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UTILIZATION OF THE SKINS OF AQUATIC ANIMALS.

BY

CHARLES H. STEVENSON.

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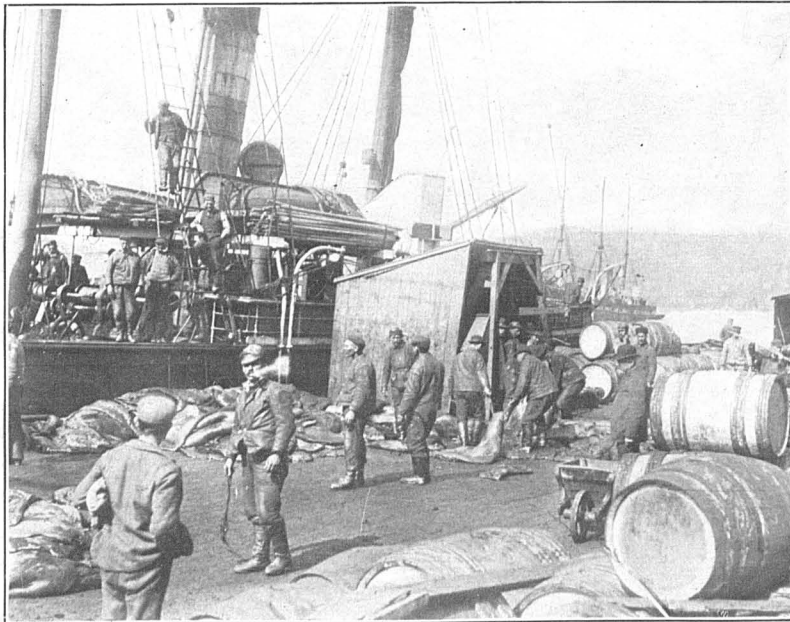
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SEALING STEAMER AT ST. JOHNS, NEWFOUNDLAND.



WEIGHING SEAL PELTS AT ST. JOHNS, NEWFOUNDLAND.

# UTILIZATION OF THE SKINS OF AQUATIC ANIMALS.

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By CHARLES H. STEVENSON.

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## PREFATORY NOTE.

The utilization of the skins of animals is coexistent with the development of human activities. To the primeval man they were invaluable. They clothed and protected his body from the weather; they supplied him with tents, with boats, with thongs for the chase, and with innumerable articles requiring the use of firm membranous structure. The development of the textile industries, however, greatly reduced their relative importance, and spinning and weaving now to a very large extent supply the articles formerly made from the skins of animals. While by no means so important to man as formerly, numerous uses yet exist for these products and create a demand for them approximately equal to the present resources.

The skins of most mammals are covered to a greater or less extent with hair, which serves to protect the body against external influences, especially that of low temperature. In addition to the hair, and coexistent with it, many animals, particularly those of cold latitudes, have fine, soft underhair, termed fur. When the fur is sufficiently thick and soft, its value, left on the skin, exceeds that of any leather which can be made from the membranous tissue alone. This gives two classes of skins, (1) those deriving their value from the covering of fine underhair, which are used as furs, and (2) those dressed as leather without the hair. The present paper is, therefore, naturally divisible into two parts, the first relating to aquatic furs and the second to aquatic leathers.

While the writer desires to acknowledge his indebtedness to all persons who have rendered assistance in the collection of material for this paper, yet the number is so large that to cite each one individually would be to list the principal manufacturers and merchants handling furs and fancy leathers in America and many in Great Britain, each of whom has been uniformly obliging in furnishing all information asked for. However, it is desired especially to refer to the courtesy of Mr. Alfred Frazer, Mr. Max Bowsky, Mr. Adolph Bowsky, Mr. Samuel Williams, Mr. Joseph Ullman, Mr. Belden, and Mr. Robert Badcock, of New York City. To Messrs. John Russitz & Co. and to Messrs. Revillon Frères, of New York City, we are indebted for the loan of furs for photographing purposes, and to Messrs. Tiffany & Co., of New York, for photographs of several aquatic skins.

## AQUATIC FURS.

## GENERAL REVIEW.

Exclusive of the great variety of rabbit, squirrel, and opossum skins produced in all parts of the globe, a large portion of the world's product of furs is obtained from aquatic animals. Indeed, the trade in fancy furs is made up very largely of the skins<sup>a</sup> of those animals.

An examination of the sales made in 1901 by the largest fur-brokerage house in the world shows that the aquatic furs constituted 49 per cent in number and 54 per cent in value of all peltries handled. Of the furs produced in the United States, fully 75 per cent in value are yielded by aquatic animals. Formerly the proportion was much greater, but is reduced by a decrease in product of beaver, fur-seal, otter, and sea-otter, and the large increase in quantity of rabbit, opossum, raccoon, etc., which have multiplied with the settlement of the country.

The principal fur-producers among the aquatic animals are the fur-seal, mink, muskrat, beaver, otter, sea-otter, and nutria. The greatest value is placed on the sea-otter, the choicest skins selling for upward of \$1,200; the number of sea-otters obtained annually, however, has been reduced to about 600. This fur has never been fashionable in western Europe or the United States; the market for it exists in China and Russia, those countries using probably 85 per cent of all the skins secured since its introduction into commerce in the seventeenth century. For two hundred years previous to 1800, beaver was by far the most important item in the fur trade as regards the total value of the product. The increasing scarcity of that animal, however, and the adoption of substitutes have greatly depreciated its prominence.

During the last thirty years, fur-seal skins have outranked all others in commercial importance, being the fashionable material in Europe and America for ladies' garments for use in the cold weather. Since 1890, the product of fur-seal has greatly decreased, especially in the territory of the United States, and at the present time the yield of mink in this country is more valuable. The latter is probably the most durable of all furs, but the demand for it is very irregular, the market sales not exceeding 200,000 or 300,000 skins in one year and in a short while increasing to a million or more. Next to these in

<sup>a</sup> Among the furriers the term "skin" is used to designate the fur and the membranous tissue combined, while "pelt" is restricted to the membranous or coriaceous portion of the animal's coat, which is contrary to the general usage. The term "fur" in a general sense refers to the soft underhair of the fur-bearing animals. The skins of these animals, when removed from the body and cured, are called peltry. When the membrane is converted into a form of leather by a process called "dressing," the skin obtains the name of fur in a restricted sense. The term fur is also applied in a still more restricted sense to the underhair cut from the skin and presented in the form of delicate filaments for felting purposes, but this is more commonly known as hatters' fur.

aggregate value, but of far less value individually, is the muskrat, of which about 5,000,000 are slaughtered annually. The nutria or coypu is a small, beaver-like animal found in large numbers in South America, and about 2,000,000 are taken annually. Many thousands of beaver and otter skins are obtained each season, and each of these forms an important item in the fur trade.

The following summary, condensed from the table appearing on page 287, shows approximately the total quantity of aquatic furs produced throughout the world in 1900:

*Classified statement of the world's product of aquatic furs in 1900.*

Designation.	Number of skins.	Total area.
		<i>Square feet.</i>
Beaver.....	66,000	264,000
Fur-seal.....	95,485	535,700
Mink.....	728,000	400,000
Muskrat.....	5,285,000	3,488,100
Nutria.....	1,950,000	1,891,500
Otter.....	33,640	93,183
Sea-otter.....	590	4,595
Total .....		6,677,078

The foregoing table shows the great importance of the muskrat in the trade, the aggregate area of the skins yielded annually by that animal being as great as that of all other aquatic furs combined, and more than six times as great as that of the fur-seal. Indeed, the aggregate area of the muskrat skins secured annually in the United States is approximately twenty times as large as that of the fur-seal product. The nutria ranks second in total area, but about 30 per cent of those skins are used by manufacturers of hats. Far below these two comes the fur-seal with 535,700 square feet, or scarcely 8 per cent of the total area of aquatic furs produced. Lower yet, in this particular, rank the mink, beaver, and otter; while of sea-otter fur only 4,595 square feet were produced in 1900, or less than one-fifteenth of 1 per cent of the total area of aquatic furs yielded during that year.

There are many industries more or less directly associated with the fur trade. Omitting the manufacturers of traps, guns, boats, vessels, and other apparatus and equipment, the men principally interested are the many hunters, trappers, and the like engaged in securing the pelts. Then come large numbers of men who collect the furs, transport them to the trade centers, effect their sale, and distribute them to the places of consumption. Next are the fur-dressers, who prepare the raw, greasy pelts and make them suitable for manufacture. The fur-manufacturers employ a very large number of skilled workmen, including assorters, cutters, nailers, sewers, etc. In addition to these are the wholesale fur-dealers and the numerous retail merchants. It is estimated that the number of persons employed in the United States in the various branches of the fur trade approximates 15,000.

## THE FUR SUPPLIES AND MARKETS.

From the Middle Ages to 1600, Russia was the great source of furs for the world. Many skins were obtained in other parts of Europe and Asia, but even in the aggregate the quantity was relatively small. The discovery of the resources of North America changed the current of the trade, this continent soon becoming the great fur territory; and during the last three hundred years the United States and Canada have been the principal fur-producing countries.

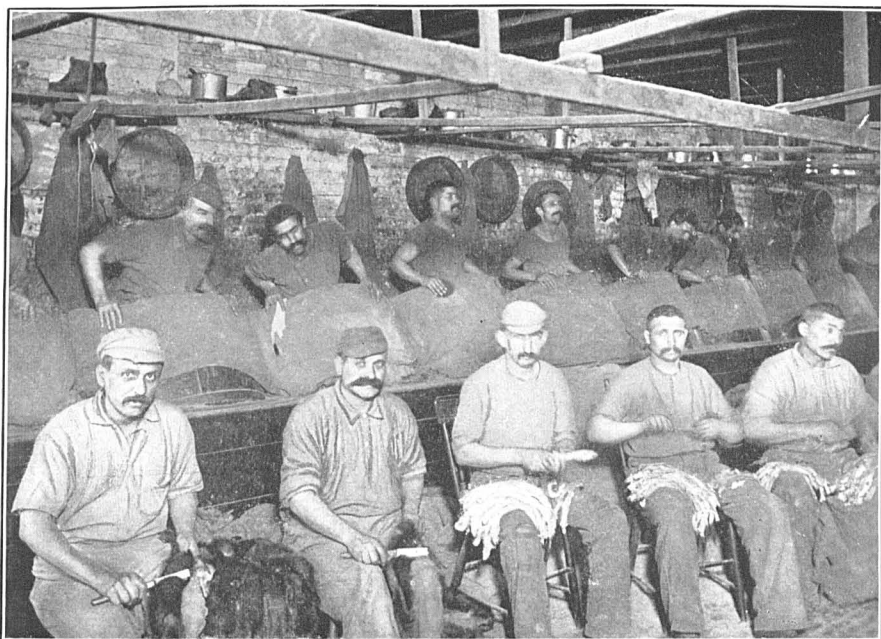
The prominence of the United States in the product of aquatic furs is especially notable, the value of the raw skins produced in 1900 being \$2,302,100, whereas the total for all other countries was \$2,960,610. This country yielded 80 per cent of the muskrat, 70 per cent of the mink, 56 per cent of the sea-otter, 35 per cent of the otter, 30 per cent of fur-seal, and 12 per cent of the beaver produced throughout the world.

The importance of the Dominion of Canada as a producer of aquatic furs is very much less than that of the United States. Indeed, excluding the take of the fur-seal in the pelagic fishery, the total value of aquatic furs secured in that country in 1900 amounted to less than \$1,000,000, only 40 per cent as much as in the United States. The aquatic furs obtained in the limits of Canada are beaver, mink, otter, and muskrat. The fur-seal fishery as a Canadian enterprise is of comparatively recent origin, dating from about 1880, and the animals are caught in the Pacific Ocean and Bering Sea at a great distance from Canadian territory.

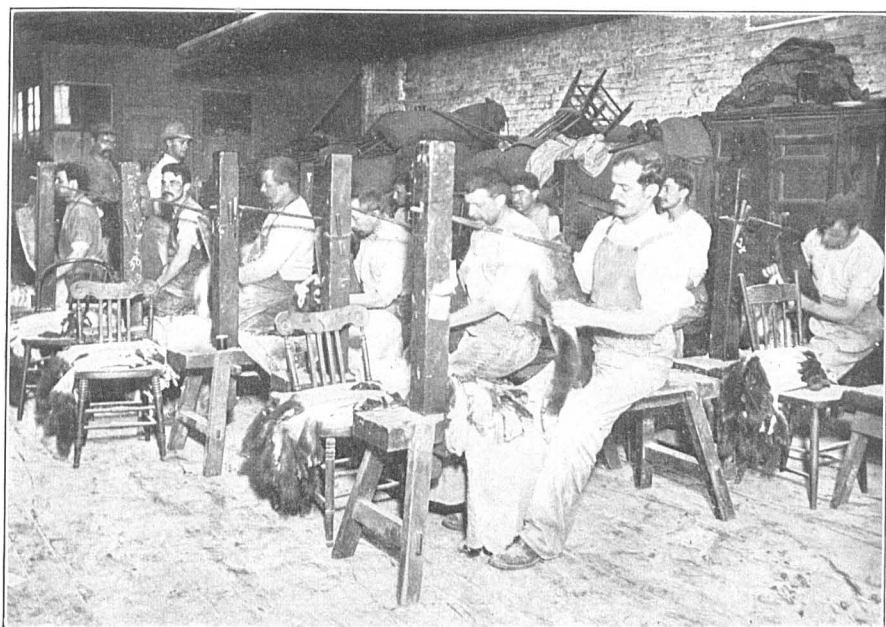
Russia, especially that portion bordering the Pacific Ocean, at one time yielded the great bulk of aquatic as well as of other furs on the market, the product of sea-otter and fur-seal being particularly large. Owing to the cession of Alaska to the United States and the increasing scarcity of furs on the Siberian coasts, the importance of Russia in this particular is now greatly reduced. South America yields only two aquatic furs of consequence, viz, nutria and fur-seal. Several species of otter occur there, but they are of little value and few are taken. Japan yields some fur-seal and sea-otter skins. From Europe, Africa, Australia, and the southern coast of Asia the product of aquatic furs is of very little importance.

The annual yield of aquatic furs fluctuates greatly, and an estimate of the collection is far from reliable, except for the particular year to which it relates. When furs of a special variety are fashionable, hunting becomes active; as a result the quantity placed on the market lowers the price and the hunt declines, giving the animals another opportunity to increase in numbers. While there are no means of learning the exact quantity collected during any one year, in view of the fact that the great bulk are handled at the London auction sales it is possible to form a very close estimate of the total product.

With the assistance of several of the principal fur-houses of the world, including the Hudson's Bay Company, Mr. Alexander Fraser,



TUBBING, COMBING, AND REVERSING FURS.



FLESHING MINK SKINS.



and Mr. Joseph Ullman, the following estimate is made of the number of aquatic skins produced in the United States and in all other countries combined during the year 1900, and their value in the wholesale trade:

*Classified statement of the product of aquatic furs in 1900.*

Designation.	United States.		All other countries.		Total.	
	Number of skins.	Value.	Number of skins.	Value.	Number of skins.	Value.
Beaver.....	8,000	\$39,860	58,000	\$301,200	66,000	\$341,060
Fur-seal.....	24,000	660,000	71,485	1,471,000	95,485	2,131,000
Mink.....	578,000	810,000	150,000	330,000	728,000	1,140,000
Muskrat.....	4,035,000	565,000	1,250,000	138,000	5,285,000	703,000
Nutria.....	.....	.....	1,950,000	444,000	1,950,000	444,000
Otter.....	14,600	98,260	19,040	170,850	33,640	264,110
Sea-otter.....	330	133,980	260	105,560	590	239,540
Total value.....	.....	2,302,100	.....	2,960,610	.....	5,262,710

During the summer months the skins of most of the fur-bearing animals are practically worthless, the thickest and finest part of the fur being shed as warm weather approaches, growing again in the fall to protect the animal in winter. This deterioration furnishes great protection to the animals, their value in the summer pelage being so small as to not warrant their capture. Furs in best condition are designated "prime," and this state is indicated by the color of the pelt. That of a prime skin is generally very light and clear, but as warm weather approaches it becomes bluish and dark. Most aquatic furs in the United States become prime about the middle of November and remain so until March, but beaver and muskrat are not thoroughly prime until late in December and are good until the last of April, while the fur of the otter may be prime as late as the end of May. There are two prominent exceptions to the general rule of taking fur-bearers during cold weather only, viz, the sea-otter and the fur-seal. The fur of the former is prime throughout the year, and the latter is taken principally during the summer for convenience of capture.

In addition to the protection afforded by the poor condition of the pelage, many governments have interdicted the capture of certain fur-bearing animals from a definite date in the spring to a fixed date in the autumn. There is no uniformity in these regulations in the different States and frequently in different counties in the same State.

None of the aquatic fur-bearers is utilized to any extent for food, though the meat of the muskrat is used by some persons; nor are these animals valuable except for the furs, which constitute the principal, and in most instances the sole, object of their capture.

With the exception of the taking of the fur-seals on the rookeries, practically all the aquatic furs are obtained by a resort to skill and stratagem. Many muskrat, mink, and otter are obtained by farmers and villagers. During cold weather, when furs are prime, comparatively little work is done in rural sections, and thousands of men and

boys find profit and sport in matching their skill and cunning against those of the wary animals. The greater portion of the peltries, however, are secured by professional trappers and hunters, who devote themselves entirely to that work during the season.

In taking or killing fur-bearing animals the use of guns or spears is avoided whenever possible, as they injure the skin by making holes in the pelt. Shooting is especially wasteful in taking aquatic animals, since a large percentage of these sink when shot, and are thus lost; furthermore, the shot cut paths in the fur, sometimes several inches in length. Neither should they be taken by poisoning, as this spoils the skin, the poison spreading through the body of the animal and injuring the texture and gloss of the fur, greatly depreciating its value.

The best method of taking these animals is by clubbing them on the head whenever that is practicable, as in the case of fur-seals, or by means of steel traps in case of the smaller and wilder animals.

Previous to 1670 the fur trade was centered in Leipsic, Amsterdam, Paris, and Vienna, the markets of Leipsic being the most important. Comparatively few choice furs were handled in London or in any market center other than those named. But shortly after the inauguration of its business in 1670, the Hudson's Bay Company began disposing of its receipts of peltries at public auction in London. Within a few years the continental markets relinquished the bulk of their trade to the new insular rival, and from that time to the present London has been preeminent as the greatest fur center of the world. The series of sales occurring at stated intervals at the various warehouses in that city dispose of the great bulk of the world's product of fancy furs. The American merchant, for instance, goes to London to buy the pelts that were obtained and shipped even from the vicinity of his own home. The reason for this is not difficult to discover. The principal fur company of the world has its headquarters in that city; the fur trade is better understood there at present than in any other large commercial center, and the importance of its being centralized makes it comparatively easy to hold when once secured; also the business ranks well among the London bankers, and they advance money on consignments of furs, and the consignor can negotiate his bill of lading on the receipt of his bales of peltries.

Although none compares in extent with that of London, there are several other markets which assist in the general work of distribution. Most celebrated among these are the fairs at Leipsic, which have existed over five hundred years. The Easter fair is the most important. This commences a week after Easter and lasts about two or three weeks. Large quantities of American peltries, especially muskrat and mink, are disposed of there. Furs are marketed in much smaller quantities at two other fairs held in Leipsic, one at Michaelmas and the other at New Year.

New York City is the great fur center in this country, not only for accumulating the raw goods but for dressing, dyeing, and manufacturing as well. Indeed, New York leads the world as a consumer of furs, the sales to individuals there exceeding that of any other city in the world. Many firms long established, with large capital and of international reputation, carry on the business. At present there are 93 fur houses in New York, many of which have branch establishments and resident partners in London, Paris, Leipsic, Shanghai, etc. In view of the fact that a very large percentage of the furs of the world originate on the North American continent, and that the rank of the United States as a fur-consuming country is constantly increasing, it seems not improbable that the enterprise of New York may result in that city securing a large portion of the wholesale trade which now centers in London.

In addition to these large centers, the work of fur distribution is carried on by traders and merchants in almost every section of the world, scarcely any large town being without its quota of fur stores of greater or less importance, according to the climate and the wealth of the inhabitants.

In the markets, the skins of each variety are graded according to their size and the condition of the fur, the number of grades or classes depending on the importance of the particular variety, the cheaper peltries requiring fewer grades than those of greater value. For the purpose of showing the comparative value of the different aquatic furs, the following summary is presented, indicating for dressed prime skins of each variety the average area in square inches, the average value in the wholesale markets of the United States in 1901, and the resulting value per square foot of area.<sup>a</sup>

*Comparative statement of the average area, value, and value per square foot of the different aquatic furs in the United States markets in 1901.*

Designation.	Area.	Value per skin.	Value per square foot.
	<i>Sq. inches.</i>		
Sea-otter, dark .....	1,285	\$600.00	\$67.24
"    brown .....	1,285	200.00	22.41
Fur-seal, Alaska .....	940	45.00	6.89
"    Copper .....	890	34.00	5.58
Mink, Canadian .....	73	2.60	5.12
"    Minnesota .....	90	2.73	4.38
"    Pacific .....	83	1.80	3.12
Otter, Canadian .....	460	10.33	3.23
"    Pacific .....	448	7.90	2.54
"    Southern .....	400	6.80	2.08
Beaver, Canadian .....	685	7.55	1.71
"    Pacific .....	650	7.05	1.56
"    Southern .....	560	5.80	1.49
Nutria .....	214	.78	.52
Muskrat, dark .....	100	.34	.49
"    light .....	100	.23	.33

<sup>a</sup>It will be observed in comparing this summary with the tables on pages 285 and 287 that the average areas and values used here are in excess of those in the tables. The explanation of this seeming discrepancy is that the figures in those tables refer to all classes of skins in a raw state, including the smallest and cheapest, whereas the present figures are for dressed skins and only those of prime grade.

## FUR DRESSING AND DYEING.

The appearance of aquatic furs as they come from the hunters and trappers is quite different from that which they present when ready to be cut into garments. They are more or less greasy and dirty and require thorough cleansing. The pelt or membrane must be converted into a form of leather and made soft and pliable, and in some varieties it must be reduced in thickness. The overhair of many skins is quite undesirable and must be removed, this being the case with the fur-seal, beaver, nutria, and cheap grades of otter. The overhair is not removed from all varieties, however; for in some it constitutes the principal attraction, as in the sea-otter, mink, muskrat, and choice grades of otter. The fur-seal alone among the aquatics is usually dyed, but many cheap grades of other varieties are also dyed for the purpose of imitating more valuable ones.

In the dressing of aquatic furs there are no especially valuable trade secrets; but, as in nearly every other industry, some establishments have methods of treatment which they consider superior to those used by others and which they desire to keep from general use. As a rule, however, these secret processes are for the purpose of substitution or imitation, and have little standing among the most successful fur-dressers. In the best establishments the excellent results are due to conscientious application of well-known methods, without stint either in amount of labor or quality of material.

The fur-dressers of the United States are prominent in the preparation of otter, mink, and beaver, while those of Germany rank well in dressing beaver and muskrat furs. The English have excelled for forty years in the dressing and dyeing of fur-seal skins and have prepared the great bulk of those on the market, but the Americans and French now prepare them equally well. The Chinese fur-dressers are the most ancient and among the best in the world. They dress sea-otter skins remarkably well and secure wonderful effects in matching furs of all kinds.

The principal fur-dressing establishments in this country are located in New York City, where the great bulk of the skins are prepared. Smaller establishments exist in Chicago, St. Paul, Newark, and Philadelphia. In Europe the fur-dressing is centered at Leipsic, Weissenfels, and Lindenau, Germany; London, England; Paris and Lyons, France; and Moscow and St. Petersburg, Russia.

When received at the fur-dressers, peltries are usually hard, greasy, and dirty. If very greasy, as in the case of mink skins, the surplus grease is scraped or beamed off. The skins are soaked in water over night for softening and opening the texture preparatory to the unhairing and leathering processes. Salt water is generally used for soaking, especially during warm weather, as its tendency to loosen



SKIVING BEAVER SKINS.



BEAMING AND PLUCKING BEAVER SKINS.

the hair is less than that of fresh water. Heavy pelts, as of beaver, otter, etc., are beamed the following day for the purpose of breaking up the texture of the membrane and softening it. The beam on which the skins are successively placed for this purpose is made of some hard wood, as locust, boxwood, etc.; it is about 40 inches long and 8 or 10 inches wide, and is placed at an incline of about 45 degrees. The breaker is a dull scraping knife, with a handle at each end like a carpenter's draw knife, and is always operated in a downward direction. After beaming, the pelts are washed in warm soap water until perfectly clean and then they are freed of moisture.

If the overhairs are to be removed, that process is next in order, except in the dressing of muskrat skins, when it is usually postponed until after the dressing. In preparing for plucking, the hair side is dried and warmed by artificial heat, the membrane being kept moist in the meantime. Each skin is placed flesh side down on a flat, hard-wood beam, similar to that used in breaking except that it is covered with thick, elastic leather. Chalk is first sprinkled over the hair, and then, using a knife similar to that employed in breaking, a workman rubs or works most of the overhairs out of the membrane. Those not removed in this manner are subsequently plucked out with a dull knife of soft metal. With this knife in his right hand and his thumb protected with a rubber cot about 4 inches in length, the picker grasps the hairs between the edge of the knife and his protected thumb, and with a quick, jerking motion pulls them out, going over the entire pelt in this manner. The fur-seal is quite difficult to unhair, and the process is more complicated, as may be seen from the description on page 305.

