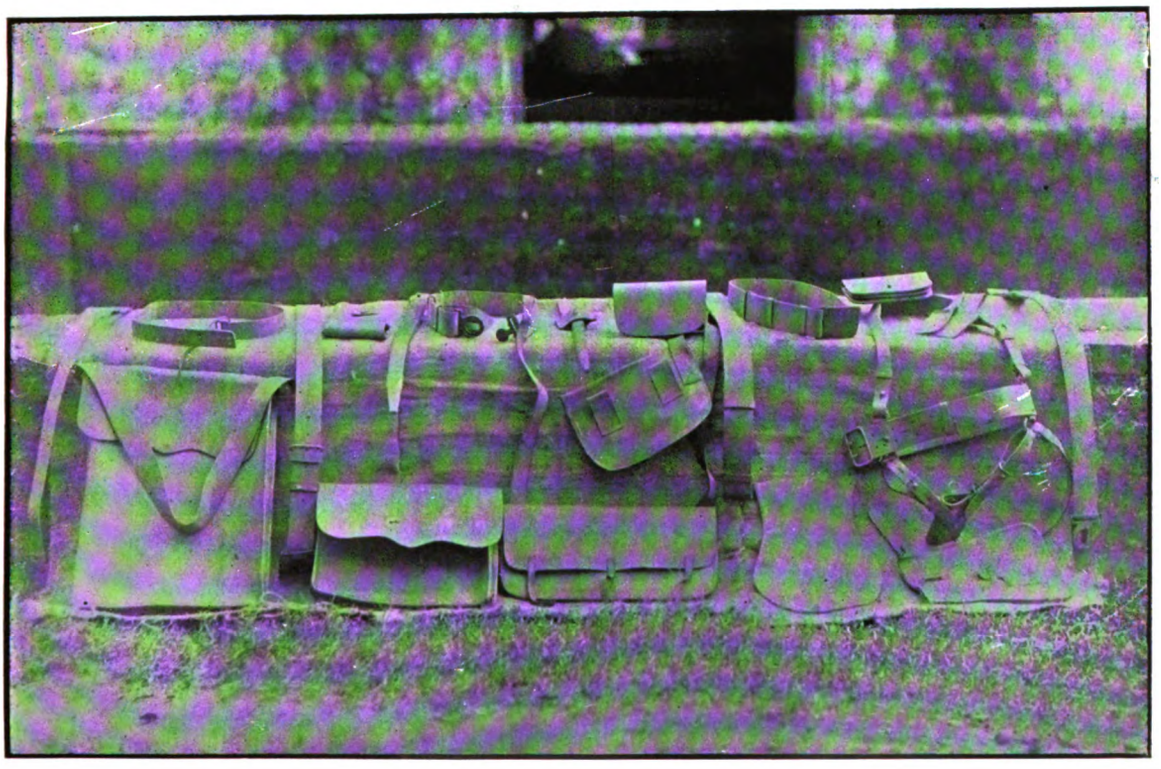


Photo-Block. Survey of India Offices, Calcutta, 1904

Various articles manufactured by native workers at Messrs. John Teil & Co.'s Tannery at Kidderpur.

The implements used are—

(1) A wooden board (*pirhi*) on which the leather is planed.
(2) Do. stick (*benga*) to smooth the leather.
(3) A chisel (*kharpa*) for cutting leather.
(4) A chisel (*khurpi*) for graining the edges of the sole.
(5) A pounder (*lohia*).
(6) Pincers.
(7) Sewing pin (*khatarni*) to pull the thread through when stitching.
(8) Boring pin (*sutarni*).
(9) Horn (*singhia*) to keep lard or wax in. The lard or wax is used to make the thread come through easily.
(10) Hammer (*haturi*).
(11) The last (*phorma*).
(12) Wedges of wood or leather fastened to the last to make it fit (*paratala*).

CHAPTER X.

THE TANNERS AND LEATHER WORKERS.

The leather industry in this country is, as is well known, in the hands of men who hold one of the lowest places in the social and religious scale of the Hindus, *viz.*, the Chamars and the Muchis. Their position is so low that the ordinary barbers and washermen will not shave them or wash their clothes, nor would Brahmins officiate as their priests at their festivals or religious ceremonies. They are held as unclean, and their touch is pollution, and to avoid them their quarters are assigned invariably away on the outskirts of towns and villages. So great is the depth of the degradation of these classes in the eyes of the higher castes, that the term Chamar has passed into one of obloquy. To call a person a Chamar, is to call him the meanest of men.

It is very likely that Chamars and Muchis were originally mere subdivisions of one main caste, whose occupation was preparing leather and working in it. They have, however, been two distinct castes since a long time, and if a distinction were to be made as to which of the two was the higher caste, it would be the Muchi. The Chamar handles dead bodies in pursuing his vocation, and in the eyes of a Hindu it is the most unclean of all things to touch dead bodies. The Muchi is only a manufacturer of leather articles, and has got nothing to do with dead bodies; consequently he is less unclean than his brother the Chamar, and holds a higher position than the latter. The mythology, about the origin of the Chamar is that his first parents were a Mallah (boat-man) and a Chandal woman. One story goes that he was originally a Brahmin and he turned into a Chamar in this way. Once upon a time four brothers, Brahmins by caste, were crossing a river. Having seen a cow struggling in the water and about to be drowned, the youngest of them went to its rescue, but before he could reach the animal it was dead and, consequently, he could only bring away the carcase. As he now became unclean the other three brothers at once disowned him, and as to touch him, or to live with him, would be pollution, they sent him away, saying that he was no longer a Brahmin but a Chamar. The Chamar himself claims to be descended from one Luidhar or Rui Das or Ravi Das—a man reputed to be an ascetic and a devotee, and to whom, it is held, the deity revealed the mysteries of the art of leather making. Some legends about the origin of the art have been given in the first chapter.

The Chamars have many sub-castes, and the names of at least 15 of them have been found, namely, Dhusia, Goreya, Dohar, Dhureya, Jeswaria, Kanoujia, Janakpuria, Jaunpuri, Kurila, Kori, Magahia, Mahara, Ranguja, Jatua, and Lantua

The Chamar is polygamous, but as he is extremely poor, he cannot afford to have more than one wife usually. One curious custom is that two sisters are not to be married to the same husband at the same time. As Brahmins will not act as their priests, an elder of their community, a guru, performs their rites and ceremonies. The marriage of widows is customary. The bodies of their dead are buried by them and not burned.

The Chamar is a Hindu; but his religious festivals are very few, the principal one being that in connection with the worship of Biswakarma (the god of artizans). The festival is celebrated by some in the month of Bhadra, and by

others in the month of Aswin. On the *nabomi*, or the ninth day of the new moon, often on the Bijoya-dashami day, in Aswin, the god of artisans is worshipped. A clean place outside the house is selected and plastered over with cow-dung and mud and a small stool is placed there to serve as the seat of the deity, and flowers are spread over it. The tools and implements are then cleaned and placed beside the stool, and are dedicated to the deity, with a view to secure efficiency to the instruments and consequent prosperity to their owners. Offerings are then made of flowers, sweetmeats, vermilion, rice, fruits, wood-apple leaves, fried rice, curd, jaggery, etc. These are sprinkled over with liquor. Goats are also sacrificed by those who can afford it. The ceremonies are accompanied the whole time by music of a religious character. Often Luidhar or Rui Das is also worshipped at the same time. Some people, instead of the stool, worship a waterpot on which are placed mango leaves and a cocoanut. The ceremonies are usually performed at night, and are wound up by the distribution of the offerings among the people assembled. The last thing is a feast according to the means of the worshipper, and the meat of goats sacrificed forms the chief dish in it, and liquor is indulged in without restraint. Till the puja is over no food is taken.