After plucking, the heavy pelted skins—as beaver and otter—are placed successively on a beam and shaved to a thin, even surface with a skiving knife. The blade of this knife is a straight piece of steel sharpened to a keen edge, which is then turned at right angles to the plane of the knife by means of a peculiar flat steel. This blade is fastened in a tool having two wooden handles differently attached, one running parallel to or in direct continuation of the blade, and the other placed at right angles thereto. Each skin is placed, fur down, on the beam, and by pushing the skiving knife downward and forward from his body, the workman scrapes the pelt perfectly clean and shaves off some of the membrane for the purpose of rendering it less bulky and more pliable.

The skins are now ready for leathering. The pelt side is dampened over night with cold salt water, and the following day butter or other animal fat is rubbed on the membrane. In dressing very fat or oily pelts, as those of mink, the greasing is omitted.

The pelts are then tubbed. This is probably the most noticeable operation in the fur-dressing establishment. Tubs or half hogsheads, slightly inclined backward from the floor, are located in a row along one side of the room. A number of skins are placed in each one,

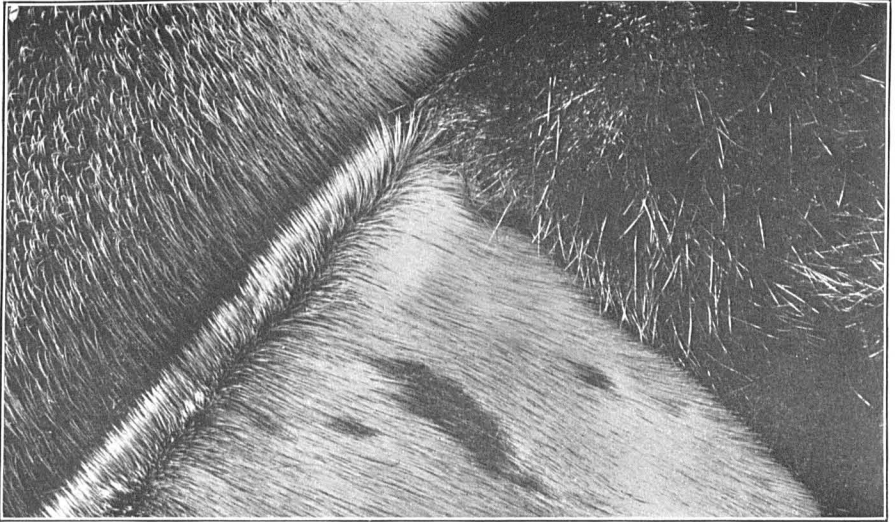
usually with a small quantity of sawdust. A workman with bared feet enters the tub, with a heavy cloth or piece of bagging tied about his waist and to the chimb of the tub to prevent the sawdust from flying out and to retain the heat. By treading and twisting movements he works the skin over and over for two or three hours or more until the pelt is thoroughly softened or leathered. It is a strange and interesting sight to see 10 or 12 men working in an equal number of tubs placed in a row, each person monotonously treading and swaying from side to side in solemn manner.

Tubbing is gradually giving way in a greater or less extent to the "tramping machine," whenever anything less than the very best work will suffice. This machine is adapted from the French apparatus for fulling wool stock. It consists of two wooden hammers, which are moved alternately back and forth or up and down in a suitable receptacle, agitating the skins slowly and constantly, turning them over and over each other, and developing by friction the necessary heat, thus rendering the pelts soft and pliable. This process is far more economical than tubbing, costing only 10 or 20 per cent as much. The result, however, is not always so satisfactory, and for the choicest skins tubbing is yet generally used.

At this stage of the dressing process comes the fleshing or skiving, the former being applied to small skins and the latter to large ones. Fleshing consists in removing all particles of flesh and fat by means of a fleshing knife, formed with a broad blade having a sharp edge, fastened in an upright position on a bench. The workman sits astraddle the bench immediately behind the knife, with the edge turned from him, and proceeds to flesh each pelt by grasping it with both hands and drawing it repeatedly across the sharp edge of the knife, cutting off the superfluous flesh. Only small skins, such as mink and muskrat, are fleshed in this manner. Large skins, as those of beaver, otter, etc., are shaved on a beam with a skiving knife, in much the same manner as before the leathering process, except that the operation is performed much more carefully.

After fleshing or skiving, the skins are usually put through the tubs or tramping machines a second time, and on removal therefrom are cleaned of grease. In this operation two forms of revolving drums are used, one known as the cleaning drum and the other as the beating drum. The purpose of the former is to extract the grease by means of dry sawdust, and of the latter to remove the sawdust. The drums are usually about 4 feet wide and 6 or 8 feet in diameter, but the size is entirely a matter of convenience and desired capacity.

The cleaning drum is made of wood, and upon its interior circumference are four or five wooden shelves about 6 inches wide and at suitable distances apart. Instead of these shelves some drums are provided with rows of wooden pins or pegs 6 or 8 inches in length and similarly situated. Sometimes each cleaning drum is inclosed in a wooden



Blueback seal.

Harp seal.

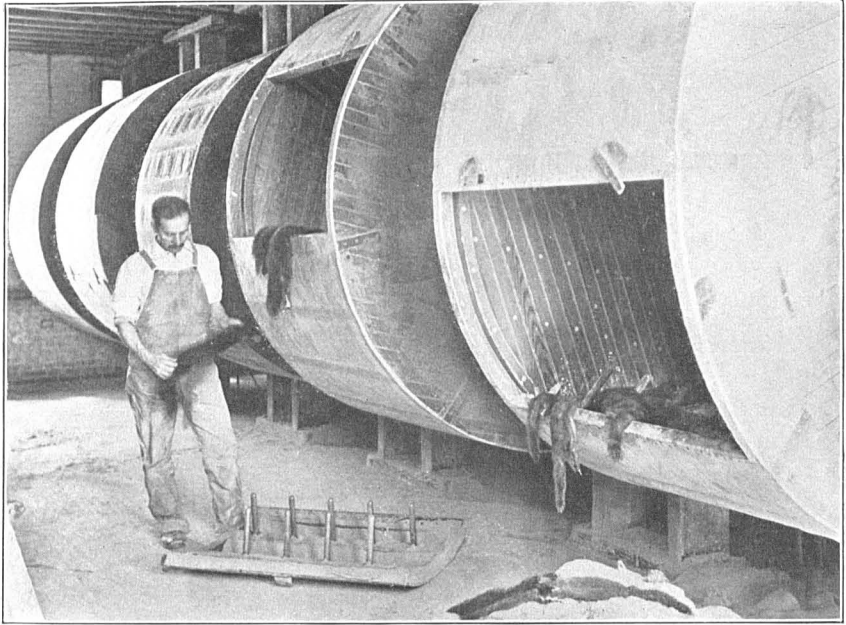
Wool seal.

SEAL SKINS TANNED WITHOUT REMOVING THE HAIR (SEE P. 335).



SHAVING MINK SKINS.





CLEANING-DRUMS.



BEATING BEAVER SKINS FOR REMOVING SAWDUST, ETC.

closet, which is heated by steam pipes or a charcoal fire. A number of skins, with a quantity of fine, dry, hard-wood sawdust, are placed in each drum. The latter is revolved steadily, making about 20 revolutions per minute, and within three or four hours the dry sawdust absorbs the grease, leaving the fur clean and soft but filled with sawdust.

The beating drum, also sometimes inclosed in a closet, has wooden ends, and the side or circumference of wire gauze, with meshes about one-fourth inch square. Along the interior circumference are wire-gauze shelves about 10 inches wide, which catch the pelts at the bottom of the revolving drum and carry them nearly to the top, when they slide off and fall against the wire gauze covering the circumference of the drum. In this manner the pelts are cleaned of every particle of sawdust. Many of the larger pelts are beaten with rattans for the same purpose.

After removing the sawdust and straightening the fur with a steel comb, the dressing process is at an end. This general process would suffice fairly well for all varieties of aquatic furs, but it is modified to suit the characteristics of the different sorts. The special methods applicable to each variety are described at length in appropriate chapters.

Except in case of very cheap skins, the expense of dressing furs represents only a small percentage of their value. The following tabular statement shows the average charges that prevail in New York City for dressing skins in quantities for the trade:

*Statement of average charges prevailing in New York City for dressing aquatic furs.*

Species.	Dressing.	Dressing and plucking.
Beaver.....	\$0.50	\$0.60
Fur-seal <sup>a</sup> .....		3.00
Mink: Cased.....	.15	
Open.....	.14	
Mink tails.....	.03	
Muskrat.....	.06	.08
Nutria.....		.25
Otter.....	.50	.65
Sea-otter.....	2.00	

<sup>a</sup> Dressing, plucking, and dyeing, \$5.

With the exception of the fur-seal, the choicest furs of any particular species are rarely dyed. Indeed, their degree of excellence is determined by the nearness of their approach in the natural color to the most desirable shade for that species. So important is this that a skin of the proper tint may be worth three or four times as much as one whose texture is equally fine but lacking just the right shade. For instance, the present average value of prime dark sea-otter skins is about \$600 each, whereas the average price of prime brown skins is only \$200. In case of mink, otter, and other choice species the difference is as great in proportion.

In order to obtain those shades which taste and fashion have determined to be the most desirable, much of the aquatic fur is dyed; either the ends of the fur and hair are merely tinted, or the color of the entire skin may be changed. The object of tinting or blending is to make all parts of the fur used in a garment of the same color, to make an inferior grade of fur like that of a superior, or to cause the fur of one animal to resemble that of another. Certain furs so closely resemble choicer ones in every particular except color that when dyed to a similar hue they are almost indistinguishable to the casual observer.

While dyeing may be a cheap and ready process in the treatment of low-priced furs, it is an art when applied to choice skins. Its perfection consists in the exact imitation of the proper color and tint, with the preservation of the glossiness of the fur and its natural firmness and pliability, and, finally, in the durability of the dye. In case of the fur-seal, fashion has decided that the color shall be changed to a lustrous blackish-brown, an original color resembling nothing whatever in the animal kingdom.

Some skins of beaver, otter, etc., are "silvered" by passing lightly over them a solution of sulphuric acid, and also some are made a golden yellow by means of peroxide of hydrogen. Dyed furs are generally not so durable as those left in the natural state, the artificial color fading and the garment sooner presenting an old and worn appearance.

The dyeing of furs is of great antiquity, but its principal development, in America and Europe at least, has been within the last forty years. Experiments on the part of conscientious and able chemists have resulted in greatly improving the permanency of the dyes and lessening their injurious effects. The methods are constantly undergoing changes and many improvements are introduced from time to time. The composition of the new dyes and the methods of applying them are carefully guarded from general knowledge. One frequently runs across published directions for compounding the dyes and methods of applying them, but usually these descriptions are totally valueless, the methods described being either superseded by better ones or lacking in certain essential ingredients.

The number of successful dyers in the world is very small; their prosperity is dependent as much upon the elimination of competition as on the excellence of their work, consequently they are not proclaiming from the housetops the composition of their dyes, frequently the results of long and costly experiments.

In the separate chapters devoted to each variety of furs certain general methods of dyeing those particular skins will be described, but the writer is unable to promise the formulæ and details of the newest and most successful dyes in every instance.

## AQUATIC FURS USED BY HATTERS.

During the seventeenth and eighteenth centuries an important if not the principal use of aquatic furs in Europe was in making fashionable hats, commonly called beaver hats, beaver fur being the chief material in their make-up. The general adoption of the silk hat about sixty years ago resulted in greatly reducing the quantity of aquatic furs used by hatters, but those manufacturers are yet large consumers of these articles for the production of fine grades of soft hats.

The principal felting furs among the aquatics are nutria, muskrat, beaver, fur-seal, otter, and mink, named in the order of the extent to which they are now used. Rabbit, cony, and hare furs are used far more extensively than all the foregoing combined, owing to their cheapness, but are less desirable than most varieties of aquatic furs. Hatters' furs are both cut and blown, the former being taken from the whole skins, and the latter from small pieces, clippings, roundings, and other waste obtained in cutting skins for sewing into garments.

The choicest felting fur is that of the beaver; but its high cost limits its use in hat-making. A felt hat of average size and weight made of fur cut from choice beaver pelts could not be made for less than \$500 per dozen, and no demand exists for such expensive goods. But manufacturers receive a quantity of beaver cut from damaged skins of little value as dressed fur and also considerable blown from clippings and the waste from cutting skins into garments. The choicest beaver fur for hatters' purposes is obtained from the cheeks of the animal, with that from the belly, the back, and sides, following in the order named.

Beaver clippings sell for about \$1 to \$1.25 per pound, and the fur, when blown free from hair and impurities, sells for \$8 or \$10 per pound. Cut beaver has been sold as high as \$224 per pound by brokers yet in the business. The quantity of beaver fur used by hat-manufacturers throughout the world averages about 6,000 pounds annually. It is made into very light soft hats, which sell wholesale at about \$80 or \$90 per dozen. These are very durable, and if occasionally cleaned or dyed may be worn almost indefinitely. A small demand still exists for the old-fashioned beaver-napped hats, shaped somewhat like the present style of silk hat, being the fashionable headgear for the guards on drags and coaches, and to a small extent for ladies' riding hats.

The next highest grade of fur used by hat-manufacturers is nutria, which is the standard choice fur for making into soft felt hats. It is estimated that about one-third of the total product of nutria skins are cut for hatters' use, and in addition the hat-manufacturers receive large quantities of blown fur from manufacturers' clippings. Nutria is very nearly as desirable as beaver for felting, selling at present for about 80 per cent of the value of the latter, whereas in the dressed-fur trade it is worth only 30 per cent as much as an equal area of beaver fur. During the past twenty-five years the average value of cut and blown nutria fur has ranged between \$2.25 and \$7.50 per pound. In

1877 it was \$5.50, and gradually decreased to \$2.25 in 1886; it increased to \$7.50 in 1897, and in 1900 it averaged \$6.50 per pound. Single sales have been made as high as \$14 per pound. The total product of nutria fur used in hat-manufacturing in 1900 is estimated at 80,000 pounds, valued at \$520,000. It is claimed that a single manufacturer in Philadelphia has at times over a million nutria skins in warehouse.

Otter ranks next in grade among felting furs, but only a small quantity of this kind is used, and that is obtained from fur-cutters' waste. The clippings and waste sell for about 45 cents per pound, and the cut and blown fur for about \$3.50 per pound. The quantity used by hat-manufacturers annually probably approximates 700 pounds.

Muskrat fur is used extensively in hat-making, the whole skin as well as cutters' waste being utilized. Like beaver fur, it is assorted into three grades—backs, sides, and bellies—on account of difference in color and texture. The belly fur is the choicest and is used for making light or pearl hats. During the last 25 years the price has ranged from \$1.80 to \$3.25 per pound, averaging about \$2. In 1876 it was \$2.25, from which it varied little till 1890, when it began to increase, reaching \$3.25 in 1892, and since then it has steadily decreased to the present price, \$1.80 per pound. The cutters' waste sells for 35 to 40 cents per pound and the blown fur for \$1.30 to \$2 per pound. The standard mixed grade of blown muskrat fur usually sells for 30 or 40 cents less per pound than the belly fur, while dyed muskrat sells usually for one-third the price of cut belly, or about 60 cents per pound.

A small quantity of mink fur is used by the hat-manufacturers, the amount not exceeding 1,500 pounds annually, obtained entirely from cutters' waste, no whole skins whatever being used for this purpose. Mink fur is rather poor for felting, as may be inferred from the price at which it sells, the clippings fetching about 15 cents and the blown fur about \$1.10 per pound, or only one-sixth the price of beaver.

The cheapest aquatic fur received by the hatters is that of the fur-seal, of which probably 5,000 pounds are used annually. This is obtained almost exclusively from cutters' waste of dyed clippings, and when cut and blown sells for about 75 cents per pound.

The preparation of all of these furs for felting purposes is practically the same in each case. Preparatory to cutting them from the whole skins, the pelts are scoured thoroughly with soap water to remove the grease and other impurities, then they are properly dried and plucked, each one of these several processes being performed in much the same manner as in the fur-dressing establishments, except that it is done with greater expedition and less care. The overhairs are of no value in felting, and are sold as stuffing in upholstery, for plasterers' use, etc. The plucked skins are next caroted, consisting in moistening the fur with a solution of quicksilver and nitric acid or chloride of mercury, and then spreading them out flat to dry. This is done either in the open air or in rooms heated by steam, according to the color desired.

When dried in the open air the fur becomes whitish, and when dried by subjection to steam or other artificial heat it assumes a yellow, carrot-like hue. This explains the abbreviations W. C. (white carrot) and Y. C. (yellow carrot) always given in connection with the designation of each kind of felting fur. In the preparation of beaver and some other furs, the carrotting is occasionally omitted, but this raw stock does not felt so readily and is usually mixed with properly carroted fur.

After drying, the carroted skins are brushed by holding each one for a few seconds against a revolving wheel studded with quills. This is for the purpose of removing all dust and to straighten the fur so that it may be readily cut from the skin. Originally the cutting was done by manual labor, a pair of shears being used, and later by means of an ingenious mechanism giving a chopping motion to a vertically mounted knife. At present a much better machine is used, which with great rapidity cuts the pelt from the fur in little narrow strips about one-sixteenth of an inch in width and equaling in length the width of the skin. These strips of coriaceous membrane fall into a receptacle and go to the waste heap or to the manufacturers of certain oleaginous compounds. An endless apron carries the fur forward without disarranging it or changing its natural formation, where it is properly assorted by experienced operators.

Each assortment consists of the fur from a particular part of the skin, the chief divisions being the back, the sides, and the belly. Fur cut from the back is the darkest in color; that from the sides is lighter, and somewhat lower in quality. The belly fur is nearly always the lightest in color. It varies in quality, however, being the finest of the principal grades when cut from the beaver, nutria, or muskrat skins, and the lowest when obtained from the skins of land animals, such as the cony and rabbit. Minor assortments consist of the fur cut from the tails of various animals and from the cheeks of the beaver, the latter being the choicest felting fur obtainable. Belly fur is used in making light-colored hats; that from other portions is available for the production of felt hats of every desirable color. All of these assorted furs are placed separately in paper bags, containing 5 pounds each in America and England and 1½ kilograms each in France, in which they are stored or marketed.

The blown furs are those obtained from fur-cutters' waste, which every furrier establishment saves carefully. These pieces are assorted and sold to the cutters of hatters' furs at prices ranging from \$1.25 per pound for beaver to 15 cents per pound for mink clippings. The fur-cutter runs them through a chopping machine, where they are cut into minute pieces, and afterwards are repeatedly blown to separate the fur from the overhairs and pieces of skin. Blown fur is not usually carroted, and since it is short and is not readily assorted into various grades it sells for considerably less than cut fur.

## THE SKINS OF FUR-SEALS.

## DESCRIPTION OF THE SKINS.

There are two distinct groups of marine mammals commonly called seals. The members of one family, the *Otaridæ*, provide the fashionable fur, and are known generally as fur-seals; while the *Phocidæ* supply seal leather and oil, and are called seals or hair-seals.

The northern fur-seal pelts on the market are of three sorts, viz: Alaska skins, Copper skins or Copper Island skins, and Northwest Coast skins. Of the southern pelts the principal varieties are the Lobos, the South Shetland, the Cape Horn, and the Cape of Good Hope skins; but the present yield of these is quite small compared with that of the northern skins. These several classes of pelts are distinguishable from each other and sell at different prices. The Shetland Island skins are the choicest, but they are now very scarce and are rarely on the market. Of those obtainable in marketable quantities, the most valuable are the Alaska skins; next are the Copper skins; and the Lobos and Cape of Good Hope skins are of least value.

The pelage of the Alaskan fur-seal consists of a nearly uniform coating of dense, soft fur overtopped by coarse rigid hair of varying length. The coriaceous membrane is thin, pliable, and of light weight. The fur increases uniformly in thickness and fineness all over the body until the third or fourth year, when it is about three-eighths of an inch in length and is in its greatest perfection. After the fourth year it grows longer and thicker on the neck and shoulders and becomes thinner on the posterior parts, thus deteriorating in value. The hair overtopping the coating of fur is longest on the back of the neck, where in case of 4-year-old males it reaches a length of 2 inches or more; on the posterior parts it is shorter, and near the hind flippers it is usually less than an inch in length; on the limbs it is much shorter and less dense, and in some places quite absent. It is shed annually in August and September, new hair appearing as the old is cast. The process occupies about six weeks, and while in that condition the skins are known as "stagy," and are of inferior value owing to the amount of labor required in the process of dressing.

The Alaskan skins have constituted the greater part of those on the market since fur-seal has been fashionable in Europe and America. The Pribilof Islands, whence they are obtained, have probably yielded one-third of the total product of fur-seals of the last two centuries, and 80 per cent of those secured in the last seventy-five years. From the reports of the United States Treasury Department, it appears that from 1870 to 1900, inclusive, 1,837,563 marketable fur-seal skins have been shipped from the Pribilof Islands, and the revenue to the United States Treasury has amounted to \$7,812,036.

The fur of Copper skins, from the Commander Islands, is coarser and less dense than that of the Alaska skins, and commands a lower

price in the markets, usually about 70 per cent of the price of the latter. The pelt is also less porous than that of the Alaskan skins, this being especially noticeable in the process of working them preparatory to leathering. It is far more difficult to unhair a Copper skin, as the membrane is harder and stiffer and the hair more brittle.

Since 1871 the Russian Government has leased the sealing rights on the Commander Islands under conditions similar to those in the Pribilof lease. Following this, the number of skins secured averaged between 35,000 and 40,000 for upward of twenty years, but during the last six years it has greatly decreased.

The skins from Robben Island, in Okhotsk Sea, were formerly classed separately from those obtained on the Commander Islands, and were regarded as inferior, owing to the greater difficulty in removing the hair and the lighter color of the fur. Improved methods of dressing and dyeing have lessened this difference, and within the last fifteen years they have been combined with those caught on Copper Island and included in the term "Copper skins."

The Northwest skins are obtained in the North Pacific Ocean and the adjacent seas, and are the product of the so-called pelagic fishery, which has occupied so much attention in diplomatic correspondence and in the public press during the last twelve years. Previous to 1881 the output of this fishery never exceeded 10,000 skins; then it increased until 1894, when the catch was 141,143 skins, and since then it has greatly decreased, the product in 1900 being 38,923. Notwithstanding the fact that the Northwest skins are from the same herd as the Alaska skins, they are of much less value, many of them being taken out of season, when the fur is poor and the pelt stogy. As a rule they are not so well cured as the skins taken on the islands, and have many raw spots, a result of their being salted in the foul air of the ship's hold under indifferent supervision. They are readily distinguishable from the Alaskan and Copper skins by the fact that they are all pierced by bullet, buckshot, or spear, furnishing another reason for diminished value.

The Lobos Island fur-seal, at present the most numerous of all the southern members of this family, is obtained principally from Lobos Island, at the mouth of the Rio de la Plata, which is owned and controlled by the Republic of Uruguay. It is of a greenish or yellowish-brown color, with sides of a darker brown, and the fur is comparatively long. The pelt is thin, rather spongy, and easy to work. Since 1825 the right to take seals on the island has been leased under a system of regulations resembling somewhat those in force on the Pribilof and Commander islands. The annual product is from 15,000 to 20,000. The total number of skins obtained since 1873 approximates 415,000, valued at \$4,000,000, a remarkable output for an island covering less than 1 square mile in area. The rookeries on this island are the only ones in all the southern seas which have been protected, and they



are also the only ones whose output has continued undiminished to the present time.

The general color of the South Shetland or Cape Horn fur-seal, according to Mr. Henry Poland, is light gray with a silvery hue; the neck and cheeks are whitish, and the sides and belly are of a rich brown. The fur is thick and heavy, and of a reddish or deep pink color. The habitat of this seal is the islands in the Antarctic Ocean, and it is more numerous on South Shetland Island than elsewhere. When in good condition this fur is the choicest on the market, its quality being much superior to that of the Alaskan seal, the high latitude and the rigor of the climate developing the fur into full perfection at the time when the seals seek those shores. During the seventies the skins of the South Shetland fur-seals sold for nearly twice the price of Alaskan skins, although, owing to the inferior quality of the leather, they are less durable. Since 1882 the receipts of Cape Horn skins have been small and irregular, ranging from 6,000 to less than 100 a year. The high prices of the pelts have resulted in the searching of every accessible beach and rock in the southern oceans and the removal of all fur-seals that could be secured, their only protection being the severe weather, which often makes it impossible to effect a landing on the rookeries.

The total number of fur-seal skins marketed since their introduction in the early part of the eighteenth century aggregates probably 13,000,000, of which 5,000,000 were secured from northern localities and the remaining 8,000,000 from the rookeries of the southern seas, the great bulk of the latter being marketed at Canton, China, a hundred years ago. At the present market price the total value of these pelts would approximate \$500,000,000, but owing to their cheapness in the early years, when the greater part of them were obtained, the actual returns have probably not exceeded a tenth of that amount.

In curing fur-seal skins preparatory to shipment it was formerly customary to dry them while held stretched upon the ground by the use of stakes and twine or by means of wooden pegs driven through the edges. It was often impossible to dry the skins thoroughly in the damp climate of Alaska; and even when artificial drying was resorted to, it was frequently difficult to prevent them from deteriorating while en route to market. The drying process also made it difficult to unhair the pelt in dressing. This led, about 1855, to the salting of the skins, which is now the general practice. However, a few are dried by the natives along the mainland and on the adjacent islands of Alaska, a thousand or more being marketed each year.

#### FUR-SEAL MARKETS.

Previous to 1855 fur-seal skins were in little demand in Europe or America. The fur was not fashionable and the skins were made into gloves and riding rugs, caps for cabmen and street peddlers, and even

for the covering of trunks and boxes. Another use to which they were put when unusually cheap in the European market was to clip the fur from the skin and tan the latter for the general purpose of leather, while the cut fur was either discarded or manufactured into napping for "beaver hats." But few hats were made of this material after the adoption of silk felt.

About 1825 the unhairing and dyeing of fur-seal was introduced, and although the article was very poor compared with the choice product of the present time, it was a decided advance over the former methods of dressing. Between 1855 and 1870, through experiments on the part of Messrs. Oppenheim & Co., and of Messrs. Martin & Teichman, in London, and of Mr. George C. Treadwell, in Albany, the methods of dressing and dyeing fur-seal were greatly improved, resulting in an exquisitely soft and downy texture and rich dark-brown color, which was quickly adopted by the fashionable world for cloaks, jackets, muffs, trimmings, etc. So popular did the fur become that the demand quickly ran up from 10,000 skins in 1860 to 20,000 in 1865, to 150,000 during the seventies, and 200,000 during the eighties at greatly increased prices. The high prices resulted in excessive drains on the rookeries and unwise methods of slaughter at sea, so that the quantity of skins obtainable now is very much less than ten or fifteen years ago, only 95,485 being handled in 1900, and the price is much in excess of what it ever was before.

Previous to 1871 fur-seal pelts were comparatively cheap, the undressed Alaskan skin rarely selling for more than \$4 or \$5; but since that time the market price has greatly increased. In 1875 Alaskan skins averaged about \$13 each; in 1880, \$20; in 1885, owing to the large number received from the pelagic fishery, the price fell to about \$16 each, but in 1890 it increased to \$35, and in 1900 to \$40.

Since 1870 practically the entire world's product of fur-seal skins has been sold in London. Most of them are handled by Messrs. C. M. Lampson & Co., who receive consignments from the North American Commercial Company, the lessees of the right to take skins on the Pribilof Islands; from the Russian Sealskin Company, the lessees from the Russian Government of the rights on Commander Island and Robben Reef, and a large portion of the Northwest skins. Other prominent firms in London handling skins are the Hudson's Bay Company, Messrs. Boulcher, Mortimer & Co., the consignees for Lobos skins, and Messrs. Culverwell & Brooks, who receive many of the Northwest skins.

The skins are duly catalogued, and public-auction sales are held at stated times during the year, usually in March, October, and December, when all the leading furriers of Europe and America are represented, the number averaging about 50. Generally the entire stock on hand is sold at each occasion.

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The consignments of skins are assorted according to the size, the following grades being recognized:

Name of class.	Age.
Wigs.....	6 to 10 years.
Middlings.....	4 to 5 years.
Middlings and smalls.....	4 years.
Smalls.....	3 years.
Large pups.....	2 years.
Middling pups.....	1 year.
Small pups.....	Under 1 year.
Extra small pups.....	
Extra extra small pups.....	
Grey pups.....	

The following summary, compiled by Mr. Alfred Fraser, shows the total number of skins offered at the London auction sales during each year since 1872:

*Statement of the number of each variety of fur-seal skins offered in London during a series of years ending in 1900.*

Year.	Alaskan.	Copper Island.	Northwest coast.	Lobos Island.	Cape Horn.	Total.
1872.....	96,283	7,182	16,312	7,000	320	127,097
1873.....	101,248	21,614	8,931	6,956	9,000	139,749
1874.....	90,150	30,349	8,843	8,509	8,600	146,451
1875.....	99,634	34,479	3,575	8,179	9,500	155,369
1876.....	90,267	33,298	4,097	11,353	6,306	145,321
1877.....	75,410	25,380	1,945	13,066	7,631	123,432
1878.....	99,911	19,000	3,610	12,301	8,227	143,016
1879.....	100,036	28,211	16,527	12,295	12,180	168,249
1880.....	100,161	38,885	13,501	14,836	17,562	184,945
1881.....	99,921	45,209	16,573	13,569	13,164	188,436
1882.....	100,100	39,111	23,765	13,200	11,711	187,329
1883.....	75,914	36,500	5,028	12,861	4,655	139,474
1884.....	98,887	26,675	19,269	16,258	6,743	169,705
1885.....	99,719	48,929	20,265	10,958	3,404	183,270
1886.....	99,910	41,752	33,973	13,667	909	190,213
1887.....	99,940	54,584	43,339	11,068	2,762	211,693
1888.....	100,000	46,333	40,000	20,749	4,403	211,483
1889.....	100,000	47,416	41,808	8,755	3,021	201,000
1890.....	20,994	95,486	39,014	18,541	2,460	176,485
1891.....	13,473	17,025	65,263	15,834	3,114	104,709
1892.....	7,554	30,678	64,108	12,202	6,292	120,834
1893.....	7,492	32,832	121,618	13,624	2,131	177,697
1894.....	16,030	27,298	171,914	12,145	62	227,449
1895.....	15,062	17,721	57,842	12,017	1,888	104,470
1896.....	7,500	14,415	30,651	14,019	2,510	99,095
1897.....	22,504	(a)	68,623	13,407	2,037	106,571
1898.....	20,762	13,726	46,178	30,348	3,900	114,914
1899.....	26,434	8,942	44,993	15,381	6,291	102,041
1900.....	19,935	9,784	42,829	15,116	7,821	95,485

<sup>a</sup> The 1896 skins were sold in December, 1896; no 1897 skins were sold until March, 1898.

Previous to 1820 no market existed for fur-seal skins in the United States, and practically all of those received from the Southern oceans were reshipped to China, either direct or by way of Europe. In 1822 Mr. Denison Williams, a cap-manufacturer of Albany, N. Y., introduced fur-seal caps to the trade. From a manuscript written by him, and now in the possession of Mr. Samuel Williams, we have extracted the following notes in regard to the development of this business:

In 1822 the first fur-seal came into our market. At that time no one knew a process of removing the hair from the fur, therefore we made them into caps with the hair on, which took well. The next season we used large quantities of fur-seal, and after a number of experiments succeeded in removing the hair, greatly increasing the value of the fur. Those skins were from the South Shetlands, then just discovered,

and were the finest ever found. The next season we prepared a lot of hair-seal caps which took well in the Southern markets. In the fall of the following season (1825) we succeeded in coloring both the fur-seal and the hair-seal skins, the first ever colored in this country, thus enhancing their value 100 per cent.

Mr. Williams was quite successful in the fur-seal cap business, establishing agencies in Boston, New Orleans, and Nova Scotia, and having made a net profit of \$60,000 in four years, retired in 1827. The business was continued by Mr. Williams's former associates, Messrs. Packer, Prentice & Co., who built up a large trade, their manufacture of various furs in 1831 amounting in value to half a million dollars. In 1833 Mr. George C. Treadwell, who in later years enjoyed so prominent a reputation in fur-seal dyeing, began dressing the skins, and in a few years others embarked in the business, making Albany the principal center in the United States for this industry. Fur-seal skins constituted a large item in the business, 20,000 being unhaired and dyed in a single year, nearly all of which were used in the manufacture of caps. Previous to 1835, most of the skins were dyed "London brown." In that year Mr. James Chase, of the Treadwell company, discovered how to give them a dark plum color, and afterwards deepened it to a deep sable hue.

The skins were obtained from the South Shetlands and other places in the vicinity of Cape Horn and from various places on the west coast of Africa. With the decrease in yield from these localities about 1840, the business at Albany began to wane, and finally fur-seal skins became so scarce that nearly every manufacturer ceased using them. Mr. Treadwell continued their use for caps and gloves, obtaining his supply of raw skins from the occasional lots received from the southern seas, supplemented by shipments of Pribilof skins from London.

The attention of Mr. Treadwell having been called to the growing demand in London for fur-seal sacques, he began dressing and dyeing the skins for the trade in the United States. He did not produce the seal-black fashionable at the present time, but a reddish brown, which became known as seal-brown. This product gave excellent satisfaction, the dye retaining its bright color without fading. Meeting with sufficient demand for his output, he did not attempt to secure the black shade of color finally adopted by the London dyers in response to the demands of fashion.

Mr. Treadwell was the only fur-seal dresser in this country up to the year 1878, when Mr. J. D. Williams, of Brooklyn, the son of Mr. Denison Williams, referred to above, began dressing and dyeing the skins a dark brown, similar to the London color. At the present time, the sons of the late Mr. J. D. Williams, above noted, are the only fur-seal dressers and dyers in this country, although there are many who redye skins. The reason fur-seal skins are not dressed and dyed more extensively in the United States is not due to the high cost of labor here, for that is more than counterbalanced by the 20 per cent

import duty on the prepared skins; nor is it due to the lack of expert workmen. The principal reason is that the raw skins are sold in London and harmonious cooperation exists among the fur-brokers, fur-dressers, and bankers there, so that a first payment may be made on skins purchased in the fall, and most of the purchase money be withheld until the skins have been dressed, dyed, and made ready for manufacture six or eight months later.

In estimating the industrial value of the manufacture of fur-seal articles in the United States, seven of the principal furriers made affidavit in 1892, as follows:

The number of Alaska fur-seal skins that are imported annually into the United States, after dressing and dyeing in London, is, upon the basis of the importations during the past ten years and upon a catch of 100,000 skins at the Pribilof Islands, correctly estimated at 65,000 to 75,000. The value, before paying duty thereon to the United States, of each dressed and dyed fur-seal skin so imported, may be said to range between \$15 and \$50, with an average value during the past ten years of about \$25 per skin. The wages paid annually to people engaged in the manufacture and remodeling of seal-skin articles are, on an average, about \$7 a skin, or upon 70,000 skins, \$490,000. The profits made annually by merchants, wholesale furriers, and retail furriers amount to about \$30 a skin, or upon 70,000 skins \$2,100,000. The amount of silk consumed annually in the manufacture in the United States of 70,000 fur-seal skins into articles and in the repairing of these articles may be estimated at \$150,000 to \$200,000. All silk which is being so consumed at the present time is made in the United States. Working men and women are employed in the industry of manufacturing seal-skin articles in the United States as follows:

Classification.	Num-ber.	Wages per diem.
Fur-cutters (i. e., people who trim, repair, and prepare the general shape of skins).....	1,200	\$3.50 to \$4.50
Nailers (i. e., people who stretch and nail skins into shape on boards).....	600	2.00 2.50
Sewers and finishers (i. e., people who put the article into final shape).....	1,500	1.50 2.00
Those who machine skins (i. e., remove the portion of guard hairs left by the unhairers).....	60	2.00
Total.....	3,360	

The fur-cutters represent skilled labor of a high order. No account is taken of porters, clerks, salesmen, etc., employed in the large establishments.<sup>a</sup>

Owing to the smaller quantity of skins received on the market at the present time, the number of persons employed in manufacturing them into garments is much less than in 1892, probably not over 60 per cent as many. The total number of persons actively employed at present in various parts of the world in handling fur-seal skins from the live animals to the finished garments probably aggregates 4,000, and the total value of the product \$6,000,000 or \$8,000,000 annually.

#### METHODS OF DRESSING AND DYEING.

The present method of dressing fur-seal skins represents the highest development in the fur-dresser's art. The difference in appearance between a raw and a finished pelt of beaver, otter, or muskrat is com-

<sup>a</sup> Fur-seal Arbitration, Washington, 1895, Vol. III, p. 526.

paratively small; but the raw fur-seal skins, as received at the fur-dresser's establishment in their dirty and unsightly condition, bear little resemblance to the finished product delivered to the garment manufacturers. The following account of the present methods of dressing these skins is based on information furnished by fur-dressers of New York and London, and especially by Mr. Samuel Williams and Mr. Max Bowsky, of New York City:

The moist skins are first freed of salt and then "blubbered," consisting in placing each skin, fur down, on an inclined wooden beam somewhat like a tanner's beam, and with a two-handled knife removing all particles of blubber, flesh, and other extraneous matter, care being taken that no cuts or uneven places are made in the pelt. These blubber scrapings are oleaginous and are usually handled by manufacturers of oils and greases. The skins are soaked in cold water over night and then washed in strong soap water, the amount of washing depending on the condition of the pelt, some pelts standing more than others, too much washing loosening the fur. Whale-oil soap was formerly considered necessary for this, but its use is now almost abandoned. After the washing, the skins are placed on a beam with the fur side up and the grease and water are removed by scraping or pressing with a beaming knife.

Then comes the depilation or unhairing, the most difficult and important single step in the process. In preparing for this, a slight difference of practice exists among the various dressers. Usually after the washing, as above noted, each skin is stretched and sewed with heavy cord to the rim of an iron hoop and suspended in dry atmosphere until thoroughly dry, usually requiring several days. Next they are soaked in cold water from one to three days, the length of time varying according to the condition of the skin and the temperature of the water. On removal the fur is dried and the skin made quite warm, doubled together, and sweated in a warm place from one to three hours or until the hair commences to start. In some establishments the drying of the skins on iron hoops is omitted entirely, and the fur is dried and the moist pelt warmed and sweated as above noted immediately after the washing process.

When the skins are in good working condition, the picker or unhairer bends several of them across boards by the side of a stove, and thus warms and dries the fur side, keeping the skin side moist in the meantime. Each skin while warm is successively placed on the unhairer's beam, pelt side down, and the hair removed by using a dull knife of soft metal, known as a picker's knife, the workman grasping the hair between the knife and his thumb, the latter being protected by a rubber cot. Extra force should not be used in case the hairs do not yield readily, for they are liable to break off; but the pelt should be again moistened and the fur side warmed. After a portion of the skin has been unhaird, it is necessary to warm another part of it at the

stove, keeping the pelt moist as before, and the operation is continued until the entire skin has been unhaired. In order that the hairs may be easily removed, it is necessary to heat the skin to the limit which it will stand without injury, and much experience is required to determine this limit. Many skins have been so injured in the unhairing that the fur loosens and readily comes out after a few weeks' wear.

For economy of time, a workman generally operates on three or four skins at the same time, unhairing one while the others are warming. The hairs must be pulled out and not broken off. Care is also taken to avoid removing the fur with the overhairs, and thus leaving bare spots on the pelt. Even after the above process stagy skins retain many short or second-growth hairs which reach a short distance above the fur. Many of these may be removed by the picker warming the skin and passing a dull beaming-knife rapidly over the fur. When the skins are very stagy they are sometimes unhaired in part from the skin side. The roots of the hair penetrate the membrane farther than those of the fur, and when the skin is pared down thin the hairs may be pulled out by grasping the base of the roots.

The skins are next stretched and nailed on boards and dried very hard, the drying continuing from two to five days to remove every particle of moisture. On removal they present the appearance of thin, uneven boards with little curls of brown fur on one side; these may be cracked or split by a person walking on them almost as readily as though of wood.

When opportunity presents, the dried skins are dampened on the pelt side with fresh or salt water and skived or shaved on a beam with a currier's knife to a thin, even surface. Salt is used in the water to prevent the fur from coming loose, but too much salt "cuts" the leather, and its use is not desirable except in hot weather. Some dressers postpone this shaving until after the fur has been dyed, but others are so annoyed by the grease coming out of the thick membrane and interfering with the dyeing of the fur that they thin the pelt at this stage of the process. The pelts are stretched and partly dried, being "worked" in the meantime to prevent their drying stiff and hard.

The pelt side is then covered with butter or other animal grease, and the skins are softened or leathered by tramping them in tubs, with a quantity of fine or veneer hard-wood sawdust, or in a tramping machine built on the principle of a fulling mill (see p. 292). This leathering is continued until the grease is driven thoroughly into the pelt, requiring from two to four hours in either the tramping tub or the fulling machine. The skins are then cleaned free of grease by revolving them with a quantity of fine sawdust, and this is in turn removed in the beating drum, thus terminating the operation of dressing.

Next comes the dyeing process. All holes and defective spots are first mended. If the pelts have been already partly shaved, a sheet of

paper is pasted on the flesh side; but if the pelt has been left thick, as is commonly the case, the paper pasting is omitted. The fur is treated with an alkali solution, followed by an acid mordant, for the purpose of "killing" the surface. Each establishment has its own formula for making the dye, the secret of which is usually carefully guarded. Formerly the fur was frequently bleached to a golden hue by means of chloride of calcium or peroxide of hydrogen, or, as was the usual practice in the United States, by a brushing of aqua fortis, over which hot irons were immediately passed; but this color is no longer fashionable. In most establishments the dye for the ends of the fur consist of various combinations of copperas, alum, salt, litharge, antimony, copper dust, verdigris, red tartar or argol, and salmiac. The ground color is formed of combinations of logwood, hippuric, fustic, nutgall, and iron liquor, in varying proportions, according to the experience and fancies of the dyer.

The fur is prepared for coloring by the application of a lime solution. Then the surface coloring is applied with a large brush, the points of the fur being carefully covered to the required depth. After lying folded, with the points touching each other for 6 to 12 hours, the skins are hung up and dried. When dry this dye forms a thin layer or crust, which is broken and beaten out with rattan sticks. Other coats of dye are then successively applied, dried, and the crust removed until the desired effect is secured. For the light brown shade formerly popular, 18 or 20 coats of the dye were necessary; but for the very dark shade popular at present fewer coats of a much stronger dye are used, the usual number applied being 8 or 10. Some years ago a process of dyeing was introduced by which the fur was dipped into the dye, which in this case must be hot. Fewer coats were necessary and a more brilliant color was imparted, but the texture of the fur was injured to some extent by the hot liquid.

When the desired shade is reached for the top of the fur, four or five coats of the more delicate dye are successively brushed on heavily and tramped in, forming a base or ground color. In tramping this ground color in, two pelts are placed together on the floor with the fur sides against each other, and the dyer lightly treads on them for two or three minutes. The skins are thoroughly cleaned with sawdust and all superfluous dye removed. The pelt side is then moistened with water and shaved down to the required thinness, removing all superfluous flesh and leather and leaving the pelt clean and free from dye. The skins are revolved in a cleaning drum, with maple or other light-colored veneer sawdust for several hours, and on removal, and after being freed of sawdust, are ready for manufacture into garments.

While the foregoing is the general process, it is necessary to vary it for different skins, and successful dressing and dyeing require long experience and much judgment. Owing to the necessity for drying the skin a number of times in the dressing, and also after the applica-

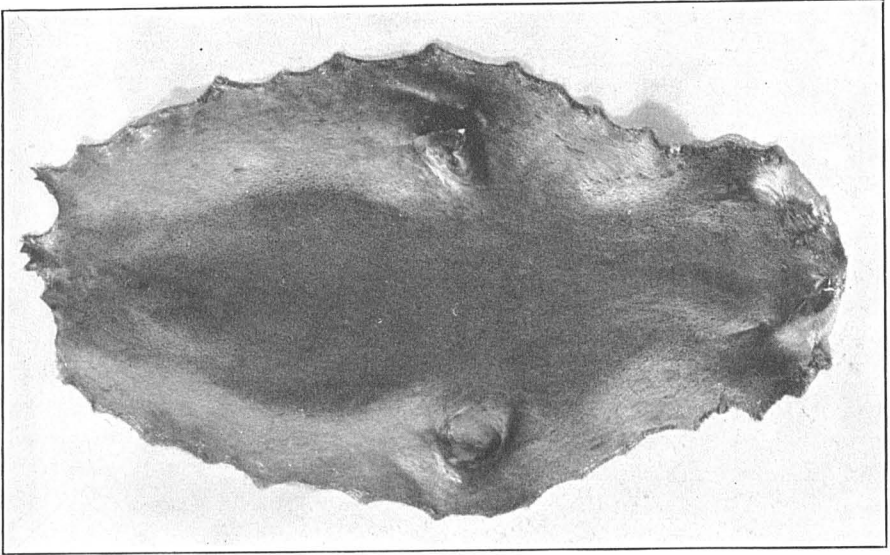


tion of each coat of dye, the length of time required for both operations is six to eight weeks. The expense of this work in London is about 14 shillings, while in New York, owing to the higher price for labor and materials, it is about \$5 for each skin.

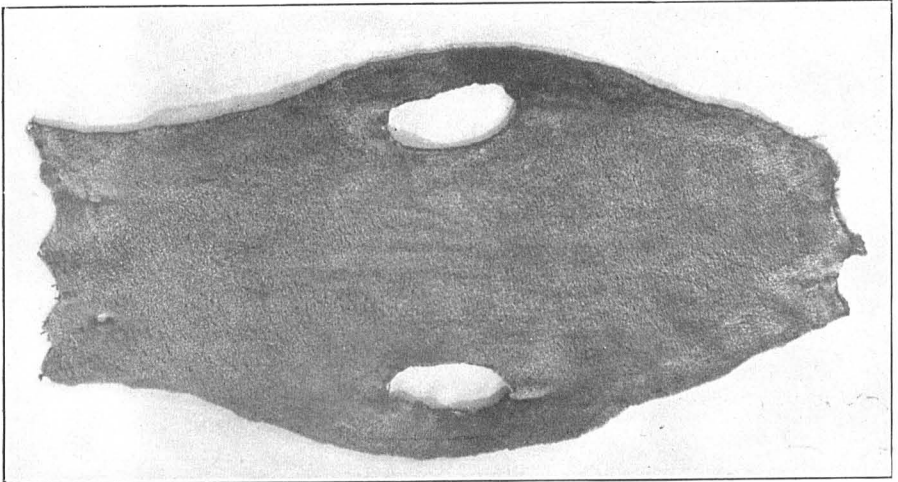
No matter how carefully the unhairing process is performed, a number of hairs are broken off near the surface of the fur, and there remain many of young growth and not yet above the surface, detracting from the beauty and softness of the fur, but adding thickness and durability, owing to the protection afforded. In the early history of fur-dressing in England and America these few hairs were left in, but when fur-seal increased in fashion it became important to have the fur as free from coarse hairs as possible. From 1870 to about 1882 the few hairs remaining after the process of depilation were removed commonly by hand labor, a slow and expensive process. Most fur-manufacturers employed girls to "pick" the skins. Blowing open the soft fur with her breath, the operator cut off the stiff, extended hairs with small shears, requiring one to five days for one person to complete a single skin.

Since 1883 most of this work has been done by complicated mechanism which accomplishes the work as effectually and far more expeditiously. In this process the skin is bent across the upper edge of a vertical board and the soft fur blown aside and divided by a thin, wide current of air from a bellows, when a pair of small knives descend and cut off the stiff, upright hairs. The knives are raised, the skin advanced the fraction of an inch, and the operation repeated until the entire surface is gone over, requiring about one hour to complete an average skin. This removal of the short hairs is invariably postponed until after the dressing and dyeing are completed.

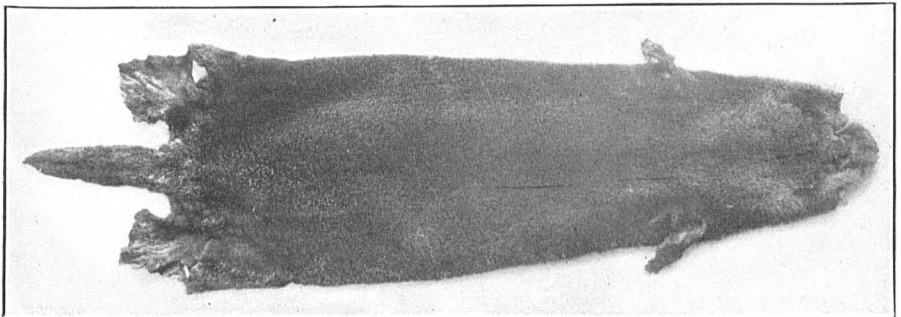
On the adoption of fur-seal as a fashionable material, about 1870, and the great increase in price which quickly ensued, many substitutes were introduced, and since then few furs have been so frequently imitated. These were prepared from numerous cheaper furs, as otter, beaver, nutria, muskrat, cony, and even sheep. The otter, beaver, and muskrat imitations were fairly successful, especially for the manufacture of caps, gloves, and trimmings. They were not satisfactory for cloaks, the membrane being too thick and too weak to trim down sufficiently thin. The garments looked well at first, but soon showed wear, especially at the seams, and the dye faded. A large market was developed on the continent of Europe, especially in Germany and Russia, for fur-seal imitation prepared from muskrat pelts, this cheap substitute greatly injuring the market for the genuine material. Owing to the general dissatisfaction resulting from their use, these imitations were gradually abandoned by reliable furriers, and with the exception of that made from the French cony or rabbit, and known as "electric seal," "coast seal," "China seal," "Canadian seal," etc., fur-seal is not frequently imitated at the present time, except, as before stated, for trimmings and small articles.