These people are very superstitious. They believe in mischievous hobgoblins and other evil spirits, and in order to pacify them, and to ward off evil, they offer pujas now and then with eggs, pigs and liquor.

The Chamars and Muchis are regarded, and often justly, as great cattle lifters and poisoners of cattle, and one of their *pujas* is characteristic of them. It is the worship of Kali performed in the month of Kartick, when they all assemble in a field and exhort the goddess to increase mortality among cattle for their benefit.

The chief occupation of the Chamar is the leather industry. He has usually a small piece of land which he cultivates himself. In rural areas many of them depend entirely on cultivation for their living ; some of them earn a living as agricultural labourers, some as musicians and some as grooms.

The Muchi, also called Rishi, has also a mythological account of his origin. The story goes that a lower deity used to make offerings of cow's meat to the higher deities, and that, after the worship, he would restore the cow to life and send it away. One day he failed to revive the cow, and found that this was due to his wife having eaten a portion of the sacrificial meat. On this he cursed his wife and sent her away. She was expecting a child at the time, and shortly afterwards gave birth to one who became the first Muchi. There is another story, namely, that the progenitor of the Muchis was one Muchi Ram, who came into existence out of the sweat of Brahma, and so held a very high place in the scale of castes. Muchi Ram somehow happened to offend a Rishi (sage), and the latter, in revenge, accused him of being the father of twin children born of some Brahmin widow. On this Muchi Ram, though innocent, was expelled from his high position, and the twin children became, one the founder of the Bara Bhagiya, and the other the founder of the Chhota Bhagiya section among the Muchis. These are the two main subdivisions in the Muchi caste. Some recognise three, namely, Gura, Darsana and Rari, of which the Gura is the highest. The Gura does not eat the flesh of dead animals, like the Darsana and the Rari. These are all Hindus by religion. There are also Muhammadan Muchis but their number is very small.

Their marriage and religious customs and ceremonies are the same as those of the Chamars, excepting that the Muhammadan Muchis, perform Muhammadan religious rites and ceremonies. Muchis, unlike the Chamars, however, burn their dead. Besides working in leather, they make baskets, brushes and mats, and follow agricultural pursuits. Some of them earn their living as sweepers and musicians. The female Chamar is usually a midwife, but the female Muchi never follows this vocation.

The material condition of the Muchis and Chamars is very poor indeed. They live a hand to mouth life. Many of them cannot get two full meals a day, and those who do get two full meals for themselves and their families consider themselves lucky. They live in dirty, low-built thatched huts. Half a dozen people huddle themselves together in a hut already half-filled with household articles and hides and implements. The value of such a hut is not more than Rs. 5. Those that are better off, have two or three huts and the

value of these is within Rs. 15. They have no furniture worth the name; but the comparatively well-to-do among them have one or two *khatias* (bedsteads), bamboo baskets and boxes, and some brass utensils for cooking and eating their food. The majority have one or two pieces of gunny-bags and one or two mats to sit and lie on, and the utensils and crockery they possess consist of some earthern pots and pans. Their food consists of *murhi* (fried rice), *bhat* (boiled rice), pulses, sometimes vegetables, fish on rare occasions, and the flesh of dead animals. Two to four *dhoties* and the same number of *sarees*, two or three *gamchas* (towels), and a couple of shirts, some razais made of rags obtained from dead bodies, or presented by the relatives of the dead, are all the clothing they possess. The income of a family of 6 members is, roughly estimated, at Rs. 12 to Rs. 25 per mensem, and the details are as follows:—

(1)	Tanning skins and hides and sale of leather ...	...	Rs. 5 to Rs. 10
(2)	Making shoes	...	„ 2 to „ 4
(3)	Manufacturing other leather articles ...	...	Re. 1 to „ 2
(4)	Mending shoes and leather articles ...	...	Ans. 8 to Re. 1
(5)	Value of crops on his lands	...	„ 8 to Rs. 2
(6)	Acting as musicians	...	„ 8 to Re. 1
(7)	Working as agricultural labourers and as menial servants of the higher castes ...	...	Rs. 2 to Rs. 4
(8)	Midwifery	...	Ans. 8 to Re. 1
	Total	...	Rs. 12 to Rs. 25

Their expenditure, per mensem, is roughly estimated as follows:—

Food	...	Rs. 8 to Rs. 15
Liquor	...	„ 2 to „ 4
Clothing	...	Re. 1 to „ 2
Cost of tanning materials and allowance for wear and tear of implements	...	Ans. 8 to „ 2
Cess for permission to take skins of dead animals	...	Nil. to Ans. 8
Social functions and festivals	...	Ans. 8 to Re. 1-8
Total	...	Rs. 12 to Rs. 25

Although occupying the lowest place in society in this country, and living on the brink of starvation, the statistics of the past census operations show that they are not behind any other caste in multiplying themselves. Had the contrary been the case, there could have been some chance of a change for the better in their material condition.

The census statistics are as follows:—

Chamars	1881	...	1,088,842
	1891	...	1,079,644
	1901	...	1,172,869
Muchis	1881	...	292,811
	1891	...	404,194
	1901	...	436,096

Taking the two together, the increase, in 1891 as compared to 1881, was over 6 per cent., and the increase, in 1901 as compared to 1891, was 8 per cent. The Patna Division has the largest number of Chamars and, after it, the Bhagalpur Division. The largest number of Muchis, however, are to be found in the Presidency Division, and next to it in the Burdwan Division. Among the Muchis the males exceed the females, whereas among the Chamars the females exceed the males. The last census shows the majority of these men as engaged in agricultural pursuits and in the leather industry. The other occupations recorded of them are, "provision and care for animals, menial service, dealing in food and drink, weaving, working in metals, wood, glass, stone, canes, bamboos, leaves," etc. Education at last seems to have found an entrance into their ranks, and we find that, among the Chamars, there are 5,521 literate people, including 198 females, and that among the Muchis there are 2,904 literate persons of whom 232 are females. The Muchis include 131 Muhammadan Muchis, and curiously enough all of them are literate. Some further advance is noticeable. In the ranks of the Chamars, we now find 7 clerks, 166

men holding the position of rent-receivers, and 12 medical practitioners. The Muchis show 147 men enjoying the status of rent-receivers and 15 of medical practitioners.

The following statistics show the number of persons at present engaged in the various branches of the leather industry:—

Leather dyers	141
Shoe, boot and sandal makers	153,432
Tanners and curriers	22,323
Water-bag, well-bag, bucket and ghee-pot makers	657
Harness makers	15

Figures under similar heads are unfortunately not available in respect of the previous censuses. Had they been available, they would have helped us to form a clear and definite idea of the rate of decline of the native leather industry.

CHAPTER XI.

TRADE STATISTICS.