FUR-SEAL SKIN, DRESSED, NATURAL.



FUR-SEAL SKIN, PLUCKED, NATURAL.



SEA-OTTER SKIN, DRESSED, NATURAL.

## BEAVER FURS.

## DESCRIPTION OF BEAVER SKINS.

During the seventeenth and eighteenth centuries the beaver furnished the principal item in the fur trade of the world, but at present it is of somewhat minor commercial importance among the aquatic fur-bearing animals. The skins received by the wholesale dealers from various localities shows different characteristics of pelage. In winter, the color on the back and sides is generally dark bay or brownish black, tipped with chestnut or russet, and seal-brown on the under parts, legs, and feet. The prevailing color ranges toward the south to a yellowish tinge upon brown, and in the north approaching a glossy blackish brown. In general, the beavers obtained in cold latitudes are darker than those secured in warmer climates, but those from the northwestern part of the United States are very light in color. A few black beavers and still fewer spotted ones are obtained; also, at very rare intervals, a yellowish white or pure white one is taken. The Labrador beaver, now somewhat scarce, is superior to those caught farther west, while those of Canada in general, as well as of the northern parts of the United States, are superior to those taken in the Southern States.

The overhair of the beaver is from  $1\frac{1}{4}$  to  $2\frac{1}{2}$  inches in length, rather stiff, and of a dull color for two-thirds of its length from the base, and is terminated by shining points ranging in color from the most delicate brown to rich, glossy blackish-brown, giving the general color to the pelage. The underhair or fur is very thick, fine, and soft, from one-half to three-fourths of an inch long, and of a uniform bluish or brownish gray color from the roots to the tips. It is denser and shorter on the underparts than on the back. The fur becomes prime in October in the latitude of the northern boundary of the United States, and continues in good condition until May, when it begins to deteriorate. The pelts are marketable, however, till about June 15, although they are somewhat thin, light in weight, and of less value.

## THE MARKETS FOR BEAVER SKINS.

The economic use of beaver pelts antedates the discovery of America. As far back as the Middle Ages, at least, beaver skins were used as clothing by primitive people in Europe. Their principal use, however, was as furnishing material for fashionable hats for men. Beaver hats were worn as early as the twelfth century, but their popularity was not permanently established until the sixteenth century, and then for more than two hundred years the beaver supplied the fashionable world with hat material. As the business increased, it resulted in the slaughter of hundreds of thousands of the animals, the market consumption in certain years approximating 400,000 skins, practically all of which were obtained from Canada and the United States. So extensive and regular was the beaver trade that in the

eighteenth and the early part of the nineteenth century the skins were accepted as currency throughout the western part of Canada and the United States and were the standard for bartering with Indians.

It was not long before the market demands outran the resources of nature and the beaver was in danger of extermination. The price of the skins increased correspondingly, selling at times for \$8 or \$10 per pound, and the finished hat for \$20 or more. At length the supply of the fur became so inadequate that other materials were necessarily substituted, resulting about 1839 in the general adoption of the silk hat by the fashionable world.

The demand from manufacturers of hats diminishing, the price of beaver pelts fell so low that the hunt proved unprofitable. Later a demand developed for the skins in the dressed-fur trade, and the price became steady at about \$2 or \$3 each. This fur became fashionable about twenty years ago, and the indications are that it will be in favor for many years. Small quantities, partly damaged in the curing, are yet used by the hatters, but its employment is mainly as dressed fur for caps, mufflers, gloves, trimmings, etc. Sometimes entire garments are made of it, but its weight makes it objectionable for that purpose. The darker pelts are usually purchased for the European and Canadian markets, while the medium and paler shades are worked up for consumption in this country.

The greater portion of the beaver skins taken on the American continent during the last 200 years have been handled at the London auction sales. The first sale occurred on January 24, 1672, and was an event of much importance. From that time to the present the total number of skins handled in London approximates 30,000,000 with a total valuation of \$100,000,000. The average annual sales at present approximate 50,000 in number.

In addition to those handled in London, about 20,000 beaver skins are now marketed each year, being sold at Leipsic and at private sale in the United States and Canada. This makes a total of about 70,000 skins marketed annually in recent years, of which about 10,000 are obtained in the United States and 60,000 in the Dominion of Canada.

In the markets, beaver skins are classed not only according to the general localities whence they are obtained, but also according to their size and the quality of the fur. In assorting them four grades are recognized. Those of the first grade have a flesh-colored pelt, which appears fresh and sound, and with long heavy fur, which separates down to the membrane when blown into and appears uniformly even, fine, and silky. The seconds are almost clear in the pelt and the fur only slightly scant or poor. In the thirds the fur is thin, scant and poor, and the pelt dark. Fourths are of the poorest quality, with pelt almost black or bluish-green color, and the fur short and thin. Each of these grades is divided according to size, the large, medium, small, and kits. The prices range from \$1.25 for the poorest to \$10, \$12,

and even \$16 for those of choicest grade, averaging somewhat less than \$6 per skin.

Fifteen years ago large quantities of beaver fur were used in this country, and as much as 65 per cent of that sold in London was purchased for the United States trade. At that time long garments were fashionable, and plucked and dyed beaver was much in demand for trimmings. During recent years, however, beaver fur has been largely out of fashion in the United States and Canada, and consequently the consumption in these countries has not been extensive.

#### DRESSING AND FINISHING BEAVER SKINS.

On arrival in the markets beaver skins are rough and greasy, with the fine rich fur almost concealed by the coarse brownish hair. In the process of dressing, the skins are first soaked in water over night. The following day each one is placed, flesh side up, on a flat, hard-wood beam, and with a breaking knife a workman breaks up the grain of the pelt, thus softening it. The pelts are washed with warm water and soap, and then prepared for plucking. The water is removed by passing them through either an ordinary roller wringer or a centrifugal wringer, or, in some houses, by pressing them with the breaking knife. The hair side is dried and warmed by artificial heat, care being taken to keep the pelt side damp; chalk is sprinkled over the surface, and the hair is removed in the general manner described on page 291. A very small percentage of beaver skins, probably not more than 1 per cent, are left "in the hair"—that is, the overhair is not removed. Only a small demand exists for natural beaver, however, owing to its rough and coarse appearance.

Formerly it was customary to shear beaver skins, instead of plucking them, and many are yet prepared in that manner on the continent of Europe. In this case it is unnecessary to moisten the pelt preparatory to plucking; but, placing the skin, flesh side down, on a beam and using a comb and shears, a workman clips off the greater part of the long hairs in much the same way as a barber operates. Beaver thus prepared bears some resemblance to sea-otter fur, especially when very dark pelts are used, and sheared beaver is often used in imitation of that costly fur. The imitation is greatly enhanced when the overhairs are whitened by means of an acid.

After plucking, the pelt is shaved with a skiving knife, as described on page 291, for the purpose of reducing its bulk preparatory to leathering. The pelt side is then dampened with cold salt water and allowed to so remain over night. The following morning it is stretched lengthways and crossways and partly dried. Butter or other animal grease is rubbed on the pelt side, and a number of skins placed in a fulling or tramping machine in which two hammers push or beat and turn them for eight or ten hours. The skins are then placed with a quantity of hard-wood veneer sawdust in a large drum, over either gentle charcoal fire or steam heat, and revolved for three

or four hours. Next they are placed with sawdust in tubs, where they are tramped by barefooted workmen for about three hours, each tub containing about twenty skins.

On removal from the tramping tubs the pelts are thoroughly stretched by hand, and the leather side dampened over night preparatory to shaving on the following day. Shaving is the most difficult feature and is intrusted only to skilled workmen. Each skin is placed, fur down, on a perfectly smooth hard-wood beam, similar to that used in skiving, and by means of a skiving knife the operator shaves off the membrane of the pelt until the roots of the fur are almost visible.

The skins are again stretched lengthways and crossways by hand, dried, and for the second time placed in the tramping tubs with hard-wood sawdust for further softening and leathering. After two or three hours' tramping they are removed, straightened or stretched out, and returned for two or three hours further tramping. They are next thoroughly beaten with bamboo sticks to remove the sawdust, and then combed with a fine steel comb to lighten up the fur. The skins are then placed on a beam and by means of a large flat-bladed knife, sharp as a razor, a workman shaves over the top surface of the fur, removing all scattering hairs and impurities, thus completing the dressing process.

While it is not customary to dye beaver fur, many light skins are blended to a darker shade, and a few are dyed in much the same manner as fur-seal. Some few skins are bleached golden brown, and a smaller number to a creamy white. Some are silvered by passing lightly over them a solution of sulphuric acid, and some are made a golden yellow by means of peroxide of hydrogen.

About twenty years ago many beaver skins were "pointed," the plain solid color being ornamented by inserting white hairs at irregular intervals, in imitation of the pelage of the sea-otter or the silver fox. The hairs were generally sewed in the pelt by wig-makers, but in some cases they were firmly fastened with cement. Badger hairs were most frequently employed, but white hairs of the gray fox, cony, and skunk were also used. On account of its varied white tips, the hair of the Egyptian ichneumon was also in great demand, being superior to the hair of the fox, or even the badger. Some skins were likewise ornamented with the white tips of small feathers taken from the breast of the grebe and less frequently of the peacock. This ornamentation was quite fashionable from 1881 to 1884.

Beaver fur is especially serviceable for making hats because of its remarkable felting characteristics and its durability and glossiness. So strong are its felting properties that coats made from cloth of this material, manufactured solely by the felting process, have been known to wear for years, and it is claimed that in former times beaver fur was sometimes felted for hosiery purposes. While it is the most desirable of all furs for hat-making, its high cost prevents its general

use for that purpose. Practically the only beaver fur now received by the hatters is the blown fur obtained from manufacturers' clippings and that cut from skins damaged in curing or otherwise, as has been already noted in the chapter on hatters' furs. But even in using fur from these sources, a light hat made from beaver can not be purchased for less than about \$10, and the price is likely to be \$15 or more.

### MUSKRAT FURS.

#### DESCRIPTION AND CHARACTERISTICS OF FUR.

The fur of the muskrat is dense and soft, somewhat like that of the beaver, but is shorter and inferior in denseness, fineness, and durability. The color is generally drab blue, in some cases with a whitish appearance, and tipped with reddish brown. The fur of the small muskrat found in Alaska is of a light silvery color, almost white on the abdomen, and very fine, the pelts from that locality being highly prized when beaver hats were in fashion. The fur is concealed by long, stiff, brown overhairs on the upper surface and sides of the body. The general color of the animal is dark umber brown, almost blackish brown on the back and gray below, but specimens are found ranging through the various shades of brown, blue, and yellow to pure white.

In the Chesapeake and Delaware regions and, to a less extent, in other parts of America, in addition to those of the usual coloring, some individuals are very dark, so nearly black, in fact, that they are designated "black muskrats" in the trade. These are of superior quality and value. In some specimens, especially among those found in certain regions of Canada, the chest and abdomen is of a chestnut brown and in others almost white, but the latter are by no means common. Pure white muskrats are occasionally found, but they are of no more value in the trade than those of the ordinary coloring, although highly prized by collectors of natural-history specimens. As is the case with most aquatic mammals, the skins of those occurring in southern localities are thicker and more spongy than those in the colder latitudes. Muskrat fur is inexpensive, the skins selling usually for 10 to 20 cents each; however, under the skill of the fur-dresser and the dyer, it assumes a high rôle in the form of imitations of more costly furs; in retail stores it is found prepared in so many different ways and with such a variety of finish as to be scarcely recognizable to the most expert trappers who are familiar with the raw skins only.

#### PRODUCT OF MUSKRATS AND THE MARKETS THEREFOR.

While the annual product of muskrats is at present very large, this extent is of comparatively recent development. During the eighteenth century the annual yield was relatively small and the fur was little prized. Many farmer boys found it convenient to set a few traps, using some of the skins for making caps, gloves, etc., and sending the rest to the market. The average quantity received on the market

throughout that century probably did not exceed 100,000 skins annually, although on three or four occasions the annual receipts at London exceeded 200,000, but in other years they amounted to only 25,000 or 30,000. During the second and third decades of the nineteenth century the output increased considerably, principally on account of the greatly increased market value and the opening up of new trapping territory. In 1829, for the first time, the London receipts exceeded 1,000,000 skins, the total being 1,165,663. The annual receipts thereafter fluctuated greatly, but on the whole continued to increase, exceeding 2,000,000 in 1862, 3,000,000 in 1867, and 4,000,000 in 1871. Since the year last named, the price of the skins has greatly decreased, but the receipts at London have been fairly constant, averaging about 3,500,000 annually.

In addition to those handled at the London sales, about 2,000,000 muskrat skins are placed on the markets each year. Of these, 1,500,000 pass through Leipsic, and 500,000 are sold to the furriers of the United States and Canada without passing through the two large market centers. This makes an aggregate of over 5,000,000 skins annually, of which nearly one-fourth are obtained from the Dominion of Canada and the remainder are caught in the United States. The total product of muskrat skins in the United States and Canada during the nineteenth century reaches the enormous amount of 250,000,000 in number, sufficient to make a blanket covering nearly 4,000 acres.

Formerly the fur of the muskrat was used largely as a substitute for that of beaver in hat-making, forming a cheap and fairly satisfactory imitation. Owing to its scarcity it was then of much greater value than at present, selling for 40 or 50 cents per skin, even equaling the value of the mink at times. The general adoption of the silk hat resulted in a great decrease in the demand, and the price fell as low as 6 or 7 cents per skin, and trapping then was of little profit. During the last sixty years muskrat has been used principally as dressed fur, prepared in imitation of the more highly prized beaver, otter, and fur-seal. It is about the best of all the cheap furs.

In the market muskrat skins are classed as "firsts," "seconds," "thirds," "fourths," and "kittens." The firsts are those caught during the spring or very late winter; seconds are caught in mid-winter; thirds, those taken in very early winter or fall; fourths, in early winter or fall, and are poor and small; and kittens are those less than 3 or 4 months old. The value of the skins varies from 5 to 40 cents each, according to color and condition. Those from the Chesapeake average about 14 cents each for brown and 25 cents for black. The black pelts are marketed principally in Russia, where they are used for coat linings, but many are used in England, France, and America for cloaks, trimmings, and gloves. The price of the No. 1 black skins at the last London sales averaged 1*s.* 3*d.*; in 1891 it was about 1*s.* 7*d.*, while in 1875 it was over 3*s.* The lighter skins fetch about 7*d.* each.



## DRESSING MUSKRAT SKINS.

At the fur-dresser's, muskrat skins are first dampened on the pelt or flesh side with salt water and permitted to so remain over night, for the purpose of softening. The following morning the skins are placed in a tramping machine, where they are fulled or tramped for eight or ten hours. Formerly the tubbing process was used, but the tramping machine is much more economical and is now employed for these skins by nearly all dressers. In tubbing, a good operator can work 100 muskrat pelts in a day, whereas a tramping machine can work 2,000 in the same length of time.

The pelts are next covered with a mixture or paste of sawdust and salt water and so remain over night. The water is used to keep the pelt soft, the salt to prevent the hair from falling out in the heating, and the sawdust to hold the moisture. The following morning the skins are cut open down the front, provided they are cased, as is the general rule, and are then fleshed, in the manner described on page 292, one man being able to flesh 200 to 300 per day. They are now stretched lengthways and crossways and hung up to dry. When thoroughly dry, in the leather as well as in the hair, they are again moistened with salt water on the leather side, remaining thus over night. They are next brushed on the leather side with animal fat, such as butter or fish oil and tallow, most of the grease being placed in the center, and the skins laid in pairs with the hair side out. After remaining thus over night, they are placed in tramping machines and worked constantly for 6 or 8 hours or until thoroughly soft and pliable. On removal from the tramping machines the skins are stretched in every direction.

At this stage the fur has a dirty, greasy and uninviting appearance, the grease and sawdust having worked into it during the preceding operations. The skins are placed in quantities of 300 or 400 with sawdust in revolving cleaning drums; where, exposed to steam heat or charcoal fire, they are revolved for about three hours, the sawdust by that time having completely absorbed the grease, leaving the fur clean and soft. They are next inclosed in a beating drum, previously described (see pp. 293), where they are revolved for two or three hours. On removal they are beaten with rattans and the fur cleaned with a comb. The pelt of many muskrats is quite thick, and these are selected out at this stage of the process and fleshed down, thus completing the operation of dressing with the exception of plucking.

Plucking is performed the same as in case of beaver pelts, except that it is done after the pelt has been dressed rather than before; after plucking, the fur is again cleaned and the process is ended. Twenty years ago 85 per cent of the muskrats were plucked, but at present the conditions are reversed and only a very small percentage are so treated. Indeed, on one occasion the writer spent nearly two hours

among the furriers of New York in fruitless quest of a plucked muskrat skin, visiting eight or ten of the principal establishments, and finally was obliged to have one specially plucked for his use.

For the home-dressing of a small quantity of muskrat skins the following has been recommended: After washing them in warm water, all fatty and fleshy matter is carefully removed. In a liquor composed of 10 gallons of cold soft water, 8 quarts of wheat bran,  $\frac{1}{2}$  pint of old soft soap, 1 ounce of borax, and 1 pound of salt, the skins are soaked eight or ten hours if they are fresh, or until very soft in case they have been previously dried. The salt should be omitted from the solution if the skins have already been salted, and the addition of 2 ounces of sulphuric acid to the solution will prepare them in about one-half the time. The skins should then be soaked in a liquor made of 10 gallons of warm soft water,  $\frac{1}{2}$  bushel bran, and  $2\frac{1}{2}$  pounds sulphuric acid. The bran should be stirred in the water until thoroughly mixed, and then left to stand in a warm room until it ferments, when the sulphuric acid is added by degrees and with constant stirring. After soaking in this liquor for about four hours, the skins are removed and rubbed with a fleshing knife and then over a smooth beam until dry.

Muskrat fur is used more extensively in Europe than in America, the Russians and Germans being especially large consumers. It is employed in making gloves, collars, capes, muffs, trimmings, linings, etc., and is made up either natural, plucked, plucked and pointed, or plucked and dyed black or various shades of brown. Large quantities are used as linings for overcoats and long wraps, from forty to sixty being necessary for each garment. Sometimes the under parts are used separately for this purpose, the natural bluish-white color being quite effective. The skins of young animals are especially suited for linings. The unplucked skins are frequently dyed to imitate mink, and sold as Alaska mink, water mink, or black mink.

Two or three decades ago quantities of muskrat skins were plucked and dyed to imitate fur-seal, the resulting article readily deceiving the uninitiated. While the fur is soft and short, it is not as thick as that of the fur-seal, and the leather is much heavier and not sufficiently strong to permit its being scraped to a suitable thinness. After a few weeks' wear the fur becomes matted down, being less elastic than seal fur. During the eighties the use of muskrat for this purpose was extensive, especially in Europe, thus providing a large market for this abundant and easily procured fur. It injured the popularity of fur-seal, persons hesitating about paying \$200 for a garment when a fairly good imitation was obtainable for one-fifth of that amount. The imitation, however, was generally unsatisfactory to the trade, and on the introduction of "electric seal," made from the cony, the use of muskrat pelts for this purpose was generally abandoned, except for small articles, as gloves, caps, etc.

## FUR OF THE COYPU OR NUTRIA.

Somewhat similar to the beaver and the muskrat is the coypu, sometimes called the South American beaver. In the fur trade it is known exclusively as nutria, from the Spanish *nutria*, the otter, owing to the similitude of its fur to that of the otter. It inhabits the river banks and low lands of South America, and is most numerous in the vicinity of Rio de la Plata. The hunting season is from May to October, and after the pelts have been cured by drying they are sold to traders, who bale and ship them to Hamburg, London, and New York.

Nutria fur is short and silky, and except on the back is quite thick, being choicest underneath the body. Its similarity to beaver fur is noticeable, differing principally in being much shorter and less brilliant. The overhairs are bristly, from 1 to 3 inches in length, and of a brownish-yellow color. This fur was introduced in commerce about 1810, as a substitute for that of beaver in hat-making. After the silk hat came into fashion, nutria was gradually adopted as a dressed fur and, as in case of muskrat, largely in imitation of beaver, otter, and fur-seal. Probably one-third of the output is yet consumed in hat-making, being used for choice grades of soft hats.

The product fluctuates considerably, but is always large. Two or three generations ago five or six million skins were sometimes shipped from South America in a single season, and over 5,000,000 have been received at New York in one year. Owing to imperfect curing, or improper storage afterwards, many of the pelts arrived in faulty condition and were suitable for little other than glue manufacture. The abundance of the animals was greatly reduced, and at the same time, owing to conditions in the hat trade, the value of the fur decreased, so that the output shrank from 6,000,000 pelts annually to about one-tenth of that number. But during the last two or three years the output has been much greater, amounting in 1900 to somewhat less than 2,000,000 skins, obtained principally from the valley of Rio de la Plata. It is estimated that about 75 per cent of the product is used in the United States. Owing to the varying supply, the price has fluctuated considerably, ranging from \$4 to 30 cents per pound. The skins are usually sold by weight, one of fair size weighing 6 or 8 ounces.

The dressing is quite similar to that of beaver skins, the principal difference being that the pelt of the nutria is not "broken" (see p. 291), the overhairs are pulled out by the picking knife instead of with the beaming knife, the pelt is fleshed instead of being shaved, and it is oiled after fleshing instead of before. These differences in treatment are due principally to the greater thinness and weakness of the pelt. In dressing, the nutria skins are soaked in water overnight and washed thoroughly in warm soap water until the membrane is perfectly clean. The water is then removed and the skins prepared for plucking by drying the fur and overhair, at the same time keep-

ing the pelt moist. The overhairs are removed principally by hand, the workman pulling them out by grasping them between a dull knife of soft metal and his thumb, protected by a rubber cot. Practically all nutria skins are plucked, it being difficult to find a single dressed unplucked skin in New York.

If convenient, the pelts are soaked again overnight in cold water, and then fleshed by drawing each one successively across the edge of a large vertical knife (see p. 292). After fleshing, the skin is brushed on the pelt side with strong salt water, and after remaining in that condition over night, it is treated in much the same manner as a beaver skin. It is moistened on the flesh side with some animal grease, preferably butter, worked in the tramping machine or the tramping tub, the grease removed by revolving in a drum with sawdust, and the skin freed from sawdust in a cleaning drum. It then goes to the picker, who places it upon a beam and skims over the surface of the fur with a large flat-bladed knife having a razor-like edge, removing the remaining hairs, thus completing the process.

Nutria fur, natural, plucked, or plucked and dyed, is used for all the purposes of beaver fur, and the choicest can be distinguished from the latter only by experts, being nearly as fine and durable. It is used principally as a dressed fur, the overhairs being removed and the fur dyed dark brown, affording one of the best imitations of fur-seal for small articles. It is also dyed various other shades of brown, and occasionally is silvered with acid as in case of beaver furs.

#### OTTER FURS.

##### CHARACTERISTICS OF PELAGE.

The fur of the otter is short, abundant, and of fine quality. It is slightly waved and silky and is similar in appearance to that of the beaver, but is somewhat shorter and more delicate and glossy. The fur on the stout tail is of the same character as that on the body, but not so long. That on the body is of a whitish-gray color for two-thirds of its length from the base, rich brown at the tips, and is interspersed with stiff, thick overhairs similarly colored. The general color of the overhairs is brown above and a little whiter beneath, with chin and throat whitish. The shade of brown varies according to the locality in which the animal lives; in eastern Maine this is almost black; in Canada, Nova Scotia, and Labrador it is dark brown; in Alaska and British Columbia the animal is light brown. The fur on the throat, under parts, and inner surface of the legs is usually of various shades of brown. White or albino skins are occasionally secured, and silvery, grizzly, mottled, and slate-colored are met with at times.

##### TRADE IN OTTER SKINS.

The early trade in otter skins in America, although never so extensive, was almost contemporaneous in its development with the trade in beaver furs. In the operations of the early fur-traders in the pres-

ent limits of the United States many otters were obtained. It appears, however, that the capture of these was merely incidental to the taking of beaver. Indeed, during the first hundred years of the exploitation of America the beaver was almost the only fur-bearing animal whose capture was a special object of industry. Later, however, with the increase in value of the pelts, the otter became an object of special pursuit, and by 1777 the industry reached an extent from which it has varied little up to the present time.

It is quite remarkable that the number of otter skins which are handled annually at the London sales should have fluctuated so little during the last 140 years. From 1763 to 1900 the annual quantity exceeded 30,000 only twice, and it fell short of 8,000 the same number of times, and the average by decades is nearly the same throughout the last 120 years.

With the exception of the nutria, a smaller proportion of the total product of otter skins are now handled at the London sales than in case of any other aquatic fur, only about one-third of the American product being sold there. The others are sold at Leipsic or directly to the furriers of the United States and Canada. The best local markets for otters are in Russia and Greece, where the fur is much used for caps, collars, and trimmings.

Out of a total of 7,865 otter skins sold in London in March, 1901, 3,293 were No. 1; 2,498 were No. 2; 1,318 were No. 3, and 756 were cubs. The No. 1 averaged in value 28*s.* 6*d.*; the No. 2, 20*s.* 6*d.*; the No. 3, 12*s.* 1*d.*, and the cubs 5*s.* 6*d.* per skin. These prices were somewhat less than the average in 1900. The highest price secured at the 1901 sale was 115*s.* each for a lot of 42 skins, while the lowest price was 3*s.* each for a lot of cubs, and also for a number of part pale No. 3. Exclusive of the cubs, those of a brown color numbered 269, while 301 were partly brown, 693 pale, 1,691 partly pale, and the remaining 4,155 of the distinctive dark otter color.

#### DRESSING OTTER SKINS.

When received at the fur-dresser's, otter skins are almost invariably cased, and are first cut open longitudinally down the chest and abdomen. The pelt is soaked in salt water over night for the purpose of softening it and preparing it for "breaking." The following morning each skin is placed on a beam, and a workman proceeds to break up the grain of the membrane by the process described on page 291. The pelt is now washed in warm soap water and the water removed, as in case of beaver skins. (See p. 311.) If the overhairs are to be plucked, that is done next. The choicest skins are left "in the hair," the number amounting to about a third of the total quantity dressed. The plucking is done in the manner described on page 291.

The pelt, which has become less bulky and quite soft from frequent handling, is now placed on a beam and skived in the general manner

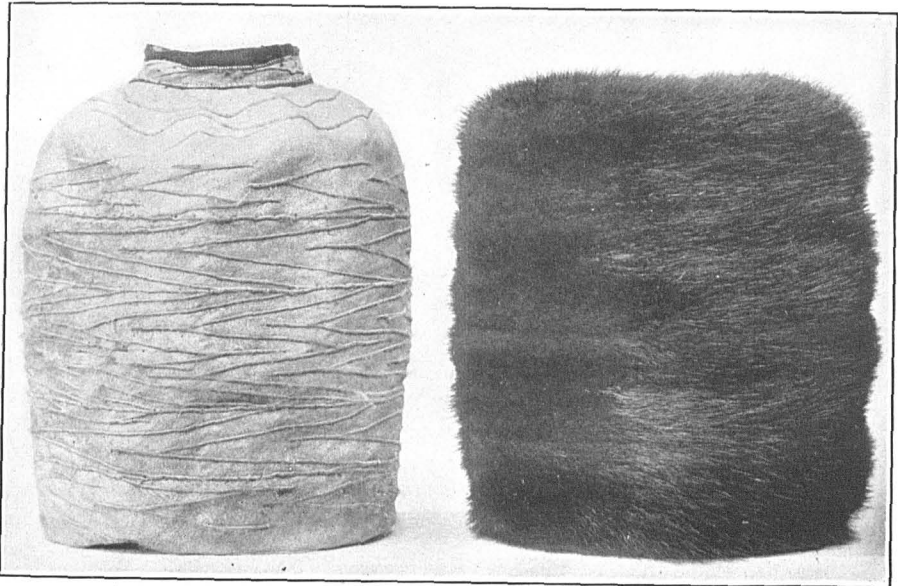
further described on page 291. It is next dampened with cold salt water and allowed to thus remain over night. The next morning it is stretched lengthways and crossways and partly dried, when it is ready for the leathering process. It is well rubbed with butter, or some other animal grease, and placed with others in a tramping machine, where it is worked for hours. On removal the skins are revolved for three or four hours with a quantity of hard-wood sawdust in a cleaning drum, under which there is steam heat or a charcoal fire. Next they are placed in tubs with a quantity of sawdust, where they are tramped for about three hours by barefooted workmen and on removal are thoroughly stretched. The leather side of the pelts is dampened over night and then shaved down to a uniform thickness as in case of beaver skins. (See p. 311.) A skillful workman can shave 30 or 40 otter pelts in a day. The skins are then stretched, dried, and placed for a second time in tubs with hard-wood sawdust and tramped for two or three hours, then removed, stretched again, and returned for two or three hours' further tramping, and then the fur is straightened out with a fine steel comb. The skins now receive a thorough beating with rattans to remove every vestige of sawdust and to lighten up the fur. If they have been unhaired, they go to the workman who removes all scattering hairs by means of a broad-bladed knife.

The methods of dressing otter furs have been greatly improved in this country in recent years, and the reputation of American workmen in this particular is preeminent. Otter skins having coarse overhairs are greatly improved in appearance by plucking, as the fur is extremely soft and dense. When plucked, the fur is used either natural or dyed various shades of brown. A few skins are clipped. This fur is very durable, the leather being strong and fine-grained. In the natural state choice otter makes rich trimmings for seal sacques; and the plucked fur, both plain and dyed, is used for caps, gloves, capes, and garments. The skins are also used for coat collars and storm coats, more especially in Europe. In Scotland many are used in making the characteristic sporrans.

During recent years otter has been extensively dyed in imitation of the fashionable fur-seal, being cheaper than the latter, and when carefully and newly prepared can be distinguished only by experts. The price of good otter skins and the cost of dyeing the same is so great that these dyed skins have cost nearly as much as fur-seal. This has retarded their popularity, but with the advancing price of fur-seal dyed otter will doubtless find a larger market. In appearance it is the equal of seal skin and its wearing qualities are excellent. It is desirable to dye otter skins while in the raw state, as the grease prevents the dye from penetrating and injuring the leather, which would be weakened if the dye were applied after the skin had been dressed. Only the heavy-furred skins are selected for this purpose.



NUTRIA SKIN, DRESSED, NATURAL.



MUFF OF MINK SKIN, SHOWING METHOD OF SEWING AND PIECING.

## SEA-OTTER FURS.

The sea-otter yields the most valuable of all aquatic furs. The skins are of the greatest value in the third or fourth year of age, when the overhairs are scanty, exceedingly fine, and extend but little beyond the fur, which is unusually dense, fine, and silky. There appears to be little difference in the quality of the pelage at different seasons of the year. The glossy, durable fur is about three-fourths of an inch in length all over the body, except that on the feet, head, and tail it is rather shorter, finer, and with fewer overhairs. The under portion of the back, the nose, and the upper lip are the only naked parts.

The color of the pelt varies considerably, the predominant shade being lustrous brown brightened with silvery overhairs. Some pelts are a deep brown or a brownish black, and are known in the trade as "black." Others are brown, with a tendency toward bluish green or dark-plum color, and are known as "dark." The fur is in all cases lighter on the abdomen than on the back. The hair on the head is lighter in color, and is light brown in the brown variety, but in the black animals it is almost completely white, the effect of the large number of white overhairs. The skins from British Columbia, Washington, and Oregon are frequently of a yellowish-brown hue, and albino skins have been taken rarely.

The choicest sea-otters have dense, brownish-black fur of silky, shimmering gloss and extreme fineness, exhibiting a silver color when blown open and with a reasonable number of white hairs regularly distributed, too many white hairs depreciating the value of the pelt. The skin of the male is usually more valuable than that of the female, being more brilliant and velvety in appearance. After they pass the age of perfection the fur becomes a dingy brown.

The skin is remarkably loose, like that on the neck of a young dog, and 12 inches or more of slack may be gathered in the hands from most parts of the body, the pelt of an individual 3 feet long readily stretching to 5 feet. A full-grown prime skin, which has been stretched before curing, is about 6 feet long and 24 to 30 inches wide.

The sea-otter belongs exclusively to the shores of the North Pacific Ocean and the adjacent seas, its range extending from Bering Sea southward to Japan on the Asiatic coast and possibly to Mexico on the American coast. It was formerly quite abundant throughout that region, but its numbers have been so reduced by excessive hunting that it is now very rare and in great danger of extermination.

The territory within which sea-otters are at present taken extends along the American coast from the Aleutian Islands southward to Washington, and on the Asiatic coast from Kamchatka to Japan. In most of that region, however, the catch is exceedingly limited, the annual product on the entire coast of the United States, exclusive of Alaska, for instance, not exceeding one dozen. The bulk of the catch is obtained now, as 100 years ago, among the islands of southeast Alaska.



The total product of sea-otter skins, obtained from the North Pacific since the development of the hunt, about two hundred years ago, approximates 700,000, made up as follows:

By whom obtained.	Number of skins.
Russian traders, previous to 1797	130,000
Russian American Co., 1798-1807	160,000
Miscellaneous traders, 1795-1828	250,000
Miscellaneous traders, 1829-1867	15,000
Miscellaneous traders, 1868-1900	145,000

Assuming that these skins cost the consumers an average of \$150 each, we have a total of \$105,000,000 expended for sea-otter furs, of which doubtless over 95 per cent came from residents of China and of Russia, and probably more than 80 per cent from the Chinese alone. A single skin has sold for \$1,400, and though that is a fancy price, \$700 or \$800 is not unusual. The value is determined by the size, richness of color and texture, and the depth of the blackish hue studed with a suitable number of silvery hairs. The market value has varied somewhat from year to year, but has been high ever since the origin of the traffic in these furs. At the time of Cook's celebrated voyage to the North Pacific in 1778, the price of a prime skin was about \$120 in China. In 1802, when the largest collection was made—25,000 skins—the average price of large and small at Canton was about \$50 each. In 1840 prime skins sold readily for \$150 each out of the vessel. The average price of all skins at the London sales in 1888 was £21 10s.; in 1889, £33; and in 1891, £57; but the first-quality skins fetched much higher prices. At present, pelts average in value £65 each, including cubs as well as prime skins, while choice specimens readily fetch £200 each.

Seldom do the choicest sea-otter skins enter into the retail trade in America or England; and although the greater part of them are caught within the limits of the United States, it might be difficult at times to find a dozen skins in all the fur stores of the country. This fur has ever been held in high estimation by the Russians and Chinese, but the great cost limits its use to the wealthy classes exclusively. It is the royal fur of China, being worn by officers of State, mandarins, and other persons of importance in the Celestial Kingdom. In Russia it is used principally for the collars of overcoats. Sea-otter fur is also used for making muffs and for bordering fine garments made of textile fabrics or of other costly furs. Owing to its great weight as well as cost, entire wraps are rarely made of it.

While many sea-otter skins are marketed in Asia and Russia, probably 80 per cent of them pass through the London auction sales held in March of each year. The large decrease in the abundance of these animals is well illustrated by the decreasing numbers offered at those sales, the quantity sold at present being little more than 10 per cent of what it was twenty years ago.

The following shows the quantity offered at those sales during each of the last thirty years:

Year.	No. of skins.	Year.	No. of skins.	Year.	No. of skins.
1871.....	3,824	1881.....	5,647	1891.....	2,329
1872.....	4,307	1882.....	5,657	1892.....	1,368
1873.....	5,095	1883.....	5,680	1893.....	1,788
1874.....	4,920	1884.....	5,038	1894.....	1,533
1875.....	4,564	1885.....	4,908	1895.....	1,221
1876.....	5,059	1886.....	4,804	1896.....	1,550
1877.....	5,420	1887.....	4,413	1897.....	1,201
1878.....	5,258	1888.....	4,352	1898.....	955
1879.....	5,176	1889.....	3,511	1899.....	760
1880.....	5,583	1890.....	2,713	1900.....	584

The sales of Messrs. C. M. Lampson & Co., London, for March, 1901, included 409 sea-otter skins,<sup>a</sup> of which 145 were large black skins, which sold at prices ranging from £52 to £280 each, or a total of £12,585 for the 145. The next largest class was a total of 118 large dark skins, varying in price from £48 to £125 each, or a total of £7,640. Only 14 brown skins were offered at that sale, of which 13 were large and 1 was of medium size. Out of the total of 409 skins, there were 276 large ones, the others consisting of 96 medium, 25 small, 1 extra small, and 11 cubs. The average value of the large skins of all classes was £75 6s. 7d.; of the medium size, £50 8s. 10d.; of the small size, £35 6s. 5d.; of the extra small, £12; and of the cubs, £2 1s. 10d. Four very small cubs sold for 10 shillings each. While it is extremely gratifying that the large skins formed so high a percentage of the total number, yet it is to be regretted that there were any small skins whatever, and the taking of cubs was wanton destruction of valuable resources. The prices realized in 1901 were practically the same as in 1900, when 584 sea-otter skins were offered.

The following summary shows for each grade of skins at Messrs. C. M. Lampson & Co. March, 1901, sale, the number sold, minimum and maximum prices, total selling value, and average selling value:

Designation.	No. of skins.	Minimum price.	Maximum price.	Total value.	Average value.
Large, black.....	145	£52	£280	£12,585	£86.79
dark.....	118	48	125	7,640	64.75
brown.....	13	38	68	570	43.85
Medium, black.....	43	40	75	2,258	52.51
dark.....	52	32	70	2,549	49.02
brown.....	1	36	36	36	36.00
Small, black.....	11	32	42	393	35.73
dark.....	14	30	40	490	35.00
Extra small, dark.....	1	12	12	12	12.00
Cubs.....	11	†	3	23	2.09
Total.....	409			26,556	64.93

#### DRESSING SEA-OTTER SKINS.

The sea-otter should be skinned as soon as practicable after killing, and if caught far from the shore or from the vessel it should be laid out smoothly in the bottom of the boat and covered over with seaweed

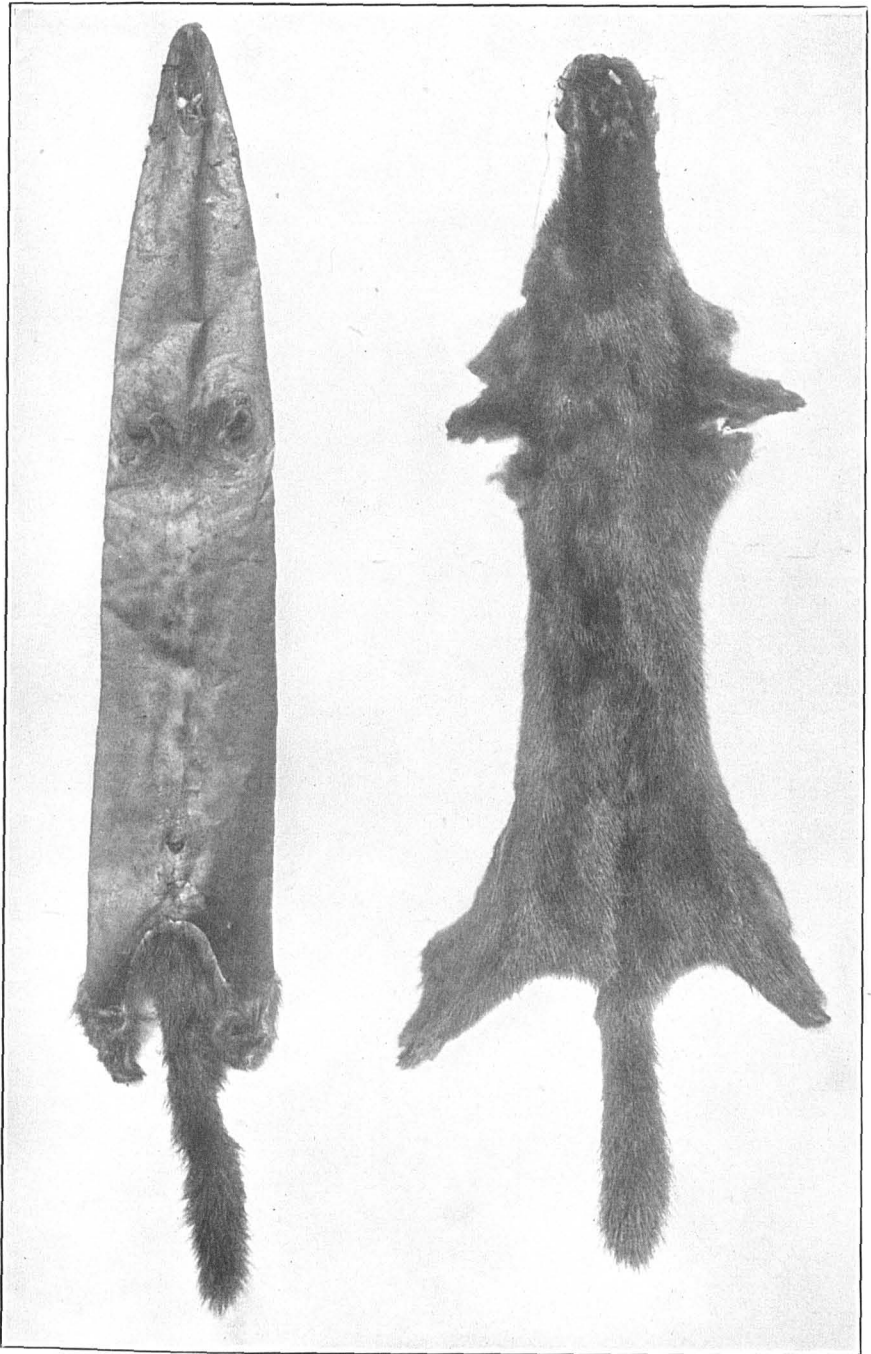
<sup>a</sup>A total of 422 were offered, but only 409 were sold. This comprises the bulk of the sales of sea-otters throughout the world for that year.

or otherwise protected. In skinning, a cross slit is made down the hind legs and a longitudinal cut made along the under side of the tail throughout its length, and the pelt drawn flesh side out over the body and head without cutting along the abdomen. No fur whatever is left on the carcass—tail, legs, and head being carefully stripped of their covering, though the fur on the legs and head is of relatively little value. The pelt, with the fur inside, is then tightly stretched on a stretching board. The fat adhering to the flesh side is carefully removed, the holes made by spears, or otherwise, carefully sewed up, and the pelt placed in the open air, protected from the sun, to dry. When quite dry, the fur is combed and the pelt rolled up and stored in a safe place, whence it is occasionally removed and examined for moths, etc.

The present method of dressing sea-otter pelts is much less complicated than the treatment of beaver or mink, but, owing to the great value of the fur, extreme care is taken at all stages. The flesh side is first dampened over night with salt water, and then greased with choice butter, and several skins at a time tramped in a foot tub for four or five hours. Fine hard-wood sawdust is then added, and the tramping continued for two or three hours longer. On removal they are moistened with soap water over night and then shaved to thin the pelt, the same as in dressing beavers. Next they are worked in a tramping tub with fresh sawdust for two or three hours, and on removal are cleaned of sawdust, either in a beating drum or by striking with rattan sticks. After combing with a fine steel comb, the skins are ready for delivery. Owing to the care necessary in the process, the cost of dressing sea-otter skins is about \$2 each, compared with 50 cents each for those of beaver and otter. Unlike other cased pelts, sea-otters are rarely ever cut open at the fur-dresser's.

#### MINK FURS.

The pelage of the mink consists of dense soft fur, of excellent quality and nearly uniform on all parts of the body, overtopped by stiff, lustrous hairs about three-fourths inch long. The color shows marked variations, ranging from a light dull-yellowish brown to a dark brownish black, but is ordinarily of a rich dark brown or chestnut brown glossed with black. It is usually slightly darker on the upper parts than below, the back and tail being the darkest, and the gloss is also most marked in the fur of the upper parts. The choicest are nearly black, approximating the desirable hues of sable, these being generally from New England, the wooded districts of Nova Scotia, and the Province of Ontario. The lighter colored are of less value, and are usually dyed or blended to the desired dark shade. Albinos, as well as mottled and drab-colored pelts, are occasionally secured. Sometimes skins with white hairs sprinkled in the brown fur are obtained. Often there is a white spot on the throat similar to that of the marten, and a white spot or line of varying length sometimes occurs under-



MINK SKINS CASED AND DRESSED.

neath. At times the long, bushy, and somewhat tapering tail is tipped with white. Minks from southern localities generally have fuller and thicker tails than those from farther north.

The fur is generally dark bluish-brown and sometimes dark blue in case of very dark pelts. It is dense, glossy, short, and exceedingly durable, making it one of the most economical furs in use. The skin is very thin, the thinnest of all the aquatic fur-bearers, yet it is very tough. The mink pelts from cold localities are the choicest and most brilliant; those from southern regions are coarser, harsher and with less difference between the fur and the overhair. They are marketable only when taken late in autumn, in winter, or early in spring.

When the fur of the mink was very fashionable and correspondingly high in price thirty years ago, several attempts were made to raise these animals in confinement. But it was found difficult to rear them when large numbers were kept together, the breeding being reduced and the females quarreling and fighting and frequently killing the young. Practically all these experiments ended in failure.

#### MARKETS FOR MINK SKINS.

Few furs surpass that of the mink in richness of coloring, quality, and durability; yet, owing to the capriciousness of fashion, it has frequently sold at a comparatively low price. It furnishes a striking example of the vagaries of fashion in the fur trade. Formerly it was used almost solely for imitating marten. About 1860 the fashionable world took a fancy to it for cuffs, collars, trimmings, and even for garments of various sorts, resulting in increasing the market price of the pelts from about 50 cents each to \$8, \$10, or even \$20 for very choice skins. A mink muff of good quality sold for \$75 or \$100, and a full-depth mink wrap sold at times as high as \$1,500. Indeed, during the sixties, it was the leading fashionable fur of this country. Then its popularity gave way to fashion's demand for change of color and shorter pelage, and the price of prime skins decreased from \$15 each in 1864 to \$8.50 in 1866, to \$3 in 1878, and to \$1.25 in 1883. For many years the mink was out of favor and it almost disappeared from the market. But among those who could be independent of fashion, this warm, durable fur maintained its former popularity. It is now somewhat more in demand, but is moderately cheap compared with prices prevalent thirty-five years ago, rarely selling for more than \$3 each wholesale, except for very choice skins. In consequence of its many good qualities, it merits much greater popularity than it enjoys.

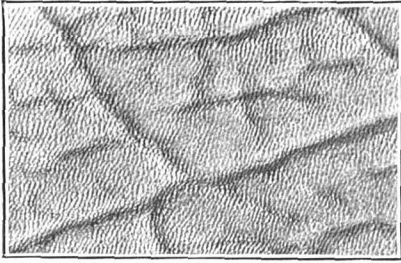
About 400,000 mink skins are sold in London each year. This represents about 55 per cent of the total product of mink, the other skins being disposed of at private sale to furriers in Europe and America. About 80 per cent of the total product is obtained from within the limits of the United States, the remainder coming principally from Canada.

## DRESSING MINK SKINS.

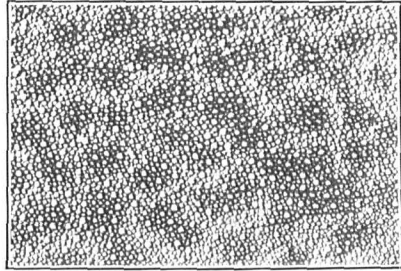
Mink skins as received at the dresser's are usually cased, the fur being turned inside and only the greasy skin appearing, and they usually remain cased during the entire operation of dressing. As may be required, the fur and the leather sides are successively turned outward, and this tedious process forms one of the principal items in dressing this fur. The first operation is to place each pelt on a beam and scrape or beam off all the grease and surplus flesh adhering to the membrane. They are next moistened on that side with salt water. After remaining thus overnight they are placed in a tramping machine, 2,000 pelts at a time, and revolved for four to six hours, until they are thoroughly softened. In the best establishments, the same result is accomplished in the tramping tubs. They are next turned fur side out and cleaned in a revolving drum containing sawdust and a few handfuls of plaster of paris or fuller's earth. This is continued until the grease is entirely removed, when they are revolved in the beating drum and the sawdust, etc., removed.

On removal therefrom the skins are turned leather side out, moistened with salt water over night, then fleshed, as described on page 292. After fleshing, they are stretched as wide as possible with special iron stretchers, hung up and dried. The following day they are placed in the foot tubs—100 skins and 1 peck of sawdust to each tub—where they are treaded by barefooted workmen for about three hours. On removal they are stretched lengthways and beaten with rattans or in a beating drum. Then they are turned fur side out, placed in the cleaning drum with fine hardwood sawdust and revolved until thoroughly clean, which may require five or six hours. They are again placed in the beating drum to remove all the sawdust. On removal therefrom the fur is combed straight and they are turned leather side out and cleaned and polished with a fleshing knife, or, according to more recent practice, on an emery wheel.

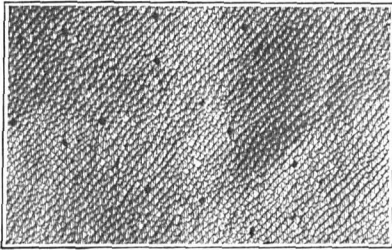
Mink fur is manufactured into muffs, wraps, gloves, caps, and boas, either in natural state or dyed. Many skins are also used for coat linings. The tails are usually made into capes. Mink pelts are never plucked unless the overhair is exceptionally poor. This fur is very durable, lasting with moderate care a generation or more. The writer recently examined a mink muff "almost as good as new," which had been in use for more than fifty years. Mink fur is very frequently sold under the name "American sable."



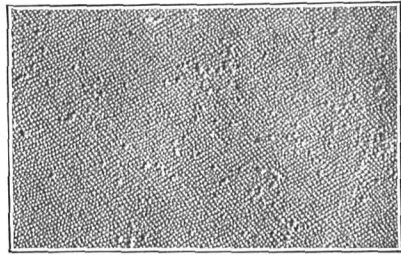
WALRUS LEATHER.