In the annexed statements, III to VI, figures have been furnished showing the trade, external and internal, in dyes and tans, hides and skins, and leather and leather manufactures. The trade in tanning barks sprang up within the last few years, as, although they have been in use from time immemorial, no commerical value was attached to them until quite recently. Fifty years before there was no trade in hides and skins worth the name, the whole quantity of these articles being locally used up, as they were available. Within the last half a century, a class of men, chiefly Muhammadans, have taken to collecting them in the villages and sending them to Calcutta. Thence the articles are exported to foreign countries, and as the business is a very lucrative one, it is continually increasing, but, as has been pointed out, its effect on the indigenous leather industry has been extremely injurious. Raw hides and skins were, a quarter of a century back, exported in small quantities to other Provinces. But this has now practically ceased, and Bengal exports these products to Calcutta only. The figures of sea-borne trade show the magnitude of the exports of the raw materials to foreign countries, and of the imports of foreign leather and of leather manufactures. The exportation of raw materials, and the importation of foreign leather and leather articles, have hand in hand steadily increased, and are an evidence of the steady decline of the native industry and of the supplanting of native manufactures by foreign products.

Dyes and tans.—The figures showing the internal trade, from 1889-90 to 1899-1900, include only cutch and myrabolams, as these are the only tanning materials specifically mentioned in the reports. The figures for the last two years include, besides myrabolams and cutch, tanning barks. The imports into Bengal are chiefly from the port of Calcutta, and next to it from the United Provinces; and the imports into Calcutta are mostly from Bengal. Consequently the exports from Bengal are mostly to Calcutta and from the latter mostly to the former.

The figures showing the external trade include Indian as well as foreign articles, and separate figures have been furnished for each class. The import trade comprises "cutch, gambier, myrabolams, turmeric and other sorts;" but of these cutch and myrabolams are the only articles which are used as tanning ingredients by indigenous tanners. The figures for cutch, however, cannot be had separately from gambier, and so the statistics furnished include gambier. These are mostly imported from the ports of Madras and Bombay and in insignificant quantities from foreign countries. Bengal has a large export trade in these articles and nearly the whole of the exports is to foreign countries. Cutch appears to be exported in the largest quantity to France. Among other countries to which it is exported are South and East Africa, Ceylon, the Fiji Islands, and Great Britain. By far the largest export trade is in myrabolams and Germany

heads the list of the countries to which it is exported. Great Britain, Austria, Australia, Belgium, China, Japan, the Fiji islands and South America, are among the countries to which it is exported.

Raw hides and skins.—In the internal trade, the imports to Bengal come from the United Provinces, Assam, Central Provinces, the Punjab, the Native States and the ports of Bombay and Madras; but by far the largest quantities come from the United Provinces, and the Punjab. The exports are mostly to the United Provinces. The statistics of seaborne trade show that the interior of Bengal gets the largest quantity from Calcutta and small quantities from the ports of Bombay, Madras and Burma. But Bengal returns the supplies to these exporting ports, and her imports and exports seem to be fairly counterbalanced. She also imports foreign hides and skins. The trade report for 1901-1902, shows that the articles were imported from the following countries, which are stated in the order of the quantity of hides and skins supplied by them:—Great Britain, France, Ceylon, Germany, Italy and Persia. Hides and skins are exported to foreign countries and the exportation is of so great a magnitude as to bear no proportion to the importation of these articles. The countries to which they are exported are—Germany, Egypt, China, Austria, France, New Zealand, Great Britain, Australia, Holland, Belgium, Greece, Italy, Russia, Spain, Turkey, the United States, Japan and Canada. Of these the largest quantities are taken by Italy, the United States, Spain, Austria, France, Great Britain and Germany.

Dressed and tanned leather.—There is a large interchange in this article between the interior of Bengal and Calcutta. Formerly, fairly large quantities used to be imported also from Bombay, Rajputana, Berar, the Central Provinces, and Central India. At present, however, beyond a small quantity obtained from the United Provinces, the internal trade is practically a mutual interchange of the article between the interior of Bengal and Calcutta.

The external trade in Indian leather is with Madras, Bombay and Burma. During the last decade, the imports from these ports have considerably decreased, but the exports to them have slightly increased The foreign trade consists of very large imports from Great Britain, Austria, France, Germany, Persia, Belgium and Ceylon, and of exports on a limited scale to Great Britain, Egypt, Africa, the Straits Settlements, Turkey, the United States, China and Australia. The exports are nominal as compared to the imports. The imports have steadily increased, whilst the exports, though still fluctuating, have a decided tendency to fall.

Leather manufactures.—Native leather articles are obtained mainly from the United Provinces and the Punjab, and in small quantities from the Central Provinces and Assam, and quantities are exported to these Provinces in return. But the total exports is very small compared to the total imports. Moreover, the imports have steadily increased during the past years, whilst the exports have materially decreased. In 1889-90, the exports to the United Provinces and the Punjab were half and one-third, respectively, of the imports from those Provinces. In 1893-94, the imports from the United Provinces increased 25 per cent., and from the Punjab, nearly 175 per cent. whilst the exports showed a heavy fall. In 1900-1901, a further increase in the imports and a further fall in the exports is noticeable. In 1901-1902, there was a still further increase in the imports, but the total export was practically the same as in the preceding year. Bengal now sends by far the greater part of her leather manufactures to Assam, and if tanneries be opened in this Province, she will have an increasing export trade with Assam and a large field in Burma.

Indian manufactures were formerly imported also from Bombay, Karachi, Madras and Burma, but the importation gradually decreased, and it now seems to have died out. Foreign articles are, however, imported on a very large scale; their importation has steadily increased, and their quantity is so large as to bear no proportion to the Indian manufactures imported. Nearly the whole of the foreign manufactures comes from Great Britain. The exportation of Indian manufactures, mostly saddlery and harness, to Indian ports has on the whole slightly increased. Bombay, Madras and Burma are among the countries to which they are exported, but by far the largest quantity is exported to Burma. The exportation of Indian manufactures to foreign countries is usually very limited in scale. On account, however, of the Boer and China wars,

there was a sudden and great rise in the export trade in 1900-1901 and 1901-1902, but now that the wars are over, the exports will revert to their normal state. Among the foreign countries to which Indian manufactures find their way, are Africa, the Straits Settlements, Siam, Ceylon, the Phillippine Islands and Australia. The Indian manufactures referred to in this paragraph are, however, not indigenous manufactures, but the products of European firms in Calcutta. The suggestions in the next chapter are offered with the view that the indigenous industry may make its way up in the future and eventually attain a place in the commercial world in no way inferior to that held by the leather industries of foreign countries.

CHAPTER XII.

THE PAST AND THE FUTURE OF THE INDUSTRY.

Writing of the people of the period, in his translation of the Rig Veda, Mr. Wilson, the Sanscrit scholar, says:—"They were a manufacturing people; for the art of weaving, the labours of the carpenter, and the fabrication of golden and iron mail are alluded to, and what is more remarkable they were a maritime and mercantile people." Of leather, Royle in his "Arts and Manufactures of India" says:—"It is another chemical art with which the Hindus have long been acquainted, though it is doubtful whether they ever made leather of very superior quality; but the art is practised in Native States where it is not likely to have been introduced by European influence, *e.g.*, Cashmere, Cutch, whence we have had skins dyed of different colours." "Leather work is a very ancient art in India," says Sir George Birdwood. Further quotations are perhaps not necessary, as the general consensus of opinions is, that the art of leather making has been known in this country from very olden times. Some writers, however, have attempted to show that the arts of India were borrowed from the Greeks; but the latter came to India in the 4th Century B.C., whereas the industry is mentioned in various Sanscrit writings, some of them as old as 3000 B.C.