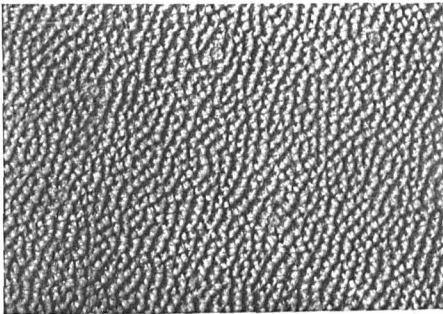
SKIN OF MOTTLED SHARK.



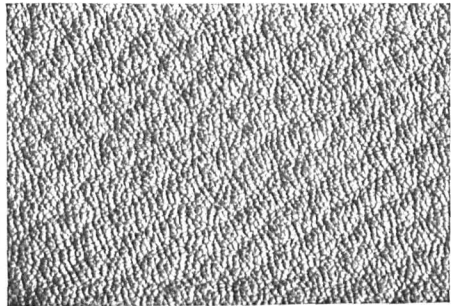
SKIN OF BRAZILIAN SHARK.



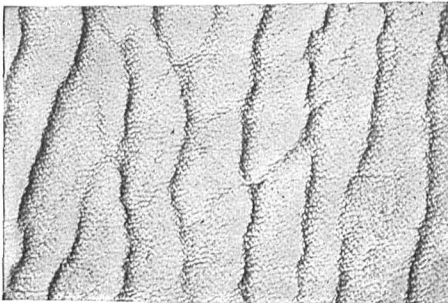
SKIN OF WHITE SHARK.



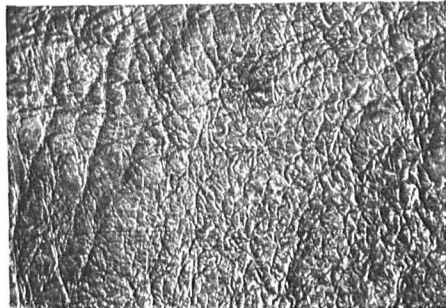
MANATEE LEATHER.



SEAL LEATHER.



SEA-LION LEATHER.



LEOPARD SEAL LEATHER.

## AQUATIC LEATHERS.

## GENERAL REVIEW.

The crude skins and hides of aquatic as well as of land animals are easily putrescible when left in a green state, and if dried they lack suppleness, and are hard, unpliant, and almost impermeable to air. Leather, on the contrary, is one of the most imperishable of animal products, and is supple and porous to a greater or less extent according to the process of manufacture. To transform the crude skins into leather is the business of the tanner and the currier; the former removes the tendency to putrefaction and incidentally increases its strength, durability, and imperviousness to water, and the currier renders it soft and pliant and at the same time imparts to it such finish and coloring as suit the special purposes for which it is intended.

Leather is made from the skins of practically all the aquatic mammals and of some species of fishes; but at the present time, except among primitive people whose stock of raw materials is limited, these products rank among novelty or fancy leathers. Ordinarily the supply of aquatic animals yielding skins suitable for tanning is so small or so difficult to obtain, compared with the enormous quantities of domestic animals available, that the leather made from the former can not compete in price with that from the latter. The nearest approach to competition is in the case of seal leather, of which large quantities are produced each year, the value of the annual product averaging \$1,500,000; but the durability and choice grain of this article secures for it a much higher price than is obtainable for a good quality of calfskin. The hide of the beluga, or white whale, is one of the best of all skins for leather purposes on account of its durability, strength, and pliability; it is sold as porpoise leather, and probably \$200,000 worth of tanned hides are marketed annually. Alligator skins are also obtained in large quantities, and, owing to the peculiarity of their markings, are used entirely as fancy leather; the total value of the output amounts to about \$500,000 annually. Tanned walrus hides, and especially the thick ones, are in great demand for polishing wheels and other mechanical purposes, and probably \$100,000 worth are sold annually. These are the only aquatic leathers which at present have an established position and a fairly constant price in the markets, but they are not the only aquatic leathers obtainable, the writer having collected 31 other varieties, although these are used in such small quantities that no constant market exists for them. Among those used to a less extent may be mentioned sea-lion, porpoise, sea-elephant, manatee or dugong, water moccasin, frog, otter, beaver, beaver tail, muskrat, and a variety of fish skins.

The art of the tanner has been so developed that the preparation of certain skins in imitation of others is by no means a difficult process.



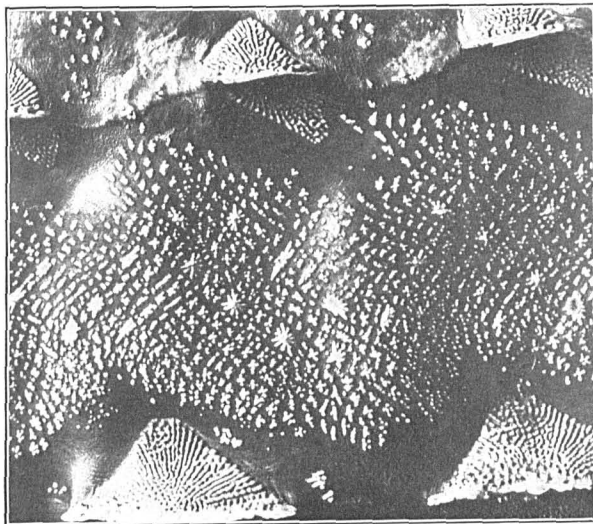
The hides of walrus, sea-lion, sea-elephant, etc., are generally so damaged by the animals fighting among themselves, and from other causes, that, while the raw pelts may be abundant and cheap enough, it is difficult to secure them sufficiently free from defect to permit of their use as fancy leathers with economy. On this account, seal skins, which are comparatively free from the objection noted, are generally used to imitate those leathers, the tanning and currying process being so modified as to develop the peculiar grain desired; and while there is much genuine walrus leather, sea-lion leather, etc., the great bulk of that on the market sold under those names is made from seal skins.

The skins of fish are generally glutinous and soluble in water, but the texture of most of them is sufficiently firm and strong to permit of their use as leather, although their employment for practical purposes is rather limited. Skins of eusk, cod, eels, flat-fish, and the like, have been converted into leather suitable for gloves, purses, boot tops, etc. The tubercular skins of many sharks, rays, and allied fishes are largely employed under various names for polishing purposes and for covering boxes, sword grips, etc. All of these miscellaneous skins are valued principally because of their peculiar grain or markings, and are tanned so as to bring the grain into prominence. Their use is principally in small articles as belts, cardcases, pocketbooks, and the like. Recently they have been applied to the artistic binding of books, planned at the suggestion of Mr. George F. Kunz. Among these was the catalogue of the Izaak Walton exhibition at the Grolier Club, New York City, in 1894. Beautiful effects have been secured by the use of variously colored shark skins, polished to a smooth surface and frequently inlaid with some other material. The possibilities for the development of this use of fish skins are remarkable.

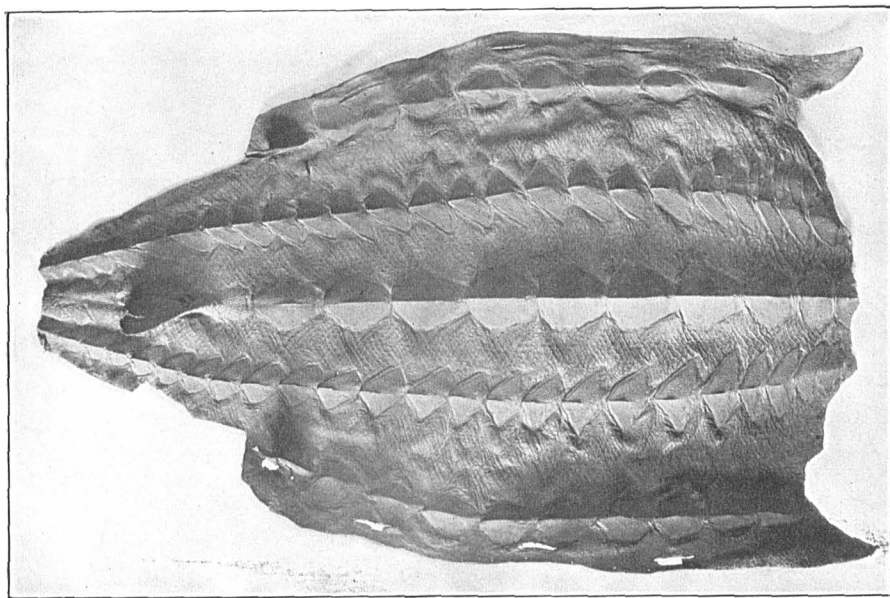
Fish skins are employed extensively in the preparation of glue and fertilizer stock. Especially notable in this connection is the waste from the New England factories engaged in preparing boneless codfish in the forms of bricks, and thousands of dollars' worth of skins of cod, hake, haddock, etc., are annually converted into fertilizer and glue.

#### GENERAL METHODS OF PREPARING AQUATIC LEATHERS.

Leather manufacture is of great antiquity. A process of tanning, differing principally in detail from that practiced at the present time, was doubtless followed long before the days of Simon the tanner. While its kindred industrial arts, spinning and weaving, have made enormous progress, the art of tanning has remained almost stationary for ages, the methods of the present day surpassing those in vogue centuries ago in expediting the process rather than in the quality of the product. Leather-making is simple, consisting in unhairing the skins, removing the fatty matter clinging to the membrane, soaking them in an infusion of tannin, and then softening them by means of greases.



SECTION OF EUROPEAN STURGEON SKIN (SEE P. 348).



SKIN OF DELAWARE RIVER STURGEON, TANNED IN NEWARK, N. J. (SEE P. 348).

The skins of most mammals are composed of four membranes or parts. The first is the fat-bearing tissue, situated between the flesh and the body of the skin; the second or middle portion, known as the dermis or true skin, is made up of layers of fibers interwoven and intersecting in every direction; the third or outer part is a more or less horny membrane, which contains the nerves, the smaller blood vessels, and the base of the perspiratory glands; the fourth is a thin, semitransparent cellular tissue, known as the epidermis, in which the hair is rooted. The dermis or true skin forms the leather, and the third layer above noted—the horn-like tissue containing the nerves and perspiratory glands—forms the “grain” or “bloom” of the leather. The fat-bearing tissue and epidermis, as well as the hair, are removed in the various processes of preparing the skin for tanning. In some leathers—for instance, porpoise—the grain or bloom is also removed.

Many persons in securing aquatic skins fail to appreciate the importance of care in removing them from the dead animals, and through carelessness make many knife-cuts in the membrane. In the case of furs these cuts are not so very serious, since the membrane can be sewed together and the damage concealed by the fur; but when skins are to be used for leather the cut portions are wholly valueless.

Under ordinary conditions, as soon as life ceases decomposition of the skin begins unless a detergent is applied. Salt is very generally used for this purpose and is plentifully sprinkled over the skin on its removal from the animal. Although effective, salt is not the least injurious agent that may be used, borax being generally more satisfactory and more easily removed by soaking.

On account of the great range of raw materials and requirements of the leather trade, the various processes of leather-making are necessarily numerous, differing even for skins of the same variety, according to their quality, the season of the year, and many other conditions, the correct understanding of which is the outcome of experience. However, the general principle is so far identical in all classes of leather-making that it may be outlined here.

The skins and hides usually reach the tanner after remaining in salt a greater or less length of time, depending on the distance from the place of slaughter. The first procedure is to cleanse the skins and to loosen and remove the hair and epidermis, neither of which is desired in the finished leather. In case the skins are received direct from the animals, they are easily cleansed from blood and dirt by soaking a few hours in fresh water and then washing for a few minutes in a perforated rotating drum, known as a wash-wheel, through which a stream of water is constantly flowing. If the skins have been salted, as is usually the case with aquatic pelts, a more thorough soaking and washing, with several changes of water, is necessary, the soaking sometimes extending over several days. In case of large hides which have been heavily salted the process may be assisted by a “hide-mill,” in which,

by means of cranks, heavy hammers are moved in pendulum fashion on the hides, or in which the hammers are alternately raised by cams. It may also be aided by using caustic soda in the tank water in the proportion of about 1 pound to each 100 gallons of water.

Various agencies are used for loosening the hair, viz, putrefactive fermentation; lime, either alone or in connection with caustic soda; calcium or sodium sulphohydrate, etc. The first is of ancient origin, and is the method even yet employed by primitive people. The green hides are permitted to remain several days in a warm, moist condition. Putrefaction soon begins, and quickly dissolves or destroys the epidermis and loosens the roots of the hairs embedded in it, when the latter easily slip out. This sweating process has little effect in splitting up the fiber bundles of the true skin and is usually employed only where a firm, solid leather is desired, as for polishing wheels, covering the Alaskan bidarkas, or more commonly in the preparation of sole leather.

A more important method of removing the hair, and the one in general use, is by means of a solution of lime or calcium oxide in water, making a milk of lime, or calcium hydrate. This not only has a solvent effect on the epidermis, but splits up the fibers of the skin, both of which are essential to the production of good, pliable leather. The skins are sunk flat and smooth in a tank or pit filled with milk of lime, and after twenty-four hours they are removed with hooks or tongs, the lime stirred up, and the skins returned, this process being repeated daily for a week or ten days, or until the hair is sufficiently loosened. The immediate effect of the lime is to swell the fibers of the skin and to split them up into their constituent fibrils, the dissolving of the epidermis being attributed to the action of the enzym products of bacteria. In preparing leather of different degrees of solidity or pliability, variations are made in the freshness and the temperature of the milk of lime, fresh lime at a low temperature being used for heavy leathers, while old lime at a high temperature is used in making thin, pliable leathers.

Comparatively few fish skins are limed, since it destroys the fiber rather than loosening it; therefore they are usually tanned without liming. Shark skins, however, will go through the lime, and eel and cat-fish skins may be limed for one or two days.

On removal from the liming tank the skin is laid, flesh side down, on a sloping beam having a convex surface, and scraped on the grain side with a blunt knife to remove the hair; then turned over and scraped on the flesh side with a sharp knife to remove all the adhering flesh, fat, and other loose tissue, this process being known as "fleshing."

Next it is necessary to remove the lime from the skin, as its presence would interfere with the subsequent tannage. Also, when soft, pliable leathers are desired, the swollen condition of the fiber produced by the lime must be reduced, and in some cases a further portion of the

cementing substance of the fiber must be dissolved. Removal of the lime is sometimes accomplished by neutralizing it with an acid, as sulphuric or boracic, and then washing out the neutral salt.

A more common method, however, is by the "bran drench," either alone or supplemented by dung bates. Hot water is poured upon bran, and the mixture set with a few pailsful of a fermenting drench liquor. When the skins are placed in this liquid, maintained at a temperature of 70° F., fermentation soon ensues, floating the skins up to the surface. They are again forced mechanically down into the liquid, but soon rise as before. When this has occurred three or four times, in 12 to 16 hours, the action is generally sufficient. Large hides, especially those of alligators, are sometimes submitted to the action of paddle wheels to hasten the removal of the lime and make that removal more uniform.

This process is often preceded by treating the skin in a fermenting infusion of excrement of dogs in the preparation of lighter skins, and of pigeon or hen dung in case of heavy leathers. This not only acts on the lime so as to make it possible for it to be easily washed out, but it also renders the leather soft and pliable. The dog dung, called puer, is dissolved in water at a temperature of 90° F., and in this liquor the skins are kept in gentle motion for an hour or more. The previously plump skins become extremely soft and flaccid, and may be stretched in any direction without springing back. This operation is known as puering. The treatment with hen or pigeon bate is similar, except that it usually takes place without artificial heat and the process requires four or five days.

The hide is now a simple network of fiber, all the interfibrous substance, or filler, having been removed in the various processes above noted. Next comes the principal operation in the process of tanning, viz, dehydrating the skin and combining with it certain agencies which change the fiber network into leather. These agencies are (1) mineral salts, when the product is known as "tawed leather"; (2) oils and fats, making "chamois leather"; and (3) tannin or tannic acid, resulting in "tanned leather." Mineral salts are rarely used in tanning aquatic skins, being employed mostly in preparing laces for belts; and the chief use of the oils and fats for aquatic leathers is in preparing porpoise hides for shoelaces. Most of the aquatic leathers are prepared by the third process, the use of tannin or tannic acid.

After liming and bating, the hides are submitted to the action of infusions of tanning material. They are first worked by wheels in the tanning liquors for one to three days, according to the result desired, and then placed in tanks or pits, where, for several weeks, they are subjected to fresh tanning liquor, with frequent renewals of the liquor. On removal therefrom the skins are finished. This operation differs so much, according to the variety and quality of the skins, that accounts of the special treatment of the different kinds of skins are reserved for appropriate subchapters.

## LEATHER FROM SEAL SKINS.

The seals whose skins are utilized for making leather are quite destitute of the coat of choice fur which gives to the fur-seals their great commercial prominence. Yet on account of the valuable products of leather and oil, the economic importance of this group of animals is scarcely less than that of the fur-seals. They are found in various northern waters, especially off the northern coast of Labrador and Newfoundland, in the waters of Greenland, the Arctic Ocean north of Europe, along the Nova Scotia and New England coasts, in the Northern Pacific Ocean, in the Caspian Sea, and to a much less extent in the Antarctic seas.

The principal sealing districts in the north are Newfoundland, Jan Mayen Seas, Nova Zembla, Kara Sea, and the White Sea. The Newfoundland fishery is by far the most extensive. It ranks among the most venturesome and important of all the marine industries of the world, giving direct employment to 5,000 men, while thousands of others are engaged in preparing the resultant products of leather and oil. American vessels have not engaged in this fishery except in a few instances, but the fishermen of Scotland unite with those of Newfoundland in reaping large returns from the seal hunt off the northeast coast of America.

According to Mr. Robert Badcock, the total product of seals in the Newfoundland fishery in 1901 approximated 345,000, of which 27,000 were young hoods or bluebacks, 13,000 were old hoods, 10,000 old harps, 4,000 bedlamers, and the remaining 291,000 were whitecoats or young harps. The catch of bluebacks was far greater than usual, the average take of that variety not exceeding 5,000 in one season. A small percentage of the whitecoats are known as "fast furs," the long, thick woolly or hairy covering not easily separating from the pelt, as the name implies. These are usually very young animals, less than fifteen days old. Owing to the vessels reaching the seals quickly in 1901 a larger number of fast furs were secured than usual, the total amounting to about 10,000, whereas it is usually much less. In the markets these are commonly known as wool-seal skins.

After discharge from the vessels the pelts pass through the hands of the "skinners," who remove the blubber, take out the flippers, cut off the noses, etc. The skins are at once dry-salted and placed one over the other, with the flesh side uppermost, in piles of small height. There they remain for about three weeks, when they are sufficiently cured for shipment to Europe or the United States to be tanned.

After removal of the blubber the skins of the young harp seals average 5 or 6 pounds each in weight, and are worth about 80 or 85 cents at the present time. Bedlamers' skins average about 12 pounds in weight and \$1.30 in value, and old harps, from 14 to 18 pounds in weight and 90 cents in value. The skins of the young hood or blueback seal weigh 6 or 7 pounds and sell for about \$1.35 each, and the

old hoods range from 15 to 24 pounds and average about \$1.65 each in value. Of the old seals the skins of the females are preferred to those of the males, as the latter are frequently damaged about the neck and foreflippers, by the animals fighting among themselves.

The principal seal fishery of northern Europe is prosecuted in the seas about Jan Mayen and Spitzbergen by vessels sailing from Dundee and various other ports of the North Sea, and engaged also in the capture of whales and walrus. As in the case of the Newfoundland fishery, the Greenland or harp seal is the principal species secured in the Jan Mayen district, but many hooded or bladder-nosed seals are also obtained, principally by shooting. During recent years about 35 vessels have been engaged from the various ports, mostly from Norway and Scotland, and the annual take of seals has ranged between 100,000 and 200,000, the proportion of mature seals being much greater than in the Newfoundland fishery. Owing to increasing scarcity of seals north of Europe, the British vessels have almost abandoned their pursuit, leaving it in the hands of Norwegians, whose more economical outfits enable them to continue the fishery at a profit.

In the seas north of Russia, especially the White Sea and in the vicinity of Nova Zembla, many harp seals are taken in the spring by vessels from Norway and also by natives of the coast. The fishery is not so extensive as that off the Newfoundland coast, the product amounting to probably less than 20 per cent of the latter. Another important seal fishery is that of the Caspian Sea, the species captured being peculiar to those waters. This industry is centered at Astrakhan, and the annual product is reported as less than 100,000 pelts.

#### METHODS OF TANNING SEAL SKINS.

The total quantity of seal skins received in the markets of the world approximates 650,000 annually, valued at \$600,000. The majority are sold in London, but some are sold in Liverpool, Dundee, Hamburg, New York, Halifax, St. Petersburg, and Moscow. Most of them are tanned in Great Britain, London and Dundee being more extensively interested than any other places; but some are tanned in Norway, Russia, Germany, France, and the United States. Previous to 1901 the number tanned in the United States was small, not frequently exceeding 30,000 in any one year; but during 1901, owing to an overstocking of the trade in Great Britain, about 75,000 skins were purchased and prepared by leather manufacturers in the United States.

The general methods of tanning seal skins employed in Europe and America do not differ greatly from the treatment of similar pelts. As received at the tanneries, seal skins are thick, heavy, and extremely oily, but except in the last characteristic they closely resemble other raw skins. They are roughly cleaned of adhering flesh and blubber and as much of the oil as practicable is pressed out, when they are placed in lime pits to loosen the roots of the hair and prepare them for depi-

lation. The skins are put first into an old-lime solution and frequently changed to stronger solutions until the liming effect is completed, three or four weeks being generally required for this operation.

The action of the lime is usually hastened by frequent "handling" and changing the skins from one tank to another. When the bulbous roots of the hair are thoroughly loosened, the skins pass to the fleshing house where each one is separately laid on a beam and carefully unhaired on one side and fleshed on the other. In some establishments the skins are partly unhaired before the liming process is completed. The choicest grades of hair are used largely by plasterers, but most of it is suitable only for fertilizer or the waste heap. After a thorough washing and "striking out," *cürrier* fashion, the skins are in condition to be converted into leather.

Owing to the excessive and irregular thickness of the skins, it is desirable at this stage of the process to split or shave them, although many tanners, especially those in the United States, postpone this until the tanning is complete. The splitting is effected with a machine of clever mechanism, its principal parts consisting of two metal rollers, revolving horizontally one above the other, between which passes the skin spread out smoothly. The advance edge of the skin is presented to a keen blade, moving with great rapidity parallel with the line of contact of the rollers, thus splitting the skin into two pieces of equal superficial area, of which only the grain or outside portion is desirable for leather-making. The other half is sometimes used for making an inferior grade of leather, or cheap and somewhat deliquescent size or glue, but ordinarily it goes to the waste heap to be converted into fertilizer. The thinned skins are puered with bran or dog dung, followed by drenching and a thorough working out on a beam to remove all traces of lime salts and other refuse materials, as already described on page 331, and thus made ready for the tanning solution.

The skins are next steeped in tanks or vats containing successively stronger baths of the astringent infusion of oak bark, japonica, sumac, or any other tanning agency. For fancy shades of coloring, sumac only is used, as a rule. During the first few days the skins are frequently "handled," so that the liquor may quickly strike through them. This "handling" or "working" is cheaply effected by means of paddle wheels, which turn the skins over and over in the solution. The more they are worked by the paddle wheel, the larger the grain of the finished leather. From four to six weeks' time is usually required to complete the tanning process, even with the use of paddle wheels. In England and Scotland large quantities of the skins are tanned by sewing together two skins, flesh to flesh, around the edges, so as to form sacks or bags, which are then filled with liquid sumac. This method is cheaper and gives a better color. It is also more expeditious, requiring usually less than one week.

The tanned skins are next submitted to a sumac bath containing a



cleaning acid, such as oxalic acid or sulphuric acid, then "struck out" and lightly oiled. They are afterwards selected for coloring, and dyed if desired. To "finish" the skins, they are dampened, sammied or partly dried, and "struck out"—that is, stretched out on each side with a tool. If a bold grain be desired, in using the skins of old seals, they are embossed and dried out; but if the natural grain is retained they are blacked at once. A finish is imparted by a good bottom coat of logwood, prepared by subjecting 1 hundredweight of Campeachy hard wood and 5 pounds of carbonate of soda in 50 gallons of water until the logwood is extracted, the liquor being at once drained off.

After airing slightly in a warm place the skins are ready for "wet graining." They are again dried out in a warm place, laid away to cool, and then seasoned with three-fourths of a pint of milk and about 1½ pints of blood added to a gallon of water, which is rubbed in well with a stiff brush. The skins are now moistened with a mixture of milk and water, in the proportion of 1 to 6, and rolled up, half a dozen skins together, grain to grain. After a few hours they are rolled, grained off, and oiled with warm cod oil, when they are ready for the market.

When carefully prepared, seal leather has greater strength and durability in proportion to its weight than almost any other on the market, and on account of its choice and attractive grain it is very popular for such articles as cardcases, pocketbooks, shopping bags, etc. Much of it is enameled for belts and upper shoe leather. The market value of seal-skin leather in the United States is from \$20 to \$30 per dozen skins, equivalent to about 50 or 60 cents per square foot.

The "fast furs" or "wool-seal" skins are blubbered in the same way as the ordinary pelts, and are sold to the fur trade in the salted state. By the fur-dressers they are washed and leathered as in the first stages of fur-seal dressing. The thickness of the pelt is reduced by shaving or by friction on an emery wheel. When the dressing is completed the hairs are dyed black or brown, scarcely any of these skins being left in the undyed state. They are used for various purposes, especially for gloves and military busbies. During some seasons they are fashionable for trimmings, and a brisk demand exists for them. This was especially the case during the early eighties, when they sold for \$3 to \$6 each, dressed. At present the average price in the dressed condition is \$1 to \$2 each. Many furriers—in America, at least—fail to recognize the fast furs as from a species of hair seals, considering them as the skins of a distinct and separate species, to which they give the name "wool-seal."

On the Continent of Europe the bluebacks are used mostly for fur trimmings after they have been dressed with the hair on; but in Great Britain and America they are usually tanned for leather purposes. During the last season some blueback skins were tanned in this country with the hair on, but they did not take very well.

## LEATHER FROM SEA-LION SKINS.

Sea-lion hide was formerly considered unfit for tanning purposes, owing to its thickness and coarse texture, consequently the hunters taking these animals for oil-rendering rarely saved the skins; but at the present time the hide is worth as much as the oil. When properly tanned the skins of the young animals make a soft, velvety leather, quite popular for fancy articles. The thick hides of the old animals are used to a limited extent as a substitute for walrus hide in polishing wheels for metal-workers. It is much like bull-neck leather, and, although inferior to walrus polishing wheels, is prized by silversmiths for small work. The hides suitable for polishing purposes are one-fourth to one-half inch thick, weigh 30 to 40 pounds when tanned, and are worth about 30 to 40 cents per pound wholesale. The poor or cheap hides are used to some extent as glue stock.

In preparing the skins of sea-lions for covering the Eskimo kaiaks or bidarkas, the green hides, as soon as removed from the animals, are closely rolled together and permitted to "sweat" until the hair becomes loosened, when it is readily removed by scraping with blunt knives or stone flensers. When unhaired, the moist skins are deftly sewed together in suitable patterns and stretched, flesh side out, over the boat frames, the entire structure being covered, with the exception of a circular hole or holes in the top. This boat is perfectly water-tight and substantial, and, although weighing usually less than 100 pounds, will carry several hundred pounds of goods in addition to the crew. Because of the softening influence of the water, after each day's use the boat must be hauled up out of the water, turned bottom side up and air-dried during the night. Protected in this manner and oiled occasionally, it lasts many seasons. Sea-lion skins are also used to some extent for covering the bidarrahs, which differ from the bidarkas in that they are much larger and more substantial. Usually, however, walrus hides are used for that purpose.

The natives make various other uses of sea-lion skins, such as tent coverings, harness for the sledge dogs and reindeer, and, in case of very young animals, even for clothing. When used for these purposes the hides are sweated, as when used for covering the bidarkas, then stretched for about ten days to cure, when they are taken down, rubbed between the hands to render them pliable, then cut into suitable size for use as may be desired.

In the fisheries of the southern seas, sea-lion hides were sometimes saved and brought to port. In curing them for this purpose they were removed from the animal with half an inch of blubber adhering. After washing and while yet wet they were plentifully sprinkled with salt rubbed well into the fat, particularly around the edges and neck folds, and then packed in tiers in the ship's hold.

Sea-lion skins for fancy leather are tanned in precisely the same

manner as seal skins, and especially those of large seals. The only difference in treatment is due to the greater size and body of the former. On account of the difficulty in procuring sea-lion skins free from scars and markings, and also the ease with which its peculiar grain is imitated on seal leather, the great bulk of the sea-lion leather on the market is prepared from seal skins. The value of the genuine skins when converted into leather ranges from \$2 to \$12 each, according to their quality and freedom from damage.

#### LEATHER FROM WALRUS SKINS.

Formerly the principal use of walrus hides in Europe was for the rigging of vessels, for which it is especially adapted. For many years nearly all the rigging of vessels on the north coast of Norway and Russia was made of this article. The skins were also employed for protecting the rigging of vessels from chafing. Later came their use in northern Europe for manufacture into harness and sole leather.

Then the thick heavy leather was adopted by silversmiths and other manufacturers of bright metal objects, for removing marks and scratches and to polish fine metal surfaces. The hide is particularly desirable for this purpose because of its peculiarly tough grain. It is usually cut into circular shape, forming a wheel of solid leather, but sometimes a ring of leather is cemented to a wooden center by which it may be attached to a revolving head or mandril. Other than that made from bull neck, buffalo, or sea-lion hides, there is no satisfactory substitute for walrus leather for these purposes. The thickest parts of the hide are the most valuable, and the demand at the present time is quite large, the principal silver works of the United States and Europe making use of it. The London value of an average hide suitable for polishing purposes is in excess of \$100.

About 30,000 pounds of tanned walrus hides are imported into the United States annually. The import value is about \$25,000 and the selling value after it is cut in the form of wheels is from \$40,000 to \$50,000. The quantity used in Europe is probably double the amount of the importations into this country. A small quantity of walrus hide has been tanned on the Pacific coast of the United States, but the quality of the output is reported as inferior to that prepared in Great Britain. As shipped from the tanneries, the "sides" weigh from 30 to 200 pounds. The cub sides weigh from 30 to 40 pounds, measure from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch in thickness, and are worth about 30 cents per pound. The largest sides weigh 180 to 200 pounds each, are  $1\frac{1}{2}$  to 2 inches thick, and sell for \$1 to \$1.25 per pound. The average sides weigh 80 or 90 pounds, are  $\frac{3}{4}$  to 1 inch thick, and sell for 60 to 70 cents per pound. Of course, when cut into circular shape these are sold at very much higher prices. The average price paid by metal-workers in this country is probably between \$1 and \$2 per pound, and for the very thick hide as much as \$5 per pound has been paid.

Another use to which tanned walrus hide is put is as covering for the rollers used in ginning long-staple cotton, such as Sea Island or Egyptian. This is a comparatively recent use, yet probably 6,000 pounds are consumed in the United States annually in this manner. The tanned hide is cut into thin strips and attached to the surface of the roller, entirely covering that portion that comes in contact with the cotton. It is peculiarly adapted to this use and much more satisfactory than bull-neck leather or any other material formerly employed.

Formerly the light or thin hides of walrus were little used, as they were not suitable for polishing purposes, and therefore they were of small value. But during the last few years the leather made from these thin hides has become quite fashionable for such articles as card-cases, pocketbooks, belts, etc. For this purpose the leather is split and so tanned that the grain has a remarkably smooth velvety appearance.

The process of tanning walrus hides depends on the purpose for which the finished material is designed. If intended for polishing purposes the hide should be tanned as thick and heavy as possible, with a hard, tough texture. The tanning of the heavy leather consumes from six months to one year or more when properly done. Acceleration of the process is likely to result in uneven texture, with the interior fibers imperfectly tanned. It is claimed that the best of the heavy hides are English tanned.

For thin, pliable fancy leather, the skins are tanned in precisely the same manner as seal skins, except the changes and the greater length of time due to the superior thickness of the leather. It is proper to state, however, that the greater portion, indeed possibly 90 per cent, of the so-called "walrus leather" manufactured into cardcases and other fancy articles is nothing more than seal leather with a walrus grain, which is easily given to it in the process of currying. The walrus skins are so difficult to obtain and are so frequently cut and damaged that they can not be economically used for fancy articles. The seal leather is equally durable, and when properly grained and finished the substitution can be detected by comparatively few persons.

#### LEATHER FROM MANATEE AND DUGONG.

For many years the market has received small quantities of curiously grained, tough, and durable leather made from hides of manatee and dugong.

The manatee is found in the shallow waters of the tropical seas on both sides of the Atlantic and in the large tributary rivers. It occurs principally among the West Indian Islands, the coasts of Brazil and Florida, and on the Senegambian coast of Africa. Owing to its gregarious and inactive habits it is easily killed. Being valuable for its oil as well as for its hides, it has been so extensively slaughtered that it is now quite scarce.

The dugong or halicore is the manatee of the Asiatic and Australian

coasts. It differs from the Atlantic manatee only slightly in outward appearance, the difference being most noticeable in the shape of the tail, which in the dugong ends in flukes instead of being spoon-shaped.

The dugong is reported as much less numerous than formerly. It attains a length of about 10 feet and is reddish brown in color, somewhat lighter than the porpoise. The hide is so thick and tough that harpoons used by the whalers are almost ineffective in its capture.

The skin of the manatee, as well as of the dugong, is hard and thick, exceeding 1 inch in places, and has comparatively few hairs on the surface. When removed and salted it is of a dark lead color. The number of skins received on the markets of Europe and America is relatively small, probably not exceeding 50 annually, most of which come from Queensland. They are tanned in the same manner as seal skins, but as they are larger and heavier more time is required.

These skins produce the most characteristic grain of all marine leathers. It is quite unlike that of the seal, walrus, or sea-lion, consisting of closely associated and irregular rows of well-defined ridges, and at intervals of about one-half or three-fourths of an inch there are peculiar indentations or pin marks surrounded by a circular ridge, the locations of the hair follicles. Unlike that of walrus and sea-lion leather, this grain is rarely imitated. Indeed, it is difficult to make a satisfactory imitation. Owing to the small quantity received, there is no regular market for this leather and no standard price. It is used almost wholly for small articles, such as cardcases, belts, and the like.

#### PORPOISE LEATHER.

The most abundant porpoise on the Atlantic coast is the harbor porpoise or puffing pig, which occurs from Nova Scotia to the Gulf of Mexico, ascending the rivers to the limit of the brackish water. This species is not at present an object of fishery at any point on the United States coast, although occasionally it is taken incidentally in pound-nets and seines set for food-fish. Owing to the fact that the skins are rarely free from the markings of sharks' teeth, they are not used for leather purposes to any great extent.

Of much greater economic importance is the Hatteras porpoise or bottle-nosed dolphin, which occurs in great abundance on the coasts of the United States and Europe and at times has been the object of extensive fisheries. This species also has shark markings but the skins are usually in far better condition than those of the harbor porpoise. On the North Carolina and New Jersey coasts profitable fisheries have been maintained for its capture and its utilization for leather, oil, and even for food.

Porpoise fishing has been prosecuted during the winter season since 1810 at several points on the Atlantic coast, and especially along the "Banks" of North Carolina. It was abandoned for several years following 1860 and again in 1893, the period of greatest extent being

from 1885 to 1890. During the last few years the fishery has not been prosecuted, owing to conditions in the leather market, but it appears probable that it will be reestablished at an early date.

The porpoise are dressed as soon as practicable after they are dead. The flippers and the dorsal fin are cut off and the skin and blubber cut along the middle of the back and of the abdomen from nose to flukes, and the whole peeled off in two uniform parts, the hide and blubber being removed together. The halves are laid on an inclined beam, similar to that used by carriers, and the blubber shaved off and processed for extracting the oil, while the skins are salted for the tanners. The largest catch of porpoise on the coast is reported to have been about 20,000 in 1887. The value of the green hides was about \$2 per side, and when tanned they were worth \$10 or \$12 per side.

The commercial porpoise leather of England is made from the skin of the beluga or white whale. This species attains a length of 18 feet or more, and averages perhaps 14 feet in length and 10 or 12 feet in circumference. At several places along the coast of northern Europe, and to a much less extent in the Gulf of St. Lawrence, in Hudson Bay, on the coast of Newfoundland, etc., the beluga is captured chiefly for its hide, to be used in leather-making, and also for the oil that may be rendered from the blubber. The principal fishery is prosecuted by vessels from Dundee, Scotland, and from ports of Norway and Sweden. It is estimated that the annual take is over 7,000, of which 6,000 are obtained north of Europe, leaving 1,000 as the catch in the northern part of the American continent. The value of the hide when green is about \$8 per side, and when tanned it averages probably \$25 per side.

While the skins of other cetaceans are occasionally tanned, the product is of no commercial importance. These skins are very spongy and usually have a villous or woolly surface.

#### TANNING PORPOISE SKINS.

According to Mr. R. G. Salomon, of Newark, N. J., to whom we are indebted for most of our information in regard to the method of tanning this leather, skins of the beluga and of the Hatteras porpoise are tanned in precisely the same manner, but the former require much longer time on account of the greater body. Both are received at the tanneries in a salted condition, and the first operation consists in cleaning out the salt by soaking them in water for two or three days, according to the state of the hides and the temperature of the water. After this soaking, they are washed thoroughly in warm water and again soaked for a day or so, and the grease worked out by hand or by machinery. They are next immersed in lime solution for a length of time depending on the condition of the hides, but usually much shorter than for cowhides. After liming they are bated and washed thoroughly to remove the lime and other impurities. The skins are now immersed in whatever tannic acid is desired. When half tanned they may be reduced to the required thickness by splitting, or this

operation may be postponed until the tanning is at an end. After the tanning is completed the nap is shaved off and the leather scoured and prepared for stuffing with oils and then finished in the usual manner. The new chrome or metallic tannages seem likely to produce excellent results in porpoise tanning and will doubtless soon be adopted.

Most of the beluga skins are tanned in Dundee and Glasgow, but several small tanneries in the province of Quebec prepare this leather. Porpoise tanning in the United States has been mainly at Newark, N. J.

Leather made from porpoise hides is remarkable for its tractility; a portion one square foot in area is easily drawn out to  $1\frac{1}{2}$  feet in length, losing correspondingly in width, a feature possessed by few other leathers. This makes it especially adaptable for shoemaking, for in whatever direction the foot is thrust by the weight of the body the leather will adapt itself to that shape. It is also exceedingly durable, readily outlasting two or three pairs of calfskin shoes. It has another recommendation apparent only when it is wet; then it swells up, becoming almost twice as thick as in its dry condition, and absorbs water but allows very little to penetrate it. This, added to its strength and suppleness, makes it most desirable for hunting and wet-weather boots, since it is not easily penetrated by moisture under ordinary conditions. It is sold by the pound, the price varying from \$2.25 to \$3.75 per pound, each side weighing from  $1\frac{1}{2}$  to 4 pounds. Ordinarily a pound is sufficient for about three pairs of shoes.

The skin of the beluga is among the very best for leather purposes of any obtained from either aquatic or land animals. It resembles the hide of the Hatteras porpoise in many respects, especially in having the fibers running mostly in one direction and in possessing great tractility. However, the beluga is more solid and durable than the latter. Beneath the nap it has a membrane like the "shell" on the rump of a horse,<sup>a</sup> which becomes soft and flexible in dressing and makes strong and durable leather. In comparing the tensile strength of the two, it is found that a shoestring of average size made of beluga sustains a weight of about 300 pounds, whereas one of Hatteras porpoise supports 85 to 100 pounds, and calfskin only 40 or 50 pounds. If a porpoise lace lasts three months, the life of a beluga lace subject to similar usage is said to be nearly two years. Beluga leather keeps its shape when made into shoes, whereas porpoise leather gives with the movement of the feet. Considering its great tensile strength and the large pieces obtainable, it is apparent that beluga leather is remarkably well adapted to the purpose of machinery belts. A continuous piece 60 feet long and 18 inches wide has been cut from a single skin.

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<sup>a</sup> The shell in horsehide is the flat muscle spread over the horse's rump from the tail to the forward point of the hips and extending down to the legs, making an oval-formed sheet about 2 feet long and  $1\frac{1}{2}$  feet wide in the widest part. This muscle grows firmly to the grain of the skin and furnishes remarkable pulling power. When shaved clean of its shewy matter and properly tanned, this shell makes most durable leather. The members of the equinal or horse family are said to be the only land animals possessing this membrane, but it extends nearly over the entire skin of the beluga.

Leather from the beluga is especially suitable for use as shoelaces on account of its tenacity and durability. That from the Hatteras porpoise was never much used for this purpose, owing to its unfavorable size, causing much loss in cutting. Many shoelaces made of inferior leather are sold as porpoise. The genuine can be easily distinguished by grasping it with the thumb and forefinger of each hand about one-half inch apart and contracting or pushing it together in the direction of its length, when the contracted portion will increase about one-third in width. "The genuineness of the article is positively assured by this simple test, for no other leather has this feature."<sup>a</sup>

The beluga laces sell for about \$8 or \$10 per gross, while calfskin laces sell for about \$1.25 per gross. No beluga laces are made in the United States, nor is the demand for them here of importance; but many are made in Scotland for the English and continental markets.

#### LEATHER FROM ALLIGATOR SKINS.

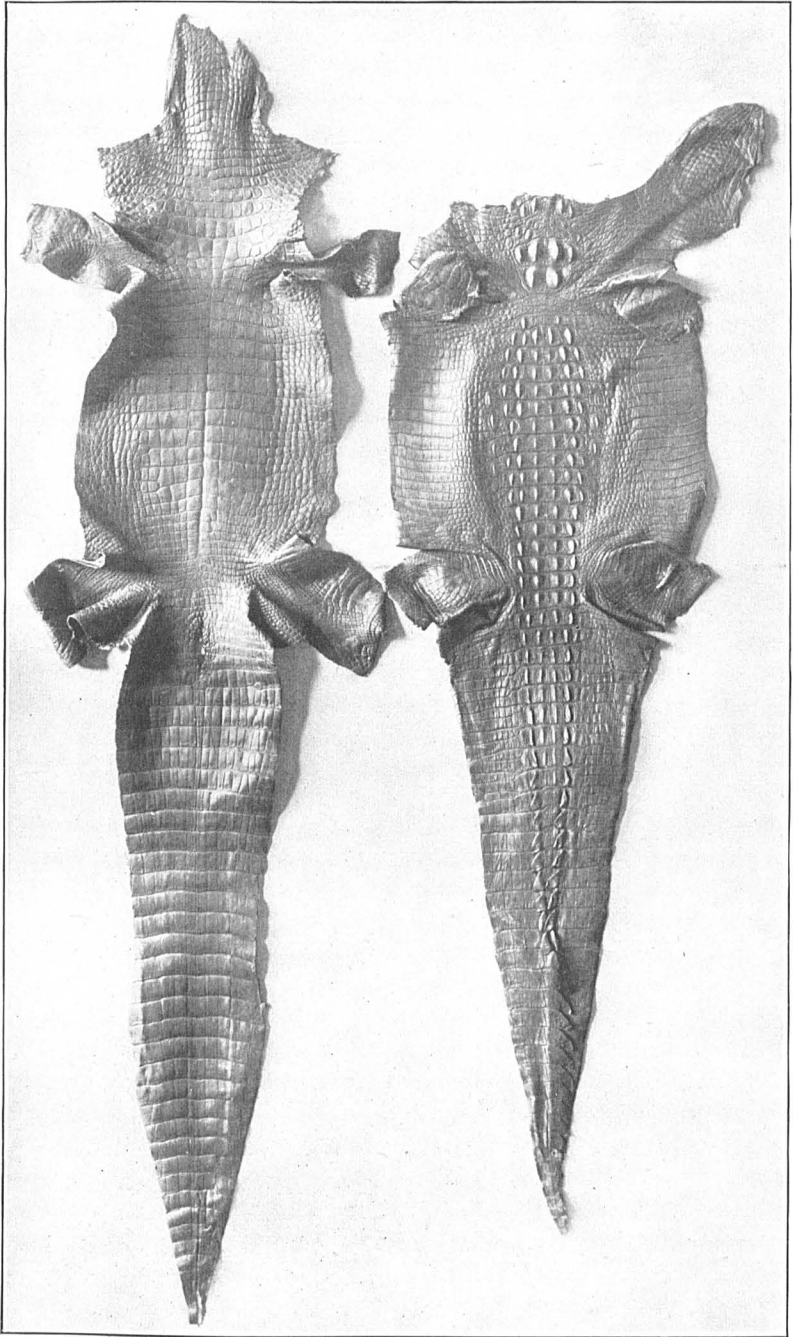
Occasional attempts to utilize the coriaceous epidermis of alligators in leather manufacture have been made for one hundred years or more, but not with much success until about 1855, when this novel leather became somewhat fashionable and a considerable demand developed. The market, however, was not long continued, and after a few thousand hides had been shipped from the Gulf States the demand ended. During the civil war another raid was made upon these saurians to supply shoe material, and they were again slaughtered in thousands; but with the cessation of hostilities and the restoration of free commerce in shoe materials, the alligators were again left to repose for a period.

This rest, however, was only temporary, for about 1869 fickle fashion again called for the leather for manufacture into fancy slippers, boots, traveling bags, belts, cardcases, music rolls, etc. An immense demand was soon created for it, resulting in the slaughter of many thousands of the animals every year, giving employment to hundreds of men. The demand soon exceeded the productive capacity of our own country, and large numbers of skins were imported from Mexico and Central America. The consumption of this leather at present is greater than ever before, and owing to the large importations the market price is somewhat less than a few years ago. The output of the tanneries of the United States approximates 280,000 skins annually, worth about \$420,000. It is among the most characteristic of all aquatic leathers—indeed, of all leathers—being curiously checkered in oblong divisions, known as "scales" or "bosses," separated by intersecting grooves, and varying in size and character from the rough horn-like scutes on the back to smooth pliable markings on other parts of the body, giving the skin that peculiar effect which makes it so popular for leather purposes.

There are several distinct varieties of alligator skins on the markets, the most important being the Floridian, Louisianan, and Mexican;

<sup>a</sup>Shoelaces, by R. G. Salomon, 1886, p. 21.





ALLIGATOR SKINS, UNDER-SURFACE AND HORN-BACK.

each differs from the others in certain well-defined characteristics, and owing to these differences each variety has its special uses.

The Florida skins are longer in the body—that is, from the fore legs to the hind legs—than those from Louisiana and Mexico, and consequently they are largely in demand by manufacturers of large handbags. They also have a number of so-called “buttons” or “corn marks” on the inside or under surface of an equal number of the scutes, resulting from embedded horn-like tissues in the center of those scales. These increase the difficulty in tanning the skins and detract somewhat from the appearance of the finished article, and for this reason the Florida skins are ordinarily the cheapest on the market. The farther south the skins are secured in Florida the greater the number of “corn marks,” and those from the vicinity of Key West are almost valueless on this account.

The Louisiana skins differ from those of Florida in the absence of the “corn marks” above noted, and from both the Florida and Mexican skins in being more pliable and in having the scales more artistically curved and shaped. Consequently they are preferred for such small articles as cardcases and pocketbooks, and usually sell at the highest prices. Skins obtained in Mississippi and Texas are similar to those secured in Louisiana, while those from Georgia and South Carolina are similar to the Florida skins, except that the “corn markings” are not so numerous. All the Florida and Louisiana skins show greater uniformity of coloring, being of a bluish black on the upper surface and a peculiar bluish white on the under side.

In addition to an absence of the characteristics above noted, the Mexican and Central American skins are distinguished by having from 1 to 4 small dots or markings like pin holes near the caudal edge of each scale. The length of the Mexican skins varies greatly in proportion to the width, sometimes equaling that of the Florida skins. Those from the east coast of Mexico are the best, being lighter in color and with neat and attractively shaped scales. The west coast skins are yellowish in color when in the green state, and the scales are larger and not so artistically formed. The Florida and Louisiana skins are almost invariably split down the back, or rather along each side of the back, so as to preserve the under side in a solid piece, but most of the Mexican skins are split down the middle of the abdomen, keeping the back intact, making what is commonly known as “horn alligator.”

On all of these hides the scales or bosses are far apart, without mutual articulation or overlapping. The number of nuchal scutes is usually four large ones, forming a square, separated on the median line, with a pair of small ones on front and another pair behind; there are 17 or 18 transverse series of dorsal scutes, the broadest series containing 8 scutes.

The skins of the alligators or caymans from Brazil, Venezuela, and other South American countries are distinguished by having a much

heavier or more horny covering than the foregoing. The cuticular plates on the back are articulated together, and those on the under surface are more strongly developed than in skins from Mexico or the United States. They are of very little value for leather purposes, owing to the difficulty in properly tanning them.

Of the 280,000 skins used each year in the United States probably 56 per cent are furnished by Mexico and Central America, 22 per cent by Florida, 20 per cent by Louisiana, and the remaining 2 per cent by the other Gulf States. The South American hides do not come on the market in the United States.

The quantity of alligators has greatly decreased in all the Southern States, and it seems only a question of a few years when it will be impossible to obtain the hides at a price that will justify their general employment. Thousands of the animals have been slaughtered merely for sport, no use whatever being made of them. It is estimated that the number in Florida and Louisiana at present is less than 20 per cent of what it was twenty years ago. This decrease is attributed largely to the shooting of them in wanton sport. It has been deemed necessary to legislate for the protection of alligators in some localities, especially in Florida, owing to the rapid multiplication of the cane rat which threatened ruin to many harvests. There is a strong sentiment among the hunters in Florida and Louisiana favorable to a law interdicting the killing of those measuring less than 5 feet in length.