One of the oldest books is the Rig Veda, written about 3000 B.C. It indicates a civilization in India at least as advanced as the best of ancient civilizations left on record. If therefore any art or industry is mentioned in it, that art or industry must have existed, and must have been practised, from a long time before; and although it is not possible to fix dates, it may be safely assumed that, if the industry did not exist in the country before, it came in with the race which produced the Rig Veda. It is, therefore, claimed that the leather industry in India dates back to the entry of the Aryans in India. Now the Aryans invaded India between 3500 and 4000 B.C., and this is the probable date of the origin of the leather industry in this land.

Dr. Rajendra Lala Mitra in his "Indo-Aryans" says:—

"In the time of the Rig Veda, leather *mashaks* for water were well-known, and Indra is praised as piercing the rain-confining skins or *mashaks* of the clouds. Bottles of the same material also were evidently in common use. For Agastya (2000 B.C.) in his poison-neutralizing mantra says, 'I deposit the poison in the solar orb, like a leather bottle in the house of a vendor of spirits.' In the Laws of Manu (800 B. C.) *mashaks* for water are alluded to under the name of *dritti*, and its peculiar form with the four feet left intact is pointed out. Directions are also given for the purification of leather articles. Other Smritis ordain that oleaginous articles preserved in leather bottles do not become impure by the contact of the impure cowhide; and in the present day jars of that material are in extensive use, in Bengal and the United Provinces, for the storage of oil and ghi. In the latter place, leather bags are universally used for raising water from wells, and according to the law books of Sankhya and Likhita (2000 B.C.), that water is declared pure which is kept in old leather bottles. Atri (2000 B.C.) is likewise of the same opinion, and adds that flowing water, and that which is raised by machinery, are not defiled. The use of such words, as *charmanta, charmapath, varatra, chasalandha* &c., in old Sanskrit works, indicates that straps, bands and strings of leather were in common use, and sails were also made of leather or hide."

Shoes and sandals, shields and coats of armour (*varma*), quivers and gauntlets, saddles and bridles, whips and harness, etc., were among the other,

manufactures from leather. The shoe incident in the Ramayana is well known, and may once more be quoted. Bharata says to Rama:—

"Put noble brother I entreat,
These sandals on thy blessed feet,
These, lord of men, with gold bedecked,
The realm and people will protect."

Again

"Through fourteen seasons will I wear
The hermit's dress and matted hair;
With fruit and root my life sustain,
And still beyond the realm remain,
Longing for thee to come again.
The rule and all affairs of state
I, to these shoes will delegate."

Bharata places Rama's slippers on the throne of Ajodhya to represent Rama, and carries on the government, in his name till the latter returns to his kingdom.

In the Ramayana (1300 B.C.) we further find the leather industry as among the many other thriving industries of the day. The Ajodhya-kanda tells us that the inhabitants went out with Bharata seeking after Rama in the following order:—

Jewellers, potters, ivory workers, perfumers, goldsmiths, weavers, carpenters, braziers, painters, musical instrument makers, armourers, *curriers*, glass makers, inlayers, etc.

There are other books mentioned by Dr. Mitra. He says:—

In Manu and the Mahabharata (1500 B.C.) the slippers are also mentioned, and the time and mode of putting them on pointed out; and mediæval Sanskrit authors allude to them pretty frequently. The Vishnu Purana enjoins all who wish to protect their person, never to be without leather shoes. Manu, in one place, expresses great repugnance to stepping into another's shoes, and peremptorily forbids it, and the Puranas (500 A.D.) recommend the use of shoes, when walking out of the house and particularly in thorny places and on hot sand. Arrian (about 200 B.C.) says: "They, the Indians, wear shoes made of white leather, and these are elaborately trimmed, while the soles are variegated, and made of great thickness to make the wearer seem so much taller". *

In the 'Toy Cart' of Sudraka which dates from the 1st century B.C., the mother of a rich courtezan is described as arrayed in flowered muslin with her feet thrust into a pair of slippers, showing that in ancient times, as in the present day, women of the town were in the habit of wearing shoes."

Panini, the grammarian (350 B.C.), speaks of the *anupadina*—a variety of boots, and Amara Singh refers to it. Paramananda (57 B.C.) also mentions it in his Amarkoshamala. The use of hogskin for the preparation of shoes has also been found mentioned in the Vedas.

Of musical instruments (drums), Dr. Mitra says:—

"Of percussion instruments the *dholaka*, played either on one or both sides, is the most prevalent representative to be met with everywhere, and was made of various shapes; some were of large size with small ends and broad centres, like the *mridanga* of our day; others less protruberant in the middle, but with broad ends, like the *pakwaj*; others, again, of a small size. Of the large military drum played with a stick, there are the *rana dhaka* and the *jayadhaka* with which the heroes of the Ramayana, and the Mahabharata, are said to have inspired their legions with military ardour on the battle-fields."

The *mridanga* is commonly believed to have been invented by Brahma. This indicates a belief in its origin to be so ancient as to be lost in obscurity. Of another instrument, the native bagpipe, Dr. Bidie says:—

"Instruments of the nature of a bagpipe are of very ancient date and very widely diffused, having been used by the Hebrews, Greeks, Romans, Arabs, Persians and Hindus, and by most Celtic and Slavonic races."

The Rig Veda often refers to the quiver and the gauntlet. Of the use of the bridle, Megasthenes (300 B.C.) says:—

"When it is said that an Indian by springing forward in front of a horse can check his speed and hold him back, this is not true of all Indians, but only of such as have been trained from boyhood to manage horses; for it is a practice with them to control their horses with bit and bridle, and to make them move at a measured pace and in a straight course."

Harness, and chariots in which leather was used are also mentioned in the Rig Veda. Here are some verses—

"The Pajras, the kinsmen of Kakshivat, rub down the high-spirited steeds, decorated with golden trappings."

"Harness with traces to thy car thy long maned ruddy steeds to the sacrifice."

"Ascend Aswins your sky-touching chariot with golden seat and golden reins. Golden is its supporting shaft, golden the axle, both golden the wheels."

In the 17th century A. D., we find a traveller recording his opinion about the industrial skill of the Indians, and of their skill in imitating foreign manufactures, which include boots and shoes. He says:—

"The natives show very much ingenuity in their curious manufactures, as in the silk stuffs.....They make likewise excellent carpets.....Their skill is likewise exquisite in the making of cabinets, boxes, trunks, standishes curiously wrought within and without.....They paint staves, bedsteads, chests or boxes, fruit dishes, large chargers .....They are also excellent at limning and will copy out any picture they see to the life. The truth is that the natives.....so full of ingenuity that they will make any new thing by pattern, how hardsoever it seems to be done; and therefore it is no marvel if the natives there make shoes, boots, clothes, linen, bands and cuffs of our English fashion, which are also of them very much different from their fashions and habits, and yet make them all exceedingly neat....." (Terry's Voyage in the East Indies, 1655).

It is thus clear that the art and industry were well known in India in ancient times; that although no information is available from which we can fix the date of their beginning in this country, it may be safely assumed that they came in with the Aryans; that consequently they are more ancient than the Greek art of leather making; and that as late as the middle of the 17th century the art was well known and practised with admirable skill.

Reference has already been made to the present state of the industry—how and to what extent it has suffered in consequence of the exportation of raw materials and the importation of foreign manufactures.

We may now look forward and consider what the future of the industry will be and what can be done in its interests.

The last 50 years has been a record of the continuous decline of the industry. Considering the rate at which it has run its downward course, we can well conceive that it will not be long before the manufacture of boots and shoes from native made leather will cease. The same may be expected in regard to the manufacture of boxes, baskets, pouches and bags, country harness, native saddlery, water-carriers bags, vessels for the storage of ghee, molasses, oil, &c. What will be left will be the native musical instruments and the articles required in connection with agriculture—traces, ropes, whip-thongs, water-buckets, &c.

The revival of the industry, and its attaining to a footing equal to what it has in Europe or America, depend on a number of circumstances of which the following appear to be the principal:—

(1) Better raw materials.
(2) Discouraging the exportation of the raw materials from the land.
(3) The production of leather which will compare well with European or American leather.
(4) Cheapening the cost of tanning leather and economising the time now spent on it.
(5) Manufacturing leather articles which will compare favourably, in respect of quality and workmanship, with European and American products.
(6) Reducing the cost of manufacturing articles and the time now spent on them.

Better raw materials mean better breeds of cattle. Cattle-breeding has not yet engaged the attention of the people of this country, and the only cattle-breeding farm, we at present have, is that in the Hathwa Raj, under the immediate superintendence of Mr. N. N. Banerji who received his training in agriculture in England. Another farm of this kind may be expected in the near future. It is in the contemplation of Government to include cattle-breeding in the operations to be carried out at the farm to be shortly established at Pusa,

in Darbhanga. The Civil Veterinary Department of Government has cattle-breeding as one of the branches of its work and it forms part of the curriculum of studies at the Bengal Veterinary College. But no practical advance can be expected, unless the people themselves take an interest in the matter and come forward to participate in the improvement of the country's breeds of cattle. More work in this direction is expected from the District Boards as they hold the best position for doing practical work.

The direct, but an artificial means, of discouraging the exportation of raw hides and skins would be to impose on the export trade a tax. But free trade is a principle characteristic of the British Government, and free trade alone will prevail in the long run in the struggle for existence. State interference in the way of taxation of exportation cannot therefore be suggested. The natural means of stopping exportation would be the revival of the indigenous industry, including the establishment of tanneries, and to this we must look as the real remedy.

A good deal can be done for the revival of the native industry. A good deal has to be done to obtain superior native leather and superior native products. Superior leather means superior processes of tanning, and superior products require an improvement in the knowledge of the leather workers. The latter are not wanting in natural skill and industry, but better and more economical processes should be taught them. A regular scientific education is not necessary. A practical training in the modern methods of leather tanning and manufacturing leather articles is what is required. There are already a few industrial institutions in the country, and arrangements can be made without difficulty for giving such a training in them. The number of such institutions, however, is small at present, and unless the number is greatly increased—at least so long as regular tanneries are not established in the country—very little fruit can be expected. The raising up of a considerable number of men acquainted with up-to-date methods of leather manufacture, will prepare the way to the establishment of regular tanneries. The Muchis and Chamars are, however, very poor people, and at first some inducement will be necessary to call them away from their homes and hereditary associations to new places and associations requiring a more costly mode of life. The inducement may take the shape of money grants or subsistence allowances. District Boards should be able to supply the funds which may be supplemented by the subscriptions and donations of noblemen and well-wishers of the country. Taking for granted that all this is realised, it is clear that after all training at technical and industrial institutions will not be so practical and thorough as in a regular tannery. My next suggestion, therefore, is that these men should be sent for a course of training to a regular tannery, say the Government Tannery at Cawnpur. The expenses should be supplied by the District Boards. When the course is completed, in order to enable the men to make a start in business, presents or rewards in the shape of tools and implements, tanning ingredients, samples of leather tanned under different processes, and the like, may be given.

But a supply of skilled workers only will not suffice. Tanneries are required where leather on the modern principles, and leather articles which can compete with foreign manufactures, will be produced. For the supervision and management of such tanneries experts are required. We have at present no such Indian experts. A staff of such men, therefore, has to be raised up, and the only way of doing this is to send periodically to Europe, America, or Japan, two or three young men selected by turns from Bengal and the other Provinces of the Indian Empire. Young graduates in the Science course, selected and recommended by the Universities, would seem to be the most suitable. They may be sent at Government expense at first. Students are at present sent with State scholarships to complete their education in the English Universities, and until private enterprise supplies the want, Government help is the only means of providing the country with qualified men.* I am, however, happy to be able to say that one Indian nobleman has already taken the initiative in this line. I refer to the enlightened and

* Since writing this I have seen the scheme just sanctioned by Government for the improvement of technical and industrial education in this country. Ten annual scholarships have now been founded for training Indian youths in technical and industrial arts in Europe and America.

munificent Chief of Mourbhanj, in Orissa. This nobleman has offered three scholarships, tenable in Japan, or America, for the training of Indian youths in the useful arts, and one of these scholarships is for learning the art of leather-making. Those of our noblemen who desire to be real benefactors of their country, may well follow the example of the Chief of Mourbhanj, and with their help we might have in a short time a number of experts capable of taking up the supervision and management of tanneries. The establishment of tanneries will then naturally follow. The exportation of raw hides and skins will in course of time die a natural death, as the establishment of tanneries will create a great demand for raw materials. But the future of the leather industry is not confined to the production of leather and leather articles capable of successfully competing with foreign articles. The industry is susceptible of expansion by the inclusion of raw materials, of which no use is made at present. Little use is made at present of pigskins and the skins of the guana. No use is made of the hides of horses and asses. The use of the hides of crocodiles and alligators and of the furs of wild animals is unknown. Some use can no doubt be made of dog skins of certain kinds. Fancy articles may be prepared from the skins of snakes and frogs of certain kinds. Thus materials are available of which no use is made at present, but which can be turned into marketable products.

From the fact that there are already good tanneries in Calcutta, Cawnpur, and Agra, it does not follow that, if tanneries could yield a good profit in Bengal, they would have been opened by this time. The question is not one of profit at all, but of knowledge in up-to-date methods of tanning and working in leather, and of capital—two factors essential to the establishment of tanneries. Capital, it is understood, will not be wanting when expert knowledge is available. The circumstances which regulate profits are apparently in favour of, and not against, the establishment of tanneries in the interior of Bengal, and may be summed up as follows :—

(1) Small supervisional cost;
(2) Cheap cost of labour;
(3) Cheap cost of materials;
(4) Cheap ground rent of factory.