The hide should be removed shortly after the animal is dead, for in the warm climates putrefaction ensues quickly and the value of the hide is depreciated. The operation is begun by cutting through the scaly covering longitudinally from the nose to the end of the tail, along either side of the horny ridge along the back, or in the middle of the under surface of the animal. The former is the usual method in Florida and Louisiana, while the latter is common in Mexico and in Central America. Formerly it was considered difficult to tan the horn-like back properly, but it is now prepared almost as readily as the more pliable portions, and its use is very extensive.

After making the incision above noted, a cut is made running from the longitudinal one to and along the middle of each of the legs on their upper side; or, if the back is to be saved, along the under side, extending almost to the wrists. After cutting around the jaws, the skin is peeled off in a blanket piece. Great care should be exercised to avoid careless cuts in the membrane. A very large percentage of the hides received in the market are badly damaged in this manner. These knife cuts may be scarcely noticeable in the raw skins, but when dressed are so apparent as to render quite valueless the part of the skin in which they are contained, resulting in much waste.

The hide should be salted immediately, the salt being carefully rubbed in all folds and crevices as well as over the entire inner surface of the skin, the use of coarse-grained salt being avoided. The edges along

the abdomen and the parts from the legs are folded over neatly and the entire skin rolled up in a compact bundle and placed in a dry, cool place. Many hides spoil by reason of insufficient or indifferent salting, the grain side becoming so damaged that at best they are suitable only for second-class leather. After thorough curing, the salted hides are placed in boxes, barrels, or bags, and are bartered at the neighboring trading store, whence they are duly shipped to the tanneries.

The price received by the hunters for alligator hides varies from 15 cents to \$2 each, according to the length and condition of the skin, and averages probably about 90 cents. Prime hides 5 feet long, with no cuts, scale slips, or other defects, are worth about 95 cents each, in trade, when the hunter sells them at the country stores, and about \$1.10, cash, at the tanneries. Those measuring 7 feet are worth \$1.55; 6 feet, \$1.12; 4 feet, 52 cents, and 3 feet, 25 cents. Little demand exists for those under 3 feet in length.

#### TANNING ALLIGATOR HIDES.

The principal tanneries in the United States handling alligator hides are situated at Newark, N. J., and New York City, N. Y. Some hides are also prepared in New Orleans, Jacksonville, and in one or two of the tanneries in Massachusetts. Many are also exported to Germany and to England and there tanned. Alligator hides of all lengths, from 2 feet up, are used, but those most in demand are about 7 feet long. Hides over 10 feet in length are not much used, owing not only to their scarcity but to the hardness of the cuticular plates, making them difficult to tan properly and almost valueless for leather purposes, although some over 17 feet long have been prepared.

Formerly only the skin from the underpart and the sides of the animal was used, that from the back being so heavily armored with tough, horny plates and shields as to be of little value, except in case of very small hides. During recent years, however, a demand has existed for "horn" alligator, i. e., leather from the back of the animal, and this demand has been supplied by the importations from Mexico and Central America, a very large percentage of which are cut down the abdomen so as to preserve the back in one piece. The Louisiana and Florida skins are not cut "horn back" because they are not so flexible on the back as the Mexican.

On receipt at the tannery the hides are assorted according to their size, the small, medium, and large being treated separately on account of the difference in texture. With plenty of salt they are placed in a suitable storage room, whence they may be removed as required.

In the process of preparing for tanning, the skins are first immersed in vats of clear water, the smaller ones remaining about two days and the larger ones six days, according to the condition of the membrane. When sufficiently soaked they are immersed in a solution of lime, which should not be so strong as for depilating, and there they remain

from eight to fifteen days, according to their size and the conditions of the water and the temperature. Each day the hides are reeled or removed into a stronger lime solution, great care being observed to avoid injuring the skin during this handling. The wet hides are now placed on a beam and shaved on the flesh side, all fat and superfluous flesh being removed. The bate of bran into which they next pass is made very weak, and in it the hides are gently agitated by means of a wheel, remaining there for ten to fifteen hours.

The hides are next cleaned in a wash-wheel tank and then immersed in a vat of oak bark extract, gambia, or sumac liquor of about 4° strength. Every day or so the liquor is made stronger, increasing to about 20° at the end of eighteen or twenty days. A gentle agitation of the tanning liquor during the last ten or twelve days is very beneficial, as it aids in the more thorough tanning of the skins and prevents the sediment of the liquor from settling in the creases, which is liable to rot the tender portions, especially in case of small hides. The hides are removed from the tanning liquor and suspended in the open air for samming, or partial drying and hardening, so that they may be again shaved on the flesh side to further reduce the thickness. They are returned to the tan liquor, where they are reeled for four or five days, the strength of the liquor being increased from time to time.

On removal from the tan liquor the second time, the hides are scoured with sumac water and selected for the different colors. Many are left in the natural color, yellowish brown. The popular dyed effects are black, and various shades of brown, green, yellow, red, etc. The coloring is done in a bath with wood and aniline dyes, the immersion lasting from ten to sixty minutes. The skins are next stretched out, and in most cases nailed on wide boards or frames for drying, and when thoroughly dry they are "staked" over iron beams or stakes for the purpose of making them flexible and pliable. If intended for shoes they are seasoned before staking, this consisting in stuffing them with tallow, fish oil, etc. But very few alligator hides are now prepared for shoe leather, since they are rather fancy for that purpose. After dressing them on the polishing machine, the skins are measured and stored in the warehouse or delivered to the leather manufacturers.

Although green alligator hides are sold according to length, tanned hides are sold by the width of the leather at the widest part. The price for skins of standard grade ranges from \$1 to \$1.65 per 12 inches of width. Some skins tanned and dyed in a superior manner sell for \$2 or more for single skins 2½ feet in length. As a rule the Louisiana skins fetch the highest prices, and those from Florida the lowest.

Imitation alligator leather is now prepared in large quantities, principally from sheepskins or the buffing from cowhides. These are tanned according to the usual process, and before the skins are finished they are embossed with the characteristic alligator markings by passing them between two rollers.

## SKINS OF SHARKS, RAYS, AND DOG-FISH.

The skins of sharks, rays, and dog-fish are commonly very rough and studded with numerous horny tuberculous markings or protuberances. Some have small imbricated and triangular scale-like tubercles; others unimbricated and nearly rhomboid, which in one species are ranged near each other in quincunxes, or they may be quite square, compact, and comparatively smooth on top. These protuberances are usually firmly fixed to the skin so that they are not easily separated therefrom. They are rough and hard and take a polish almost equal to stone.

These skins, like those of all cartilaginous fishes, are very durable. A peculiarity, in addition to the markings above noted, is the non-porous character. The pores that are everywhere present in the skins of most mammals, which give the natural grain in the tanned leather, are entirely indiscernible in the skins of these fish. The result is to render them almost proof against water absorption. Although by skillful tanning the fibers of seal and other skins may be plumped and the body of the membrane solidified, yet much water exposure loosens up the fiber and gradually permits absorption. Not being of a porous nature, shark skin is naturally free from this defect. But the advantage is also a disadvantage in some respects. The nonporous leather is practically airproof as well as waterproof, and that is a serious defect when its use for footwear is considered. Beyond this, the skins of sharks and similar fishes may be prepared in a very durable, noncracking leather, for which many uses may be found.

Formerly, large quantities of these skins were used for polishing wood, ivory, etc., for which they are excellent, owing to their roughness, hardness, and durability. But the great improvements made in preparing emery compositions and sandpapers have resulted in substituting them almost entirely for polishing purposes. However, a small demand yet exists for shark skins for cabinet-workers' use.

The principal uses made of the skins of sharks and allied fishes at the present time are for covering jewel boxes, desk ornaments, cardcases, sword sheaths, sword grips, and a great variety of small articles for which the tuberculous markings peculiarly adapt them. The demand for these purposes, however, is small and restricted, and each producer has to develop his own market. Comparatively few of these skins are prepared in the United States, and diligent search among the tanneries and leather stores will result in the finding of only a few skins. Many, however, are prepared in France, Turkey, and other countries of southern Europe, and also in China and Japan.

A Parisian manufacturer has made quite a reputation tanning the skin of a species of Malabar shark into morocco, and establishments in Turkey make green leather from the skin of the angel shark found in the Mediterranean Sea. The skin of the diamond shark obtained in the North Sea, and so called because of the shape of the markings or protuberances, is used to cover the sword grips of German officers,

and for this purpose is not surpassed by any material obtainable. Some parts of the skin of certain varieties of sharks when dried and hardened take a polish equal to that of stone, and bear a strong resemblance to the fossil coral porites, and are much used in the manufacture of ornaments and jewelry.

In preparing them for the use of cabinet-makers, shark skins are merely cleaned and not tanned. The hard, dry skins are soaked in lukewarm water for three or four days, shaved on the flesh side to remove surplus flesh and muscular tissue, and then dried. The skins of some species of sharks are so hard that they can not be shaved. The appearance of these skins is improved by bleaching, using chloride of lime and sulphuric acid. The durability of some of them is remarkable, outwearing many sheets of sandpaper of equal area.

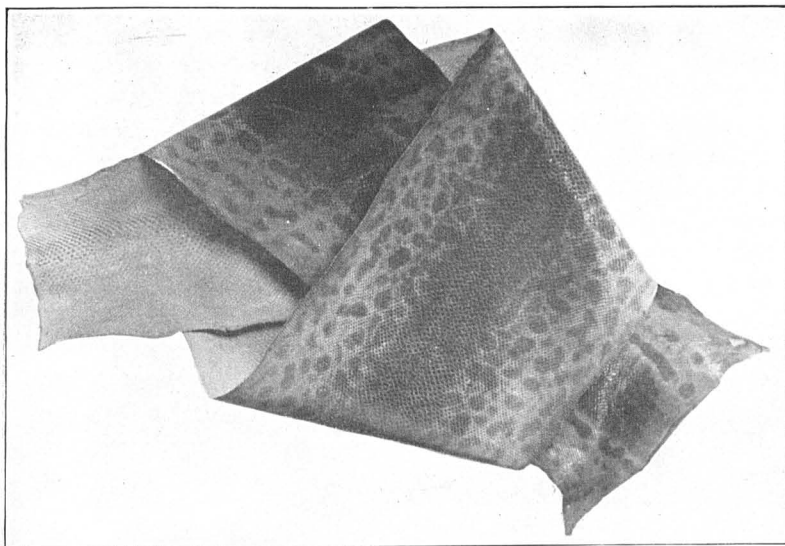
In tanning shark skin for leather or ornamental purposes an alum process is generally employed. Each establishment usually has its own particular method, but the general process is much the same, consisting of a preliminary soaking, liming, bating, and fleshing, and then tanning or preserving in an alum compound. The hard skins are first soaked in water four or five days, and then in limewater for two to six days, depending on the condition of the texture, temperature of water, etc. The skins are washed free of lime and bated in bran water; then shaved on the flesh side to remove all excess of flesh and the like. The alum solution in which they are immersed is composed of a pound of alum and one-fifth pound of salt to a gallon of water. The skins remain in the solution two or three days, with occasional stirring. On removal they are dried and are then ready for manufacturing.

#### STURGEON SKINS.

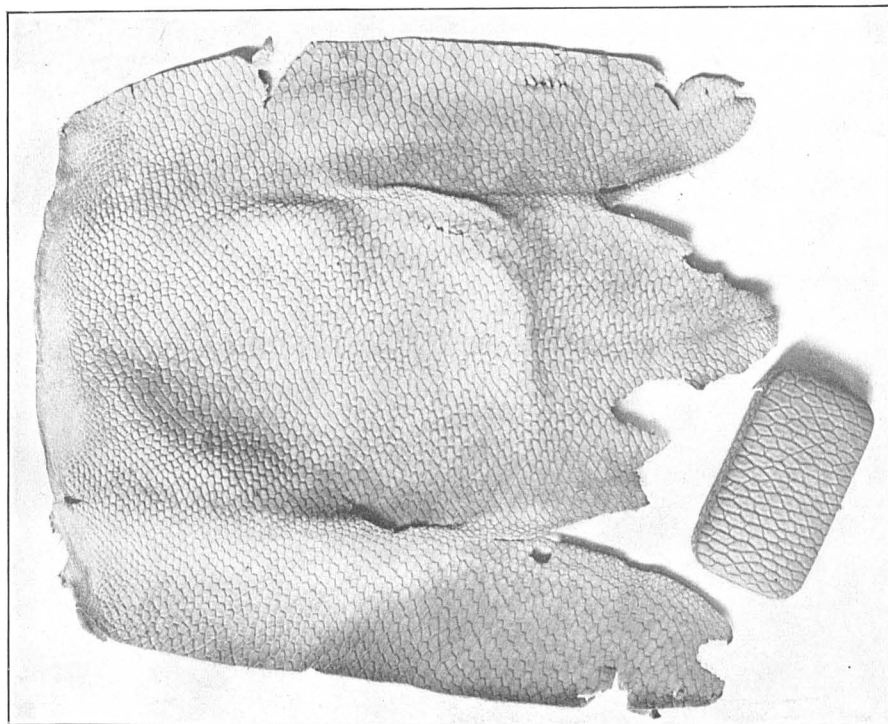
The skins of sturgeon are thick and unwieldy, and at first it might appear impossible to use them for any purpose other than glue or fertilizer stock. They are covered with rows of large prominent horny bosses, leaving space for comparatively little flexible membrane between each row. In the skin of the sturgeon common on the Pacific coast, and especially in the Columbia River, and those common in the Great Lakes and on the Atlantic coast the membrane between the rows of bosses may be tanned into a comparatively flexible and very durable leather, used as laces for mill belts and as durable as the belts themselves. But it is as ornamental leather, employed so as to display the rows of bosses, that sturgeon skins are especially desirable.

Some of these skins are remarkably attractive, particularly those from a species found on the coasts of Europe, which are distinguished by rows of small but very horny bosses, between which are numerous horny protuberances varying in form from a mere dot to beautiful, irregularly shaped bosses nearly half an inch in length. (See plate 35.)

Considerable variation exists in the methods of tanning sturgeon skins. Some varieties may be limed, while others go to pieces in a



SKIN OF WATER SNAKE.



SKIN OF BEAVER TAIL, AND JEWEL BOX COVERED THEREWITH.



lime solution. Alum and bark tannings are generally used, sometimes both together and at others first the alum and then the bark liquors. The method of tanning the skin shown in pl. 35 was as follows: This variety of skins is very oily, and half a gill of oil may be removed from the cavity beneath each of several of the bosses. The skin was soaked in lukewarm water for 2½ days, and then beamed to remove all grease, surplus flesh, and the like. It was then immersed in a solution of 1 pound of alum and 4 ounces of salt to 1 gallon of water, where it remained about four days; then retanned in oak liquors, the strength of the liquor being increased daily. On removal from the tan liquor the skin was dried without any special finishing.

#### BEAVER-TAIL SKINS.

A very characteristic leather seen occasionally in the markets is made from the skin of beaver tails. This is one of the most curiously marked of all of the aquatic leathers, being entirely covered with unimbricated scale-like bosses of irregular outline, usually hexagonal, a few pentagonal, and some quadrangular, the sides in all cases being slightly curved. Each of the bosses is about a third of an inch or less in length. The tail itself is about 10 inches long and 4 or 5 inches wide, and the skin produces a piece of leather about 8 inches square. Probably not over 50 pieces of this leather go on the market in the course of a year, but it might readily be increased to 20,000 or more. It is not especially durable and is used mainly for covering small jewelry boxes and the like.

For the preparation of this leather the skin is removed by cutting an incision along the middle of the under side from the base to the end, and stripping it off in one piece. Sometimes this is done by the trappers, but more frequently the entire tails, preserved in salt, are received at the tanneries. The skin is cleared out by soaking in tepid water for a length of time ranging from two to eight days, according to its condition, and is then limed for two or three days. It is shaved on the flesh side and submitted to a japonica, sumac, or alum tanning solution for about two weeks, shaved again, and cleaned with a sumac or sulphuric acid solution, and then colored if desired.

Very tough and durable leather may be made from the skin covering the body of the beaver. Before the adoption of the present method of cutting hatters' furs the tanneries received many of the skins from which the fur had been clipped, and beaver leather was comparatively common in the markets. Among the Huron Indians, whose wants were largely supplied by the beaver, the skin was much used for belts, bags, thongs, and even tent coverings. At present, however, leather made from beaver skin is comparatively unknown, many dealers in fancy leathers never having seen any. The grain is noticeable, but not especially attractive, no more than that of pig skin.

## WATER-SNAKE SKINS.

The hide fiber of water snakes is scarcely distinguishable from that of alligator, being close and compact. While its thinness and consequent lack of durability render it unsuitable for many purposes, the curious markings and the novelty make it desirable as covering for cardcases and other small articles. For this purpose the skins should be treated in such a manner as to retain their original coloring and appearance as much as possible. The market for these skins is so small that the tanning of them does not amount to an industry at any place, although probably more are prepared in France than in all other countries combined. The quantity prepared in the United States probably does not exceed 100 skins a year on an average.

In preparing these skins bark tanning is not often used, and most of the methods are secret, being the result of individual experiments. Mr. A. M. Villon gives the following process in use in some establishments in France where these skins are prepared. The skins are soaked for a long time in water containing sulphate of zinc to prevent putrefaction. This requires at least ten days. They are fleshed, scraped, washed by hand, and placed in a bath made of water, 1,000 parts; borax, 10; boracic acid, 100; tartaric acid, 25; precipitated alumina, as much as liquid will dissolve. They are left in this for a day, then transferred to bath No. 2, containing water, 1,000 parts; phosphate of zinc, 25; benzoate of aluminum, 25; glycerine, 50; alcohol, 20.

They are left for a day in this solution, then placed in the first bath for a day, then back in the second bath for another day, this being continued for five or six days, when the tanning is usually completed, and the skins are dried, lightly staked, and finished off.

## SKINS OF GAR-FISH OR ARMORED FISH.

Among the very ornamental fish skins seen in jewelry and novelty stores, and used for covering picture frames, cases and boxes of various sorts, is that of the gar-fish or armored fish. The skin of this fish is covered with slightly imbricated and firmly attached layers of rhomboid horny cuticle. It is very hard and may be polished smooth and even, retaining an ivory-like finish. The rows of scale-like cuticle readily separate from the mass, but the rhomboid sections in each row remain firmly attached to each other. In using the skin as many rows of the sections as may be necessary are broken off, and these are bent and shaped as may be required, and firmly glued to the body of the frame or box. When the whole has been applied and thoroughly dried it is polished as desired. These skins are obtained mainly from Louisiana; only a few score are used annually.

In preparing gar-fish skins for tanning they are first soaked in lukewarm water for from two to four days and cleaned of surplus flesh. In some establishments skins of this kind are not limed, owing to

their tendency toward disintegration when put through that process. If limed at all, it must be done very carefully in a weak solution. The skins are then bated in bran water for eight or ten hours and washed in lukewarm water. Next they go into the tan liquor, consisting of a solution of extract of bark, sumac, and alum. This liquor is made somewhat weak at first, and the strength is increased from day to day until the tanning is completed, usually at the end of ten or twelve days. After drying in a flat shape, the skin is ready for use.

Certain tribes of savages have used the horny cuticle of the gar-fish in making breastplates which turn a knife or spear and even a hatchet, although they are readily pierced by bullets. With such a breastplate is usually worn a helmet of the skin of porcupine-fish, which is covered with formidable spines. The helmet serves not only as a protection to the head, but also as a weapon of offense in butting.

#### FROG SKINS.

The skins of frogs and toads are used to a limited extent for leather purposes. Two or three factories in France pay much attention to tanning them, obtaining the raw skins from northern Africa, Brazil, and other tropical regions. Elsewhere than in France comparatively few are tanned. Occasionally tanners in the vicinity of New York City prepare a few frog skins on special orders, but no regular market exists for them, and it would probably be difficult to find 50 prepared skins in all the tanneries and leather establishments of the country. This leather is thin and very pliable. It possesses a delicate but not especially attractive grain, and is used principally for cardcases and other small fancy articles.

#### MISCELLANEOUS FISH SKINS.

Although fish-skin leather can not yet be considered a commercial article, successful experiments have been made in the preparation of good leather from the skins of the cod, cusk, salmon, and other species. At Gloucester, Mass., shoes and gloves have been made from cod and cusk skins. Some very serviceable gloves were made at Berlin in 1880 from the skins of these fish sent from Gloucester. The skin of the wolf-fish (*Anarhichas*) is especially adapted to leather-making, and quantities of it have been placed on the market for cardcases, shopping-bags, and the like. In Egypt fish skins from the Red Sea are made into soles for shoes, and burbot skins have been used in Russia and Siberia to trim dresses. Eel skins have been largely used in Europe for binding books, and to a considerable extent in making whips, and have also been tanned and dyed and made into suspenders. In Tartary they are dried and oiled and used as a substitute for glass in windows.

Along the Yukon River, the Amur River, and in other northern regions as well, the skins of salmon, cod, and other fish are utilized for making various garments. They are taken from the fish in blanket

pieces and the scales carefully removed. The skins are then dried and afterwards worked with a scraper until they become pliable. When finished the membrane resembles kid in appearance and softness, but is almost as tough as parchment. They are frequently dyed brown, red, yellow, and indigo, and some of the garments are highly ornate. They are sewed together with fine thread, made also of fish skin. The American Museum of Natural History in New York has many of these garments, obtained principally from Eastern Siberia.

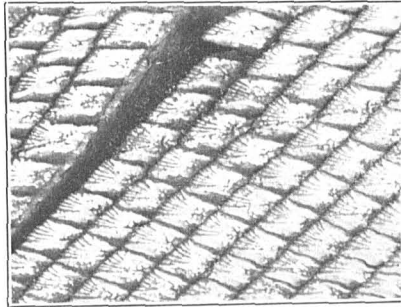
Bags and sacks of various kinds, with capacity varying from a pint to a bushel or two, are made from fish skins by some primitive peoples. Nelson describes one made from salmon skin and intended for storing clothing. It is neatly sewed with sinew thread and ornamented with bands of russet-colored fish skins and white parchment-like skin from the throats of seals. The bottom is oval shaped, with the seam inside. The upper border is hemmed, and through a series of rawhide loops, sewed at intervals around the top, passes a cord of the same material for use as a drawstring in closing the bag. These bags are said to be in common use from the Lower Yukon to the Lower Kuskokwim.

#### INTERNAL MEMBRANOUS TISSUES.

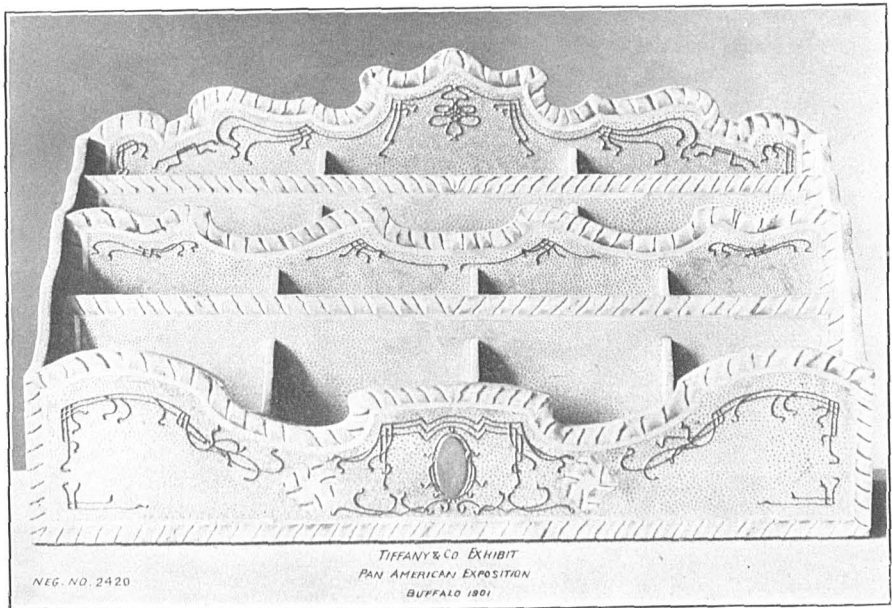
In addition to the skins, certain internal membranous tissues of several aquatic mammals are used for purposes of leather, especially among primitive peoples. Prominent among these are the throat lining, stomach, and intestines of seals, fur-seals, sea-lions, and walrus. The throat linings of all these animals may be made into gloves and similar articles.

The most important use of these membranes is for waterproof overgarments, or kamlaikas, from the intestines of pinnipeds, and especially of the sea-lion. For this purpose the intestines are distended with air, dried, and cut longitudinally, forming a long ribbon 3 or 4 inches wide. A number of these ribbons are neatly sewed together with a close seam in the pattern of a loose shirt, closed behind and before, provided with long sleeves, a hood fastened to the back of the neck for drawing over the head, and drawstrings around the wrists, neck, and bottom. These garments are very durable and are said to possess greater strength than india-rubber garments, are equally water-repellent, and are not affected by grease and oil.

Walrus intestines were used by the Alaskan Eskimo in making sails for their bidarrahs, or family boats. Although its total weight is only about 4 pounds, the sail is remarkably strong and durable.



SECTION OF GAR-FISH SKIN.



LETTER BOX, MOUNTED WITH SHARK SKIN, GAR-FISH SKIN, AND MOTHER-OF-PEARL.