This monograph will be incomplete without a reference to the latest process of manufacturing leather, viz., the chrome process. The characteristics of the chrome leather are thus described by Mr. C. T. Davis, in his "Manufacture of Leather." "Chrome leather has special and peculiar qualities which distinguish it from all other kinds of leather, and these special features cause it to be a superior fabric for all the purposes for which leather is used. It has often been stated that chrome leather is waterproof, but this is not a proper term to use in connection with it; it should more properly be called non-absorbent. All kinds of leather produced with tannin absorb water readily, like a sponge, while chrome leather does not absorb water, but resists it, or sheds it, like the feathers of a duck. In fact, it is a difficult matter to thoroughly wet chrome leather when it is once dry. Again, water and air are the agencies in nature which promote decomposition and decay; and as tannin and hide substance are both organic materials, and when combined, as is the case in bark tanned leather, and subjected to the process of wetting and drying, such leather will eventually but surely deteriorate and become rotten. Chrome leather, on the other hand, being a combination of an inorganic material with the hide substance and subjected to the same process of wetting and drying shews no effect whatever. In fact, the oftener chrome leather is wet and dried the softer and more flexible it becomes. Even subjecting it to boiling water apparently has no effect upon it, whilst any sort of leather produced with tannin and placed in boiling water is utterly destroyed. Moreover, chrome leather is of much lighter weight than bark leather, and this is a decided advantage for almost all purposes for which leather is used."

Mr. Talati, a Parsi gentleman, proprietor of the Minocher Leather Works in Bombay, learnt the process in America some years ago, and, on his return to India, made experiments in it in his factory and found it suitable to this country. The old process of bark tanning takes a month at least to tan a goat skin, whereas the chrome process requires only a day. Cowhide

calf skins, and sheep skins can all be chromed like goat skins. The process has also been introduced into the Madras tanneries, and a great future is expected of it. Professor Chatterton, of the Madras Government School of Art, considers chrome leather as the most suitable for water-buckets and water bags.

As to profit, Mr. Talati is of opinion that it will be mainly regulated by the following circumstances:—(1) price of raw materials; (2) rent of factory; (3) wages of workmen; (4) supervision of the proprietor; (5) nearness of port; and (6) honesty of the workmen. The process in his opinion may be learnt in two to six months according to the intelligence and application of the learner. It is clear this process has a great future in this country, and the sooner it is introduced the better. The establishment of good tanneries will take time, but in the meanwhile the existing native tanneries in the suburbs of Calcutta may well start the work of manufacturing chrome leather. Time is valuable and competition is keen in every business, and unless prompt action is taken very little fruit can be expected. I trust the native factories, realising the importance of the process and the necessity of prompt action, will lose no more time in adopting the process.

APPENDIX I.

Tanneries in Calcutta and its Suburbs.

1. Monteith & Co. (Tannery at Ballygunge).
2. Cuthbertson and Harper.
3. Morrison, Cottle & Co.
4. C. Galstaun and Son.
5. Watts & Co.
6. G. Wense & Co. (Bentinck Street).
7. Chowson Chinaman's Tannery in Entally.
8. The Calcutta Tannery in Beniapukur.
9. The Bengal Tannery in Beniapukur.
10. Satcory Sircar's Tannery in Beniapukur.
11. Mokim Sirkar's Tannery in Beniapukur.
12. Munshi Jonab Ali's Tannery in Beniapukur.
13. Kurrya Tannery in Beniapukur.
14. Mohamed Ishaq's Tannery in Beniapukur.
15. John Teil & Co.'s Tannery in Watgunge, established in 1796. The oldest tannery in Bengal, if not in India.
16. Tangra Tannery—Agents, Jardine, Skinner & Co.
17. J. H. H. Pereira & Co., Entally.

APPENDIX II

Showing leather and leather articles manufactured by native workers at Messrs. John Teil & Co.'s Tannery.

Name.	Price.	Remarks.	Name.	Price.	Remarks.
	Rs. A.			Rs. A.	
Cross-grained enamelled top hide ...	20 0	each.	Waist belt	0 12	each.
„ „ „ hood hide...	14 0	„	Bayonet scabbard	1 0	„
Black hood hide	8 8	„	„ frog	0 4	„
Brown „ „	7 8	„	Sword frog	0 8	„
„ sheep skin	1 4	„	„ scabbard	2 8	„
Cow harness leather	1 2	per lb.	Bandalier	2 0	„
Buffalo „ „	1 0	„	Kukri frog	0 4	„
„ sole leather	0 14	„	Leather belting (singl·) ...	0 4	per ft.
Japanned hide (both sides) ...	15 0	each.	„ „ (double) ...	0 8	„
„ dash leather ...	20 0	„	Leather laces	1 0	per lb.

APPENDIX

Showing Imports by

		Dyes and tans.	Hides (dressed).		Hides (raw).		Skins
		Value in rupees.	Quantity in maunds.	Value in rupees.	Quantity in maunds.	Value in rupees.	Quantity in maunds.
1889-90	Bengal	1,31,355	7,031	2,61,347	37,353	6,87,181	666
	Calcutta	1,69,711	3,14,627	1,13,87,661	2,13,872	47,01,464	39,039
1890-91	Bengal	1,08,235	12,581	4,71,691	41,341	7,40,162	657
	Calcutta	1,80,364	3,43,605	1,23,02,125	2,83,204	60,32,176	45,167
1891-92	Bengal	98,237	10,579	3,89,277	39,613	7,30,622	940
	Calcutta	2,65,866	2,99,925	1,04,34,049	2,46,825	52,53,830	84,437
1892-93	Bengal	1,10,569	8,522	3,10,340	46,690	8,69,048	542
	Calcutta	2,78,218	3,14,392	1,09,76,549	2,57,512	60,67,719	75,980
1893-94	Bengal	1,75,619	6,620	2,35,516	62,055	10,58,733	705
	Calcutta	2,39,550	3,10,656	1,06,53,383	3,53,898	82,04,302	54,238
1894-95	Bengal	3,28,600	4,610	1,69,081	72,496	11,69,017	280
	Calcutta	2,71,771	4,11,194	1,49,95,098	3,11,244	51,83,365	73,925
1895-96	Bengal	3,48,896	4,759	1,81,839	47,743	7,53,770	37
	Calcutta	2,75,318	4,44,214	1,53,68,443	2,36,740	43,50,430	52,884
1896-97	Bengal	2,66,613	3,103	1,14,555	48,656	8,96,005	197
	Calcutta	2,89,126	3,94,107	1,34,69,341	2,32,386	42,78,577	43,038
1897-98	Bengal	2,06,230	2,119	75,938	61,134	10,93,821	336
	Calcutta	2,70,558	5,05,136	1,71,28,753	4,19,020	79,56,690	32,070
1898-99	Bengal	1,97,016	4,342	1,49,276	63,573	10,48,282	289
	Calcutta	2,94,655	3,09,714	96,24,000	4,60,248	82,29,028	36,823
1899-00	Bengal	2,71,333	4,899	1,70,129	51,048	9,62,362	245
	Calcutta	3,97,276	3,64,317	1,12,08,196	10,43,037	1,93,07,190	42,202
1900-01	Bengal	3,60,225	2,563	87,825	51,520	10,51,968	250
	Calcutta	3,05,605	90,637	24,07,684	9,99,032	1,80,03,058	9,569
1901-02	Bengal	3,18,972	1,173	39,310	44,332	8,92,295	401
	Calcutta	3,25,443	22,985	7,48,794	6,46,583	1,20,69,603	10,588

APPEN

Showing Exports

		Dyes and tans.	Hides (dressed).		Hides (raw).		Skins
		Value in rupees.	Quantity in maunds.	Value in rupees.	Quantity in maunds.	Value in rupees.	Quantity in maunds.
1889-90	Bengal	2,25,056	2,23,350	80,04,600	1,99,293	44,34,269	27,647
	Calcutta	1,38,601	1,646	59,256	5,916	1,31,631	689
1890-91	Bengal	2,40,635	2,39,584	84,75,285	2,69,182	57,87,414	31,987
	Calcutta	1,43,513	2,140	75,701	3,759	80,817	310
1891-92	Bengal	2,89,441	1,48,313	52,65,112	2,38,974	51,37,941	44,042
	Calcutta	1,02,387	2,288	81,224	1,783	38,335	398
1892-93	Bengal	3,09,863	1,73,714	64,37,418	2,40,808	57,79,393	48,466
	Calcutta	1,08,985	1,964	72,668	5,206	1,24,944	275
1893-94	Bengal	2,87,119	2,06,447	73,03,063	3,31,414	77,46,803	46,000
	Calcutta	1,81,419	2,201	77,860	4,112	96,117	146
1894-95	Bengal	3,90,397	2,09,199	64,59,018	2,63,163	44,91,731	58,513
	Calcutta	3,43,812	3,481	1,07,476	5,364	89,847	188
1895-96	Bengal	3,99,927	2,11,430	67,91,867	2,04,064	38,00,693	34,461
	Calcutta	3,84,983	1,551	49,826	15,774	2,93,791	11
1896-97	Bengal	3,48,416	1,56,602	50,11,264	1,95,435	36,15,546	36,367
	Calcutta	2,86,777	1,489	47,648	12,270	2,26,983	237
1897-98	Bengal	2,96,365	1,93,002	61,76,704	3,21,787	61,94,398	31,471
	Calcutta	2,43,809	3,307	1,05,824	3,815	73,438	266
1898-99	Bengal	3,26,157	1,47,474	43,87,352	3,82,952	68,45,267	25,418
	Calcutta	1,99,011	517	15,380	3,488	62,347	345
1899-00	Bengal	4,03,257	78,568	24,35,608	3,67,592	68,92,349	24,660
	Calcutta	2,53,266	405	12,556	3,092	57,975	267
1900-01	Bengal	3 11,636	6,351	2,04,031	4,75,488	87,27,789	3,659
	Calcutta	3,64,659	571	18,327	10,406	1,91,310	76
1901-02	Bengal	3,61,876	8,827	2,82,618	4,69,918	86,80,162	1,804
	Calcutta	3,18,722	743	23,824	12,824	2,36,827	102

III.

rail and river.

(DRESSED).	SKINS (RAW.)		LEATHER (UNWROUGHT).		LEATHER (WROUGHT).	
Value in rupees.	Quantity in maunds.	Value in rupees.	Quantity in maunds.	Value in rupees.	Quantity in maunds.	Value in rupees.
27,166	1,758	30,377	Not available.	Not available.	20,442	40,43,707
15,90,950	13,254	2,68,923			10,943	11,99,680
25,377	6,286	86,213			17,465	22,28,736
17,19,983	17,893	3,41,066			9,579	12,31,176
36,780	2,608	45,061			22,290	35,59,307
32,41,744	15,728	3,71,336			11,978	15,69,282
21,388	4,093	53,244			20,499	34,26,812
29,92,046	64,950	14,97,460			10,746	13,43,803
28,292	4,485	1,00,443			19,274	32,56,323
20,72,825	54,039	12,35,623			10,814	13,33,933
9,671	3,094	62,547			21,257	40,17,965
21,98,972	50,394	11,87,631			15,636	22,26,808
1,295	9,902	1,94,115			20,160	34,83,731
21,46,892	59,336	13,81,216			9,674	14,38,859
7,556	58,993	11,56,472			36,441	46,10,817
16,29,145	7,07,287	2,02,72,434			11,024	16,30,428
12,519	4,757	93,248			22,918	40,46,045
13,22,714	85,916	18,69,295			16,850	27,57,700
10,955	5,961	1,16,461			23,923	41,01,349
13,72,097	93,532	20,47,540			11,482	17,67,466
9,190	8,405	1,66,120			25,134	45,08,445
16,03,797	1,78,936	41,68,467			14,041	21,92,423
8,976	10,583	2,27,075	816	30,737	5,023	8,05,584
3,43,878	1,25,559	27,83,824	27,325	7,60,541	3,313	4,75,331
14,909	8,590	1,77,209	1,203	46,780	2,133	3,29,093
3,93,454	1,89,447	41,03,656	20,442	6,10,471	4,585	6,94,487

DIX IV.

by rail and river.

(DRESSED).	SKINS (RAW).		LEATHER (UNWROUGHT).		LEATHER (WROUGHT).	
Value in rupees.	Quantity in maunds.	Value in rupees.	Quantity in maunds.	Value in rupees.	Quantity in maunds.	Value in rupees.
11,12,792	16,290	2,03,227	Not available.	Not available.	3,143	9,83,474
27,733	1,363	26,723			11,847	37,25,880
11,71,525	11,893	2,27,455			3,207	7,55,248
11,353	799	15,725			8,456	19,91,369
15,52,490	11,068	2,60,570			3,957	8,29,960
14,030	310	7,283			12,307	25,90,417
18,78,058	35,607	9,83,095			1,601	3,83,639
10,657	154	4,273			10,527	25,17,268
17,36,500	35,849	9,14,150			1,292	3,04,750
5,513	3,019	76,984			10,105	23,83,517
27,20,808	27,003	7,69,585			1,377	3,27,726
8,741	2,221	63,296			13,335	31,73,730
14,99,054	23,358	6,18,967			1,879	3,43,037
478	2,151	57,002			12,042	26,16,123
13,95,584	4,21,842	1,06,24,906			1,277	2,80,940
9,094	14,633	2,99,023			11,857	26,06,540
11,95,898	75,092	16,43,639			5,484	12,11,279
10,108	963	20,956			11,499	25,37,633
9,65,884	62,786	13,34,202			1,534	3,35,380
13,110	1,133	24,054			12,174	26,78,289
9,37,040	72,931	15,63,016			1,704	3,83,543
10,146	615	13,231			11,652	26,15,870
1,39,168	87,016	18,53,850	258	13,775	567	99,930
2,893	530	11,148	745	28,865	2,897	5,94,766
73,875	1,94,113	20,14,688	197	7,053	239	89,530
4,165	1,686	32,113	1,415	50,044	2,613	4,13,949

APPENDIX V.

Showing Imports by Sea.

		Dyeing and tanning materials.	Hides, raw.		Skins, raw.		Hides, dressed.		Skins, dressed.		Leather, unwrought.		Manufactures.
		Value in Rs.	Weight in maunds.	Value in Rs.	Weight in maunds.	Value in Rs.	Weight in maunds.	Value in Rs.	Weight in maunds.	Value in Rs.	Weight in maunds.	Value in Rs.	Value in Rs.
1889-90	Foreign	...	636	12,678	15	1,060	293	29,948	475	1,09,418	1,116	1,24,730	3,35,456
	Indian	10,23,982	46,264	11,62,168	3,993	28,252	1,398	57,660	1,783	1,56,153	49	411	2,880
1890-91	Foreign	...	42	880	1	50	312	23,809	665	1,34,040	898	96,982	3,20,107
	Indian	11,73,283	30,535	6,55,270	460	26,262	1,804	59,505	3,348	2,61,303	75	1,217	2,956
1891-92	Foreign	30	101	3,545	...	...	57	11,737	665	1,52,061	1,639	1,20,309	3,19,143
	Indian	18,18,936	35,207	7,68,233	569	33,319	1,575	55,408	2,540	1,85,850	...	62	5,950
1892-93	Foreign	...	...	...	...	...	121	22,657	692	1,68,097	872	97,821	3,34,051
	Indian	17,49,676	41,183	9,67,920	1,708	1,12,739	2,846	81,180	1,395	78,950	22	1,459	4,227
1893-94	Foreign	117	195	7,181	26	2,523	56	10,422	640	1,72,424	1,144	1,16,969	3,60,292
	Indian	9,28,080	29,731	7,49,947	710	35,647	2,211	77,885	1,204	72,680	144	760	2,577
1894-95	Foreign	690	232	11,847	153	11,053	59	15,031	651	1,73,533	1,123	1,26,700	3,26,185
	Indian	9,33,582	44,580	7,45,492	471	24,439	1,877	63,741	1,604	77,921	155	1,681	10,846
1895-96	Foreign	159	4,132	1,54,829	33	1,600	112	17,315	549	1,82,016	1,307	1,49,820	3,34,922
	Indian	2,66,017	37,063	8,31,726	539	32,949	2,335	76,965	1,760	78,665	131	1,320	4,215
1896-97	Foreign	...	4,140	95,270	236	22,890	65	18,424	574	2,08,301	1,279	1,53,247	2,94,839
	Indian	4,25,441	35,982	7,90,694	767	38,665	2,843	87,250	1,606	73,979	109	1,086	3,351
1897-98	Foreign	1,550	1,718	86,508	...	19	78	10,753	548	1,68,122	1,394	1,51,335	3,48,926
	Indian	2,06,231	46,352	9,71,231	492	25,910	1,570	55,381	1,733	79,810	56	492	2,528
1898-99	Foreign	3,190	1,471	32,923	...	...	23	5,876	589	1,64,172	1,451	1,42,083	4,17,287
	Indian	2,27,010	37,673	8,58,575	730	41,148	1,421	52,520	1,035	67,220	...	...	...
1899-00	Foreign	...	236	8,407	60	3,594	23	2,924	715	1,83,415	1,459	1,52,681	4,16,655
	Indian	3,89 980	43,806	10,11,677	1,460	98,256	783	28,275	1,221	1,04,066	...	...	...
1900-01	Foreign	1,680	26	1,680	88	4 544	1,345	54,298	553	1,42.145	1,584	1,89,640	4,21,886
	Indian	3,71,408	42,581	8,40,332	787	53,445	1,289	48,020	1,1:8	1,06,125	...	...	...
1901-02	Foreign	...	136	4,097	219	72,289	762	35,685	691	1,57,181	2,022	2,27,909	5,35,128
	Indian	2,60,914	40,319	18,20,907	2,243	1,54,260	1,763	2,95,721	1,231	1,17,800	...	...	...

APPENDIX VI.

Showing Exports by Sea.

		Dyeing and tanning materials.	Hides, raw.		Skins, raw.		Hides, dressed.		Skins, dressed.		Leather, unwrought.		Manufactures.
		Value in Rs.	Weight in maunds.	Value in Rs.	Weight in maunds.	Value in Rs.	Weight in maunds.	Value in Rs.	Weight in maunds.	Value in Rs.	Weight in maunds.	Value in Rs.	Value in Rs.
1889-90	Foreign	10,40,524	5,54,712	1,49,22,786	49,708	32,74,235	1,022	57,114	2,034	1,67,864	109	8,477	11,637
	Indian	80,443	44,848	10,65,969	8,471	4,36,381	63	3,624	549	39,094	313	23,858	22,276
1890-91	Foreign	10,79,461	6,10,179	1,59,59,304	80,246	45,61,943	618	24,958	2,157	1,58,608	124	9,022	19 892
	Indian	12,573	26,815	5,74,385	11,689	5,71,214	54	3,447	655	41,091	403	30,322	22,964
1891-92	Foreign	11,56,446	6,18,102	1,60,30,884	1,04,125	63,02,979	1,061	57,361	2,764	1,91,414	157	10,717	13,557
	Indian	22,100	31,519	6,93,088	16,007	6,37,553	48	2,734	722	45,892	392	30,996	31,115
1892-93	Foreign	17,41,256	5,75.292	1,62,86,546	1,34,704	86,34,483	1,044	66,873	1.350	97,037	135	8,953	17,575
	Indian	15,084	31,798	7,83,582	9,610	4,09,671	29	1,250	583	35,906	441	48,446	33,068
1893-94	Foreign	10,70,323	6,27,280	1,82,45,973	1,03,153	60,60,094	737	44,916	101	9,752	182	13,082	15,719
	Indian	31,520	26,551	6,69,926	17,245	8,55,916	124	7,151	193	17,779	1,951	80,296	28,827
1894-95	Foreign	7,35,275	7,02,065	1,93,68,716	1,10,692	78,38,152	790	47,003	182	9,924	546	31,022	23,813
	Indian	24,850	32,224	6,36,718	28,820	12,14,238	184	9,348	161	13,438	1,691	69,341	45,556
1895-96	Foreign	3,54,705	6,97,239	2,12,44,943	1,25,347	99,52,960	1,255	69,152	143	8,930	384	29,726	18,137
	Indian	34,086	24,796	5,23,696	14,111	7,37,212	90	4,605	54	3,578	381	23,461	31,364
1896-97	Foreign	2,21,380	6,56,015	2,18,80,718	78,739	66,28,687	698	41,220	125	9,694	252	21,115	12,848
	Indian	18,926	25,093	5,66,608	9,085	4,40,104	58	3,061	252	16,619	418	26,736	24,842
1897-98	Foreign	1,56,864	9,65,159	3,06,42,505	1,35,417	1,10,22,530	569	43,990	58	8,506	324	23 410	10,978
	Indian	11,160	31,906	6,70,280	3,891	2,14,614	80	3,702	290	20,408	584	22,498	32,166
1898-99	Foreign	1,84,405	8,39,209	2,67,09.553	14,806	1,15,11,114	516	33,735	63	3,760	311	26.853	14,505
	Indian	13,975	27,644	6,38.983	4,409	2,78,529	91	4,832	394	21,160	692	40,481	32,858
1899-00	Foreign	2,69,336	12,56,522	3,98,28,370	2,67,472	1,78,17.664	490	44,624	88	8,163	627	39,389	93,100
	Indian	8,710	32,263	8,77,408	3,869	2,75,678	169	9,070	721	63.724	841	55,453	28,533
1900-01	Foreign	1,99,623	12,70,334	4,11,47,001	2,02,645	1,43,90,059	255	16,021	76	8,515	717	54,729	2,64,068
	Indian	5,340	25,114	5,73,977	3,37	2,45,994	256	13,147	1,166	96,721	719	44,328	59,416
1901-02	Foreign	2,00,429	8,36,860	2,66,36,906	2,34,603	1,80,09,429	486	37,824	202	10,225	1,735	76,992	5,93.979
	Indian	11,905	21,799	4,19,549	1,371	81,102	69	4,299	924	68,701	954	65,372	46,506

B. S. Press—1597J—500—30-3-1904—C. A. P. & others